# ELECTRICAL INDUSTRY OF BURMA/MYANMAR ON-LINE COMPENDIUM

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# GENERAL INTRODUCTION

The compendium consists of approximately **two hundred key articles** about Burma/Myanmar's electrical industry. This introduction provides general information on the organization of the compendium and tips on **navigating** around the various sections.

'Electrical industry' has been defined in a broad sense. With a few exceptions, the articles in the compendium are of a non-technical nature. They cover not only the side of the industry that includes the generation, transmission and distribution of electric power in Burma/Myanmar but also aspects concerned with the use of electricity, the production of electrical and electronic goods, support industries, government regulation of the industry and the increasing intervention of outside players in Burma/Myanmar's electrical industry.

The articles have been listed under thirteen subheadings in the **topical index**. (<u>TI</u>). **Key articles** under the subheadings provide an introduction to subjects of importance under each classification. For instance, each of the major hydropower generating stations is covered by a separate article in the domestic hydropower section. (<u>HS</u>) Additional information about the subject of the article is added immediately below the key article and **cross references** to related articles are provided.

The compendium is **arranged chronologically** according to the date of publication of the key articles with the most recent articles appearing at the top of the compendium. The chronological index (<u>CI</u>) provides a complete listing of the titles of each of key articles in order of publication. The original headline or title of many of the key articles has been altered to reflect their content more accurately or the reason for inclusion in the compendium.

Information about some topics connected with Burma/Myanmar's electrical industry is of a more general nature or of a kind not appropriately listed under a key article. These articles are included as separate **appendices or annexes**. (AP) A key to commonly used **abbreviations, acronyms and measurements** in the compendium is also included. (AA)

It is planned to update the compendium frequently. To find the most recently published key articles, use the link to the **article head**. (AH) Newly published material will also be included as **updates** to older key articles. Articles listed as 'under preparation' will be added from time to time as well as introductions for the topical indexes.

The articles used in the compendium have been **freely edited and revised** to make their meaning clearer. Many have also been condensed and shortened. Users are urged to consult the originals using the URLs which are listed in the headings of the vast majority of the articles reproduced in the compendium.

The articles in the compendium represent many different viewpoints. No attempt has been made to reconcile **contradictory statements and data** presented in the articles, but charts in the appendices, clearly identified with the compendium name, represent a 'best guess' with regard to conflicts in the data presented on various projects.

No attempt has been made to standardize the spelling of the versions of international English used in the originals of the articles reproduced in the compendium. The same applies to the wide variation in the spelling of Burmese place names, although in some cases alternative spellings are included in parentheses.

Foreign currency exchange rates noted are as of the original date of publication of the articles. A listing of the average annual US\$ exchange rate for the kyat over the period covered by most of the articles in the compendium can be found in the section dealing with measurements. (KTR)

Comments, corrections, suggested additions and inquiries are welcomed by the compiler. <u>excelsus@shaw.ca</u>

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# CONSUMER CONCERNS AND POWER SHORTAGES

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This section of the compendium deals with major state-sponsored hydropower projects in Burma/ Myanmar that are operating or being developed primarily to provide electricity for use inside the country. In the Burma/ Myanmar context a 'major' project is considered to be one that generates 10 megawatts or more. Since the 1960s all major hydropower projects in the country were undertaken by the state for use within the country, but two new trends have emerged in recent years. On the one hand, plans have been announced to harness the waters of important rivers near border areas of the country in order to export electricity to China, Thailand and India. These are covered in the section dealing with the export of electricity. (EP) More recently, independent producers have completed or come up with plans for small but significant hydropower projects for internal comsumption of the electricity produced. These are covered in the section dealing with independent power producers. (IP)

Up to the present four large hydroelectric projects have emerged in Burma Myanmar. The first was the the still unfinished Lawpita plant and associated dams in Kayah state, begun in the mid-fifties and added to on various occasions until it reached its present operating capacity of 192 MW in 1992. The text article (LP) covers a wide range of material available on the Lawpita stations. The second, the 280-MW Paunglaung dam with its underground station, (PL) was begun in 1996 but not completed until 2005. Work on the Yeywa project (790 MW) on the Myitnge river south-east of Mandalay (YY) was begun in 2000 and is scheduled for completion in late 2009. The fourth major facility on the Shweli (Mao) river in northern Shan state has been capped at 600 MW (SL). Power production, now scheduled to start up in 2008-09, was originally slated for domestic consumption in Burma/Myanmar, but a recent news report indicated that as much as 85pc may be exported to neighbouring Yunnan province in the PRC.

During the eighties the Kinda (56 MW) (KD) and Sedawgyi (25 MW) (SD) multi-purpose dam projects with both irrigation and hydropower components were undertaken in Mandalay division with multilateral financing. These developments spawned a whole series of medium-sized multi-purpose dam projects in the nineties and since the beginning of the present decade in rivers of the Sittaung basin. The largest of these has been the Paunglaung dam (PL) near Toungoo. Other functioning multi-purpose dams and power plants in the Sittaung basin include the 25-MW Yenwe creek (YW) plant in Kyaukdaga township and the 20-MW Zaungtu (ZT) plant on the upper Bago river in Bago township, while the 60-MW Kunchaung (KN), the 30-MW Khabaung creek (KB), the 40-MW Pyu creek (PU) and the 75-MW Shwegyin creek (SG) projects are scheduled for completion before 2010. West of the Ayeyawaddy, the multi-purpose Monechaung dam and power house (MN) that has a 75-MW capacity became operational in 2004. In the upper reaches of the southward flowing Mu River in Sagaing division, the long-planned Thaphanseik dam (TP) to control the waters used in the extensive irrigation system of the Mu was completed in 2001, was followed a year later by the commissioning of a power house capable of generating 30 MW.

One trend that has become increasingly evident over the last few years is the development of secondary support dams on rivers that have already been harnessed for hydropower and irrigation purposes. The need for support dams of this type is clearly put in the key article for Upper Sedawgyi project (<u>SD</u>). The first of these was developed in the nineties on the Zawgyi (<u>ZG</u>) in Lawksawk township in western Shan state where an 18-MW run-of-the-river hydro station was opened in 1998, followed by the construction of a dam and a second hydro power station about 10 miles upstream on the Zawgyi in 2000. The long –delayed opening of the Paunglaung dam and power station in 2005 was accompanied by an announcement that work was to begin immediately on support dams on the Upper Paunglaung and Nancho (<u>UPN</u>) rivers because the new facility would not be able to function at at full capacity even in the rainy season unless other dams were built

in the watershed above it. Work is also proceeding on similar support dams for the Sedawgyi (SD), Monechaung (UB) and the Kengtawng Falls (KF) power plants. In mid-2007, it was announced that plans were underway for a support dam for the 790-MW Yeywa power dam on the Myitnge at Pyaungsho (PS) in Nawngkhio township. Construction has also begun on multi-purpose dams on the lower Zawgyi (MG) and lower Mone (KK) which will be supported by already completed dams on the upper stretches of these two rivers.

Work has begun on diversion tunnels or site preparation for several other projects in more isolated areas of the country These include the Pyintha (40 MW) and Manipur (380 MW) (PM) dams in the Myittha river valley near the border of Chin state and the Thahtay Creek (102 MW) (TT) and Ann (15 MW) dams in southern Arakan state. Other projects for domestic consumption under study or survey are the 20-MW Thakyet river station (TK) in Taninthayi township, the 25-MW Daying creek station (DY) in Hlaingbwe township, the 660-MW Shwesayay dam (SY) in Budalin township on the Chindwin and the long-postponed Bilin river (280 MW) (BL) dam in Mon state.

The outdated but readily available set of US Army topographic maps of Burma (1:250.000) has been referenced to pinpoint the location of each of the projects and hydropower stations for which an entry is provided. <u>http://www.lib.utexas.edu/maps/ams/burma/</u>. Dams that were established before 2002 are clearly visible on Google Earth and are so noted.

Not surprisingly, most of the attention in the official media is devoted to describing visits by senior officials of the military junta to dam construction projects which are carried out by or under the supervision of state corporations, while very little information is provided about the generating equipment that is provided for these facilities. This is now almost entirely contracted to PRC firms which also undertake the installation of the equipment. The main construction work at the large, recently completed Paunglaung project, and the still uncompleted Yeywa and Shweli No 1 diversion and dam facilities and power houses has also been undertaken almost entirely by PRC companies and financed through soft loans ftrom official and private sources in the PRC.

Feasibility studies and project design for the following hydropower projects have been or are being carried out by Kansai Electric Power Co of Japan: Yenwe, Khabaung, Pyuchaung, Shwegyin, Bawgata, Shwesayay, Nancho. Colenco Power Engineering Consultants of Switzerland is under contract for studies and design of the Yeywa, Htamanthi, Upper Paunghung and Pyaunghylo projects.

With the exception of the Lawpita hydropower facilities, very little information is available about the maintenance of dams, diversion facilities and generating equipment once they are put into operation. Apparently, little has been done to exhaustively evaluate the economic rate of return and social and ecological impacts of major hydropower projects except for the Kinda project (KD) which was studied by an ADB team in 2001. Unfortunately, even this review was limited in scope when the study team was prevented from visiting the project area in person.

# MAJOR THERMAL STATIONS AND SUPPLY NETWORKS

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GAS IN <u>SHORT SUPPLY</u> TO MEET DEMAND FOR ELECTRICITY (MT: 17/09/07) <u>MORE GAS NEEDED</u> FOR 24/7 POWER IN YANGON (MT: 02/0707) <u>YWAMA</u> POWER STATION DEPENDENT ON GAS DISTRIBUTION SYSTEM (NLM: 01/02/07) <u>ARAKAN OFFSHORE</u> GAS RESERVED TO MEET DEMAND IN MYANMAR (PTI: 19/01/07) <u>THAKETA</u> POWER STATION IMPORTANT DISTRIBUTION HUB (NLM: 13/1206) <u>INVENTORY</u> OF GENERATING PLANTS, TRANSMISSION GRIDS, PROJECTS (NLM: 30/07/06) <u>COAL-FIRED TIGYIT</u> PLANT NEARS COMPLETION (MT: 25/04/05) <u>MAWLAMYAING POWER STATION</u> OPERATING AT REDUCED CAPACITY (NLM: 27/10/02) <u>PIPELINE TO SOLVE</u> ELECTRICITY SHORTAGES (MT: 16/09/02) GAS-FIRED ELECTRIC POWER PLANT AT <u>THATON</u> UPGRADED (MT: 01/10/01) CHRONOLOGY OF THE CANCELED <u>LIGNITE POWER PLANT</u> AT TACHILEK (NLM: 10/05/00) COMBINED CYCLE POWER PLANT IN AHLON TOWNSHIP OPENED (MIC: 15/09/99) COMBINED CYCLE POWER PLANT LAUNCHED AT <u>HLAWGA</u> (Reuters: 02/05/99) <u>YADANA GAS</u> WILL FIRE ELECTRIC POWER PLANTS IN MYANMAR (MP: Sept 1995) GAS-FIRED POWER <u>PLANTS OF THE AYEYAWADDY VALLEY</u> NOTES (Appendix 4) <u>DIESEL-OPERATED GENERATING PLANTS</u> IN MYANMAR: NOTES (Appendix 5) USE OF <u>YADANA GAS FOR POWER GENERATION</u> AND INDUSTRY: CHRONOLOGY (Appendix 6)

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NATIONAL HIGH-VOLTAGEGRID SYSTEM MAPS (Annex 1)

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### Article Head

### PATHI HYDROPOWER PLANT INAUGURATED IN TOUNGOO TOWNSHIP

NLM, 03/01/08. http://mission.itu.ch/MISSIONS/Myanmar/08nlm/n080103.htm

The inauguration of Pathi hydropower plant of the Hydropower Generation Enterprise of EPM No 1 was held at the plant in Toungoo township this morning. Southern Commander Ko Ko said the plant near Ngwetaunglay Village, 10 miles from Toungoo, will use water stored behind Pathi Dam. The dam was completed in February 1997 and has been supplying irrigation water to 1,500 acres of farmland in Toungoo township since then. Now the EPM No 1 had fulfilled the demand for electricity in the region by implementing the second phase of the project which will supply power to Thandaunggyi and Thandaungthit in Kayin state through a 33 KV power line. Since Pathi creek originates in Kayin state it is fitting that electricity provided by power plant in Bago division should be used there as a sign of the friendship and amity of the national races. The power plant is equipped with two 1-megawatt generators.

Other operating hydel power stations of EPM No 1 in the Si ttaung valley include the 20-MW Zaungtu plant in Bago township and the 25-MW Yenwe plant in Kyauktaga township. Also under construction in the Sittaung watershed are the 30-MW Khapaung project in Ottwin township, the 140-MW Thaukyekhat-2 project in Toungoo township, the 40-MW Pyuchaung project in Pyu township, the 60-MW Kunchaung project in Pyu township and the 75-MW Shwegyin project in Nyaunglebin township. It is expected that the Khabaung station will be inaugurated in the near future. The Kunchaung and Thaukyekhat-2 hydropower projects have been designed to supply irrigatation water to farmland.

EPM No 1 Zaw Min said that the Pathi hydropower plant was the thirteenth operating power plant of the Hydropower Generation Enterprise. The HPGE had begun work on the plant in December 2006 and conducted test-runs in December 2007. It will generate 8 million kWh annually. The Pathi hydropower plant is the 46th facility of its kind in the entire country, and the fourth operating station in Bago division and the Sittoung valley. Of the 15 hydropower projects currently under construction by EPM No 1, seven are scheduled for completion by 2010: the 54-MW Kengtawng project, the 600-MW Shweli No 1 project, the 790-MW Yeywa project, the 30-MW Khabaung project, the 60-MW Kunchaung project, the 40-MW Pyuchaung project and the 75-MW Shwegyin project.

Afterwards, Managing Director Kyi Tha of the HPGE formally unveiled the signboard of the power plant and the commander launched generator No 1 using the controls on a computer system that automatically regulates operation of the power station. It will distribute power to Thandaung township and any surplus to the Toungoo region.

### Additional references:

NLM, 20/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070220.htm

EPM No 1 Zaw Min, accompanied by D-G of HPID Aung Koe Shwe, inspects the Pathi hydropower project, 10 miles north-east of Toungoo. They are briefed by Managing Director Kyi Tha of the Hydro-electric Power Enterprise on construction building of the power station. Two [single-] megawatt generators to be installed at the station will produce an average 8 million kWh per year.

NLM, 30/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061230.htm

EPM No 1 Zaw Min inspects the Pathi hydel power project and assists in the construction work. Two 1-MW generators will be installed at in the plant which is expected to generate 8 million kWh per year. The power generated will be sent to the national grid. Pathi hydel power project is located 10 miles north-east of Toungoo.

Monywa Copper Mine Electric Power Plant Project by BOL Scheme, ECFA -- Japan, [late 2004]. http://www.ecfa.or.jp/japanese/act-pf/H16/minkatsu\_Myanmar\_Eng.pdf [doc, p.18]

According to a long range plan for development of hydropower resources developed in 2001 by the Planning Dept of the Ministry of Electric Power, two single megawatt generators were to be installed at the Pathi dam which was expacted to produce 10 million kWh annually. Procurement of the turbine generator sets was said to be underway. Completion was scheduled for 2003.

# NLM, 09/01/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030109.htm

Assistant Director of Toungoo District ID Zaw Htut Oo reports data related to the Pathi dam, canals and hydro-electric power project to the Southern Commander. It is irrigating 1,200 acres of farmlands. Deputy Director of HPD No 3 Construction Group Khin Maung Lat reports on construction of the building which will house the two MW turbines.

Website of the Irrigation Dept of the A&I Ministry. <u>http://www.irrigation.gov.mm/works/1988.html</u> Pathi dam, 90 ft high; 2500 ft long; catchment area, 21.5 sq mi; average annual flow of Pathi creek. 65,000 acre feet; dam storage capacity, 30,500 acre feet, construction costs, K 490.53 million; begun in 1993-94, completed in 1996-97; dam opened on 28/02/97.

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# DAM QUARTET ON MONE CREEK HEADED BY UPPER BUYWA PROJECT

NLM, 18/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071218.htm

Generals Than Shwe and Shwe Mann and party inspected Ahtet Buywa dam project on Mone creek where they were briefed by A&IM Htay Oo and officials of the Irrigation Dept on the Ahtet Buywa, Buywa and Kyee-ohn Kyee-wa dam projects on Mone creek.

The Ahtet Buywa dam is on the upper reaches of Mone creek near Thukaungkyin village in Sedoktara township. It will generate electricity and supply water to Buywa [20° 39' N, 94° 10' E]. This will increase the water available to the Mone creek and the Kyee-ohn Kyee-wa dams. As the final step in the process Mezali diversion weir below the Kyee-ohn Kyee-wa dam will be able to irrigate 100,000 acres of farmland in all seasons.

Industry No 1 Minister Aung Thaung and EPM No 1 Zaw Min reported on the supply of cement and heavy machinery for the projects.

Gen Than Shwe said the projects were aimed at providing an adequate supply of power to industries that will take shape over the next few years and efforts should be made to complete them earlier than scheduled. The engineers and technicians working on these projects had already gained much experience and should be able to be innovative in the fields of irrigation and hydro-electricity. The important thing was for them to have confidence in their work and stand on their own feet in the long run.

Afterwards, the visitors looked into the construction of the hydro-electric and diversion tunnels and the site for the main dam. The Ahtet Buywa dam will be gravel-filled. It will be 451 feet high and 3,300 feet long. It will generate 150 MW, while it is estimated trhat the Buywa dam below it on Mone creek is will generate 42 MW. Taken together all four damson Mon creek will be able to generate 341 MW.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-15: Myohaung Buywa dam near Buywa village [20° 39' N, 94° 10' E], grid square reference: 12\1, 23\3 Upper Buywa dam near Thukaungkyin village [co-ordinates n.a.], grid square reference: 12\3, 23\2 [?] <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-15.jpg</u>

### Additional references

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

Buywa dam and power station with a planned capacity of 41 MW is under implementation by the ID. It will generate 195 million kWh annually when it comes on line in 2008. The Upper Buywa dam will be 137.5 m [451ft] high and the power station with a planned capacity of 150 MW is expected to generate 534 million kWh annually. It is currently in the planning stage and will be carried out by the ID and HPID.

NLM, 23/09/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060923.htm

Bu Ywa dam project will be launched on the Mone Creek near Bu Village, 13 miles upstream Mone creek dam in Sedoktara township, and Ahtet Bu Ywa dam project on the same creek near Thukaungkyin village, about 25 miles upstream Mone creek dam.

See below: <u>'Mon creek</u> multi-purpose dam and power station opened' (NLM: 30/12/04) '<u>Kyee-ohn Kyee-wa</u> multi-purpose dam on Mon creek underway' (NLM: 01/0703)

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### PYIN-U-LWIN HYDROPOWER PROJECTS SPEEDED UP

NLM, 30/11/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071130.htm

D-G Aung Koe Shwe of HPID and Pres Feng Ke of YMEC of the PRC for the purchase of materials needed for the implementation of Zawgyi No 1, Dattawgyaing and Wetwun hydropower projects. The equipment purchased will allow the projects to proceed on time.

### Additional references

See below: <u>'Yadanabon cyber</u> city slated for soft opening in September (MT: 24/09/07)

NLM, 22/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071222.htm

During a tour of the Pyin Oo Lwin area A&IM Htay Oo and CPTM Thein Zaw visited the Dokwin Agriculture Farm of the Myanma Agriculture Service where herbal orchids are grown in accordance with the guidance of the Head of State. Afterwards, the ministers inspected a small hydel power project on a irrigation canal of Dokwin Dam that can produce 5 kW. Generators are also equipped on irrigation canals to produce hydro power on a small scale.

NLM, 06/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061106.htm

EPM No 1 Zaw Min received Chairman Feng Ke of YMEC at Wharton International Hotel in Nanning on 29 October. They discussed matters related to Shweli No 1, Upper Paunglaung, Nancho, Wetwun, Dattawgyaing and Zawgyi No 1 hydel power plants.

NLM, 15/04/06. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040415.htm

Gen Than Shwe visits Wetwun hydroelectric power station and gives guidance on extending its capacity and on harnessing Dattawchai waterfalls to produce electricity. To further meet the demand for electric power in Pyin Oo Lwin he wants consideration given to building other small hydropower stations in the area by utilizing the flow of water at projects such as the Hsinlan dam which are used for drinking water and irrigation purposes.

NLM, 04/09/02. <u>http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020904.htm#1</u> Officials report on the maintenance of the turbines at the Wetwon hydropower station. Nos 1 and 2 turbines at station were installed in 1933 and 1939 respectively. The turbines each generate 255 kW.

NLM, 09/03/01. <u>http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010307.htm</u> EPM Tin Htut briefs Gen Maung Aye on the repair of Wetwun hydroelectric power Station in Pyin Oo Lwin township.

www.allmyanmar.com/new%20allmyanmar.com/pin%20oo%20lwin%20%20maymyo%20Myanmar%20Burm a.htm

The best known waterfalls in the Pyin-oo-Lwin area are three picturesque falls: DattawGyaink (Hollow of the Sacred Relic), Wetwun Falls and Pwegauk Falls (better known as B.E. Falls as it is near the Depot of Burma Engineer Corps).

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### FOREIGN CONSULTANTS FOR PRIVATE HYDROPROJECTS

Kyaw Thu, Myanmar Times, 26/11/07. http://www.mmtimes.com/no394/b005.htm

Two private Myanmar companies developing hydropower projects are planning to hire foreign consultant companies, said an energy expert close to one of the companies on November 20. Asia World and Olympic Construction are the first two private, local firms to have been entrusted to build hydropower projects in Myanmar.

The expert said Olympic Construction is considering Swiss firm Colenco Power Engineering, Japanese Newjec Inc, Chinese Sinohydro Corp or another unnamed Chinese company to assist with its project. Of these four, Colenco Power Engineering is already consulting on the Yeywa project in Mandalay Division; Sinohydro is involved in the construction of the US\$1 billion Hutgyi project on the Thanlwin River; and Newjec Inc has worked on the Baluchaung 1, 2, 3 and Hutgyi projects since 1984.

However, he refused to say which company – or companies – Asia World is planning to hire, nor the value of any such deal, although he did say what its role would be. "The foreign consultancy company will help us to draw-up a project design and monitor the overall construction," he said.

Asia World is slated to build the Thaukyegeat hydropower project in Bago Division, which is expected to produce some 140 megawatts (MW) of electricity, while Olympic Construction will build the Baluchaung 3 project in Kayah State. This project is hoped to deliver a further 48MW. "The two companies have been running feasibility studies and preparing to submit a proposal to the Myanmar Investment Committee," he said.

When finished, the electricity generated by the two projects will be sold to the Ministry of Electric Power 2 for distribution through the national grid.

# Additional references

See below: <u>'Invitation for foreign investment</u> in electric power sector' (Gov't website, circa 1998) <u>Thaukyekhat hydel power project</u>: Notes (Appendix 16)

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# FULL RESERVOIRS TO BOOST HYDROPOWER

Kyaw Thu, Myanmar Times, 19/11/07. http://www.mmtimes.com/no393/n006.htm

The production of electricity from hydropower is expected to be higher during the upcoming dry season than in previous years, an official from the EPM No 1 said earlier this month. He said reservoirs at hydropower projects throughout the country were holding more water than usual as a result of steady rains that lasted until the end of October, a month later than normal. "In previous years the production of electricity from hydropower projects dropped about 50pc during the dry season but this year we expect it to drop only about 30pc," he said.

Because hydropower is the source of about 50pc Myanmar's electricity, declines in production during the dry season can cause power outages in Yangon and other cities. Aside from hydropower, 40pc of the country's electricity comes from natural gas, 9pc from steam and 1pc from diesel engines. During the dry season the government partially compensates for the drop in electricity from hydropower by increasing the percentage from natural gas.

According to the Yangon City Electricity Supply Board, about 11,284 MW of electricity are required from hydropower and 8013 MW from natural gas to supply 24-hour electricity to the public and to industries in Yangon.

The ministry official said problems with electricity shortfalls will be solved when the 790-MW Yeywa hydropower project in Mandalay Division is finished in December 2009. "When Yeywa is finished we will be able to meet the country's electricity needs," he said. Construction on the Yeywa project, located on the Myitnge River about 50 kilometres southeast of Mandalay, started in 2001. The total cost is expected to reach K15 billion.

# Additional references

See below: Gas in <u>short supply</u> to meet demand for electricity (MT: 17/09/07) <u>'Full power</u> supply promised for July' (MT: 04/06/07) <u>'Low water</u> levels hinder power distribution (MT: 02/04/07)

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#### CHINESE FIRM TAKES 51% INTEREST IN TASANG HYDROPOWER PROJECT

Kyaw Thu, Myanmar Times, 19/11/07. http://www.mmtimes.com/no393/b004.htm

A Chinese energy firm has picked up a 51pc stake in the US\$6-billion Tasang hydropower project planned for the Thanlwin River, an official from the Ministry of Electric Power 1 said on November 13. China Gezhouba Water and Power Group Co Ltd took up the majority holding earlier this month after Thailand's MDX Group Co., Ltd told the Myanmar government it needed to reduce its stake due to financial difficulties, the official said. The design of the 7110-MW plant in eastern Shan State, which is scheduled for completion in 2022 and represents the single largest investment ever in Myanmar, has not be changed, the official said.

Under the new arrangement, MDX Group holds a 24pc stake and Myanmar's Department of Hydropower Implementation holds a 25pc stake, he said, adding that the EPM No 1, Colonel Zaw Min, informed Thai ambassador Bansarn Bunnang of the change on November 8 in Nay Pyi Taw.

"The MDX Group have been implementing the project for a decade but there has been no significant progress so far. So the government handed it over to the Chinese consortium," the official said in a telephone interview. He added that the government had been annoyed at the slow pace of development and had decided to diversify the stake holdings because it was less confident about MDX Group's ability to proceed with the project.

A Yangon-based representative of MDX Group, U Win Moe, told The Myanmar Times last month that the Thai company was not facing any financial difficulties and had halted work at the Tasang site due to challenges posed by the wet season. Work at the site, some 75km from the Thai border, had since resumed, he said. U Win Moe was unavailable for comment last week.

MDX signed a joint venture agreement with the DHP in April 2006 to develop the project. The department was broken into three new departments the following month when the EPM was split in two.

Work on the Tasang project started on March 30 this year. Thailand had been expected to purchase most of the annual production of 35,400 kWh of electricity generated by the plant, although it is now uncertain who the buyer will be, the ministry official said last week. Officials have said construction would take place over 15 years and create 15,000 jobs.

Meanwhile, Ministry of Electric Power 1 officials were due to discuss the Hutgyi power project with its stakeholders in Nay Pyi Taw on November 16. The Hutgyi dam is a \$1-billion, 1200mw project planned for the Thanlwin River downstream from the Tasang in Kayin State. It is a joint venture project involving the Ministry of Electric Power 1, the Electricity Generating Authority of Thailand and China's Sinohydro Corp.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-14: Mong Pan Tasang dam, near Wan Kawpa [20° 31' N, 98° 38' E], grid square reference: 11\8, 28\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-14.jpg</u> See also the map at the Shanland website: <u>http://www.shanland.org/environment/2004/Dam on the Salween definitely on.htm</u>

### Additional references

Nation (Bangkok), 21/11/07. http://nationmultimedia.com/2007/11/21/business/business\_30056827.php

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MDX has declined to confirm a report that a Chinese power company has replaced it as a majority stakeholder in the Tasang dam project in eastern Shan state by taking up a 51-pc share in the project. According to a report published in the Myanmar Times on 19/11/07 the Thai company's stake had been reduced to 24pc. An MDX official also told the AFP news agency that it was considering reducing its stake in the controversial hydropower project, the biggest in the military-run country. "We are looking for a business partner to go ahead with the project, and we are considering reducing our stake," the official said. MDX has reportedly invested about US\$6 billion (Bt203 billion) in the project. The Thai company has held an 85-percent stake in the project, with the rest owned by Burma's military government.

See below: 'EGAT <u>agreed only</u> to study feasibility of Salween project' (BKKP: 10/06/07) 'Myanmar, Thailand begin work on <u>controversial Tasang</u> dam' (AFP: 05/04/07)

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### FISHERIES FACTORIES TO GET 24-HOUR POWER "BY MARCH"

Sann Oo, Myanmar Times, 22/10/07. http://mmtimes.com/no389/b006.htm

Work on getting exclusive electricity supplies to fisheries factories ahead of the dry months following monsoon should be fully completed by March next year, the director general of the Dept of Fisheries, U Khin Maung Aye, told a meeting of fishery sector entrepreneurs. Factories were encouraged in June to sign on to the scheme in the hope it would provide them with 24-hour power.

In all, 68 out of 85 eligible factories agreed to the plan, which they must finance themselves by paying for necessary substations and connecting power lines. "We are waiting for the parts we need from abroad and we expect that all work will be finished within two or three months," said factory owner Tun Aye, referring specifically to his Shwe Yamon Company's processing plant at the Hlaingthaya IZ. The scheme, being organised by the Dept of Fisheries in conjunction with the YESB, is aimed at keeping plants operating so they can increase exports and earn more foreign currency for Myanmar.

Daw Toe Nandar Tin, owner of the Anawar Dawi fishery processing plant in Dawbon township, said it would cost K6-10 million to set up the new electricity connection to her factory. "According to the distance between the main power line and my factory, the initial calculations show that amount," she said at a special meeting held to discuss the project.

Fish Farmers Association chairman Than Lwin said the scheme should be expanded to cover ice factories. "Ice factories should also get electricity because ice plays a crucial role in the fishery sector," he said. "If they can get more electricity, production costs can be reduced for ice and that would eventually reduce costs for the fishery sector too." Many factories have welcomed the move to supply more electricity as it cuts back on the need to run costly diesel generators, which U Than Lwin said doubled ice production costs.

Although the initial plan included providing the nine fish-feed factories in Yangon with 24-hour electricity, the YESB said it was now considering reducing this, possibly to 18 hours a day. "Processing factories and cold storage facilities need electricity around the clock because of the nature of their work, but for factories producing fish feed, I think they would be okay if they got power for 18 hours a day," an official from YESB told the Myanmar Times.

### Additional references

See below: <u>'Fisheries factories</u> offered 24-hour power' (MT: 09/07/07) <u>'Business leaders</u> to pay for new power stations' (MT: 17/07/06)

### SMALL ELECTRIC POWER PLANTS OPENED IN 2007

Maung Linn Yaung, NLM, 11/10/07. <u>http://myanmargeneva.org/NLM2007/eng/10oct/n071011.pdf</u> [document p 11]

**Compiler's Note**: This article has information about a number of small electric power stations opened in rural Myanmar during the first half of 2007. The information has been included at the appropriate places in Appendix 10: 'Electricity generation in Myanmar by <u>state and division</u>'. Photos of the exteriors of the Zaungtu station and Biluchaung stations accompany the text in the print edition of NLM.

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### VILLAGE RICE HUSK POWER PLANT WILL SERVE AS RESEARCH CENTRE

Kyaw Thu, Myanmar Times, 24/09/07. http://www.mmtimes.com/no385/n010.htm

A team of engineers from Myanmar and Thailand has started a project to set up a rice-husk power plant that will bring electricity to Taguntaing village in Twante township, Yangon Division, U Win Khine, the general secretary of the Myanmar Engineering Society, said last week. The 8-million-baht (US\$ 251,000) project – which will result in the construction and installation of a 30-kilowatt rice-husk power plant in the village – is expected to be finished in December. "The aim is to develop the socio-economic conditions of the village," he said.

The Study and Demonstration of Biomass Gasification for Electricity Project, funded by a grant from Thailand, will not only bring electricity to the village but will also help facilitate the development of research and technological specifications for rice-husk power plants, U Win Khine said. "Even though there are more than 500 rice-husk power plants in the country we have no standardised technical or equipment specifications that can guide us in their construction," he said. "This project will help us develop these standards for future projects."

The project is being conducted with help from researchers and equipment from Chiang Mai University. "They have also invited two local technical engineers involved in the project to attend the university for postgraduate degrees. They will conduct research during the project and write theses about it," U Win Khine said.

He said the power plant would be built in Hlaingthaya IZ in Yangon and moved to the project site when it is finished. "After the project is done a committee will be formed to manage the power plant," U Win Khine said. He added that MES has recommended that the university install power-saving light bulbs in Taguntaing. "If they use power-saving bubs, an additional 100 households can get electricity," he said.

# Additional references

See below: 'Plans for <u>\$7-million-dollar</u> rice-husk power plant edge forward (MT: 27/08/07) The list at the conclusion of this article provides links to other biogas generation articles in the compendium.

### YADANABON CYBER CITY SLATED FOR SOFT OPENING IN SEPTEMBER

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Ye Kaung Myint Maung, Myanmar Times, 24/09/07. http://mmtimes.com/no385/n001.htm

The first phase of the multi-billion-kyat Yadanabon Cyber City being developed near Pyin Oo Lwin in Mandalay division will be ready for a soft opening later this month, a senior official said last week. U Zaw Min Oo, the chief engineer at the Information and Technology Dept of MPT in Nay Pyi Taw, said the soft opening would take place soon after September 25, the deadline for completing construction and infrastructure work.

An MPT report has estimated the cost of the first phase of the cyber city project, involving a three-storey teleport building, three incubation centres and roads, at about K3.8 billion. The teleport building has nearly 82,000 sq ft of floor space, the incubation centres about 23,000 sq ft each, while the cyber city has 12 miles of roads, being built to a width of 24 feet. The soft opening is expected to be attended by national leaders, ambassadors from ASEAN countries and other countries involved in the development of the project, guests and the media. "Yadanabon Cyber City will be a new source of national pride," said U Zaw Min Oo, adding

U Zaw Min Oo said approval had been given to many international companies to invest in the cyber city. They include C-BOS, a Russian company that specialises in software development and is establishing a presence at the cyber city in co-operation with Myanmar conglomerate, Htoo Trading. Another foreign investor is Malaysia's Maxi Net company, which specialises in network solutions as well as software development, said Zaw Min Oo. Many global ICT companies have also shown interest but a list of confirmed investors has yet to be released.

The MPT report says the master plan for developing the cyber city covers 4400 acres, of which half will be allocated to software firms and the other half to hardware companies. The Yadanabon master plan provides for the site to be expanded to 10,000 acres, the report says. As well as the teleport building and three incubation centres, the master plan provides for the construction of facilities for international and Myanmar software companies, a convention centre, a research and development centre, a training centre, commercial and services facilities and residential accommodation.

The plan also provides for the development of indoor and outdoor sporting facilities, a cinema, police station, post office, bank, clinic and market. According to a recent report by the Department of Human Settlement and Land Development under the Ministry of Construction, the city is targeted to house 50,000 people. Water will be supplied to the site from two dams northeast of the cyber city and the EPM No 1 will be responsible for providing power, with consumption estimated at 50 MW.

# Additional references

See above: <u>'Pyin-U-Lwin hydropower projects</u> speeded up' (NLM: 30/11/07) 'Dam design at <u>Yeywa</u> hydropower project saves time, costs' (MT: 04/04/05)

# Shah Paung, IRROL, 21/12/07. http://www.irrawaddy.org/article.php?art\_id=9715

The opening ceremony of the Yadanabon Information and Communication Technology (ICT) Park took place 14/12/07. Burmese state media reported that the center is situated on 10,000 acres of land, over one-fifth of which will house the production of software and hardware. According to the editor of a weekly journal, Rangoon will remain the IT and business center of the country, because most students and IT experts were based either there or in Mandalay. He added that it would not be easy to contract IT personnel to work in Yadanabon Cyber City and that transportation costs would become a problem. According to Gen Than Shwe who was present at the opening the government had provided a water and power supply, communications and administration facilities for the new town to enable local and foreign entrepreneurs to make investments in the ICT park. State media said that a total of 11 local and foreign companies had proposed investments in the project including Shin Satellite from Thailand; ZTE and Alcatel Shanghai Bell of China; IP Tel Sdn Bhd (Malaysia); and CBOSS (Russia). However, sources inside Burma said that many people doubt whether the project will come to fruition, because even in large cities like Rangoon and Mandalay, the government cannot provide enough electricity to run businesses. Electricity is currently rationed to six hours per day in rotation across those cities. Internet café owners in Burma still have to use their own generators to power their work stations.

Htar Htar Khin, Myanmar Times, 12/11/07. http://www.mmtimes.com/no392/b008.htm

The three-storey teleport building, centrepiece of of the Yadanabon Cyber City project, is now 95pc complete. The building comprises a total 81,778 square feet of floor space including a technical equipment area, an international conference room, an IT exhibition area, a meeting room and a service area, according to U Si Thu Myint Swe, a senior architect with ST&T Architecture & Building Services, who designed the teleport building's interior. Built by A1 Construction Co., Ltd, the building will be handed over to the telecommunications ministry once all work finishes this month. It will officially open in the second week of December, 2007 U Aung Zaw Myint, president of the Myanmar Computer Industry Association, said on November 7. The teleport building will be first used to host Myanmar ICT Week – an annual exhibition that allows IT businesses to showcase their products and services to the general public – which is leaving its former home at Tatmadaw Hall in Yangon for Yadanabon Cyber City. The cyber city will eventually be made up of nine "zones" being developed simultaneously, although a completion date is yet to be set. The nine

zones comprise the teleport building; seven single-story "incubation units"; local and international software zones; a park and convention centre zone; a commercial and services zone; a research and development zone; a training centre; and a residential area. U Si Thu Myint Swe said the residential area would include a 400-acre subdivision of duplexes and standalone houses as well as a 123-acre section of serviced apartments. A report by Myanma Post and Telecommunications (MPT) estimated the cost of the first phase of the project, including the teleport building, three incubation centres and roads, at about K3.8 billion. The Yadanabon masterplan also calls for indoor and outdoor sporting facilities, a cinema, police station, post office, bank, health clinic and marketplace.

# NLM, 18/08/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030818.htm

The opening ceremony of the Mandalay Information Communications Technology Park and an International ICT Exhibition was held in the park centre on the third floor of the Yadanabon Market on 16 August morning. General Khin Nyunt, chairman of the Myanmar Computer Science Development Council said that new park had emerged as a result of the formation in February 2003 of the Mandalay ICT Development Corporation Ltd consisting of IT technicians, IT entrepreneurs and executives and members of the computer associations in Mandalay. The ICT park would play a pivotal role in enabling economic and social organizations and government departments in Mandalay and the whole of upper Myanmar to make extensive use of information technology. Mandalay division commander Ye Myint thanked the Head of State for his assistance in the opening of the ICT Park in Mandalay, so that it could keep abreast of Yangon in the IT field. He said the ICT park in Mandalay was a place where softwares of international standard could be produced. Mandalay ICT Park Chairman Than Aung said that the co-operative efforts of the executives of the Computer Scientists Association and the Computer Industry Association in Mandalay had enabled the park to be built in a period of four months. Then General Khin Nyunt and party viewed the operations and displays and course work of the 35 software and hardware IT companies occupying the centre. Afterwards Maj Than Aung formally opened the International ICT Exhibition and General Khin Nyunt and party viewed the services of MPT and Bagan Cybertech in the centre.

Moe Zaw Myint, Myanmar Times, 21/01/02. http://www.ibiblio.org/obl/docs3/MT099.htm

The Information Communication Technology Park, the first such centre in Myanmar, was inaugurated at Yangon University's Hlaing campus on January 21. The Park adjoins a teleport and internet data centre established by semi-government Bagan Cybertech, which opened the same day. In all it is estimated some US\$10 million has been spent on the complex. "The opening of MICT Park and Bagan Teleport and Internet Data Centre is an encouraging event for the development of the ICT sector." said U Thein Htut, a director of the Myanmar ICT Development Corp, the consortium which developed the park. "The park will create business opportunities for Myanmar software companies, while the teleport and internet data centre will assist in the expansion of communications infrastructure," U Thein Htut said. The concentration of IT companies at the park would enable the development of big software projects which were beyond the scope of a single company acting alone, he said. The park provides facilities for 32 tenants. They include 24 Myanmar IT companies, which have already established operations at the facility. The park also has two Japan-Myanmar e-learning centres and six rooms have been reserved for future use by foreign software firms. Bagan Cybertech provides the MICT Park with high speed data communication broadband Internet access and telephony voice services, in collaboration with Ministry of Communications, Posts and Telegraphs. A three-day 'Myanmar Software and Solutions' exhibition opening at the park today features displays by 38 Myanmar and foreign companies of software developed for use in the banking and finance. hospitality, manufacturing, telecommunications, health care, human resources and entertainment sectors. The events promoting the opening of the MICT Park also include a two-day seminar starting at Traders Hotel on January 21. It will be attended by participants from Asean countries and Europe.

See below: <u>'Homegrown software</u> industry struggles on' (MT: 12/03/07) 'Collaborate on contracts<u>, ICT sector</u> urged' (MT: 12/12/05) 'Electronics industry <u>spreading roots</u> in industrial sector' (NLM: 06/06/04) <u>'Software growth</u> badly in need of human touch' (MT: 16/10/00)

GAS IN SHORT SUPPLY TO MEET DEMAND FOR ELECTRICITY

Minh Zaw, Myanmar Times, 17/09/07. <u>http://mmtimes.com/no384/n010.htm</u>

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An YESB official said early this month that round-the-clock electricity supplies in the city would likely end by the end of November. "When the rainy season ends we lose a lot of our hydropower. But if we had enough natural gas supplies we could keep the power on 24 hours a day," he said.

During the rainy season Yangon gets 200 MW of electricity from a hydropower station in Lawpita in Kayah State and an additional 200 MW from four gas-based power stations, which is enough for the city but not enough to power the outlying industrial zones. According to the EPM No 2, 99 million cu ft of onshore gas or 134 mmcf of offshore gas are needed for Yangon's four gas-based power stations to run at full capacity of more than 300 MW. However, the current supplies of 59.46 mmcf are only enough to produce about 200 MW.

In the meantime, Yangon's total power needs have skyrocketed to 530 MW this year, up from 430 MW last year, resulting in difficulty providing 24-hour electricity supplies to the city even during the rainy season. "Increasing demand from IZs and increasing use of electric appliances have contributed to supply shortages," the YESB official said. He said officials at the ministry were always busy trying to figure out ways to distribute available energy supplies to people in the city. "We've divided the city into three areas but we have also developed 79 patterns of power distribution depending on the situation," the official said.

He said he was optimistic about the future of electricity supplies in Myanmar. "Right now about 19pc of the country is on the national grid, with 60pc of the electricity going to Yangon and 40pc going to the rest of the country. But projects are underway to build hydropower dams that will produce more than 21,000 MW. So far we're getting about 700 MW from hydropower," he said. "The present problems with electricity will be solved by the end of 2009, we think," the official said.

# Additional references

See above: <u>'Full reservoirs</u> to boost hydropower' (MT: 19/11/07)

NLM, 11/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071211.htm

A coordination meeting on power supply to the states and divisions including Yangon division was held at the meeting hall of the ministry in Nay Pyi Taw, on 8 December. After EPM No 2 Khin Maung Myint made an opening speech, Chief Engineers Tin Maung Tun and Aung Khine briefed the minister on work in progress. MD Tin Aung of EPSE, MD San Oo of MEPE and D-G Thein Tun of HEPD gave supplementary reports. After hearing the reports, Deputy EPM No 2 Win Myint reported on dealing with the public and efficient use of funds in running the project and timely completion of project tasks. Next, the minister called for close supervision in the supply of power as consumption is on the increase. He said the public should be made aware of [matters related to] power supply starting immediately.

# Mizzima 23/11/07.

http://www.bnionline.net/index.php?option=com\_content&task=view&id=3063&Itemid=6

The erratic supply of electricity in Rangoon has further worsened. Except for very important areas such as the Bogyoke market, Tamwe market, and a few other localities, residents in Rangoon said power black outs are the order of the day in most townships. Earlier, authorities supplied electricity and effected power cuts on a rotational basis in different townships, but recently the supply of power has become much more erratic, residents said. Even VIP areas such as Bahan township no longer enjoy uninterrupted supply. Though most townships have been facing regular power black-outs since October, the industrial township of Hlaingtharya has been receiving regular power supply. However, workers at the industrial zone in Hlaingthaya township said they received a notice yesterday stating that electricity would be cut-off in the township from 5pm to 11pm. Since we are in the administrative office, we have to inform all the 500 industries in the township. But most industries use their own generators for power supply," a manager in the Hlaing Tharyar industrial zone told Mizzima.

Total: Yadana [undated: beginning of 2007]. <u>http://burma.total.com/en/contexte/p\_1\_3.htm</u> Contractually, Myanmar is entitled to take up to 20% of Yadana's production for domestic consumption. Until recently, it was taking about half of its entitlement, with 40 to 50 million cubic feet per day (1.1 to 1.4 million cubic meters per day). Since December 2006, it is taking 100 to 110 million cubic feet per day (2.8 to 3.1 million cubic meters per day). The gas is piped further north to a cement factory in Myaingkalay and then to Yangon via a pipeline built and operated by MOGE that ties into the Yadana pipeline at Kanbauk.

See below: <u>'More gas needed</u> for 24/7 power in Yangon (MT: 02/07/07) '<u>Full power</u> supply promised for July' (MT: 04/06/07) 'Electricity supplies get boost from <u>YESB plan</u>' (MT: 24/07/06) '<u>Pipeline to solve</u> electricity shortages' (MT: 16/09/02)

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### **RISING WORLD LEAD PRICES ZAP YANGON BATTERY MARKET**

Sann Oo, Myanmar Times, 10/09/07. http://mmtimes.com/no383/b005.htm

Prices of batteries in Myanmar are rising in line with soaring international prices for lead. However, the full impact is not likely to be felt until the dry summer months because of currently good electricity supplies due to full hydropower lakes, battery traders in Yangon said. Lead acid batteries enjoy regular sales to vehicle owners but sales to customers using them to augment electricity supplies at home tend to peak during the hot months of February through May, the dealers said.

Lead cost US\$1,200 per tonne on the London Metal Exchange (LME) one year ago but has since almost tripled to around \$3,300. According to the LME, batteries account for 71pc of the world's lead consumption. "The world price for lead has gone up about 75pc in recent months and that affects costs for battery producers worldwide and they have to raise the prices of their batteries," said U Than Oo, MD of Best Battery Trading Co Ltd, which stocks Atlas batteries imported from South Korea. "Some foreign producers have cut back their production and our supplier only sent part of our last order," he said. Over the past year battery prices in Yangon have risen 10-20pc, he added.

U Than Oo said some manufacturers use recycled lead acid to be able to offer cheaper products. "Pure lead costs about 30pc more than recycled lead but recycled lead is lower quality and results in a shorter lifespan for batteries," he said.

Most of Myanmar's discarded batteries are exported to China where battery makers recycle the lead, often sending the lead back into Myanmar in the form of new batteries. "Every part of a battery can be used again so China buys up the old batteries," U Than Oo said.

# Additional references

Kyaw Zin Htun, MT, 17/12/07. http://www.mmtimes.com/no397/b002.htm

Proven Technology Industry Co, maker of domestically produced Toyo batteries, plans to make tubular battery, the first of its kind in Myanmar. They are called tubular batteries because the lead plate is made from linked tubes rather than the perfectly flat plates normal wet-cell batteries use. The type is already popular internationally but hasn't been tried yet in Myanmar, according to Toyo GM Than Htke Lwin. He said it is well suited for use with solar panels. The company plans to produce tubular batteries with capacities ranging from 250 to 800 amps which will be distributed to government projects and private businesses. The lifespan of tubular batteries will be at least two-and-a-half to three years and they are expected to last twice as long as normal batteries. The tubular batteries will be produced at the company's factory in Shwe Pyi Tha IZ. They will cost 25pc more but deliver twice the performance.

Kyaw Zin Htun and Kyaw Hsu Mon, MT, 10/12/07. http://www.mmtimes.com/no396/b002.htm

The domestic car battery and inverter industry is facing stiff challenges as the domestic and international price of lead – the main raw material – increases production costs, producers said last week. Only two local companies mass-produce batteries in Myanmar – GP and Toyo – but small- and medium-scale producers have been popping up around the country in recent years. Some of them have been forced to suspend their production because lead is too difficult, or expensive, to buy. Daw Rosie Rao, the managing director of GP Battery Industries Private Ltd, said the price of lead had nearly doubled in the past year – from US\$2000 a tonne in October last year to between \$3800-4000 now. "We've had to increase the price of our batteries

because raw material costs have increased significantly," she said, adding that the company imports its lead from Australia. U Than Htike Lwin, general manager of Proven Technology Industry Co, which makes Toyo batteries, said the company has been skirting around the international price rises by buying lead locally and then refining it for production. He said smaller manufacturers that do not have the same resources are being forced out of production. "Chinese battery companies are buying as many of the discarded batteries in Myanmar as they can and then recycling the lead at their factories. This is also pushing up the price of lead," he said. U Than Htike Lwin said that when used batteries are available they sell for between K800 and K1000 a viss (about \$480 a tonne). U Kyaw Sein, a battery retailer in Latha township, said most customers this year have been buying 120-amp instead of 150-amp batteries because prices are too high. A 150-amp GP battery retails for about K160,000, while a GS battery, imported from Thailand, sells for about K167,000, meaning there is little price advantage in buying local. "Last year the 150-amp batteries were our best-selling item but this year the 120-amp batteries are out-selling them," he said. U Kyaw Maung, the manager of Arrthit Battery sales centre in Tarme township, said that some customers have chosen to buy imported batteries because the price gap between them and locally produced versions has narrowed so much.

JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan. The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summary, pp 9, 18. http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&segno=1 Lighting systems supplied by battery charging stations (BCS) have been widely introduced in Myanmar since the early 1970s. 24pc of households at the national level and 32pc in rural areas were found to be using them during a household income and expenditure survey carried out by the Central Statistical Organization in 1998. Lighting is by 4-8 watt fluorescent lights. Battery-lighting systems were introduced when kerosene disappeared from the market after the first world oil crisis in 1973. Before that kerosene lights were the main source of lighting for farm households. As a result of the non-availability of kerosene, many BCSs, powered either by the grid or by small diesel generators, operate on a commercial basis countrywide. However, batteries and fluorescent lights available in the market have a short lifetime and need frequent replacement. In the households that cannot afford to buy a fluorescent light at about \$1.00, people use small incandescent bulbs that are less bright but are cheaper and last longer than fluorescent lights. These battery-lighting systems provide valuable lighting for dinner and communication among the family. However, such lighting is inadequate for children to read books and may even weaken their eyesight. Battery recycling shops are in operation on a commercial basis in most parts of the country. Batteries are collected nationwide and recycling manufacturers in Yangon produce recycled batteries. The cases and connectors are recycled at shops operating in local areas. This recycling process reduces the disposal of old batteries and helps to reduce environment pollution.

**Compiler's Note**: Good pictures of a battery charging station and household lighting system with fluorescent lights are available on page 9 of Volume I. A separate volume in the same series, entitled *Memo on Interviews/Field Surveys in Villages for Rural Electrification: February 2001 - November 2002*, presents interesting examples of the use of the battery operated lighting system on pages 57, 59, 60, 62, 66, 68, 72, 73, 85, 87-89. Many of these examples involve price comparisons between different sources of power used in charging the batteries such as diesel operated generators, rice husk gas systems and solar panels. http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159779&volno=000000000&filename=11734175\_03.pdf&segno=3

See below: <u>'Inverters</u> keep lights and TV sets running' (MT: 04/07/05) 'Local <u>battery brands</u> compete with imports' (MT: 24/11/03)

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# PETROL SUBSIDIES AND THE PRICE OF ELECTRICITY

San Oo Aung, Burma Digest, 02/09/07. [excerpt] http://burmadigest.info/2007/08/29/analysis-of-how-tatmadaw-had-ruined-the-myanmar-economy

PM U Nu started the Lawpita electricity generation project before Ne Win took over. "To make paradise on earth with the use of electricity" was his famous slogan. It really generated and sparked a lot of progress after that dam started electricity distribution.

But the fuel to run those generators is like a luxury. Petroleum and diesel are restricted items sold by rationing with permits. People have to buy from the roadside smugglers, if they need them. APC sells petroleum and permits. There are frequent problems because of adulteration and fire hazards from the illegal improper storage by these petrol hawkers.

The rights of energy generation, production and distribution are jealously guarded by the Myanmar military. If they can't manage after forty long years, they should allow local and foreign players to get involved. Advice from experts of the World Bank and IMF that the Myanmar military should stop fuel subsidies is false and short-sighted. Their statements make it look like the SPDC is doing the right thing.

The very low earning power of the Myanmar people, which is even ridiculously lower if converted into foreign currency at the black market exchange rate, must taken into consideration. It is clear that to force the whole population, including the low-earning poor, to use vitally needed commodities like petrol or gas at the black-market exchange rate is totally wrong.

# Additional references

See below: 'Fuel <u>price increase</u> impacts industrial use of electricity' (IRROL: 15/08/07) 'Electricity <u>rates raised</u>, subsidies for civil servants dropped' (AP: 15/05/06)

Alfred Oehlers, IRROL, 22/08/07. [excerpt] <u>http://www.irrawaddy.org/article.php?art\_id=8318</u> Burma is essentially a diesel-powered economy. We see this in the buses, trains and trucks that rumble around the country. We also see this in the dilapidated power plants that sometimes generate electricity. Most of all, we see this in the ubiquitous portable generators that exist in nearly every home, factory and shop that can afford one. For a long time now, diesel prices have been kept artificially low through subsidies. But as demand for diesel has continued to grow in tandem with an expanding economy, the amount spent on these subsidies has similarly expanded, posing an ever increasing strain on the regime's finances. The only solution has been to import diesel, since Burma's ageing refineries simply cannot refine crude volumes sufficient to meet demand. And as this is usually done at spot market prices, it is an extremely costly solution.

PLANS FOR 7-MILLION-DOLLAR RICE-HUSK POWER PLANT EDGE FORWARD

Kyaw Thu, Myanmar Times, 27/08/07. http://www.mmtimes.com/no381/b005.htm

It will likely be several more months before the government signs an MoU with a Japanese organisation for the construction of a US\$7-million rice-husk electricity plant, an official with the A&IM said. The power plant planned for Dedaye in Ayeyarwady Division will be the biggest of its kind in Myanmar and is aimed at cutting long-term costs for rice millers in the area.

A target for starting the three-year construction project lapsed in January. "The Japanese side wants to sign the MoU as soon as possible," said the ministry official. He added that the government was currently reprocessing financial data in preparation for the signing.

The Japanese government is providing the rice-husk power plant at a cost thought to be over US\$6 million. Installation will be carried out by the Japan government's alternative energy research arm, the New Energy and Industrial Technology Development Organisation. The Myanmar government is to loan the Myanmar

Rice Millers Association (MRMA) \$780,000 to cover construction costs at the six-acre site 70km from Yangon.

The association aims to make this money back once the plant is running by selling electricity to 13 rice mills and one ice factory in the area, MRMA joint S-G Win Aye Pe told The Myanmar Times. The plant will produce a total of 1500 kW per day through consumption of three tonnes of rice husks and will be able to distribute 1000 kW to millers. A third of the plant's output is required to keep it running.

Once completed – likely in early 2011 – the power plant will be operated by a committee comprising local authorities and representatives of the A&IM and the EPM No 2. "We will provide training to workers employed at the rice-husk power plant and send some overseas (for advanced training)," the agriculture ministry official said. The official also noted that the growing number of smaller rice-husk electricity generators being set up in Myanmar – particularly in Yangon division and Mon state – was beginning to drive up the price of rice husks.

# Additional references

See above: 'Village rice husk power plant will serve as <u>research centre</u>' (MT: 24/09/07) See below: 'Rice-husk generators slated for villages in Yangon division' (MT: 11/06/07) 'Inventor co-op society exports first rice-husk generators' (MT: 21/08/06) 'Interest growing in rice-husk generation' (MT: 10/07/06) 'Paddy husk power plant tested to cut rice <u>milling costs'</u> (MT: 19/12/05) 'Biogas power plants supply electricity to rural areas (MT: 16/08/04) 'Biomass gasifier used for <u>tobacco curing</u> in Myingyan (TERI: 08/04)

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# FUEL PRICE INCREASE IMPACTS INDUSTRIAL USE OF ELECTRICITY

Irrawaddy On-line, 15/08/07. http://www.irrawaddy.org/article.php?art\_id=8250

The retail price of compressed natural gas in Burma has more than tripled in a new round of fuel cost increases that threaten to close down many businesses. Prices of other fuels doubled. CNG —compressed natural gas — increased in price by more than 300pc, jumping from K600 (\$US0.46) for a 50-liter canister to K2,175 (\$1.60). The price of diesel oil doubled, from K1,500 (\$1.15) to K3,000 (\$2.30), while a gallon of gasoline rose from K1,500 to K2,500 (\$1.90).

The owner of a Rangoon printing house told The Irrawaddy the rise in the price of diesel made it impossible for him to continue his business. He said the diesel oil he used to generate his electricity already cost him K7 million (\$53,850) a month. A wholesale trader who also runs a vehicle rental business in Rangoon said, "Everyone is now very depressed and disappointed."

The black market price of diesel oil has risen from K3,000 – K3,200 (\$2.30 - \$2.40) a gallon to K4,000 - K5,000 (\$3.00 - \$3.80), and some outlets have stopped selling it altogether. City bus fares have also doubled, Rangoon residents reported.

Meanwhile, the price of gold on the Burmese market rose today from K464,000 (\$356) to K469,000 (\$360) per kyattha (16.33 grams).

### Additional references

Ye Lwin and Aung Kyi, Myanmar Times, 31/12/07. http://www.mmtimes.com/no399/b006.htm

Pun Hlaing International Hospital, operated by First Myanmar Investment will be re-organised In an attempt to staunch losses, said U Theim Wai, company chairman, at the 15th annual general meeting on December 18. Starting from January 1, the company will launch a series of cost-controlling programs including the reduction of the workforce from 430 staff members to about 200. U Theim Wai said to make the hospital profitable within the next 18 months. He said that FMI's management did a feasibility study before the hospital was built but he admitted that there was difficultly in fully evaluating the country's market and

conditions. Hesaid location, expenditure and electricity supplies were criteria that the feasibility study did not correctly evaluate. Pun Hlaing hospital is situated in the Hlaing Tharyar Industrial Zone, which is at least one hour's drive from downtown Yangon. This location makes visits difficult and undesirable for patients, physicians and surgeons. Another unexpected cost has been electricity. U Theim Wai said that before the hospital was granted a special power line by the Yangon Electricity Supply Board, generator costs were about K2 million a day. "Now that the authorities have provided us with a special power line, we can tighten our belts to some extent," he said. Another cost reduction, he announced is reducing the hospital's operating area to only one third of total floor space.

# Wai Moe, IRROL, 26/12/07. <u>http://www.irrawaddy.org/article.php?art\_id=9743</u>

In mid-August the government increased the price of subsidized fuels, creating severe problems for transport operators and people already struggling with soaring prices for food and other essential goods and services. The inflation rate approached 50 percent at the end of 2007, according to The Economist Intelligence Unit. "Owners are afraid to extend their businesses at the moment," said a successful businessman who works in one industrial zone. "We [businessmen] think all business situations are uncertain after the crackdown on protesters [in August and September]." An additional factor is the lack of electricity. Since November, electricity distribution has been irregular in Rangoon with long outages. Disruptions grew worse this month, with many residents experiencing about five hours of electricity daily. In many industrial zones there is no electricity from 5 p.m. to 8 a.m., forcing factories to operate only in the day time. Running private generators to supply electricity is no longer an option for many businesses, since diesel fuel sells for around 5,000 kyat (about US \$3.9) a gallon, said a factory owner.

Myanmar Times, 17/12/07. http://mmtimes.com/no397/n002.htm

A challenge for hotels at the popular Ngwe Saung beach resort in Ayeyawaddy division is supplying electricity to guests. "All the hotels have to run their own generators and buying diesel adds about K15,000 a room to the cost of running the hotel each day," said U Maung Maung Aye, manager of the Silver View Hotel. While many hotels run their generators from 6pm to 6am some of the bigger resorts keep them on 24 hours a day.

Alfred Oehlers, IRROL, 22/08/07. [excerpt] <u>http://www.irrawaddy.org/article.php?art\_id=8318</u> Burma is essentially a diesel-powered economy. We see this in the buses, trains and trucks that rumble around the country. We also see this in the dilapidated power plants that sometimes generate electricity. Most of all, we see this in the ubiquitous portable generators that exist in nearly every home, factory and shop that can afford one. For a long time now, diesel prices have been kept artificially low through subsidies. But as demand for diesel has continued to grow in tandem with an expanding economy, the amount spent on these subsidies has similarly expanded, posing an ever increasing strain on the regime's finances. The only solution has been to import diesel, since Burma's ageing refineries simply cannot refine crude volumes sufficient to meet demand. And as this is usually done at spot market prices, it is an extremely costly solution.

Shah Paung, IRROL, 16/0807. <u>http://www.irrawaddy.org/article.php?art\_id=8266</u>

Higher gas and diesel prices have also raised the cost of transporting goods, where companies in the former capital have been forced to rely on black market sales of diesel. The price of black market diesel has gone up from about K3,000 (\$2.26) to as much as K5,000 (\$3.77).

IRROL, 21/10/05. http://www.irrawaddy.org/article.php?art\_id=5109

Burma has a quota system for the allocation of fuel to car owners who receive vouchers that allow them to receive up to 60 gallons of fuel each month at a cost of K180 (US\$ 0.14) per gallon. The ninefold price increase on 19/10/05 raised the price of subsidized gasoline to to K1,500 (\$1.22) per gallon, while diesel fuel used primarily in the industrial sector rose to around K4,000 (\$3.26).

### Myanmar Times, [April, 2002?]. [not available on-line]

Six months ago [MT: 15/10/01], the EM Lun Thi, told the Myanmar Times that the ministry was distributing 7.5 million gals of petrol and 16 to 19 million gals of diesel a month. Meanwhile, diesel consumption by generators has fallen dramatically since the EPM began providing 10 hours of electricity a day to all IZs in Yangon late last month. An official of Myanmar Petroleum Products said daily diesel consumption at

factories in the Shwepyitha IZ No 2 had dropped 50pc to 4,170 gals. The improvement in the power supply had also enabled the South Dagon IZ to save 5,000 gals a day.

See above:'Petrol subsidiesand the price of electricity'(Burma Digest: 02/09/07)See below:'Electricity rates raised, subsidies for civil servants dropped'(AP: 15/05/06)

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#### RELIABLE POWER SUPPLY GIVES ADVANTAGE TOTHAI SHRIMP FARMERS

Sann Oo, Myanmar Times, 13/08/07. www.mmtimes.com/no379/b002.htm

Myanmar shrimp farmers should work harder to acquire quality-recognition certificates to better tap export markets as well as build a more skilled labour base, an official from the Myanmar Shrimp Association (MSA) said after returning from a research trip to Thailand. The MSA sent a 14-member delegation to Thai shrimp farms last month to learn from the neighbouring country's success in producing and exporting the seafood.

Association chairman HIa Maung Shwe, who led the delegation on the July 23-26 trip to shrimp farms, hatcheries and processing plants in southern Thailand, said Myanmar's organisational structures and labour practices paled in comparison with those used in the neighbouring kingdom. "They use advanced farming technologies, like farming under a roof in a controlled environment, which helps them achieve a higher level of production," U HIa Maung Shwe said. Greater productivity meant lower per-unit costs, he explained. "They can produce like factories. Their production runs according to a schedule, and they don't have to worry about the weather."

The high quality of Thai shrimp was also recognised worldwide, U HIa Maung Shwe said. "They pass all the international quality-assurance standards. Most of their farms have quality certificates, and that's one of the most import things if you're going to compete in the world market. "It's something our farmers need to practice more widely." He added that Myanmar's workforce also appeared to lag behind their Thai counterparts. "They only need a few workers compared to our farms and most of their workers are very skilful," U HIa Maung Shwe said.

The MSA delegation visited Thailand at the invitation of the Charoen Pokphand (CP) Group, which U Hla Maung Shwe said provides about 10pc of the 500,000 tonnes of shrimp Thailand exports annually. By comparison, Myanmar exported some 25,000 tonnes of prawns in 2006-07, earning US\$120 million. Of this, only \$13 million came from shrimp farms, with most prawns sourced from the open seas. Myanmar farmers should take whatever lessons they can from Thailand as they chase a bumped-up export target of \$60 million this fiscal year, U Hla Maung Shwe said. "Some of their methods are not so different from what we do here, while others are much more advanced. And although we can't make investments like they do at the moment, there are other good things we can take from them."

Something Myanmar shrimp farmers likely wish they could take from Thailand is a reliable electricity supply, which U Hla Maung Shwe said put producers there at an advantage because they did not need to run more expensive diesel generators. "They can get electricity to run the machines at their farms," he said. "And they can easily transport their products to processing factories in a short time."

### Additional references

See below: <u>'Fisheries factories</u> offered 24-hour power' (MT: 09/07/07)

Alfred Oehlers, IRROL, 22/08/07. [excerpt] <u>http://www.irrawaddy.org/article.php?art\_id=8318</u>

Burma is essentially a diesel-powered economy. We see this in the buses, trains and trucks that rumble around the country. We also see this in the dilapidated power plants that sometimes generate electricity. Most of all, we see this in the ubiquitous portable generators that exist in nearly every home, factory and shop that can afford one. For a long time now, diesel prices have been kept artificially low through subsidies. But as demand for diesel has continued to grow in tandem with an expanding economy, the amount spent on these subsidies has similarly expanded, posing an ever increasing strain on the regime's finances. The only solution has been to import diesel, since Burma's ageing refineries simply cannot refine crude volumes

sufficient to meet demand. And as this is usually done at spot market prices, it is an extremely costly solution.

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### PREMIUM RATES FOR ELECTRICITY IN MON VILLAGES

Banyol Kin, IMNA, 03/08/07. <u>http://www.monnews-imna.com/2007/augupdate.php?ID=705</u>

Ironical as it may seem, Burma which is the richest in terms of gas reserves among south-east Asian countries has one of the poorest power supplies at home. It is now allowing the private sector to supply electricity in Mon State .

A private company KTO (Ko Than Oo and Brothers Electric Mart) is supplying electricity twice a day from 6pm to 10pm and 4am to 7am to about ten villages in Ye township. "When we subscribed four months ago, we had to pay K110,000 (US\$86.60) for the meter board, and for electricity we paid whatever was consumed. For our house we have to pay about K300,000 (\$236.00) but now it has increased. A meter board now costs K150,000 (\$118)," said a consumer in Ye township. The private firm's charge for one unit of electricity is equal to the price of one bottle (six bottles = 1gal) of diesel which costs about K700 (\$0.50) compared to normal public sector electricity per-unit cost of K50 (\$0.03).

"Everybody is keen on having electricity but it is difficult to get a connection. We applied last year but have not got it yet. When we ask them they keep saying next month every time," said a Mudon town resident.

In some places like Chaungzone township (10.5mi from Moulmein) gas-fired generators have been set up using paddy husks from the villages. But power is not available all the time. When it is on, it is only from 6pm to 10pm. In the Moulmein area, 12 MW of electricity is currently available to the public, while 22 MW is available for Mon State, according to the state electrical engineer interviewed by telephone.

The military government cannot fulfill the demand for power, although the country is rich in natural gas and its Yadana gas is being sold to Thailand for generating electricity. Yadana gas is piped from the field to the gas grid that supplies the Ratchaburi and Wang Noi power plants in the Bangkok region (total capacity of 6400 MW, with Yadana gas used to generate 2500 MW). Around 70pc of the power generated in Thailand is gas-fired, using local gas resources supplemented by gas from Myanmar's Yadana and Yetagunfields.

# Additional references

IMNA, 24/12/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=3238&Itemid=6</u> Most villages in Mon State are trying to get power by spending their own funds. Karoat-pi (Kayokpi) village in Thanphyuzayart township has spent about K 100 million to extend electric poles and have more transformers. A household has to pay K 0.7 million including K 0.3 million for electric meter boxes and K 0.4 million for electric poles and other costs. Some people say that they would spend that amount if they could get electricity regularly. Others have not sbuscribed because they don't have faith in the government's ability to supply electric power. Moreover the government raised the cost of electricity about 10-fold in 2006 and since August 2007 it costs about K 50 per kilowatt hour. The township electric service also charges K 500 per month for maintenance purposes.

See below: <u>Acute shortage</u> of electricity disappoints Mon residents (IMNA: 21/02/07) <u>Private operators</u> meet need for alternative power service (MT: 03/02/02)

# BANGLADESH, MYANMAR TO SIGN HYDROPOWER DEAL

Xinhua, 15/07/07. http://news.xinhuanet.com/english/2007-07/15/content\_6379678.htm

Dhaka and Yangon have agreed to sign an MoU to build a large hydropower plant in Myanmar to feed Bangladesh's power-hungry national grid, private news agency UNB reported. The agreement was reached when a Bangladesh delegation recently visited Myanmar, as part of a hectic government search for sources

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A delegation will make a follow-up visit to Myanmar in November and sign the MoU to conduct a joint technoeconomic feasibility study of a planned hydropower plant in Rakhaing State that could supply power to Bangladesh. Kabir said three locations are being considered as potential sites for the plant. Among those, a site on the Lemro River of Rakhaine State has the best prospects, as there is a potential for building a 500 MW-600 MW plant. This site is approximately 100 km from Bangladesh.

Kabir said both countries would examine all the possible options which could serve as the basis for such a big-venture plant. "It could be either a government-government joint-venture project or a private-public joint-venture between the two countries." But, he added, everything will be decided after the feasibility study.

The Power Secretary said the feasibility study would look into the technical and financial viability of the project so that both countries can benefit from it. He mentioned that the proposed power plant would be built under long-term planning and would have no role in resolving the present power crisis.

**Compiler's Note**: Prospective locations for the power plants on both the Lemro and Michaung rivers would appear to be in Paletwa township in southern Chin state rather than in Arakan (Rakhaing) state. For possible sites on the Lemro river see Burma 1:250,000: Series U542, U.S. Army Map: NF 46-15, Myohaung. http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-15.jpg

For possible sites on the Michaung see Burma 1:250,000: Series U542, U.S. Army Map: NF 46-11, Mount Victoria. <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-11.jpg</u>

For the Saingdin falls site, see Burma 1:250,000: Series U542, U.S. Army Map: NF 46-14: Akyab Saingdin Falls in Buthidaung township [co-ordinates n.a.], grid square reference: 12\4, 21\6 [?] <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-14.jpg</u>

# Additional references

Independent (Bangladesh), 29/10/07. <u>http://www.theindependent-bd.com/details.php?nid=61718</u>

Bangladesh may drop the idea of importing electricity from Myanmar for reasons of security as well as the huge cost of establishing a power plant there. Local experts feel an investment of US\$2 billion could yield more benefit by being utilised within Bangldesh. They cite difficulties in setting up a power grid in hill and forest areas and in monitoring and of maintaining it in difficult terrain. The Power Ministry will still invite Myanmar power sector officials to visit Bangladesh in November, but more as a diplomatic courtesy. The rivers close to the Bangladesh border do not have much power potential; the Michaung can produce 100 MW and the Saingdin has a potential of 80 MW, while the Lemro has a potential of up to 400-600 MW. For every MW of capacity, it is necessary to invest TK5.5 to 6.5 crore (US\$800,000 – 950,000).

# Independent (Bangladesh), 16/09/07.

http://www.theindependent-bd.com/archive.details.php?nd=2007-09-16&nid=57170

Bangladesh and Myanmar will conduct a joint feasibility study on the technical and financial issues involved in power transmission between the two countries before discussing issues relating to a specific project, according to a delegation that spent four days in Myanmar. The Lemro river was said to have an enormous potential of 500-600 MW but the rivers closer to Bangladesh do not have as much potential; the Michaung could produce 100 MW, and the Saingdin, 80 MW. A huge dam would have to be installed. The project would involve a transmission line of 350 - 400 km; also the upgrading of transmission lines in Bangladesh. The whole project could cost more than a billion dollars. Myanmar would require 30pc of power produced; there would be 35-year concession period; each MW capacity would cost between TK5.5 to 6.5 crore (US\$ 800,000 – 950,000).

Narinjara News, 25/06/07. <u>http://www.narinjara.com/details.asp?id=1315</u>

Bangladesh would have to spend US \$1 billion to import electricity from Burma if it goes ahead with a hydro project to be set up on the Ma Aei-Chaung and Lemro rivers in Rakhine state. The project would involve installation of an 800-MW plant in two phases along with a 120-km-long 132-kV transmission line between the two countries. A delegation led by Bangladesh Power Secretary Fawzul Karim, accompanied by Power Development Board Ch Khijir Khan, and MD Harunur Rashid of the Bangladesh Power Grid Co will go to

Burma in July to discuss the project with their Burmese counterparts. Bangladesh power ministry sources say the Burmese government sent a proposal to the Bangladesh government outlining conditions for the project, including 30pc of the power produced and transfer of the plant to Burma after a 40-year concession period.

Narinjara News, 11/06/07. <u>http://www.narinjara.com/details.asp?id=1301</u>

Bangladesh will look for funds from the WB, ADB and Japan to prepare a feasibility report on a hydropower project in Burma. The Power Division (PD) requested the Economic Relations Division to seek funds for the study since a large investment is required. An assessment of potential sites prepared by an expert team of the Power Development Board (PDB) identified sites along the Michaung and Lemro rivers in Arakan State as having potential for generating 800 MW. These areas are viable as they are situated close to Bangladesh's Cox's Bazar. Bangladesh requires around 5,000 MW of power, but its production capacity staggers between 3,000 MW and 3,300 MW, depending on the condition of its decades-old power plants.

Financial Express (Bangladesh), 27/01/07. [no longer available on-line]

The Power Division (PD) is weighing the possibility of bringing hydro-electricity from Myanmar following the severe power scarcity in Bangladesh over the last few months. PD has assigned the Bangladesh Power Development Board (PDB) to assess the potentialities. Natural gas, the main source of power in Bangladesh, is declining gradually. The Myanmar Energy Minister has urged the Bangladeshi ambassador in Yangon to set up hydro-electricity plants there. A PD official said that as per Myanmar government's rules and regulations, Bangladesh would have to supply 30pc of the power generated to domestic consumers in Myanmar and the remaining 70pc could be brought to Bangladesh through a cross-border transmission line.

See below: '<u>Thahtay creek</u> dam and other hydropower projects in Arakan' (NLM: 20/04/06)

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# POWER SUPPLY, BANK CREDIT KEYS TO SME BREAKOUT

Win Nyunt Lwin, Myanmar Times, 09/07/07. <u>http://mmtimes.com/no374/b006.htm</u>

Myanmar should emphasise the development of small and medium enterprises (SMEs) to put the country on a competitive footing with regional rivals, according to an official at the Ministry of Commerce. Dr Htein Lynn, a deputy director at the ministry's Directorate of Trade, said enhancing the efficiency of smaller businesses would increase exports and earn Myanmar more foreign exchange. It would also increase companies' chances of survival when barriers to competition from other Southeast Asian countries are removed in a free trade agreement (FTA) scheduled to take effect in 2015, he said.

"When there are zero tariffs in the region, products from our country must be competitive in terms of price as well as quality or we will lose," said Dr Htein Lynn, who obtained a PhD from Germany's Goettingen University through research into the SME sector. The food and beverage industries were prime areas for enhancement, he said, claiming these businesses helped bridge the gap between agro-based and industrialised economies by using agricultural products in an industrialised setting, thereby encouraging growth in both sectors.

Myanmar was undergoing a gradual shift from an agricultural country to an "agro-based industrialised country", Dr Htein Lynn said. But for the transition to have the greatest chance of success, businesses need to be supplied with enough electricity to meet their needs, as well as have a modern banking system at their disposal, he told The Myanmar Times. "Only when there is a good banking system can small businesses get loans for their development," he said.

Co-operation between the government and the private sector would remove obstacles to development, Dr Htein Lynn added, noting that a stable business climate was necessary to support the planning required to achieve long-term progress.

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FISHERIES FACTORIES OFFERED 24-HOUR POWER

### Sann Oo, Myanmar Times, 09/07/07 http://mmtimes.com/no374/b002.htm

Fisheries factories in Yangon were last week invited to provide details necessary for the YESB to provide them with 24-hour power independent of neighbourhood supplies. U Nyo Win, deputy chief engineer for the YESB, told factory owners at a weekly meeting of leading figures in the fishery sector that the authorities were willing to help set up electricity substations in the city to provide power supplies exclusively to processing plants.

The substations, which must be funded entirely by the private factories that would receive the electricity, are intended to help companies sustain production over the dry summer months when electricity supplies nationwide decline due to reduced output at the country's hydropower stations. No estimate was given on how many substations might be built, although U Nyo Win said the YESB hoped to see the system in place before the end of this year.

"We will arrange to get power to the factories, especially for the coming summer. "Factories owners need to submit their plans for what they want to the YESB," U Nyo Win said on July 3 at the meeting held at the Myanmar Fisheries Federation (MFF) headquarters in Yangon. The board would then calculate and inform factories of the costs involved before arranging for the transmission plants and power lines to be installed, he added. U Nyo Win said the system would allow electricity to reach factories even when neighbouring residential areas were blacked out.

Securing sufficient electricity has long been the bane of factories in Yangon but supplies this year have become especially important to the fishery sector as it chases an ambitious export target more than 60pc higher than it earned during 2006-07. "Electricity is crucial for our processing plants as we make efforts to reach US\$750 million (of exports). Factories play a crucial role in achieving that," U Han Tun, chairman of the Export Promotion Cte, said at the meeting.

He applauded the move to increase electricity supplies, saying power should be distributed to processing plants, ice factories and animal feed factories because all were essential to building a strong marine products industry. Using generators dramatically increased production costs, he said.

There are currently some 85 factories processing marine products in Yangon. "We will work as hard as we can to get them electricity – that way they can increase their production," U Nyo Win said. "We will help the fisheries sector achieve their export target."

The MFF and the EPM No 2 recently set up a committee to help coordinate the establishment of the exclusive electricity supplies. The 22-member committee comprises 18 factory owners from various townships and one representative each from the YESB, the Export Promotion Cte, the Myanmar Fishery Producers and Exporters Ass'n (MFPEA) and the Dept of Fisheries. Townships with fisheries factories that might get the substations include Thaketa, South Dagon, Hlaingthaya and Mingala Taung Nyunt.

A representative of factory owners in South Dagon township said last week that longer electricity supplies would be of great help and the companies he represented were keen to press ahead with securing the separate power lines. "Currently we receive electricity in a half-day rotation, from 5am to 12pm or from 12pm to 7pm. Basically, that is not enough for our plants," he said.

A representative from Thaketa township, which has six factories producing marine products, was also eager to see the scheme implemented. "We've finished our negotiations and plan to submit a proposal to the YESB," he said. "We are hoping to get the final budget to proceed very soon."

The 15 factories in Yangon that produce animal and fish feed were also invited to provide outlines of their needs for uninterrupted power supplies to the YESB. D-G Khin Maung Aye of the Dept of Fisheries warned that businesses should prepare now for the coming summer. "Although we are far from next summer when electricity shortages will happen, we need to prepare right now. It is a long-term plan and we cannot do it in a short time," he said. "Electricity is important. We want you to take this opportunity now that officials are arranging for what you need. Complaining later is not helpful."

Meanwhile, a US\$1.4-million project funded by South Korea to help develop Myanmar's electricity network, is currently focussing on power lines and substations in Yangon and Mandalay, the local Flower News reported last week The network development project aims to share Korean knowledge and experience in power system operation and protection, general facilities testing, fault analysis and the provision of relay equipment. It is funded by South Korea's International Cooperation Agency (KOICA) and undertaken by the Korea Electric Power Corporation in collaboration with the state-run Myanmar Electric Power Enterprise.

# Additional references

See above:'Fisheries factories to get 24-hour power by March' (MT: 22/10/07)<br/>'Reliable electricity supply gives advantage to Thai shrimp farmers' (MT: 13/08/07)See below:'Business leaders to pay for new power stations' (MT: 17/07/06)

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# COLENCO ENGINEERING TO ADVISE ON UPPER MYITNGE PROJECT

NLM, 04/07/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070704.htm

Lt-Gen Kyaw Win of the Ministry of Defence and Maj-Gen Aung Than Htut of the North East Command met with officials of the Pyaunghlyo hydropower project being undertaken by the HPID and Colenco Power Engineering Co near Nawnghkio township on 2 July, 2007. At the briefing hall, Director U Myint Zaw of HPID reported on salient points of the project including the site chosen. In response, Gen Kyaw Win stressed the need for speedy implementation of the project to satisfy the power demand. The project is situated 29/2 mi south of Nawnghkio on the Dokhtawady (Myitnge) river. It will be able to generate electricity ranging from 60 to 300 MW. After that, Lt-Gen Kyaw Win and party inspected the construction of Nawnghkio-Taungkhin-Kyaukgu-Intaw road and the Dokhtawady Bridge.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-09: Mandalay Pyaunghlyo dam near Yedwingyi village [co-ordinates n.a.], grid square reference: 13\6, 26\4 [?] <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-9.jpg</u>

# Additional references

NLM, 13/12/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071213.htm</u> While visiting the Yeywa dam site, Gen Than Shwe is briefed on the survey, findings and preparations for the Pyaungsho hydropower project that is to be implemented on the Namtu (Myitnge) river near Yaydwingyi Village, 32 miles south of Nawnghkio town in accordance with his guidance.

NLM, 12/07/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070712.htm

PD Myint Zaw and Dep Dir (Geology) Kyaw Nyein brief EPM No 1 Zaw Min on feasibility study for the Nawnghkio hydropower project, including geographical conditions and flow of water in the Dokhtawady river, 25 mi upstream from the Yeywa hydropower project.

Myanmar Times, 28/08/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-331/h010.htm</u> The design for Htamanthi Dam is expected to be finalised in early 2007. The Agricultures and Irrigation Ministry has already drafted the design and hopes to finalise it under supervision of Colenco, an international consulting and engineering company.

NLM, 28/04/04. <u>http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040428.htm</u> The 60-MW Pyaungsho and 160-MW Namlan hydel projects in Nawnghkio tsp are mentioned at a meeting of the National Electric Power Development Co-ordination Cte.

See below: 'Dam design at <u>Yeywa</u> hydropower project saves time, costs' (MT: 04/04/05)

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MORE GAS NEEDED FOR 24/7 POWER IN YANGON

Kyaw Thu and Zaw Htet, Myanmar Times, 02/07/07. <u>http://mmtimes.com/no373/n007.htm</u>

An official of the YESB said last week that households and industrial zones in the city will only start getting 24-hour electricity when natural gas supplies increase and water levels at hydropower dams rise. The official, speaking on June 27 during a press conference at board headquarters in Ahlone township, said the city needs to receive at least 19,000 MWh of power a day to enjoy 24-hour electricity but is now getting less than 17,000 MWh. He said that last July, when Yangon was getting around-the-clock electricity, the city was receiving 11,284 MWh from hydropower and 8,013 MWh from gas turbines, for a total of 19,297 MWh a day.

But this year, as of June 25, Yangon was only getting 10,195 MWh from hydropower and 6,326 MWh from gas turbines, or a total of 16,521 MWh a day. "The shortage of natural gas supplies to Yangon's four gas turbine power plants is the main reason for the decrease in electricity production," the official said. He said gas supplies to the four power stations had dropped from 108 million cubic feet of gas a day (cf/d) last July to 59,466 million cf/d this month. "We need 130 million cf/d to supply regular electricity to the whole country," he said. "The amount we get is quite low compared with demand."

Yangon's gas supplies come from offshore and onshore gas fields in Myanmar. Some have speculated that the Ministry of Energy, which is responsible for supplying natural gas to Yangon's four power stations, has shifted natural gas supplies to fulfil the needs of the growing number of compressed natural gas (CNG) stations in the country. However, an energy expert said last week that the 27 CNG stations in Yangon use only about 12 million cf/d, a mere fraction of the 240 million cf/d [of natural gas] used throughout Myanmar.

Of this total, 130 millio cf/d come from onshore gas fields and 110 million cf/d from the offshore Yadana gas project in the Gulf of Mottama. Most of the natural gas goes to power stations, cement factories and fertiliser factories. The natural gas used to supply the CNG stations comes from Myanmar's biggest onshore gas field – Nyaungdon, located about 55 km west of Yangon – which produces 80 million cf/d.

The state-run daily newspaper The Mirror announced on May 2 that a new onshore gas deposit found in Maubin in Ayeyarwady Division was producing 3.2 million cf/d. The report said the Ministry of Energy was planning to use the gas to supply CNG filling stations, gas turbines and factories. The YESB said officials were now negotiating to boost gas supplies to Yangon's gas turbines.

Another reason for the shortage of electricity supplies this year has been an increase in the number of commercial electricity meters from 589,599 in 2006 to 692,044 this year, according to figures from the board. The addition of more than 100,000 commercial meters comes in anticipation of increased electricity supplies following the completion of several major hydropower projects in the near future. Meanwhile, the same official said the board started installing household power meters earlier this month in Yangon households that also run cottage industries. The price of the meters in K400,000 for 10 kilowatts hours (KWh), K600,000 for 20 KW hand K800,000 of 30 KWh.

**Compiler's note**: Complaints about periodic shortages of electric power in Yangon are commonplace in media reports, but little attention has been paid to the question of how more efficient use of natural gas could serve as a partial remedy for the situation. The introduction of co-generation plants and combined cycle operation of the existing network of electric power plants in the city in the late 90s marked an important step in this process. In an interview with the Myanmar Times in 2002 U Soe Myint, director-general of the national Energy Planning Dept, stated that the city's power plants were using approximately 300,000 cf of natural gas for each megawatt of power generated. ("Normally, 3 million cu ft of gas can generate 10 MW." (Myanmar Times: Vol 6, No 129, 17/06/02; not available on-line); However much more efficient ratios are widely reported. For example, AECI's Chouteau Power Plant in north-eastern Oklahoma reports that its combined-cycle operation with a capacity to provide 522 MW uses roughly 86 million cubic feet of natural gas per day, i.e. 165,000 cf of gas per MW generated. http://www.aeci.org/FacilitiesCH.aspx. Even better efficiencies are promised through the development of fuel cell technology that uses natural gas to generate electricity through electrochemical reactions as opposed to the combustion of fossil fuels. http://www.eei.org/industry issues/energy infrastructure/fuel diversity/natural gas

# Additional references

See above:	'Gas in short supply to meet demand for electricity' (MT: 17/09/07)
See below:	' <u>Full power</u> supply promised for July' (MT: 04/06/07)
	'Electricity supplies get boost from <u>YESB plan</u> ' (MT: 24/07/06)
	'Pipeline to solve electricity shortages' (MT: 16/09/02)

#### ELECTRICITY MINISTERS BUSY IN BEIJING AND KUNMING

NLM, 13/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070613.htm

The ministers who accompanied SPDC Secretary No 1 Thein Sein on his visit to the People's Republic of China from 5 to 10 June held talks with officials of China during the visit.

EPM No 1 Zaw Min and EM Lun Thi called on V-C Jang Kho Pao of the National Development and Reform Commission at the State Guest House in Beijing. Minister Zaw Min and V-C Jang Kho Pao held talks on hydropower projects being implemented by companies from Myanmar and China. Minister Lun Thi and V-C Jang Kho Pao frankly discussed energy projects being carried out by companies from Myanmar and China. Similarly, Minister Zaw Min met with V-Cs Deng Zon Zi and Jin Shoar Lu of China Power Investment Co at the hall of Grand Hotel Beijing at 10 am on 7 June. They discussed work on the hydropower projects at the Ayeyawady confluence and Chibwe creek and future tasks to be carried out in those places. On 8 June, Minister Zaw Min received V-C Li Pinging of Yunnan Power Grid Corp at the Empark Grand Hotel in Kunming. During the meeting, they discussed the Namlway and Namkha hydropower projects [in eastern Shan state].

EPM No 1 Zaw Min and EPM No 2 Khin Maung Myint visited the 2400-MW Gingchaung hydro-power project being implemented by the Farsighted Co in Lijiang, Yunnan province, where they met with Chairman Li and discussed matters related to the upper Thanlwin hydropower project and the connection of power lines.

On 6 June, EPM No 2 Khin Maung Myint met officers of of the Central China Power Grid Co at the Grand Hotel in Beijing. They dealt with matters related to the supply of equipment for the Hlinethaya-Myaungdaka-Athoke power line and sub-power stations. Later the same minister met V-C Jian Lianxing and party of the China Poly Group Corp and discussed co-operating on a power grid project in Myanmar. On 7 June, the minister met the chairman of the China National Heavy Machinery Corp, Lu Wenjun, and party and discussed supply of equipment for the Yeywa project. The minister also met the vice-chairman of the China International Water and Electric Corp, Wang Yu, and party and discussed co-operating in a power grid project in Myanmar and transfer of technology. On 8 June, the minister met the chairman of Sichun Machinery and Equipment (I & E) Co Ltd, Yao Yuning in Kunming and discussed the supply of materials for the Shweli power line and timely completion of the project.

EPM No 2 Khin Maung Myint also met with the chairman of Sichun Tonghui Industrial Group, Hongyuan Jin, and they discussed a power grid project and establishment of windmills in the Myanmar coast. Later, the same minister discussed the purchase of T&D instruments for 230-KV and 132-KV power lines with General Manager Gao Rong of the China National Electric (I&E) Southwest Co. In the evening, the minister met with Chairman Feng Ke and V-C He Wen of the Yunnan Machinery and Equipment Co Ltd and discussed cooperating on a power grid project in Myanmar with them.

### Additional references

See below: 'Ministers meet with <u>PRC suppliers</u> in Nanning and Wuhan' (NLM: 06/11/06) See also the listings for individual projects in the categories <u>FS</u>, <u>EP</u>, <u>HS</u>, <u>TS</u>

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**<u>RICE-HUSK GENERATORS</u> SLATED FOR VILLAGES IN YANGON DIVISION** Kyaw Thu, Myanmar Times, 11/06/07. <u>http://mmtimes.com/no370/n005.htm</u> Yangon division PDC in collaboration with the EPM No 2 has started a project to provide electricity to remote villages in the division using power plants fuelled by rice husks, an official from the ministry said on June 7. The official said the project will benefit villages and towns in locations where rivers and creeks have made it difficult to build towers for power lines, and are therefore beyond the current reach of the national power grid. "Setting up rice-husk power plants to supply electricity will help bring social and economic development to these villages and towns," the official said.

The ministry official said the YDPDC has been working to get villages to contribute to the project by purchasing the power plants from the Myanmar Inventor Co-operative Society. "The ministry will help provide equipment and local power lines where they are needed," he said. The power plants convert rice husks, which would otherwise be burnt in the open air or left to decay, to a source of biofuel that is used to power generators that produce electricity. Benefits include reducing reliance on oil and natural gas by using a renewable resource as a source of fuel.

The Myanmar Inventor Co-op has already set up a 15-kW plant in Kayan township, about 50 km (30 mi) from Yangon city. U Soe Tint Aung, the president of the society, said the K4.5-million plant will supply electricity to households throughout the town. "The project will expand to other towns and villages in Yangon division. We already have orders for two more rice-husk power plants in Thongwa township near Kayan, each with a capacity of 160 kW," he said. There are 51 townships in Yangon Division, 30 of which make up the Yangon metropolitan area. The remaining 21 include areas that are not served by the national power grid.

# Additional references

See above: 'Plans for <u>\$7-million-dollar</u> rice husk power plant edge forward (MT: 27/08/07) See below: 'Inventor co-op society exports first rice-husk generators' (MT: 21/08/06) 'Interest growing in rice-husk generation' (MT: 10/07/06) 'Paddy husk power plant tested to cut rice <u>milling costs'</u> (MT: 19/12/05) 'Biogas power plants supply electricity to rural areas' (MT: 16/08/04) 'Biomass gasifier used for tobacco curing in Myingyan' (TERI: 08/04)

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# EGAT AGREED ONLY TO STUDY FEASIBILITY OF SALWEEN PROJECT

Krabi Agencies, Bangkok Post, 10/06/07. http://www.bangkokpost.net/breaking\_news/breakingnews.php?id=119346

Thailand has no plans to buy electricity from the controversial [Tasang] hydropower dam on the Salween River in Burma, and the present government is not looking for cheap energy supply from that country, Energy Minister Piyasvasti Amranand said on Sunday. The Electricity Generating Authority of Thailand (EGAT) had never signed a contract with Burma to purchase electricity but had merely inked an MoU to conduct a feasibility study of the project. "If someone is clearing a road, that's their business. Our government's policy is different from the previous government, different from five years ago," he told Bangkok-based foreign correspondents during a talk on "Renewable Energy Policy in Thailand" in the southern resort island here last night.

Piyasvasti said the present government, which came to power after the Sept 19 coup that ousted former prime minister Thaksin Shinawatra, was looking to Laos, another neighbour, to meet its power supply needs, with the possibility of buying 5,000 MW. "We intend to buy more power from Laos and we are encouraging Thai investors to invest there. Anything beyond 2015, we will look at China, but it all depends on the next government," he said.

The Thaksin government's friendly business relations with the military junta in Burma was criticised by international human rights groups, particularly its plan to buy hydro power from Burma. Burma's state-run *New Light of Myanmar* newspaper reported that Thailand's MDX Group had invested about US\$6 billion in the Tasang project in eastern Shan state, the biggest of four planned dams on the Salween River, the longest undammed waterway in the region. Construction of the 868m-long and 227m-high dam, located about 75 km from the Thai border in Shan state, started on March 30. Once completed, generators installed at the

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-14: Mong Pan Tasang dam, near Wan Kawpa [20° 31' N, 98° 38' E], grid square reference: 11\8, 28\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-14.jpg</u> See also the map at the Shanland website: <u>http://www.shanland.org/environment/2004/Dam on the Salween definitely on.htm</u>

# Additional references

See above: 'Chinese <u>firm takes 51% interest in Tasang</u> hydropower project' (MT: 19/11/07) See below: 'Myanmar, Thailand begin work on <u>controversial Tasang</u> dam' (AFP: 05/04/07)

Christa M Thorpe, SHAN, 22/06/07. <u>http://www.shanland.org/environment/2007/activists-believe-thailand-continues-involvement-with-salween-dam-projects</u>

A claim by Thailand's Energy Minister Piyasvasti Amranand that EGAT had not signed contracts with Burma is receiving skeptical reactions from Salween Watch activists. A report published by the Shan Sapawa Environmental Organization lists two official agreements, an MoU signed by the MDX group of Thailand with Burma's Ministry of Energy (20/12/02), and an MoA between MDX and the Burmese Dept of Hydroelectric Power witnessed by EGAT (03/04/06). The amiable business relations between Burma and the previous Thai government under Thaksin Shinawatra were strongly criticized by various human rights groups, who remain unconvinced that Thailand will now drop the incentives for hydro-electricity purchases from Burma.

NLM, 21/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070621.htm

On 25 May 2007, Triangle Region Commander Maj-Gen Min Aung Hlaing inspected construction of Namhupakwe bridge being undertaken by MDX Co from Tarhsan Hydropower Project on Nakaungmu-Mongton Road.

Sai Silp, IRROL, 11/06/07. http://www.irrawaddy.org/article.php?art\_id=7434

The current Thai government position on Burmese plans to build a series of dams on the Salween River is no guarantee that human rights abuses connected with the projects will end, according to Sai Sai, a Shan environmentalist from the organizations Shan Sapawa and Burma Rivers Network. He was reacting to a statement by Thai Energy Minister Piyasvasti Amranand pointing out that EGAT had never signed a contract with Burma to purchase electricity but had merely inked an MoU to conduct a feasibility study of the project. Sai Sai suggested that the current government might have adopted a new stand on the Salween dams projects because of pressure from opponents. There has been wide criticism of the planned dams. Thailand recently announced it remained interested in the exploitation of such power sources as natural gas and hydro-electricity from Burma while searching for alternative sources such as bio-energy and nuclear power. EGAT director Kraisri Kannasuta has said the generating authority is looking for a suitable site for a nuclear power plant. Former Thai Senator Tuenjai Deetes said that it is a good sign that EGAT was looking for other sources of energy than hydropower from Burma, but she maintained that agreements between previous government and other countries were difficult to change because relationships and investment might be affected.

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# MA MYA DAM PUT INTO SERVICE IN MYANAUNG TOWNSHIP

NLM, 08/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070608.htm

The Ma Mya Dam in Myanaung township, Ayeyawady division, was inaugurated this morning. The facility, built by Construction Group 9 of the ID, is on Ma Mya Creek, about one-and-a-half miles north-west of Hmyinwataung Village on the Pathein-Monywa road. The dam can irrigate 10,000 acres of monsoon paddy,

4,800 acres of summer paddy, 5,200 acres of pulses and beans, 8,000 acres of summer paddy and 2,000 acres of edible oil crops.

After Gen Khin Maung Than of MoD formally opened the dam, he and his party viewed the dam's water control tower and earth embankment and inspected the operation of a 2-kW generator on the right main canal that will supply power to Hmyinwahtaung village. They also looked over a 2-kW generator and a 3-kW generator that will supply electricity to staff quarters at the dam.

The earth embankment of the dam is 11,800 ft long and 150 ft high. It can store 70,000 acre-feet of water and it has two reinforced concrete conduits measuring 4 ft by 6 ft each and an ogee-type reinforced concret e spillway. The dam will irrigate 10,000 acres of farmland in Myanaung township and prevent overflow of water onto farmlands on either side of Ma Mya creek. A plan is under way to install two 250-kW generators at the dam to supply power to the region. Four 2-kW and two 3-kW generators are currently being operated using canal water from dam to supply electricity to Hmyinwahtaung vllage and its surrounding areas. Among 17 outlets along the canal from the dam to Letpankwin Village, small-scale hydropower is being generated at two outlets, and the remaining outlets will be installed with generators.

# Additional references

See below: <u>'Mini hydropower plants</u> planned for rural areas' (MT: 08/08/05)

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### FULL POWER SUPPLY PROMISED FOR JULY

Ye Lwin, Myanmar Times, 04/06/07. http://mmtimes.com/no369/n002.htm

Regular electricity supplies later this year will depend on adequate water in the dams and reservoirs supplying 11 hydropower stations which generate 48pc of Myanmar's total output, officials from EPM No 2 said last week. A regular supply of power was likely by mid-June, subject to the early arrival of the monsoon, the officials said. "One of the reasons why more electricity was supplied in May than April was due to heavy rain in the first week of May," said U Aung Khine, the chief engineer of the YESB . "Last year, we managed to provide 24-hour electricity throughout the country from July 9 to December. This year, we will be able to provide 24-hour electricity no later than July 9," U Aung Khine told the Myanmar Times.

As well as the 11 hydropower stations, Myanmar's electricity supply is provided by nine natural gas turbines and five thermal power plants. A statement released by EPM No 2 on May 23 said the country's total production capacity is 1542 MW but the amount being generated was 782 MW. The hydropower stations have a combined output of 738 MW but have been operating at 58.8 percent of capacity because of low water levels in the dams or reservoirs, the statement said.

During the summer season, only the Lawpita hydropower station, at the Moebwe dam in Kayah State, was able to operate at full capacity, the statement said. It said the nine natural gas turbines, which have a combined capacity of 450 MW, were operating at 42pc of capacity. To operate at capacity, the turbines need 206 million cubic feet a day but are receiving just under 102 million cubic feet a day on average, it said. The five thermal power plants have a combined output of 285 MW but are operating at 38pc of capacity, the statement said.

Demand for electricity in Yangon is 530 MW, of which 410 MW is for public consumption and 120 MW for industrial zones, said Col Maung Maung Latt, secretary of the YESB.

The 11 hydropower stations and a coal-fired thermal power plant are operated by EPM No 1, which is responsible for supplying the national grid. The natural gas turbines and the remaining thermal plants are under EPM No 2, which is responsible for transmission. Just under 50pc of electricity supply is distributed in Yangon division, 3.1pc is for Nay Pyi Taw and the balance goes to the rest of the country.

### Additional references
See above	' <u>Full reservoirs</u> to boost hydropower' (MT: 19/11/07)
	'Gas in <u>short supply</u> to meet demand for electricity' (MT: 17/09/07)
	'More gas needed for 24/7 power in Yangon' (MT: 02/07/07)
See below:	'Electricity supplies get boost from <u>YESB plan'</u> (MT: 24/07/06)
	'Pipeline to solve electricity shortages' (MT: 16/09/02)

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# FACTORIES URGED TO SPEED UP PRODUCTION OF LAMPOSTS AND WIRING

NLM, 30/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070530.htm

EPM No 2 Khin Maung Myint inspected the Maga lamp post factory in Hlinethaya IZ No 4 today. Factory manager U Toe Hlaing gave an account of the production process. The minister called for quality control and extensive production of lampposts in order to increase the supply of power and inspected the production line. He also inspected the Ne Lin Aung lamppost factory in Shwepyitha IZ where factory manager U Myint Tun reported on the production and distribution of lampposts. The minister stressed the importance of quality control and inspected the work site and the products.

Next, the minister inspected generators and factories under construction at Asian Golden Myanmar cable wire factory in the Shwepyitha IZ where factory owner U Shao Seng and factory manager U Kwun Wai explained the production process. The minister gave instructions on the products.

Later the minister met with lampost factory owners and entrepreneurs at Sein Myodaw lamppost factory in Thadugan IZ [in Shwepyitha]. He told them that extensive production of lampposts was needed for the installation of wire lines in the power sector. Factories should speed up the production of quality lamp posts and distribute the products at reasonable prices, he added. Factory manager U Htay Win conducted the minister around the production area of the Sein Myodaw factory. Then the minister fulfilled the requirements of the factory.

## Additional references

See below: 'Advanced <u>insulator factory</u> planned for Chauk' (NLM: 24/03/07) See other articles under the category 'Power Grids and Distribution Networks'. <u>PG</u>

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## THAI COMPANY PURSUING BIG HYDROPOWER PROJECT IN TANINTHAYI

Kyaw Thu, Myanmar Times, 21/05/07. http://mmtimes.com/no367/b002.htm

Foreign investment in Myanmar hydropower is likely to soar in coming months as the government plans to sign a series of deals with neighbouring countries, an official from the EPM No 1 said on May 15. The government expects to sign deals for hydropower projects with companies from China and Thailand interested in implementing major power plants in eastern Shan state and Tanintharyi division, the official said on condition of anonymity.

"There are two hydropower project sites in eastern Shan state and one in Taninthayi division," the ministry official said. The Shan state sites were sought by Chinese firms, while a Thai company was pursuing a project in Myanmar's southern Tanintharyi division, he added. "We are conducting data surveys for the project in Taninthayi division," he said, adding that the surveys indicated a project there could generate 600 MW.

Meanwhile, the same official said that surveying at the Hutgyi dam site in Kayin State had been stopped over the rainy season and that a draft feasibility report on the project would be finished by July. Additional information required to finalise the report would be acquired when survey work resumes after the rainy season, he said. The Hutgyi hydropower plant is expected to cost US\$1 billion and generate 600 MW. It is being developed by Myanmar's HPID, EGAT and China's Sinohydro Corp. **Compiler's note**: For possible sites on the Taninthayi (Tenasserim) river see Burma 1:250,000: Series L509, U.S. Army Map: ND 47-15: Hua Hin.

http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-nd47-15.jpg The project in Shan state mentioned in this article would seem to be one in the north-east part of state that was agreed in April 2007. See below: 'MoU on <u>Upper Thanlwin</u> hydropower project inked'.

## Additional references

NLM, 25/03/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070325.htm</u> EPM No 1 Zaw Min reports to SPIC that theTaninthayi hydel power project will be undertaken on Taninthayi river, over 37 miles from Myeik and that it will generate 600 MW.

The Nation (Bangkok), 06/12/05. <u>http://www.sea-user.org/news-detail.php?news\_id=1478</u>

Egat Plc is set to ink an agreement with the Burmese electricity authority on Friday to form a J-V to construct at least five hydropower plants in Burma with a combined capacity of 10,000 MW. CEO Kraisi Karnasuta said yesterday that the energy ministers of the two countries would witness the signing ceremony. The MoU will encourage the J-V to put up a hydropower plant at the Wegyi Dam in Burma. A second [hydropower] plant will be located opposite Prachuap Khiri Khan province, with a capacity of 600 MW. The output will be supplied directly to the Sahaviriya Steel mill in the province.

Sahaviriya Steel Industries Plc website information. [n.d.] <u>www.ssi-steel.com/en/abt/abts.htm</u>

Sahaviriya Steel Industries PIc, or SSI, was established in 1990 as Thailand's first manufacturer of hot-rolled steel sheet in coils (HRC). Today SSI has become the country's largest high-quality and high value-added steel sheet producer. At an investment cost of Bt13.3 billion (over US\$500 million), SSI erected a modern hot strip mill with an annual production capacity of 2.4 million tonnes on a 480-acre plot of land in the Bang Saphan district of Prachuap Kirikhan Province, 400 km from Bangkok on the western coast of the Gulf of Thailand. Operations in Bang Saphan include a cold strip mill with an annual production capacity of 1.2 million tonnes, an electro-galvanizing mill with an annual production capacity of 180,000 tonnes, a deep-sea commercial port for ocean-going vessels, with annual through-put capacity of 6 million tonnes, as well as engineering and repair and maintenance services. The company's head office is located near Silom Road, in Bangkok's central business district. SSI employs over 800 persons, both in Bangkok and Bang Saphan.

See also: 'Hydropower planned for <u>border industrial zones</u>' (MT: 31/05/04)

NLM, 28/04/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040428.htm

General Than Shwe at a co-ordination meeting of the National Electric Power Development Committee: Other major electric power projects are ... the 600-MW Taninthayi project in Taninthayi division.

Myanmar Snap Trade Directory [undated: circa 1999. <u>http://www.myanmarsnap.com/investment07.asp</u> A preliminary study by Nippon Koei of a 600-MW hydropower project in Taninthayi division is under negotiation. Power produced would be for export to Thailand.

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## ELECTRICITY METERING PROGRAM TAKING ROOT

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IMNA, 11/05/07 http://www.monnews-imna.com/2007/mayupdate.php?ID=612

Thirteen villages in Mudon township will get electricity through an arrangement being worked out by an electricity committee and three companies, according to a source close to a member of a Village Peace and Development Council in the township .

"The electricity committee in the village and the companies said they cannot tell villagers whether they would get power supply this year or next. But the villages will get it for sure," said an applicant for electricity connection. They are not clear about the companies involved and are afraid to ask about them.

The villagers have to pay half the cost to be enrolled by May 15th. The payment to apply for the power connection is about K 600,000 per house. "The amount to be paid is for a household applying for a new

The committee called a meeting of villagers on May 2nd and asked them to submit applications. However, they did not mention when the villagers would have to pay the second instalment.

The 13 villages including Wet-tae, Nyaung-gone, Kyaik-ywe, Taw-guu, Thagun-taing, Kawga-law have approximately 300 houses per village, according to a Nyaung-gone villager. About 300 electric boxes have already been booked for Nyaung-gone village.

Villagers are apprehensive that the power supply will be limited even after the meters are installed because even Mudon town residents only get a little electricity. A Mudon resident said that they get power supply for about an hour a week and it costs as much as K 500 a month.

# Additional references

Myanmar Times, 02/07/07. http://mmtimes.com/no373/n007.htm

Another reason for the shortage of electricity supplies in 2007 has been an increase in the number of commercial electricity meters from 589,599 in 2006 to 692,044 this year, according to figures from the YESB. The addition of more than 100,000 commercial meters comes in anticipation of increased electricity supplies following the completion of several major hydropower projects in the near future. Meanwhile, the same official said the board started installing household power meters earlier this month in Yangon households that also run cottage industries. The price of the meters is K 400,000 for 10 kWh , K 600,000 for 20 kWh and K 800,000 of 30 kWh.

# Shan Herald, 20/06/07

http://www.bnionline.net/index.php?option=com\_content&task=view&id=1882&Itemid=6

Based on a promise to people in Mongton that they would be provided with electricity, authorities have been selling meter boxes to locals. The going price is K1,500,000, said a local who arrived at the Thai-Burma border on June 15. About 400 meter boxes have been sold to people in Mongton town. All families living near a main road have to buy a meter box. Over 200 boxes were sold in Nakaungmuu. Electricity supply has been promised for August, though there are no transmission lines and lamp-posts on the road yet. A 75 MW-dynamo (sic) brought from China arrived in Mongton on May 25, the local added. "About 50 soldiers have been ordered by the Mongton-based strategic operations commander to work daily at hydropower sites. The soldiers are from IB No 65 and LIBs nos 553, 554, 227, 293, 225, and 519," a local close to the army said. Two small hydropower projects are under construction. One is in Phaline-Namm Narnue, five miles north-west of Mueng Ton and the other, the Namm Kaung Narlue hydropower project is 10 mi from Mueng Ton–Mae Kin Road and 22 mi south of Mueng Ton.

Myanmar Times, 24/07/06. http://www.myanmar.com/myanmartimes/MyanmarTimes17-326/b006.htm

YÉSB is installing electric meters in houses which currently have no electricity connection, as part of a project launched in August last year to install 100,000 meter boxes across Yangon division. "So far, we have installed more than 90,000 new electric meters and plan to install more if they are needed," said U Tun Aye, chief engineer of YESB. "We've finished 95pc of the downtown area and now need to install them in the outskirt townships of Yangon."

## NLM, 17/09/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030917.htm

At the power station in Tachilek, Gen Aung Htwe of MoD was briefed on the power production capacity of the station and progress in the installation of the unit system. He gave instructions to provide power to the villages round the clock and to extend installation of meter boxes. The station is situated on a 24-acre site on Polo [Ponglo] Street in Haungleik village-tract in Tachilek. A project for ensuring all-day power supply to the town was launched on 17 April 2003. Up to 9 September, 528 meter boxes have been installed. Arrangements are being made to generate electricity using the current of Mehok Creek 20 km from Tachilek.

Shan Herald, 30/04/03. <u>http://www.shanland.org/general/2003/few\_buy\_new\_electricity\_meters.htm</u> Since an official announcement was made in Tachilek on 1 April that meter boxes from Thailand would be replaced by those from a company contracted to supply electricity to the border city, not more than 30 have been purchased by townspeople, according to several local sources. The announcement by the township council stated that U Tar Wai, an ethnic Chinese partner of the Hongpang Co, had been engaged to provide electricity to the city. According to the notice, U Tar Wai has obtained 3,000 meter boxes that will have to be purchased at Bt35,000 each to connect to the service. U Tar Wai will be using three diesel-run generators during the day time and another three at night. The charge for the service is to be eight baht per kWh. Sources say most residents are reluctant to procure the new meter boxes because the service charge is much higher than the five-baht rate previously charged by Thailand and because the boxes will have to replaced after only two years. Many have also bought their own generators since Burma cut off service from Thailand during a border confrontation between the two countries in 2002.

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#### MYANMAR CASHES UP ON ENERGY, BUT LOCALSIN THE DARK

Hla Hla Htay, AFP, 15/04/07. www.burmanet.org/news/2007/04/16/

Military-ruled Myanmar has recently signed off on a raft of energy deals with its power-hungry neighbours, winning the junta a desperately needed income stream. But Chinese and Thai dams to be built on Myanmar's rivers to power their own economies and Asian companies drilling for natural gas off the coast to boost fuel exports are cold comfort for impoverished locals. Most have been left in the dark as blackouts stretch through most of the day, even as reclusive officials in Naypyitaw, the new administrative capital in central Myanmar, enjoy an abundance of energy. The sprawling capital, once a mountainous backwater and home to government and military offices since last year, boasts 24-hour electricity, amply lit streets with few cars and fairy lights that twinkle around ministry buildings.

That contrasts starkly with Yangon, the nation's biggest city, where people and businesses do without electricity for most of the day. They are hurting. "Now we average about four hours per day with power in our industrial zone, about a 50pc decline from eight hours per day in March," a businessman, who spoke on condition of anonymity, told AFP. "Many factory owners have mostly to rely on their own generators. The price of diesel is also going up now. But we have no choice," he added. "We were informed that the electricity distribution department has some technical problems. But we don't know when it will be in normal condition."

As of September last year, Myanmar had an installed capacity of 1,775 MW. Just one of the dams Thailand is building on the Salween river has a capacity to produce three times that amount.

Myanmar's official energy statistics provide some insight though many questions are left unanswered by bureaucrats responsible for administering one of the world's most isolated states. According to MEPE, 40pc of the electricity generated in 2005 was never sold to consumers or businesses. While some electricity is normally lost during transmission and distribution, the enormous shortfall has never been explained and electricity officials could not be reached for comment.

In Yangon, the nation's former capital and commercial hub, the power shortage is hammering a moribund economy and for many, the lack of power also means a lack of water as most pumps are electric. "We normally get power about six hours per day, but we can't do anything since it usually comes on at night," said Htwe Htwe, a 50-year-old Yangon housewife, who complained that the outages prevent her from cooking or cleaning. "My family has to eat leftover rice and curry. Our first priority is to get water when the power returns, " she said. "For the last two weeks, we only get three hours a day."

Residents are especially chafed over the outages because the government hiked electricity charges 10-fold last year, earning authorities an extra eight million dollars in the first half of the 2006 fiscal year.

For those who can afford it, generators have become a necessity. But soaring demand for fuel has sent prices surging and created further shortages in an already unstable market, petrol dealers said. This has forced frustrated consumers onto the black market where prices are up about seven percent for petrol and diesel -- when it is available at all. Otherwise, people go without. "Many residents come to buy for their generators. But sometimes we have no petrol to sell," one black market dealer said.

#### Additional references

See other entries under the category 'Consumer Concerns and Power Shortages' PS

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#### MYANMAR LEARNS TO LIVE WITH THE LIGHTS OUT

Aung Hla Tun, Reuters, 09/04/07. http://www.burmanet.org/news/2007/04/09/

Chronic power shortages in Myanmar are leaving cities shrouded in almost permanent blackout, driving its citizens to despair and crippling an economy reeling from decades of military misrule. "We've had only nine hours of electricity in the last three days," lamented Yi Yi Soe, a resident of the leafy colonial-era capital, Yangon. "Some of our neighbours have completely run out of water."

As with other problems in the once-prosperous ex-British colony, there is little explanation in the statecontrolled media, which abound with pictures of generals inaugurating new hydropower projects and promising sufficient power "next year". Few people believe them. Instead, with a stoicism born of 45 years under military rule, they have learnt to live with the privations. "We haven't been able to use the washing machine for ages as the power never lasts long enough. It now serves as a laundry basket," said Yangon housewife HIa Myint, adding that all her other electrical goods were virtually worthless. "We recently decided to retire the rice cooker and we use the fridge as a cupboard. We've unplugged the cable and keep the crockery and glassware inside."

According to official data, in 2006 Myanmar could generate 1,775 megawatts of electricity for a population of 53 million. By contrast, neighbouring Thailand produces 26,000 MW for its 65 million people -- more than 12 times the power per capita. Small businesses such as photo-processing shops or Internet cafes need portable generators to get by and have to hike prices to reflect the high cost of diesel, nearly all of which is imported. "I now charge two different prices for photocopying: 20 kyat per page with government-supplied power and 50 kyat with my own generator," photocopy shopowner Kyi Aung said.

But the use of generators comes with hidden costs for the wider population, mainly in the form of noise and air pollution. "With all the blackouts, generator noise, diesel fumes and flash floods in the rainy season due to the choked drains, life here has become horrible," said Ba Tin, a retired civil servant. "My whole family has developed a sort of migraine. We often get headaches and nausea, especially when the big diesel generators in the restaurants next door are running," he said.

Doctors and psychiatrists say they have had to treat an increased number of respiratory ailments and stressrelated conditions, which they attribute to the noise and fumes. The situation grew so acute in February with the start of the hot season, when temperatures soar to  $40^{\circ}$ C ( $104^{\circ}$  F), that a small group Yangon residents staged a rare anti-government protest. "Our cause is for 24-hour electricity" the protesters chanted before they were arrested.

The widespread use of generators also creates a massive fire hazard, and local papers are full of reports of neighbourhoods or blocks burnt to the ground due to an unattended generator overheating.

Beyond Myanmar's commercial centre, conditions appear to be even worse. Residents of Sittwe, the capital of the north-western state of Rakhine which is home to Myanmar's vast off-shore natural gas reserves, say they have not received any state electricity for a decade. Private companies sell power at K300 (US\$0.24) a unit, compared with K25 in Yangon, and even then the lights are only on from 7pm. to 10pm -- just long enough for the junta's propaganda blitz on state-run MRTV. "As soon as MRTV's evening news ends, the blackout starts," Sittwe resident Ko Aung Khine told Reuters.

The only place not suffering is Naypyitaw, the secretive junta's brand new administrative capital, purposebuilt in hills and scrubland about 240 mi (385 km) north of Yangon. Many in Yangon believe the blackouts are a deliberate ploy to make the port city iso insufferable that government workers and others will be happy to move to the Naypyitaw, which remains little more than a building site. "It's very strange that all the roads are brightly lit even though they are almost deserted day and night, while the crowded roads in Yangon have no lights," economics student Saw Lwin said. "You can't help wondering if the government is forcing all of us to go and settle in Naypyitaw," added his father, Ba Tin. "With the blackouts here every day, we can't do anything."

## Additional references

See other entries under the category 'Consumer Concerns and Power Shortages'. PS

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#### MOU ON UPPER THANLWIN HYDROPOWER PROJECT INKED

NLM, 07/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070407.htm

EPM No 1 Zaw Min received V-P Zheng Yuewen and party of the All China Federation of Industry and Commerce (ACFIC) of the PRC at his office, here yesterday. Also present at the call were DepMin Myo Myint, directors-general, Ch Li Hejun and officials of the ACFIC, MD Tun Myint Naing of Asia World Co and officials. They discussed implementation of the Upper Thanlwin hydropower project.

In the evening, a ceremony to sign an MoU on implementation of the project in northern Shan state between HPID and the Farsighted Investment Group Co Ltd and Gold Water Resources Ltd of the PRC was held at EPM No 1. In the presence of both electric power ministers Myint, and departmental officials V-P Zheng Yuewen and party of ACFIC and officials of Farsighted Investment Group Co Ltd and Gold Water Resources Ltd, MD Tun Myint Naing of Asia World Co and officials, D-G Aung Koe Shwe of HPID and CEO Li Hejun of ACFIC signed the MoU and exchanged notes.

HPID and Farsighted Investment Group Co Ltd will jointly implement Upper Thanlwin Hydro-power Project to generate about 2,400 MW.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-02: Hsenwi Tarpa bridge dam, near Ta-hö-hkao[23° 51' N, 98° 25' E], grid square reference 7\7, 39\3 Nanim confluence dam, near Man Tongkep [23° 25' N, 98° 36' E], grid square reference 7\2, 39\6 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-2.jpg</u>

## Additional References

NLM, 13/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070613.htm

While in the PRC, EPM No 1 Zaw Min and EPM No 2 Khin Maung Myint visited the 2400-MW Gingchaung hydro-power project being implemented by the Farsighted Co in Lijiang, Yunnan province, where they met with Chairman Li Hejun and discussed matters related to the upper Thanlwin hydropower project and the connection of power lines.

NLM, 20/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070520.htm

At Kunlon, Gen Kyaw Win of the MoD meets senior military officers of Kunlon and Laukkai Stations, local leaders and Chinese technicians conducting a feasibility study for the Upper Thanlwin hydropower project. North-east Commander Gen Aung Than Htut reports on a scale model of the 2,400-MW hydropower station and Lt-Col Maung Maung Myint of Kunlon Station on the choice of site for the project.

Kyaw Thu, Myanmar Times, 14/05/07. <u>http://mmtimes.com/no366/b005.htm</u>

A decision on whether one or two hydropower projects will be built on the upper Thanlwin River in Myanmar will be made when a feasibility report is completed in 2008, an official from the EPM No 1 said on May 8. The MoU signed on April 5 was to build a hydropower dam that will produce 2400 MW of electricity. But the ministry official said it remained to be decided if the groups would go ahead with a second dam, as the number of dams was not specified in the original MoU. "We will make a decision after finishing the report," he said, adding that this would be about a year away. The Chinese side had already proposed two projects between the towns of Konkyan and Kunlon in Shan State, one capable of generating 1160 MW and the other 1240 MW, the ministry official said.

NLM, 20/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070420.htm

General Than Shwe stresses the need to implement the Upper Thanlwin project in the Kunlon region of Shan state as soon as possible.

NLM, 25/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070325.htm

Report to the SPIC: The Upper Thanlwin hydel power project will be carried out in two phases. The first phase will be implemented on the Thanlwin river, a mile upstream of the Tarpa bridge in Kunlon township with a power plant of 1,160 MW. The second phases will be upstream of the confluence of Nanin creek and the Thanlwin. The power plant there will generate 1,240 MW.

China Southern Power Grid website, 28/12/06. <u>http://www.yndw.com/showinfo.asp?id=37407</u> Message in Chinese characters under the heading: 'Survey Group Completes On-site Upper Salween River Survey'. Text of the message: Yunnan Power Grid Co. and Mid-South Design and Research Institute (CHECC) surveyed a 147-km section of the upper Salween River in December, 2006.

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## MYANMAR, THAILAND BEGIN WORK ON <u>CONTROVERSIAL TASANG</u> DAM

AFP, 05/04/07. <u>www.burmanet.org/news/2007/04/05/</u>

Myanmar and Thailand have begun building a controversial hydro-power dam on the Salween River, the as yet longest undammed waterway in south-east Asia, official media reported Thursday. Thailand's MDX Group Co Ltd has invested about six billion dollars in the Tasang project in eastern Shan State, which is the biggest of four planned dams on the Salween. The state-run *New Light of Myanmar* said construction began on March 30 -- a move likely to dismay environmentalists who had called for a delay to allow a public consultation on the project.

Activists say the dams could prove disastrous to Salween's delicate ecosystem and accuse Myanmar's military junta of using the dams as an excuse to evict thousands of ethnic minority villagers from their land. NLM said the dam, located about 45 miles (75km) from the Thai border in southern Shan state, would be 2,848 ft (868 m) long and 746 ft (227 m) high. "On completion, generators to be installed at the power station will have a total capacity of 7,110 MW and the project is expected to produce 35,446 million kWh yearly, the newspaper said. Senior officials from Myanmar's state-run energy firms and MDX Group attended an official opening ceremony.

Three more dams on the Salween near the Thai-Myanmar border are in the pipeline, mostly backed by Chinese state-owned energy companies. The United States and Europe have economic sanctions against military-run Myanmar to punish them for the ongoing detention of democracy leader Aung San Suu Kyi and other human rights abuses. But energy-hungry neighbours like Thailand, China and India are keen to exploit the country's abundant natural resources including energy, natural gas and timber, throwing an economic lifeline to the military junta.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-14: Mong Pan Tasang dam, near Wan Kawpa [20° 31' N, 98° 38' E], grid square reference: 11\8, 28\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-14.jpg</u> See also the map at the Shanland website: <u>http://www.shanland.org/environment/2004/Dam\_on\_the\_Salween\_definitely\_on.htm</u>

## Additional references

See above: 'Chinese <u>firm takes 51% interest in Tasang</u> hydropower project' (MT: 19/11/07) 'EGAT <u>agreed only</u> to study feasibility of Salween project' (BKKP: 10/06/07)

*Thailand Burma Border Consortium, Internal Displacement in Eastern Burma: 2007 Survey*, October 2007. <u>http://www.tbbc.org/idps/2007-idp-english.pdf</u> [doc, p. 38] The Ta Hsang dam in Mong Pan remains the largest single project to have caused development-induced displacement in southern Shan State, given that 30,000 people have already been forced to leave their homes.

## Platts Myanmar Country Energy Profile [mid-2007]. For access information, see Power Profile.

In April 1998, Germany's Lahmeyer International finished a project pre-feasibility study for the Tasang dam and hydroelectric project on the Salween (Thanlwin) River. In December 1998, Japan's Electric Power Development Co (EPDC) (now J-Power) received a \$796,000 contract from GMS Power Public Co Ltd (GMS) for a feasibility study of what was then planned as a 3,300-MW plant. This study was finished at the end of 2000. In May 2002, it was reported that a soil survey team from Thailand's MDX Co, the parent of GMS, was working in the Tasang area. With a proposed height of 230m, the 870-m- long dam would be the highest in southeast Asia and the first dam to be built on the mainstream of the Salween. It is opposed by both environmental groups and human rights activists. In April 2006, the Myanmar EPM signed a development agreement for the US\$ 6-billion project with MDX with completion scheduled around 2020. In April 2007, the official Myanmar media reported that implementation was underway for Tasang, now listed at 7,110 MW. The site in southern Shan state is 53 km west of Mongton and 480 km northeast of Yangon. Tasang is a joint venture of Myanmar's EPM, together with MDX, Ratchaburi Co, and CH.Karnchang Co of Thailand and China's Gezhouba Water and Power Group Co Ltd. Annual output is expected to be 35 TWh. Electricity from the plant is mostly designated for export to Thailand with some to be supplied in Myanmar. The actual status of plant construction is unknown.

## Shan Herald, 05/07/07

http://www.bnionline.net/index.php?option=com\_content&task=view&id=1977&Itemid=6

Construction of the Salween-Tasang dam by the MDX Co has ground to a halt because of incessant rain which began with the onset of monsoon in early June. The Salween has overflowed its banks leading to the stoppage. Twenty on-site construction workers have not gone back home. They are housed along with construction materials in two big warehouses on Tang Pa Laung hill, 50 yds east of the construction site. "Bamboos and pipes have been put under the digging hole near both sides of the Salween River bank." Soil from the digs is brought by boat to Tasang. The construction site in Tang Pa Laung port is 15 minutes from Salween-Tasang bridge by boat and 20 minutes from Ta Hsar Lar village on the east side of the Salween by car. Loi Hsai mountain is located on the west side of the Salween opposite Tang Pa Laung.

## Michael Casey, AP, 12/04/07. http://salween-watch2.livejournal.com/2007/04/12/

Thousands of villagers could be displaced and a fragile ecosystem destroyed by Tasang hydropower project on Salween River, the World Wildlife Foundation (WWF) said today. WWF claims damming the Salween will 'displace and negatively impact upon tens of thousands of poor and marginalized people from ethnic minorities in that country'. "The Salween is the only free-flowing river linking the Himalayan glaciers to the coastline of the Andaman Sea,' said a statement from Robert Mather of the WWF's Living Mekong Program. "We are destroying the Salween before we even know what we're losing," Mather said. "From what little we do know about its large number of endemic fish species and abundance of freshwater turtles, we can conclude it is likely to be globally exceptional." A Myanmar gov't spokesman, Ye Htut, said the dam site is in a remote area and "very few people will need to be relocated for the hydro project." "The Myanmar government will use every means to limit (the) environmental effect," he said. "But we should not forget that industrialized countries have caused more damage to the environment then developing countries and have given very little assistance to environmental conservation works in developing countries."

## International Waterpower & Dam Construction, 11/04/07.

http://www.waterpowermagazine.com/story.asp?sectioncode=130&storyCode=2043576 Construction works on the project will involve building a 876m long, 230m high concrete dam, and two 8m

diameter tunnels the longest of which will be 1.2km long.

NLM, 05/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070405.htm

A ground breaking ceremony for the Tar-hsan hydropower project on the Thanlwin [Salween] river in eastern Shan state took place on 30 March. HPID and MDX Group Co Ltd are implementing the project, 33 miles west of Mongton, in a joint venture. Deputy EPM No 1 Myo Myint, Deputy D-G of HPID Win Kyi and Dr Subin Pinkayan of MDX cut the ribbon to launch the project. The concrete dam will be 2,848 ft long and 746 ft high. The generators installed at the power station will have a total capacity of 7,110 MW and the project is expected to produce 35,446 million kWh yearly. Also present on the occasion were officials of Ratchaburi Co [Egat Holding Plc], <u>http://www.ratch.co.th/eng/home.aspx</u>, CH.Karnchang Plc <u>http://www.ch-karnchang.co.th/</u> and China Gezhouba Water & Power Group Co Ltd <u>http://www.gzbgj.com/</u> that hold shares in the project.

# Shan Sapawa Environmental Organization, 29/03/07.

http://www.salweenwatch.org/March29\_SAPAWA\_PressRelease\_Eng.html

At least 400 villagers, including schoolchildren, from Mongton and Mongpan are being trucked to a ceremony to launch construction of the Tasang Dam at the dam-site, where they are being forced to welcome high-ranking Burmese military officials arriving by helicopter. Those attending the 'celebration' include villagers already forcibly relocated from their homes north of the dam-site. In the past ten years, the Burma Army has relocated over 60,000 villagers from areas adjoining the dam site and the projected flood zone. "These villagers have already been driven at gunpoint from their homes and lands. Now they are being forced to clap and cheer while MDX joins hands with their oppressors to construct a dam that will flood their homes for ever," said Sapawa spokesperson Sai Sai. "MDX has been working in this area for almost ten years. How can they be so blinded by profit that they don't see the abuses going on around them?" MDX has turned to China for investors in the project. Increased Chinese involvement was highlighted earlier this month, when the China Gezhouba Group announced on March 15 that it had won a contract for part of the initial dam construction. Recent reports have indicated that the Yunnan Power Grid Corp has also visited the dam site.

# China Gezhouba Co website information, 15/03/07 <u>http://www.gzbgj.com/article.asp?id=749</u>

A four-line news release in Mandarin titled: 'News of Victory from Burmese Market Developments'. The China Gezhouba (Group) Co (CGGC) received a notice from the Burma Tasang Hydropower Co stating that CGGC had won a bid to construct the diversion tunnel for the Tasang C2R hydropower plant. Since its 2005 entry into the Burmese market, the China Gezhouba (Group) Co. has relied on its strength, outstanding achievement, and good reputation, to win a succession of bidding projects and become Burma's most welcomed Chinese company. The Tasang 7260-MW C2R hydropower plant diversion tunnel project follows CGGC's work on the Yeywa and Piaoliang projects. This project is located at the middle section of the Salween River, and over the course of 32 months will involve the construction of two 8m diameter tunnels for a total length of 1,200m. This project is wholly undertaken by the company.

Myanmar Times, 02/10/06. http://www.myanmar.com/myanmartimes/MyanmarTimes17-336/b002.htm

Myanmar's HPID and Thailand's MDX Group will form a J-V to undertake construction of the Tasang hydropower project, an official from EPM No 1 said last week. "We expect to form a J-V before the end of the year," said the official, who requested not to be named. The Tasang project, to be built on the Thanlwin River in Shan State, will be the largest hydroelectric power plant in Myanmar and the biggest Thai investment in the country. The ministry official said plans for the power plant had been finalised and tenders from companies seeking to provide construction materials for the project would be called for as soon as the joint venture company was formed. Myanmar's Hongpang General Trading Co Ltd had already expressed interest in participating in the project, the official said. HPID was currently building accommodation for workers employed on the project, he said, adding that the project would employ some 15,000 people over the course of its construction. The Tasang project would take place in several phases, with a 200-MW plant being built first. "Firstly we will build diversion channels from the Thanlwin River and we will produce 200 MW from this," he said, adding that this approach of building a smaller power plant first was very rare in such projects. The smaller power plant would be operational in two or three years, he said. Work on the Tasang project started a decade ago and a pre-feasibility study commenced in October 1997 with Lahmeyer International GmbH of Germany as consultant.

## AP, 20/05/06.

http://thestandard.com.hk/news\_detail.asp?we\_cat=9&art\_id=19647&sid=8151732&con\_type=1&d\_str=2006 0530

In 2002, the ADB studied the Tasang dam as part of a master plan for a regional power grid. But it backed away, voicing "serious socio-environmental concerns." Rajat Nag, who heads the bank's Mekong Dept, says: "It didn't pass our first filter. The dam would have a profound impact on the Salween river. The project would fragment a fragile river ecosystem, reduce the flow of nutrients and water downstream and reduce the biodiversity. Deforestation is likely and would lead to soil erosion in the rainy season which would exacerbate flood damage."

## NLM, 21/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060621.htm

At the site of the Tarhsan hydel power project on the Thanlwin River between Mongpan and Mongton townships, V-P Noppon Prapaitrakul of the MDX Group reported to EPM No 1 Zaw Min on progress of the project and future tasks. The minister gave instructions on environmental conservation, the health and social needs of local employees and worksite safety. Then the minister inspected a scale model of the project site and the sites for the embankment, two diversion tunnels and the hydel power plants, as well as construction of the staff quarters, offices and the road. Next, the minister and party oversaw completion of a 150-kW hydel power station near Wamsala Village. The preliminary engineering works of the project commenced in the early 2004. The plan includes construction of a 200-MW power plant in the first phase, three 771-MW plants in the second phase, and seven 771-MW plants in the third phase. On completion, the project will generate 7,310 megawatts.

#### NLM, 04/04/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060404.htm

A joint-venture agreement on the Tasang hydropower project between the DHP of the EPM and the MDX Group of Thailand was signed in Yangon today (03/04/06). The project will be implemented on the Thanlwin [Salween] river in southern Shan state. About US\$6,000 million will be injected into the project which is expected to have a generating capacity of 7,110 MW. "It will supply a certain amount of electricity free to areas in Myanmar and the rest will be sold to Thailand." D-G Win Kyaw of the DHP and ED Roy Jutabha of the MDX Group inked the agreement on the joint venture. Pre-engineering tasks of the project, which is expected to completed within 15 years, started in early 2004.

#### NLM, 21/12/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021221.htm

An agreement between the Dept of Hydel Power of the MEP and the MDX Group of Thailand on construction of the Tasang hydel power plant on the Thanlwin river was signed at the International Business Centre in Yangon this morning (20/12/02). Director-General U Win Kyaw of HPD and Managing Director Swarng Champa of MDX explained matters related to the project. The plant, which will be capable of generating 7,110 megawatts on completion, is to be constructed on the Thanlwin river. The first phase of the project includes installation of three 711-MW generators with other equipment to be installed every year. Electricity generated from the plant is to be sold to Thailand and the south-east Asia region. Power will be supplied for local use in accord with the ratio of shares held by Myanmar. The agreement to set up a joint-venture company is an important step in the implementation of the project.

BKK Post, 18/12/02. www.burmalibrary.org/TinKyi/archives/2002-12/msg00021.html

The Thai Senate foreign affairs panel has called on EGAT and MDX Plc, a construction group, to scrap projects to build dams on the Salween river in Burma, citing concerns for national security and image. Panel chairman Kraisak Choonhavan said the projects would lead to more human rights violations in Burma, thus forcing more oppressed Burmese people to seek refuge in Thailand. Thailand already had to deal with more than four million illegal Burmese immigrants. If the government gave the projects the go-ahead, the problem of illegal labour and refugees would worsen, the senator said. The Senate would raise the issue with PM Thaksin Shinawatra, the Foreign Ministry and EGAT, he added. Nassir Archwarin, of the Thai Action Committee for Democracy in Burma, said the dams would destroy one of south-east Asia's richest river ecosystems. The Salween was the lifeline of more than 10 million people in 13 ethnic groups, he added. Mr Nassir yesterday handed a petition to Mr Kraisak calling on the Senate to stop the government and agencies concerned from supporting the projects. The petition was backed by Burma's opposition NLD party led by Aung San Suu Kyi, as well as 69 Thai and Burmese NGOs working on environment and human rights issues.

## Shan Herald, 25/05/02.

http://www.shanland.org/environment/2002/dam\_on\_the\_salween\_project\_reviv.htm/

The New Era Journal, in its May issue, reports the revival of the Tasang hydroelectric dam on the Salween. It said that a soil survey team from Thailand's MDX Co was in Tasang on 16 April. A recent report reaching the S.H.A.N. supports this claim. It told of the arrival of a Myanmar-Thai Joint River-course Survey Project in Mongton, 60-miles north of the Chiangmai border on 16 April. The 36-man team brought 3 motor vehicles, 146 items of equipment and 10 ICOM radio transmitters with them. Two LIBs have been assigned for security. Another source confirmed that the MDX had "indeed returned" after securing the assistance of Somkid Onman (aka Sia Ord) of the Thai Saward Co, whose 13 year experience of working in the area were

considered to be an asset. Exploration of the Salween began in 1997 by GMS Power, a subsidiary of MDX, and continued until the end of 2000.

#### Images Asia, November 1999. www.ibiblio.org/obl/docs/SW03.htm

Tasang hydropower project studies have been carried out by GMS Power Plc and consultants working for it. GMS Power is a subsidiary of the MDX Group, an influential Thai holding company that includes former senior MP's and ex-directors of EGAT. MDX is also involved in dam projects in Laos, Cambodia and Yunnan. According to leaked documents, GMS signed a contract with the Myanmar Economic Corp (MEC) in September 1997. It then subcontracted Lahmeyer International, a German consulting engineering firm, to assist with a pre-feasibility study. The GMS reps are quoted as saying the desk, reconnaissance and pre-feasibility studies were done at the same time, starting from November 1997. This study was completed and submitted in April 1998. The Electric Power Development Corp of Japan (EPDC) was contracted to carry out (or assist with) a feasibility study. According to GMS sources, this feasibility study was done between Oct 1998 and Mar 1999. This is borne out by local and NGO observers who reported that Thai, Japanese and other foreigners visited the Tasang site and carried out sampling activities during this time, although they did not stay long.

## Images Asia, 12/01/99. [not available on-line]

Surveying for the Tasang dam on the Salween River in Shan State is seriously underway. The first reports started arriving in Oct 1998. The main company involved is MDX Power, whose staff were crossed the Thai border at Nong Ook (up from Chiang Dao in northern Chiang Mai prov) and travelled by road to the Sal ween River north-west of Mongton. Further reports received in Dec 1998 and early Jan 1999 have confirmed that the dam is being planned for the Tasang area above the place where a major bridge is being built across the river at Tasang. There is a heavy Burmese military presence in the area. The survey area covers a distance about one-and-a-half hours by boat south of the confluence of the Nam Hsim river with the Salween and north of the village of Wansala. The site where most of the survey activities are being carried out is where the Salween passes through a steep gorge. The surveyors, assisted by Burmese army engineers have begun dynamiting and drilling a number of deep holes into the rocks at the base of the gorge and along the river. Teams including about 20 Japanese have been travelling together with Thai staff from MDX by road and boat to the dam site. Security is provided by the Burmese army. The dam is ostensibly being planned to divert water from the Salween into Thailand, as well as to produce electricity for Thailand and Burma. It is said that it could produce an estimated 3,700 megawatts of electricity. Dr Subin Pinkavan, a senior MDX advisor and former government minister, has approached the Shan opposition not to obstruct the survey activities. The logging company Thai Sawat, which has held concessions in the area since the late '80's, is closely co-operating with MDX in the survey.

LOW WATER LEVELS HINDER POWER DISTRIBUTION Ye Lwin, Myanmar Times, 02/04/07. <u>http://mmtimes.com/no361/n003.htm</u>

Although Myanmar increased its potential electricity output to 1572 MW last month, only about 70pc of this total is currently being distributed because low water levels are forcing hydropower projects to operate below capacity, EPM No 2 Khin Maung Myint said last month. The completion of the Yenwe hydropower project in Bago division in February boosted total electricity output from 1546 MW to 1572 MW, he told a meeting of industrialists at the office of the Hlaingthaya IZ Management Cte. However, he said that although it was possible to supply 24-hour electricity from July to December due to abundant rainfall, low water levels in reservoirs at hydropower projects from January to June made it difficult to deliver regular power supplies throughout the country.

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The minister also said electricity demand has exceeded supplies because of residential and industrial development since 1988, and because of increased use of air conditioners and refrigerators in recent years. In 2006, about 410 MW of power was distributed to Yangon division, while the rest of the country shared about 600 MW, he said.

The Ministry of Electricity was split into two separate entities last May, with the EPM No 1 responsible for hydropower projects and the EPM No 2 overseeing the transmission and distribution of electricity, in addition

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to managing the generation of electricity by natural gas supplied by a pipeline from the offshore Kanbauk field.

"EPM No 2 has been collecting about K10 billion to K13 billion a month in electricity charges so far this year, a dramatic decline from the K16 billion it was bringing in last year during the football World Cup," the Minister said. The government provides a subsidy of K25 per kWh for electricity consumption by the public. The industrial sector, which is not subsidised, is charged K50 a unit. The government has said it plans to supply 24-hour, year-round electricity throughout the country in 2008 and boost electricity output to 5,000 MW sometime in the future.

# Additional references

See above: <u>'Full reservoirs</u> to boost hydropower' (MT: 19/11/07) See also other articles under the category 'Overview'. <u>OV</u>

# INDUSTRIAL ZONES TO RUN AT NIGHT

Ye Lwin, Myanmar Times, 26/03/07. http://mmtimes.com/no360/b003.htm

All private factories in Yangon industrial zones from April 1 will be allowed to operate at night in order to raise the industrial sector's output, according to an order from a senior government official. Gen Myint Swe of the MoD informed the Yangon IZ's Management Cte of the decision to extend operating hours from next month during a meeting at the Hlaingthaya IZ on March 11. Currently, private factories are only permitted to operate from 8am to 6pm.

"The economic development of the country depends on progress made by Yangon's economy. Only when the economy of Yangon is successful will the economy of the country be strong. Next to Naypyitaw, Yangon will remain as country's main commercial city," Lt Gen Myint Swe said when announcing the decision. Employers would need to reach their own agreements with staff for operating a nightshift, he added. The decision affects more than 1,500 factories and 120,000 workers.

U Myat Thin Aung, president of the Hlaingthaya IZ Management Cte, told the Myanmar Times that extended factory hours would be beneficial for "all parties – labourers, employers and the country". "By operating a nightshift, there will be more working hours and the labourers will earn more wages than usual," U Myat Thin Aung said.

Lt Gen Myint Swe's pledge that electricity would be supplied at night would also benefit companies because their production costs would fall as their consumption of diesel used to run generators would be reduced. EPM No 2 Khin Maung Myint, said at the March 11 meeting that the industrial zones would have priority in Yangon's electricity distribution in order to strengthen the sector and raise the division's gross domestic product.

U Myat Thin Aung said channelling more electricity to industry would generate more revenue for the YESB since factories pay twice as much per unit as households do. Yangon's GDP in the 2007-08 financial year, starting April 1, is targeted to reach K2.38 trillion, Lt-Gen Myint Swe said. Yangon's GDP was K790 billion in 2005-06, according to the Yangon DPDC. The regular working week for factory employees is currently considered to be 48 hrs/wk, with a maximum additional 28 hours of overtime.

# Additional references

Ye Lwin, Myanmar Times, 24/09/07. <u>http://www.mmtimes.com/no385/b\_brief.htm</u>

In September, the YESB increased power supplies to all industrial zones in the city, said U Myat Thin Aung, president of the Hlaingthayar IZ Management Cte. All IZs in Yangon are receiving 24-electricity every third day and 18 hours of power on other days. The increased supplies "will be very convenient for manufacturers as it significantly saves on production costs", he said, alluding to factories' frequent use of more expensive diesel-powered generators during blackouts. There are some 1,500 factories in Yangon industrial zones

which pay K50 per unit of electricity, compared with K25 for residential users. "If the factory uses diesel to generate electricity, per unit costs are much higher than what the YESB charges," U Myat Thin Aung said. The YESB is expected to cut back electricity supplies again when lake levels at the country's hydropower stations fall after monsoon.

See also other articles under the category 'Industrial Use'.

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## ADVANCED INSULATOR FACTORY PLANNED FOR CHAUK

NLM, 24/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070324.htm

From a report to the Special Projects Implementation Committee. The Ministry of Industry No 1 will implement the Advanced Insulator Factory Project (Chauk) that will manufacture 800 tons of advanced insulators a year. The factory will be built beside Chauk-Sale road, four miles from Chauk. The insulators are used in power lines. The Ministry of Industry No 2 will establish a factory in Pahtosan Village of Magway township to produce aluminum conductor steel reinforced cables to be used for the grid.

#### Additional references

NLM, 05/05/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070505.htm</u> Industry Minister No 1 checks on advanced porcelain insulator factory project of MCI in Chauk.

NLM, 30/11/05. <u>http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051130.htm</u> Unicom Trade and Travel Co Ltd of Thailand won a contract to export machinery and provide technical assistance to the porcelain insulator factory project of Myanmar Ceramics Industries-MCI to be built in Chauk.

See above: 'Factories urged to speed up production of <u>lampposts and wiring</u>' (NLM: 30/05/07)

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YANGON INDUSTRIALISTS URGED TO INCREASE PRODUCTION NLM, 12/03/07 http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070312.htm

Lt-Gen Myint Swe of the MoD met with chairmen of IZ management ctes and industrialists from the IZs of Yangon North at Kanaung Hall in Hlinethaya township this afternoon. The chairman of Yangon North District IZ Management Cte, U Thein Naing, and other management cte chairs reported on investment and other matters in their zones.

EPM No 2 Khin Maung Myint presented reports on the generating of power in the entire nation and the supply of power to Yangon City and IZs. Chairman Hla Htay Win of the Yangon DPDC explained that 30pc of the net production of Yangon division comes through the industrial sector. Due to increased power this year, industrial zones have been able to boost their production. He said industrialists should use websites to announce matters related to the products of their factories with a view to attracting local and foreign consumers.

D-G Aung Win of the Dept of Human Settlement and Housing Development submitted reports on arrangements for setting up Thilawa IZ and maintenance of roads in the zone.

In his instructions, Gen Myint Swe said that as Yangon is a commercial centre, the economic development of Yangon division reflects the growth of the national economy. Industrialists should assume their role in making the economy boom and, for its part, the government would respond to their requirements. He stressed the need to manufacture import-substitute products and to penetrate foreign markets.

## Additional references

See above: 'Industrial zones to run <u>at night</u>' (MT: 26/03/07)

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#### HOMEGROWN SOFTWARE INDUSTRY STRUGGLES ON

Ye Kaung Myint Maung, Myanmar Times Supplement, 12/03/07 http://www.mmtimes.com/feature/electronic/e019.htm

Producers of computer software in Myanmar have battled hard to forge an industry for themselves in the last decade as the country has slowly been pulled into the digital revolution. A narrow market, widespread piracy, negative attitudes to locally made products and the lack of a reliable network infrastructure have forced developers to work hard for every inch of market share they have gained.

Software developers classify their products into either ready-made or tailor-made programs. Readymade software is developed to satisfy a wide ranging market – dealing with issues faced by many people in different places. But tailormade software is made to fill a specific gap. This usually requires the user – after the software has been developed – to undergo training just to be able to use it.

Ko Saing Nay Htut, marketing manager of iNTEGRA Systems Company, said the most popular markets for software were the accounting, sales and human resources sectors. iNTEGRA Systems has produced a widely known program called "iLedger". It combines accounting software, human resources management software and the "iStock" sales control system in one handy package. Myanmar's software industry enjoyed a small time of prosperity in the years leading up to the banking crisis in 2002. In that 'boom' time the international delivery service company DHL and several up-and-coming banks ordered a number of tailormade programs. But the banking crisis put an end to that prosperity and some of the foreign banks closed shop and left Myanmar.

The condition of the country's marketplace today has led software development companies to focus on small and medium enterprises, according to Ko Saing Nay Htut. "We developed some readymade software but we market and sell in tailormade form," said Ko Saing Nay Htut. "For example, iLedger covers all common processes in accounting but we can also modify it and add additional features when users give us specific requirements," he said.

Local software programmers face a constant struggle against illegal pirate software CDs. These discs are imported and duplicated in Myanmar. They are available on the market for about K1,000 (less than US\$1) and only require installation in the computer. These illegal products have heavily influenced user attitudes toward software. But locally made products have continued to survive in competition against illegal imports by being cheap and by offering special features and handy maintenance services. "Even if the foreign-made software programs were perfect, there would be still a place for local developers who know exactly what the users need and can tailor programs to suit. We often include Myanmar language font systems that foreign programs don't bother with."

iNTEGRA Systems has also begun planning for future product needs. "We are now upgrading our products to be compatible with Window's Vista platform. But until now, there have been few Vista users," Ko Saing Nay Htut said.

Recently, some local companies have begun importing foreign software and penetrating local markets by providing additional services – just like local software developers. Daw Lwin Lwin Myint, manager of IT Myanmar, a local company that markets the Malaysian-made software, Mr Accounting, said the company has been providing services similar to local software developers. "Mr Accounting focuses on business procedures in countries like Myanmar. It includes user-friendly interfacing systems, multicurrency systems and an automatic depreciation function. It can be used on either client-server types or stand-alone types. We provide free service for six months and allow two staff members from the buyer's company to join the computer accounting courses we have," Daw Lwin Lwin Myint said.

U Ye Myat Thu, from Mandalay Computer Industry Ass'n, said people's attitudes were vital for the development of IT businesses. "Most Myanmar people have no idea about the value of computer software, many think they will only pay for the hardware and get the software for free. Entrepreneurs want to spend their money on advertisements and promotion instead of investing in software for the long term," he said. "Information technology is just a tool to assist, not a solution. That's what IT technicians always say. Some of them think it makes no difference using better software. But others overestimate software and think it will solve everything. I think the truth is somewhere in the middle of those two viewpoints," U Ye Myat Thu said

#### Addtional references

See also other articles in the 'Electronics' supplement of the Myanmar Times edition of 12/03/07 <u>http://mmtimes.com/feature/electronic/feamain.htm</u>.

See above: <u>'Yadanabon cyber city</u> slated for soft opening in September' (MT: 24/09/07) See below: 'Collaborate on contracts, <u>ICT sector</u> urged' (MT: 12/12/05) 'Electronics industry <u>spreading roots</u> in industrial sector' (NLM: 06/06/04) <u>'Software growth</u> badly in need of human touch' (MT: 16/10/00)

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#### ASIAN ELECTRICAL APPLIANCES VIE FOR MARKET SHARE IN MYANMAR

Ye Lwin, Myanmar Times Supplement, 12/03/07. http://www.mmtimes.com/feature/electronic/e015.htm

Sales of electrical appliances have risen steadily in recent years and become one of Myanmar's main imports, according to figures released by the Commerce Ministry. Electrical appliances imported through border trade from China and Thailand have gained a foothold in the market and are competing against well-known brands from Japan and South Korea, said retailers and distributors. Consumers can choose from among about 20 brands of imported appliances, of which up to 90pc are from Asian countries. About a third are from China and the balance from other countries, mainly South Korea and Japan. Televisions and MP3 or MP4 portable music players which are made in China and imported through the border checkpoint at Muse have a strong share of the market.

But refrigerators and DVD and VCD players are mainly imported from Thailand through the Myawaddy border checkpoint, said U Htay Aung, manager of the Advance Electronic Retail Shop in downtown Yangon. "The prices of electronic goods from China and Thailand are relatively low compared with other brands and are within the reach of ordinary people," he said, adding that most consumers opted for Chinese products. U Htay Aung said televisions and DVD players were the top sellers in the electronics market. "Sales of DVD players are rising at an unprecedented rate compared to other electronic goods," he said. However, sales of televisions had declined and were averaging about 150 units a month, about half that in 2006, U Htay Aung said.

Meanwhile, Samsung has launched a campaign to promote sales in Myanmar of its high-tech televisions, said U Myat Thin Aung, the chairman of AA Electronics Co Ltd, the South Korean company's sole distributor in Myanmar. The campaign follows a survey by Samsung which found that sales of televisions with liquid crystal display or plasma screens were increasing throughout the world. However, there was consumer resistance in Myanmar because the televisions were about 10 times more expensive than models using tube-type screens, U Myat Thin Aung said.

Televisions were once considered a luxury in Myanmar but have come to be regarded as an essential for providing entertainment and information, said U Than Win Aung, the managing director of the Star TV factory in the Hlaingthaya industrial zone. The growing demand for electrical appliances co-incided with the rise in living standards, said U Than Win Aung. Consumers with disposable incomes opted to buy televisions for entertainment, information and education, he said. It is estimated that nearly all households in Yangon and about 60 per cent of those in rural areas have a television.

#### Additional references

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#### WIND ENERGY BOOSTS RURAL DEVELOPMENT

Kyaw Thu, Myanmar Times, 05/03/07. http://www.mmtimes.com/no357/n003.htm

In an important development to promote the use of alternative energy sources, the Dept of Development Affairs has begun producing wind turbines to supply power to villages not connected to the national grid. The decision to make the turbines followed the successful development of prototypes made at the department's research centre in Yangon under a project begun in July 2005. The supervisor of the research team, U Thein Shwe, said turbines capable of generating 300 and 750 watts had gone on the market. The 300 W turbine costs K450,000 and the 750 W model retails for about K1 million. A 300 W turbine is capable of supplying enough power to illuminate ten 36 W fluorescent lights for five hours.

U Thein Shwe said one advantage of using the turbines in remote areas was that it would make it easier for students to study at night. He said the department needed to conduct more research on prevailing wind speeds in various parts of the country to determine which areas are best suited to benefiting from the alternative energy source.

U Soe Ko Ko of the development affairs department said it planned to eventually sell turbines capable of generating between 700 W and 1000 W. As well as wind turbines, the dept is also conducting research into the use of mini-hydropower projects throughout the country.

The secretary of the Renewable Energy Ass'n, U Aung Myint, said 300 W and 1000 W wind generators were ideal for rural communities because they were easy to maintain. He also said the association was planning four mini-hydropower projects in Shan State.

Myanmar is among many countries throughout the world which are exploring the use of alternative energy sources because of the rising price of fossil fuels and their impact on global warming. At the ASEAN summit in the Philippines in January, Myanmar and its nine partners in the regional grouping, along with Australia, China, India, Japan, New Zealand and South Korea signed the Cebu declaration on energy security which provides for increased efforts to promote the use of alternate energy.

A former executive director of the ADB, U Hla Maung, said at the launch of his book The World and the Energy Crisis on February 27 that more subsidies were needed to support research into the use of renewable energy sources in Myanmar. U Hla Maung, who is also a former director general of the Ministry of Planning and Finance and a former ambassador, referred to the example set by Brazil, which provided tax exemptions for companies making alternative energy technology. He also urged the private sector to become more involved in the renewable energy sector.

**Compiler's note**: A good photo showing the testing of wind turbines under production at a research centre in Yangon accompanies the original article.

#### Additional references

See below: 'Wind power <u>system ideal</u> for villages, says engineer' (MT: 05/12/05) See also the section on wind energy in '<u>Electricity potential</u> of energy sources available in Myanmar'.

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#### TURBINE FACTORY PLANNED FOR THAGARA INDUSTRIAL REGION

NLM, 25/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070225.htm

General Than Shwe and party arrived at Thagara Industrial Region of Ministry of Industry No 2 in Yedashe township. At the briefing hall, Minister Saw Lwin reported that three projects were being implemented in the region. The first is a plant that will produce various kinds of multipurpose diesel engines, the second is a

plant to produce bulldozers and excavators at the rate of 100 bulldozers and of 200 excavators per year. The third is a plant that will produce turbines and hydel power engines. This plant will produce Francis turbines of 100 kW, 500 kW, 2,000 kW and 5,000 kW at the rate of 50 per year. Minister Saw Lwin presented the aims, signing of the contracts, investment involved, acquisition of technology and progress of the project.

Afterwards, Gen Than Shwe gave guidance, saying that the various plants established in the Thagara region will contribute to industrial development and to the national economy. Innovative efforts are needed to produce better engines, turbines and machinery than those currently under production. It is not good to be complacent about the current situation. The Ministry of Industry No 2 is responsible to develop the industrial sector of the state. It should be playing a greater role in industrial development.

# Additional references

NLM, 31/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071231.htm

On a visit to the Thagara industrial region, PM Thein Sein checks the site where a turbine and generator factory will be built. The government has set a target of an annual average growth rate of 25pc in the industrial sector. Electric power plays an important role in the development of this sector. Despite generating over 770 [1770?] MW, Myanmar's electric power plants cannot the demand. Fifiteen hydropower projects are being implemented simultaneously. When completed, they will add 10,000 MW to the system. The hydropower turbines and generators to be manufactured at Thagara will make a significant contribution to the development of the electric power sector of the State.

NLM, 05/09/07. www.myanmargeneva.org/07nlm/n070905.htm

Machinery to be installed in the factories that will produce diesel engines, heavy machinery, turbines and generators has arrived at the project site of the IZ four miles from Thagara. Arrangements are being made for the supply of electricity to the zone. Foreign experts are on hand assisting with the construction of the factories.

NLM, 06/11/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061106.htm</u> In Nanning in the PRC Minister for Industry No 2 Saw Lwin received the chairman of the China National Machinery (I&E) Corp, Mr Tang Yi and party. They discussed construction of the hydro-turbine and generator factory in Thagara.

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## ACUTE SHORTAGE OF ELECTRICITY DISAPPOINTS MON RESIDENTS

IMNA, 21/02/07. http://www.monnews-imna.com/2007/febupdate.php?ID=534

Despite the promise of the Energy Ministry that it would try hard to provide smooth and efficient service, residents in Mon State are sorely disappointed. They have been waiting since last year to receive proper electricity supply. "Power supply is available when people sleep. It is not available when people need it most," a resident in Mon State said. Moulmein in Mon state, and Pego town in Pego division only get power supply a few days a week. But in some quarters where the power supply is connected to government offices people are lucky and get better electricity supply.

Sometimes, when power comes for a few hours the residents cook rice but often it goes off before the rice is fully boiled. That is the reason why rice is wasted many a time, said a Thanbyuzayart resident. Given the rise in consumption of electricity, when power comes to their quarters it is only for a short time. Many home owners have bought generators, so they can watch movies.

The military government has extended electricity supply to model villages and put a banner at the entrance to the villages which says: "Villages and townships must develop quickly". Even Kawbein village in Kawkareik township, Karen state, gets regular electricity. Some houses in Karoat-pi village, Thanbyuzayart township have increased consumption to about 15 kWh but others have not increased even by one unit after the extension two months ago. A Mudon resident said, "Electricity consumption has gone up in every household." They get the supply by rotation from one quarter to another.

Residents into business do not rely on the government's electricity supply and have bought generators made in China. They are available on the market. Some small business outfits are spending more money because they use petrol and diesel to run the generators. Some people subscribe to private electricity supply companies, but their services are expensive. That is why some whose children are not students are not buying electricity from the private sector. "Eat dinner before dusk because candles are expensive. That's why I eat dinner and sleep early," a Mudon resident said.

## Additional references

#### See above: 'Premium rates for electricity in Mon villages' (IMNA: 03/08/07)

IMNA, 24/12/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=3238&Itemid=6</u> Residents of Mon state are complaining that they are being supplied with power on rotation. A housewife from Kyat Khine Ye quarter in Thanphyuzayart town said it is no use to them when it comes on in the daytime because they can't even cook rice and iron clothes, She said that is because everybody is using inverters to store electricity. "Most houses have bought inventers, so that when electricity is available the supply is so low they can't use it properly," a Mudon resident said. People get power about twice a week in rotation in each quarter in the towns during the daytime. But mostly they get electricity during the nights. But it is not for a full 48 hours.

IMNA, 31/08/07. <u>http://www.monnews-imna.com/newsupdate.php?ID=736</u>

The military junta increased electric charges from K2.5 to K25 per kWh in 2006. Although the fees are supposed to cover maintenance costs, there always additional charges for repairing transformers or transmission lines. "The authorities collected K5,000 per house in our quarter and other quarters paid K10,000 per house to repair a transformer which broke down in town and to buy a larger transformer," said a Mudon resident.

See below: <u>'Private operators</u> meet need for alternative power service' (MT: 03/02/02)

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## COMPLETION OF HYDROPOWER PLANTS ASSIGNED HIGHEST PRIORITY

Kyaw Thu, Myanmar Times, 12/02/07. http://mmtimes.com/no354/b003.htm

The completion of planned hydropower projects in Myanmar has been given priority over all other government projects, an official from the EPM No 1 said February 2. The ministry was pushing to finish all 13 hydropower projects scheduled for completion between 2007 and 2009 on time, said the official who requested not to be named. "We (the Ministry of Electric Power No 1) will be given sufficient funding to finish the existing hydropower projects," he told The Myanmar Times.

The ministry has started work on 15 hydro-electric projects that are due to be finished before the end of 2020. Four are scheduled to be finished in 2007, four in 2008, five in 2009, one in 2010 and one in 2020. The 13 targeted for completion from 2007 to 2009 – with a combined output of more than 2000 MW – have been given priority over other ministries' projects, the official said. The Yenwe power plant, which was delayed due to the late arrival of a turbine from China, is not included among the 13 to open by 2009. Yenwe was set to open in February 10, the official said.

The Hutgyi and Tasang plants on the Thanlwin River are not included in the government's priority list as they are Thai and Chinese projects whose output will mostly be diverted abroad.

The ministry said it would use foreign and local technicians to help meet target dates. "We hired about 40 Myanmar engineers last November and we are now giving them training at the ministry-owned training school in Hlaingthaya township," the official said. Japan's Kansai Electric Power Co is designing and supervising construction of all but one of the ministry's projects – the 790-megawatt Yeywa power plant in Mandalay division. Switzerland's Colenco Power Engineering Ltd is serving as technical consultant for Yeywa, which is due to open in December 2009.

## Additional references

NLM, 17/11/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071117.htm

Gen Than Shwe at annual general meeting of USDA: At present, 1616 MW of electricity is produced compared to only 568 MW [in 1988]. On completion, the 23 hydroelectric power projects currently under construction will increase power generated by 11,000 MW. Although hydroelectric power projects are long-term, the government is striving hard to fulfill the needs of the populace within the shortest period. To ensure a smooth supply and distribution of electricity, extremely high voltage transmission lines have been erected or expanded.

NLM, 28/10/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071028.htm</u> Gen Thein Sein: The implementation of 17 hydroelectric power projects that can generate 10,000 MW is well under way

Myanmar Times Energy Supplement, 20/08/07. <u>http://mmtimes.com/feature/energy/06.htm</u> Current hydropower electricity production stands at 745.68 megawatts (MW), some 43pc of total electricity production. However, government figures show an additional 2034.2 MW are expected to come online at the end of 2009 when several hydropower plants should be finished. A total of 13 plants are included in this list and range from 2.2 to 790MW in capacity. By the end of 2007 about 686 MW from four projects should become available for the national grid, while 247MW will theoretically come on-line in 2008, but 2009 is expected to show a considerable increase – with more than 1,100MW expected. In addition to the projects intended to be operational by the end of 2009, another 11 plants are slated for the future. These projects are expected to generate up to 15,725 MW and should be finished by 2015.

Myanmar Times, 13/11/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes18-342/h011.htm</u> Completion of several hydropower projects in 2009 is expected to more than double production of electricity in Myanmar from 1667 to 4000 MW, an official from the EPM No 1 said last week. Among the hydropower projects expected to be finished in 2009 are those at Yeywa in Mandalay Division and Shweli in Shan State. The official also said the HPID is conducting a feasibility study for a hydropower station about 16 km (10 miles) upstream from the village of Ann in Rakhine State. "The department is building camps and roads to facilitate the project," the official said, adding that the station will include three turbines capable of producing a total of 15 MW. Hydropower currently supplies 38.5pc of Myanmar's electricity output, with gas turbines producing another 48.44pc, coal-fired steam turbines 12.5pc and diesel engines 0.5pc.

See below: 'Government will <u>prioritize hydropower</u> projects over gas' (MT: 10/07/06) 'Hydropower project <u>nearing completion</u>' (MT: 28/06/04) 'Generation facilities scheduled for <u>commissioning in 2002-2004</u>' (MT 07/01/02) 'More inputs needed to power a <u>hydro future</u>' (MT: 04/06/01)

#### **YENWE HYDROPOWER STATION INAUGURATED**

NLM, 11/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070211.htm

Yenwe hydro-electric power station was inaugurated in Kyaukdaga township this morning (10/02/07), with an address by Ch of Work Cte for Development of Electric Power Projects PM Soe Win. The PM said in his address Yenwe multi-purpose project is one of thirteen Sittoung Basin development projects including Paunglaung, Upper Paunglaung, Nancho, Thaukyehkat 1, Thaukyehkat 2, Bawgata, Khabaung, Kunchaung, Pyu, Shwegyin, Zaungtu, Pathi, and Yenwe. Of these three projects --Yenwe, Paunglaung and Zaungtu -- have been completed.

In addition to the hydro projects of the EPM No 1, the A&I Ministry is also undertaking projects to supply electric power. Altogether nine hydro-electric power projects are under construction in Bago division. He also spoke about four projects in the upper region of the Ayeyawady River. A feasibility study is being conducted for the Ayeyawady confluence project and the Tappain project. Preparations are underway for similar projects in the Chindwin and Thanlwin basin regions.

Yenwe Dam can generate only 25 MW, but good experiences can be gained from it for construction of other similar dams. Good experiences have also been gained from the hydel power projects such as Zaungtu on the Bago river, Zawgyi on the Zawgyi river and Thapanseik on the Mu river, and the Mone hydel power station project on Mone creek where a variety of natural barriers had to be overcome. That led to the implementation of greater hydel power station projects such as Yeywa on the Myitnge and Htamanthi on the Chindwin. Other hydel power projects as Kengtaung, Shweli and Kyee-ohn Kyee-wa will be accomplished before long.

EPM No 1 Zaw Min said Yenwe hydro-electric power station is the 45th project implemented by the Hydropower Dept. Currently, the ministry has 16 hydro-electric power projects underway. Of the remaining 15 projects, the Khabaung, Kengtung, Shweli, Kunchaung, Pyuchaung, Shwegyin and Yeywa projects will be completed in the period from 2007 to 2010. The minister thanked CITIC and CNEEC of the PRC and service personnel and all responsible persons for efforts to complete the project in time.

Afterwards, the PM presented a basket of fruits to V-P Liao Shengsong of China National Electric Equipment Corp and inspected the station and storage of water in Yenwe Dam.

Yenwe hydro-electric power project was implemented on Yenwe creek about two miles from Myochaung village in Kyaukdaga township. The earth dam is 1,050 ft long and 251 ft high. The intake structure, which is 48 ft long and 40 ft high, is of reinforced concrete. The power station is 128 ft long, 82 ft wide and 85 ft high. It will be able to generate 123 million kWh annually, The dam will irrigate 118,500 acres of farmland. The project was implemented by Construction Group No 4 of HPID and the ID. It was built at a cost of K5,322 million plus US\$ 8.47 million.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-15: Toungoo Yenwe dam near Myogyaung village [18° 04' N, 96° 28' E], grid square reference: 8\9, 25\9 http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg

## Additional references

NLM, 27/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061227.htm

GM Kyi Tha and Director Khin Maung Win of HPGE conduct EPM No 1 Zaw Min and party around the underground power station at Yenwe dam. The minister inspects the running of No 1 turbine and the installation of No 2 turbine.

Kyaw Thu, Myanmar Times, 16/10/06 <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-338/</u> Myanmar power supplies will get a welcome boost with the start of production at the Yenwe hydropower plant in Kyauktaga township at the end of the month, an official at the EPM No 1 said. The Yenwe plant is equipped with two turbines each capable of generating 12.5 MW. It is predicted to generate 125 million kWh a year, which will be fed into the national grid. The project was designed with a multi-purpose dam – measuring 320 metres (1,050 ft) wide by 76.5 metres (251 ft) high – which can supply water to 118,500 acres of farmland. Construction on the project started in 2000 and cost about K 13.8 billion. About 38.5pc of Myanmar's electricity is generated by hydropower plants, with the remainder coming from gas (48.5pc), steam turbines (12.5pc) and diesel (0.5pc).

NLM, 23/03/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060323.htm

Yenwe multi-purpose dam was inaugurated in Kyauktaga township. It is an important part of the Sittaung valley development project and was implemented as a result of damage to the Pagaing embankment. The Pyundaza and Bago plains became wetlands and the streams and canals were silted up. So major sluice gates have been built on the Yenwe, Baingda and Kawliya streams. With the building of the Yenwe and other dams, the wetlands will be turned into valuable and arable farmlands. Thanks to the construction of the dam, two main canals stretching 7.1 miles and canals stretching for 309 miles (sic) will irrigate 118,500 acres of monsoon and summer paddy, edible oil crops, vegetables and sesame plantations in the region. The Government spent K16,165 million on construction of the 251-ft high, 1,050-foot long dam which is capable of storing up to 931,800 acre-feet of water. Laying of concrete for the steel pipelines is continuing, as well as construction of the power station which is expected to start operations at the end of May 2006.

NLM, 01/01/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060101.htm

EPM Tin Htut oversees completion of the power station at Yenwe hydel power project, installation of the steel pipeline, dredging of the inlet water tunnel, building of the main embankment, sluice gate tasks and flow of water into the dam. Afterwards, he checks the project site of the 230-kV Thayagon (Kyaukdaga) sub-power station.

NLM, 29/12/04. <u>http://www.myanmar.gov.mm/NLM-2004/Dec04/enlm/Dec29\_h2.html</u> Yenwe Dam will have a water storage capacity of 1,212,600 acre feet.

NLM, 22/09/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030922.htm

PM Khin Nyunt and party visit Yenwe multi-purpose dam project where they are briefed by the A&IM Nyunt Tin and the D-G Kyaw San Win of the ID on the annual rainfall, water storage capacity of the dam, geological condition of the region and construction of the temporary sluice gate and diversion tunnel and spillway. D-G Win Kyaw of HPD provides details on the construction of the power intake, the gate shaft and the installation of the gates and trash racks, the digging of the intake tunnel and installation of reinforced concrete liners and steel pipe liners, the penstock tunnel and the construction of the hydel-power station. Two 12.5-megawatt generators will generate 123 million kilowatt hours per year.

NLM, 18/01/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010118.htm

Gen Than Shwe inspects the project on Yenwe Creek, 2.5 miles south of Myochaung village. The dam will be 1,050 feet long, 251 feet high. The project is being jointly undertaken by the ID and MEPE. It will irrigate 118,500 acres and benefit 237,000 acres and will generate 20 MW.

MEPE website information, [circa 2001]. [no longer available on-line] The feasibility study and design for the Yenwe dam and hydropower project was done by the Kansai Electric Power Co. It is scheduled for completion in 2006.

NLM, 28/12/00. <u>http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n001228.htm</u> A&IM Nyunt Tin is briefed on the geological feasibility survey of dam site; a design engineer reports on soil layers and rocks, as well as work on construction of the spillway, the main structure of the dam and ground clearning work.

WPD, 15/09/90. http://www.ibiblio.org/obl/docs3/BPS90-09.pdf

SPIC, chaired by SLORC V-C General Than Shwe, met to review hydel power and energy projects. Among the projects planned for later implementation are the Ye-nwe multipurpose dam project in Kyauktada township. It is expected to generate 16.2 MW and irrigate 40,000 acres.

WPD, 04/08/90. http://www.ibiblio.org/obl/docs3/BPS90-08.pdf

At a mtg of SPIC, General Than Shwe outlines major irrigation projects, notably the Mu river valley project, the Sittoung river valley project, the Mon, Man and Salin reservoir project, and the Yinchaung valley basin tank series. At present, only 13pc of Myanmar is irrigated, priority will be given to the Mu river valley project and the multi-purpose Ye Nwe dam project. **Compiler's note**: maps available in the print edition of the WPD.

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YWAMA POWER STATION DEPENDENT ON GAS DISTRIBUTION SYSTEM

NLM, 01/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070201.htm

EPM No 2 Khin Maung Myint inspected Thakayta, Hlawga and Ywama power stations and attended to needs for the stations to run at full capacity. On his inspection tour of Thakayta power station, the minister called for the timely completion of the replacement of machinery at the station to ensure the running of the station at full capacity. At Hlawga power station, the minister inspected the installation of pipelines and refinement of natural gas supplied to the station.

At Ywama power station, the minister met with officials and heard reports on the arrangements for refinement of natural gas and supply of gas to the station. He gave instructions on extended supply of power

to Yangon. Afterwards, the minister went to the natural gas store/distribution station (Ywama) of the EM where the engineer in-charge, U Ye Myint, reported on the system of gas pipelines linking offshore and inland gas fields. After hearing the reports, the minister and party inspected the supply of natural gas to the power stations.

#### Additional references

Platts Myanmar Country Energy Profile. [mid-2007]. For access information, see <u>Power Profile</u>. Ywama power station in Yangon has a generating capacity of 90 MW including oil- and gas-fired steam and gas turbines

Myanmar Times, 02/10/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-336/h003.htm</u> Repairs have been completed on a pipeline that supplies natural gas to four power plants in Yangon; problems with the pipeline were blamed for blackouts in Yangon. The 320-km (199-mile) pipeline carries 3.1 million cu m (110 million cu ft) of gas a day to the Ywama gas control station from Yandana gas project in Tanintharyi division.

NLM, 26/04/04. <u>http://www.myanmar.gov.mm/Artcle/Article2005/April05/April26a.htm</u> NLM, 27/04/05. <u>http://www.myanmar.gov.mm/Artcle/Article2005/April05/April27a.htm</u> Myanmar launched the first-ever drive to distribute electricity to the people in the post-independence period with the use of two coal-fired power plants -- a coal-fired power plant (30 MW) in Yangon, and the other in Ywama. At that time, the plants were installed with the turbines, each of which could generate only 10 MW.

NLM, 04/05/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040504.htm

At the main natural gas station (Ywama) of MOGE in Insein township, EM Lun Thi lays down plans for the distribution of natural gas to power stations, factories and plants in Yangon and other regions. A 14-inch natural gas pipeline has been connected and greater quantities of natural gas produced in the Nyaungdon region can be distributed to the factories and plants in Yangon.

NLM, 31/01/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040131.htm

Officials of MOGE brief DepMin EM Than Htay on the installation of a 14-inch gas pipeline leading from the Nyaungdon oil and gas field to Ywama.

Myanmar Times, 28-07-03. [not available on-line]

MEPE is expected to begin work soon on building a 33-MW power station in Insein tsp that will have one gas-powered turbine and another that uses steam; most of the project funding is to be provided by the Japanese government.

U.N.O Consultant Geotechnical Engineering Group, [undated].

http://www.consultantgeotech.net/our\_project.htm

The company carried out a survey for a proposed No 3 gas turbine project site in the compound of the Ywama power station at Insein. The client was the MEPE.

Myanmar Ministry of Energy, [circa 2001]. <u>http://www.energy.gov.mm/MEP\_1htm</u> Ywama gas turbine power station has a generating capacity of 66.90 MW

Salween Watch, November 1999. <u>http://www.ibiblio.org/obl/docs/SW03.htm</u> Ywama thermal power station opened in 1958 and was equipped with steam driven turbines having a capacity of 30 MW. In 1975 additional gas turbines capable of generating 37 MW were added.

Tin Maung Maung Than, "Burma's Energy Use: Perils and Promises" in *Southeast Asian Affairs 1986*, Institute of Southeast Asian Studies, 1986, p. 84. [not available on-line] Among the gas turbine power stations commissioned in recent years, those at Mann, Ywama and Prome, started in fiscal year 1978/79, were financed partly by loans and grants (mainly for turbo-generators and control/switching elements) from the United Kingdom.

World Bank, Burma: Issues and Options in the Energy Sector, June 1985, p 54. [doc, p 75]

http://www-

wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1999/09/17/000009265\_3970723102606/Rendered /PDF/multi\_page.pdf

Future increases in consumption of [of natural gas] will be dominated by a small number of big users: a new glass factory at Chauk (2 billion cu ft per annum), the conversion of the Sittang paper factory to use natural gas (2 billion cu ft), a new fertilizer factory at Kyaw Zwa (5.5 billion cu ft), a methanol plant at Seiktha (5.5 billion cu ft), and the conversion to gas of the Ywama power station (1.5 billion cu ft).

World Bank, *Burma: Issues and Options in the Energy Sector*, June, 1985, p 53. [doc, p 74] [see URL above]

Natural gas from the Payagon field in Bogalay township is currently being used to substitute for fuel oil consumption (1,500 b/d) in power generation at Ywama; 30 million cf/d is being supplied through a 10-inch pipeline, 47 miles long.

#### www.transelektro.hu/letoltes/referencelist/reference list 2002 edition.pdf

In 1971/72, in collaboration with Investimport, Beograd, the Hungarian company, Transelektro, delivered steam turbines (29 atm., 415oC, 11.3 MW), generators (14.3 MVA, 11 kV) and complete electrical equipment to the Ywama steam power station in Rangoon.

#### www.unithistories.com/officers/IndianArmy\_officers\_D01.html

After independence in 1948, R.M. Duffy stayed back in Burma and was appointed construction engineer to build the Ywama power station at Insein, Rangoon, 1958-62. When it became operation he was appointed power station engineer.

## http://maureenb.myphotoalbum.com/view\_photo.php

Rangoon Electric Tramway and Supply Company (incorprated in England) issued a certificate to R.M. Duffy who had been in the employ of the company from 1925 to September 30, 1953 when the company was nationalized. At the time of termination he was the assistant superintendent of the Ahlone power station. Several pictures of the Ahlone and Ywama power stations and staff feature on the website.

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#### ARAKAN OFFSHORE GAS FIND TO MEET NATIONAL DEMAND IN MYANMAR

Press Trust India, 19/01/07. <u>http://www.outlookindia.com/pti\_news.asp?id=444772</u>

The proposed Rs 8,500-crore (US\$ 2 billion) gas pipeline from Burma to India may never come to pass as Rangoon has discovered that reserves in its offshore area do not support export pipelines. "Current estimate of reserves in Block A-1 is not enough to meet the demand of an export pipeline to India," said U Soe Myint, D-G, Ministry of Energy, Myanmar.

UK-based Gaffney Cline and Associates has certified the 'best' estimate of recoverable reserves at A-1, where ONGC Videsh Ltd and GAIL together hold 30pc, at four trillion cubic feet. Production estimates are being put at 18 million standard cu m/d, 40pc of volumes needed to support investment in a transnational pipeline.

"Gas found in Block A-1 and in its adjacent block A-3 will first be used to meet local demand in Myanmar and if there is surplus, we will look at export options," he said, adding Burma needs 200-300 million standard cubic feet per day (8.5 million standard cubic meters per day) of gas.

Burma plans to tie-up volumes in Block A-1 and A-3, which also has equity pattern similar to A-1, and explore development options -- a pipeline to India, China or Thailand or liquefied natural gas (LNG) to South Korea, Japan or India. "We know for sure the volumes do not support multiple export options," Myint said, adding reserve estimates in A-3 would be known by second half of 2007 after completing an appraisal programme.

Myanmar, he said, believes the blocks together hold an in-place reserve of 20 trillion cubic feet and can produce 2 billion cubic feet (56.6 million standard cu m/d) of gas for 25 years. "We need third party certification of reserves to establish our belief," he said.

Additional references

## Bloomberg/AFP, Myanmar Times, 03/09/07. http://www.mmtimes.com/no382/b006.htm

The Myanmar government will sell natural gas from from the A-1 and A-3 areas in the Bay of Bengal to the highest bidder among China, India, Bangladesh and Thailand, U Soe Myint, D-G of the Energy Planning Dept at the Myanmar EM, said in Singapore, dismissing reports that China had won the contract. "We have not concluded any deal with China," U Soe Myint said. "The price of gas is very much undervalued." Thailand is [currently] buying Myanmar's gas at about US\$40 a barrel for the equivalent amount of oil by energy content, compared with about \$69 [a barrel] in global markets, he said. Myanmar prefers to send the gas via a pipeline in the first phase before considering an LNG plant, U Soe Myint said. A Daewoo spokesman told AFP the company hopes to supply 600 million cu ft/d of gas, or 3.7 million tonnes of liquefied natural gas per year [from the two blocks] for up to 25 years. The Seoul government would like the gas to be liquefied and delivered to South Korea, which imports most of its oil and gas. But Daewoo has acknowledged it would be cheaper and quicker to pipe the gas to neighbouring countries.

#### Reuters, 16/08/07 http://asia.news.yahoo.com/070816/3/36hf0.html

Burma has agreed to sell gas from its A-1 and A-3 blocks to China, a major ally but not a stakeholder in the blocks, a senior EM official said in Yangon. "We have decided to sell the gas from A-1 and A-3 to China and details are under negotiation. Once we reach an agreement, we will go ahead," the official, who asked not to be named, told Reuters. "If everything goes well, the gas from these offshore blocks will be sold to China through a pipeline," he added. Thursday's comments were the first confirmation of that from Burma. The A-1 and A-3 fields off the Rakhine coast have proven reserves of 5.7 to 10 trillion cubic feet with up to 8.6 trillion cu ft recoverable, according to assessments by the U.S.-based international certification agency GCA.

#### Dow Jones, as reported in the Myanmar Times, 05/12/05.

http://www.myanmar.com/myanmartimes/MyanmarTimes15-295/b002.htm

State-run MOGE is likely to conduct a feasibility study on a China-Myanmar gas pipeline soon, MD San Lwin said on the sidelines of the 8th ASEAN Council on Petroleum conference in Manila. "Our company has signed an MoU with China on the pipeline and we hope we'll conduct a feasibility study very soon." U San Lwin said Myanmar is also considering building a liquefied natural gas terminal in the future, because "we have a new discovery in the western part of our country." If approved, the pipeline would be built by a consortium, including South Korea's Daewoo International Corp, he said. However, no time-frame had been set for the project. "Based on the reserves and feasibility study, we will decide whether we should go ahead (with our plans)," he said.

# Pradeep Puri, Business Standard (New Delhi), 17/01/04

# http://groups.yahoo.com/group/IFI-Burma/message/194

The recoverable reserve of natural gas from a recently discovered off-shore gas field in north-west Myanmar is in the range of 4 to 6 trillion cubic feet (TCF) of gas, which is equivalent to 700 million to 1.1 billion barrels of oil. GAIL, which is part of Indo-Korean consortium, comprising ONGC Videsh Ltd, GAIL (India) Ltd, Daewoo International Ltd and Kogas that discovered the field, has already announced plans to invest around Rs 4,000 crore (US\$1 billion) to transport the gas from this field to India. Under the production sharing contract, MOGE, a dept of the government of Myanmar, has a 65pc share of the production, while the consortium reserves the right to market the remaining 35pc.

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## AGREEMENT SIGNED FOR KACHIN HYDROPOWER PROJECTS

NLM, 02/01/07 http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070102.htm

EPM No 1 Zaw Min met with V-P Shi Chongliang of the China Power Investment Corp (CPI) at his office here on 28 December. Also present at the call were Dep EPM No 1 Myo Myint, directors-general of enterprises under the the ministry, V-P of the Dept of Planning and Development Wang Xian Chun and responsible persons of CPI Corp, and MD Tun Myint Naing of Asia World Co Ltd. They discussed matters related to the

implementation of the Maykha-Malikha valley region hydel power project and the Ayeyawady confluence hydel power project.

Next, officials of HPID and personnel of CPI Corp signed an MoU for the Maykha-Malikha Water Resources and Ayeyawady Confluence Hydel Power Project. After the signing ceremony, D-G Aung Koe Shwe of HPID and V-P Wang Xian Chun of CPI exchanged documents and had a documentary photo taken.

HPID and CPI will build the 2000-MW Chibwe hydel power project on the Maykha river and the 3,600-megawatt Ayeyawady Hydel Power Project at the confluence of the Maykha and Malikha.

## Map references:

The best set of maps for understanding the context in which the Maykha-Malikha valley series of dams will be built is to be found in the recently published *Damming the Irrawaddy*. The locations of the seven major dams are tentatively pinpointed on doc p 17. The maps on docs pp 28 and 62 show the estimated flood area of the Myitsone dam near the confluence of the N'mai and Mali rivers. <u>http://www.aksyu.com/2007/AKSYU-Books/Damming-the-Irrawaddy-eng.pdf</u> These maps may be usefully compared with the older U.S Army topographic series listed below.

Burma 1:250,000: Series U542, NG 47-09: Myitkyina http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ng47-9.jpg China 1:250,000: Series L 500, NG 47-10: T'eng Ch'ung http://www.lib.utexas.edu/maps/ams/china/txu-oclc-10552568-ng47-10.jpg China 1:250,000: Series L 500, NG 47-06: Fu Kung http://www.lib.utexas.edu/maps/ams/china/txu-oclc-10552568-ng47-6.jpg China 1:250,000: Series L 500, NG 47-02: Kung Shan http://www.lib.utexas.edu/maps/ams/china/txu-oclc-10552568-ng47-2.jpg

# Additional references

KNG, 14/12/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=3197&Itemid=6</u> Eyewitnesses report they have seen excavators and bulldozers and hundreds of hired workers at more than 15 camps of Chinese contractors around the site of the Chipwe (Chahpwi) hydroelectric power project. About 100 villagers from Mangdung, Hpala, Kawngla and five other villages in the area have been taken on working as general workers at the project site. 10 Peking jeeps and four wheeled cars pick take the local workers to and from the construction site. Both young and elderly villagers from the Chipwe and Sawlaw areas are being paid over K 4,000 (US \$ 3.1) per day which is much higher than the regular wage. The construction site is seven miles north of Chipwe and the Chinese inspectors are conducting tests in ten sites on both sides of the river banks by drilling stones, workers said. Inspectors are carrying stones from the project site to Tengchong in China's Yunnan Province. The black-coloured stones from the testing site along the river banks are cylindrical, a foot in diameter and three feet long.

KNG, 16/11/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=3015&Itemid=6</u>

Release of four women and an elderly man arrested for opposing Myitsone dam project; had been held for two days in No. 1 Police Station in Myitkyina; arrests were related to signature campaign in Myitkyina against the Myitsone dam; detainees were interrogated by members of the Special Branch (SB) and Military Affairs Security Unit (Sa-Ya-Pha); release was conditional on a guarantee by respected persons in the community that the detainees would cease the signature campaign. The previous week anti-dam wall writings saying "No Dam Myitsone: Than Shwe killer" had been spray painted at key places in Myitkyina where there are always crowds. The wall writings were the handiwork of university students owing allegiance to the All Kachin Students Union (AKSU).

See also China Power Investment Corporation website information. <u>http://eng.cpicorp.com.cn/</u>

China Power Investment Corporation (CPI) was set up from some of the constituent businesses of the former State Power Corp of China. With a registered capital of 12 billion RMB, CPI has been approved as a state-authorized investment entity and state-owned holding corporation. By the end of 2005, the total assets of CPI amounted to 138.342 billion RMB. The installed capacity under CPI's control total is 32,386 MW and its equity capacity is 24,294 MW. CPI has 169 member companies/ institutions and 15 participating

companies with 84,527 employees in total. CPI owns assets in 23 provinces, autonomous regions and municipalities in the PRC.

Kachin Development Networking Group, *Damming the Irrawaddy*, October 2007. http://www.aksyu.com/2007/AKSYU-Books/Damming-the-Irrawaddy-eng.pdf

A preliminary study of the Myitsone [Confluence] dam (Irrawaddy Myitsone Dam Multi-purpose Water Utilizing Project, prepared by MEPE and the A&IM in 2001-02, estimated the maximum height above sea level of the dam reservoir at 290 metres (p 23). Using contours derived from a digital elevation model database of the Upper Kachin region, KDNG projects a flood zone of 766 sq km (map, p 22), inundation of 47 villages (map, p 58) and the displacement of an estimated 10,000 people, if the project proceeds as planned. Many other villages will be impacted by a reduction in available land for farming, loss of forests and an influx by those displaced by the flood in other villages. The main roads from Myitkyina north to Putao and northeast to the Chibwe area will also be cut off. The report presents valuable insights into the traditional patterns of life in the confluence area, much of which it claims will be severely disturbed or lost completely, should the dam plans go ahead (pp 25 - 32). Safety concerns involving the recent collapse of two dams in the area are cited (see below, 'KIO promises better power supply for Kachin state). Detailed information is provided on the threatened loss of biodiversity in the Mali and N'mai river basins and on probable health risks resulting from the proposed dam scheme. Extensive gold mining along the beds and banks of both the Malikha and N'maikha in recent years has produced high levels of mercury in 22 fish species along the Irrawaddy. "Any mercury accumulated in the area will be trapped behind the [Mvitsone] reservoir where it will transformed to methylmercury. When the water is released . . . millions living along the Irrawaddy throughout Burma will be affected" (pp 42-3). Two map showing the projected flood area and the villages affected are included. Colourful photos illustrating the traditional life patterns in the area accompany the text.

# Inc-Global website information, September 2007.

http://inc-global.com/index.php?option=com\_content&task=view&id=41&Itemid=55

Yu Pei Geng, GM & Chief Engineer of China Power Investment Corp, addresses an international seminar in Beijing on the subject of Myanmar-China hydro-power projects, including updates and developments on the Maykha river project, the Maykha-Ayeyawady project and the Myanmar Hydropower Dept.

## Mizzima, 01/08/07. http://www.mizzima.com/MizzimaNews/News/2007/Aug/01-Aug-2007.html

Kachin activists who staged a rally in New Delhi to demand a halt to a planned hydro power project involving the construction of several dams in northern Burma claimed that at least 50,000 villagers around the dam sites will be displaced because their villages will be inundated. They said over 100 Chinese workers have already been brought into Kachin state to work on the project and that there are plans to bring in at least 40,000 labourers from China.

KNG, 28/06/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=1930&Itemid=6</u>

Myitsone residents told KNG that the number of Chinese visitors has increased significantly following pretesting activities for the Myitsone hydropower project which began last year. Recently, a group of Chinese inspectors led by Zhou Chuan-song, the Deputy Chief Engineer of the Space Surveying Company under the Changjiang (Yangtze River) Institute of Surveying, Planning, Design and Research, completed five months of inspection in Myitsone. A Chinese news story published on 30 May 2007 provides further details. http://www.cjw.com.cn/index/civilization/detail/20070530/88736.asp Damming the Irrawadddy,(p 15), following the signing of the MoU between CPI and HPID (see lead article above), Chiangjiang teams carried out geological and hydrological surveys at the Myitsone site from Jan to May 2007. CISPDR is the largest engineering institute involved with planning, designing and supervising large-scale water conservancy and hydropower projects in the PRC. (Damming the Irrawaddy, p 19).

#### Kun Sam, IRROL, 22/06/07. <u>http://www.irrawaddy.org/article.php?art\_id=7619</u>

The Kachin Consultative Assembly (KCA) has sent a letter of complaint to Burma's military gov't asking it not to build a dam at the Irrawaddy confluence. The complaint followed a report in NLM on 5 May, 2007 that seven hydropower dams that would generate 13,360 MW were to be built in Kachin state. The largest of these is a 3,600-MW facility at the Irrawaddy confluence, 26 miles north of Myitkyina. According to the KCA, nine villages, including Tanghpre and nine villages in N'Jang Yang township would be flooded out if the dam is built. Tanghpare alone has 178 households and more than 1,000 residents, a primary school and a high school. The letter said the dam would destroy the lives and property of local people, damage natural

resources and cause the loss of irreplaceable natural habitat. The gov't has not responded to the letter. **Compiler's note**: A translation of the letter can be found on pp 54-56 of *Damming the Irrawaddy*. The letter emphasizes the fact that much smaller hydropower projects would be able to provide the electricity needed for the development of Kachin state. It calls upon the Asia World Co to inform the PRC companies collaborating in the project about the "grievous impacts" resulting from the building of the Myitsone dam.

#### NLM, 13/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070613.htm

While in Beijing, EPM No 1 Zaw Min met with V-Cs Deng Zon Zi and Jin Shoar Lu of China Power Investment Co at the hall of Grand Hotel Beijing on 07/06/07. They discussed work on the hydropower projects at the Ayeyawady confluence and Chibwe creek and future tasks to be carried out in those places.

# China Power Investment Corp website information: 21/05/07.

# http://eng.cpicorp.com.cn/news.do?cmd=show&id=24580

On 21 May 2007, CPI South China Branch signed a co-operation agreement on co-development of hydropower projects in the N'mai Hka River, Mali Hka River and Irrawaddy River Basins in Myanmar with South China Grid Corp, which signals that the two companies have become strategic partners on the project. Compiler's note: CSG operates in the five southern provinces of the PRC where it assumes responsibility for the construction and management of cross-regional power transmission as well as purchase and sale of power and the financing of power projects "at home and abroad". According to the company website, there is total installed capacity of 79,540 MW in the region with transmission lines of 229 kV and higher spanning CSG says it has been particularly active in 41,005 km and substation capacity of 138,400,000 kVA. process of Mekong Sub-region power co-operation. promoting the Greater http://eng.csg.cn/topic.php?channellD=1&topicID=1 Without providing verification, Damming the Irrawaddy (p 11) cites a report of the Myanmar Hydropower Dept of CPI's South China Branch which claims that Yunnan Power Grid Co, a wholly owned subsidiary of CSG, will be responsible for transmission of electric power produced by the project to the region.

## NLM, 07/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070507.htm

Opening of a project office for the Maykha and Malikha Valley and Confluence Region and Chibwe Creek hydropower projects, in Sitapu ward of Myitkyina. EPM No 1 Zaw Min, V-P Shi Chengliang of CPI, Project Manager Niu Xinqiang of Chiangjiang Design Institute (CISPDR), MD Tun Myint Naing of Asia World Co and an official of CPI Southern Branch participated.

## KNG, 07/05/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=1651&Itemid=6</u>

A Kachin Anti-Dam Committee (KADC) has been formed by four Kachin organizations -- Kachin Labour Union (KLU), All Kachin Students and Youth Union (AKSYU), Kachin Development Networking Group (KDNG) and the Kachin Environment Organization (KEO). KADC was formed after work started on a 65-MW hydroelectric power project on Chibwi creek in Kachin state on April 30. KADC aims to raise awareness both in Kachin state and internationally that will bring a halt to the project. It will have branch offices in Thailand and India.

## NLM, 05/05/07 http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070505.htm

HPID and the China Power Investment Corp (CPI) of the PRC started construction of a hydropower plant on Chebwe Creek in Kachin State on 30 April. The project, which is expected to generate 65 MW is being built to supply power for seven other hydropower projects to be built on the Maykha and Malikha (rivers) and at the confluence of the Ayeyawady. The seven other projects include the dam at the Ayeyawady confluence (3,600 MW), a 2000-MW project in the Chibwe area, a 1,600-MW-project at Pashe, a 1,400-MW project at Lakin, a 1,500-MW project at Phizaw, a 1,700-MW project at Khaunglanphu and a 1,560-MW project at Laiza, all in Kachin state. Together the projects are expected to generate 13,360 MW. Participants in the ground breaking ceremony included Maj-Gen Ohn Myint, EPM Zaw Min and CPI V-P Shi Chengliang.

# KNG, 13/04/07. <u>http://www.kachinnews.com/read.asp?CatId=14&NewsId=158&</u>

On 24/03/07, Myawaddy TV reported that the government plans to construct a huge hydropower project on the Ayeyawaddy river (known to locals as Mali Hka) about 25 miles north of the state capital, Myitkyina. Locals say that Asia World Co Ltd has been carrying out pre-testing activities a mile below Myitsone since 2006. Several houses have been built at the site and others are under construction at riverside, but to date

# NLM, 25/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070325.htm

A 3,600-MW generator that "will generate at least 2,090 megawatts" will be installed in the power plant of the Ayeyawady Confluence hydel power project. **Compiler's note**: The estimated average annual production figure of 16,634 million kWh cited in *Damming the Irrawaddy* (p 12) seems far closer to the mark. KNDG cites "project engineers" as the source of its estimate, but does not provide verification.

# NLM, 06/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061106.htm

In Nanning, EPM No 1 Zaw Min meets with the V-C of China Power Investment Corp and China CAMC Engineering Co Ltd about surveying and implementation of hydel power projects at the confluence of the Ayeyawady, Maykha (N'maihka) and Malikha rivers.

## NLM, 01/12/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051202.htm

A Myanmar delegation led by EPM Tin Htut returns after signing an MoU between the HPD and YMEC in the PRC. **Compiler's note**: *Damming the Irrawaddy* (p 20) cites a report in the Yunnan Daily News of 01/12/05 that the MoU signed in Kunming on 30/11/05 had to to with the "N'mai Hka Basin Development Co-operation" (www.yndaily.com.cn/en/about.htm). In the months prior to the signing of the MoU with YMEC, Suntac Technologies, a Yangon firm that specializes in digital mapping, and Kunming Hydropower Design Institute both carried carried out survey work at the Myitsone dam site apparently under contract with YMEC (*Damming the Irrawaddy*, p 14). Up to the present, there is nothing to indicate that YMEC is involved in the Maykha (N'mai) - Malikha Valley Region hydropower project of the China Power Investment Corp.

# Mizzima, 11/06/04. http://www.mizzima.com/archives/news-in-2004/news-in-jun/11-jun04-19.htm

Rangoon's plan to proceed with a dam at the Irrawaddy River confluence, in spite of a letter of objection from Kachin locals, has stirred anger. On 1 February, villagers from the N'Hkai bum area submitted a letter of objection outlining the negative impacts on their communities of the project. These include damage to 5,000 houses in over 20 villages and 18,000 acres of farm land, as well as to natural resources, wild life and valuable forest products in the N'hai bum area. Historic Christian missionary monuments will also be affected. The letter was sent to the SPDC's divisional commander, with copies to the KIO and the NDA-K. No reply was received from the authorities. A survey team from a Japanese company, Kang Seng [Kansai], visited the area twice in 2003. **Compiler's note**: A translation of this letter can be found on p 57 of *Damming the Irrawaddy*. There are some notable discrepancies between the translated version and the Mizzima news report.

Kachin Development Networking Group, *Damming the Irrawaddy*, October 2007, p. 11. <u>http://www.aksyu.com/2007/AKSYU-Books/Damming-the-Irrawaddy-eng.pdf</u>

A document titled "Irrawaddy Myitsone Dam Multi-purpose Water Utilizing Project", prepared by MEPE and the Ag & Irrig Ministry and dated February 2002, provides the initial specification of the project. According to this document the dam would be rock-filled, with a concrete face, 152 metres high and 152 metres long. The reservoir level at full brim would be 290 metres and the power house would have an installed capacity of 3,200 MW.

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## CHINA'S FIRST BOT HYDRO POWER PROJECT IN MYANMAR REVS UP

Yunnan Channel (Kunming), 30/12/06. (Source: Xinhua) www.newsmekong.org/chinas 1st hydro bot project in burma\_revs\_up

The Build-Operate-Transfer (BOT) agreement for the Ruili (Shweli) River I hydropower station, signed in Myanmar's capital, Naypyidaw, on Dec. 30, 2006 is China's first hydropower BOT project in its neighbouring country. The agreement was signed by the Yunnan Joint Power Development Co [YUPD] and HPID of Myanmar's EPM No 1. The project owner will be Ruili (Shweli) River I Power Station Co Ltd, which was formed by the above two parties. The Yunnan company, which was formed by Yunnan Huaneng Lancang River Hydropower Co, Yunnan Power Grid Co and Yunnan Machinery Equipment (E & I) Co Ltd, is dedicated

to developing hydropower resources in Myanmar and southeast Asia. Shweli River I power station will also be the company's first hydropower project outside mainland China.

The Yunnan company, which owns 80pc of the Sino-Myanmar joint-venture, will be fully in charge of the project construction, operation and management. The company will run the power station for 40 years after its completion, and then transfer it to the Myanmar government. The Ruili (Shweli) River I power station is located inside Shan state in northern Burma, 90 km from China's border city of Ruili. This will be a run-of-river hydropower station, which involves no resettlement, little land inundation and environmental impact. The installed capacity is 600 MW. The actual power supply will be 174.8 MW, and the annual power output will be 4,033 GWh. The electricity will be transmitted to both Myanmar and China through 230 kV and 220 kV cables.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-01: Mong Mit Shweli no 1 hydropower project near Man Tat village [23° 41'N, 97° 29' E], grid square reference: 12\1, 23\3 Upper Buywa dam near Thukaungkyin village [co-ordinates n.a.], grid square reference: 7\4, 38\3 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-1.jpg</u>

See also maps *Under the Boot*, published by the Palaung (Ta'ang) Youth Network Group, Dec 2007, pp 11, 14, <u>http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf</u>

## Additional references

MT, 29/10/07. http://mmtimes.com/no390/n006.htm

According to EPM No 1, Shweli No 1 hydropower project will generate 600 MW when it goes online by the end of 2007. It is is a joint venture project with China, with about 85pc of the electricity generated expected to be exported to that country.

NLM, 07/09/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070907.htm

EPM No 1 and the NE Cmndr are briefed on construction of Shweli Hydropower Project by officials and President Huang Guangming of YUPD Co of the PRC and D-G U Aung Koe Shwe of HPID. The whole project is 65.75pc complete.

Sinohydro, Zhang Runliang, 20/08/07.

http://www.sinohydro.com/english/portlet?pm\_pl\_id=7&pm\_pp\_id=13&ARTICLEID=11881812170001&COLU MNID=11424148920001&CHCOLUMNID=11443003710001&GSCOLUMNID=-1

Synohydro's 14th Bureau linked two parts of the 1~2 intake tunnels. The main intake tunnel is 2,850 meters long, and a subtunnel is 1,200 meters long. Due to the poor geological condition of tunnels 1 and 2, (most of which are IV and V type dangerous rocks, and some of which are VI and VII type), the tunnels have become the key line which will influence electricity generation of the entire power plant. The excavation of No.2 tunnel has been especially difficult.

NLM, 25/08/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070825.htm

Ass't Director U Nay Lin of HPID briefs Lt-Gen Kyaw Win on the Shweli project; it will be equipped with a 610-MW generator and is expected to produce 4,022 million kilowatt hours annually..

Platts Myanmar Country Energy Profile. [mid-2007] [edited] For access information, see Power Profile

In August 2003, YMEC signed a US\$ 150 million turnkey contract to build the first 200-MW phase of what was then planned as a 400-MW plant called Shweli-1. In January 2007, MEP and Yunnan United Power Development Co signed a joint-venture agreement for what was now a 600-MW plant, which, as of April 2007 was said to be 50% complete. The project site is in Namkham township, Shan state, 710km north of Yangon. A 288-km-long [230-kv power line] will link the plant to Mandalay. Other Chinese companies participating in the scheme include Yunnan Lancang River Hydropower Co and Yunnan Power Grid Corp.

NLM, 20/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070420.htm

Gen Than Shwe visits Shweli No 1 project; he is told that it will generate 600 MW; currently under construction are the concrete embankment, diversion tunnel, pilot channel, power intake building, and approach tunnel. He is also briefed on the installation of the 180 mi-long 230-kv power line from Shweli to Mansan and Shwesaryan near Mandalay. Than Shwe wants the project finished up as quickly as possible.

He presents a fruit basket to Exec V-P MA Lipeng of YUPD Co and V-P He Wen of YMEC Co. The project is currently 51pc complete. The general is also briefed on arrangements for the 460-megawatt Shweli No 2 and the 360-megawatt Shweli No. 3 projects that will built in Momeik township.

NLM, 25/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070325.htm

From a report of a meeting of SPIC: Shweli No 2 hydel power plant in Momeik township, 12.5 miles downstream from Shweli No 1, will be implemented. It will be installed with a 460-megawatt generator. EPM No 1 will implement Shweli No. 3 hydel power project, 30 miles downstream from Shweli No 2. The power plant will produce 360 megawatts.

NLM, 01/01/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070101.htm

A J-V agreement on the Shweli hydropower project is signed by D-G U Aung Koe Shwe of HPID and Chairman Huang Guangming of Yunnan United Power Development Co. "Under the agreement, a dam will be built on Shweli River 17 miles southwest of Namhkam, Shan State (West) for a power station that will generate 600 megawatts. The power station will distribute 4,022 million kilowatt hours through the national power grid every year."

Yunnan Machinery (I&E) Co Ltd, 21/12/06. <u>http://www.ymec.com.cn/cn/news/news\_7.htm</u> Title in English: 'River successfully closed [blocked off] for Shweli No 1 hydroelectric power project' **Compiler's note**: A picture that accompanies this news release in Chinese shows a section of the river before it was blocked off. See also the aerial photo of completed diversion structure on p. 9 of *Under the Boot* (PYNG, Dec: 2007). <u>http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf</u>

MIC, 13/12/06. http://www.myanmar-information.net/infosheet/2006/061213.htm

EP Minister No 1 and President Huang Guangming of YUPD Ltd officially open the diversion tunnel of the Shweli hydel power project dam in Namhkam township. 42% of the construction work on the project has been completed. It is expected to generate 3,022 million kilowatt hours a year.

Myanmar Times, 13/11/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes18-342/h011.htm</u> Among the projects expected to be finished in 2009 are those at Yeywa and Shweli.

## Sinohydro, Yan Zhenwei, 10/10/06.

http://www.sinohydro.com/english/portlet?pm\_pl\_id=7&pm\_pp\_id=13&ARTICLEID=11631307410001&COLU MNID=11424148920001&CHCOLUMNID=11443003710001&GSCOLUMNID=-1

Sinohydro's 14th Bureau finished excavating the diversion tunnel of Myanmar Rilijiang [Shweli] power station. Owner required that the diversion closure be finished by the end of 2006.

MIC, 26/09/06. www.myanmar-information.net/infosheet/2006/060926.htm

PM Soe Win briefed on Shweli hydel power project and building of the power plant in co-operation with foreign companies, also on arrangements for distribution of power to Shweli, Mansan and Shwesayan via Bel Lin sub-power station through 230-KV power lines. Construction of the 853-foot diversion tunnel is underway. The project will generate 600 megawatts; it is 38% complete; souvenirs are presented to the chairman of YUPD Co Ltd. A series of power projects is to be implemented along the Shweli river.

NLM, 30/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm

From the report of a meeting of Hydroelectric Power Development Project Work Cte: plans are underway to implement the 150-MW Shweli No 1 hydel power plant in Namhkam township in Shan state north and the 500-MW Shweli No 2 hydel power plant in Momeik township, also in Shan state north.

NLM, 16/06/06. http://www.ibiblio.org/obl/docs2/NLM2006-06-16.pdf

Four 100-MW generators will be installed at the Shweli hydel power project. The project is expected to generate 3,022 million kWh per year which will be transmitted throughout the country. It is being carried out by HPID of EPM No 1 and the YMEC.

NLM, 03/06/06. <u>http://www.ibiblio.org/obl/docs2/NLM2006-06-03.pdf</u> Shweli Hydel Power Project will be equipped with six 100-megawatt generators. NLM, 22/0305. <u>http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050322.htm</u> PM Soe Win inspects work on the entrance to the intake and diversion tunnels. The Shweli project will generate 400 megawatts. It is being built on the Shweli River near Mantet Village [23° 41' N, 97° 29' E], 17 miles southwest of Namkham. A 25/7-mile-long gravel road links it to the Union Highway. The road and project site were built by Asia World Co Ltd and completed in June 2004.

#### NLM, 27/02/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040227.htm

SPDC V-C Maung Aye and party are told that the natural condition of Shweli River is good for the generation of hydro-electric power. The Shweli project will be able to generate 400 megawatts and produce 3,022 million kilowatt hours a year. Preliminary tasks are being carried out. Electricity generated from the project will be supplied to Shan state north through 66-kv high-tension cables. A grid including a 230-mile long double high-tension cable line from Shweli to Mandalay will be built to supply power to other regions. YMEC Chairman Feng Ke expresses thanks for assigning his company the task of building the facility. Maung Aye and party view site of main dam, tunnel and preliminary engineering works. The concrete gravity dam will be 531 feet long and 154 feet high. Two tunnels, the first 850 feet long, 33-feet in diameter, and the second 3.12 miles long and 23-feet in diameter, will be built.

Palaung (Ta'ang) Youth Network Group, Under the Boot, December 2007. pp 9,10, 11, 14,

#### http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf

According to the text of the document *Shweli hydro-electric project* published by the HPD of the EPM on 22/02/04, the Shweli No 1 Hydropower Project is to consist of a concrete gravity dam, 531 ft (162m) long, 154 ft (47m) high, a 33-ft-diameter, 256.41-metre-long diversion tunnel, a 23-ft-diameter, 5014-metre long conveyance [mill-race] tunnel. Initial construction costs are estimated at US \$185 million. Electricity generated by the project is to be supplied by a system of high voltage lines and substations to a [lead and zinc] mine at Namtu, a copper mine at Monywa, and a nickel mine in Thabeikkyin. **Compiler's note**: The photo mock-up on p. 9 of *Under the Boot* and the map and photo on p 14 appear to be reproduced from the document published by the HPD. The map on p. 11 gives a useful overview of the area on the Shweli river where the project is tro take place. With reference to the nickel mine, an agreement was signed in Beijing on 12/07/04 granting the China Non-ferrous Metal Corporation rights to explore for nickel chromide and to develop a plan to mine the ore in the Tagaung-taung area in the northern part of Thabeikkyin township (NLM: 19/07/04). Studies have shown a deposit of up to 40 million tonnes of ore with average grades of over 2pc.

See below: <u>Shweli transmission</u> line contract Signed' (People/s Daily Online: 10/10/03) 'Contract for Shweli hydropower project <u>signed with YMEC</u>' (NLM: 09/08/03)

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## MYOGYI MULTI-PURPOSE DAM TO HARNESS WATERS OF THE ZAWGYI

NLM, 25/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061225.htm

Gen Thura Shwe Mann and Lt-Gen Ye Myint of the Defence Dept visited the site of Myogyi multi-purpose dam project on the Zawgyi river near Myogyi Village in Ywangan township. At the briefing hall of the project A&Imin Htay Oo reported on the construction of the diaphragm wall, the main embankment, the diversion tunnel and the tunnel for the hydel power station by Construction Group No 7 of the ID. The earth embankment of the Myogyi Dam will be 2,461 feet long and 258 feet high. The dam will irrigate Meiktila plain through the canals of Kinda dam. It will also generate 30 MW of power.

Presently, five projects are underway to make more irrigation water available to Meiktila plain. The first is Kengkham multi-purpose dam project located on Nam-et creek, a subsidiary of the Zawgy river near Kengkham village (. Kengkham dam which will also generate six megawatts. The second project, already completed, is Zawgyi multi-purpose dam on the Zawgyi river near Indaw village. The third is Myogyi multi-purpose dam on the Zawgyi. It will supply water to Meiktila plain through Myogyi diversion dam and the Kinda feeder canal. The fourth, already completed, involved the construction of Chaunggauk, Lunngin, Letkhokpin and Nyaunggon dams with their canal and the fifth, currently underway, has to do with the building of Shanmange dam in Meiktila township. All of these projects will feed water into Meiktila lake and make possible the systematic utilization of Samon Dam.

Lt-Gen Ye Myint instructed officials to build the Myogyi diversion dam at the same time as worki proceeded on the Myogyi dam project. He stressed the need for supplying water to Meiktila Plain through the Myogyi diversion dam and the timely completion of Kengkham multi-purpose dam project.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-09: Mandalay Myogyi dam near Myogyi village [21° 28' N, 96° 20' E], grid square reference: 13\0, 25\8 http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-9.jpg

#### Additional references

See below: <u>'Zawgyi</u> no 2 hydropower station launched' (NLM: 17/03/00) <u>'Kinda dam</u> fifteen years on: an evaluation of hydropower impacts' (ADB: Mar 2002)

NLM, 13/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071213.htm

Gen Than Shwe visits Myogyi multi-purpose dam project and is briefed on work on the main dam and diversion tunnel, construction of the hydropower tunnel and spillway. The dam will store water from Zawgyi River which will be supplied to Meiktila Plain by means of a canal that will carry the water through the Myogyi diversion weir. Construction group no 7 of the ID is implementing the project on the Zawgyi river. Besides supplying more water for irrigation purposes the dam will generate 30 MW. Over 36pc of the project has been completed.

NLM, 30/11/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071130.htm

Lt-Gen Ye Myint is briefed on earth work, the construction of a diversion tunnel and concrete work at Myogyi dam project, as well as the selection of the route for tunnel that will supply water from Myogyi Kinywa [21° 28' N, 96° 20' E] diversion dam to the Gonywa [21° 11' N, 96° 09' E] river pump project through the Kintarlay dam. The water will irrigate 5,000 acres of farmland in the Daingkaunggon area of Wundwin township. Efforts are to be made for the completion of the diversion dam and civil work on time and arrangements are to be made for power supply to the project.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Myogyi dam and power station with a planned capacity of 30 MW is under implementation by the ID. It will generate 135 million kWh annually when it comes on line in 2009.

NLM, 26/07/07, http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070726.htm

Work on the Myogyi [21° 27' N, 96° 22' E] multi-purpose dam project in Ywangan township is moving forward. 700 feet of the 1,698-ft-long main tunnel have been dug. Concrete laying on the interior surface of 1,575-ft-long diversion tunnel is underway. Two 15-MW generators will be installed at the dam.

NLM, 23/03/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060323.htm

PM Soe Win and party visit Myogyi multi-purpose dam project being implemented by Construction Group 7 of the ID. The entrance to the underground diversion tunnel is being dug and a separation wall measuring 1,535 feet by 50 feet is being built. The dam will supply 500,000 acre-feet of water to the catchment area of Zawgyi dam in Kyaukse district and 400,000 acre-feet of water to Meiktila olain. The dam will generate 24 MW of electricity.

NLM, 19/08/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050819.htm

PM Soe Win and party visit Zawgyi (Myogyi) dam project site near Myogyi village in Ywangan township where they are briefed on work on the Zawgyi (Myogyi) dam as well as preliminary engineering preparatory tasks for the implementation of Kengkham dam project. He tells officials to get down to the business of construction in the upcoming open season. Water will be supplied from the Zawgyi dam already existing on the Zawgyi River in Yaksawk township and from the watershed area between Zawgyi and Myogyi dams to farmlands and Meiktila Plain. The Myogyi dam will be 2,650 feet in length and 282 feet in height. It will be able to store 480,580 acre feet of water. Kengkham dam on Nan-et Creek in Yaksawk township will supply water to the Zawgyi dam for the greening Meiktila Plain.

#### NLM, 11/11/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n041111.htm

At the Myogyi dam project on the Zawgyi river near Myogyi village in Ywangan township, Lt-Gen Ye Myint of the Defence Dept receives reports on preparations for the project and the water supply system from officials of the ID and the WRUD. The earthen dam will be 2,270 feet long and 223 feet high on and will be able to store 271,850 acre feet of water. Annual average water flow into the dam is 200,000 acre feet. It is expected to generate 12 MW. Water from the Myogyi and Zawgyi dams will be supplied to the project for the greening of Meiktila Plain via the Kinda diversion weir.

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#### **THAKETA POWER STATION IMPORTANT DISTRIBUTION HUB**

NLM, 13/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061213.htm

EPM No 2 Khin Maung Myint visited Thakayta Power Station in Thakayta Township on 10 December. The head of the power station, U Tun Hlaing, reported on maintenance work, operation of the generators based on the supply of gas, requirement of gas for the three generators to run at full capacity, distribution of electricity from Toungoo and Hlawga grids and the station. The chief engineer of YESB, U Tun Aye, reported on direct supply of electricity from Toungoo and Hlawga power stations; and D-G Thein Tun of the EPD on a plan to establish a 230 KV sub-power station in the east of Yangon City. The minister stressed the importance of operating the generators at full capacity, calling for constant supervision of maintenance of the generators.

Director U Thein Hlaing of Electricity Distribution Project (South) reported on the construction of a 230- KV grid line across the Bago river connecting Thakayta andThanlyin. The minister called for co-operation with the officials concerned and completion of the project on schedule. Daw Soe Soe Tint of Myanmar V-Pile Co Ltd gave an account of the plan under way for setting up towers. The minister inspected the control room and dealt with the project for distribution of electricity. He also inspected designated sites for putting up the towers on the Thakayta side.

## Additional references

#### NLM, 23/11/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071123.htm

A contract for the purchase of spare parts for the F-5 gas turbine to be installed at Thakayta gas trurbine was signed by MEPE and United National Oil & Gas Pte Ltd held at Shwe Myanmar Hotel in Naypyitaw on 20/11/07. EPM No 2 Khin Maung Myint delivered an opening speech. After that, GM Lee Bang Ho of United National Oil & Gas Pte Ltd spoke words of thanks and he and MEPE MD San Oo signed the contract and exchanged notes.

NLM, 06/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070306.htm

Inspection of a new fuel nozzle, cross fire tube, combustion liner and filter at Thakayta Power Station needed to run the station at full capacity. Briefing on gas control equipment, turbine and generator; at the Thaketa Gas Station, preparations for sending gas from the gas control and distribution station to the gas station and acquisition of gas. Need for for concerted efforts to increase power supply.

NLM, 09/01/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070109.htm</u> EPM No 2 Khin Maung Myint inspects the natural gas supply stations of Myanma Oil and Gas Enterprise in Thakayta Township and Dagon Myothit (East) Township.

Myanmar Times, 02/10/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-336/h003.htm</u> Repairs completed on a pipeline that supplies natural gas to four power plants in Yangon. Problems with the pipeline, which was shut down September 23 for repairs, were blamed for blackouts in Yangon. The 320kilometre (199-mile) pipeline carries 3.1 million cubic metres (110 million cubic feet) of gas a day to Yangon's Ywama gas control station from the Yandana gas project in Tanintharyi division.

NLM, 29/11/03. http://www.ibiblio.org/obl/docs/NLM2003-11-29.pdf

**Compiler's note**: A good exterior picture of the Thaketa power plant is available on page 11 of the print edition of the New Light of Myanmar of this date.

Kawasaki Plant Systems, undated. <u>www.khi.co.jp/kplant/english/products/PowerPlant/01.html</u> In 1995, Kawasaki was awarded a turnkey contract to install an F5-3 Hitachi steam turbine as a combined cycle add-on to MEPE's natural gas turbine plant at Tharkayta [in Yangon]. The contract was completed in 1997 raising the total installed capacity at the plant to 92 MW.

Myanmar official website information, undated. [no longer available on-line]

Marubeni Corp of Japan was awarded the contract for construction of a combined cycle power station on Ayeyarwun Street in Thaketa township. Work started 24/03/95 and was completed in Jan 1997. A single 35-MW turbine was installed at a cost of US \$ 23.5 million (K 141.02 million) + K 348.0 million for other construction costs making a total of K 489.02 million.

WPD, 08/05/92. http://www.ibiblio.org/obl/docs3/BPS92-05.pdf

At the annual meeting of MEPE, Minister for Energy Khin Maung Thein reported that the Thaketa Power Station would be able to distribute more power as the Aphyauk oil field can produce and distribute gas.

U.S. Dept of State, Burma Petrogas Report, 1991. <u>www.ibiblio.org/freeburma/docs/usgasrep.txt</u> In January 1992, Shell Oil found gas -- 11,000 mcfd at a depth of 2,940 m -- on the Apyauk field (Block G) which it began producing at the rate of 20 mmcfd for the Ministry of Energy 1992. To accommodate the Shell gas, the Burmese built a 24-km spur to the existing gas pipeline which leads from the Payagon gas field to the gas turbine in Rangoon.

WPD, 11/01/92. http://www.ibiblio.org/obl/docs3/BPS92-01.pdf

Aphyauk No. 1 test well in Taikkyi tsp is yielding 14.78 million cubic-feet of natural gas per day, according to the latest survey. It was jointly drilled by MOGE and Shell Oil of the Netherlands and natural gas was found at 9,669 feet. 11 million cubit-feet. Surveys under way for steady yield.

Myanmar official website information, undated. [no longer available on-line]

Marubeni Corp of Japan began construction of the Tharkayta gas trurbine power station on Ayeyarwun street, Thaketa township, Yangon on 09/02/88. Three 20-MW gas turbines were installed for a total capacity of 60 MW. Unit 1 started operations in Jan 1990, Unit 2 in Feb 1990, Unit 3 in Mar 1990. Total amount expended was ¥ 310.96 million (K 174.3 million) + K 124.6 million = K 298.9 million.

Minerals Yearbook, US Bureau of Mines, 1987

http://digicoll.library.wisc.edu/cgi-bin/EcoNatRes/EcoNatResidx?type=article&did=ECONATRES.MINYB1987V3.GKINNEY&isize=M

Twelve new production wells and seven appraisal wells are expected to increase gas output at the Payagon gasfield, 50 km southwest of Rangoon, by 35 million cubic feet per day. A 40-centimeter pipeline will be laid to Rangoon and a basic gas distribution network to serve the capital, and pilot LPG and compressed natural gas plants will also be constructed. The field currently supplies 12 million cubic feet per day through a small pipeline to four industrial plants and three powerplants in the Rangoon area. A planned second phase would extend the pipeline to industries in Mon and Karen States east of Rangoon. Gas use will be further expanded by a Government plan to set up a 60-megawatt gas turbine power station at Thaketa, a suburb of Rangoon.

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## MINISTERS MEET WITH <u>PRC SUPPLIERS</u> IN NANNING AND WUHAN

NLM, 06/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061106.htm

EPM No 1 Zaw Min received Chairman Feng Ke of YMEC at Wharton International Hotel in Nanning on 29 October. They discussed matters related to Shweli No 1, Upper Paunglaung, Nancho, Wetwun, Dattawgyaing and Zawgyi No 1 hydel power plants. At the same venue, the Minister received Chairman Yang Jixue and party of China Gezhouba Corp and discussed construction of the roller-compacted concrete dam at the Yeywa hydel power project and sending of the contractor's equipment. Chairman Jean Zhou and party of CITIC Technology called on the minister and held discussions on matters related to the pen stock

and tunnel lining of the Yenwe hydel power project and the hydraulic steel structure for the Yeywa hydel power project.

Minister Col Zaw Min met with Chairman Zhao Ruolin and party of China National Electric Equipment Corp. They discussed matters related to the timely arrival of electronic and mechanical equipment for the Yenwe, Yeywa, Khabaung and Kengtawng hydel power projects. V-C Zhu Xu and party of China National Heavy Machinery Corp called on the minister and discussed the timely despatch of electronic and mechanical equipment and the hydraulic steel structure for the Kun and Khabaung hydel power projects, and the timely shipping of 230-KVA transmission lines and sub-station equipment for the Yeywa hydel power project. Minister Zaw Min also received the chairman of Sinohydro Corp, Huang Baodong, and party. They discussed matters related to the timely shipment of hydraulic steel structure No 2, turbines and generators for the Yeywa hydel power project and the Hatgyi hydel power project.

YUPD Chairman Wang Wen and party called on Minister Zaw Min on 30 October. They discussed matters concerning Shweli No 1, Shweli No 2 and Shweli No 3 hydel power projects. The minister also met with the V-Cs of the China Power Investment Corp and of China CAMC Engineering. They discussed the survey and implementation of hydel power projects at the confluence of the Ayeyawady, Maykha and Malikha rivers.

On 29 October, PM Soe Win separately received MD Huang Guang Ming and party of YUPD and Chairman Yang Jixue of the China Gezhouba Corp in Nanning. On 30 October, the PM met with V-C Zhang Xiaolu and party of China Power Investment Corp.

On 3 November, PM Soe Win and party visited the Central China Power Grid Co in Wuhan, Hubei Province. Chairman Xie Ming Liang reported on power supply, generation of power and co-operation with international companies. General Soe Win said generation of power and distribution is undertaken by two ministries in Myanmar. Investment, technological assistance and cooperation are needed to expedite its momentum. He said that Myanmar would welcome the participation of Central China Power Grid Co in hydro-electric power projects and power distribution in Myanmar. The Prime Minister and the Chairman exchanged gifts.

## Additional references

See above: 'Electricity <u>ministers busy</u> in Beijing and Kunming (NLM: 13/06/07)

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## TAPING RIVER HYDROPOWER PROJECTS UNDER DISCUSSION IN CHINA

Hubei Daily (Wuhan), 04/11/06. [translated] http://www.cnhubei.com/200611/ca1198075.htm

Myanmar's prime minister, Gen Soe Win, visited the Central China Power Grid Co (CCPG) and reached consensus over joint co-operation in developing Myanmar's hydropower resources. In March 2004, the Company successfully clinched a bid to build the transmission line and sub-stations between Yangon and Yekyi [in Ayeyadwaddy division]. The contract was worth about US\$ 16 million. Two sub-stations and a transmission cable were put into service in June, and the construction of the other sub-station and transmission cable will be finished by next April.

Gen Soe Win also negotiated with CCPG over the construction of a hydropower station on the Taping river in Myanmar (known as the Daying River upstream in Yingjiang County of Yunnan's Dehong Prefecture). The installed capacity of the hydropower station will be 240 MW. The total cost will be 108 million yuan. Both parties signed a draft agreement on a framework for co-operation in September, and are expected to sign the official text in the near future.

Gen Soe Win said Myanmar has rich hydropower resources and urgently needs capital and technology from outside the country. The GM of Central China Grid Company, Mr. Xie Ming-liang, said the company is looking into the feasibility of building a production chain based on the electricity output.

**Topographic map reference**: China 1:250,000: Series L500, U.S. Army Map: NG 47-14: Lung Ling The Tapein No 1 hydropower project, near Kalon [24° 25' N, 97° 34' E], grid sq ref: 8\3, 38\3

# Additional references

See above: 'Ministers meet with <u>PRC suppliers</u> in Nanning and Wuhan (NLM: 06/11/06)

Sinohydro Corp. 25/12/07. http://www.sasac.gov.cn/zygy/gcjz/200712250102.htm.

Excerpted trom a translation by Kevin Li. <u>http://groups.yahoo.com/group/greenburma/message/1138</u> The construction of the the Taping River hydropower station was launched on 19/12/07 by the China Datang Group and Myanmar's EPM No 1. The station will be located close to China-Myanmar border in Kachin State 90 km from Yingjiang county of Dehong prefecture in Yunnan Province. The power plant will have four generating turbines with a total capacity of 240 MW. It will consist of a hub station, water diversion systems and generating area hub. The developer plans to dam the river in October 2008. The first generating unit is scheduled to begin operations in Sept 2009, while the complete power plant will be finished by June 2010. Majority owner of the power plant will be the China Datang Group with minority shareholders Central China Power International Trade Co and Jiangxi Water Resources Planning and Design Institute. Project construction is to be undertaken by the PRC's Sinohydro Corp, including all civil construction, installation of metal, and the structure of the electrical and mechanical equipment, and will be carried out by the 14th Bureau of Sinohydro's subsidiary, the China Water Resources and Hydropower Construction Corp. Construction of the diversion tunnel for the project is currently in full swing with work progressing smoothly. Translator's note: The Taping River is known in China as Da-ying-jiang (Da-ying River).

NLM, 25/10/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071025.htm

EPM No 1 Zaw Min and DepMin Myo Myint meet with President Wu Jing, V-P Hing Heng Xi and officials of Dalang (Yunnan) United Hydropower Developing Co Ltd (DUHD) in Nay Pyi Taw on implementation of Tapein hydropower project.

NLM, 07/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070507.htm

At Tarpein No 1 hydropower project, 33 miles from Bhamo, near Kalon Village, Vice GM Xiong Heng Xi of CCPG and Deputy EPM No 1 Myo Myint brief cabinet ministers on the project. The power plant of Tarpein No 1 Hydropower Project will generate 240 megawatts and produce 1,081 million kwh yearly.

NLM, 20/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070420.htm

Gen Than Shwe briefed on the 240-MW Tarpein No 1 and the 168-MW Tarpein No 2 projects in Momauk township; he stresses the need to implement two Tarpen project as soon as possible. Water resources have been surveyed; surveys are to search for more resources, the power grid is to be installed on schedule in order to supply electricity to the nation.

NLM, 25/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070325.htm

Tarpein No 1 hydel power project to be implemented on the Tarpein river in Kachin state is 3.5 miles from Momauk. Tarpein No 2 hydel power plant will be 6 miles downstream of Tarpein No 1.

China Datang Corporation

http://www.china-cdt.com/en/ABOUTCDT/BRIEFINTRODUCTION/46465.html

China Datang Corporation (CDT), one of the five large-scale power generation enterprises in the PRC, was established in Dec 2002 on the basis of the partial power generation assets of former State Power Corporation of China. It is a solely state-owned corporation and operates as an experimental state-authorized investment and state share-holding enterprise. CDT is mainly specialized in the development, investment, construction, operation and management of power energy; organization of power (thermal) production and sales; electric power equipment manufacture, maintenance and commissioning; power technology development and consultation; contracting and consulting of electric power engineering and environmental protection projects and renewable energy development. CDT has established 6 wholly funded subsidiaries and 8 branch companies. It also owns owns the Datang International Power Generation Co Ltd, the first company in China listed on the London and Hong Kong stock exchanges. Its subsidiaries have several large-scale power plants with a capacity over 1,000 MW each and other wind and hydro power projects under development with a planned capacity of 6,300 MW. It also includes the China National Water
Central China Power Grid Co Ltd website information, undated, (circa 2004). [edited] http://intl.ccpg.com.cn/pub/huazhong/english/organization/CentralChina/default.htm

generation assets are widely distributed over 19 provinces or autonomous regions.

Located on the banks of East Lake in Wuhan city, Hubei prov, the Central China Power Grid Co Ltd (CCPG) was established in November 2003, through the restructuring of the former Central China Power Administration of the Central China Power Group Corp and the State Power Central Co. CCG is a stateowned company vested by the State Grid Corp of China with 36 billion yuan as its authorized equity capital. Its main duties are: operating and controlling the power grid as well as power sources remaining with the power grid, guaranteeing safety of power supply, developing plans for the regional grid, fostering a regional power market, running the power dispatch and exchange centre, implementing integrated dispatch of the regional grid and integrated optimization of power resource allocation in the region it serves. As one of six large regional grids in China, CCG operates in an area of 1,298,000 sq km, supplying power to a population By the end of 2002, the installed generating capacity in the region reached 73.59 GW, of 382 million. accounting for 25pc of the total installed capacity in China. its annual electricity generation was 314.3 TW h, total assets 269. 73 billion yuan and annual sales revenue 84.7 billion yuan. As the strategic planning centre of central China region, CCG has established close ties with many famous power companies and institutions all over the world. By Nov, 2003, 33 foreign-invested large-scale power projects with a total installed capacity of 14.61 GW and total foreign investment of 6,274 million US dollars in CCG have been approved by the State. At the same time, a number of power enterprises have stepped abroad to develop the international market, resulting in the design and construction of 24 power projects in southeast Asia, the Middle East and Africa.

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#### PADAUNG FACTORIES BEGIN PRODUCTION OF GENERATORS AND METERS

NLM, 17/10/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061017.htm

Myanma Machine Tool and Electrical Industries (MMT&EI) under the Ministry of Industry No 2 opened two factories that will produce generators and meters in Padaung township in Pyay District on 14 October. The generator factory will produce 5 KW, 10 KW single phase generators and 20 KW, 30 KW, 50 KW and 100 KW triple-phase generators. The factory is expected to produce over 1,800 generators per year. Present for the opening were the Southern Commander, the Minister for Industry No 2 and officials of the China National Machinery Corp and Angelique International Co Ltd.

The generator factory was formally opened by the MD of MMT&EI, the MD of Myanma Industrial Construction Services (MICS) and the MD of China National Machinery Import and Export Corp.

The triple-phase, watt-hour meter factory was formally opened by the MD of MMT&EI, the MD of MICS and V-P of Angelique International Pradeep Arya. The triple-phase, watt-hour meter factory launched its test run on 22 September 2005 and can produce 200 triple-phase, watt-hour meters a month. It is expected to manufacture 10,000 triple-phase, watt-hour meters a year. 80pc of the components for the meters are produced in Myanmar.

#### Additional references for production, sale and use of meter boxes:

See above: 'Rural electricity <u>committees metering</u> prospective customers' (IMNA: 11/05/07) See below: 'Yangon company producing <u>industrial energy meters'</u> (MT: 04/07/05)

NLM, 07/07/07. www.mrtv3.net.mm/newpaper/77newsn.pdf

The EPM No 2 is briefed on production of electric meter boxes at the factory of MMT&EI in South Dagon. The moving disc, base, terminal block cover, die and mould for the boxes are produced by the meter box factory in Padaung township.

NLM, 23/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070523.htm

The Minister for Industry No 2 and the D-G of the Directorate of Myanma Industrial Planning inspect the electrical and electronic appliance factory in Mayangon township. Rice cookers and electric irons are produced in the household workshop of the factory. The minister urges production of appliances with modern marketable designs and distribution to the markets in timely fashion.

#### NLM, 02/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070402.htm

The Minister for Industry No 2 is conducted around the electric meter workshop of the electrical and electronic manufacturing factory in the South Dagon IZ by GM Lei Lei Win. Meters produced at the factory are under test run.

#### NLM, 26/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061226.htm

EPM No 2 visits the power testing centre in Ahlon township and is briefed on the testing, distribution and installation of electric meters.

NLM, 29/05/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060529.htm

EPM No 2 looks into the test lab [at the Ahlon Gas Turbine]. He tells the staff that arrangements are being made to install 100,000 electric meters in Yangon. So far, 72,507 electric meters have been allotted to consumers. A thorough inspection of the meters is required.

#### Additional references for production, sale and use of generators

See below: 'Market expands for generator and rental shops' (MT: 09/05/05)

#### NLM: 19/11/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051119.htm

An industrial development coordination meeting took place at the Ministry of Industry No 1 on Kaba Aye Pagoda Road in Yangon with an address by Committee chairman Gen Soe Win. After the meeting, Gen Soe Win and party viewed round the materials displayed by ministries and private entrepreneurs in the compound of the Ministry of Industry No 2. Minister Saw Lwin and Deputy Minister Khin Maung Kyaw and officials conducted the Prime Minister and party around the booth of MMT&EI. At the booth, a 5-kW hydel power generator to be used with 15 ft-high waterfall, a 40-kW hydel power turbine to be used with a 60 ft-high waterfall, and 60 kW and 200 kW hydel power turbines to be used at 130-ft-high water falls were on display. A Francis water turbine model-HL-160-WJ-42 that can be used at 130-ft-high water level was also on view. The Ministry of Industry No 2 had a display of motors of various capacities manufactured by the electric motor factory in Indagaw. In addition, ignition coils, fuel pumps, alternators and starter motors manufactured at the automobile electronics factory in Indagaw and meters produced at at the meter workshop in Sinde were put on display.

NLM, 15/12/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021215.htm

Minister for Industry No 2 Saw Lwin visits No 2 Machine Tool Manufacturing Factory of MMT&EI and inspects the production of generators. He gives instructions on the production of quality products.

NLM, 03/02/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020203.htm

The Minister for Industry No 2 inspects the manufacture of 5 kVA, 10 kVA and 35 kVA generabrs and the test run of 100 kVA generators at at the Machine Tool Factory No 2 of MMT&EI in Mayangon township. He leaves instructions on timely production, quality and marketing of the products.

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#### USE OF **<u>BIO-DIESEL FUEL</u>** FOR RURAL ELECTRIFICATION TO GET ATTENTION

NLM, 05/10/06. [excerpted] http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061005.htm

At meeting no 1/2006 of the Central Cte for Development of Border Areas and National Races, General Than Shwe gave an address.... He said efforts are to be made to step up the supply of electricity to rural areas generated from hydel power plants and bio gas-using generators. Officials are to encourage the use of biodiesel extracted from physic nut seeds to run generators to produce electricity. General Soe Win said that [since 1988] small-scale hydel power plants had been set up in 14 towns in border areas and 265 generators provided to 199 villages. Small-scale hydel power plants had been put in place in border areas where water resources were available. . . . In accordance with the guidance of the Senior General, the Ministry of Industry No 2 is constructing a factory to produce turbines and generators. . .

EPM No 1 Zaw Min submitted reports on small scale hydel power projects being implemented by the ministry.... [He said that the] Ministry of Electric Power No 1 has made arrangements to establish a total of 185 small-scale hydel power plants in Kachin, Kayah, Kayin, Mon, Rakhine and Shan states and Sagaing, Bago, Magway and Mandalay divisions. When completed, these plants could be expected to generate a total of 187 MW.

#### Additional references

See the following on the use of physic nut oil to fuel diesel-operated generators:

Reuters, 29/08/07 (as reported by the Myanmar Times: 03/09/07). <u>www.mmtimes.com/no382/b005.htm</u> Myanmar plans to export jatropha-based biodiesel as it attempts to tap the growing market for biofuels, a senior Myanmar energy official told a seminar in Singapore on August 27. "By this time next year we hope to have seven million acres (2.8 million hectares) of jatropha plantations in full swing and a large amount of biodiesel for export in the future," said U Soe Myint, D-G of the Energy Planning Dept. "Myanmar's requirements for biodiesel are minimal, but the jatropha project should earn some foreign exchange income," he said. "Malaysian and Indonesian companies are already in talks with people in the various states to set up processing plants, while the central government will be responsible for quality control."

Win Nyunt Lwin, Myanmar Times, 30/04/07. <u>http://www.mmtimes.com/no364/n011.htm</u>

The government has unveiled a plan for a massive increase in the production of biofuel from the jatropha or physic nut plant as an alternative to diesel. The plan has set a target for growing the plants, which produce oil-bearing nuts, on up to eight million acres by 2008. Realising the target would support the production of about 20 million tonnes a year of the nuts, which contain up to 37pc of an oil which does not need refining and can be mixed with fuel for use in simple diesel engines. U Kyaw Swe Linn of Myanma Industrial Crops Development Enterprise said the physic nut plants were currently being grown on about 1.6 million acres, mainly in the dry zone areas of Mandalay, Sagaing and Magwe divisions. Almost 900,000 acres of the hardy, drought-tolerant plants, which bear fruit twice a year, had been planted as community forests or live fencing. A one-acre plantation can produce about 100 gallons a year. U Kyaw Swe Linn said the use of the oil would help to increase the mechanisation of the agricultural sector as well as reducing the country's reliance on imported diesel. Myanmar produces about 90 million gallons of diesel a year but needs to import more than 200 million gallons annually. Myanmar has about 15.85 million acres of low-grade land suitable for growing jatropha plants, so realising the target would not involve the use of areas earmarked for other crops. The enterprise has developed refining equipment costing about K 7 mil lion that can produce about 100 gallons of biofuel a day from the nuts.

NLM, 21/03/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060321.htm

In Lashio Maj-Gen Myint Hlaing reported on efforts to implement guidance by the Head of State on . . . the production of bio fuel for heavy machinery. Arrangements will be made to grow 500,000 acres of physic nut in Shan State within three years to produce the bio fuel. Prime Minister gave instructions saying that strenuous efforts would be made for growing of physic nut plants. Conditions are favourable to produce bio fuel on a commercial scale and physic nut oil can be used in generators, water pumps and tillers, he said.

### NLM, 24/02/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060224.htm

Diplomats, officials of UN agencies, journalists and the Deputy Foreign Minister participate in a physic nut planting ceremony on a 100-acre model farm of the Northeast Command in Lashio. Together with local national races and members of social organizations they sow seeds and plant physic nut grafts. Afterwards, they observe the test run of generators and grinding machines run on physic nut oil.

NLM, 15/01/06. http://www.ibiblio.org/obl/docs2/NLM2006-01-15.pdf

Testing of physic nut oil in running buses, light trucks and generators produced by Mandalay Industrial Zone showed considerable success, drawing the attention of rural folks. The tests showed that using a gallon of the oil, a jeep or a light truck installed with 2C engine could run 23 miles. It is learnt that with 100pc use of diesel, such a vehicle can run 25 miles. A 42-passenger bus can run 10 miles with 100pc use of a gallon of physic nut oil and 12 miles with the use of a gallon of diesel. Farmers can use physic nut oil they produce with the use of manual millers to operate power-tillers, reapers, combine harvesters, water pumps, generators, outboard motors less than 20 hps, small agricultural trucks.

On other types of small-scale generation of electricity for rural communities see the following: 'Interest growing in rice husk generation' (MT: 10/07/06) 'Wind power system ideal for villages' (MT: 05/12/05) 'Village electrication technology on display (MT: 14/11/05) 'Mini hydropower plants planned for rural areas' (MT: 08/08/05) 'Hydropower station commissioned in Kaungkha' (NLM: 26/07/05) 'Biogas power plants supply electricity to rural areas' (MT: 16/08/04) 'Private sector promoting interest in renewable energy' (MT: 12/07/04) 'Rural Areas Encouraged to make greater use of renewable energy (MT: 05/01/04) 'Solar power seen as solution for remote villages' (MT: 06/10/03) 'Alternative energy project uses three power sources' (MT: 06/01/03) 'Introduction of renewable energies in rural areas of Myanmar' (In preparation) 'Electricity generation in Myanmar by state and division' (In preparation)

#### ELECTRIC POWER SUPPLY IMPROVES AFTER <u>YEARS OF ABNORMAL STATUS</u>

Xinhua, 02/09/06. http://english.people.com.cn/200609/02/eng20060902\_299091.html

Electricity supply in Yangon city has gradually improved to nearly normal since late July with round-the-clock distribution of electricity after experiencing years of abnormal and restricted power supply. The alternate distribution at three different times a day had caused much inconvenience. The resumption of almost normal electricity supply in all townships as well as in the industrial zones of Yangon is mainly due to the functioning at full capacity of two hydropower plants -- Paunglaung and Mone -- official media reported. The Paunglaung hydropower plant in Pyinmana township has a capacity of 280 MW, while the Mone plant in Magway division has a capacity of 75 MW.

Electric power authorities have been working to ensure electricity in Yangon 24-hour a day in the wake of years of power shortage. MEPE, the main electricity supplier, said it is supplying 360 MW of electricity to Yangon daily and 860 MW to other parts of the country. MEPE has also attributed the possible increase of power supply in Yangon to the removal of government ministries to the new capital of Nay Pyi Taw since last November. This has resulted in reduced power consumption by ministry offices in Yangon and has made it possible to increas distribution to residential areas as well as industrial zones.

MEPE raised the prices charged for electricity prices last May, advising people to use electric power more efficiently and to avoid overuse. The new rates are K 25 (US\$ 0. 02) per unit for home-lighting purposes, up from previous rates that varied from K 2.5 to K 25 for 1 to 200 units. Unit charges for business customers doubled. The previous rates had been in force since May 1999.

Official stats show that before 1988, there were 24 power plants in Myanmar with a total capacity of 568.45 MW with 14 hydropower accounting for 228.45 MW. Since 1988, Myanmar has built 39 new power plants with a total capacity of 1, 071 MW. Thirty are hydropowered, having a capacity of 517.22 MW. Myanmar is currently building 16 hydropower projects with a total capacity of over 1,778 MW. These projects in Mandalay, Bago, Shan, Kayin and Rakhine divisions and states include Yeywa (790 MW), Kunchaung (60 MW), Pyuchaung (40 MW), Khabaung (30 MW), Yenwe ( 25 MW), Shwegyin (75 MW), Shweli (600 MW), Kengtawng (54 MW) and Thahtay (102 MW). Plans are underway to build 15 more plants that would increase add another 4, 346 MW. These include facilities at Bawgata (160 MW), Bilin (280 MW), Hatkyi (600 MW), Shwesayay (660 MW), Manipura (380 MW), Tanintharyi (600 MW), Shweli No 1 (150 MW), Shweli No 2 (500 MW) and Maykha (800 MW).

According to government stats, Myanmar had an installed generating capacity of over 1,775 MW as of October 2005, up from 706.82 MW in 1988. Hydropower account for 35pc, while gas-fired generation stands at 50pc. Other recent stats show that electric power produced totalled 6.064 billion kilowatt-hours in 2005-06, up from 2.2 billion units in 1988-89. Despite the improvement in Yangon's electricity supply, issues such as frequent power failure due to old-aged cable lines and voltage drops remain to be resolved.

#### Additional references

See above:	' <u>Full power</u> supply promised for July' (MT: 04/06/07)
	'Myanmar learns to live with the lights out' (Reuters: 09/04/07)
See below:	'Yangon electricity supplies get boost from <u>YESB plan</u> ' (MT, 24/07/06)

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#### PLANS FOR <u>HTAMANTHI</u> DAM PROJECT ON CHINDWIN NEAR FINALIZATION

Nwe Nwe Aye and Moe Moe Oo, Myanmar Times, 28/08/06. http://www.myanmar.com/myanmartimes/MyanmarTimes17-331/h010.htm

The design for Htamanthi Dam, slated to be the biggest ever built in Myanmar, is expected to be finalised in early 2007, an official from the Ministry of Agriculture and Irrigation said early this month. U Aung Naing Win, an official with the Irrig Dept, told MT in an interview in the village of Tazone, about 52 kilometres (32 miles) from Homalin in Sagaing Division, that the ministry had already drafted the design and hoped to finalise it under supervision of Colenco, an international consulting and engineering company.

The project, which will be built on the Chindwin River, was started in 2005 and is being implemented by the Ag & Irrig Ministry along with EPM No 1, which will build the power house, navigation lock and spillway, said U Aung Naing Win. "We are now at the stage of preparing the land, installing machines and finding rock that will be used for the dam bed," he said. The completed dam will be 2,350 metres (7759 ft) long and 72m (236 ft) high, and will create a reservoir with a surface area of 540 sq mi. It is expected to produce 1200 megawatts of power.

The project will also include the installation of two 373-km (230-mi) cables that will carry 500 kilovolts of power from the dam to Monywa. The surplus electricity will be sold to India. The entire project is expected to be complete within seven years.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-12: Tamanthi Htamanthi dam near Tason village [25° 07' N, 95° 03' E], grid square reference: 9\0, 35\5 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ng46-12.jpg</u>

#### Additional References

Mizzima News, 05/03/07. http://www.mizzima.com/MizzimaNews/News/2007/Mar/07-Mar-2007.html About 380 households from Leivomjang and Tazong villages, located between Tamanthi and Homalin towns on the Chindwin river, have been forced to leave their homes and relocate to new places, said an ethnic Kuki woman, whose family members were compelled to relocate from Leivomjang village. She said the Burmese Army had started destroying houses in the two villages, forcing the villagers to relocate to a new village named 'Laung Min' on the eastern bank of Chindwin. However, as the new village site is barren and is situated in a remote area away from the communication network, villagers have refused to stay in the new place, she said. "Most refused to go to the new site and some went into the jungle to hide. Some are temporarily staying in farm huts. No one dares to remain in their village," she added. The Burmese junta with the help of India's National Hydroelectric Power Corporation (NHPC), is building a hydro project on the Chindwin that will generate 1,200 MW of electricity. According to anti-Tamanthi Dam campaigners 80% of the power is to be transmitted to India. They said the authorities in Burma had forcibly seized about 17,000 acres of agricultural land from villagers for the proposed dam site. Lu Lun, coordinator of the ATDCC in New Delhi, said that over 61 Kuki villages lying in the area targeted for the dam will be forced to relocate. Moreover, the construction which has begun without an iota of environmental assessment, will adversely affect the existing biodiversity, ecological balance and climatic conditions in the region.

#### NLM, 28/01/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070128.htm

General Soe Win and party went to the site of the Htamanthi dam and hydroelectric power multipurpose project where he was briefed by EPM No 1 Zaw Min. He reported on [plans] for the power intake, steel pipelines, power station, canal, spillway and switching yard. Next, Ag & Irrig Minister Htay Oo reported on preliminary engineering work and the arrival of heavy machinery and Deputy EPM No 1 Myo Myint explained matters related to geological conditions and change of design for the main embankment. Deputy Ag & Irrig Minister Ohn Myint clarified construction of separation wall, collection of quality stones and tasks being carried out in co-operation with Colenco Co. Then the PM and party viewed construction of the concrete separation wall, preparations for construction of the main embankment and other engineering works. Next, the PM inspected the Test Cell 2 site, a completed fuel tank and concrete mixer. Afterwards, the PM presented fruit baskets to the Project Director of Colenco Power Engineering Ltd and engineers.

#### NLM, 19/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061219.htm

General Than Shwe and party visit the Htamanthi multipurpose hydel power site at Tazone Village about 30 miles north of Homalin. EPM No 1 Zaw Min reported that the project will be undertaken by HPID. The 1,200-MW power station will generate 6,685 million kWh of electricity annually. Besides the Htamanthi project, the 520-MW Mawlaik hydel power project and the 600-MW Shwesarye hydel power project [also on the Chindwin] will be implemented. Ag & Irrig Minister Htay Oo explains the dam-building work to be carried out by the Irrig Dept. The two ministries concerned will work co-operatively in building the diaphragm, the spillway and the irrigation network. Personnel have already been trained to drive the trench cutter machine that will be used in building the diaphragm. Forestry Minister Thein Aung reports on forests in the project areas, Energy Minister Lun Thi reports on arrangements for the provision of fuel. The earth dam on the Chindwin will be 5,250 feet long and 263 feet high. Water stored by the dam will be used to irrigate over one million acres of farmland. Six 200-megawatt turbines are to be installed.

#### Tribune News Service, 20/07/05. www.tribuneindia.com/2005/20050721/cth1.htm

Over six years after a joint Indo-Myanmar hydro-power generation project was initiated, it has finally made a headway, with the gov'ts of both countries accepting the pre-feasibility report for Tamanthi Hydro-Electric Project. It will have a generating capacity of 1,200 MW and will be developed as a mutual interest venture between India and Myanmar. "We had started work on the report in April, 2004, after signing a formal agreement with the Ministry of External Affairs," said Mr M.M. Madan, Executive Director of the National Hydro Power Corporation (NHPC). "Acceptance of the report implies that both countries are keen to go ahead with the project." This is the third major foreign project to be undertaken by the NHPC after setting up power stations in Nepal and Bhutan. The NHPC was tasked by the External Affairs Ministry to prepare the report on the Tamanthi project, and it has conducted field surveys and investigations at the project site in collaboration with the Myanmar authorities. It would be the major Indian agency to execute the project. The project would involve construction of a dam on the Chindwin, the main tributary of Myanmar's major river, the Irrawaddy. The 840-km-long Chindwin, known as Ningthi in Manipur, has its source in the Pulkai Kumon ranges along the Indo-Myanmar border.

In February 1999, a fact-finding mission led by the Member (Hydro), Central Electricity Authority (CEA), visited Myanmar, followed by a joint site inspection by technical experts from both countries. The Indian team comprised experts from the CEA, the NHPC, the Central Water Commission and the Geological Survey of India. It identified two potential sites at Tazon and Hwena, and gauge and discharge stations were established to study the general geology of the sites. During his visit to India in Oct 2004, General Than Shwe signed an MoU on the project with the Indian gov't. In Feb 2005, a five-member team of experts from the CEA, the NHPC and the Power Grid Corp of India held discussions with Myanmar authorities about exporting 80% of the power generated by the project to India. Laying of transmission lines from the project site to a hub in north-eastern India, funding, contracts and investments were other issues reportedly discussed during the visit. It was also among energy and infrastructure-related issues on the agenda when External Affairs Minister Natwar Singh, visited Myanmar in March 2005.

Myanmar Times, 12/06/00. <u>http://www.myanmar.gov.mm/myanmartimes/no15/enormous\_potential.htm</u>

U Soe Myint, D-G of the Myanmar Energy Planning Dept, at a BIMSTEC energy conference: "Myanmar is to export its hydro power to northeastern parts of India once we can substantiate our proposed [Tamanthi] project, which is expected to cost US\$1 billion. n five years' time we could be ready." Rajendra K Pachauri, Indian expert from the New Delhi based Teri group: "This is very exciting prospect. There is enormous potential for Myanmar and India on energy generation and this project is impressive."

Anti-Htamanthi Dam Campaign Committee, [undated].

http://www.freewebs.com/anti-htamanthi/photospeaks.htm

Current volume of Chindwin river is 115 million acre-feet or 16% of Burma's fresh water resources. Genesis of this project goes back to 1962 when preliminary investigation work was carried out with the assistance of the UNDP agency.

**Compiler's Note**: Pictures of the project area and villages, maps and a petition are available on this site. Consult also these Kuki websites:

http://www.petitiononline.com/67kukis/petition.html

http://www.ksdf.org/read.asp?title=TAMANTHI%20DAM%20IN%20BURMA&CatId=Article&id=2

See also the following editions of the New Light of Myanmar: 28/04/04, 09/06/05, 30/01/06, 01/02/06, 24/09/06, 23/01/07

#### TROUBLED HISTORY OF **POWER SUPPLY AT TACHILEK**

Shan Herald: 25/08/06 <u>http://www.burmanet.org/news/2006/08/25/shan-herald-agency-for-news-%e2%80%98patriotic-power-shut-down-in-tachilek/</u>

For the fourth consecutive day Tachilek, the twin city of Maesai, has been in darkness again, three years after electricity supply from Thailand was stopped by the order of the Burma Army, according to sources from the border. This time the plant in Ponglo quarter is undergoing repairs.

The military zone north of the city, however, has not been affected by the power outage. "Actually, it was the military that got hit by the blackout," one respected citizen explained. "But they ordered that the supply lines going into the city be redirected to the military zone." "In a way, this is another sample of our future democracy," he quipped, "which will be of the army, by the army, for the army."

The plant in Ponglo quarter, set up in 2003, is undergoing emergency repairs under the supervision of five engineers summoned from Mandalay, said another source.

Before 2003, electricity to Tachilek was supplied by Thailand, at 4.75 baht (US\$ 0.10) per unit. However following a series of confrontations with Thailand, Maj-Gen Khin Zaw, then commander of eastern Shan State, downgraded the purchase of power from Thailand as an 'unpatriotic act' and contracted the local Wai Family Electrical Production and Supplies Co.Ltd, owned by U Tar Wai, instead to supply electricity to the city, at 8 baht (\$0.2) per unit, which has now gone up to 12.50 baht (\$ 0.30) per unit.

U Tar Wai, said to be a close associate of Wa druglord Wei Hsuehkang, was arrested last year in connection with the Myanmar Universal Bank that was closed down in August by a military order. "He was freed later after paying Kyat 800 million (\$666,000)," a Wa source told S.H.A.N. U Tar Wai reportedly was close to Maj Gen Khin Zaw, now commander of Mandalay-based Central Region Command, when he was still chief of Tachilek district between 1998-2000.

Additional references:

See below: <u>'Private operators</u> meet consumer need for alternative power service' (MT: 03/02/02) Chronology of the canceled <u>lignite power plant</u> at Tachilek (NLM: 10/05/00)

#### NLM, 17/09/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030917.htm

At the power station in Tachilek, Lt-Gen Aung Htwe of the Ministry of Defence was briefed on the power production capacity of the station and progress in the installation of the unit system. He gave instruction to

provide power to the villages around the clock and extended installation of meter boxes. The station is situated on a 24.42-acre site on Polo [Ponglo] Street in Haungleik village-tract in Tachilek. A project for ensuring all-day power supply to the town was launched on 17 April 2003. Up to 9 September, 528 meter boxes have been installed. Arrangements are being made for generating electricity with the use of the current of Mehok Creek 20 km from Tachilek.

#### Shan Herald, 27/06/03.

http://www.shanland.org/war/2003/electricity\_considered\_one\_of\_th.htm/?searchterm=bomb%20explosions %20Tachilek

Whatever the political and military reasons were that led to the bomb explosions in Tachilek on 21 May that killed 4 and wrecked the statue of a Burmese hero, the jostle for the right to electricity supply among local businessmen was one issue that could not be brushed off easily, a recent informal meeting of traders in Mae Sai concluded. "The destruction of the statue of King Bayintnaung (1551-1581) was carried out simply to confuse the issues," said one. "The main object of the exercise was the Tar Wai power station, where the blast successfully damaged two of the generators." Tachilek, except for government guarters and people with private generators, is once more in the dark since the electricity plant of Wai Family Electrical Production and Supplies Co. Ltd. went out of commission during the blowup that also killed one of its workers. The Wai family station had only been in operation for less than a month, after the application of another local businessman, Sai Hseng who wanted to use meter boxes from Thailand at a cheaper rate was turned down. Instead the concession was granted to Tar Wai, who enjoys close ties with the United Wa State Army and its business firm, Hong Pang. The grant angered even the local authorities who thought they had been cheated out of their rightful shares in the spoils by Triangle Commander Brig-Gen Khin Zaw, according to a source. "As a result, there is a concerted effort by some officers at present to have him removed from eastern Shan State." Currently, U Tar Wai, U Maung Win, 58, another ethnic Chinese applicant, and an unidentified representative of the Thai power agent in Mae Sai are in Rangoon to have the issue resolved.

Asian Tribune, 21/05/03. www.burmalibrary.org/TinKyi/archives/2003-05/msg00022.html

Soon after four bombs exploded in and near Tachilek late last night and this morning, commanders of the rebel Shan State Army turned out to disclaim suggestions as to their involvement. According to the Shan Herald, the first bomb reportedly blew up at 22:00 last night, killing two policemen in the Pakook police box, 6 miles east of the town. A second went up at 03:15 am near the Myanmar Petroleum Production Enterprise (MPPE) gas station in Paliang ward, east of the Maekhao, a tributary of the Maesai, killing a civilian. The third explosion was at the King Bayintnaung statue at the center of the city at 06:45am. The blast was of such force that all windowpanes from a third-story building were smashed to pieces," informed another resident. The fourth bomb that discharged at 08:20am blew away a worker at the newly set up electricity plant near the Regina Hotel. The plant was owned by U Tar Wai, an ethnic Chinese with connections to the Wa, said the source.

Shan Herald, 30/04/03. http://www.shanland.org/general/2003/few\_buy\_new\_electricity\_meters.htm

Since an official announcement was made in Tachilek on 1 April that meter boxes from Thailand would be replaced by those from a company contracted to supply electricity to the border city, not more than 30 have been purchased by the townspeople, according to several local sources. The announcement by the township council stated that U Tar Wai, an ethnic Chinese partner of the Hongpang Co, had been engaged to provide electricity to the city and that he had obtained 3,000 meter-boxes that would have to purchased at 35,000 baht each in order to connect to the service. U Tar Wai would be using three diesel-run generators during the day time and another three at night. The charge for the service would be eight baht per unit. Sources say most residents are reluctant to procure the new meter boxes because the service charge is much higher than the five-baht rate previously charged by Thailand and because the boxes will have to replaced after only two years. Many of them have also bought their own generators since Burma cut off service from Thailand during a border confrontation between the two countries in 2002.

Moe Kyaw, IRROL, 28/06/02. <u>http://www.irrawaddy.org/article.php?art\_id=2407</u>

The Burmese border town of Tachilek has been plagued by an electricity deficiency since relations between Thailand and Burma soured last month. The town's electricity is normally drawn from Mae Sai, Thailand, opposite Tachilek, but on June 9 Burma's military government issued an ordered prohibiting residents from accessing electricity from Thailand, according to a report from the Thai-based Khaosod newspaper. Since

then, residents have had to rely on diesel-powered generators for their electricity. Due to the high price of fuel and the rising cost of generators, only well-to-do residents of Tachilek have been able to afford the service. The price of generators has quadrupled since the bridge was sealed, according to a Thai merchant from Mae Sai. Government offices in Tachilek are reportedly able to draw power from 6:00pm to 8:30pm with the help of government-provided generators. The United Wa State Army's (UWSA) Hong Pan Company along with Kyi Myanmar Import and Export Co Ltd are trying to setup a huge generator in order to distribute electricity in Tachilek. U Kyi Myint of the Kyi Myanmar Co has travelled to Rangoon to try to obtain the necessary business permit. Hong Pan already has a giant generator capable of providing for the town's energy needs but has been unable to move it from its location near the Tachilek airport since the border is closed. Moving the giant generator requires the use of a large crane that is currently in Thailand.

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#### KIO PROMISES BETTER POWER SUPPLY FOR KACHIN STATE

Khun Sam, Irrawaddy On-line, 25/08/06. <u>http://www.irrawaddy.org/aviewer.asp?a=6097&z=154</u>

The Kachin Independence Organization (KIO) says it will be soon able to supply electricity throughout Kachin State from its hydropower projects. The ethnic ceasefire group confirmed on Thursday that the newly-completed Mali Hka hydropower plant had concluded a one-month test and would soon be able to more than double power supplies to the Kachin capital, Myitkyina.

Kumhtat Gam, the KIO's liaison officer in Myitkina, told The Irrawaddy on Friday that power would be supplied by the state-run MEPE and the KIO-run Buga Co Ltd under the terms of a contract signed by the KIO and the Burmese government. Kumhtat Gam said the unit price of the electricity had been provisionally fixed at K 130 (less than US \$ 0.10 ) for government departments, K 110 for households and street lighting and religious buildings, and K 250 (\$ 0.20) for businesses.

Mali Hka hydropower plant, which took three years to build, can generate a total of 10.5 MW and will provide 5 MW to Myitkyina. The rest will be used in the construction of the KIO's other project, Dabang Hka hydropower plant.

The announcement of the planned boost in power supplies to Myitkyina was welcome news for residents of the city, who have been hit by black-outs since flooding damaged the main power station, Chying Hkrang Hka. Kachin State also relies for electricity on two other hydropower plants—Nam Hkam Hka and Galai Jaung—run by the government.

#### Additional references

KNG, 13/08/07. <u>http://www.burmanet.org/news/2007/08/13/kachin-news-group-pregnant-women-give-birth-in-candle-lit-myitkyina-hospital/</u>

Pregnant women have been giving birth to babies in the Myitkyina Government Hospital by candle light. The hospital has been without electricity for over a month, said a hospital source. The hospital's Delivery Room is lit with candles and sometimes torchlight is used during delivery and surgery, the sources added. Currently power is available to the hospital for only two hours from 7pm to 9 pm Pregnant women are expected to carry candles and a torches, a hospital worker told KNG. Although the hospital has a private electric generator it can run for only one hour daily from 11am to 12 noon to provide power for the X-Ray machine. If patients need surgery, they have to pay K 7,500 (US\$ 6) per hour for the cost of electricity specially generated for the hospital's operating room by the hospital-owned generator. Shortage of electricity began when the government's Chyinghkrang river hydroelectric power plant was destroyed during flooding in May 2006. Power supply was resumed when a hydroelectric facility on Mali creek built by the KIO commenced operations in July 2006 but there are often technical problems in the plant, according to KIO officials.

#### DVB, 11/07/06. http://six.pairlist.net/pipermail/burmanet/20060712/000989.html

The barrier of Kyeinkran Hka dam near Myikyina broke and the raging water washed away the hydro-electric plant situated nearby, killing at least five people. A staff person at the plant told DVB that the dam barrier collapsed in the middle of the night after five weeks of heavy rains which started in early June. Four security

staff and an engineer were drowned during the disaster. The main bridge on the 12-mile road connecting Kyeinkran Kha village and Myitkyina was washed away, cutting off communication lines. Neither the dam nor the plant can be rebuilt or repaired as the whole location, situated between two mountain ridges was washed away by the force of the water. **Compiler's note**: According to official records, the Kyeinkran dam was built between 1991 and 1993. Over US\$1,400,000 in local and foreign exchange was spent in building and equipping the dam and power plant. Four turbine/generator sets made in the PRC, with a total capacity of 2.52 MW, were installed in the power plant. Villagers interviewed by the authors of *Damming the Irrawaddy* (pp 36-7) recalled that thousands of local people were recruited to work without pay building roads, cutting timber, clearing the dam site and acting as general labourers during the construction period. The local communities had high expectations for the electricity that the dam and power house were intended to provide but in the end the villages that had provided the labour only received electricity once every four days, while military offices and camps got full-time electricity free of charge.

NLM: 14/06/06 <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060614.htm</u> Malichaung hydel power project in Waingmaw township will be equipped with three 3.5-MW generators.

## Global Witness, A Choice for China: Ending the Destruction of Burma's Northern Frontier Forests, p. 58, October, 2005. www.globalwitness.org/media\_library\_detail.php/492/en/\_

In 1997, the KIO initiated the construction of two large hydro-electric power stations -- the Mali Creek hydropower scheme and the Dabak River dam -- to improve the electricity supply situation in Kachin State. Eight years later, in Jan 2005, the KIO was in negotiations with MEPE regarding the purchase of electricity to be generated by these plants. The Jinxin Co with bases in both Tengchong and Pianma is the largest logging company operating in Kachin State. It is this company that has been the main contractor for the construction of both dams. Work is being carried out in return for logging rights to timber in the area, worth millions of dollars. The dams are being built with the permission of the SPDC, which also gave permission for logging the upper Dabak region to pay for the schemes. Neither dam has yet been completed, despite the fact that the value of the timber already exported to China exceeds the cost of the Mali project and half that of the Dabak project. Ara La, who manages the projects, formerly a leading member of KIO, left the organization in disgrace in the wake of a corruption scandal surrounding the dam construction. Following pressure from the Yunnan provincial gov't, Jinxin agreed in principle to complete Dabak. Whether or not Jinxin is asked to finish the Mali dam depends on their performance at Dabak. It is feared that more timber will have to be felled in order to pay for further work.

NLM, 17/01/04. www.myanmar.gov.mm/NLM-2004/Jan04/enlm/Jan17\_rg7.html

Mali hydel power project in Waingmaw township, with a capacity of over 10 MW, and Dabut creek hydel project, with a capacity of 24 MW, are being implemented in Kachin state. The projects will contribute to the industrial development of Kachin State.

NLM, 16/01/04. http://www.myanmar.gov.mm/NLM-2004/Jan04/enlm/Jan16\_rg3.html

At Bala Minhtin Bridge across the Ayeyawady river officials reported on implementation of the Mali hydropower project. Efforts are being made to complete the project by the end of 2004. Electricity from the 10.5-megawatt power plant will be distributed tto Myitkyina and Waingmaw.

Pan Kachin Development Society, Karen Environmental and Social Action Network, *Listening to the People's Voices*, 2004, p. 12. <u>http://www.xs4all.nl/~bijstbnd/birma/birma-12.html</u>

In 2001, the KIO hired the Hung Ki Company to build the Mali hydropower station. In return the Jahta area was given as a logging concession to the Hung Ki Company. Now the concession has been extended to two Chinese companies -- the Hung Ki and Hung Hta companies. KIO leaders have ordered local people not to do any logging in this area.

## Global Witness, *A Conflict of Interests: The uncertain future of Burma's forests*, October 2003, p. 93. <u>http://www.globalwitness.org/media\_library\_detail.php/113/en/</u>

Electricity generation in Kachin state is totally inadequate. The Jinghkrang dam built by the SLORC in 1993 does not produce sufficient electricity to supply Myitkyina, let alone the rest of Kachin state, and that which is generated is prioritised to the Tatmadaw bases. Since 1997, the KIO has been involved in two hydroelectric power schemes, the Mali creek hydropower scheme and the Dabak river dam, to increase electricity generation in the state. This would increase the rate of development and provide for the needs of nascent

industries in the area. In terms of the timber trade this could mean an increase in processing capacity and the manufacture of value added timber products. However, it is far from clear whether there would be a ready market for such value added products;

NLM, 11/04/01. http://www.myanmar.gov.mm/NLM-2001/enlm/April11.htm

SPDC Secretary No 1 Khin Nyunt and party were welcomed by KIO leaders, officials of the Bugar Co, members of the national races and local people. Officials reported on the targets and benefits of the Mali and Dabat hydro-electric power projects. Afterwards, Secretary No 1 and party met with KIO Chairman La Mon Tu Jai and national leaders, officials of Bugar Co and local people. They were introduced to officials of Mali hydro-electric power project. Secretary-1 said the Dabat and Mali power projects were the result of the KIO's endeavours for the local people's interests. Electric-powered home industries and commercial-scale industries would emerge not only in Myitkyina and Waingmaw but also in the villages in the area.

NLM, 27/05/97. www.ibiblio.org/obl/reg.burma/archives/199705/msg00006.htm

Minister for Energy U Khing Maung Thein and the Northern Commander Maj-Gen Kyaw Win visited Dunban [= Dabak?] Creek in Waingmaw township where a hydel power project is to be implemented. Assistant Chief Engineer Aung Koe Shwe reported on the project. Dunban creek hydel power project will generate 45 million kWh a year.

Yunnan Machinery (I & E) Co Ltd [undated]. <u>http://www.ymec.com.cn/en/hpp/Project\_jcc.htm</u> **Compiler's note**: A good picture of the interior of the Chingkran hydropower station is available on this site

For more information on electric power in Kachin state, see Appendix 9: 'Electricity generation in Myanmar by <u>state and division</u>' (in preparation).

Preparation of the Ching Hkrang (Kyeinkram) dam site about 10 miles north Myitkyina began in 1982. Eventually the construction of the dam involved thousanda of unpaid laborers. People were organized by village tract in a rotating system of free labor provision: villagers had to cut down trees and clear and make roads and help with the construction operations. Laborers had to bring their own food and work materials. If a family could not provide a labourer, they had to pay K3,000 instead. Widows and other families that didn't have a male member also had to either work or pay for a substitute. Over 500 workers a month were involved on-site.

In the end most people were very disappointed with the results. The local communities had high expectations for the electric power that the dam and power house would provide. The government had said the electricity would be used first for schools, second for the military, third for churches and pagodas, fourth for government officials and the local communities in general and finally for the street lighting. After the project was completed the electricity was supplied on a rotating basis. Each village had electricity only once every four days, but the the military offices and camps had full-time electricity free of charge.

At 2am on July 11, 2006 the Ching Hkrang dam broke after five week of heavy rains., The ragin water washed away the whole hydro-electric plant situated nearby, killing at least five people. The main bridge connecting Ching ;Hkrang village and Myitkyina was also washed away. Neither the dam nor the plant could be rebuilt or repaired.

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#### **INVENTOR CO-OP** SOCIETY EXPORTS FIRST RICE-HUSK GENERATORS

Kyaw Thu, Myanmar Times, 21/08/06 <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-330/b002.htm</u>

The Myanmar Inventor Cooperative Society has agreed to sell Laos rice-husk-fuelled electricity generators in a deal worth US\$1.5 million that marks the group's first sale abroad. An MoU was signed July 28 with the Laos Ministry of Energy and Mines to provide the mid-sized renewable energy plants. The deal follows the ASEAN-organised Fifth Renewable Energy Project Competition held in Brunei in June where the society won third place for its rice-husk power plant design.

U Soe Tint Aung, president of the inventors' society, said the generators sold to Laos would have a power range of 20 kilowatts to 50kw and were to be exported this year, with installation work to begin in 2007. He said that Laos had not yet decided how many or exactly what size generators it wanted. "The final contract will be signed in October," U Soe Tint Aung said. "We don't know whether they will buy 20kw or 50kw plants."

The society would build a small factory in Laos and train local people how to operate the generators, he added. "We will set up the power plants up in areas where there is no connection to the national power grid." U Soe Tint Aung said the generators were not reliant solely on rice husks and could be run on branches and other kinds of plant waste.

The society was also set to ink a joint venture deal with a Thai electricity company last Thursday for five ricehusk power plants that produced between 650kw and 1000kw. "Although this is joint venture, we will try to manufacture the entire generator in Myanmar," U Soe Tint Aung said. He added that the society had also received orders from Vietnam, Cambodia and the Philippines. "The award (from the Fifth Renewable Energy Project Competition) helped us penetrate new markets," the 18-year industry veteran said.

The society has sold more than 470 of the generators in Myanmar, although U Soe Tint Aung said the deal with Laos was the first time they had exported their generators.

#### Additional references

**Compiler's Note**: The extracts immediately below relate mainly to the *manufacture* or *assembly* of gasifiergenerator sets at various locations in Burma/Myanmar. Links to other entries in the compendium dealing with paddy (rice) husk generators are found at the end of this entry.

NLM, 19/06/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070619.htm</u> At a state-owned vest factory in Kyaukse, the Minister of Industry No1 and party view a demonstration of producing electricity using a paddy husk-fired plant.

NLM, 30/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070530.htm

Industrialists at the Kalay IZ explain the assembly of husk-fired generators, power distribution and the manufacture of small-scale generators to Lt-Gen Ye Myint of the Defence Dept. He visits a husk-fired power station in the zone which is supplying power to 450 houses in four villages close to the IZ. The 300-kVa generator of the station consumes eight to twelve baskets of paddy husk per hour. The generator is a product of the zone. Other editions of NLM that refer to the manufacture of small-scale hydro turbines by workshops in the Kalay IZ: 16/08/06, 05/05/06, 25/03/05, 14/06/04, 19/01/04. U Aung Min is the proprietor of a workshop which assembles jeeps and other vehicles.

NLM, 05-03-07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070305.htm

The Yangon Commander and the EP Minister No 2 inspect a 'fuel-substitute factory' in Hlinethaya IZ where they check over paddy husk-fired engines. A total of 519 15KV-100 KV generators have been produced since 1995. The generators are used widely in water pumping projects, ice factories, saw mills and watercraft. The 'inspection' was followed later in the month by a visit to the factory by delegates to a renewable energy conference sponsored by ASEAN. The Myanmar Inventors' Co-op won an ASEAN Alternative Energy Award in 2006 (NLM: 26/03/07). A good picture of some of the products and the workers at the Inventors' Co-op factory in Hlaingthaya is available on the front page of the print edition of NLM of 06/07/07. <a href="http://www.ibiblio.org/obl/docs2/NLM2007-07-06.pdf">http://www.ibiblio.org/obl/docs2/NLM2007-07-06.pdf</a>. See also NLM: 20/06/06 in which U Soe Tint Aung explains the 20pc saving in fuel costs through the use a mixture of diesel and paddy husk gas and on the test run of 180-HP engine using the mixture.

NLM, 17/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061117.htm

Lt-Gen Khin Maung Than visits the fuel-substitute paddy husk-fired power generator industry of Mann Cho and Sons Co in Hsamalauk Village in Nyaungdon township. For more on village electrification at Hsamalauk see the extract on the program there under '<u>Interest growing</u> in rice husk generation'.

Kyaw Thu, MT, 11/09/05. http://www.myanmar.com/myanmartimes/MyanmarTimes17-333/b004.htm

The Myanmar Inventors' Cooperative Society will set up five rice-husk electricity generators in townships in Rakhine state, according to the society's manager U Than Aung. The generators will produce 0.15 - 0.30 MW. Their installation in Sitwe and Minbya townships marks the second phase in boosting the region's electricity supplies after five rice-husk generators were installed in the state earlier this year. The total cost for the 10 generators will be between K200 million and K300 million. They are for communities where there no electricity connection is currently available.

May Oo Moe, MT, 05/05/06. www.myanmar.com/myanmartimes/MyanmarTimes16-319/b006.htm Hein Engineering Co Ltd signed an MoU with Act Venture Sdn Bhd (AVSB) of Malaysia to produce gasifiers using high technologies. Under the agreement, research and development of the gasifiers will be shared with other ASEAN countries, according to U Zarni Aung, MD of Hein Engineering. The company, which engages in the production of feed mills and the installation of steel structures, began production of biomass gasifiers using technology from China in 2006. A news item in the New Light of Myanmar (14/03/07) reports that the company will export gasifiers to Cambodia and Malaysia. They are of two different types: one that operates 100pc on biogas and another that use a dual fuel system.

Good News Weekly Journal, 17/03/05 (as summarized in the MT Media Review column: 28/03/05). http://www.myanmar.gov.mm/myanmartimes/no260MyanmarTimes13-260/media.htm

A Myanmar technician has invented a device that enables diesel and petrol engines to operate on gas produced by rice husks. The president of the Yangon-based Myanmar Inventors' Co-op, U Soe Tint Aung, had also succeeded in devising a method to remove tar from the gas, which ensured that the engines operated more efficiently. According to U Soe Tint Aung, the gas was about 80pc cheaper than diesel or petrol. The co-operative has sold 208 engines of various capacities that have been fitted with the device. Most of the engines sold were used to power rice milling machines.

#### NLM, 18/02/05. <u>http://www.myanmar.gov.mm/NLM-2005/Feb05/Feb18.html</u>

Chairman of the Myanma Inventors' Co-op Ltd U Soe Tint Aung explains the conversion of a 1,200/ 1,400 BHP diesel engine to a paddy husk-fired power generator. Good pictures are available with this article.

## JICA, MEPE, NK, IEE Japan, *The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summary*, Sept 2003, p 17.

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&segno=1

Although there are commercially successful examples of biomass gas engines in China and Thailand, the removal of tar from the gas produced from rice husks by pyrolysis has proved difficult. However, the Myanmar Inventors' Co-operative succeeded in overcoming the problem and started commercial production of a gasification-engine-generator system in 1995. A total of 109 husk engine units were installed up to 2000. These are mostly used to power rice-mills. Application to rural electrification began in 2001. The husk combustion chamber and filtering devices of the gas are all locally made. Second-hand diesel engines from trucks are converted to spark plug ignition. [If produced on a large scale in Myanmar], the supply of spare parts for the used engines could become a problem. The cost of the rice husk gasification -engine generator set is low. No special expense is necessary for water treatment, unlike the steam turbine generator. The lines used for distribution would normally cost more than the gasifier-generator set itself. According to tests carried out in Japan by the Agriculture Mechanization Research Institute, 3 - 5 kilos of rice husks are needed to generate 1 kWh, whereas data from China quotes a figure of 2.0 - 2.2 kg/kWh. It is essential to test and confirm the actual relationship between fuel consumption and power generation of the units produced by the Myanmar Inventors' Co-op.

**Compiler's Note**: Two photos of the units produced by the Inventor's Co-op accompany the description.

Thaung Win Bo, NLM, 09/01/03. <u>http://www.myanmar.gov.mm/Article/Article2003/jan/jan9a.html</u>

Paddy husk-fired engines of Myanma Inventors' Co-operative Society are popular and prominent among the exhibits at the Co-op Products Exhibition and Market Festival 2003 in the Co-op Commercial Centre in Bahan township. They are used for pumping water, livestock breeding, rural power supply, rice and oil mill grinding, saw mills, ice factories, brewing and other operations. Located at No 55/56 on Kyaikwaing Pagoda road in Mayangon township, the co-op is producing engines of high quality after years of research and experiment. In seven years it has sold 155 of 158 engines produced of which 64 were sold in Ayeyawady

NLM, 16/02/02. <u>http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020216.htm</u> During an inspection of the Myitkyina industrial zone Maj-Gen Ye Myint of the Defence Dept urges industrialists to extend production of bio-mass power generators in the Myitkyina zone.

NLM, 23/01/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020123.htm

Maj-Gen Khin Maung Than of the Defence Dept visits the Ayeya Swan-ar paddy husk-powered engine production plant in Pathein IZ in Pathein. Manager Maj Aung Naing reports on the production of 54 engines. Instructions are given. A news item in NLM (05/05/01) refers to the inauguration of one of the paddy husk-fired plants manufactured by Ayeya Swan-ar in Yonthalin village in Henzada township. The 130-KVA power plant can light up over a thousand homes in the village. Ayeya-shwewa, the parent company of Ayeya Swan-ar, is in the agribusiness in a big way. It is reported to have received grants of over 45,000 acres in various townships of Ayeyawaddy Division to develop for commercial farming purposes (NLM: 22/06/99, 02/09/00).

Myanmar Times, 15/01/01. www.myanmar.gov.mm/myanmartimes/no46/

By using a paddy husk-fired engine to pump in 600,000 gallons of water on a 1,200-acre farm at Payami in Thabaung township, the Ayeya shwe-wah Co saved as much as K 30,000 daily in fuel costs. Diesel would have cost the company K 30,800, but the 176 bushels of rice husks needed to produce the gas for the operation only cost K 880. The inventor of the paddy gas-husk engine is U Soe Tint Aung, president of thje Myanmar Inventors' Co-op. Though designed as a paddy husk-fuelled engine, his machine can also run on gas produced by saw dust or organic waste. Besides pumping water, it can generate enough power to run a rice mill, a saw mill or an ice factory. One of the engines is supplying the electricity needs of Nyaung-gan village in Htilin township.

NLM, 25/07/98. http://mission.itu.ch/MISSIONS//Myanmar/98nlm/n980725.htm

Four cabinet ministers including the Minister for Electric Power visit the Myanma Tihtwinthumyar Co-op Syndicate on Kyaikwaing Pagoda Road in Mayangon township. The co-op chairman U Soe Tint Aung briefs them on paddy husk gas-powered engines, the syndicate's financial accounts and marketing of the engines. He has been experimenting with 'producer gas' obtained from paddy husks since 1992 and has been successful in operating engines such as 30-HP [300?] Toyota which are used in rice mills, saw mills, edible oil mills, ice factories, generators and pumps. The co-op has has twenty 200-HP engines for sale. It could sell up to 49 machines valued at over K26 million to state/division co-op syndicates and private co-ops.

See above:'Village rice husk power plant will serve as research centre' (MT: 24/09/07)<br/>'Plans for 7-million-dollar power plant edge forward' (MT: 27/08/07)<br/>'Rice-husk generators slated for villages in Yangon division' (MT: 11/06/07)<br/>'Interest growing in rice-husk generation' (MT: 10/07/06)<br/>'Paddy husk power plant tested to cut rice milling costs' (MT: 19/12/05)<br/>'Biogas power plants supply electricity to rural areas' (MT: 16/08/04)<br/>'Biomass gasifier used for tobacco curing in Myingyan' (TERI: 08/04)

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#### SOUTH KOREA' S KEPCO TO STUDY IMPROVING POWER TRANSMISSION SYSTEM

Kyaw Thu, Myanmar Times, 31/07/06. http://www.myanmar.com/myanmartimes/MyanmarTimes17-327/

A meeting was held in Nay Pyi Taw last week between the Ministry of Electric Power (2) and Korea International Cooperation Agency (KOICA) to discuss plans for the development of an improved electrical power network in Myanmar. The meeting, which was held July 28, was also attended by representatives from Korea Electric Power Corporation (KEPCO), which will likely conduct surveys and training programs for the development project.

The meeting followed the signing in April of an agreement between the ministry and KOICA to provide systematic management and operation of a power network to improve the energy sector in Myanmar. "The

project, whose combined budget amounts to US\$1.4 million, will include the transfer of (South) Korean knowledge and experience in power system operation and protection, general facilities testing, fault analysis, the provision of relay equipment, and a vehicle for field surveys," said a statement released July 21 by KOICA. The project, which is expected to take three years to complete, will also include a study of the condition of power lines and power substations in Yangon and Mandalay.

#### Additional references

Khin Myat, Myanmar Times, 03/09/07 <u>http://mmtimes.com/no382/n016.htm</u>

The Korea International Cooperation Agency (KOICA) and the EPM No 2 met to discuss the KOICAsponsored project to develop a nationwide electric power network. The third phase of the project is 50pc complete; the first phase in 01-02 involved analysis of Myanmar's power system network; the second phase in 03-05 involved draft of a basic design for a 500-kilovolt transmission system. During the third phase, titled 'Power System Operation and Protection Scheme' from 2006 to 2008, KEPCO has been commissioned to carry out research and consulting activities including data surveys for operation and protection areas, establishment of a reactive power compensation plan and a statistics management system, and to prepare recommendations to prevention of power system blackouts prevention methods.

William Boot, IRROL Business, 06/07/07. <u>http://www.irrawaddy.org/article.php?art\_id=7792</u> Claims by Burmese media that a South Korean-led technical development program will expand Burma's

Claims by Burmese media that a South Korean-led technical development program will expand Burma's power supply by setting up a 'national grid' fall short of reality, according to Bangkok energy researcher Sar Watana. The program, financed by KOICA, will be at the halfway point when Seoul officials present a progress report in the Burmese capital in August. Burma had a total generating capacity of 1,775 MW at the end of 2006 -- barely enough to power Rangoon. According to Sar Watana, the Koreans are "installing 500-kilovolt transmission lines, which are not the fastest or most modern" but which will be an improvement in the areas the program is directed to. Compared with Thailand's generating capacity and population Burma is about 20,000 megawatts still too short.

Xinhua: 04/04/07. <u>http://english.eastday.com/eastday/englishedition/business/userobject1ai2950269.html</u> According to the local Flower News, South Korea's latest network development project in Myanmar aims to share Korean knowledge and experience in power system operation and protection, general facilities testing, fault analysis and the provision of relay equipment. The project is funded by KOICA and undertaken by the Korea Electric Power Corporation (KEPCO). It is starting with the power lines and power substations in Yangon and Mandalay. Technical training will be conducted with officials in Bago division's Thayagon subpower station. KOICA funded two other projects in 2001-02 and 2004-05 that studied the electric power system network and the transmission system.

Kyaw Soe Linn, Myanmar Times, 02/07/07. <u>http://mmtimes.com/no373/n008.htm</u>

A seminar in August 2007 will review progress on KEPCO's two-year, US\$ 1.4 million project: 'Power System Operation and Protection Scheme'. Kim Jong Hwa, general manager of the project team of KEPCO said it is third co-operative project between KOICA and MEPE aimed at establishing systematic management and operation schemes for Myanmar's national grid. The first project in 2001-2002 involved an analytical study of Myanmar's overall power system network, while a 2003-2005 project focused on designing and installing a 500-kilovolt transmission system for the grid. The current project involves research and consulting activities such as conducting data surveys for the operation of the national grid and prevention of system failures, establishing a statistics management system and developing recommendations for ways to prevent power system blackouts. Other aspects include the provision of testing equipment, training sessions for Myanmar electric power technicians in South Korea and visits to Myanmar by KEPCO consulting teams.

Korea International Co-operation Agency website information, 2007:

https://www.koica.go.kr/english/board/news/1206244\_597.html

KOICA will conduct an 'Advanced Transmission Technology' training program for 15 staff members in charge of transmission engineering from electric companies in Cambodia, Laos and Myanmar as part of the Korean government's grant aid and technical cooperation program for 2007. The course will take place at the training institution of the Korea Electric Power Corporation (KEPCO) in Seoul from March 15 to April 15, 2007. Lectures and practice sessions will include the following topics: insulation co-ordination, conductor design, tower design, transmission line design, transmission line grounding, sag design, insulator design, transmission line electrical environment, hardware design, conductor connection spot inspection, project manage[ment], material transport and tower foundation, tower erection, supervisory tracking system in transmission maintenance, lightening indicator, transmission facility foundation rei-nforcement, 765 kV transmission technology, line maintenance and operation, methods for detecting faulty insulators disaster response systems and procedures. It will also include country report presentations by the participants on developments in the power industry over the last years and information on power utilities. Study trips and field vsits will be made to a tower manufacturer at Hyosung, to the LS cable manufacturing factory, the Gochang testing center, POSCO, Hyundai Heavy Industries.

KEPCO 2005 Annual Report. <u>http://cyber.kepco.co.kr/kepco/updata/eng/2005.pdf</u> KEPCO [has been conducting] a feasibility study and designing a basic plan to upgrade existing grid voltages in Myanmar to 500kV. Project duration: Jan 2004 to Jan 2006.

Yonhap, 31/10/02. www.burmanet.org/bnn\_archives/2002/20021031.txt

Korea Electric Power Co (KEPCO) has completed a one-year project to diagnose and research the electric power network in Myanmar, KEPCO said Thursday (31/10/02). The project marked the company's first overseas venture in the power transmission and transforming sector. Under the project, the power company engaged in an overall analysis of Myanmar's electric power system and made proposals of short- and long-term measures to improve it. This will pave the way for South Korean firms to make advances into Myanmar's power generation and transmission market, a KEPCO official said.

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#### **INVENTORY** OF GENERATING PLANTS, TRANSMISSION GRIDS, PROJECTS

NLM, 30/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm

The meeting (1/2006) of the State Electric Power Development Project Work Committee took place at the PM's office with an address by General Soe Win, chairman of the committee. It was attended by ministers, deputy ministers, directors-general and officials of the SPDC office and the PM's office, departmental heads and officials of the Ministries of Electric Power Nos 1 and 2.

The Prime Minister said the development of electric power goes together with that of the socio-economy of the State. That is why the leading committee and the work committee for the State Electric Power Development Project were formed. The work committee is responsible for presenting the conditions of the projects being implemented and to be implemented to the leading committee. Presently, the State is taking steps to change the nation's agro-based economy to a system in which different kinds of industry can be set up. To bring this about, emphasis has been placed on boosting the power supply in order to develop both the agricultural sector and the industrial sector. This is why the Ministry of Electric Power itself was reconstituted into the two ministries, one to focus on generating electric power and the other to getting it distributed.

The duties of the work committee include the co-ordination necessary to speed the implementation of ongoing projects. It will also take charge of matters related to the systematic generation and distribution of electric power. Another priority is the constant implementation of small-scale regional hydel power station projects.

The Head of State has assigned to the Ministry of Industry No 2 responsibility for the production of machines for small-scale hydropower plants in the respective regions. Surveys will have to be conducted with the help of local people in the different regions to find out which water resources are best suited for hydropower plants. Simultaneously, measures are to be taken for changing dams constructed by the Ag & Irrig Ministry into multi-purpose facilities to supply electric power to the regions. The process calls for a master plan through which the major projects that are part of the national grid and the projects designed to supply electric power to the regions concerned can be implemented in harmony.

The drive for extended generation of electric power is to cover construction of new power plants, the building of more sub-power stations and power lines, and the upgrading of present electric power facilities. Furthermore, steps are to be taken to improve the distribution of electric power, and eliminate the dishonest

ways in which power is sometimes consumed. Nor have the problems of unnecessary wastage of power through machinery breakdowns been remedied completely. Preventive measures are to be taken remedy power losses through both causes. Besides, necessary arrangements are to be made for correctly levying taxes on power consumption.

In his report, EPM Minister No 1 Zaw Min compared the differences in electric power capacity and production in 1988 with the current situation. In 1988, there were 24 power plants that could generate 568.453 MW, 14 hydel power plants (228.453 MW), seven gas turbines (280 MW) and three steam power plants (60 MW). Since 1988, the ministry had built 39 new power plants: 30 hydropower plants (517.227 MW), four steam power plants (281 MW), one [coal-fired] steam (120 MW) and four recycle power plants (152.9 MW).

A total of 16 hydel power projects are currently underway: Yeywa in Kyaukse township (790 MW); Kunchaung in Pyu township (60 MW); Pyuchaung in Pyu township (40 MW); Khabaung In Ottwin township (30 MW); Yenwe in Kyaukdaga township (25 MW); Shwegyin in Shwegyin township (75 MW); Shweli in Namhkam township (600 MW); Kengtawng in Mongnai township (54 MW); Pathi in Thandaung township (2.2 MW); and Thahtay in Thandwe township (102 MW).

Furthermore, plans are under way to implement 15 hydel power projects such as Kawgata in Kyaukkyi township (160 MW); Biluchaung No 3 in Loikaw township (48 MW); Bilin in Bilin township (140 MW in it first phase and 140 MW in its second phase); Hatkyi in Hlaingbwe township (600 MW); Shwesayay in Budalin township (660 MW); Thandwe in Thandwe township (39 MW); Kyeintali in Gwa township (30 MW); Kengtawng in Mongnai township (54 MW); Manipura in Falam township (380 MW); 600-megawatt Taninthayi in Taninthayi township (600 MW); Shweli No 1 in Namhkam township (150 MW) Shweli No 2 in Momeik trownship (500 MW); Maykha in Myitkyina township (800 MW), Dayaingchaung in Hlaingbwe township (25 MW); and Thakyet in Taninthayi township (20 MW). The capacity of the machines in the power plants [in the planning stage] will amount to 4,346 megawatts in total.

Ten hydel power plants are already connected to the national grid: Biluchaung Nos 1 & 2 in Loikaw township, Kinda in Myittha township, Paunglaung in Pyinmana township, Hsedawgyi in Madaya township, Zawgyi Nos 1 & 2 in Yaksawk township, Zaungtu in Bago township Thaphanseik in Kunhla township and Monechaung in Sedoktara township. There is also the Tikyit coal-fired power plant in Pinlaung township. The capacity of the machines in the [grid-linked] power plants already in operation amounts to 832 megawatts.

The hydel power projects with top priority are Yenwe, Kabaung, Kengtawng, Shweli, Kunchaung, Pyuchaung, Shwegyin and Yeywa hydel power projects. Yenwe, Khabaung and Pyuchaung hydel power projects are being implemented through the joint efforts of the Ministry of Electric Power No 1 and the Ministry of Agriculture and Irrigation.

EPM No 2 Khin Maung Myint reported that that the hydel power stations already supplying electricity to the national grid are Baluchaung No 1, Baluchaung No 2, Zawgi No 1, Zawgi No 2, Kinda, Hsedawgyi, Zaungtu, Thaphanseik, Paunglaung and Monchaung. These stations are currently generating 712 MW in total. The gas-fired power stations are Ywama, Kyunchaung, Mann, Thaton, Shwedaung, Myanaung, Thakayta, Ahlon and Hlawga, and these are currently generating 549.9 MW. Steam-powered stations are Ahlon, Hlawga, Ywama, Thakayta, Tikyit and Mawlamyine, and these power stations are currently generating 285 MW. The 25 grid-linked power stations have a capacity of 1546.9 megawatts in total. But the actual producing capacity in 2005 ranged from 601 to 818 MW.

The EPM No 2 has twelve 230-KV power stations, sixteen 132-KV power stations and forty-seven 66-KV power stations for a toal of 75. The national grid lines under the ministry include thirteen 230-KV sections with a total length of 834.16 miles; nineteen 132-KV sections with a total length of 1056.73 miles, and fifty-two 66-KV sections with a total length of 1224.92 miles. Sections to be built to improve the power supply are the 177-mile-long 230 KV grid linking Taungoo-Kyauktaga-Bago-Thanlyin, the 105- mile-long 230 KV line linking Meiktila and Taungdwingyi, the 60-mile-long 230-KV line linking Bago and Myaungtaga [in Hmawbi township], and the 12-mile-long 230 KV line linking Shwesayan [in Singaing township] and Aungpinle [in Patheingyi township]. Sections to be built connecting new hydel power stations to the grid include the 180-mile-long, 230-KV line linking Manipura and Monywa, the 100-mile-long, 230-KV line linking Kyiohn-Kyiwa

and Minbu, the 69-mile-long, 230-KV line linking Thahtay and Ushitbin and the 24-mile-long, 230-KV grid linking Ushitbin and Shwedaung.

Minister Khin Maung Myint made a comparison between 1988-89 and 2005-06 with regard to power generation, consumption of power and loss of power. In 1988-89, there were 2,226.45 million units of power generated, 1475.55 million units of power consumed and 750.90 million units of power lost, accounting for 34pc power loss [in the transmission-distribution process] In 2005-2006, there were 6064.16 million units of power generated, 4431.06 million units of power used and 1633.10 million units of power lost, accounting for 27pc power loss [in the transmission-distribution process].

A&I Minister Htay Oo reported on the hydro-electric power projects [of his ministry], co-operation with the Ministry of Electric Power and future programmes for full supply of electric power. Deputy EPM No 1 Myo Myint and Deputy A & I Minister Ohn Myint reported on the generation of electric power from dams and reservoirs. Minister for Industry No 2 Saw Lwin reported on the production of meter boxes and ACSR wire by factories under his ministry and future programmes. Minister for Energy Lun Thi reported on the drilling of natural gas wells that allow for greater distribution of power, the installation of pipelines, distribution of gas and future programmes. Minister for National Planning and Economic Development U Soe Tha reported on the role of electric power sector in economic development.

#### Additonal references

Country Presentation Myanmar: Franco-ASEAN Seminar, 6-7 September, 2007. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

See p 11 for a list of operating power stations, p 12 for existing substations, pp 21-22 for hydropower projects under construction and p 36 for hydropower projects under planning. See p 24 for information about existing transmission facilities, pp 25 – 27 for transmission lines under construction or planning, p 28 for substations under construction, pp 30 – 32 for a list of transmission projects to be implemented in the near future, p 33 for a list of substations to be constructed in the near future, p 29 for a map of the existing national transmission grid, p 34 for a map of the future national grid system and p 35 for a long-term planning projection of the national grid system.

See below: <u>'National update</u> on electric power plants' (NLM: 18-22/01/06) 'State's electric <u>power projects'</u> (NLM: 25-27/04/05) 'Than Shwe on <u>key role of electricity</u> in national development' (NLM: 28/04/04) <u>'Formation of work committee</u> for electric power development' (NLM: 01/04/04)

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#### YANGON ELECTRICITY SUPPLIES GET BOOST FROM YESB PLAN

Kyaw Thu and Ye Lwin, MT, 2407/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-326/b006.htm</u>

To help Yangon City achieve regular electricity supplies, the Yangon City Electricity Supply Board (YESB) is building new transformers and extending powerlines, an official from the board said July 14. "We are now building 10 MVA transformers at Dagon Seikkan and HI aingthayar townships, and have a plan to build a 100 MVA power station in Bayintnaung in Mayangone township," YESB chief engineer U Tun Aye said. He said that now that all 30 townships in Yangon City had access to the national power grid, 24-hour electricity could become a reality.

Yangon City currently has about 450 megawatts (MW) at its disposal. About 250 MW comes from four gaspowered electricity generating plants in Yangon and the remainder comes from the national grid. Yangon's industrial zones use about 100 MW and the rest is available for individual consumers, U Tun Aye said. He added that the maximum demand for electricity in the city last year was 430 MW and demand this year was expected to exceed that "So far (this year) the highest demand we've had for electricity in Yangon is 380 MW," he said. According to U Tun Aye, he total power consumption for the country is 900 MW. The YESB started a program this month to deliver 24-hour electricity to Yangon's 51 townships, 21 of which are on the city's outskirts. The YESB official said that a good inflow of water at hydropower projects like Paunglaung and Mone Creek were contributing to the success of 24-hour electricity supplies. U Tun Aye said electricity supplies would likely be cut back again after the rainy season as hydro-electric dams reduced production. He noted, however, that some blackouts were currently occurring due to broken tree branches falling onto power lines. "That is the main problem for us. We deliver electricity to the households and industries but broken branches cut supplies," he said. Another cause of blackouts was aging transformers breaking down under heavier electricity supplies, although U Tun Aye said this was secondary to damage caused by falling trees.

Meanwhile, the YESB is installing electric meters in houses which currently have no electricity connection as part of a project launched in August last year to install 100,000 meters across Yangon Division. "So far, we have installed more than 90,000 new electric meters and plan to install more if they are needed," U Tun Aye said.

"We've finished 95 percent of the downtown area and now need to install them at the outskirt townships of Yangon." With more meters in homes, the YESB is also looking for more staff to read them and distribute electricity bills. YESB director U Ko Ko said the 400 people currently employed by the board for such jobs was insufficient. Board member U Toe Aung said the YESB was now recruiting an additional 200 workers and positions were open to anyone with a minimum of high school matriculation.

Additional references for the Yangon City Electric Power Supply Board

See below: 'Ministry of Electric Power <u>re-organized</u>' (NLM: 16/05/06) 'Yangon City Electric Power <u>Supply Board Law enacted</u>' (NLM: 23/11/05)

Myanmar Times, 29/10/07. http://mmtimes.com/no390/n006.htm

Two new power transmission lines from local substations to suburban areas of Yangon will be installed by the end of the year to reduce reliance on the national power grid, according to U Mg Mg Latt, secretary of the YESB. One power line will extend from Thanlwin power substation to South Dagon, the other will go from Ahlone substation to Myaungdagar IZ In Hmawbi township. The new power lines will elp reduce the loss of electricity during transmission. "About 10pc of the power is lost when it is transmitted from the national power grid. By installing new lines from substations serving Yangon we can reduce the loss of power during transmission to households," he said.

NLM, 11/08/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070811.htm

EPM No 2 Khin Maung Myint visits YESB's switchgear factory on Strand Road in Ahlon township and is briefed on preparations for construction work at the factory, as well as the production of switchgears and parts by Asst Chief Engineer U Sein Aung and U Zeya Thura Mon of Gunkul Engineering Supply Co Ltd. The minister inspects control panels, switchgears and circuit breakers manufactured at the factory.

NLM, 02/08/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070802.htm

EPM No 2 inspects the storage of electrical equipment at the supply division of YESB on Hninsigon Street in Ahlon township. He checks on the system for keeping electric meters and transformers.

NLM, 01/01/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070701.htm

EPM No 2 and the YESB chairman check on work crews restoring damaged power lines caused by the strong wind in Dagon South. At the township's sub-power station, the district officer Lt-Col San Htay reports on the damage to the power lines of YESB and their repair.

NLM, 26/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070526.htm

EPM No 2 meets with district and township engineers at YESB office. He calls for minimizing the waste of electricity and the exposure of those who are using it illegally. Those present incude the chairman of YESB, Col Khin Maung Soe, Sec'y U Maung Maung Latt, Joint-Secretary U Toe Aung, chief-engineers U Tun Aye and U Aung Khine, directors and engineers.

NLM, 09/03/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070309.htm</u>

EPM No 2 attends a meeting to co-ordinate the supply and consumption of electricity in Yangon city area at the hall of YESB in Ahlon township. Attendees include the chairman of YCESB, Col Khin Maung Soe, the Chief Engineer U Aung Khaing, power station managers, and district and township head electrical engineers. After hearing reports on the installation of electric meters and the exposure of illegal usage of electricity, the minister gives necessary instructions.

#### NLM, 31-01-07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070131.htm

EPM No 2 inspects the Thanlyin township office of EPSB and checks the cash counter, staff quarters and distribution of power from Myoma sub-power station. U Kyaw Min Tun of the township EPSB reports on distribution of electricity, condition of the power lines and the strength of service personnel at the district electrical engineer's office. The minister urges the staff to try to win the love of the people and to minimize the loss of electricity.

#### NLM, 25/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061225.htm

EPM No 2 inspects Myaungdagar Power Station in Hmawby township. Chief Engineer U Tun Aye of YESB and Project Manager U Saw Win Maung of Power Supply Project (South) report on the supply of electricity from the power station. At Ahlon Power Station in Ahlon township, the minister hears reports on the availability of natural gas for the gas turbines and the generation of electricity by Deputy Chief Engineer U Nyunt Aung of YESB.

NLM, 13/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061213.htm

EPM No 2 visits the pffice of the electric power supply board in Hlinethaya township where he is briefed on the supply of electricity to the township. The Superintending Engineer of YESB reports on the extension of power lines and what needs to be done to improve the power system in the township. The minister also goes on to the concrete lamp-post factory of YESB the township where he is briefed on daily production and sales of lamp-posts. At the No 1 power station in the township he checks on the supply of electricity to the township.

#### NLM, 18/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061118.htm

At the 33/6.6 KV Tiger Ali sub-power station near Hanthawady jct in uptown Yangon the EPM No 2 is briefed on the supply of power and installation of transformers at the sub station and substitution of underground cable. At the Yangon Crown Wire Cable Factory Ltd in Shwepyitha IZ No 3 the factory manager reports on parts being produced and sold by the factory.

#### NLM, 14/10/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061014.htm

EPM No 2, Col Khin Maung Soe of YESB, and ME San Oo of MEPE are briefed on the running of Thakayta Gas Turbine by Turbine Manager U Than Naing Oo. They check the control room and the repair of the 230/33-11 KVA transformer in the switching yard. At the Asia World Jetty on Strand Road in Kyimyindine township, they check on the arrival of machinery to be substituted in the No 1 Boiler of Ahlon power station.

#### NLM, 02/09/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060902.htm

EPM No 2 meets with 1,030 employees of Yangon West and North district offices and 1,363 employees of Yangon East and South district offices of YESB. He stresses the need to minimize loss and wastage in the supply of power and the collection of payments for power consumption. Col Khin Maung Soe of the board instructs the employees to be accurate in collecting bills for power consumption from consumers. MEPE's Director (Finance) Myo Naing and Chief Engineer U Tun Aye of YESB join in the discussions.

#### NLM, 26/08/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060826.htm

EPM No 2 and Chief Engineer U Tun Aye of YESB inspect the 33/11-10 MVA transformer of the sub-power station in Dagon Seikkan township. The transformer, previously operated on a self-reliant basis by the Dagon Seikkan IZ Management Cte is being transferred to the YESB.

#### NLM, 03/08/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060803.htm

EPM No 2 and Chairman Khin Maung Soe of YESB visit the Pabedan township office in downtown Yangon where they are briefed on staff strength, installation of transformers, overhead and underground cables by the township officer and Asst Chief Engineer Nyo Win of YESB. After inspecting the Latha, Pabedan,

Kyauktada, Pazundaung and Mingala Taungnyunt township offices, they meet with service personnel to impart instructions.

NLM, 24/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060624.htm

EPM No 2 and officials of YESB visit Hmawby township General Admin Dept (GAD) where they are briefed on the supply of electric power. They also visit the 33/11 KV Kyatphyukan sub-power plant in Hmawby township and the GAD office in Htaukkyant and the Yangon North district GAD office as well as the site where a 230 KV-power line from Hlinethaya to Bayintnaung is under construction.

NLM, 20/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060620.htm

EPM No 2 and Chairman Khin Maung Soe of YESB visit a factory in Hlinethaya township that produces paddy husk-fired engines. Executive director U Soe Tint Aung briefs them on the use of a mixture of diesel and paddy husk gas to save fuel. Engines of over 180-HP are being test run at the factory using this mixture. At a transformer factory in Shwepyitha township, the executive director, U Tun Lin Thaung, briefs them on the system for controling the volume of paddy husk gas and the production transformers.

NLM, 14/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060614.htm

EPM No 2 and Chairman Khin Maung Soe of the YESB visit the transformer factory of Soe Electronics Co in South Dagon township It was established in 1983/84 and has a staff of 250. It assembles transformers and other machinery which it distributes to various ministries.

NLM, 05/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060605.htm

EPM No 2 and Chairman Khin Maung Soe of YESB inspect Sein Pan Myaing and Mayangon township subpower Station in Mayangon township. In Hlinethaya IZ No 1, they meet with the supervisory cte and entrepreneurs and informed them that the newly formed EP Ministry No 2 is responsible for the supply of power. The ministry will see to the distribution of electricity to the industrial zones on schedule so as to boost national productivity. Col Khin Maung Soe of YESB and officials report on the installation of new power lines, the supply of electricity to industrial zones and the functions of the sub-power stations.

NLM, 02/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060602.htm

Newly appointed EPM No 2 Khin Maung Myint meets with responsible personnel of YESB where Col Khin Maung Soe, chairman of the YESB briefs them on the formation of the Board, its set up and departmental functions. The YESB was launched on 01/04/06 and the Yangon division Electrical Engineering Office functions under it. Among its priorities are the supply of electric power to Yangon City on a 24-hr basis and the speedy installation of electric meters. YESB personnel are to take prompt action against those who use electric power illegally.

Additional references for the metering program outside of Yangon area:

See above: 'Electricity <u>metering program</u> taking root' (IMNA: 11/05/07)

#### Additional references for Yangon power supply and demand

See above'Gas in short supply to meet demand for electricity (MT: 17/09/07)<br/>'More gas needed for 24/7 power in Yangon (MT: 02/07/07)<br/>'Full power supply promised for July (MT: 04/06/07)See below'Pipeline to solve electricity shortages' (MT: 16/09/02)

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#### **INDUSTRIAL SECTOR TO BENEFIT** FROM ATTENTION TO POWER SUPPLY

NLM, 23/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060723.htm

The Industrial Development Cte held its coordination meeting 1/2006 in Nay Pyi Taw with an address by its Chairman, PM Soe Win. General Soe Win said that as the industrial sector of the State commences to transform from mainly agro-based industries to full industrialization, the Government is making arrangements for the development of the electric power sector in conformity with that of the industrial sector. To highlight

the need for power in the industrial sector, separate electric power ministries had been created: No 1 and No 2, each with its assigned duties for the production and supply of electricity.

In the past, the Government took responsibility for large- and medium-scale production of electric power, and entrepreneurs of the private sector were permitted to produce electricity on a medium scale and micro scale. At present, localized and nationalized plans are being implemented to carry out production and supply of power. The Government's large- and medium-scale hydel power projects will have to generate about 5,000 megawatts. Presently, these hydel power plants are producing 1,500 megawatts, a significant increase if compared to the past. Furthermore, the plan is being carried out to extend the national power grid in order to connect it to the hydel power projects under construction.

When progress is made in generating localized power and implementing large-scale hydropower projects and national grid extension projects, industries in the entire nation including the Myaungdaga fertilizer factory and foundries, and the Thanlyin and Thilawa special industrial zones will gain momentum. This will ensure parallel development of industrial sector with the electric power sector.

With regard to industrial development, in the final year of the [present government's] third five-year plan in 2005-2006, "the industrial sector contributed 17.5pc to the GDP of the nation. Sustained efforts are to be made to develop the industrial sector's contribution towards GDP by 18.9pc in 2006-2007, the first year of the fourth five-year plan, by 20.9pc in the second year, and to 23.3pc, 25.9pc and 28.9pc in the next years". the last year of the third five-year short-term plan, the industrial sector's contributed 17.5 per cent to the GDP of the nation. Sustained efforts are thus to be made to develop the industrial sector's contribution towards the GDP by 18.9 per cent in 2006-2007, the first year of the fourth five-year plan, by 20.9 per cent in the second year, by 23.3 per cent, 25.9 per cent and 28.9 per cent in the next years.

The electric power plants constructed in the third five-year plan are now in operation and they will produce electricity with increasing momentum year by year. So, the private sector, organizations concerned and the government should strive in harness to raise the industrial sector, enhance industrial development and ensure take-off....

The PM said there are good prospects in the agricultural sector. Various kinds of industries with good prospects such as rice and its products, beans and pulses, wheat, fish and meat, forest, rubber and cotton are to be set up. The oil palm industry which started with cultivation projects has moved to refining. It has emerged due to high morale, perseverance, diligence, risk-taking and confidence in the government. Priority should be given to the establishment of cultivation-to-production industries.

In implementing rural development tasks, efforts are to be made to supply power to rural areas and the invention of physic nut oil-driven machinery. Under the guidance of the Head of State, cultivation of phycis nut is being undertaken nationwide. Within two years, the use of physic nut oil will be wider, the PM said. Ethanol would be produced from sugarcane soon. In the future, bio-gas production will develop. Therefore, industries that can apply the use of ethanol and physic nut [oil] should be founded.

The hydro-electric power industry, the gem and mining industry and energy, electrical, transport and communication sectors will also improve gradually.

He said more electricity and natural gas will be used in the very near future. Extensive measures are also being taken to improve technological and educational standards and to develop technological courses and research in factories and plants. The State will take steps also to develop the industrial sector more significantly by conducting more research. Greater co-operation is needed if the correct policies and guidance of the Head of State are to meet success. The development of industrial sector requires characteristics such as speed, skill and flexibility. Strenuous efforts are needed if the industrial sector is overcome the difficulties which hinder its development.

#### Additional references

See above:Yangon industrialistsurged to increase production (NLM: 12/03/07)See below:'Industrialists urged to diversify production(MT: 09/0106)See also other articles under 'Industrial Use of Electricity'IU

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#### **BUSINESS LEADERS** TO PAY FOR NEW POWER SUB-STATIONS

Ye Lwin, Myanmar Times, 17/07/06. www.myanmar.com/myanmartimes/MyanmarTimes17-325/

The Yangon Electricity Supply Board (YESB) on July 5 called on business leaders to set up new power supply stations in each of Yangon's IZs by next month at their own expense, said U Myat Thin Aung, president of the Myanmar Industrial Association (MIA).

Colonel Khin Maung Soe, chairman of the YESB, said each station should have a capacity of 10 megavoltamperes (MVA) to supply electricity to the industrial zones 24 hours a day. The project will be implemented in three major industrial zones – Hlaingthaya, Shwepyitha and Dagon Seikkan – in which a total of about 2000 factories are operating.

There are currently four power stations in Hlaingthaya IZ supplying a total of 55 MVA of electricity, which is "not sufficient for the more than 700 factories in the zone", U Myat Thin Aung said.

The estimated cost to establish each station is about K 150 million, for which the government is not expected to supply any financial assistance. However, the YESB said it would provide technical assistance for the project.

#### Additional references

See above: 'Reliable electricity supply advantage to <u>Thai shrimp</u> farmers' (MT: 13/08/07) <u>'Fisheries factories</u> offered 24-hour power' (MT: 09/07/07)

#### NLM: 16/07/07 http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070716.htm

Lt-Gen Khin Maung Than of the Ministry of Defence attended the opening of the new Pyay IZ in Nawade ward in Pyay. Chairman Aung Khin of the supervisory cte reported on the purpose of setting up the industrial zone, allotment of 303 plots for entrepreneurs, manufacturing of machine parts, auto parts and vehicles, and arrangements for the supply of water and power. The IZ is producing one-ton light trucks and the Pyay Jeep. At the 5-MVA power station of the zone, Khin Maung Than heard reports on supply of power to the industrial zone and control of power.

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#### GOVERNMENT WILL PRIORITIZE HYDROPOWER PROJECTS OVER GAS

Kyaw Thu, MT, 10/07/06. http://www.myanmar.com/myanmartimes/MyanmarTimes17-324b001.htm

The government intends to wean Myanmar off its reliance on gas for electricity generation and make hydropower the country's sole source of electricity by 2030, an official from the Ministry of Electric Power No 1 told The Myanmar Times. Currently gas accounts for the bulk of Myanmar's electricity production, providing about 48.5pc of supplies, the official said. "But now the government prefers hydropower."

Hydropower currently accounts for about 38.5pc of electricity, steam turbines 12.5pc and diesel the remaining 0.5pc. But by 2030, the government hopes that 100pc of the country's electricity will come from hydropower plants, which are the most cost-effective option, he said. The government plans to establish 24 hydro-electricity plants which will vary in output from 48 MW to 7,100 MW.

A percentage of the electricity from these projects is to be exported to neighbouring countries. The Hutgyi hydropower dam, which is being built with the Electricity Generating Authority of Thailand (EGAT) at the cost of US\$1 billion, will export some 60pc of its electricity to Thailand. In April, Thai energy firm MDX Group and the government agreed on a \$6 billion hydropower project on the Thanlwin River, from which Thailand will receive 85pc of the electricity. MDX said its dam, the biggest in Myanmar, would be ready in 2012, with electricity capacity to be upgraded to 7,000 MW later.

Progress on the Hutgyi dam slowed earlier this year, although an official from the EPM No 1 denied this was the result of the death in May of an EGAT employee working on the feasibility study. In early May an EGAT official had said full-scale surveying was not expected to resume until 2007. "We feel we have enough information to complete the feasibility study, even though it is not really as complete as we would have wanted," the EGAT official said. The Myanmar government official said the feasibility study had been finished. "In May, we finished the feasibility study for the whole project," he said. "And that's why we stopped the progress for a certain period." The official predicted construction on the Hutgyi dam would start in Dec 2006 or Jan 2007, ahead of the Nov 2007 date in the initial agreement.

With all planned dams in operation by 2030, the EPM No 1 estimates 23,300 MW of electricity will be available. It balances this with a projected annual domestic demand for 18,900 MW by 2030. In comparison, Thailand, with a population of about 64 million, in September 2004 had an installed power generation capacity of 25,970 megawatts, according to the Electric Power Trade Mission, an international organisation set up by the US Department of Commerce, the International Trade Administration and the Office of Global Trade Programs.

A ministry official told The Myanmar Times that as hydropower accounts for more electricity generation, the government will direct a greater proportion of Myanmar's gas reserves to fertiliser production and other projects. A 1995 World Bank study showed the theoretical potential for hydropower in Myanmar to be 108,000 MW.

#### Additional references

- See above: 'Completion of hydropower plants assigned <u>highest priority</u>' (MT: 12/02/07) 'Hydropower project <u>nearing completion</u>' (MT: 28/06/04) 'Generation facilities scheduled for <u>commissioning in 2002-2004</u>' (MT 07/01/02)
  - 'More inputs needed to power a <u>hydro future</u>' (MT: 04/06/01)

See also the section on hydropower in 'Electricity potential of energy sources available in Myanmar'.

Myanmar Times Energy Supplement, August 2007. <u>http://mmtimes.com/feature/energy/06.htm</u> Current hydropower electricity production stands at 745.68 MW, some 43pc of total electricity production. However, gov't figures show an additional 2,034.2 MW are expected to come on-line at the end of 2009 when several hydropower plants should be finished. A total of 13 plants are included in this list and range from 2.2 to 790 MW in capacity. By the end of 2007 about 686 MW from four projects should become available for the national grid, while 247 MW will theoretically come on-line in 2008 but 2009 is expected to show a considerable increase – with more than 1,100 MW expected. In addition to the projects intended to be operational by the end of 2009, another 11 plants are slated for the future. These projects are expected to generate up to 15,725 MW and should be finished by 2015.

Myanmar Times, 13/11/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes18-342/n011.htm</u> Completion of several hydropower projects in 2009 is expected to more than double production of electricity in Myanmar from 1,667 to 4,000 megawatts, an official from the EPM No 1 said last week. Among the hydropower projects expected to be finished in 2009 are those at Yeywa in Mandalay Division and Shweli in Shan State. The official also said the Dept of Hydroelectric Power (DHP) is conducting a feasibility study to build a hydropower station about 16 km (10 miles) upstream from the village of Ann in Rakhine State. "The department is building camps and roads to facilitate the project," the official said, adding that the station will include three turbines capable of producing a total of 15 MW of power. Hydropower currently supplies 38.5pc of Myanmar's electricity, with gas turbines producing another 48.44pc, coal-fired steam turbines 12.5pc and diesel engines 0.5pc.

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INTEREST GROWING IN RICE-HUSK GENERATION Kyaw Thu and Khin Hnin Phyu, Myanmar Times, 10/07/06. http://www.myanmar.com/myanmartimes/MyanmarTimes17-324/b004.htm As an environmentally-friendly, renewable energy source, local experts say rice husks could be used to generate electricity in Myanmar and reduce dependence on expensive oil imports. Rice-husk power plants process husks by heating them to create a gas that is then burned and converted into electricity. Experts say the technology could be particularly useful for developing rural areas. It is also an idea that neighbouring countries are putting into practice, with the support of the Asian Development Bank (ADB) and other investors.

On May 31, a United Arab Emirates-based fund, Al Tayyer Energy, announced it would provide US\$120 million for Thailand to build rice husk power plants in the country's more remote north. The move was designed to provide Thailand with alternative energy sources in the face of soaring global oil prices and was expected to save the country some 800 million baht (\$21 million) a year from the six million tonnes of rice husks it produces annually, Al Tayyer Energy said.

On June 22, the ADB announced it would release about \$1 billion dollars each year for renewable energy and energy efficiency projects. U Soe Myint, the vice president of the Renewable Energy Association Myanmar, a local non-governmental organisation, said rice husk projects here could lead to more widespread availability of electricity in villages and also benefit cottage industries and private industrial firms.

Local rice mill owners said there were plenty of rice husks to get the idea off the ground. "We should use these plants in the countryside where rice husks are abundant," said one mill owner, noting that Mon, Rakhine, Ayeyarwaddy, Yangon and Bago states and divisions were the most suitable areas to develop rice husk plants as they were the country's biggest rice producers. As an agriculturally-based country of which rice was the primary crop, he said the husks were cheap and readily available in Myanmar.

According to the Ag & Irrig Ministry, the 1,250 million baskets of rice Myanmar produces each year results in some 230 million baskets (about 4.8 million tonnes) of rice husks. Founder of the Myanmar Inventors' Cooperative Society U Soe Tint Aung, who has been designing rice-husk energy systems since 1985, said public interest in the technology had increased significantly in recent years due to the comparatively low cost of energy production. It was about 10 times cheaper than using diesel, he said. Such plants were being set up on the town-level with firms in industrial zones such as ice as saw mills being the main customers, he said.

Currently there are only a handful of firms designing and producing rice-husk energy plants, although U Soe Tint Aung said rising demand was leading to more companies getting involved in plant production. U Than Nyunt, the managing director of Ar Mahn Tech, a company that sells dual-fuel generators, said that although it was possible to build rice-husk energy plants in Myanmar, more advanced technology was needed to optimise production. The start-up costs and technology needed restricted what local companies could do, he said. One of the main technical hurdles for such alternative energy designers currently is the amount of tar rice-husk plants generate as a by-product, U Than Nyunt said. "This is the barrier for us. If we could eliminate the tar, it would be okay."

Graham James Dwyer, External Relation Specialist for the ADB, also noted that the bank had not provided Myanmar with a loan for 20 years. Locally-designed rice-husk plants currently produce up to 300 kilowatts. However, a rice miller told The Myanmar Times there was a plan to produce a plant generating as much as 1,500 megawatts in Dedaye, Ayeyarwaddy Division. "We are conducting a feasibility study for building the power plant," he said. Last month, a rice-husk power plant designed by the Myanmar Inventor's Cooperative Society was awarded third place in the ASEAN-organised Fifth Renewable Energy Project Competition in Brunei.

#### Additional references

**Compiler's Note**: There are numerous references in Myanmar publications to paddy husk generators installed in villages throughout the country. The entries below have been selected on the basis of the details they provide about the political and financial arrangements for installation of the gasifier-generator systems and technical data about the gasifier - generator systems used. Information about other villages where biogas power plants have been installed can be found in the Appendix: 'Electric power generation by state and division' (in preparation).

#### NLM, 30/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071230.htm

Western Commander Maung Shein and EPM No 2 Khin Maung Myint attended the launch of a 500 KVA paddy husk-fired generator and a diesel-fired generator at the Electrical Engineer's Office of Taungup township in Thandwe district on 22 December. The minister said the 500 KVA paddy husk-fired generator was the largest of its kind in the nation, and that the diesel-fired generator had been put into commission to help supply sufficient electricity. Chairman of the township committee for supply of electricity Kyauk Taung gave an account of the steps followed in obtaining the generators. Managing Director of the EPSE Htin Aung and Chairman of the Myanmar Innovators Cooperative Ltd Soe Tin Aung conducted a tour of the power plant and explained the operation of the paddy husk-fired boilers and the engines to generate electricity.

NLM, 20/12/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n041220.htm

On 17 December, a ceremony was held to inaugurate a bio-gas power plant in Thongwa model village in DaikU township. The plant can generate 50 kilowatts of electricity. It would need 480 gals of diesel per month worth over K 950,000 to generate the same amount of electricity that can produced with an expenditure of K 50,000 for paddy husks. Thus the village is able to save over K 900,000 a month by using the paddy-husk gas system.

#### Myanmar Times, 13/09/04. [not available on-line]

The first power plant in Bago division to generate electricity from rice husks was officially opened in Bine-dar village, Nyaunglaypin township, on August 9. The plant is capable of producing 50 kilowatts of energy for 426 households. It was established by the village electrification committee with the support of the township's USDA. Before the plant was set up, some villagers relied on small and expensive diesel generators for electricity. Because of the cost, many households had no electricity. The plant cost K10.5 million to build, about K 6 million of which was paid with a loan from the Co-operative Bank. The village electrification committee raised the balance of the funds.

NLM, 27/10/02. www.myanmar.gov.mm/NLM-2002/enm/Oct27\_region2.html

Lt-Gen Maung Bo and party visit Kyweku Village in Myeik township where they are briefed on the construction of a paddy husk-powered electric power station. The station and a 'Ngwelwe' paddy thresher innovated by youths of Ingamaw village are being test run. The furnace installed at the power station is of an RH 20/22 type, and the engine is a Hino EF 750 V8 with 200 HP. It burns 30 baskets of paddy husks an hour and can supply power to 2,400 four-foot fluorescent lamps. It will supply power to Kyweku Village and a 50-ton rice mill near the station. A report in NLM: 18/11/02 describes the opening of the 120-kilowatt power station on Novmber 9. It is said to have cost K 92.27 [K 9.27?] million. [www.myanmar.gov.mm/NLM-2002/enlm/Nov16\_region6.html]

NLM, 04/05/01. www.myanmargeneva.org/01nlm/n010504.htm

A power plant run on paddy husk gas was opened in Yonthalin village-tract, Hinthada township, on 1 May. The 130-KVA power plant was built by Ayeyar Swanar Engine Production Enterprise. It will electrify 1,010 houses in Yonthalin Village.

For more on the Yonthalin community project see the volume 'Interviews/Field Surveys in Villages for Rural Electrification: Feb 2001-Nov 2002', in the series: 'Study on Introduction of Renewable Energies in Rural Areas in Myanmar:

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159779&volno=000000000&filename=11734175\_03.pdf&seqno=3

A memo on pages 94-95 describes a visit to the village on 12 June 2001 by a JICA field team. It reports that the engine at the Yonthalin is a 140-HP, 135 kVA Hino 12-cylinder [converted] diesel type and that the furnace is an RH-14 type and the starter a small DG of 4.4 kW. 420 of the 1,100 households in the village are hooked up, as well as 40 street lights. Households are allowed to use 3.2 foot lights, TV, radio and karaoke, but not rice cookers. The system provides electricity for 5 hours a day during the evening from 18:00 to 23:00. 12 baskets of husks (each weighing 2.3 kg) are needed to operate the system for one hour. The village has approximately 1,200 acres [500 h] of paddy fields of which 250 acres are cultivated by the villagers. The rest is owned by 'non-villagers' [Aye-ya shwe-wah?]. There are 6 privately owned rice mills in the village. The memo does not say whether these are being operated by the gasifier system separately from the community electrification scheme. Total costs for construction of the plants amounted to K 1.5

million for the engine, and 2.5 million for the distribution lines. Erection of the lines was provided free of charge by MEPE. Installment charges of 20,000 - 40,000 per household are being collected from the villagers.

The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summary, pp 37-38.

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&seqno=1 and also

Interviews/Field Surveys in Villages for Rural Electrification: Feb 2001-Nov 2002, pp 97-101.

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159779&volno=0000000000&filename=11734175\_03.pdf&seqno=3

Samalauk village has been selected as a model village for electrification using a ri ce-husk-gas-fueled engine and generator. It is located in Nyaungdon township approximately 50 km west of Yangon along the Yangon-Pathein Highway. The main aim of the model village program will be to monitor the implementation of a rural electrication scheme that uses a rice-husk generator. The generator is is to be operated and maintained under the management of a local electrification committee (VEC) on a self-help basis. The monitoring arrangement will show how a rice-husk-gas generating system could best be adapted for use in electrifying paddy-cultivating villages in Myanmar. Samalauk already has four battery charging stations, each capable of charging about 20 batteries at a time. The rice-husk generator program would include 200 of the village's 800 households. Assuming three 20 W lights per household and one 60 W TV per four households (or one 15 W radio per household), average household demand would be 75 W and the total lighting demand would be about 13 kW. The households selected for the program would be in the central part of the village within a thousand metres of the engine-generator. Electricity generated by the plant would be supplied to the houses by 230 V distribution lines for five hours a day from 18:00 to 23:00. The capital cost of the husk gas engine generator system and distribution lines is estimated at about US\$ 130 per household. The operation and maintenance cost is estimated to be \$ 6 per household per annum. Power consumption per household would be: 75 W x 0.75 (factor of concurrent use) x 5 hour/day x 30 days/month = 8.4 kWh/month The monthly tariff would be in the order of K 600 per household per month. The unit price would be about K 71 kWh (\$ 0.11/kWh) (i.e. much higher than the current tariff of MEPE at K 2.5 kWh). A BCS charges K 100 for a 12 V battery and K 50 for an 8 V battery. A village household that uses a battery spends K 1,500-2,000 for lighting per month. A family with two 8 W fluorescent lights spends K 1,000 per month on lighting. Houses in the outlying areas of Samalauk could be electrified by a line-fed BCS system and smaller satellite villages scattered further afield by a solar powered battery charging system. Compiler's Note: The notes from the Field Survey provide additional useful background information about Samalauk and the proposal for the electrification system there.

Myanmar Times, 15/01/01. http://www.myanmar.gov.mm/myanmartimes/no46/b2.htm

Myanmar has been a rice-producing country for centuries, and yet the productive potential of the paddy husk – other than for use as a coolant for ice blocks and as cheap fuel for open-fire cooking – has not been utilised. Last summer Ayeyar Shwe Wah, an agri-business company, cultivated 1,200 acres of land at Payarni village in Thabaung township, Ayeyarwady Division for growing paddy. What was noteworthy about the venture was that the company used paddy-husk-fuelled engines to pump in 600,000 gallons of water onto the site daily. Had it used diesel oil, the company would have faced a daily cost of K 30,800. But with the price of a bushel of paddy husks at just K 5, Ayeyar Shwe Wah's daily cost was just K 880. If diesel pumps had been used throughout the summer cultivating period the total cost would have been K 2,772,000. But using paddy husk fuelled engine pumps cost only K 79,200. The inventor of the paddy husk fuelled system is U Soe Tint Aung, the president of Myanmar Inventors Cooperative Ltd. Though designed as a paddy-husk gas-fuelled engine, his machine can also run on gas produced by saw dust or organic waste. Besides pumping water, it can generate enough power to run a rice mill, saw mill or ice factory. One of the engines is supplying the electricity needs of the Nyaung-gan village in Htilin township, Magwe District.

See also the following report of the same field test from the January 2001 edition of The Irrawaddy. <u>http://www.irrawaddy.org/article.php?art\_id=724</u>

The Myanmar Inventors Cooperative Ltd has produced a workable version of a paddy-husk fueled engine that could help beat the high costs of imported diesel fuel. Ayeyar Shwe Wah, an agribusiness company, used the prototype engine last summer to pump 600,000 gallons of water daily to cultivate 1,200 acres of

land at a cost \$2.25 per day, or less than 3% of the \$78 required using imported diesel. The high cost of diesel has long hampered cash-strapped Burma's efforts to expand its agricultural output.

See above: 'Plans for <u>7-million-dollar</u> rice-husk power plant edge forward' (MT: 27/08/07) '<u>Rice-husk generators</u> slated for villages in Yangon division' (MT: 11/06/07) '<u>Inventor co-op</u> society exports first rice-husk generators' (MT: 21/08/06) 'Paddy husk power plant tested to cut rice <u>milling costs'</u> (MT: 19/12/05) '<u>Biogas power plants</u> supply electricity to rural areas' (MT: 16/08/04) 'Biomass gasifier used for <u>tobacco curing</u> in Myingyan' (TERI: 08/04)

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#### TRANSFER OF CAPITAL CREDITED WITH IMPROVING YANGON POWER SUPPLY

Xinhua, 08-07-06. http://english.peopledaily.com.cn/200607/07/eng20060707\_280963.html

The Myanmar Electric Power Enterprise (MEPE), the main electricity supplier, is currently supplying 360 megawatts of electricity to Yangon daily and 860 MW to other parts of the country. MEPE attributed the possible increase of power supply in Yangon to the move of government ministries to the new capital of Nay Pyi Taw last November, resulting in reduced power consumption by ministry offices in Yangon and making possible increased supply to residential areas and industrial zones. Previously, electricity was supplied to the city alternately at three different times, causing much inconvenience to consumers.

According to the MEPE, 15 major hydropower projects that will increase electricity generation by 10,000 MW are underway. They include Tasang(7,110 MW), Shweli (400 MW), Yeywa (780 MW) and Htamanhi (1,200 MW) among others. Twelve of these projects yielding over 2,000 MW are expected to be finished in the next three years. This will potentially triple the amount of electricity available on the national power grid, experts said. Official figures show that Myanmar had an installed generating capacity of over 1,335 MW at the end of June 2005. Hydropower stations account for 35pc and gas-fired plants for 50pc of of total capacity. Myanmar's electric power generation grew to 5.4 billion kWh in 2004-05, up from 2.2 billion units in 1988.

#### Additional references

See above: 'Electric power supply improves after <u>years of abnormal status</u> (Xinhua: 02/09/06).

Myanmar Times Energy Supplement, August 2007. <u>http://mmtimes.com/feature/energy/06.htm</u> Current hydropower electricity production stands at 745.68 MW, some 43pc of total electricity production. However, gov't figures show an additional 2,034.2 MW are expected to come on-line at the end of 2009 when several hydropower plants should be finished. A total of 13 plants are included in this list and range from 2.2 to 790 MW in capacity. By the end of 2007 about 686 MW from four projects should become available for the national grid, while 247 MW will theoretically come on-line in 2008 but 2009 is expected to show a considerable increase – with more than 1,100 MW expected. In addition to the projects intended to be operational by the end of 2009, another 11 plants are slated for the future. These projects are expected to generate up to 15,725 MW and should be finished by 2015.

DIPLOMATS, JOURNALISTS TOUR <u>BAGO HYDROPOWER PROJECTS</u> NLM, 16/05/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060516.htm</u>

Factual information from this article has been filed under entries dealing with the individual projects visited. Some of the information presented is obviously garbled, such as the following statement: "Out of 15 hydro power projects, 12 will be completed in 2006-07 fiscal year, then total production of power will reach over 10,000 MW."

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MINISTRY OF ELECTRIC POWER RE-ORGANIZED

#### NLM, 16/05/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060516.htm

Union of Myanmar: State Peace and Development Council Order No 5/2006: 4th Waning of Kason, 1368 ME (15th May 2006)

In order to effectively carry out the economic, nation-building and development tasks, the State Peace and Development Council has reorganized the Ministry of Electric Power as follows: (1) Ministry of Electric Power No (1) (2) Ministry of Electric Power No (2)

#### By Order, Sd/ Thein Sein, Secretary-1, State Peace and Development Council

**Compiler's Note**: The decision to split the Ministry of Electric Power into two parts, communicated through the announcement of the appointment of two new ministers on 15 May 2006, was not accompanied by any explanation in the official media. A brief clarification of the reasoning behind the move was offered a few months later by General Soe Win in remarks to the SPDC's Electric Power Development Project Cte. "Presently, the State is taking steps to change the nation's agro-based economy to a system in which different kinds of industry can be set up. To bring this about, emphasis has been placed on boosting the power supply in order to develop both the agricultural sector and the industrial sector. This is why the Ministry of Electric Power itself was reconstituted into the two ministries, one to focus on generating electric power and the other to getting it distributed." What was actually involved was more complex than the oversimplified version offered by Soe Win.

The Ministry of Electric Power No 1 (EPM No 1) was formed by separating out the Hydropower Dept (HPD) which had been responsible for the planning and construction of new hydro-electric projects under the old ministry and adding to it a new state economic enterprise known as the Hydropower Generation Enterprise (HPGE), which took over from MEPE the operation of the existing network of medium and large hydro-electric plants, as well as the 120-MW coal-fired plant at Tigyit. In creating the new ministry the Hydropower Dept was renamed as the Hydropower Implementation Department (HPID) The HPID appears to be responsible for dam construction work, while HPGE takes charge of the installation of power generating equipment and maintenance of the entire facility once the plant is operating. A separate unit known as the Department Hydropower Planning (DHP) was created to take care of planning and internal affairs of the Ministry.

Interestingly, the MoAs, MoUs and agreements to form joint-ventures with foreign companies to develop new hydropower projects in Myanmar are still signed with the renamed HPID of EPM No 1. In reality, decisions about these projects and about which domestic hydropower projects are to be given priority in the allotment of funds appear to be made by the Electric Power Development Project Lead Committee under the direction of General Than Shwe. The work committee under the lead committee would appear to have the responsibility of apportioning dam building assignments between HPID and bodies under other ministries such as the Irrigation Dept which has a much longer history of involvement in dam construction and a much larger inventory of construction equipment to work with.

The Ministry of Electric Power No 2 (EPM No 2) has inherited what remains of MEPE, in particular the operation of the existing gas-fired and steam generating plants in Yangon, Mon state, and the Irrawaddy valley. As pointed out by Soe Win, the most important function of EPM No 2 is to provide impetus to the renewal of the national power grid and to prepare it for the coming on-line of the 790-MW Yeywa plant, perhaps as early as 2010. Three separate but related power supply project teams (north, central and south) under MEPE are engaged in this task. MEPE's mandate for the local distribution networks throughout the country has been handed off to two other newly formed agencies, the Yangon Electric Power Supply Board (YESB) and the Electric Power Supply Enterprise (EPSE) under EPM No 2. These two entities relate to the district and township electrical engineering offices which provide power service to the individual customers. The same agencies are also responsible for the re-invigorated meter box distribution program and the collection of electricity tariffs.

EPM No 2 Khin Maung Myint whose name crops up in the official media two or three times a week is portrayed as a particularly energetic individual, rushing about here and there, meeting with suppliers and contractors, investigating difficulties, demanding answers, finding solutions to a myriad of problems. He and his Ministry certainly have a daunting task. As he pointed out to a meeting of the SPDC's Electric Power

Development Project Committee soon after taking office, the grid-linked power stations in the country had a capacity at the time of almost 1550 MW, but actual production capacity was less than half of that figure for most of the year. Moreover, of six million kWh produced by the system in the previous year, more than a quarter had been lost in the transmission-distribution process. Recently, a YESB official put another face on the problem. He told a Myanmar Times reporter that Yangon power engineers have developed 79 different patterns of power distribution in the city to try to deal with the great imbalance between supply and demand at any given time.

#### Additional references

See above: 'Yangon electricity supplies get boost from <u>YESB plan</u>' (MT: 24/07/06) See below: 'Yangon City Electric Power <u>Supply Board Law enacted</u>' (NLM: 23/11/05)

NLM, 11/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071211.htm

A co-ordination meeting on power supply to the states and divisions including Yangon division was held at the meeting hall of the ministry in Nay Pyi Taw, on 8 December. After EPMNo 2 Khin Maung Myint made an opening speech, Chief Engineers Tin Maung Tun and Aung Khine briefed the minister on work in progress. MD Tin Aung of EPSE, MD San Oo of MEPE and D-G Thein Tun of HEPD gave supplementary reports. After hearing the reports, Deputy EPM No 2 Win Myint reported on dealing with the public and efficient use of funds in running the project and timely completion of project tasks. Next, the minister called for close supervision in the supply of power as consumption is on the increase. He said the public should be made aware of [matters related to] power supply starting immediately.

Country Presentation Myanmar: Franco-ASEAN Seminar, 6-7 September, 2007. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf



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Ye Lwin, Myanmar Times, 04/06/07. http://mmtimes.com/no369/n002.htm

The 11 hydropower stations and a coal-fired thermal power plant are operated by EPM No 1, which is responsible for supplying the national grid. The natural gas turbines and the remaining thermal plants are under EPM No 2, which is responsible for transmission.

Ye Lwin, Myanmar Times, 02/04/07. http://mmtimes.com/no361/n003.htm

The Ministry of Electricity was split into two separate entities last May, with EPM No 1 responsible for hydropower projects and EPM No 2 overseeing the transmission and distribution of electricity, in addition to managing the generation of electricity by natural gas.

NLM, 30/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm

The meeting (1/2006) of the State Electric Power Development Project Work Committee took place at the PM's office with an address by General Soe Win, chairman of the committee. It was attended by ministers, deputy ministers, directors-general and officials of the SPDC office and the PM's office, departmental heads and officials of the Ministries of Electric Power Nos 1 and 2. The Prime Minister said the development of electric power goes together with that of the socio-economy of the State. That is why the leading committee and the work committee for the State Electric Power Development Project were formed. The work committee is responsible for presenting the conditions of the projects being implemented and to be implemented to the leading committee. Presently, the State is taking steps to change the nation's agrobased economy to a system in which different kinds of industry can be set up. To bring this about, emphasis has been placed on boosting the power supply in order to develop both the agricultural sector and the

industrial sector. This is why the Ministry of Electric Power itself was reconstituted into the two ministries, one to focus on generating electric power and the other to getting it distributed.

#### NLM, 17/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060717.htm

A co-ordination meeting of EPM No 1 was held in Nay Pyi Taw and addressed by EPM No 1 Zaw Min. It was attended by Deputy Minister Myo Myint, directors-general, deputy directors-general, directors, plant managers and officials. The minister said the power supply sector plays a very important role in progress of the industrial sector. Strenuous efforts are to be exerted to complete construction of power plants. He urged officials to train junior engineers in order to increase their work efficiency. There were reports on the progress of projects, future tasks, arrival of heavy machinery and materials and the supply of power by project directors and plant managers. The GM of the Hydroelectric Power Production (aka Generation) Enterprise (HPGE) and the D-G of the Hydroelectric Power Administration Dept (HPAD) gave supplementary reports.

NLM, 07/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060607.htm

Lt-Gen Kyaw Win of the Ministry of Defence met with responsible personnel at the meeting hall of Mandalay Division PDC and discussed matters on the use of electricity and fuel. The meeting was attended by divisional representatives, officials of EPM No 2 and the Ministry of Energy and others. Manager of Mandalay division MEPE U Kyaw Thaung reported on distribution of electricity in the division, steps being taken to prevent the loss and wastage of power and thrifty use of power in the division. After that, Head of Tagundaing Sub-power Station U Win Maung and Head of Aungpinle Sub-power Station Daw Aye Aye Min reported on acquisition of power and distribution of it.

#### NLM, 02/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060602.htm

EPM No 2 Khin Maung Myint held a meeting with responsible personnel of YESB and gave necessary instructions. First, Col Khin Maung Soe of Yangon City Electric Power Supply Board briefed on formation of YESB and its set up and departmental functions. Responsible personnel replied to the questions raised by the minister regarding the tasks of the Board. Next, the minister made a speech saying that YESB launched its initial tasks on 1 April and it was set up with Yangon Division Electrical Engineering Office under it. Responsible personnel were to strive for supplying more electric power to Yangon City round the clock and speedy installation of electric meters. He said that they were to take action against those who were using electric power illegally. He also said that the staff were to cooperate with other related departments and should go on field trips.

#### NLM, 01/04/04. www.myanmar.gov.mm/NLM-2004/Apr04/enlm/Apr1\_h3.html

The Work Committee for National Electricity Development held a coordination meeting that was addressed by the chairman, Lt-Gen Soe Win. Among those present were Sec'y No 2 Thein Sein, A&I Minister Nyunt Tin, Energy Minister Lun Thi, Finance Minister Hla Tun, EP Minister Tin Htut, D-G of the SPDC Office Pe Nyein, deputy ministers and officials. Sec'y No 1 Soe Win said that as electricity is the basic requirement for national modernization and regional development a Leading Cte for National Electricity Development led by General Than Shwe and a nine-member Work Cte had been formed to supervise and implement power projects. The work committee has two sectors – one for supervising the power projects and another for approving new projects. As there are plenty of the hydro-electric power projects to be implemented, it is impossible for the EPM alone to look after all of them because some are immense. They are to be undertaken with the combined efforts of ministries concerned under the supervision of the SPDC. Therefore, the leading committee and work committees had been formed to implement the projects systematically. The work ctes are to provide necessary assistance for implementation of the projects providing correct priority.

#### ADB Power Interconnection and Trade Report (EGP-9), 18/11/03.

http://www.adb.org/Documents/Events/Mekong/Proceedings/egp9.asp

Section 22. Dr. Thein Tun, Director General, Ministry of Electric Power (EPM), recalled that the EPM was established in November 1997 to promote effective operation of the power sector. He said that MEPE was put under the EPM and that a newly established Dept of Electric Power acted as policy-making body as well as Secretariat to the Ministry. In January 2002, he noted that the DHP had been established to increase capacity for implementing hydropower projects. He gave a quick review of the policy and strategies of the EPM and presented the demand and supply situation of Myanmar's power industry. He gave the demand forecast for the next 10 years. He stressed that to meet future power demand, the EPM had laid down a 5-

year short term and a 30-year long-term strategic plan. The first was to meet rapidly rising domestic demand, and consisted of plans to develop 14 hydropower stations and a coal- fired thermal plant, and 28 transmission lines and substations. He enumerated the objectives of the 30-year plan, which is to consider power trade with GMS, ASEAN and the BIMSTEC region.

# JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan, *The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summary*, pp 5, 6, 20, 21, September 2003.

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&seqno=1

Section 2.1. Introduction. Power Sector. The power sector is administered by the Ministry of Electric Power (EPM), under which there are two departments and one enterprise: the Department of Electric Power (EPD) responsible for policy making; the Department of Hydroelectric Power (DHP) responsible for investigations, designing and implementation of hydropower projects; and the Myanma Electric Power Enterprise (MEPE) responsible for operation and maintenance of hydro and thermal power stations, construction and maintenance of transmission and distribution networks, and management of electricity business such as tariff collection.



Figure 3 Organisation Diagram – Myanma Electric Power Enterprise (MEPE)

As a State Economic Enterprise (SEE), MEPE relies on funds provided by the government. Its focus is not on increasing income, which is essentially allocated by the government, but rather on controlling expenditure to keep income and expenditure in balance. There has been no finance from the private market since 1989, when the authorities shifted all their financial requirements to the budget, and in effect finance became an inter-governmental budget allocation. MEPE's picture of financial performance in its financial statements is very different from reality for two major reasons. One is the gap between the

official exchange rate and the real market exchange rate. The other is the subsidization on prices of fuels. MEPE's income statement has very low figures of interest and depreciation charges. This is because all foreign loans that the Government (not MEPE, since 1989) has taken out for power plant construction and

equipment are charged to MEPE at the official exchange rate of only K6.3 to the US dollar. Another gap is in the fuel prices. MEPE buys fuels from MOGE at fixed prices, which are far below the inflation-sensitive market prices. The government prices of gas, oil and diesel are respectively K10/1000 cubic feet, K12/gallon, and K160/gallon. The market prices, which have been rising under inflation, are around \$1.00/gallon for oil and diesel and \$3.00/1000 cubic feet for gas. Assuming K1000=\$1.00, the government prices of gas, oil and diesel are only 0.3%, 1.2%, and 16% of the respective market prices.

Business Tank, July 2002. http://mission.itu.ch/MISSIONS/Myanmar/t&b/electric htm.html

After Myanmar attained independence in 1948, the government established an 'Electricity Supply Board' in 1951, which held a monopoly in the electric power sector. The Electricity Supply Board was re-organized as the 'Electric Power Corporation' (EPC) in 1972 by the Revolutionary Council Government. The Ministry of Energy, formed in 1985, was responsible for exploration of oil and gas as well as electricity generation and distribution throughout the country. Finally, an independent entity was created by the State Law and Order Restoration Council government on the 15th November 1997 to deal more effectively with the electric power sector. Since then, the EPM and the state-owned MEPE under the ministry are responsible for the generation, transmission and distribution of electricity.

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#### ELECTRICITY RATES RAISED, SUBSIDIES FOR CIVIL SERVANTS DROPPED

Aye Aye Win, AP, 15/05/06. www.burmanet.org/news/2006/05/15

Myanmar's military government has raised electricity prices while at the same eliminating special lower rates for civil servants and the elderly, an official of the state electric power department said Monday. The move has been touted as a free market reform by the government, and comes directly after massive salary increases announced for civil servants on April 30. The new salaries appear to have been an effort to placate civil servants who in many cases were making less than US\$10 (euro 8.30) a month and were hit hard by fuel price increases last year. "As the country has adopted an open-market economy, everything has to be adjusted according to the market economy. However, the government will make a gentle and step by step increase so that the people will not face hardship," said Information Minister Kyaw Hsan last week when asked about the possibility of electricity rate increases.

Effective May 1, every household and religious building will pay the same rate of K 25 (US\$ 0.02, euro 0.015) per unit while industries will pay K 50 (US\$ 0.04, euro 0.03) per unit, said the official, who insisted on anonymity because he is not authorized to speak to the press. Under the previous rate table, there had been a sliding scale, ranging from K 2.50 (US\$0.002 or euro0.0015) to K 25 kyats (US\$ 0.02, euro 0.015) per unit, depending on the category of consumer and the amount used. The price for civil servants and pensioners had ranged between 50 pyas (US\$ 0.004 or euro 0.0003) and K 25 (US\$ 0.02, euro 0.015).

"The new rate will have a bigger impact on government servants, retirees and low-volume consumers," said high school teacher Myint Soe, who is now getting K 44,000 (US\$ 33.80, euro 27.97) a month compared to K 10,900 (US\$ 8.38, euro 6.92) before the salary hikes. It is unclear how the electricity rate increases will affect the problem of power shortages, caused by inadequate domestic fuel supplies and a shortage of money to import oil. The government for years has been forced to use electricity rationing, even in the country's commercial capital and biggest city, Yangon.

#### Additional references

Grant Peck, AP, as published in the International Herald Tribune, 02/10/07.

http://www.iht.com/articles/ap/2007/10/03/asia/AS-FEA-GEN-Myanmar-Generals-Lair.php

Rent is free for civil servants' quarters in both Rangoon and Naypyitaw, but in Naypyitaw the apartments are bigger. Water and electricity are also free here and the city enjoys a 24-hour supply of electricity, a rarity outside of military bases. **Compiler's Note**: Based on interviews in the new administrative capital of Naypytaw in April 2007.

Mizzima, 06/09/07 <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=2419&Itemid=6</u>

The recent hikes in fuel and electricity costs run contrary to the advice of leading academics asked to serve as consultants to the Union of Myanmar Federation of Chambers of Commerce Industry (UMFCCI), according to U Myint, a member of the advisory group. "The Central Executive Committee of the UMFCCI and its academic advisory group never presented a formal proposal to the authorities that energy prices should be doubled to meet rising public expenditures," writes U Myint. In a letter addressed to leading regional news agencies he reveals that the first meeting of the 10-member advisory team with UMFCCI officials was in April of 2006. The guestion to be addressed was how to generate revenue to cover the salary increase for public employees. Chief among the recommendations of a UMFCCI research team shown to the advisory group for feedback was a proposed increase in the price of gasoline from K 1,500 per gallon to K 3,000 along with an increase in the per unit charge of electricity from K 25 to K 100. Everyone in "the advisory group had considerable difficulty with the research team's proposals for meeting the additional budgetary costs of the public sector pay increase, especially with the recommendation to raise energy prices," reads the letter. U Myint, while acknowledging that energy prices in Burma are among the lowest in the region, argues that the paltry per capita GDP of Burmese, estimated by the International Monetary Fund as \$170, is incapable of shouldering the burden of an increased financial liability resulting from a hike in energy charges. This, combined with a desperately lacking public services sector, U Myint states, is the primary reason why he could not support the UMFCCI research team's proposals. Though a document is now in circulation that makes it appear that the decision to rai se energy prices was made in consultation and conjunction with UMFCCI and the 10-member advisory team, U Myint states this is patently "not true". "Academics like us play no role and are completely out of the picture in the decision-making process regarding issues that are of major concern to the people of Myanmar," continues the letter. For that reason, the consultancy group states it cannot be held responsible for policies unfolding in Burma be they positive or negative.

See above:'Petrol subsidies and the price of electricity'(Burma Digest: 02/09/07)'Fuel price increase impacts industrial use of electricity'(IRROL: 15/08/07)See below:'Special privileges alleged in electricity distribution system (NCGUB: 21/05/01)'Experts differ over how to finance improvements in power supply' (MT: 11/12/00)'Generation, distribution, consumption of electricity in Myanmar''Myanmar reels under huge electricity price hike' (AFP: 03/08/99)

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## THAHTAY CREEK DAM AND OTHER HYDROPOWER PROJECTS IN ARAKAN NLM, 20/04/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060420.htm

General Than Shwe and party arrived at the site of Thahtay creek hydel power project under construction by the HPD on Thahtay Creek, 12 miles from Thandwe. At the briefing hall, Deputy EPM U Myo Myint reported to the Senior General on aims of the project, feasibility survey works, the site for construction of the main embankment, future tasks and facts about the project. A&IMin Htay Oo briefed the Senior General on tasks in connection with hydel power projects and dam projects. In response, General Than Shwe gave guidance saying that officials of the two ministries are to collaborate by applying appropriate technology for timely completion of the projects without delay.

General Than Shwe and party inspected samples of rock extracted from the project, the site chosen for construction of the dam, and construction tasks being carried out with the use of heavy machinery. Thahtay Hydel Power Project will be connected to the national power grid and will supply power to regions of Rakhine state and other areas. The dam will also serve to prevent floods in the region. The dam will be 1,740 feet long and 280 feet high. Three 34-megawatt turbines will be installed. **Compiler's Note**: A picture of construction activity at the site accompanies the article.

#### Topographic map references:

Burma 1:250,000: Series U542, U.S. Army Map: NF 46-08: Prome Thahtay [Thade] creek dam, 12 mi NE of Thandwe [18° 28' N, 94° 22' E], grid sq reference: 9\6, 23\6 [?] http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne46-8.jpg Burma 1:250,000: Series U542, U.S. Army Map: NF 46-03: Kyaukpyu Ann creek dam, 10 miles from Ann [19° 47' N, 94° 02' E], grid square reference: 11\2, 23\2 [?]
http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne46-8.jpg

Burma 1:250,000: Series U542, U.S. Army Map: NF 46-12: Henzada Kyeintali creek dam, 38 miles SE of Kyeintali [18° 00' N, 94° 29' E], grid square reference: 8\5, 23\9 [?] http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne46-12.jpg Burma 1:250,000: Series U542, U.S. Army Map: NF 46-14: Akyab Saingdin Falls in Buthidaung township [co-ordinates n.a.], grid square reference: 12\4, 21\6 [?] http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-14.jpg

# Additional references

Times Of India, 02/11/07. http://www.rebound88.net/

India's Export-Import Bank (Exim Bank) has extended a US\$60 million Line of Credit (LoC) to the Myanmar Foreign Trade Bank to finance the Thahtay chaung hydropower project. The agreement was signed in Rangoon on Oct 29 by S R Rao, on behalf of Exim Bank, and Than Ye, MD of Myanmar Foreign Trade Bank. Under the LoC, Exim Bank will reimburse 100pc of the contract value to the Indian exporter, upfront on the shipment of goods.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

Thahhtay dam and power station with a planned capacity of 102 MW is under implementation by the HPID. It will generate 394 million kWh annually when it comes on line in Dec 2009. Ann dam and power station with a planned capacity of 15 MW is under implementation by the HPID. It is expected to generate 65 million kWh annually when it comes on line in 2009.

### NLM, 03/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070403.htm

EPM No 1 Zaw Min visits Thahtay hydel power project in Thandwe on 30 March; it will be equipped with three 37.5 MW generators. Col Zaw Min also visited An Chaung Hydel Power Project on An Creek on 31 March; work on the main dam is underway at the project about 3.5 miles north-east of Ann; the generators there will have a capacity of 15 MW and are expected to produce about 65 million kWh per year.

Myanmar Times, 13/11/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes18-342/h011.htm</u> An official of EPM No 1 said the Dept of Hydroelectric Power (DHP) is conducting a feasibility study to build a hydropower station about 16 km (10 miles) upstream from the village of Ann in Rakhine State. "The department is building camps and roads to facilitate the project," the official said, adding that the station will include three turbines capable of producing a total of 15 MW of power.

NLM, 25/04/05. http://www.myanmar.gov.mm/Article/Article2005/April05/April25.htm

Thahtay Chaung Hydropower Project will be implemented on Thate Creek 15 miles north-east of Tandwe; it will supply electricity to southern Rakhine State and contribute power to the grid. It will be a 'zone-type' dam with a central [earth] core, 1,300 feet long, 250-feet high. Maximum water storage capacity will be 340,000 acre feet, 216 feet deep. It will be able to generate 100 MW and provide 318 million kilowatt hours annually. The project will assist in the development of Thandwe and hotel services on the Ngapali Beach Resort. In addition, An Chaung hydropower project will be launched on An Creek, 3.5 miles north-east of An. It is designated for regional development. The dam there will be 1,600 feet long and 140 feet high and will have a storage capacity of 399,400 acre feet. During the first phase, it will be be able to generate 5 MW and produce 33 million kilowatt hours a year; in its second phase, it will generate 10 MW and produce 53 million kilowatt hours a year.

NLM, 18/04/05. www.myanmar.gov.mm/NLM-2005/April05/enm/April18\_h1.html

Thahtay Creek hydro-electric power project will be on the Thahtay Creek, about 15 miles north-east of Thandwe; it will be a zone type dam with a central earth core, 1300 feet in length and 250 feet in height. The water storage capacity of the dam will 340,000 acre feet; the hydropower station will be able to generate 100 MW; annual power supply is estimated at 318 million kWh.

Narinjara News, 11/05/05. www.burmanet.org/news/2005/05/11/

Three power plants are being built in Arakan State, but the people have little faith these plants are for their benefit. One project is in Ann township where the headquarters of the regional military command is located and at least five battalions and a brigade are based; the Ann Chaung hydro-power plant will be 3.5 miles north-east of Ann, and will produce 53 million kilowatt hours annually, a second plant in Sandoway (Thandwe), near the well-known beach resort centre of Ngapali is targeting the tourist sector, it will generate 318 million kilowatts hours annually; a third plant will be built in Gwa township where the Khaung Tha beach resort is located. In 1989, the military junta also attempted to build a well-publicized hydro-power project at Sai Dunn Water Fall, in Buthidaung township; however, it was withdrawn 3 years later without any explanation; every government, since that of U Nu, has tried to woo the people of Arakan with the promise of building a power plant at Sai Dunn.

NLM, 03/12/04. www.myanmar.gov.mm/NLM-2004/Dec04/enm/Dec03 h1.html

Using maps and charts, EPM Tin Htut reports to Gen Than Shwe on the the Thahtay creek, Thandwe creek, and Kyeintali creek hydel power projects to be carried out in the southern Arakan region. Than Shwe gives guidance that priority should be given to the Thahtay creek project. He wants a feasibility study and survey for the An Creek project carried out as soon as possible. A preliminary survey showed that a 15-MW power station could be built on An creek. The Thahtay creek project, 15 miles north-east of Thandwe, will have a 100 MW capacity; priority will be given to supplying power to the Thandwe region and the hotel industry in Ngapali beach. The 30-MW Thandwe creek hydel power station will be on Thandwe Creek 13 miles SE of Thandwe town. Kyeintali creek hydel power project will be located 38 miles south-east of the town. It will be installed with 28-MW turbines.

Narinjara News, 24/10/01. [not available on-line]

The SPDC junta begam to construct a hydro-electric dam with much fanfare at Saingdin Falls in Rakhine state in 1990, but the project fizzled out in 1995. **Compiler's Note**: The Saingdin River, a tributary of the Mayu, flows south through Buthidaung township in the northern part of the state. According to local sources, the falls was first surveyed as a potential site for hydroelectric development in the early 50s.

WPD, 15/09/90. <u>http://www.ibiblio.org/obl/docs3/BPS90-09.pdf</u> Saing Din hydro-electric project, Buthidaung township, (15 MW), will serve ten northern Rakhine state townships, rather than providing 76.5 MW of industrial power as originally anticipated in 1956; it will cost K 335 million (including US\$ 32 million).

See above: <u>Bangladesh</u>, Myanmar to sign hydropower deal' (Xinhua: 15/07/07)

# TRIBE'S HOME TO BE A VALLEY OF THE DAMMED

Richard Lloyd Parry, The Times of London, 22/03/06 [Abridged]. http://www.timesonline.co.uk/tol/news/world/asia/article743880.ece

Even in the dry season, and even in this time of war and uncertainty, the Salween River is a majestic waterway. It runs 1,900 miles (3,060 km) from the high Tibetan mountains to the Gulf of Martaban, and along its great length there are few places more remarkable than Weigyi, on the border of Burma and Thailand. Here the god of the Salween shows himself in the form of a notorious whirlpool that churns the waters and can even drag a boat under. Locals leave offerings of rice, flowers and bananas to appease the deity and to thank him for the prosperity he brings. But now ominous signs have appeared, signs that promise disaster for the people of the Salween and their god.

They come in the form of yellow marks painted on the rocky banks and a concrete plaque laid by Thai engineers. If their plans go ahead Weigyi will be transformed from a jungle shrine into a massive hydroelectric dam. The rocky cliffs will be replaced by concrete walls and throbbing turbines. The jungle will be penetrated by rumbling roads and high security fences.

Five dams are jointly planned by the Thai and Burmese Governments; far upstream Chi na proposes building 13 more. If only a few go ahead, the Salween, the longest undammed river left in south-east Asia, will be chained. Conscious of the potential for bad publicity, the Thai and Burmese governments have kept secret

their precise plans for dam building. But The Times has obtained a copy of the MoU between them last December.

"As long as I have lived here my family has been totally dependent on the Salween for our livelihood," says Htoo Lwee, a member of the Karen ethnic group that lives in the village of Hoekey, a few miles below the proposed dam site at Weigyi. "The river gives us a living from fishing and from boating. It is our life and our mother. If the dam is constructed we will not be able to live." The Salween is home to 70 species of fish including catfish, eel, featherback and carp who thrive in its surging rapids and deep pools. The dam would create a still-water lake to which they are ill-adapted.

The dam's opponents calculate that the reservoir will be 640 sq km — the size of Singapore. It will destroy rice paddies, vegetable fields, 26 villages and two entire towns. Temples and palaces will be submerged; 22,000 people will lose their homes and 8,000 more will lose their livelihoods.

It will destroy forever the towns of Pasaung and Bawlake, the historical capital of the Karenni people, and the site of royal palaces and Buddhist temples and stupas (holy sites). The traditional homelands of one entire tribe, the dwindling Yintalai, who number just 1,000, will disappear. The river's backed-up waters will flood rice fields and the garden plots of beans, tobacco, and chilli with which families support themselves during the dry season. It will block what locals refer to as the "Salween highway", and the trading boats which carry rattan, honey and buffalo from the Karen and Karenni territories across the river to Thailand.

Still worse, in the eyes of many of the locals, the dam project will draw into the area the notorious armed forces of the Burmese junta, which have been enslaving, raping and killing the local tribespeople for decades. "These dams will not only spell the gradual genocide of indigenous peoples, but will also inflict a death sentence on endangered animal plant and plant species," says Pascal Khoo Thwe, author of the acclaimed memoir of his Burmese childhood From the Land of Green Ghosts.

"There is no better way to destroy a country than by the combined power of guns and bulldozers. Show me a cup of dam water and I will tell you stories of human misery, and cries of dying animals and plants."

This is one of the most isolated and chaotic corners of Asia, a place of guerrillas and refugees, where no government holds sway. The tribespeople of eastern Burma, particularly the Karen and the Karenni, have always resisted government by the rulers in Burmese capital, Rangoon, whether they be British imperialists or their successors, the generals of the military junta called the State Peace and Development Council (SPDC).

Karen armed groups have fought a scrappy war against the Burmese since independence 58 years ago but have recently found themselves driven into an ever-narrower strip along the Thai border to where tens of thousands have fled the fighting. It is in one of these pockets, a sanctuary from the depredations of the SPDC, that the Weigyi dam will be built. When an earlier dam was built on the Baluchaung river in the 1960s, 24 Burmese battalions moved into the area. Human rights groups have gathered numerous accounts of the rapes, forced labour and arbitrary killings and arrests that were inflicted upon the local Karenni population.

Among the biggest victims were members of the Padaung tribe, famous for the "long neck" women who stretch their necks with brass rings. Numerous local people were killed or injured by landmines scattered as a security measure in the fields around the dams. But despite the energy generated by the hydroelectric plant, villages lying literally underneath the power lines received no electricity. "Instead of getting benefits from the dam, we will have only curses," says Seem Wen, a local village head and a major in the Karen National Liberation Army. "Human rights abuses, forced labour, killings. There will be many more refugees. If the dam is built, we will definitely show a military response."

But it is not only the Burmese junta, one of the world's most cruel and obdurate regimes that will benefit from the dam. The 5,000 megawatts of electricity generated will be channelled into the growing and energyhungry towns of neighbouring Thailand. It is this that gives the anti-dam campaigners some hope. For, while the SPDC cheerfully flouts human rights with little apparent concern for the opinion of the outside world, Thailand is a lively democracy. "The SPDC does whatever it likes," says Nay Thablay, of the organisation, Karen Rivers Watch. "But in Thailand are many people who sympathise with us and we must motivate them to put pressure on their own government."

The anti-dam campaigners are mobilising what few resources they have. A group of young people have formed a pop group, Salween Angels, and recorded songs protesting against the dam's construction. Activists are sailing down the river, warning local communities and organising demonstrations. "Even if we cannot stop this," says Htoo Lwee, "we have to try for the sake of our river." But they are a few thousand stateless, almost voiceless, people against two powerful governments, and they are realistic about their chances of success. If the dam at Weigyi is stopped, it will be a triumph of local determination. If not, then the rest of the world may hardly notice that the turbulent, vigorous god of the Salween has been reduced to a placid pond.

**Topographic map references**: Thailand 1:250,000: Series L509, U.S. Army Map: NE 47-06: Chiang Mai Weiggyi dam, just west of Hokki [18° 18' 49" N, 97° 34' 49" E], grid square reference: 20\2, 3\4 Dagwin dam, near Dagwin [18° 04' 07" N, 97° 40' 55" E], grid square reference: 19\9, 3\6 <u>http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-ne47-6.jpg</u>

# Additional references

See below: 'The <u>Weigyi</u> dam: A great barrier and a way to safety' (KDRG: March 2006) 'Potential impacts of the <u>Weigyi and Dagwin</u> hydropower dams' (FER: June 2003) 'Power purchase <u>deal between Thailand and Burma</u> on the way' (Nation: 27/05/97) '<u>Lawpita</u> power plants and associated dams' (Appendix 1)

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# THE WEIGYI DAM: 'A GREAT BARRIER AND A WAY TO SAFETY'

Karenni Development Research Group, **Dammed by Burma's Generals: The Karenni Experience with Hydropower Development From Lawpita to the Salween**', March 2006, pp 53-66 [edited and abridged]. <u>http://www.burmacampaign.org.uk/reports/Damned\_by\_Burma%27s\_Generals.pdf</u>

The proposed Weigyi dam is located at a large whirlpool in the Salween river in Papun district, Karen State, just across from the Mae Sariang district of Mae Hong Son province in Thailand. It has a proposed height of 168 meters [with maximum water level height (masl) of 220 m], and an estimated power capacity of 4,540 - 5,600 MW. Although the dam will be in Karen State, the greater part of the reservoir it will create lies in Karenni [Kayah) State. It will be at least ten times higher than Mobye dam and will flood many of the best lowland forests and agriculture lands in the state.

Papun District in Karen State has been the site of repeated military offensives and anti-insurgency campaigns by the troops of Burma's military junta. Before 1992, there were only ten Burma Army garrisons in the district. Today there are fifty-four garrisons fortified with heavy artillery, including twelve along the banks of the Salween. Of 85 original villages in the area directly adjoining the sites of the Weigyi and Dagwin dams, only a quarter remain. Most of the villagers fled to Thailand leaving their fertile farmland lying fallow; however, 5,000 remain hiding in the jungle, facing severe food shortages and health problems. Roads to the planned dam sites have been built using forced labor, and landmines have been planted along the roads. It is these local residents who will who will suffer most from the impacts of these dams, in particular Shan, Karen, Karenni villagers and displaced persons who live in hiding alongside the river. They have not been given information, let alone consulted, as to how the projects will affect their lives.

The expected flood area of the Weigyi dam will impact four of the seven townships in Karenni state, completely submerging 28 villages, including the entire towns of Pasaung and Bawlake. Many other villages in the flood area have been relocated over the years of civil conflict. Even so, based on surveys carried out by Karenni agencies, the current village population that will be directly impacted by the flood is conservatively estimated at 8,300. IDPs hiding in the flood zone are estimated at 13,500. The number of villagers either relocated or in hiding in in the Demawso and Ywathit areas who rely on paddy fields in the flood zone number 3,700. Refugees and migrants from the flood zone who have not been able to return

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The valley that the Salween cuts through in eastern Karenni State provides fertile lowland farm fields for the majority of people living there. Wet rice (more productive than upland rice) is the primary crop, with sesame, corn, peanuts, peas, and chili also cultivated for subsistence as well as trade. As most people depend on mountain creeks during the rainy season, usually only one seasonal crop is planted. However, vegetable gardens along the fertile river banks are extensive in the dry season and fruit can be harvested from various types of trees throughout the year. Bawlake township, in particular, has well-established stands of mango and coconut trees, and plum trees spread naturally in abundance; it supplies coconut and plum juice to various towns. Mae Set township is well-known for its high yields of paddy and sesame compared to other areas. Due to Karenni state's mountainous terrain, there are few other areas that are suitable for wet paddy production and lowland agriculture in the state. Most of these areas lie within the flood zone of the proposed Weigyi dam. Given the Lawpita experience, it is highly unlikely that any compensation will be offered for this devastation and it is not clear where, or if, residents will be able to find new farm lands.

The transformation of the Salween and Pawn from fast flowing rivers with seasonal changes to large reservoirs will have negative impacts on fish migrations and spawning, and ultimately on fish populations and species diversity. Residents in all of the affected areas by the flooding depend on fishing to provide protein in their diet and some rely on it to supplement their incomes. Virtually all the residents along the Pawn river (that will also be affected by the flood waters) fish, as dry and wet farming cannot fully address their subsistence needs. Since modern fishing means are out of reach, their gear consists mainly of hook and line, round loaded nets, and conical nets. They sell their catch to surrounding villages or to such towns as Loikaw, Demawso and Pruso, or have it dried for kitchen use. They save the money they earn to buy clothing, pay for their children's schooling, or for emergency needs. Some barter for other goods. The Pawn river serves as the habitat of many species of valuable fish such as catfish, long-finned eel, spiny eel, featherback, carp, Hamilton's carp, fork-tailed catfish, and snakehead. These fish come up from the Salween to nest and hatch in the Pawn.

There has been almost no research done on the number of fish species and habitats in the Pawn and Salween in Karenni State due to the unstable situation there. However, a recent study by Thai-Karen villagers on the Salween and its tributaries in Mae Hong Son province in Thailand found 70 different fish species. The study also found 18 different ecological systems, including rapids, different fish habitats, and beaches, just on the stretch of the Salween that borders Thailand and Burma alone. Local villagers along the Pawn River in Karenni State describe a similar diversity. There are hundreds of small caves and specialized habitats for fish in the Pawn near Bawlake. This area will be flooded, filling in the caves and destroying unique habitats.

Karenni people rely on forests for a large part of their livelihood. The forests provide sufficient fuel and construction materials for homes, countless varieties of wild fruits, vegetables and mushrooms, and seasonally edible products for humans and animals, biomass for fertilizing lowland farms, non-timber forest products for income generation, animals for meat, and herbal medicines for health -- to name but a few. Before most of Shadaw township was relocated to military sites, local residents there traded rattan, resin, honey, wax, stick lac, thanaka, and manufactured medicinal herbal plants for tonic uses and for curing malaria. The forests are an integral part of villagers' lives and livelihoods, but large swathes of forests will be flooded and destroyed by the reservoir. Most Karenni men go on a week-long hunting trip just before the rice harvest in order to have meat at the time of harvest. Usually they travel by boat down the river and up side streams in groups of about five. They bring fishing nets to get fish during the day; in the evenings they hunt frogs and wild animals. Of the larger animals, wild pigs and deer are commonly hunted. The group then preserves their catch: fish is made into paste and dried; meat is also dried or cured in salt. They then store everything in bamboo and divide it equally. Frogs are kept alive in cages and sold for income, as well as any surplus meat. During the rest of the year, most people are struggling with their farms and only hunt smaller animals nearby their paddy fields.

No full-scale studies have been carried out of the forests along the Salween in Karenni State. It is certain, though, that all the remaining forests in the flood area, including important habitats for wild animals and birds, will be permanently destroyed by inundation. The entire reservoir area lies within an ecoregion of

outstanding biodiversity. This potential will never be fully understood or realized once the forests lie under water. In addition to the primary effect of destroying hundreds of square kilometers of forests, many secondary effects will also impact forests that do not lie in the flood zone itself. An estimated 25,500 people currently relying on the land and forests in the flood zone will be displaced, causing encroachment into remaining forests. While lowland areas can support a larger number of people on smaller areas of land, upland areas (those that will be left for settlement after the flood) are not as productive. Therefore, in order to sustain the same populations, more land than is currently under cultivation will be sought, land most probably in previously undisturbed forests. If history is a lesson, people will also seek safety deeper and deeper into forests, thus further disturbing a previous balance in the ecosystem. Forests will likely be cut in order to build roads for dam infrastructure and to replace old roads and trading routes that will be flooded. These roads will enable, and most probably stimulate, logging in previously unreachable areas, particularly as Karenni state is home to some of the last stands of mature teak in the world.

Of the four main rivers navigable by motorized boats in Karenni -- the Salween, Pawn, Baluchaung, and Pai -- the Salween is the principal one used for trading. Most of the trade is small-scale and provides local farmers with a market for their products, especially in the absence of good roads. The town of Pasaung is an important crossroads and trading center for Karenni people. It is the focal point of transportation to Thailand through Mae Set, to the central plain of Toungoo, to Shan State via the Loikaw by-road, to Karen State and Shan State along the Salween, and to Thailand along the Pai River. The entire town, as well as Bawlake, another important center of economic activity, will be submerged under the reservoir. Mae Sam Laep, which lies in the Mae Sariang district of Mae Hong Son province in Thailand near the proposed Weigyi dam project, is a key center for trading cattle and goats, and local products such as onions, beans, sesame, dry chili and other dry goods from Burma, and commodities such as cooking oil, seasoning powder, household goods, clothing, medicines, and other consumer goods from Thailand. The Weigyi dam will cut off Mae Sam Lap from Karenni state, disrupting a generations-old trade route. Another trading center called Thakawhta on the Salween at the border of Karen and Karenni State, where local people trade homemade candles, will also be submerged.

The Yintalai are a sub-group of the Kayah; their language is slightly different, and they have no written alphabet. Only about a thousand people from the Yintalai now remain. Their ancestral lands are in Pasaung and Bawlake townships and the flooding caused by the Weigyi dam would completely submerge their sacred land, cultural heritage, livelihood, homes, and forests. The Yintalai believe that there are spirits guarding the mountains, jungles, and big trees. These spirits are powerful, hence when cultivating farm plots, offerings and appeals are made for plentiful crops and less damages. The Yintalai are primarily devoted to farming, breeding livestock, and hunting for their livelihood; they occasionally turn to handicrafts. They settle in regions surrounded with rocks and boulders and, as the soil is infertile, only subsistence cultivation. They fend for their living by selling products from the dry farms for extra income. As a people, they will proportionately suffer most from the impact of the Salween dams.

Compiler's Note: The pdf version of this report has many excellent pictures, maps and charts.

**Topographic map references**: Thailand 1:250,000: Series L509, U.S. Army Map: NE 47-06: Chiang Mai Weiggyi dam, just west of Hokki [18° 18' 49" N, 97° 34' 49" E], grid square reference: 20\2, 3\4 Dagwin dam, near Dagwin [18° 04' 07" N, 97° 40' 55" E], grid square reference: 19\9, 3\6 <u>http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-ne47-6.jpg</u>

# Additional references

See above: <u>'Tribe's home</u> to be a valley of the dammed' (London Times: 22/03/06) 'Potential impacts of the <u>Weigyi and Dagwin</u> hydropower dams' (FER: June 2003) 'Power purchase <u>deal between Thailand and Burma</u> on the way' (Nation: 27/05/97) '<u>Lawpita</u> power plants and associated dams' (Appendix 1)

MOTOR AND <u>ELECTRICAL APPLIANCE FACTORIES</u> OPENED IN INDAGAW

#### NLM, 21/03/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060321.htm

The Ministry of Industry-2 opened its motor and electrical appliance factories in Indagaw IZ in Bago township, today. Accompanied by Lt-Gen Myint Swe of the Ministry of Defence and officials, SPDC Secretary No 1 Thein Sein heard a report on the production of disc wheels, water tanks, bearings, inlet and aluminum cables, 18-hp diesel engines for power tillers and generators and auto parts presented by Minister for Industry No 2 Saw Lwin. He also briefed the Lt-Gen Thein Sein and party on the operations of the ministry's existing factories, its research and development project and on the new electric motor and auto-used electrical apparatus factories.

In response, the Secretary-1 said that adequate investment and technology is required in setting up industries for national development. The country is in the process of developing the various economic sectors with agriculture as the base. Farm machines are required to reach the goal and for farm mechanization. The ministry should strive for mass production of farm machinery and trucks. While the Ministry of Industry No 2 needs advanced machinery it also needs qualified technicians and should conduct training programmes for the staff. The machines manufactured should meet the required standards and the ministry should make efforts to run the factories at full capacity. The staff should make constant supervision to minimize loss and wastage due to negligence and misconduct. It should also introduce innovative methods to run the machines it produces with biodiesel extracted from physic nut oil. Research is needed to convert diesel engine to operate on physic nut oil engine and test-running of engines and tractors using physic nut oil.

Next, the opening ceremony of the motor factory of Myanma Machine Tool and Electrical Industries was held at the factory. MD of MMTEI U Kyaw Win, MD of Myanma Industrial Construction Services U Aung Kyi and V-P of Angelique International Ltd of India Pradeep Kumar Arya formally opened the factory. It is expected to produce 30,000 single-phase electric motors and 10,000 three-phase motors in a year.

Afterwards, the electrical equipment factory of the MMTEI was formally opened and Secretary No 1 inspected the production process of the factory. It s expected to manufacture 10,000 starter motors and 10,000 alternators for tractors, trucks and jeeps, 5,000 pieces of ignition coil and 5,000 pieces of electronic fuel pump for petrol cars per year. Lt-Gen Thein Sein and party also went to the aluminium wires factory and inspected its production process. The factory can produce 1,600 tons of wires a year.

# Additional references

NLM, 19/11/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051119.htm

In the compound of the Ministry of Industry No 2 on Kaba Aye Pagoda road, PM Soe Win and party were conducted around the booth of MMTEI where a 5-kw hydel power generator to be used with a 15-foot-high water fall, a 40-kw hydel power turbine to be used with a 60-foot-high water fall, and 60-kw and 200-kw hydel power turbines to be used with 120-feet-high water falls were on display. A Francis water turbine Model-HL-160-WJ-42 that can be used at a 130-foot-high water level was also displayed, as were various capacity motors manufactured by the electric motor factory in Indagaw. An ignition coil, fuel pump, alternator and starter motor manufactured at the automobile electronics factory in Indagaw as well as single-phase 2-wire electric meters and triple-phase 4-wire meters produced at the electric meters factory in Sinde in Padaung township were also on display.

See below <u>'Cable factory and foundry</u> opened in Indagaw industrial zone (NLM: 04/04/05)

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**DELTA HOLDS GREAT POTENTIAL FOR<u>TIDAL POWER GENERATION</u> Voice Weekly, 13/02/06, as excerpted in the Myanmar Times, 20/02/06. http://www.myanmar.com/myanmartimes/MyanmarTimes16-305/media.htm** 

A report in Voice journal said Myanmar had great potential geographically for the generation of large amounts of electricity from tidal movements, owing to more than 1700 miles of coastline and vast delta

areas. The Myanmar Engineering Society had already succeeded in building two hydroelectric facilities powered by tides in the Ayeyarwaddy division town of Ngaputaw in 2005, it said. The report also said the generator could be operated for two six-hour periods each day when the tide was going out, adding that the capacity of electricity generation depended on the difference of the water level between high and low tide, with a greater difference translating into more power generation.

# Additional references

Flower News weekly journal, 04/05/05, as excerpted in the Myanmar Times, 09.05/05. http://www.myanmar.gov.mm/myanmartimes/no265MyanmarTimes14-265/media.htm

A group of Myanmar engineers has succeeded in generating electricity from tidal movements in the Ayeyarwaddy delta, reports Flower News journal. The report said the group began working on the K500,000 project early this year at Kabala village in Ngaputaw township, about 75 km from the coast. Residents helped the project by building a dam filled by the incoming tide that drives a three-kw turbine. The generator operated twice a day for six hours when the tide is going out. The project took a month to complete and the electricity is being provided to the village. It was initiated by the Yangon branch of the Young Men's Christian Association and funded by the engineers. The group plans to install a total of 10 turbines at the site. The report said there were many villages in delta area of Ayeyarwaddy division with the potential to generate electricity from tidal movements.

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# CALL FOR ENERGY CO-OPERATION

Khin Hnin Phyu, Manmar Times, 13/02/06 www.myanmar.com/myanmartimes/MyanmarTimes16-304/

The director-general of the Energy Ministry's Planning Dept, U Soe Myint, has stressed the need for cooperation between the gov't and private organisations to help develop renewable energy technologies in Myanmar. He said many sectors in Myanmar, including gov't, NGOs and private organisations, were interested in promoting wider application of renewable energy technologies.

He was speaking on February 5 on the second day of a two-day paper reading conference organised by Myanmar Engineering Society at the Myanmar Info-Tech building in Yangon. "There is much potential and capability in this field but we lack mutual co-ordination," U Soe Myint said, adding that co-operation among the various sectors would boost manufacturing capacity, reduce the cost of renewable technologies and enable Myanmar to cope with rising fossil fuel costs and environmental pollution.

The general secretary of the society, U Win Khaing – whose paper was based on the country report he presented at recent ASEAN and Bay of Bengal Initiative regional meetings – said Myanmar had abundant sources of renewable energy. These included hydro, biomass, solar, tidal and wind power, he said. Myanmar produced an abundance of agricultural residue, including rice husks and livestock waste, that can be used to generate biomass energy, said U Win Khaing.

Meanwhile, many small hydropower plants, as well as biogas and tidal power systems, have already been established in the country by local experts and organisations, he said. He said many programs to promote renewable energy have been established by various government ministries, co-operatives, private sector interests and NGOs, but there is "no focal body or national policy at this time to co-ordinate and concentrate all of these resources". "A national policy on renewable energy is urgently needed if Myanmar is to comply with ASEAN expectations for member countries to get 10pc of its required energy from renewable sources by 2015," U Win Khaing said.

# Additional references

See below: '<u>Private Sector Promoting</u> Interest in Renewable Energy' (MT: 12/07/04) 'Rural Areas Encouraged to Make <u>Greater Use of Renewable Energy'</u> (MT: 05/01/04)

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# NATIONAL UPDATE ON ELECTRIC POWER PLANTS

NLM, 18-22/01/06.	www.ibiblio.org/obl/docs2/NLM2006-01-18.pdf
	www.ibiblio.org/obl/docs2/NLM2006-01-19.pdf
	www.ibiblio.org/obl/docs2/NLM2006-01-20.pdf
	www.ibiblio.org/obl/docs2/NLM2006-01-21.pdf
	www.ibiblio.org/obl/docs2/NLM2006-01-22.pdf

**Compiler's note**: This five-part series was published on successive days in the New Light of Myanmar under the title: 'Electric power sector witnesses sustained progress: Increased generating of power in the time of the Tatmadaw Government'. Tables accompanying the articles provide lists of power plants already operating, under construction or in planning. Good photos accompany each article. Otherwise, there is very little new information in this series. Any new facts from the series are included with the appropriate articles throughout the compendium.

#### INDUSTRIALISTS URGED TO DIVERSIFY PRODUCTION

Ye Lwin, Myanmar Times, 09/01/06. http://www.myanmar.com/myanmartimes/MyanmarTimes15-299

The industrial sector has been urged by the Government to advance its position alongside other economic sectors, such as the agricultural and service sectors, and play a more dominant role in Myanmar's economic growth. Speaking at the 12th annual general meeting of the Myanmar Industrial Association (MIA) in December, Lt-Gen Myint Swe, chairman of Yangon DPDC, said diversifying Myanmar's economic base was a key platform to growth. Myanmar's economy is currently largely dependent on the agricultural sector, which accounts for more than 50pc of gross domestic product (GDP), Myint Swe said. "The development of industry plays an important role in achieving economic growth and becoming a developed nation." he said.

MIA president U Myat Thin Aung said the industrial sector contributed 9pc of GDP in fiscal 2004/05 of which 72pc was contributed by the private business sector. As the majority of Myanmar's industrial exports were raw materials or semi-finished products, more emphasis should be placed on producing fully-manufactured goods for export, he said. The MIA was established in 1993 to represent private sector industrialists and has 3,100 members, up from 2,900 in 2004.

Lt-Gen Myint Swe said that import substitution measures currently in place were meant to stimulate the domestic production of agricultural machinery, consumer goods and food that were previously being imported. Eighteen industrial zones had been established throughout the country to promote the industrial sector and create job opportunities, he said. "At present, the most important thing for the industrial zone is to get an adequate electricity and fuel supply," said the general. More than 450 MW of electricity are needed for the 10 industrial zones and residents in the Yangon are but only 420 MW is currently being provided. Only 380 MW can be applied at a time. "Projects are underway to provide 5,000 MW nationwide, not only for consumption by the industrial sector but also for domestic, personal consumption. So far, more than 840 megawatts can be provided across the country," Lt-Gen Myint Swe said.

#### Additional references

NLM, 21/04/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040421.htm

At a meeting of the MIDC, Lt-Gen Soe Win, chairman, said that during the current five-year plan, the industrial sector development had grown by 21.8pc in fiscal 2001-2002; 26.8pc in 2002-2003; and 22.6pc in 2003-2004. Over 100,000 private factories are employing over 2 million workers. Ninety per cent of the private sector industries are small or medium enterprises. Only when SMEs are promoted will it be possible to change from an agro-based economy to being an agro-based industrial nation. Myanmar should not be content with an annual increase of 10pc - 20pc in the industrial sector. The goal is to raise the industrial production at high pace beginning with the current five-year plan; and to markedly increase its participation in the national economy. All the needed infrastructures have been built to reach this end. Some large hydel power projects will be completed in 2004, while others will be completed in 2005-2006 and 2006-2007. The electricity needed for industrial development has been generated. During the current economic plan, the Government has been giving priority to the development of the electric power sector in accord with the

extension of the industrial sector. Discussions will have to be made to materialize the motto - leapfrog with the might of industrial power.

Irrawaddy Magazine, September 2003. <u>http://www.irrawaddy.org/article.php?art\_id=3049</u>

The bulk of Burma's private manufacturing firms are small- and medium-sized light industrial operations. Using labor-intensive methods, they provide products for the domestic market. "There is considerable domestic purchasing power," a business journal editor explains. "Burma's industry is not able to meet domestic demands for soap and medicine." Shortages of capital and the lack of foreign currency are two obstacles to the development of industry. Low production standards are also affecting industrial growth and the development of new export markets. The owner of an electrical equipment factory in Rangoon explains: "We don't have any processes for quality standards on our products. Because we produce cable wires for the domestic market, we don't have to worry about meeting standards." The factory owner knows that shoddy wires can be dangerous for customers, but he argues that testing procedures at the government's Electric Inspection Dept are obsolete. "For some products, they don't even have testing equipment. We could never export our products," he adds. Lack of technology is also a significant factor in Burma's stunted industrial growth. Observers point out that Burma's technological level is poised at the mechanical stage, and that the country has yet to enter the electronic age. Factory owners say the biggest problem is constant power shortages. A Rangoon plastic manufacturer describes his frustration at running a machine for extruding plastic. "When the power is cut off suddenly, the machine stops and we lose everything -- money, time, raw material -- and we waste labor." He says that while the government claims to be providing enough electricity for the whole country, capacities are far too low for heavy machinery.

NLM: 30/03/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020330.htm

At a meeting of the MIDC, Lt-Gen Khin Nyunt, V-C of the Central Committee for Industrial Development, said that development in the nation's industrial zones had fallen short of expectations, [even though] the Ministry of Finance and Revenue had extended loans to industries and the Ministries of Industry had provided technical assistance, machinery and raw materials. For its part, the State had given special priority to agro-based industries, machinery producing industries and import-substitute industries, [but] the industrialists would have to increase investments and introduce innovative means as well as nurture human resources and develop technologies.

NLM, 13/08/99. http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n990813.htm

At a meeting of the Central Committee for Industrial Development, General Maung Aye chairman, said encouragement is to be given to private industrialists to establish industries in the industrial zones. Priority is to be given to the development of industries contributing to mechanized farming, industries manufacturing machinery and equipment and import-substitute industries. Exemption from some forms of taxation is to be granted and for reduction of other taxes. The interest rate for loans disbursed by the banks for [industrial] investment is to be reduced.

NLM, 15/06/99. http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n990615.htm

Minister for Industry No 1 Aung Thaung met with industrial entrepreneurs in Hlinethaya Industrial City. He said Myanmar is changing from manual to mechanized agriculture. The Myanma Industrial Development Committee (MIDC) had been formed [to guide] the development of the industrial sector in line with [these changes in] agriculture. He also spoke of the need to produce personal goods to meet the demand of the increasing population, urging the industrialists to produce quality goods which meet market requirements. The entrepreneurs presented their requirements and the minister gave suggestions.

See below: 'Impact of <u>unreliable power supply</u> on industrialization in Myanmar' (IDE: 10/05) See also other entries under 'Industrial Use of Electricity'. <u>IU</u>

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# POWER CUTS AFFECT ECONOMY IN RANGOON

Aye Aye Win, AP, 04/01/06. <u>www.irrawaddy.org/article.php?art\_id=5335</u>

A shortage of funds, lack of rainfall and rising demand for energy have resulted in frequent power cuts in Burma's capital, disrupting livelihoods and affecting the economy. Rangoon, a city of some 5 million

residents, needs 450 megawatts of electricity daily, but generating capacity at present stands at only 385 megawatts, according to the local journal Weekly Eleven, which quoted the military commander of the Rangoon region General Myint Swe.

An official of the Electric Power Department said that electricity rationing began in several parts of the city in mid-December and could last until June, a month after the monsoon rains set in. Last year regular power cuts began on March 26 and lasted until June 28, the official said, speaking on condition of anonymity. He said the generators at the Lawpita hydroelectric plant could not operate at full capacity due to lack of rainwater in the reservoir, while others are broken down and cannot be repaired for lack of funds. Shortage of natural gas has shut down some gas-powered generators. Lawpita, located 210 miles (350 kilometers) north of Rangoon, is one of the main sources of electricity for the city.

The cuts and brownouts have affected everyone from noodle vendors to apartment block dwellers. "Some of my fish perished when the water heater, oxygen pumps and water purifier stopped during a blackout," said Tun Tun, the owner of pet fish shop. Other small-time businessmen, many of whom can't afford their own generators, said damage to their businesses was particularly acute since the timing of the power cuts was unpredictable.

"On the days when we have no electricity in the day time, we have to get up at midnight to fill our water tanks. When everyone begins to draw water at the same time, there's often an electric overload and it damages water pumps," said Aung Myint, who lives in an apartment. "The timing of electricity supply and timing of government water supply has to coincide. Otherwise, we have to buy water to fill up our water tanks," said another Rangoon resident who relies on the government water supply which he said is available only between 6:00 am and 12:00 pm in his neighborhood.

In neighborhoods spared power cuts, brownouts occur frequently, with the voltage as low as 150 volts, rendering most electrical and electronic appliances like refrigerators and air conditioners inoperable without voltage regulators and other specialized equipment. But power rationing does not affect so-called "VIP areas" -- main roads and residential areas where senior government and military officials reside. Some expatriates who used to prefer living in quiet residential areas now seek out these areas or hotels and service apartments which have their own high-powered backup generators.

The power cuts aren't new. The military regime has been distributing electricity under a rationing system for the past eight years, barely keeping up with rising demand. Total national output of electricity is 845 MW, less than the installed capacity of 1,200 MW and short of the country's electricity needs. The crisis is exacerbated by the draining of foreign exchange reserves needed to buy fuel and spare parts for antiquated generators. Among the only people benefiting are entrepreneurs who sell electric generators and candles. But use of candles among the many poor who live in wood and thatched huts makes their neighborhoods particularly vulnerable to fires. Carrying loudspeakers on vehicles during the dry season, officials warn residents of the danger of blazes in their homes.

# Additional references

See above:'Myanmar cashes up on enery but locals in the dark'(AFP: 15/04/07)'Myanmar learns to live with the lights out'(Reuters: 09/04/07)See below:'Impact of unreliable power supply on industrialization in Myanmar'(IDE: 10/05)

See also other entries under the category 'Consumer Concerns and Power Shortages'. PS

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# <u>Start 06</u>

NIBBAN ELECTRONICS EXPECTS 'IP' PROTECTION FOR ITS PRODUCTS Compilation of Manuals, Guidelines, and Directories in the Area of Intellectual Property (IP) Portfolio Management Customized for ASEAN Member Countries, [Draft], 2006; pp. 241-47 http://www.wipo.int/edocs/mdocs/mdocs/en/wipo\_asean\_ip\_bkk\_06/wipo\_asean\_ip\_bkk\_06\_draft.pdf Nibban Electric and Electronics (NEE) started trading under the name Shwe PAHO Industry in 1972, and entered the electronics market by successfully producing its PAHO adaptor with a DC output in the range 0 to 12V. Its high frequency DC to AC converters for fluorescent lights was first locally produced in 1975. NEE produced two types of high frequency converters, one for industrial use that could illuminate from five to ten fluorescent tubes and another for domestic use that could illuminate a single fluorescent tube of various sizes. However, NEE had to stop production of fluorescent converters, when other local brands entered the market, offering the same quality at lower prices. Around 1976, battery-powered fluorescent tube ballasts came into use countrywide and NEE started to produce the PAHO battery charger that was urgently required in local markets. NEE was successful with this product and demand increased year by year.

In Myanmar, only water-driven electric generators had been used to supply electricity for the country for over one hundred years. Increasing demand for electricity because of the growing population has caused shortages in the last decade. As a result, a quota system was used to supply electricity. Sometimes, the voltage was out of the specified range (220V-240V) and so voltage regulators (step-up transformers) were needed to adjust it. Safeguards for power-line interruptions for unstable voltages were also needed to prevent unexpected damage due to incorrect voltage supplies for items such as refrigerators, airconditioners etc, while using the voltage regulator. The PAHO step-up transformer was put on the market and was able to compete with other local products due to its superior quality, durability and reasonable price. NEE produced different models of transformers according to market needs and adjusted the functions and sizes to harmonize with the end use.

Laterr, NEE has produced several types of safeguards (power line interruptors for low and high voltages) for electronic items such as audio-visual systems, computers, copiers, air conditioners, TVs, DVDs and VCDs, refrigerators, washing machines, radios, phones and overhead projectors. An uninterrupted power supply (UPS) for computers was also produced. PAHO electronic items were accepted as quality products in the local market and attracted consumers with their quality and price. NEE also produced the Auto Star 5 KVA automatic voltage regulator, an electronic circuit motor drive to compete with the Japanese-made Stavol 2.5 KVA type regulator. It met with success in the market due to its high quality and low price. However, production of the automatic voltage regulator was stopped due to lack of raw materials and price increases after the first year.

In 1982, Myanmar television programming was first introduced by MRTV and second-hand Japanese-made television sets which ran on 110/120 volts entered the market. NEE produced a step-down transformer which could convert 220 volts to 110/120 volts, since the Myanmar power supply system only provides 220 volts. At the time, NEE gained a reputation for its PAHO trademark in electronic markets. Japanese-made TV antennae which help to receive good-quality pictures and sound also entered the market. Growing use of television led to an increasing demand for new TV models from Japan and other countries. In 1984 NEE introduced its first model BXR TV antenna onto the local market to compete with foreign products under the Nibban trademark. Although the NIBBAN antenna could compete with foreign products in quality, it was sold at a very low price to attract consumers. After a year, people accepted the NEE antenna and its reputation spread throughout the country. At the time, there was only trademark registration to protect the company from unfair competition and infringing goods.

In 1994, when Myawaddy TV started transmission, a new type of TV antenna was required to receive the programs transmitted by both government stations. NEE created a new TV antenna called the TXR series that gave good-quality sound and vision reception from both MRTV and Myawaddy stations. In the following year, a new model 2-in-1 antenna booster was introduced onto the market to meet consumer needs. In cities, TV antenna have to be set up at the top of buildings to receive clear sound and vision. There is however some difficulty in setting an antenna up on high apartment blocks. NEE introduced a new 2-in-1 TV antenna together with a booster to meet market needs. This model can be set up in front of an apartment to receive programs transmitted from the two broadcasting stations. It also includes a booster amplifier to offer visual clarity and higher volume as well as a noise filter to prevent interference

Up to now, NEE has produced four durable electronic items: the PAHO battery-powered fluorescent tube, the PAHO step-up transformer, the PAHO battery charger, and the NIBBAN TV antenna. In Myanmar there is at present no statutory law to protect intellectual property assets such as trademarks, inventions or designs.

However, NEE has registered the trademarks PAHO and NIBBAN at the Registration Office of Deeds and Assurance through a Myanmar trademark law firm. NEE has tried to preserve its reputation for quality products and to satisfy consumers with its electronic products. It has invested heavily in advertising the brand name of its products using such means as leaflet distribution, advertising on TV and FM radio, taking part in exhibitions, opening of showroom and service center and setting up a sales promotion program. According to the present IP (intellectual property) system in Myanmar, NEE has no chance of protecting its IP assets, especially for product design. However, it has used a special procedure to control the design of its software to prevent unauthorized copying. Moreover, agreements such as nondisclosure in order to protect its IP are included in contracts with employees or partners.

Myanmar became a fully-fledged member of ASEAN on July 23, 1997 and joined the ASEAN Free Trade Area (AFTA) to take advantage of the benefits accorded under the Common Effective Preferential Tariff Scheme (CEPT) which has 15-year time frame running from January 1, 1993. Myanmar anticipates that large quantity of products from other ASEAN countries, including electronic goods, will enter its market in 2008 and that this will lead to an increase in foreign investment in manufacturing in the country. NEE is trying hard to keep abreast of market forces by controlling product quality, improving awareness of its trademark and applying new strategies especially in Research and Development (R&D).

# Addtional references

# NLM, 28/02/06. www.myanmargeneva.org/06nlm/n060228.htm

Dealers' Night 2006 took place at Traders Hotel to honour agents who put the sale of goods produced by Nibban Electric and Electronics top on their lists of priorities. Entrepreneur U Thein Kyi of Nibban Electric and Electronics introduced new items such as Nibban auto and manual voltage regulator, Nibban auto voltage regulator and safeguard, Nibban auto inverter and Nibban digital AVR.

# NLM, 07/09/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040907.htm

A ceremony to honour Nibban Electric and Electronics of Myanmar for receiving (ISO 9001:2000) was held at Traders Hotel yesterday. Present were cabinet ministers, the Yangon Station Commander Brig-Gen Myo Myint, heads of departments, sale agents and guests. Dr Aung Thein of Nibban Electric and Electronics reported on procedures involved in qualifying for ISO 9001:2000 certification and MD Ho Yoon Sin of Daya Manusia Sdn Bhd of Malaysia on the certificate. Proprietor U Thein Kyi of Nibban Electric and Electronics presented gifts to those who rendered assistance in receiving the certificate. The guests viewed new product UPS and antenna.

# NLM, 23/05/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040523.htm

General Soe Win and party visited Nibban Electric & Electronics factory in Thakayta IZ. GM Dr Aung Thein reported on production of TV antenna and related accessories, generators, inverters, chargers and safeguards, and on efforts to produce satellite disc antennae while the proprietor, U Thein Kyi, gave a report on technical know-how. Afterwards, the visitors went to the automobile factory of Nibban UD Group Industries where they inspected production of light trucks and 20-kW generators.

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# PADDY HUSK POWER PLANT TESTED TO CUT RICE MILLING COSTS

Win Nyunt Lwin, Myanmar Times, 19/12/05. www.myanmar.com/myanmartimes/MyanmarTimes15-297/n018.htm

The Ag & Irrig Ministry and Japan's New Energy and Industrial Technology Development Organisation have begun talks on plans for a model project to generate power from rice husks. The power generated by the US\$ 6-million project would be for use by rice mills. The talks follow the completion of a four-month feasibility study which identified Dedaye in Ayeyawaddy division, the country's main rice growing area, as being the best site for the project, said Mr Keisuke Noguchi, the Japan-based deputy director of NEDO's international projects management division. Mr Noguchi told a coordination meeting at the MiCasa Hotel on December 7 that the feasibility study was conducted at Dedaye as well as Pyapon and Kyaiklat in Ayeyarwaddy division and at Kungyangone and Hlegu in Yangon division, where there are many rice mills. A senior executive from Japan's Shikoku Electric Power Co, Shigehiko Hayashi, told the meeting that Dedaye was selected because of its suitability for the power plant and the installation of power lines, as well as the ready availability of rice husks and the co-operation of concerned organisations. The government is yet to grant approval for the project, for which Japan has offered to supply machinery, equipment and technology worth ¥ 701 million (about \$5.7 million). Should the project be approved by both si des, Myanmar would contribute about ¥ 43 million (\$360,000) to build the plant, power lines and other infrastructure.

Mr Noguchi said another study next month would be followed by further discussions aimed at leading to agreement on where and when the project would be implemented. He said the project aimed to reduce the reliance of rice mills on diesel by providing a cheaper power source that would also help them to pgrade production standards. The project was welcomed by government officials at the meeting, who said increased diesel and petrol costs had resulted in higher milling charges that indirectly affected the price paid for rice by consumers.

# Additional references

Kyaw Thu, Myanmar Times, 11/09/05

http://www.myanmar.com/myanmartimes/MyanmarTimes17-333/b004.htm

The Myanmar Inventors Cooperative Society met with a Japanese delegation and an official from the Myanmar Rice Millers' Association on August 30-31 to discuss the implementation of a large-scale rice-husk electricity generator for Dedaye in Ayeyarwaddy Division that would be able to produce as much as 1500 megawatts.

San Thein, Biomass energy production: Prospects and Potential in Myanmar', Myanmar Sugarcane Enterprise, [undated].

http://unit.aist.go.jp/internat/biomassws/02workshop/reports/20051213PP01-01p.pdf

See above:	'Village rice husk power plant will serve as research centre' (MT: 24/09/07)
	'Plans for <u>7-milion-dollar</u> rice husk power plant edge forward' (MT: 27/08/07)
	'Rice-husk generators slated for villages in Yangon division' (MT: 11/06/07)
	<u>'Inventor co-op</u> society exports first rice-husk generators' (MT: 21/08/06)
	<u>'Interest growing</u> in rice-husk generation' (MT: 10/07/06)
See below	'Biogas power plants supply electricity to rural areas (MT: 16/08/04)
	'Biomass gasifier used for tobacco curing in Myingyan (TERI: 08/04)

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# COLLABORATE ON CONTRACTS, ICT SECTOR URGED

Khin Hninn Phyu, Myanmar Times, 12/12/05. http://www.myanmar.gov.mm/myanmartimes/no296/MyanmarTimes15-296/n015.htm

Collaboration in the ICT sector is essential to promote its software outsourcing capability, said the president of the Myanmar Computer Industry Association, U Aung Zaw Myint. "We should not work against each other but instead work in collaboration to compete against other countries," he said.

U Aung Zaw Myint said ICT was the world's largest industry and provided opportunities for Myanmar software firms to earn export income by outsourcing products and to help accelerate the development of the sector rather than competing on the domestic market. He said collaboration among software firms would enable them to overcome challenges in handling big outsourcing projects because of a limited number of qualified personnel. "We need to cooperate and support one another for the development of our industry," U Aung Zaw Myint said.

He was speaking at a workshop held at Myanmar Info-Tech on November 5 to foster collaboration among software companies. Specialists from five leading software outsourcing companies – Myanmar Information Technology Pte Ltd, Myanmar.net, Azure Net, Computer Marketing and the Myanmar Computer Company Group – gave presentations at the workshop to assist in planning the steps needed for closer co-operation.

The managing director of Azure Net, U Win Maw, said co-operation within the sector would strengthen its ability to win big outsourcing contracts from other countries because most ICT companies had about 20 employees. "Co-operation among companies would enable 100 or 200 people to work on big projects," said U Win Maw. The chief executive officer of the MCC Group's SoftSys Division, U Aung Soe Lin, said developing a reputation for quality was the most important factor for winning overseas outsourcing contracts. Companies that had focussed on raising quality and skill levels would find it easier to gain trust in the market, he said.

The assistant general manager of Myanmar Information Technology Pty Ltd, U Nay Linn Than, said the strengths of the sector included the speed at which it upgraded its capacity and applied new technology. However, one barrier to overcome was a need for more highly trained personnel as most foreign companies sought business partners whose employees had internationally-recognised qualifications. "It is important for the industry to clearly understand that we need to invest in human resources development," U Nay Linn Than said.

# Additional references

See above:Homegrown softwareindustry struggles on (MT: 12/03/07)See below:'Electronics industry spreading roots in industrial sector' (NLM: 06/06/04)'Software growthbadly in need of human touch' (MT: 16/10/00)

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# HYDROPOWER DEPT AND EGAT INK AGREEMENT ON HUTGYI PROJECT

NLM, 10/12/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051210.htm

An agreement signing ceremony between the Hydroelectric Power Department and EGAT Plc Ltd of Thailand on the Hutgyi hydropower project to be implemented on the Thanlwin river in Kayin state took place at Hotel Nikko [in Yangon] this morning. It was attended by Ministers, Deputy ministers, Heads of Departments, Thai Minister for Energy Viset Choopiban, the Head of departments of the Ministry of Energy of Thailand, Thai Ambassador Suphot Dhirakaosol and embassy staff, CEO Kraisri Karnasuta and officials of EGAT Plc Ltd. Mr Kraisri Karnasuta and Director-General Win Kyaw of the Hydroelectric Power Department extended greetings and Minister for Electric Power Tin Htut and Minister for Energy Viset Choopiban made addresses on the occasion. Director-General Win Kyaw and Mr Kraisri Karnasuta signed the agreement and exchanged notes. Hutgyi Hydropower Project will jointly be implemented by the Hydroelectric Power Department and EGAT Plc Ltd. The power plant will be equipped with a 600-MW turbine that can produce 3,820 million kwh yearly.

**Topographic map reference**: Thailand: 1:250,000: Series L509, U.S. Army Map: NE 47-10: Li Hutgyi dam, 33 km downriver from confluence of Salween and Moei, grid square reference: 19/3, 3/6 http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-ne47-10.jpg

# Addtional references

Bangkok Post, 11/11/07 http://www.bangkokpost.com/Perspective/11Nov2007\_pers001.php

Construction work on the Bt-36-billion-(US\$1.1 billion-) Hut Gyi dam was scheduled to begin in 2008. But Egat has not sent any employees to the Hut Gyi site since an artillery attack that killed a Thai engineer in September. "The decision on the status of the Hut Gyi dam is likely to be made when the new (Egat) governor takes office," said an Egat official. Another reason for the present lull may be that an overall decision on the involvement of Thailand in developing dams on the Salween would probably have to be made by an elected government some time after the December 23 general election in Thailand. Activists like Pianporn Deetes of the Living River Siam-Southeast Asia Rivers Network (SEARIN) say that Hut Gyi was chosen as the first dam construction site because its inundation area would be completely inside Burma, and that consideration of the adverse environmental and social effects of a dam at Hut Gyi has not been a priority for the Thai government, much less the Burmese. However, in light of the strong opposition from environmental and human rights organisations, Egat finally hired the Environment Institute of Chulalongkorn University to conduct an Environmental Impact Assessment. But the EIA has been classified as confidential,

with only Egat having disclosure rights. Egat has also declined to discuss details of the agreement with the Burmese authorities on the construction of the Hut Gyi dam. Egat says it can't reveal details unless it receives permission from its counterpart in Burma. In late October, Dr Thaweewong Sriburi, chairman of the Environment Institute, claimed that only 42 families in Burma would need to be relocated because of the dam. He also said that leaders of the Karen National Union (KNU) and the Democratic Karen Buddhist Army (DKBA) support the construction. Environmental activists have proposed that the Thai government authorise an independent EIA so that the full impacts of the proposed dam to the river and the locals can be revealed. They cite as an example the Chinese-initiated project to blast reefs and shoals in the Mekong River. In 2003, the Thai cabinet called for an EIA study which has halted the explosions until now.

### Sai Silp, IRROL, 31/10/07 http://www.irrawaddy.org/article.php?art\_id=9156

Pornchai Rujiprapha, secretary-general of Thailand's Energy Ministry, also chairman of EGAT, told a press conference on Tuesday that the Hutgyi electricity generating project is essential to energy stability because Thailand now mainly uses natural gas to produce electricity. "Natural gas supply is decreasing and the cost is increasing, so other sources and kinds of energy are needed from both Laos and Burma," he said, according to a TNA report. He said Egat has designated Bt120 million (US\$3.6 million) to assist in public health, education and employment for local villagers in the Hutgyi dam area. Meanwhile, the Thailand Human Rights Commission organized a public forum on the dam that included people from the affected area. Pianporn Deetes of the Southeast Asian Rivers Network told the Irrawaddy that the commissioners have agreed to ask the government to stop the project because of its negative impact on villagers and the environment in both Thailand and Burma. Thaweewong Sriburi of the Environmental Research Institute of Chulalongkorn University in Bangkok told the forum that a survey of the sites in Karen state found it is a conflict zone between the DKBA and the KNU. "The leaders of these groups support the construction, but urge assistance for quality of life developments for the villagers," he said. An impact survey on the Thai side of the border has not been completed, he said.

# BKK Post, 29/10/07. http://www.rebound88.net/

Thailand's National Human Rights Commission (NHRC) has completed an initial environmental and social impact study of the controversial Hutgyi hydropower dam project on the Salween river. EGAT, the developer of the dam, has yet to come up with a report on the proposed dam's potential impact on the environment and local communities. However, EGAT has conducted an environmental impact assessment study for the Burmese side. The NHRC report includes damage to the livelihoods of ethnic groups living on Thai territory along the Salween river who might have to be relocated and possible devastation to the river's ecology. The Thai and Burmese governments signed an MoU to study the possibility of building dams along the Salween river in 2005. The Hutgyi project, about 30 km from the Thai border in Mae Hong Son, has an estimated capacity of 1,200 MW. Work on the 36-billion-baht dam was scheduled to begin in 2008 but survey work was temporarily suspended after a Thai engineer was killed in an artillery attack in Sept 2007.

# Salween Watch Coalition Statement, 05/09/07. http://www.burmanet.org/news/2007/09/05/statement-of-

salween-watch-regarding-the-attack-on-the-egat-workers%e2%80%99-camp-of-the-hat-gyi-dam-site/ The blast at the workers' camp at Hat Gyi happened because EGAT's operations have been shrouded in secrecy. They have totally disregarded voices from civil society warning about the lack of security and extensive human rights abuses in the Salween River basin, where civil war between ethnic forces and the Burma Army has been continuing for over five decades. EGAT's investment in dam projects has never taken into account the real costs and risks of operating in areas where fighting and human rights abuses are taking place. The power plants will be located in exceptionally volatile areas, where numerous armed forces are in conflict. There is a constant risk of attack from various forces at any time. This incident is now being used to justify the increased deployment of Burmese troops in the area, directly contributing to the conflict. EGAT must take responsibility for [its] failure to transparently and comprehensively consider the risks of operating in a war zone.

# AFP, 05/09/07. <u>http://www.burmanet.org/news/2007/09/05/agence-france-presse-thai-firm-says-attack-wont-stop-myanmar-dam/</u>

EGAT, Thailand's biggest utility company, vowed Wednesday to press ahead with its one-billion-dollar dam project in eastern Myanmar, despite an attack by ethnic rebels that killed a worker last weekend. "We will continue with the project after the Myanmar side promised to step up security to ensure the safety of our staff," said EGAT official Apichart Dilogsopon. "The project is a joint venture between Thailand and Myanmar.

# Bangkok Post, 04/09/07. <u>http://www.burmanet.org/news/2007/09/04/bangkok-post-thai-dam-project-in-burma-suspended/#more-8693</u>

Thailand's state-run utility EGAT decided Tuesday to suspend its exploration for a new hydropower dam on Salween River until safety is ensured. Kraisi Karnasuta, EGAT governor, revealed the Hatkyi project had to be put on hold indefinitely after EGAT employee Samarn Kantameun was killed in an attack over the weekend. He was the second victim after the first fatality, a geologist, stepped on a landmine near the project site last May.

Saw Yan Naing, Irrawaddy On-line, 04/09/07. <u>http://www.irrawaddy.org/article.php?art\_id=8484</u> Saman Kantameun, 53, a Thai engineer employed by EGAT, was killed on Sunday (02/09/07) in a grenade attack by an unidentified group at the construction site of the controversial Hat Gyi dam near the Salween river in Karen state. Forty-two EGAT workers left the site and returned to Thailand for security reasons. The state-run New Light of Myanmar claimed the Karen National Union fired heavy artillery shells into the camp, but Apichart Dilogsopon, a spokesperson for EGAT, told AP he didn't know whether the rebels were from the KNU or if EGAT officials were the intended target. "We will work with officials in both countries to see how we can step up security measures," Apichart said. The general secretary of the KNU, Mahn Sha, recently met with EGAT officials and gave the company permission to conduct a survey near the construction site, but rumors have circulated that some KNU leaders who control the area around the Hat Gyi dam strongly oppose the project.

NLM, 04/09/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070904.htm

On 2 September, a group of KNU terrorist insurgents fired heavy weapons at Malaryu in Hlaingbwe township where 13 Thai nationals engaged in the Hatkyi Hydropower survey project and an interpreter are accommodated. A shell from the heavy weapons landed on the site and exploded, leaving Mr Smarn, 54, a Thai national, dead.

Reuters, 03/09/07. http://www.alertnet.org/thenews/newsdesk/BKK297351.htm

The KNU has denied responsibility for an attack in which a 50-year-old surveyor was killed on Sunday (02/09/07). It said the attack was orchestrated by Myanmar troops with the intent of discrediting the group. "How could we do it when it is an area tightly secured by Myanmar troops?" KNU secretary-general Mahn Sa-la-pah told Reuters. "They want the Thais to hate us."

# Nation (Bangkok), 03/09/07. http://www.burmanet.org/news/2007/09/03

A Thai EGAT worker at the construction site of the Hat Gyi dam in Burma died in a grenade attack on 02/09/07. Two men on a motorbike threw two grenades into the Egat camp where some 40 workers live. The bomb killed a worker identified only as Saman and injured others.

Saw Yan Naing, Irrawaddy On-line, 29/08/07. <u>http://www.irrawaddy.org/article.php?art\_id=8416</u>

The KNU gave permission for an EGAT team to conduct two-day survey mission on the Salween despite continuing opposition to project by local villagers. The team jad attempted to reach the dam site by boat along the Moei but had been turned back at a KNU checkpoint on the Moei, but the KNU later relented and gave permission, according to KNU Gen-Sec'y Mahn Sha. Karen River Watch Director Saw Nay said the project will involve mass relocation and use of forced labor. Construction is due to start in Nov-07 and end in 2013. Half the construction costs will come from Thailand, 40pc from China and 10pc from Burmese government.

Violet Cho, Irrawaddy On-line, 23/08/07. <u>http://www.irrawaddy.org/article.php?art\_id=8327</u>

Thailand's energy authority EGAT held talks with leaders of the KNU on Thursday on a controversial proposal to build the Hat Gyi dam on the Salween River. The dam has run into strong opposition by local villagers. According to the Karen River Watch, the KNU gave EGAT permission last month to conduct a feasibility study on the dam. At the talks in Mae Sot, the EGAT delegation consisting mostly of engineers, appealed to the KNU to help the project proceed. The KNU's Lt-Col Roger Khin said no decision had been taken at the meeting, and KNU leaders would now consult with other executive committee members. The EGAT delegation was promised a decision within two weeks, he said.

Xinhua, 06/08/07. http://news.xinhuanet.com/english/2007-08/07/content\_6486386.htm

Soil tests were conducted recently at three ports along the banks of the Thanlwin with the co-operation of experts of EGAT, in connection with the Hutgyi hydropower project. The generating facility will have a 600-MW turbine that can produce 3.82 billion kWh. The project was agreed to between two countries in June 2005, quoting the Weekly Eleven News.

#### Salween Watch Newsletter, August 2007.

http://www.salweenwatch.org/downloads/Salween%20Watch\_Vol%201%20August%202007-1%20FINAL.pdf The Hat Gyi dam will be located 33 km downstream from the Salween-Moei river confluence. The area has been largely depopulated due to forced relocations. At a meeting with the EIA [Environmental Impact Assessment] team [of EGAT], Salween Watch learned that the installed capacity will be 1,200 MW, while the dependable capacity of Hat Gyi dam throughout 24 hours will only be 200 MW. The routes for the power grids have not been fixed and long term security concerns will have to be considered. Without integrated water management, the installation of large dams upstream will inevitably affect water management at the Hat Gyi dam. The EIA team has not come up with a clear analysis of the impacts of the dam on the whole ecological system of the Salween. The team admitted that they are unfamiliar with various issues they are studying, which have not arisen at dam sites in Thailand. Geographical and environmental conditions differ significantly between the two countries, including the extreme depth and strong torrents of the Salween and its large delta which are different from those found in Thailand. The team promised that after completion of the initial study report in the next two months, they would convince EGAT to hold public forums to present the information and receive inputs from concerned parties.

Irrawaddy On-line, 20/07/07. http://www.irrawaddy.org/article.php?art\_id=7943

EGAT confirmed its engineers returned to the Hat Gyi dam site to work, but they refuse to stay overnight and insist on Burmese army escorts.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information see '<u>Power Profile</u>'. In December 2005, an MOU was signed between MEP and EGAT for the \$1-billion, 600-MW Hutgyi dam and hydro project with construction scheduled to begin in in December 2007. Output from this plan is expected to be 4 TWh/yr with most power exported to Thailand.

Mizzima, 19/07/07. http://www.mizzima.com/MizzimaNews/News/2007/July/44-July-2007.html

EGAT renewed activities related to a feasibility study at the Hat Gyi dam site on 03/07/07. Thirty EGAT engineers and employees travel back and forth to the site from Pa-an on a daily basis; they travel 44 miles by car from Pa-an to Myaingyingu, thence by boat to the dam site. They are currently measuring the highest level reached by the water during the rainy season. LIB 549 is now responsible for security at the site, alongside battalion 555 of the DKBA. The number of government troops is expected to increase by 800 at the site and along the main route to the dam, Karen Rivers Watch reports that the old road from Hat Gyi to Mae Ta Rit will be repaired or rebuilt to improve access to the site.

Kyaw Thu, Myanmar Times, 21/05/07. <u>http://mmtimes.com/no367/b002.htm</u>

An official of EPM No 1 said on 15/05/07 that surveying at the Hutgyi dam site in Kayin State had been stopped over the rainy season. A draft feasibility report for the project will be finished by July-07. Additional information required to finalise the report will be acquired when surveying work resumes after the rainy season. The Hutgyi hydropower plant is expected to cost US\$ 1 billion and will generate 600 MW. It is being developed by Myanmar's Dept of Hydroelectric Power, Thailand's EGAT and China's Sinohydro Corporation.

# Myanmar Times, 19/03/07. <u>http://mmtimes.com/no359/b\_brief.htm</u>

A group of environmental-assessment experts from Thailand's Chulalongkorn University will interview villagers near the site of the Hutgyi hydropower project on March 28, according to an official from EPM No 1. A team of ten will consider the social and environmental impact of the US\$1-billion project. They will study how people at the dam site might be affected by construction of the project. Group discussions with villagers will be included. The Thai academic group will be assisted by a group from EPM No 1 who will help collect information by providing translation services and data from other Myanmar gov't depts.

#### Network Media Group, 14/03/07.

http://www.bnionline.net/index.php?option=com\_content&task=view&id=1426&Itemid=6

Over 500 local residents staged a demonstration on the Thai-Burma border near the Salween River on the 'Global Day of Action against Salween Dams in Burma' (14/03/07) demanding that the Burmese military junta and foreign companies put a halt to the planned Salween dam project. The demonstrators included people from about 30 villages in Burm'as Papun district and Thai hill people as well as NGOs. Saw Karen of Karen Rivers Watch said the protest was to emphasize the disadvantages that will result if dams are built on the Salween. "There will be human rights abuses and thousands will be displaced and homeless if the dams are built. We want to send a message not to build the dams," Saw Karen said.

Pianporn Deetes, Nation (Bangkok), 28/02/07. www.burmanet.org/news/2007/03/02/

All planning and decision-making concerned with five proposed EGAT dams on the Salween have been conducted discreetly. The deals have been brokered with no public participation or transparency. EGAT has refused to disclose agreements made with the Burmese junta claiming obligations of confidentiality. Ordinary villagers who will be directly affected by the dams have not been kept informed by the state. The claim by Thai Energy Minister Piyasvasti Amranand' that work on construction of the dams is still far away contrasts with the reality on the ground. Preparatory work at the dam sites in Burma's Karen and Shan states has not ceased. Chulalongkorn University's Environmental Research Institute was commissioned by EGAT to conduct an environmental impact assessment in Burma in Nov 2006, the same month that Piyasavati claimed the dam plan would not be re-assessed by the Thai gov't.

Sai Silp, Irrawaddy On-line, 22/02/07. http://www.irrawaddy.org/article.php?art\_id=6755

Thailand's giant electricity investor Ratchaburi Electricity Generating Holding Plc (RATCH) is negotiating with various business alliances to fund and construct multiple hydro-electric dam projects in Burma. Narong Sitasuwan, chairman of RATCH, said negotiations on shareholding agreements between companies are ongoing. RATCH is ready to invest in the 1,200-MW Hutgyi dam project with EGAT, along with a Chinese business counterpart, if EGAT supports RATCH's co-operation. RATCH is a registered company on the Stock Exchange of Thailand. EGAT holds 45% of the shares in RATCH which has many projects ongoing in Thailand and overseas. RATCH is curently conducting feasibility studies on co-investing opportunities in hydro-electricity projects in Burma. A report will be released in the final quarter of 2007. The interim PM of Thailand, Surayud Chulanont, told his Burmese counterpart in Nov-06 that Thailand's interim gov't will respect agreements between the two countries approved by the gov't of deposed PM Thaksin Shinawatra. Environmental and rights activists are preparing to stage protests on 28/02/07 against the controversial Hutgyi Dam project on the Salween River. Activists from more than 10 cities worldwide will stage protests against the construction of the dams at Thai embassies and consulates in cities worldwide, including in Tokyo, Washington, San Francisco, Sydney, Delhi, Berlin and Paris. Opposition groups claim the investment of about US \$1 billion for the construction of the dam will help to support human rights violations against ethnic groups in Burma.

Kyaw Thu, Myanmar Times, 05/02/07. http://mmtimes.com/no353/b003.htm

Myanmar and Thai survey teams are at the Hutgyi dam site to help complete a feasibility study leading to construction of a hydroelectric power plant on the Thanlwin River according to an EPM No 1 official. The additional field work follows survey work done by EGAT from Feb to May in 2006. The survey report will be completed in August, 2007.

Kyaw Thu, Myanmar Times, 18/09/06.

http://www.myanmar.com/myanmartimes/MyanmarTimes17-334/b003.htm

The Hutgyi hydropower project will be moved two km downstream in order to raise its projected output, according to an official of EPM No 1. The move will allow for increased water storage and will raise power output to 1100 MW – 1500 MW. The dam will be located about 30 km from the Thai border. "Thailand needs more power so we changed the design and location. " the official said. The cost of the project, initially estimated at about US\$1 billion, will also change as a result of the move. Work, such as building and repairing roads to the site, will begin when the rainy season ends. A joint venture company will be formed to carry out the construction of the dam and power plant. Myanmar will receive 25% of electricity generated by the project.

AFP, 27/06/06. <u>http://www.burmanet.org/news/2006/06/27</u>

China's Sinohydro Corp will co-operate with EGAT to build a billion-dollar hydropower station at Hutgyi on the Salween River near the Thai border, according to a statement from the PRC's State-owned Assets Supervision and Administration Commission. The plant will have an installed capacity of 600 MW and will be the first of five that Thailand, China and Myanmar have previously said they would build on the 2,800-km-long (1,750-mile) river, the longest undammed waterway in south-east Asia.

### Karen Rivers Watch, 17/06/06. <u>www.searin.org/Th/SWD/swd\_d2e.html</u>

Local villagers hired to work at the [Hat Gyi] dam site were paid K 4000 per day during survey operations. They are not in favour of building the Hat Gyi (Taung Kyar) dam, since it will result in the displacement of many villages including Htee Paw Mu Naw and Mae Par which will all be inundated. Some have moved away from area, taking their belongings, cattle and buffaloes. They are simple farm workers who depend on the fertile silt carried down by the river for their farms. The slowing of the current when the dam is finished would mean less silt being available, also much of the farmland would be flooded. The villagers feel unable to do anything about the decision to go ahead with the dam. Since the the explosion that killed a Thai surveyor, checkpoints have been set up and every boat going up or down river is closely checked.

#### Jessicah Curtis, Mizzima, 31/05/06. http://www.burmanet.org/news/2006/05/31/

Egat has cut short the survey phase of the Hat Gyi dam in Karen State after a worker died from injuries sustained in a landmine accident in Burma. Surveyor Chana Mongplee lost a leg on May 3 after stepping on a landmine near the proposed dam site. He died as a result of his injuries on May 9th. "We didn't feel very secure and the survey was almost complete anyway," a company spokesman said. The project will continue without the completed survey.

#### Sai Silp, Irrawaddy On-line, 01/03/06. <u>http://www.burmanet.org/news/2006/03/01</u>

A group of Thai senators plans to resubmit an official letter to the Ministry of Energy urging disclosure of details of an MoU signed by Egat Plc for construction of a hydro electric dam on the Salween River. A previous request was denied in a meeting between environmental groups and representatives of EGAT. The legislators, who are represented on the Senate's Committee for Social Development and Human Sustainability, were prompted to take the action by an unofficial report by local environmentalists that ethnic minority populations who could be adversely affected by the dam had fled the proposed construction area for Mae Hong Son in Thailand. According to Senator Tuenjai Deetes, the company claimed that it could not discuss the project without getting permission from the Burmese government. The senate group also wants Egat Plc to allow for public participation and input by openly declaring the scope and progress of the dam project.

#### Salween Watch, March 2006. <u>www.salweenwatch.org/dam\_site.html</u>

The first of four giant dams to be built by EGAT and the Burmese and Thai governments on the Salween river will be near Hat Gyi about 33 km downstream from the confluence the confluence of the Salween and Moei rivers. The dam site is at a point on the Salween where there is a powerful rapids that becomes a waterfall when water flow in the river is reduced in the dry season. The area is part of the Kahilu Wildlife Sanctuary. Work on the dam is expected to commence in late 2007. Distribution of power to Thailand scheduled to begin in 2013-14. The Thai and Burmese governments have agreed to keep all data and joint studies on this project strictly confidential. A pre-feasibility study carried out by Japan's NEWJEC group in 1999 recommended a low height, run-of-river dam having a capacity of 300 MW. On 14/11/ 05, a statement by the Thai energy minister cited a new feasibility study which indicated that "electricity production could be increased to 1,200 MW" by construction of a substantially higher dam which would create a much larger reservoir.

# Kyodo, 10/12/05. <u>http://findarticles.com/p/articles/mi\_m0WDP/is\_2005\_Dec\_12/ai\_n15957111</u>

On 10/12/05, officials from Thailand's EGAT and Myanmar's Dept of Hydroelectric Power signed an MoU about a hydropower project on the Salween river in Yangon. The ceremony was attended by Myanmar's Minister of Electric Power and Thailand's Energy Minister Viset Choopiban. Thai media reported that EGAT plans to eventually build five dams along the Salween that would generate a total of more than 10,000 megawatts of power. According to sources at Myanmar's electric power ministry, about 90pc of the power generated by hydropower plants along the Salween is expected to be exported to Thailand.

Thai News Agency (TNA) as reported in the Bangkok Post, 07/12/05.

http://www.bangkokpost.com/breaking\_news/breakingnews.php?id=66217

Thailand and Burma plan to sign an MoU on building a series of hydroelectric dams in Burma on Friday (10/12/05), according to the president of Egat Plc, Kraisi Kanasuta. Mr. Kraisi said that the construction of five dams that will generate over 10,000 MW was planned along the Salween River. The project would not only secure electricity for Thailand, but also provide much-needed income for Burma, Kraisi said. The project will also support an integrated power grid plan of ASEAN, according to Kraisi. Egat [Plc], previously known as Electricity Generating Authority of Thailand (EGAT), would sign the MOU with Myanmar's state electricity organisation to jointly invest in construction of the series dams along the Salween River, he confirmed. The Hat Gyi hydroelectric dam, the first of the series, will take five to six years to complete, and will have a capacity of 1,200 MW. China is expected to participate in the project and this will help reduce the cost of construction. China has nearly completed the Three Gorges Dam along the Yangtse River; so equipment there could be used for the Salween dams project, Mr. Kraisi said. But further discussions would be needed before deciding on China's participation.

Thai Press Reports: 14/11/05 http://www.burmanet.org/news/2005/11/16

Energy Minister Viset Choopiban said talks between his ministry and the electricity ministry of Myanmar were held recently about possible construction of five or six hydroelectric dams on the Salween River which could generate electricity up to a total of 20,000 MW. The Hat Gyi dam is expected to be the first of the series. According to a feasibility study, its production could be increased to 1,200 MW from an earlier estimate of 700 MW. The planned joint investment in hydropower production with Myanmar will benefit both countries and create a stable energy supply for Thailand, while Yangon would gain additional revenue, Mr Visert said. The recently privatised Egat Plc, formerly the Electricity Generating Authority of Thailand (EGAT), has expertise in production of electricity and will provide joint investment in the project with the Myanmar government.

See also: 'Hydropower planned for <u>border industrial zones</u>' (MT: 31/05/04)

Images Asia - TERRA report, November 1999. <u>http://www.angelfire.com/rock3/shanyouth/body/status-of-salween-dam-plans.html</u>

A pre-feasibility study for the Hutgyi hydropower project on the Salween River places it 33 km downstream from the confluence of the Salween and Moei Rivers near the former Karen resistance headquarters of Manerplaw. The study resulted from an agreement between MEPE and a group of developers including Marubeni Corp of Japan and Italian Thai Development Plc of Thailand. It was carried out by a Japanese consulting group, NEWJEC Inc, a subsidiary of Japan's Kansai Electric Power Co, and was completed in August 1998. It proposes a concrete gravity dam 37 m (121 ft) high from base to top. It would be a so-called "run-of-river dam" that would not have a large reservoir. The 'normal high water level'of the dam would be 48 metres (157 feet). The dam would have eight 37.5-MW turbines for a total installed capacity of 300 MW and is expected to produce 2,150 gigawatt hours of electricity per year. A 230-kVA power transmission line would connect the dam to the Burmese power distribution point at Thaton (or Pa-an). Another 230-kVA line could connect the Hutgyi station to a Thai electricity substation in Tak, some 230 km away. The Burmese side appears to be more interested in the project than the Thais.

WIND POWER SYSTEM IDEAL FOR VILLAGES, SAYS ENGINEER

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Khin Hninn Phyu, Myanmar Times, 05/12/05. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes15-295/n009.htm</u>

A Yangon engineer says a low-cost wind power system he has built offers an ideal solution for rural communities needing a cheap source of energy. U Nyan Htoo, who took about two-weeks to build the system at his workshop on Saya San Road, said it was designed to generate power at wind speeds as low as eight miles an hour. "I made the system to be very simple so that village people can run it easily," he said. "All of the parts except the generator can be easily maintained and repaired."

U Nyan Htoo said the system was made mainly from easily available raw materials. The blades for the windmill were made from polypropylene sheets fitted to pieces of timber. The system can be used to charge eight or 12 volt batteries or power four 10-watt fluorescent tubes and a black and white television, he said.

Unlike solar power systems which can operate only during the day, the advantage of using wind power was that it was available around the clock, subject to wind speeds. As the system needed only low wind speeds, it was suitable for use in most areas of the country, said U Nyan Htoo, who has been experimenting with wind power for nearly eight years.

U Nyan Htoo said he built the system with funding support from an NGO, the Friends of the Rainforests in Myanmar. The prototype cost K 300,000 but future versions would be available for FEC100 to make it affordable for use at village level, he said. The prototype made its debut at a village electrification exhibition held at the Sayar San Plaza at Bahan township from November 2<sup>nd</sup> to 4<sup>th</sup>. It is due to be installed at a project site of Friends of the Rainforests in Myanmar in central Myanmar.

# Additional references

NLM, 13/06/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070613.htm</u> While in Kunming, EPM No 2 Khin Maung Myint met with the chairman of Sichun Tonghui Industrial Group, Hongyuan Jin, and they discussed a power grid project and establishment of windmills in the Myanmar coast.

See above: <u>'Wind energy</u> boost rural development' (MT: 05/03/07)

# NLM, 06/10/05. <u>http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051006.htm</u>

At the inauguration of a windmill in the model village of Kyaungwa in the eastern part of Ye township along the border with Thailand, Daw Ywet Wah Myint spoke words of thanks. She said that the development of the economy and improvement of living standards in the region had made it possible to have diesel and petrol generators to produce electric power. Now, a windmill had been installed at the village power station. Kyaungwa has a station hospital, a high school, a TV re transmission station and a self-reliant library. There are cold storage facilities, ice factories and fish meal plants established in the village and local residents have jobs and earn a lot of money. In Asin model village in the western part of Ye township, VPDC Chairman U Maung Myint formally opened a windmill generator. Town-elder U Kyaw Maung spoke words of thanks. He said that in Asin Village residents were involved in fish farming. As the price of oil was increasing, they were finding it difficult to maintain the supply of electricity needed. The people were very pleased that the village now had a power station equipped with a wind mill

NLM, 19/09/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm//n050919.htm

Minister for Industry No 1 Aung Thaung and officials inspected Mibamyitta Dynamo and Electrical Appliance Factory in South Dagon IZ No 2. While inspecting spare parts for producing of generators, the minister heard a report presented by the deputy director-general of Industrial Supervision and Inspection Dept on measures being taken for production of windmills and wind-power generators to be used in projects under the ministry and ways and means for using them to produce electricity.

NLM, 17/09/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050917.htm

Mines Minister Ohn Myint attended the opening ceremony of a wind power generator in Kadoe/Kawhnat village of Mawlamyine township on 15 September. VPDC Chairman U Maung Shwe and Village USDA Organizer Daw Aye Aye Myint formally opened the generator. Village-elder U Kyee Myint spoke words of thanks. He said the village faced difficulties in supplying power with the use of a diesel-fired generator. He thanked the government for launching the wind-powered generator as power was essential for the development of the industrial sector of the village. Besides the new generator education facilities in the village had been upgraded, a station hospital worth K 60 million had been built, an earth road constructed, drinking water was now available.

May Thandar Win and Su Myat Hla, Myanmar Times, 04/07/05 http://www.myanmar.com/myanmartimes/MyanmarTimes14-273/b006.htm Renate Schlemmer, the managing director of the Aureum Palace Hotel and Resort which owns hotels under development at Ngwe Saung, Ngapali and Bagan said diesel consumption to generate electricity at her hotel usually takes up about 10pc of the total income. She suggested that establishing windmills at beaches would be the best way to provide electricity for hotels. A windmill costs only US\$300,000, while beach hotels must spend about \$60,000 a year on electricity, she said. "If you put in one or two windmills, you can fire the whole stretch of the beach. You don't need diesel – it's one-time investment and you have power," Mrs Schlemmer said. "And it's environmentally friendly, which could be a marketing point," she added.

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# YANGON CITY ELECTRIC POWER SUPPLY BOARD LAW ENACTED

NLM, 23/11/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051123.htm

The following are some of the key provisions of the Board of Yangon City Electric Power Supply Law, enacted by the SPDC on the 22nd November 2005 and published the following day without further comment by official media.

3. The Ministry of Electric Power, with the approval of the Government: (a) shall form the Yangon City Electric Power Supply Board comprising from a minimum of seven members to a maximum of fifteen members with technicians and suitable citizens, in order to carry out electric power works effectively within the area of the Yangon City Electric Power Supply.

4. The Board shall be directly responsible to the Minister of the Ministry of Electric Power.

7. The Board shall perform the following functions and duties within the area of the Yangon City Electric Power Supply:

(b) carrying out measures for enhancing the development of the electric power sector for Yangon City on a par with international standard;

(c) carrying out measures to supply sufficient electric power to the consumers of electric power;

(d) carrying out measures to prevent cut off of the supply of electric power, the loss of electric power and to collect electric power fees fully;

(e) distributing electric power to the consumers of electric power in line with prescribed voltage and current systematically, in accordance with the stipulations;

(g) inspection of the electric power works owned by the Board and causing inspection to be made by a team or by any individual;

(h) inspection of the use of electric power and causing inspection to be made by any individual;

8. The Board has the powers to carry out the following in the area of Yangon City Electric Power Supply:

(b) purchasing necessary electric power at the rate prescribed by the Ministry of Electric Power;

(c) determining and altering the rates of electric power fee with the approval of the Ministry of Electric Power;(d) cutting off the electric power supply if there is failure to pay electric power fees during the prescribed period;

(f) granting permission, if necessary to any organization or any individual to operate any electric power works as a business taking charges with the approval of the Ministry of Electric Power in the locality where electric power cannot be supplied fully as yet by the Board;

(g) arranging for development of electric power works and safety from electrical danger by making use of modern and advanced technology;

(h) scrutinizing and permitting the application for the use of electric power;

(i) cutting off electric power, if necessary, after investigation on the loss of electric power and the use of electric power by illegal means, and passing decision on the prescribed compensation;

11. The Board shall form offices at different levels to carry out the electric power works within the area of Yangon City Electric Power Supply as follows: (a) The Board of Yangon City Electric Power Supply Office; (b) The District Electric Power Supply Offices; (c) The Township Electric Power Supply Offices.

17. The Board or the inspection team and person assigned duty of inspection under section 16 have the right to enter into the relevant land and building to inspect the electric power works and the use of electric power.

19. The Board shall subsist on its own funds. In addition, it shall take responsibility for all its financial matters. It may take loans with the approval of the Ministry of Electric Power from the Government, or local and foreign organization or person, if its own funds are insufficient.

27. The Board shall pass an order on any person who commits any of the following acts in respect of electric power owned by the Board, which is in the process of execution by the Board, to pay the prescribed amount of money as compensation to the Board:

(a) transferring without the permission of the Board any electrical equipment to any other person;

(b) allowing the use of electric power by way of distributing to any other person, without the permission of the Board;

(c) using the electric power not allowed to be used for commercial purpose from general purpose meter or domestic power meter;

(d) consumption of electric power exceeding the power load limit of the industrial power meter;

(e) diverting of electric current without the permission of the Board.

(f) cutting off electric power line without the permission of the Board.

# Additional references

See above: 'Yangon electricity supplies get boost from <u>YESB plan</u>' (MT: 24/07/06) 'Ministry of Electric Power <u>re-organized</u>' (NLM: 16/05/06)

World Bank, 18/08/99. [not available on-line] See below: 'Electricity in Myanmar'

Faced with a difficult financial situation, MEPE has begun to restructure the Myanmar electric power sector. Electricity distribution in the townships that make up downtown Yangon is now being run by the Cho Cho group, under a medium-term management contract which has been running since 1996 and extended once. Cho Cho, for its efforts, receives 0.15 Kyat per kilowatt/hour on collections, but does not have capital investment obligations.

# VILLAGE ELECTRIFICATION TECHNOLOGY ON DISPLAY

Myanmar Times, 14/11/05. www.myanmar.gov.mm/myanmartimes/no292/MyanmarTimes15-292/n014.htm

Equipment and technology for village electrification projects was showcased at an exhibition held at Sayar San Plaza in Bahan township early this month. The three-day exhibition was organised by the Ministry of Co-operatives to promote the use of electrification systems in rural areas. Nearly 20 booths sponsored by government and private sectors, co-operative associations and NGOs displayed technology suitable for use at the village level. Participating government ministries included those of Co-operatives, Science and Technology and Energy.

Most of the exhibits involved the use of renewable energy sources, such as solar, wind, biogas and gasifier technology. The Myanmar Engineering Society's display featured all of the renewable energy technology used in Myanmar, including tidal power and dual fuel systems it has developed. A central executive committee member of the society, U Myint Pe, said its display was aimed at making rural communities far from the national power grid aware of the systems available to provide electricity. He said the exhibition had made an important contribution to promoting the development and use of renewable energy technology for providing electricity in rural areas. "It is more comprehensive than I expected," U Myint Pe said.

An advisor to the society, U Soe Myint, said the exhibition had enabled members of the public to learn about the technology while professionals and experts had been able to share their knowledge and experiences. "Their opportunities to make contact with one another were the main advantage of the exhibition," he said. The increased contacts would contribute to improvements in the technologies, U Soe Myint said. An assistant director of the Co-operative Department in Shan State, U Wai Lin, agreed that the exhibition had benefited researchers and developers of village electrification systems by making them more aware of technological advances.

**Compiler's note**: A photo of a solar cooker in operation accompanies the original article.

#### Additional references

See the entries listed in the Section '**Renewable Sources and Small Generating Facilities**' <u>SF</u> See especially the entries for biogas and paddy husk generation, tidal power, wind power, solar power and mini hydropower plants. A study carried out under the sponsorship of Japan's International Co- operation Agency published under the title '*The Study on Introduction of Renewable Energies in Rural Areas in Myanmar*' is particularly useful for the detailed technical information it provides on mini-hydro and rice husk generation in Myanmar. For access information to the several volumes and booklets available on-line in this series, see Appendix 9: 'Introduction of Renewable Energies in Rural Areas of Myanmar'.

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# IVANHOE LOOKING TO YEYWA PROJECT FOR POWER SUPPLY

Kyaw Thu, Myanmar Times, 24/10/05. http://www.myanmar.gov.mm/myanmartimes/no289/MyanmarTimes15-289/b002.htm

A senior official from Canada-based Ivanhoe Mines' Monywa copper project said the company expects to increase production by more than five times if there is a good enough power supply. Mark Whitehead, a director at Myanmar Ivanhoe Copper Co Ltd (MICCL), said that by 2007 the company could increase its annual production to 200,000 tonnes from the current 39,000 tonnes. MICCL is 50-50 joint venture between Ivanhoe Mines and the No 1 Mining Enterprise under the Ministry of Mines, and since 1998 has been producing London Metal Exchange Grade A copper from its deposits near Monywa in central Myanmar.

"The key issue is power. If there is enough power the copper project will be able to increase production," said Mr Whitehead. "We are also waiting for approval from the Ministry of Mines," Mr Whitehead said in a presentation at the YMCA in Yangon last week.

Mr Whitehead said the power problem would be solved when the Yeywa hydropower project is completed in 2007. Yeywa project lies 31 miles southeast of Mandalay and is expected to generate 3550 million kilowatt hours a year in 2007-2008. "Hopefully we will get the approval from the government by 2007 when the Yeywa project becomes operational," he told Myanmar Times.

He said the plan to increase production follows a growing demand for copper and its higher prices in the world market. The joint venture currently produces about 100 tonnes of copper cathode a day, but the lack of power is one of the factors limiting expansion of the mines. The company's factory currently consumes more power than any other in the country.

"We need about 50 MW to support the production of 200,000 tonnes," said Mr Whitehead, adding that the Monywa project has firm global markets, including Japan and Thailand. He said the main beneficiary of the project is the Myanmar economy, and that the government has earned US\$ 1.25 billion since the project started production in 1998.

Monywa copper mines have three deposits and MICCL is currently operating at two deposits called Sabetaung and Kyisintaung. The Monywa project employs more than 1000 people, which includes a few foreign expatriates. "Myanmar runs the mine site, and we train everyone from truck drivers to technicians," he said.

# Additional references

Ivanhoe Mines, Special Meeting of Shareholders regarding the Proposed Acquisition of the Common Shares of ABM Mining Limited, 10/11/00. pp G-6, G-7. [not available on-line]

The proposed Letpadaung Development Plan envisages a heap leach facility with capacity to stack up to 17.5 million tonnes per annum of higher grade crushed ore and a parallel lower grade run-of-mine ore dump leach being placed under leach at rates of up to 34 million tonnes per annum. Pregnant solution from the heaps will be concentrated by solvent extraction (SX) and the copper will be plates by electrowinning (EW).

The SX plant will treat solution at a rate of 6,800 cubic metres per hour and will incorporate an organic scrub circuit to control iron transfer to the EW circuit. To further control iron build up in the EW circuit, an ion exchange-based iron removal process unit has been included in the design. MEPE is responsible for supplying power to the project. The total average power requirement for the project is estimated to be 70 MVA. The Letpadaung Development Plan allows for the installation of a 215-km, 230-kV 90 MVA overhead transmission line from Thazi to Letpadaung. Thazi is located south of Mandalay on the main national electricity distribution grid. The connection was chosen after extensive study of power supply options by Ivanhoe Mines consultants in conjunction with MEPE. As an alternate source of power, the joint-venture company [MICCL] has encouraged several interested parties to study the possibility of building a coal-fired power plant in the Monywa area. A Japanese group is funding a study using local coal from the Kalewa deposits north of Monywa.

See below: 'Proposal for <u>barge-operated power plant</u> at Monywa copper mine' (ECFA: late 2004)

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# IMPACT OF UNRELIABLE POWER SUPPLY ON INDUSTRIALIZATION IN MYANMAR

Excerpted from Toshihiro Kudo, 'Stunted and Distorted Industrialization in Myanmar', Institute of Developing Economies, October 2005, pp. 22, 26-27, iii and iv. http://www.ide.go.jp/English/Publish/Dp/pdf/038\_kudo.pdf

While many developing countries including those undergoing a transition from a planned to a marketoriented economy, have liberalized the manufacturing sector, they often impose greater restrictions on the development of infrastructure. This is because the market power associated with scale economies and demand externalities makes proper market functions difficult. Even though it has recently become fashionable for the private sector to be involved in the provision of infrastructure, public provision remains dominant in many developing economies. However, in reality, publicly provided infrastructure services have often delivered poor quality and inadequate coverage. Myanmar provides a striking example.

Electric power supply in Myanmar is monopolized by MEPE, a state-owned economic enterprise (SEE) that comes under the jurisdiction of the Ministry of Electric Power. The SEE Law of 1989 stipulated that electric power generation was to be exclusively carried out by public enterprises. MEPE is the sole provider of electricity generation and transmission nationwide.

The total installed capacity of electric power was 1335 MW as of September, 2004, [Note 34] increases in capacity having lagged behind overall GDP growth. The per capita consumption of electric power is 108 kw, which is one of the lowest in the world. Only 5% of the people of Myanmar have access to electricity, a much lower percentage than in Cambodia (17%) and the Lao PDR (41%). Demand for electric power tends to increase more rapidly than GDP in any economy during the early stages of economic development and this is true of Myanmar. To make matters worse, it is said that in FY 2001, about 15% of electricity was lost during generation, transmission and distribution, making the demand-supply gap even wider. The Economist Intelligence Unit has estimated a 220 MW shortfall in electricity supply in Myanmar in recent years. [Note 35]

Because the supply of electricity is unreliable and insufficient, industrial firms depend on their own or shared generators, which are run on diesel. The market price of diesel is expensive and the technical efficiency of electricity generation by small-scale generators is low. As a result, independently generated electricity is costly compared to power supplied through the grid. Moreover, the tariff rates are multi-tiered and foreigners, whether residents or organizations, must pay in US dollars or FEC, which makes real charges for electricity much more expensive for foreigner than for locals. A foreign garment factory located in Mingaladon Industrial Estate, one of the best industrial parks in Myanmar, experienced frequent and lengthy electricity outages and had no alternative but to use its own generator. In 2004, the firm's energy costs, including electricity from the grid and diesel oil, was 1.4 times greater than its labor costs. [Note 36] Even in the highly labor-intensive garment industry, energy costs more than labor. Thus it is that cheap labor costs have been offset by expensive infrastructure services.

Notes for references cited:

34 Selected Monthly Economic Indicators, CSO, September 2004.

35 EIU, Country Profile 2004 Myanmar (Burma), 2004, p. 20.

36 Personal communication from the factory manager in June, 2005

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# Table 4-3: SEEs' Capital Investment in Main Infrastructure Sectors, as % of GDP

	FY 1985	FY 1990	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999
ENERGY	25.1	5.4	2.3	3.5	4.1	2.4	2.5
Myanma Oil and Gas Enterprise	1.1	0.5	0.0	0.3	0.2	0.3	0.5
Myanma Electric Power Enterprise	11.8	4.7	2.2	3.0	3.7	1.9	1.9

# Table 4-4: Performance Indexes for Infrastructure Development

	FY 1985	FY 1990	FY 1995	FY 2000	FY 2002	FY1985->	FY1990->	
						FY 2002	FY 2002	
Electric Power,	684	804	982	1,171	1,190	1.7	1.5	
Installed Capacity								
(MW)								
Electric Power,	2,119	2,643	3,762	5,118	5,864	2.8	2.2	
Generation								
(millions kWh)								
Electric Power,	1,460	1,675	2,262	3,268	4,691	3.2	2.8	
Consumption								
(millions kWh)								

# Table 4-5: SEEs' Current Cash Budget (Kyat Million)

MEPE	FY 1980	FY 1985	FY 1990	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999
Recipients	209.2	430.6	795.6	2,771.1	3,227.5	3,450.8	3,599.6	19,680.8
Expenditures	201.9	412.3	658.5	2,599.8	2,721.6	3,120.7	4,976.9	20,614.1
Surplus/Deficit	7.3	18.3	137.1	171.3	505.9	330.1	-1,377.3	- 933.3
% of Receipts	3.5%	4.2%	17.2%	6.2%	15.7%	9.6%	- 38.3%	- 4.7%

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# AGREEMENT SIGNED ON UPPER PAUNGLAUNG HYDROPOWER PROJECT

NLM, 04/09/05. www.myanmar-information.net/infosheet/2005/050904.htm

Director-General Win Kyaw of the Hydropower Department and Yunnan Machinery & Equipment Import & Export Co Ltd (YMEC) Chairman Feng Ke inked notes of agreement on the implementation of Upper Paunglaung hydel power project, at the hall of the Ministry of Electric Power on 1 September. In attendance were Minister for Electric Power Tin Htut and officials. YMEC plans to supply machinery worth US\$ 80 million for the project and to implement Upper Paunglaung Hydel Power Project together with the Hydropower Department.

The project site is situated on Paunglaung Creek, 15 miles above the already completed Paunglaung hydel power project, 26 miles east of Pyinmana in Mandalay division. Two 70-MW turbines will be installed at the Upper Paunglaung power plant which is expected to generate 411 million kwh annually.

Due to the storage of water at Upper Paunglaung Dam, it will be possible to increase the production of power at the [Lower] Paunglaung hydel power station from 911 million kwh to 969 million kwh yearly.

**Compiler's Note**: A good aerial photo of the Upper Panlaung dam site is available on page 5 of the print edition of the New Light of Myanmar of 21/01/06. <u>http://www.ibiblio.org/obl/docs2/NLM2006-01-21.pdf</u>

**Topographic map references**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-01: Pyinmana Upper Paunglaung river dam, 26 mi north-east of Pyinmana [19° 46' N, 96° 19' E], grid sq ref: 11\0, 26\1 [?] Nancho creek dam, 16 miles east of Pyinmana [19° 46' N, 96° 19' E], grid square reference: 10\9, 25\9 [?] http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-1.jpg

# Additional References

NLM, 23/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071223.htm

Nay Pyi Taw Commander Wai Lwin inspects the Nan Cho hydro power project in east Pyinmana. Work is proceeding on the construction of the tunnel and drilling of the stone wall. The project is expected to generate 152 million kWh a year. After visiting Wepauk and Gamong Taung villages, he goes on to the [Upper] Paung Laung dam site where he is briefed on the project which will be able to generate 454 million kWh per year.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf The Upper Paurodauno dam and power station with a planned capacity of 140 MW is under im-

The Upper Paunglaung dam and power station with a planned capacity of 140 MW is under implementation by the HPID. It will generate 434 million kWh annually when it comes on line in Dec 2009. The Nancho dam and power station with a planned capacity of 30 MW is under implementation by the HPID. It will generate 128 million kWh when it comes on line in 2009.

DVB, 16/07/07. www.burmanet.org/news/2007/07/16/

Residents of 18 villages fear forcible relocation from their homes in the south part of of Aungban [Kalaw] township in Shan state. Their villages likely to be flooded as a result of a new dam project on Paunglaung creek. A resident said authorities had told them that when dam is built their villages would be under water and they would have to move. The villagers had planned to to expand their villages and build more permanent structures, but they were waiting to be told where they would have to go and didn't know what to do. Surveying for the dam started in April 2007.

NLM, 23/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070623.htm

Acting Project Director U Tin Aye and Assistant Director U Nyein Chan report to EPM No 1 Zaw Min that 768 feet of 968-foot long diversion tunnel for the Upper Paunglaung dam project have been completed. The tunnel is 33 feet in diameter.

NLM, 25/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070225.htm

General Than Shwe and party inspect the Upper Paunglaung hydropower project, 26 miles east of Pyinmana. EPM No 1 Zaw Min reports that the dam will be of the RCC-type, 1,640 feet long and 325 feet high. Work continues on the approach roads and on the Nancho and Lainli bridges on the Pyinmana - Pinlaung road. Deputy Minister U Myo Myint comments on the significant geological position of the project and benefits. Gen Than Shwe speaks of need to complete the projects as soon as possible after finding "better technology". A fruit basket is given to the project director of Colenco Power Engineering Ltd. The visitors are taken by helicopter to the site of the Nancho hydropower project on Nancho Creek, 16 miles east of Pyinmana, where EPM No 2 Khin Maung Myint reports on the water storage capacity of the dam and how electricity produced will be distributed from the various projects in the region to the national grid. Gen Than Shwe says that the projects are being carried out to provide power for Nay Pyi Taw and environs and the whole country. To preserve the flow of water into the dams he warns against cutting timber and use of burning to clear land for agricultural purposes in the watershed areas of the dams. At the Nancho Creek project a fruit basket is given to the civil engineers of Kansai Electric Power Co, Inc. The Nancho creek project is about 12 miles upstream from the Paunglaung hydel power plant. A concrete embankment 505 feet long and 166 feet high will be built. It will be able to generate 40 MW.

NLM, 09/05/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060509.htm

EPM Tin Htut and D-G Win Kyaw of the Hydropower Dept inspect the Ahtet Paunglong hydel power project. Site clearing is underway, also the digging of the diversion tunnel and construction of an approach road. They go on to the Nancho hydel power project and check on sites for building the power station and water intake structure; site clearing is being carried out. The Nancho hydel dam and power station will be built on Nancho creek, a tributary of the Paunglong, 12 miles upstream from the Paunglong hydel power station. Feasibility studies indicate the project will generate 40 MW. It will also regulate the flow of water into the existing Paunglong dam.

NLM, 02/07/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050702.htm

The Hydro-electric Power Department of the EPM and Yunan Machinery & Equipment (I & E) Co Ltd signed an MoU to implement Upper Paunglaung Hydro-electric Power Project at the ministry on 30 June. According to the MoU, the Hydro-electric Power Department will buy the necessary machinery and equipment for the project worth US \$ 80 million from YMEC.

NLM, 26/03/05. http://www.ibiblio.org/obl/docs2/NLM2005-03-26.pdf

At the inauguaration of the Paunglaung hydel power project it is reported that the new facility will not be able to generate at full capacity of 280 megawatts even in the rainy season. So, the Ahtet [Upper] Paunglaung hydel project will be implemented above it on the Paunglaung River

NLM, 04/04/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040404.htm

SPDC Secretary-1 Soe Win and party visit the site of the future [Upper] Paunglaung dam project on Paunglaung River, 26 miles east of Pyinmana. Deputy Minister for Electric Power U Myo Myint and D-G Kyaw San Win of Irrig Dept report on arrangements for the the project. It will on the Paunglaung river above the Paunglaung project and will add to the productive capacity of that facility. It will also generate 85 MW of electricity.

See below: <u>'Paunglaung</u> power plant Myanmar's first underground station' (MT: 14/03/05)

# MINI HYDROPOWER PLANTS PLANNED FOR RURAL AREAS

Nyi Nyi Aung, Myanmar Times, 08/08/05 www.myanmar.gov.mm/myanmartimes/no278/MyanmarTimes14-278/n013.htm

The Irrigation Dept of the A&IM is planning to build mini hydropower plants at its dam projects to help support the electricity requirements of the country. "Our plan to build mini hydropower plants near irrigation projects, especially in the rural areas, will help supply more electricity to our power plants," said U Win Maung, the director of the department's Planning and Works Division. As the first step in the plan, he said the department would build four mini hydropower plants: one at a completed irrigation project in Yangon division, and three more at ongoing projects – two in Ayeyarwady division and one in Bago division. He said the department was conducting surveys and plans to start building at least one mini hydropower plant in November.

The electricity from the mini power plants will not be delivered to the national power grid, but will be administered by local electricity providers and sent through separate power lines in each region. Though the department originally began the irrigation projects only to supply adequate water for cultivation areas, it began to introduce a mini hydropower projects five years ago to help support Myanmar's electricity requirements. "Since 2000 the department has been building small-scale power plants that produce 5 to 15 kilowatts at some of our irrigation projects to supply electricity to nearby villages," U Win Maung said.

# Additional references

See above: <u>'Ma Mya dam</u> put into service in Myanaung township' (NLM: 08/06/07) See below: <u>'Private sector promoting</u> interest in renewable energy' (MT: 12/07/04)

NLM, 22/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071222.htm

During a tour of the Pyin Oo Lwin area A&IM Htay Oo and CPTM Thein Zaw visited the Dokwin Agriculture Farm of the Myanma Agriculture Service where herbal orchids are grown in accordance with the guidance of the Head of State. Afterwards, the ministers inspected a small hydel power project on a irrigation canal of Dokwin Dam that can produce 5 kW. Generators are also equipped on irrigation canals to produce hydro power on a small scale.

# NLM, 02/07/05 http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050702.htm

Pyaingchaung Dam, built by Construction Group No 3 Irrigation Dept was officially i naugurated on 30 March. It is on Pyaing Creek near Mindan Village of Kyauktaw township. The four sections of the earth embankment are 116 feet high and 925 feet long. The re-inforced concrete conduit, four feet wide, six feet high and 630 feet long, is installed with a pipeline to generate hydelpower. The spillway is 30 feet wide and 550 feet long. The dam will make it possible to cultivate over 1,000 acres of summer paddy with the use of irrigation facilities in three village-tracts of the township.

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# HYDRO POWER STATION COMMISSIONED IN KAUNGKHA

NLM, 26/07/05. www.ibiblio.org/obl/docs2/NLM2005-07-26.pdf

Kaungkha Hydel power plant was commissioned into service in Kaungkha town, Kutkai township, Shan State (North) yesterday (25/0705) with an address by Chairman of the Work Committee for Development of Border Areas and National Races Thein Sein. He said the Tatmadaw government has been building infrastructures in all sectors to develop the national economy. It is boosting agricultural production region- wide and nation-wide for ensuring food sufficiency for all the nationalities. In addition, it is trying to acquire capital for Myanmar to become an industrial nation.

A 66-foot long and eight-foot high diversion weir was built on Nanhumon creek near Loikham village of Kaungkha town to run two 75-kilowatt turbines that will generate 0.6 million kilowatt hours of electricity annually. As the power generation of the facility exceeds local consumption, the surplus power can be used by cottage industries in the region. The EPM erected the station to provide the power needed to develop the Kaungkha region of Special Region 5 of Shan State (North). The project was initiated by the Work Committee of the Development of the Border Areas and National Races of the SPDC.

U Mahtu Naw, chairman of the Kachin Defence Army of Special Region No 5, thanked the government for the facility, pledging to always serve the national and regional interests together with the government. Lt-Gen Thein Sein and U Mahtu Naw exchanged gifts. The Secretary-1 also presented gifts to the headmasters of Kaungkha Basic Education Middle School and Loikham BEMS and the medical superintendent of Kaungkha Station Hospital.

Border Areas Minister Thein Nyunt, MD San Oo of MEPE and U Mahtu Naw formally opened the station. that will supply power to Kaungkha and Loikham regions. A crowd of over 2.500 attended the opening. **Compiler's note**: Several good photos of the occasion are to the found in print edition of NLM.

# Additional references

NLM, 21-03-04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040321.htm

General Khin Nyunt visits Namhumon (Kaungkha) hydro-electric power plant near Lwekhan Village in Kaungkha Myothit of Kutkai township where he is briefed by Director Win Kyi of Construction Group 2 of the HPD on construction of irrigation facilities for the project. National race leader Mahtu Naw reports on regional development tasks. After an exchange of gifts, they view construction of the diversion weir, sluice gate, conduit and canal. Two 150-kilowatt generators will be installed to produce 1.475 million kilowatt hours a year to Kaungkha.

# NLM, 29/04/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030429.htm

Lt-Gen Aung Htwe of the Ministry of Defence went to Tamoenye, 17 miles from Kutkai in Shan State North. At Manjel Village 10 miles from Tamoenye, he attended the opening ceremony of Namhsa Hydel Power Plant Station. At the ceremony, Muse DPDC Chairman Lt-Col Soe Win and Tamoenye Region national race leader U Myint Lwin, [leader of the Tamoenye mobile militia unit] formally opened the power station. U Myint Lwin reported on the self-reliance power plant built with the help of the Ministry of the Progress of Border Areas and National Races and Development Affairs. Then, U Myint Lwin presented commemorative pennants of the opening ceremony to Lt-Gen Aung Htwe, Brig-Gen Maung Maung Thein, Maj-Gen Myint Hlaing, Kachin national race leader U Ma Htu Naw of Shan State (North) Special Region-5 and officials Namhsa Hydel Power Plant is located near Manjel Village in Tamoenye and it is generating 800 kilowatts of electricity at Namhsa Creek with the use of two 400 kilo watt generators. The embankment is 18.22 metres long, 5.9 metres wide and 5.1 metres high. The canal is 1,833 metres long, 1.5 metres wide (upper) and 1.3 metres (lower) and 1.5 metres deep. The pre-stressed pile is 120 metres long and 0.8 metre diameter. The construction tasks started on 1 March 1998 and were completed on 1 July 2000. Spending on the construction amounted to K 4.8 million.

Shan Herald, 29/11/99. http://www.shanland.org/drugs/1999/a\_slap\_in\_the\_face\_for\_undcp.htm/

The area northeast of Kengtung, from Saleu to Mongla near the Chinese border, is known as Shan State (East) Special Region No 4. It is under the sway of the New Democratic Alliance Army of Sai Leun (aka Lin Mingxian). According to official bulletins, three hydro power plants have been built in Mongla, Saleu and Mongyawng, (400 KW, 380 KW and 300 KW respectively) under the SPDC's Border Area Development Program with aid from the UN Development Program (UNDP) and the UN Drug Controrl Program at an estimated cost of K.150 - 200 millions. But the villagers had to pay 50 old coins per household, (1 old coin = K 1,000 - 1,200) for the electricity poles. Besides, each household have to pay Y. 50 (Chinese currency) per month for the electricity bills.

# **INVERTERS** KEEP LIGHTS AND TV SETS RUNNING

Tin Moe Aung, Myanmar Times, Electronic Supplement, 04/07/05. http://www.myanmar.com/myanmartimes/MyanmarTimes14-273/ele25.htm

Since inverters first appeared in Myanmar in 1997 their use has skyrocketed. Inverters are used to convert direct current (DC) to alternating current (AC), which stores energy to use when electricity is not accessible from its main source. They are used in conjunction with a battery, which is charged when the electricity is on, and which supplies power when the electricity is off. Many people prefer inverters to generators because they do not make noise and are easy to operate.

The first inverters available in Myanmar were made in China, but in 2001 domestically made models appeared on the market. "We started manufacturing inverters in 2001, and in 2002 and 2003 more people started using them in Myanmar," said Ko Myo Thant Htun from Nibban Electric and Electronics, which produces Baho inverters. Baho inverters are available in three capacities: 300 voltage amperes (VA) for K 16,500; 500 VA for K 35,000; and 1000 VA for K 42,000, he said.

Generally, a 500 VA inverter with a battery costs about K90,000. It will supply enough energy to power the lights and television. Industry sources hope that sales of inverters will continue to boom in the future but admit that upon the completion of several government hydroelectric projects they are likely to drop.

**Compiler's Note**: A good picture of an inverter is available with this article.

#### Additional references

See above: 'Rising world lead prices zap Yangon <u>battery market</u>' (MT: 10/09/07) '<u>Nibban Electronics</u> expects 'IP' protection for its products' (ASEAN: 06) 'Market for power <u>inverters expected to dwindle</u>' (MT: 29/03/04)

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YANGON COMPANY PRODUCING INDUSTRIAL ENERGY METERS Ye Lwin, Myanmar Times, Electronic Supplement, 04/07/05. http://www.myanmar.com/myanmartimes/MyanmarTimes14-273/ele02.htm Electronic products manufactured in Myanmar offer a less expensive alternative to imported goods. U Myint Zaw, the managing director of Trust and Development Co Ltd, said his company began producing utilitarian electronic devices in 2000. "We started by making multigrain moisture meters to measure the percentage of water in grains – such as paddy, beans and pulses – and later started manufacturing digital balances to measure the weight of commodities, as well as energy meters to measure electricity capacity and use," he said.

Moisture meters were produced by order of Myanma Agricultural Produce Trading (MAPT) to replace the use of meters imported from Japan. Since 2000 the company has manufactured more than 400 multigrain moisture meters, most of which have been sold to government departments. However, with the liberalisation of crop trading rules the company has also begun targeting farmers and trading companies for sales, said U Myint Zaw. Under the recommendation of the International Rice Research Institute, which is based in the Philippines, the company also plans to produce portable moisture meters for export to farmers in the Philippines and Indonesia.

The digital balances manufactured by Trust and Development since 2002 can be read in four standards – pounds, kilograms, viss and tonnes – and are available in three designs for different uses: precision (to measure the ratio of ingredients in confections), commercial (to measure the weight of rice, beans and pulses), and floor, or truck scale, which can measure weights up to 60 tonnes.

Last year the company introduced electronic energy meters, primarily produced for the Ministry of Electrical Power to track energy use in households and power plants. The company is currently scheduled to manufacture 2,000 energy meters to be installed in factories in the Hlaingthaya Industrial Zone. "And we are determined to install high-quality domestically made electronic energy meters in hydropower plants within five or 10 years," said U Myint Zaw.

U Myint Zaw, a central executive committee member of the Myanmar Industrial Association (MIA), said raw materials used in the manufacture of Trust and Development's products are imported from Germany and Hong Kong. "The advantage of domestically made electronics is that they are made according to present and future market demands in Myanmar – we are always researching local market demands," he said.

# Additional references

See above: <u>Padaung factories</u> begin production of generators and meters' (NLM: 17/10/06)

# MYANMAR EXPORTS FIRST DOMESTIC TRANSFORMER

Tin Moe Aung, Myanmar Times, 30/05/05. http://www.myanmar.gov.mm/myanmartimes/no268MyanmarTimes14-268/b007.htm

A Myanmar manufacturer last week made the first overseas sale of a domestically made transformer and has plans to export more, said the managing director of the company. "The transformer was exported to Perth, Australia," said U Tun Lin Thaung of the Yangon Transformer and Electrical Co Ltd, one of the leading transformer manufacturing companies in Myanmar. The company shipped a 750-kilovolt ampere (kVA) transformer with a price tag of US\$ 9,000 last Wednesday, he said.

"When our company started, we imported transformers to sell in Myanmar, but we started manufacturing our own in 2002," said U Tun Lin Thaung. The company has already received orders from Australia for two 3000-kva transformers to be shipped later this year, he said.

He said that last November the company earned ISO 9001:2000 certification for its quality management systems, which ensures the quality of its products and gives foreign companies the confidence to buy them. The parts and accessories used in the transformers are imported from Japan, Switzerland, Singapore and Thailand, U Tun Lin Thaung said. The company manufactures transformers with a capacity ranging from 50 to 20,000 kVA, and with prices ranging from K 2 million to K 200 million.

U Tun Lin Thaung said the demand for transformers in the domestic market has gone up year after year. "Demand has increased by about 30 per cent every year," he said. The company sells about 400 transformers annually on average, most of which have a capacity of less than 500 kVA. Most of the company's customers are from the industrial and construction sectors, said U Tun Lin Thaung.

**Compiler's Note**: A good photo of Botataung Port workers loading a 750-kVA transformer into a shipping container for export to Perth, Australia, accompanies the article.

# Additional references

Ye Kaung Myint Maung, MT, 10/12/07. http://www.mmtimes.com/no396/n004.htm

Yangon Transformer and Electrical Co Ltd has exported the first of 17 transformers it contracted to manufacture for the mining industries in Mali and Ivory Coast. U Thant Zin Thaung, the executive director of the company, said the deal to produce the high-voltage transformers was made with Australia-based Tanis IPS Pty Ltd. He said the production of the transformers, which range in capacity from 20 kilovolt-amperes to 50 megavolt-amperes, has been completed and the first two were shipped to Africa in November, followed by two more last week. "The rest will be shipped by the end of December," he said. "We won the contract agreement through tender bidding only after competing with South Korean and Indian manufacturers. We are proud of earning the contract for Myanmar because no other domestic firm can export such a heavy-industry product," said U Thant Zin Thaung. He said that although exports currently account for fewer than 1 percent of the company's total production, it had ambitious plans to expand into more overseas markets. "Mining firms consume huge amounts of electricity and they need high-quality transformers. This contract will increase our company's reputation and help us reach our goal of exporting more products," he said, adding that the Middle East in particular was a promising market for the company. Yangon Transformer and Electrical Company was founded as a transformer importer in early 1990s. In 2000 it established a factory at Shwe Pyi Thar Industrial Zone to manufacture its own products.

NLM, 08/12/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061208.htm</u>

Under a contract between Yangon Transformer Co and Timestar Holding Pty Ltd in Australia, the Myanmar company delivered its second and latest batch of four transformers to Australia through Botahtaung wharf. In the first batch, it delivered five units to Australia. At the ceremony, Director U Thant Zin Aung said the factory was set up in Shwepyitha IZ in 1999. It is now producing transformers domestically with the use of imported raw materials. At present, it produces two to five units a day. The company received an ISO 9001:2000 certificate in 2003. The first three transformers were delivered to Australia in 2005. It has also signed more contracts for 2007 with Tlimestar Holding Pty Ltd. It will also distribute its products locally. The company is producing 66 KV, 33 KV, 11 kV transformers, The units range form 50 kVA to 30,000 kVA ( 30 MVA). It is planning to produce 230-kV and 100-kVA power transformers next year.

See below: 'Local transformer manufacturers face tough competition' (MT: 27-01-03)

MARKET EXPANDS FOR GENERATOR AND RENTAL SHOPS

May Oo Moe, Myanmar Times, 09/05/05. http://www.myanmar.gov.mm/myanmartimes/no265/MyanmarTimes14-265/b001.htm

Most businesses that sell and rent electricity generators for home use are enjoying growth, but sales of generators for industrial use have stagnated as more companies are now relying on rentals, said shop owners in Yangon last week. U Thant Zin Shwe, the executive director of Kappa Power International, Ltd said that rentals and sales of generators at his company have been increasing since February. "Rentals and sales since February have been 50 per cent higher than during the same period last year," he said. The increase in sales is limited to generators intended for home use, while industrial-sized generators are mostly rented, he said. "I think the increase in business has been caused by the electricity situation," U Thant Zin Shwe said.

Kappa Power stocks such brands as Denyo, Airman and Nippon Sharyo from Japan, and F.G. Wilson and Tropic Power from Britain. U Thant Zin Shwe said most of the generators at his company are reconditioned, since new units are more expensive. New generators manufactured by F.G. Wilson and Tropic Power range in price from K8 million (20 kilovolt amperes, or kVA) to K180 million (2200 kVA), while a new 20-kVA Denyo costs K12.5 million, he said. A reconditioned, 20-kVA Japanese-made generator rents for K400, 000 a month, he said. Among the generators enjoying big sales increases are domestically assembled units that use Chinese-made engines and that sell for much less than imports.

Ma Hlaing Hlaing Maw, a spokesperson for the UD Group, said the locally assembled generators sold by her company are more popular than imported brands due to the low price. "I think we have more customers than companies that sell imported brands," she said. UD Group sells 25-kVA generators for K1.95 million and 62.5-kVA units for 3.7 million, and rents 25-kVA units for K10,000 a day. Most of the company's business is based on sales for home use rather than rentals.

Meanwhile, the sales of generators for industrial use are slow as most businesses that need them rely on rentals. U Win Naing, the managing director of Sonnenberg Trading and Engineering Services Co., Ltd said his company's generator sales depend on the health of the industrial sector. "Our products are for industrial use, so if the industrial sector grows our business will grow," he said. "Since the closure of many garment factories our business has not been as good – last year we sold only 10 generators and so far this year we have sold only two," he said. "Around the time we opened, from about 1997 to 1999, business was very good and there were many new industries, companies and garment factories, and we sold 15 generators a year," said U Win Naing. Sonnenberg Trading and Engineering Services sells new and reconditioned generators ranging in size from 27 kVA to 2000 kVA, with new unts priced at about K150,000 a kVA.

U Zaw Moe, the owner of Ever Top Trading Co., Ltd, which sells Chinese and Japanese generators for home use, said sales at his shop were not good compared to last year. "Our sales have decreased since last year but they are still good, they just haven't reached the point we expected," he said. "A lot of people assume that generator sales must be increasing because of the electricity situation, but many people have already bought generators," U Zaw Moe said. Ever Top Trading sells Japanese-made Honda generators at K44,000 for a two-kilowatt (kW) unit with a manual starter; K980,000 for a 5-kW unit without a battery starter; and K1.1 million for a 5-kW unit with a battery starter. Chinese-made generators are priced at K220, 000 for 2.2 kVA with a manual starter; K450,000 for 5.5 kVA without a battery starter; and K500,000 for 5.5 kVA with a battery starter.

Ko Myint Kyi, an engineer from Ever Seiko Co Ltd also said that sales have not increased at his shop. "But I think for the shops that both sell and rent, business is going up," he said. Ko Myint Kyi said that the units sold at Ever Seiko are mostly for office and business use.

# Additional references

See above: <u>'Padaung factories</u> begin production of generators and meters (NLM: 17/10/06) Aung Gyi Trading website information, [n.d.]. <u>http://www.aung-gyi.com/</u>

Under diesel generators, the company lists 17 different models of Cumming and Stamford diesel generator sets for commercial and industrial use, ranging from 45 kVA to 1000 kVA. For prime power use, all ratings are suitable for continuous electrical power (at a variable load in lieu of main power network). There are no limitations to the annual hours of operation and all models can supply 10% overload power for 1 hour in 12 hours. For standby power, all ratings are for the supply of emergency power at variable load in the event of a main power network failure up to a maximum of 500 hours per year. No overloads permitted.

See also other trading company listings under Generators in the Myanmar Yellow Pages.

# STATE'S ELECTRIC POWER PROJECTS

Thiha Aung, NLM, 25-27/04/05. <u>http://www.myanmar.gov.mm/Article/Article2005/April05/April25.htm</u> <u>http://www.myanmar.gov.mm/Article/Article2005/April05/April26a.htm</u> <u>http://www.myanmar.gov.mm/Article/Article2005/April05/April27a.htm</u> This three-part article provides an inventory of electric power projects and adds some useful information about several projects in particular References are included under approrpiate key articles in the compendium.

COAL-FIRED TIGYIT PLANT NEARS COMPLETION

Kyaw Thu, Myanmar Times, 25/04/05. http://www.myanmar.com/myanmartimes/MyanmarTimes14-263/news.htm

Myanmar's biggest steam-powered electricity plant was due to go into full operation by the end of April, according to a MEPE official. He said the Tigyit [Hsi hkip or Thigyit: 20° 25' N, 96° 42' E] power plant, at Pinlaung, about 22 miles south of Kalaw in southern Shan State, will generate 120 megawatts, using two 60-megawatt steam turbines, the biggest to be installed in Myanmar.

The coal-fired power plant, on which work began in February 2003, will supply 10pc of the country's total energy demand. "Electricity generated by the Tigyit plant will help to fill the gap in supply shortages which normally occur in summer, as the water inflow at many hydropower projects in the country is at its lowest during the hot season," the official said. He said one turbine was already in operation and the installation of the second was nearing completion. The second turbine would be test run on April 25 and 26. "No 1 turbine has been supplying power to the national grid since it went into operation in January," he said. The power is being fed into the national grid at Kalaw via two 132 kW power lines.

The plant was built by the PRC's China National Heavy Machinery Corporation, under a US\$ 42.93 million contract. Other work, including site preparation and accommodation for the workers and the plant staff, as well as access roads, was carried out by MEPE and the private sector Aden Group. The water supply for the plant is piped from a small reservoir on Lawpita creek, about three miles west of the plant.

The plant is supplied by Myanmar's biggest coal mine, an open-cut pit just over a mile to the south, which is operated by the Shan Yoma Nagar Co Ltd. The company's project director, U Than Lwin, said the mine has enough reserves to supply the plant for up to 30 years. The mine supplies the plant with 1,750 tons of coal a day, he said. The coal is being supplied to the plant by truck but will eventually be delivered along a conveyor built. Another official at the MEPE said equipment had been installed at the plant to reduce toxic emissions from the coal. "The smoke is made as clean as possible," he said.

**Compiler's Note**: A good picture of the steam power plant accompanies the original article.

# Additional references

# NLM, 23/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071223.htm

EPM No 1 Zaw Min visits the Tikyit coal-fired steam turbine in Pinlaung township and is briefed by the factory on power generation through the two turbines. The station has begun test-generation of electricity using coal from Kalewa coal along with Tikyit coal. MD Kyi Tha of the HPGE and Superintending Engineer Khin Maung Oo also report. The minister inspects the laboratory, water treatment plant, computer operated control room, turbines and coal stockpile. He goes on to visit the Shan Yoma Nagar coal mine where Chief Engineer Hlaing Win Aung reports on the mining, refining and supply of coal to the power plants. The minister explains matters related to the quality of coal and requirements. 200 tons are being produced daily.

# Platts Myanmar Country Energy Profile, [mid 2007]. For access information, see Platt's Profile.

In August 2001, MEP signed a US\$ 42.9-million contract with China National Heavy Machinery Corp for a 120-MW minemouth, coal-fired power plant in Pinlaung township. The first of two 60-MW units at the Tikyit plant was completed in April 2005 and the second in 2006. The plant is expected to burn 750,000 T/yr of coal delivered by conveyor from a nearby mine run by Shan Yoma Naga Co Ltd. Electricity is evacuated by two power lines, one on the route Tikyit-Tagundaing-Monywa and a second from Tikyit to Yangon on the route Lawpita-Toungoo-Hlawga.

NLM, 08/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060608.htm

EPM No 1 Zaw Min checks on exploration for and storage of coal at the Shan Yoma Naga mine and the control room, generators, boilers and water purifying factory at the Tikyit coal-fired power plant. The plant generates 960 million kilowatt hours a year and distributes power through the Kalaw sub-power station.

NLM, 25/04/05. http://www.myanmar.gov.mm/Article/Article2005/April05/April25.htm

The EPM constructed a coal-fired power plant, which is able to generate 120 megawatts, with the effective use of coal produced in Tikyit, Pinlaung township. Each of the two turbines of the Tikyit coal-fired power plant can generate 60 MW. The operators underwent thorough training at home and abroad to be able to operate the plant smoothly. For environmental conservation purposes, the EPM installed modern machinery and technologies in use in developed and neighbouring countries. The Government spent a large amount on the project, including US\$ 42.9 million. The first turbine of the plant was put into service in 2004. The other is targeted to start in the last week of April 2005.

NLM, 16/04/05. http://www.ibiblio.org/obl/docs2/NLM2005-04-16.pdf

Tikyit power plant was commissioned on 12 April 2005. Construction started on 4 September 2002 and it was completed on 31 March 2005. CHMC of China and Eden Group of Myanmar built the plant under the supervision of the Energy Ministry. Of the two turbines, one was completed in 2004 and is already generating at full capacity. The other will start generating power during the last week of April. **Compiler's note**: Good pictures of the plant and other facilities are available in the print edition of the NLM at the URL listed above.

NLM, 04/10/04. <u>http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n041004.htm</u> General Aung Htwe of the SPDC briefed on construction of the plant and installation of machinery. 1,600 workers are labouring day and night to finish the power plant on time.

MT, 05/04/04. <u>http://www.myanmar.gov.mm/myanmartimes/no211/MyanmarTimes11-211/012.htm</u>

Third and final shipment of equipment for the mine that will supply coal to Myanmar's biggest steam turbine power plant at Tigyit arrived at Yangon Port from China. The shipment is valued at US\$ 5 million. Belt conveyors, crushers and other equipment acquired from the China National Heavy Machinery Corp will be used to supply 1,750 tonnes of coal a day to the power plant. Officials hope to have one of the two 60-megawatt turbines in operation by June. The coal will be extracted from a 20.7-million-tonne deposit about 1.5 km from the power plant. The coal deposit, discovered in 1989, covers 544 acres. Excavation began in September 2002. At the current rate of extraction, the deposit will supply the power plant for 27 years. The total cost of the mining project is estimated at US\$10 million and K 3 billion.

NLM, 16/09/03. http://www.myanmar.gov.mm/Article/Article2003/sep/Sept16b.htm

Tikyit coal-fired power plant is situated east of Myintha village in Pinlaung township, 22 miles from Kalaw. Work on the plant is 55% complete. 10 companies submitted tenders to supply equipment for the plant and to build a sub-power station and install power lines. A contract was signed with China National Heavy Machinery Corp that submitted the lowest tender meeting the set standard. A contract was signed on 27 August 2001. Total value of the contract was US\$ 42,936,000. Survey work started in August 2001 and construction of the plant started in March 2002. The plant will need 750,000 tons of coal a year. Shan Yoma Naga Co Ltd and CNHMC will supply the coal for the plant. Mining operations are already under way in the Tikyit region. Power will be distributed to sub-power stations up to Monywa and to Yangon division.

NLM, 20/07/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030710.htm

Gen Aung Htwe of the SPDC briefed by U Than Lwin of Shan Yoma Dragon Co Ltd on the type of coal, obtainable tonnage, and tasks at the Tikyit coal mine. Coal deposit is two miles in length and 6 to 69 feet in thickness. Upper levels of deposit are lignite coal while deeper levels are subbituminous. 20.7 million tons can be extracted. At the power plant project site, construction of the steel boiler structure, coal storehouse, ash storehouse, control room, 132 KVA sub-power station and chimneys, and the installation of boiler tubes by Shan Yoma Dragon is underway.

Mineral Industry of Burma, 2002, citing Than Htay, M, Myanmar in Mining Annual Review. <u>http://minerals.usgs.gov/minerals/pubs/country/2002/bmmyb02.pdf</u>
The Tigyit power plant will consume 500,000 T/yr of coal. A drilling test of the coal deposit indicated a resource of 20 MT, which would be sufficient to feed the plant for 40 years. Shwe Thanlwin Co Ltd will mine the coal for the plant through a joint venture with Mining Enterprise No 3.

NLM, 12/12/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021212.htm

Gen Khin Nyunt of the SPDC briefed by Production Manager Xu Yunpeng of CNHMC on arrangements for production of coal and methods for transporting the coal to the power station. Two 60-MW generators will be installed as the first phase of the project. Another 60-MW generator will be added in the second phase.

NLM, 17/07/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020717.htm

Gen Maung Aye briefed on pre-engineering work for the Tikyit project, arrival of imported machinery, availability of coal and power distribution plans. Director U Chit Khaing of Shan Yoma Nagar Co Ltd reports on the construction of buildings related to the project. Companies of the national races are sub-contractors for the project. The China National Heavy Machinery Corporation (CNHMC) of the PRC will supply machinery including two 60-megawatt generators. The project is located near Pyintha village in the Tikyit region. Efforts are being made to start power generation in September 2003.

Myanmar Times, 24/09/01. <u>http://www.myanmar.gov.mm/myanmartimes/no82/myanmartimes5-82/</u> MEPE plans to begin work soon on Myanmar's first coal-fired power station. It will be capable of generating 120 MW and will be built in Pinlaung township in southern Shan State, about 200 miles north of Yangon. It is expected to start generating electricity in 2003 and will use machinery imported from China. It will need 500,000 tons of coal a year sourced from a reserve of nearly 21 million tons at Tikyit, about 30 miles from Pinlaung. The coal reserve will last about 40 years. The search for other coal deposits in the area continues. The concession to extract coal has been given to Shwe Thanlwin, the Eastern Development companies and a business group of Special Region 6, in Shan State South. Shwe Thanlwin is already mining subbituminous coal at the reserve.

NLM, 20/09/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010920.htm

Gen Maung Aye and party visit Tikyit power station project site in Pinlaung township where they are briefed on plans to purchase mine equipment for the project, the selection of the site and coal deposits in the area. A 120-MW station will be built using coal mined in the Tikyit region. It will be able to generate power in a short period. Efforts are needed to prevent environmental pollution.

NLM, 02/08/01. <u>http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010802.htm</u> EPM Tin Htut visits a coal production project at Teekyit in Pinlaung township and meets with officials of the Electrical Engineering Dept of the Ministry of Mines there. He gives instructions on a site chosen for the plant and inspects current charcoal production of the plant.

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# CABLE FACTORY AND FOUNDRY OPENED IN INDAGAW INDUSTRIAL ZONE

NLM, 04/04/05. http://www.myanmar.gov.mm/NLM-2005/may/enlm/May04\_h2.html

The Ministry of Industry-2 opened the Research Department, a foundry and an aluminium cable factory in Indagaw region in Bago township this morning. Lt-Gen Khin Maung Than, cabinet Ministers and senior military officers attended. The foundry can produce 1,500 tons of iron and 500 tons of steel a year. The aluminium factory can produce 1,600 tons of cables for 6.6 kv, 11 kv, 33 kv, 66 kv, 132 kv and 230 kv lines and stay wires. The ministry has built industries manufacturing disc wheels, radiators, metal bearings, inlet and exhaust valves, diesel engines, steel, ball bearings and aluminium cables in the industrial zone. An electric motors factory and an electrical apparatus factory are under construction.

# Additional references

NLM, 04/05/07. www.myanmargeneva.org/07nlm/n070504.htm

Industry Minister No 2 checks the site chosen for construction of an aluminium wire factory in [Pahtosan Village of] Magway township and is briefed on land condition and availability of water and power by MD U Aung Kyi of Myanma Industrial Construction Services.

NLM, 30/05/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060530.htm</u> MMTEI GM U Than Ngwe conducts the Minister of Industry-2 around the ACSR cable factory in Indagaw and explains the process for producing aluminium wires.

NLM, 31/12/03. <u>http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n031231.htm</u> Construction of an ACSR) factory and installation of machinery is underway in the 400-acre Indakaw IZ.

NLM, 22/06/01. <u>http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010622.htm</u> MD U Kyaw Win of Myanma Machine Tool and Electrical Industries (MMTEI) reports on the site chosen in the Indagaw IZ near Bago for a plant where Aluminium Conductors Steel Reinforced (ACSR) cable will be produced.

#### Additional references

See above: 'Motor and <u>electrical appliance factories</u> opened in Indagaw' (NLM: 21/03/06)

See below: 'Construction fuels <u>wire and cable market</u>' (MT: 29/03/04) '<u>Wire and cable producers</u> find ready market in Myanmar' (MT: 25/08/03)

### DAM DESIGN AT <u>YEYWA</u> HYDROPOWER PROJECT SAVES TIME, COSTS

Kyaw Thu, Myanmar Times, 04/04/05. http://www.myanmar.gov.mm/myanmartimes/no261MyanmarTimes14-261/news.htm

The Yeywa hydropower project, which will generate 3,550 million kWh a year when it comes on stream in 2007-2008, will be one of the biggest in Myanmar according to the assistant director of the DHP, U San Wai, who said the dam wall, of 2.8 million cubic metres, was being built using the roller compacted concrete method. "By using the RCC method, which has been widely used in the world since the 1980s, we can reduce both the cost and the construction time," he said.

Work on the Yeywa project, on the Myitnge River about 31 miles south-east of Mandalay, began in 2001. About 5,000 workers are employed on the project at a site selected in 1997 about two miles downstream from an area previously chosen for the dam. U San Wai said Myanmar engineers built two tunnels to divert water from the Myitnge River before work began on the dam, which will have a storage capacity of 2,114,200 acre feet. The tunnels are 33 feet in diameter and 3,117 feet long, he said.

The Yeywa project will use four turbines each capable of generating 197.5 MW, giving it a total capacity of 790 MW. The power house for the turbines is 510 feet long, 148 feet wide and 197 feet high. U San Wai said the power house and the dam wall would be able to withstand earthquakes of up to eight on the Richter scale. He said a Swiss company, Colenco Power Engineering, was acting as technical consultant for the project, which is being built by the department and three Chinese companies. U San Wai said the construction work was proceeding smoothly because of the experience gained by most of the engineers and other staff on the Paunglaung project, near Pyinmana.

When the Yeywa project is completed its waters will reach 25 miles upstream, but it will not affect farming or people. "There is no town or agricultural land upstream from the dam," U San Wai said. The residents of the three villages near the dam had been relocated to a site about a mile away when work began on the project. "We provided them with 24-hour electricity and good accommodation," U San Wai said.

Electricity generated by the project will be fed into the national grid via two 230-KV lines linked to substations in Patheingyi and Thazi townships. Substations would also be built at Shwesaryan and Belin in Kyaukse township to handle output from the project.

U San Wai said big hydropower projects were helping to generate more electricity and would replace fuelpowered facilities as the main sources of electricity. Existing and planned hydropower projects would supply thousands of megawatts needed to meet future energy demands, he said. The government plans to establish another 24 hydropower plants, which will range in capacity from 48 MW to 7,100 MW.

**Compiler's note**: A good picture of the dam site accompanies the orginal article.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-09: Mandalay Yeywa dam [21° 41' N, 96° 24' E], grid square reference: 13\2, 25\9

http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-9.jpg

The Google Earth exposure of the after roads were built to the dam site but before extensive clearing took place.

#### Additional references

See above: 'Colenco engineering to advise on <u>Upper Myitnge</u> project' (NLM: 04/07/07)

NLM, 13/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071213.htm

Gen Than Shwe visits the Yeywa hydropower project and is briefed on the laying of pipelines and the construction of the power station. He presents fruit baskets to consultant engineer Ljubomir Djordjevic of Colenco Power Engineering Ltd, project manager Ye Zhijiang of China Gezhouba Group and Director Myint Oo of No 2 Construction Group of the HPID. The two diversion tunnels, the concrete work on the diversion structure and the earth work for the switching yard are 100pc complete.

Myanmar Times, 29/10/07. <u>http://mmtimes.com/no390/n006.htm</u> According to EPM No 1, the Yeywa hydropower project will be completed by December 2009.

#### NLM, 29/10/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071029.htm

Lt-Gen Ye Myint of the Ministry of Defence visits the Yeywa project site and checks on the installation of the pre-stressed steel pipelines and placing of concrete. Installation of the pre-stressed steel pipelines is 54pc complete. Construction of the RCC main embankment is 62pc complete, the power intake building 61pc, the power house 31pc and the spillway 27pc.

#### Shan Herald, 11/10/07.

http://www.shanland.org/environment/2007/dam-project-suspended-junta-hits-pay-dirt/

The 780-MW Yeywa dam project has been put on hold indefinitely, because of a super-rich vein of gold in the area, according to a businessman from Mandalay. The lode was discovered while soldiers, who doubled as hired laborers, were digging through solid rock. They visited gold traders in Mandalay who offered them K10 million (\$7,690) for each day's excavations which they smuggled out by night for delivery to the traders before the news inevitably leaked to Nay Pyi Taw in Sept-07. All dam project activities have since been postponed to make way for gold mining

NLM, 07/10/07. http://www.ibiblio.org/obl/docs2/NLM2007-10-07.pdf

Scholars of Friedrich Ebert Foundation (FES) headed by Dr P Christian Hauswedell visited the Yeywa hydroelectric power generation project in Kyaukse township on 2 October. They inquired whether trhe project was harmful to the environment. Deputy EPM Myo Myint clarified that feasibility studies were made for environmental conservation before starting the project. After the project got underway, a consultant team from Switzerland had been hired to avoid [harmful] effects to the environment. No villages were removed by the project which was being implemented by Myanmar technicians only, he explained. Then, FES scholars viewed round the Yeywa hydel power project site. **Compiler's note**: A good photo of what looks to be the main gates at the dam can be found on p 8 of the print edition of NLM.

NLM, 12/08/07. http://myanmargeneva.org/NLM2007/eng/8Aug/n070812.pdf

Contract signed with Liebherr Singapore Pte Ltd to buy a travelling-type tower crane, model-630 EC-H40 (20) to be used in building the Yeywa power station.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In December 2000, Nippon Koei completed a feasibility study for the 780-MW Yeywa plant on the Myitnge River. In September 2003, it was reported that China would lend \$200 million for the project. In June 2006, China's Sinohydro Corp and China International Trust and Investment Co Ltd (CITIC) signed a US\$125million engineering, procurement, and construction (EPC) contract for the plant with completion scheduled in 2007. The project design includes a \$ 120 million RCC dam and a powerhouse with four 195-MW Chinese T/G sets. Yearly output is expected to be about 3.6 TWh. A double-circuit, 230kV line on the route Kyaukse-Meikhtila-Mandalay is part of the project.

NLM, 13/07/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070713.htm</u> Over 37pc of the project work has been completed.

NLM, 03/07/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070703.htm

Deputy Director U Khin Maung Latt of No 2 Construction Group of HEPID briefs Lt-Gen Ye Myint on completion of RCC concrete tasks of main embankment, arrangements for the installation of the penstock, work on the power house and water source prospects. Work on covering the main embankment with roller-compacted concrete continues, also connecting steel pipe at the water intake structure.

China Gezhouba (Group) Corporation, [undated]. <u>http://www.gzbgj.com/english\_n/news15.htm</u> On 16/04/07, the Yeywa Project Dept.of Gezhouba reached a total placement of 1 million m3 of RCC, amounting to 40% of the total needed to complete the project, half a year ahead of schedule. 2007 is the peak year for Yeywa project construction. The concrete conveyor system has been examined and repaired as well. Communication with the employer and engineers has been strengthened to obtain their understanding and support. RCC placement so far this year up to April 16 amounted to 360,000 m3. Currently the left bank of the dam has been raised to an elevation of 127.4 metres and the right bank to 109.4 metres.

China Gezhouba (Group) Corporation, [undated]. <u>www.gzbgj.com/english\_n/news03.htm</u>

On 28/12/06, Yeywa Project Dept of Gezhouba completed a total RCC of 625,000 m3, three days ahead of the contracted schedule for 2006. 2006 is the key year for Yeywa project (LOT CW2) construction. The staff and workers overcame a lot of difficulties to meet the deadline. Special emphasis has been put on key points of the concrete construction. The concrete conveyor system was completed and maintained on time, ensuring normal operation of equipment. The daily output reached 5,240 m3 and the maximum shift output reached 3,000m3. Since the concrete conveyor system was put into operation in early Dec 2006, the Yeywa Project Manangement has strengthened the on-site construction organization and management as well as communication with the employer and engineer to obtain their understanding and assistance. This has enabled us to complete the contracted schedule and accelerate the concrete placement.

NLM, 06/11/06. www.myanmar-information.net/infosheet/2006/061106.htm

At Nanning in the PRC, EPM No 1 Col Zaw Min met with Chairman Zhao Ruolin and party of China National Electric Equipment Corporation about the timely arrival of electronic and mechanical equipment for Yenwe, Yeywa, Khabaung and Kengtawng hydel power projects.

Kudo, Toshihiro, *Myanmar's Economic Relations with China: Can China Support the Myanmar Economy*? Institute of Developing Economies, July 2006. p 14.

http://www.ide.go.jp/English/Publish/Dp/pdf/066\_kudo.pdf

Yeywa will cost US \$700 million. In August 2003, the China Exim Bank approved a US \$200 million loan at preferential interest rates for the project. The China Water Resources and Hydropower Construction Group (Sinohydro) and the China International Trust and Investment Corporation (CITIC) got contracts to provide generators and other equipment for the project. In addition to low-priced machinery and equipment and services, long-term and low-interest loans and export credits offered by public financial institutions made it possible for Chinese enterprises to become major players in this field.

NLM, 10/04/06. www.myanmar-information.net/infosheet/2006/070410.htm

HPID and Jiangsu Pengfei Group Co Ltd of the PRC signed a contract for the construction of a 500-T plant for grinding pozzolan in Popa, the HEP Dept will purchase machinery from Jiangsu Pengfei to run the plant, expected to produce 500 tons of pozzolan a day. A 1000-ton grinding plant is already producing pozzolan which is used in the construction of the concrete dam at Yeywa.

NLM, 30/01/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060130.htm

PM Soe Win and party check the production of natural pozzolan at the site of the HEPD at Mt Popa in Kyaukpadaung township. Deputy EPM Myo Myint reports on the construction of a roller compacted concrete (RCC) dam using a mixture of cement and natural pozzolan, the discovery of natural pozzolan at extinct volcanoes in the country, completion of the natural pozzolan factory in the Popa region, construction of the RCC dam at Yeywa, prospects for extraction of 74 million tons of natural pozzolan in Myanmar and plans to produce pozzolan for export. At the factory laboratory they watch testing of natural pozzolan and the production process. The factory is located near Ngayantgon Village , two miles east of Mount Popa. P1-9 camp site can produce 3.5 million tons of natural pozzolan and P1-13 camp 32 million tons of natural pozzolan. A total of 14,000 tons of pozzolan can be stored at the warehouse. The factory can produce 1,000 tons of finished goods daily. Production started in April 2005.

NLM, 05/10/05. http://groups.yahoo.com/group/myanmar\_information/message/12776

Gen Maung Aye and party visit Yeywa hydel power project on the Myitnge River near Ye-Yaman Village, 31miles south-east of Mandalay. EPM Tin Htut briefs them on construction and tarring of the approach roads on both banks of Myitnge, installation of crushers, stockpiling of gravel, sand, cement, natural pozzolan, iron rods, diesel and supplies. The visitors check construction of the concrete separation wall, flow of water in the river, construction of the power intake and digging of the main embankment. They are briefed on the RCC [roller compacted concrete] and CVC [conventionally vibrated concrete] mixing processes. The dam will be 2,264 feet long and 433 feet high. A pozzolan plant has been built and is producing cement and natural pozolan which will be used in construction of concrete dam. According to the data collected in 2003, there are 287 RCC dams in the world. The RCC dam of Yeywa hydel power project will be one of the largest ones in the world.

Xinhua, 01/08/05. <u>http://english.people.com.cn/200508/01/eng20050801\_199558.html</u>

China's Gezhouba Water and Power (Group) Co Ltd signed a contract in Yangon with the DHP to build the dam of the Yeywa Hydropower Project. Under the contract worth US\$ 46.3 million the Chinese company will supply machinery and equipment for the construction of a re-inforced concrete dam. Signing was witnessed by EPM Tin Htut, the PRC Ambassador Li Jinjun and Gezhouba president Yang Jixue. The contract is the fourth for the Yeywa hydropower project. China National Electric Equipment Corp signed a US\$ 2.2-million contract in March 2004 to build the dam gate. The second and third contracts worth US\$ 125 million were inked in July 2005 by a Chinese joint-venture consortium including China International Trust and Investment Corp (CITIC) Technology CL and Sinohydro Corp Ltd. Under the second and third contracts, the Chinese side will supply the hydraulic steel structure and electro-mechanical equipment including turbine/generators and transformers. The 790-MW hydropower project, is being built on the Myitnge river, 50 km south-east of Mandalay. It is expected to generate 3.55 billion kWh hours of electricity per year on completion.

NLM, 10/04/04. <u>http://www.myanmar.gov.mm/Article/Article2004/Apr/Apr10a.htm</u> Annual volume flow of the Myitnge river is 12 million acre-feet.

NLM, 25/03/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040325.htm

Myanmar and the PRC signed a number of agreements in the presence of PM Khin Nyunt and Vice Premier of the PRC Wu Yi. Governor of Central Bank of Myanmar Kyaw Kyaw Maung and President of the China Export-Import [Bank] Yang Zilin signed a loan agreement on the Hydraulic Steel Structure (Lot HSS-1) of the Yeywa hydro power project. D-G of the HPD Win Kyaw and President of China National Electric Equipment Corp Jia Ding signed a commercial contract for the supply of the hydraulic steel structure (Lot HSS-I) for the project. U Win Kyaw and the GM of China International Trust and Investment Corporation Technology Co, Sun Xiaowsen, and the Vice GM of China Water Resources and Hydropower Construction (Group) Corp, Li u Qitao, signed an MoU on hydraulic steel structure (Lot HSS-2) and electromechanical equipment (Lot EM-1) of the Yeywa hydro power project.

NLM, 16/08/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030816.htm

Myanmar and the PRC signed an agreement on a special loan at the Central Bank in Yangon. According to the agreement, the Chinese government granted foreign currency equivalent to US\$ 200 million to Myanmar for promotion of bilateral friendship and economic co-operation. Governor of the Central Bank of Myanmar Kyaw Kyaw Maung and Chairman and President of the China Export-Import Bank Yang Zilin made speeches and signed the agreement. During a visit by Head of State Than Shwe to the PRC in January 2003, an agreement on the loan was reached by both sides. The loan will be used to import heavy machinery and

machines for the Yeywa hydropower project on the Myitnge River, 31 miles south-east of Mandalay. On completion, the Yeywa Hydropower Station will be able to generate 790 MW.

#### NLM, 19/04/03. http://www.myanmar.gov.mm/NLM-2003/enlm/apr19\_rg3.html

Drilling of diversion tunnel No 2 of Yeywa hydel power project was completed by Construction Gp 2 of the HPD. D-G Win Kyaw of the dept reported on both diversion tunnels: No 1 is 1,444 feet in length and 33 feet in diameter and was completed 01/01/03; drilling of diversion tunnel No 2, which is 1.673 feet in length and 33 feet in diameter, was completed on 14/04/03.

#### NLM, 26/12/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021226.htm

The EPM signed an agreement on importing machinery and construction of a pozzolan grinding mill with Chairman Krishna Sivakriskul of Siam Industrial Corp Ltd and the MD of the Olympic Co [of Myanmar]. The pozzolan grinding mill will produce 1,000 tons of pozzolan powder a day which will be used in building a roller compacted concrete [RCC] dam for the Yeywa hydel power project. Construction of the mill will be undertaken by Siam Industrial Corp Ltd and Olympic Co in co-operation with the HPD.

NLM, 24/10/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n011024.htm

SPDC Secretary No 1 Khin Nyunt visits Yeywa hydro-electric power project in Kyaukse township and is briefed on the results of a hydrological and geological survey, soil conditions, sand and rock supply for the project, construction of the main concrete dam, building of a test tunnel, spillway, diversion tunnel, pressurized pipes and power station by Deputy EPM Myo Myint and on the construction of the diversion tunnel, granite supply, a road from Kyaukse to the project site, and the discovery of pozzolan rocks by EPM Tin Htut. They check work on the main dam and the digging of No 2 test tunnel. The main dam will be built with roller compacted concrete. It will be 2,264 feet long and 433 feet high. The power station will be installed with four 175-MW turbines and will produce 3,316 million kWh of electricity annually

MEPE website information. [circa 2001]. [no longer available on-line]

A contract for the detailed design of a 780-MW (195 MWx4) power plant that will produce 3,316 GWh annually was signed with Colenco Power Engineering CL of Switzerland 03/05/01.

Colenco Power Engineering website information [n.d.] <u>http://www.colenco.ch/en/cpe/services.html</u> Colenco Power Engineering Ltd, founded in 1895, concentrates on supplying consulting and engineering services worldwide in all areas of energy and environmental technologies. Hydropower project services include conceptual studies, project design and management, construction supervision, financing, operation and maintenance

Muay Sai Leng, "The spirit of Nang Tsao Mawnla and the Yeywa Dam". Watershed, March-June, 2002, pp 52-54 [Excerpted]. <u>http://www.terraper.org/pic\_water/Watershed%207(3).pdf</u>

I travelled from Mandalay to site of the proposed Yeywa dam in the hot dry season of 2001. The existing road runs parallel to the Doukhtawaddy river (aka as the Namtu or the Myitnge) across which the dam will be built. Alongside the road are villages which house the workers who are building the new road which will be used to haul construction materials to the dam site in the midst of small clumps of trees and vegetation, and barren hills. Because the area is in the plains with a hot climate, there are few green forests. A range of bare mountains stands out clearly on the landscape. At the end of the road lies the village of Yeywa with about 30 households. Local people report that the government has been thinking about building the dam for the past 20 years. Three years ago [in 1998], some geologists from Japan joined with local engineers and members of Rangoon University's Geology and Zoology deparments in surveying the area for its suitability for dam construction. They studied the flow of the river, water level height behind the dam, the flood area, the villages and farmland that would be submerged, the ancient culture in the area, the aquatic life in the river and other topics. Once the dam is in operation, the water level in reservoir will rise about 180 metres above the present level of the river. Though there are many small villages within the flood area they are not classified by the government as villages. Consequently the villagers will not receive any compensation for the loss of their homes and land. The DHP has issued orders to the villages to vacate the area, but some in the flood area in villages such as Ngayu Chaung, Kyauk Pong, Thayi, Tan, Myitpauk, Lema have not yet left. The villagers along river make a living by fishing, logging, farming and other activities. They depend on the Doukhtawaddy which is home to many kinds of marine life including fish species known as the nga balu, nga yway, nga zinyaing and the nga chaung grows to the size of a human. Soldiers are present at every boat

landing along the Doukhtawaddy on the lookout for locals who transport logs along the river without authorisation. **Compiler's note**: The remainder of the article describes monasteries and temples in the villages of Slin and Kyauk Pong, as well as some of the traditional customs in these villages, that will be lost when the area is flooded. Pictures and a map accompany the article.

NLM, 14/04/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010415.htm

Gen Than Shwe and party visit Yeywa hydroelectric power project and are briefed on the results of the feasibility study, the watershed area of Myitnge River and the conditions for generating hydroelectric power. EPM Tin Htut reports on the suggestions given by consulting companies. They inspect samples of sand and stones from Paleik and Htonbo to be used on the project. A roller compacted concrete dam 2,060 feet long and 400 feet high will be built on the Myitnge River. It will be able to hold 19,051,000 acre-feet of water. The hydroelectric plant will be 413 feet long, 121 feet wide and 164 feet high. Four 175-megawatt turbines will be installed in the plant.

NLM, 12/07/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n000712.htm

Gen Maung Aye and party helicopter to Yeywa hydel power dam project 28 miles east of Mandalay in Kyaukse township. EPM Tin Htut reports that MEPE has conducted a feasibility study for the dam project on the Myitnge River which it is estimated will generate 700 MW. Preparatory arrangements including improvement of roads to the project have already been started.

#### Mya Buzz, 29/11/99. [not available on-line]

The D-G of Yunnan Machine Building Bureau met with EPM Tin Htut on 24/11/99 with Myanmar Electrical Power Minister about a 600-MW hydro power plant construction project in Mandalay province to be undertaken by the Chinese provincial bureau.

Nippon Koei Co Ltd website information, [n.d.]. <u>http://www.n-koei.com/english/profile/index.html</u> Nippon Koei Co Ltd carried out a study (1994-1995) and a feasibility study (1998-2000) for the Yeywa hydropower project for the Myanmar Government. The study was to confirm the feasibility of the project from technical, environmental and economic viewpoints. The basic design of the project at the time was for a facility that would include a 600-MW (150 MW x 4 units) power plant that would generate 2,815 GWh annually

Nippon Koei Co Ltd website information, [n.d.]. <u>http://www.n-koei.com/english/profile/index.html</u> Nippon Koei Co Ltd, a Japanese technical assistance consulting firm, carried out a feasibility study for a multipurpose dam at Yenwe in 1980-81. The study proposed a 72-m high earth filled barrier using 2,200,000 m3 of fill that was designed to irrigate 48,000 ha and generate 16,000 kWh annually. The study was commissioned by the Asian Development Bank.

See also the following editions of the New Light of Myanmar: 15/04/01, 02/08/01, 10/08/01, 22/06/02, 17/07/02, 02/01/03, 23/01/03, 19/04/03, 05/09/03, 23/12/03, 08/09/04, 20/12/04, 03/09/05, 23/03/06, 04/06/06, 2/06/06, 21/08/06, 26/09/06, 06/11/06, 06/12/06, 04/02/07, 22/04/07

#### KUNCHAUNG MULTIPURPOSE DAM PROJECT NEEDS BETTER CO-ORDINATION

NLM, 16/03/05. <u>http://groups.yahoo.com/group/myanmar\_information/message/11269</u>

Gen Than Shwe, accompanied by SPDC members, senior military officers, ministers and department heads, helicoptered to Kunchaung hydropower project on Kun Creek, nine miles west of Pyu in Pyu township. EPM Tin Htut reported on construction of the tunnel, plans to be implemented season-wise, arrangements for supply of electricity through the grid, and measures for arrival of machinery; Ministers Tin Aung Myint Oo and Industry Minister No 1 Aung Thaung spoke on steps for supply of materials for the power lines; Minister for Agriculture and Irrigation Htay Oo on the diversion weir and irrig system for the Kunchaung project; Energy Minister Lun Thi, on measures for the constant supply of fuel for the project, and Forestry Minister Thein Aung, on conservation of forests in the Bago Yoma mountain range.

In response, Gen Than Shwe gave guidance on completion of the dam ahead of schedule so that the people could enjoy the benefits of the facilities as soon as possible. He stressed the importance of simultaneous implementation of related tasks instead of doing only one after another. Parallel completion of the dam and canals is necessary. Innovative measures are to be taken with added momentum for production of electrical apparatuses, he said.

HPD Group No 3 is in charge hydropower section of the Kunchaung project, while the Irrigation Dept is to work on the construction of diversion weir and irrigation system. A 1,260-foot-long, 240-foot-high rock-filled dam with earth core will be constructed. The project is designed to generate 60 MW and benefit 110,000 acres of farmland.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-05: Toungoo Pyu creek dam, 9 mi west of Pyu [18° 29' N, 96° 26' E], grid square reference: 9\4, 25\7 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg</u>

#### Additional references

NLM, 26/11/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071126.htm</u> EPM No 1 checks on drilling of underground water tunnel (exit) at Pyuchaung hydropower project, site chosen for power plant and work on power intake building, as well as drilling of the tunnel and the water sluice gate.

NLM, 28/09/07. <u>http://www.ibiblio.org/obl/docs4/NLM2007-09-28.pdf</u> EPM No 1 is making increased efforts to complete the Kunchaung and Khabaung hydropower projects ahead of schedule. The hydel power project located over Kun creek, west of Pyu, is 57pc complete.

NLM, 20/09/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070920.htm</u> Earth work for the power station and the digging of approach tunnel No 1 and the power intake channel are ongoing, also the installation of steel pipelines, earth work on the main embankment, construction of the power intake structure and the approach bridge to it, 57.7pc of the hydropower project is finished.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf The Kuncheung dam and power station with a planned conscitute of 60 MW is under implemented

The Kunchaung dam and power station with a planned capacity of 60 MW is under implementation by the HPID. It will generate 190 million kWh annually when it comes on line in Dec 2008.

Platts Myanmar Country Energy Profile, [mid-2007] [edited]. For access information, see <u>Power Profile</u> In July 2004, Tianjin Alstom Hydro in China received an order from China Heavy Machinery Corp (CHMC) to supply three 22-MW Francis turbine/generator sets for the Kunchaung hydro plant. The project has a 385metre-long, 73-metre-high, rockfill dam on Kun creek located 15 km from Phyu. Completion is expected in 2007.

NLM, 14/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070214.htm

The 60-MW Kunchaung hydel power plant will generate 190 million kWh yearly. At present, 149 feet of the 335-foot-long intake tunnel have been dug. Dredging of up-stream tunnel and down-stream tunnel at the approach tunnel No 1 and construction of the 18-foot-diameter and 5,756-foot-long tunnel is underway. Work on the power intake building, water control tower and spillway are continuing. Three 20-MW turbines will be installed. The project will supply water to 110,000 acres of farmland.

NLM, 04/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061204.htm

Officials report on building the main embankment, placing of the steel pipe lines, construction of the spillway and the water-intake facility. 60pc of the project has been completed.

NLM, 06/11/06. www.myanmar-information.net/infosheet/2006/061106.htm

[In Nanning in the PRC] EPM No 1 Zaw Min met with Chairman Zhao Ruolin and party of China National Electric Equipment Corp about the timely arrival of electronic and mechanical equipment for the Yenwe,

Yeywa, Khabaung and Kengtawng hydel power projects. V-C Zhu Xu and party of China National Heavy Machinery Corporation called on the minister and discussed timely sending of electronic and mechanical equipment and hydraulic steel structure for the Kun and Khabaung Hydel Power Projects.

NLM, 25/03/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040325.htm

D-G of the HPD Win Kyaw and President Lu Wenjun of China National Heavy Machinery Corp signed a commercial contract for supply of the hydraulic steel structure works and electrical and mechanical equipment for the Kun creek hydro power project.

NLM, 22/09/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030922.htm

Gen Khin Nyunt and party visited Kunchaung hydel power station project, nine miles to the south-west of Pyu The earthen type dam will be 990 ft in length and 240 feet in height. Three 20-MW generators will be installed that will generate 190 million kWh per year.

NLM, 28/11/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021128.htm

The dam at Kunchaung hydel power project is rock-filled with an earth core, 990 ft long, 240 ft high. It can hold a maximum of 1,190,000 acre-feet of water. Spillway and conduit will be of reinforced concrete. It will be able to generate 60 MW. The project started in Jan 2001 and will be completed in Dec 2005.

MEPE website information, [circa 2001] [no longer available on-line]

Feasibility study and detailed design of the Kunchaung multipurpose dam and power station were contracted to NEPS Myanmar on 26/02/01. **Compiler's note**: NEPS is a Myanmar company, headed by U Htay Win. Apart from the fact that it occasionally makes contributions to government-sponsored causes, little other public information is available about the company, but it would appear to be a consulting engineering firm.

NLM, 18/01/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010118.htm

Gen Than Shwe inspects Kun creek hydro-electric power project. MEPE is implementing the project on Kun Creek, a tributary of the Sittoung River, seven miles west of Phyu. The power plant will be capable of generating 60 MW, and the project will irrigate 110,000 acres.

Myanmar Snap Trade Directory, [n.d., circa 1999]. <u>http://www.myanmarsnap.com/investment07.asp</u> A feasibility study on the Kun creek project has been completed by the China National Agricultural Machinery (E & I) Corp. The power plants will be capable of generating 84 MW.

WPD, 15/09/90. http://www.ibiblio.org/obl/docs3/BPS90-09.pdf

The Special Projects Implementation Committee, chaired by SLORC V-C Gen Than Shwe, met to review hydel power and energy projects. Among the projects planned for later implementation are the Kun Hydel Power Project in Pyu township (84 MW) at a cost K 1,110 million (including US\$ 100 million).

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PAUNGLAUNG POWER PLANT MYANMAR'S FIRST UNDERGROUND STATION

Kyaw Thu, Myanmar Times, 14/03/05. http://www.myanmar.gov.mm/myanmartimes/no258/MyanmarTimes13-258/n003.htm

Myanmar's biggest power plant is due to come on stream in the near future and is expected to increase the country's energy generating capacity by nearly 19pc. The Paunglaung project, 224 miles north of Yangon, is also the first underground hydropower plant in the country. Its four 70-MW turbines will produce 911 million kWh of energy a year. The turbines are powered by water from the Paunglaung river, that is stored in a reservoir behind a dam built as part of the project. The reservoir has a surface area of 559,410 acres. The water is collected behind a zone-type rock-filled dam with an impervious earth core measuring 3084 feet wide and 430 feet high.

In Nov 1999, the water flow from Paunglaung River was diverted through two diversion tunnels in order to construct the zone-type rock-filled dam across the river. "The rock-filled dam as well as all structures are designed to withstand an earthquake of between magnitude 8 and 9 on the Richter scale", said U Ngwe Thein, the superintending engineer at the plant. "The electricity generated by Paunglaung will be sent to

Pyinmana power substation, 11 miles from the site, by two 230-kilovolt power lines, and then into the national grid to be distributed throughout the entire country," said U Ngwe Thein.

Work on the project started in 1997 and took seven years to complete at total cost of K 7.9 billion, US\$ 170 million and 1.7 billion Yen. The project, which was designed in 1982 by the Norwegian company, Norconsult, was reviewed in 1997 by the Yunnan Machinery and Equipment Co ((YMEC). The underground power plant, 310 ft by 50 ft and 140 ft high, was built by engineers and technicians from DHP under technical guidance from YMEC.

Energy-generating capacity will vary according to the available water flow from the reservoir. The turbines will only operate at full capacity when the water level is between 455 ft and 623 ft. "Normally we will be able to operate all four turbines from July to September, three from October to December, and just one during the rest of the year", said U Ngwe Thein. "Because the power plant is underground, the turbines will get a higher head inflow of water" said Major Ko Lay, deputy director of the DHP. The water that powers the turbines flows from the reservoirs through two tunnels, 28 ft in diameter and 263 ft long.

Although the Paunglaung power plant is Myanmar's biggest energy project, its construction went smoothly, said Major Ko Lay. "We did not encounter any major difficulties," he said. More than 100 Chinese technicians and about 1200 Myanmar employees are working on the final installation of electrical and mechanical equipment at the project. Four 10- member teams will operate the turbines continuously, with most of the staff already fully trained. "Chinese experts have been giving our staff on-the-job training, and we have also sent our engineers to a similar underground hydropower plant in China for further training," said U Ngwe Thein.

Myanmar enjoys an abundance of water resources. A report by the World Bank in 1995 said the country could produce 108,000 MW of hydropower. However, even including the new Paunglaung project, Myanmar is currently producing only 1486.9 MW of power from all sources within the national grid. **Compiler's note**: A good photo of the inside of the generating plant is available with this article.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-01: Pyinmana Paunglaung river dam, near Kyitaung Khawma [19° 46' N, 96° 19' E], grid square reference: 10\9, 25\7 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-1.jpg</u>

The intake structure is easily located on Google Earth at 19° 46' 59" N, 95° 30' 32" E along with the impressive dam barrier and large reservoir.

#### Additional references

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In Oct 1998, YMEC and MEP signed a US\$ 160 million deal to build the Paunglaung hydroelectric plant in Pyinmana township. The first feasibility studies for this multipurpose project were conducted by America's Knappen Tippetts Abbett Engineering Co in 1953. Additional work was done by the UNDP in 1964, Japan's NEWJEC in 1976, and Norway's Norconsult from 1982-1990. The project was approved in April 1990 with a capital budget of K 16,019 million. The 945-metre rock dam across Paunglaung creek is 131 metres high, the tallest in the country. Paunglaung has four 70-MW turbine-generator sets in an underground powerhouse, the first in the country. In Sept 2000, China Export-Import Bank (CIEB) signed an agreement with MEP approving a \$ 120 million export seller's loan to help finance the plant. This was in addition to a \$ 7.2 million loan approved earlier. The ID of the A&IM took the lead on the civil works. MEP started work on the diversion tunnels in 1996 and the plant was inaugurated in March 2005. Paunglaung is connected to the grid at 230kV through an expanded substation at Pyinmana.

Mizzima, 12/04/06. www.burmanet.org/news/2006/04/12/

Despite the Paunglaung plant's capacity of 280 MW, sources said water levels were so low only two of four turbines were operational, meaning many towns were going without electricity. "Last night, the light went out at midnight. We can get power back again only at 2 pm tomorrow. Previously we got power regularly from Paunglaung power plant. We got power whole day and whole night. Since last two months back, we have been facing this load shedding," a Pyi resident told Mizzima.

NLM, 25/09/05. www.myanmar.gov.mm/digest/News-2005/Sept05/sept25.html

The Ag & Irrig Minister inspects the Paunglaung project. Director of Construction Gp 5 of the ID U Victor reports on water flow into the dam, storage of 560,000 acre feet and release of surplus water.

#### NLM, 26/03/05. www.ibiblio.org/obl/docs2/NLM2005-03-26.pdf

A ceremony to inaugurate Paunglaung Multi-purpose Dam Project near Kyitaung-Khawma village in Pyinmana township was held near the dam. PM Soe Win said underground tunnels had been built to harness the Paunglaung which has a flow of 3.3 million acre-feet of water annually. Hardships were faced in building the power station according to design. As the work volume was large, the project had needed sophisticated technology. In addition to the high rock-fill dam, the Ag & Irrig Ministry had built the four-step spillway with much difficulty. The EPM had built two diversion tunnels, the intake structure and the power plant and cables including 37 large and small underground tunnels. The Paunglaung project is a symbol that engineering technology has reached a higher level of development in Myanmar. New hydel stations can be built only if the economy is robust. The big task is strengthen the national economy. Rather than relying on outside assistance, the nation should do its best with her own capital and strength. EPM Tin Htut said the Paunglaung power plant was the first underground hydel station in the country. It can generate 280 MW but cannot produce power at full capacity in the rainy season. So the Ahtet Paunglaung hydel project will be implemented on the Paunglaung river, 32 miles above the lower station. General Maung Aye said the Paunglaung multi-purpose dam project had emerged from a 30-year long-term project to ensure all-round development in the nation. He presented cash awards to the staff who participated in the dam construction through Director U Vita of Construction Group 5 of the ID. At the hall of the power plant, the vice-governor of Yunnan province of the PRC formally unveiled a signboard reading 'Perpetual flow of the Paunglaung River and perpetual amity between Myanmar and Paukphaw' [sic] written bilingually in Myanmar and Chinese. Afterwards, General Maung Aye and party went to the site of Ahtet Paunglaung hydel power project. Good photos of the Paunglaung dam, site and power plant are available at Compiler's Note: http://www.ibiblio.org/obl/docs2/NLM2005-03-26.pdf

#### NLM, 31/08/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040831.htm

Deputy EPM Myo Myint reported to PM Khin Nyunt and party on power supply through the grid after installation of turbine No 4 at the underground power station at Paunglaung. More power will be supplied after installation of turbine No 3 in September. Arrangements are being made for installation of turbines No 1 and 2 in Nov and Dec 2004. The visitors viewed construction of the main dam and construction of stable water pond levels 1, 2, 3 and 4, and intake tower. The PM gave instructions on conservation of the forests and trees in accord with rules and regulations for greening of the project area. They also inspected power control room. A fruit basket was presented to YMEC Chairman Feng Ke and party who are engaged in the project.

See below: Paunglaung plant to supply <u>Mandalay with 24-hour electricity</u> (MT: 16/08/04)

#### NLM, 28/08/03. www.myanmar.gov.mm/Article/Article2003/aug/Aug28b.htm

The Paunglaung River is a tributary to the upper reaches of the Sittoung River. It rises on the Shan plateau and its current flows at a rate of 4,520 cu ft/second. Hsinthay creek from the Yamethin region and Ngalaik creek that flows through Pyinmana meet east of Pyinmana and together with the Paunglaung form the Sittoung River. Water flows in the creeks only in the rainy season and is hardly seen there in other seasons. The Paunglaung dam stretches between the mountains on either side of the Paunglaung river. It is 3,084 ft long, 430 feet high. Its storage capacity is 559,410 acre feet of water at full brim, of which 283,760 acre feet of water can be used. The spillway is of the ladder type with no gate. It is 410 feet wide and designed to release 353,160 cu ft of water per second. The underground power plant under construction by the HPD will house four 70-MW vertical Francis turbines. Women engineers are working alongside the men on the project. Asst Engineer Daw Aye Aye Than leads the women's group involved in digging the tunnels, building the diversion wier and intake building and carrying out tasks along the high-pressure pipe lines and the underground power station. Myanmar women can take pride in the young women engineers who are taking part in nation-building tasks like this. By July 2003, 95pc pf the tunnel work and 97pc of the tunnel for the underground power station had been completed. Priority is now being given to building of major structures such as water inflow gate and the power intake. The first turbine of the power station will be installed in December and the fourth and last turbine in 2004. Efforts are being made to distribute electricity in 2004-2005.

Yankin Soe Min, NLM, 31/01/03.<a href="http://www.myanmar.gov.mm/Article/Article2003/jan/jan31a.html">http://www.myanmar.gov.mm/Article/Article2003/jan/jan31a.html</a>Yankin Soe Min, NLM, 02/02/03.<a href="http://www.myanmar.gov.mm/Article/Article2003/feb/feb2d.html">http://www.myanmar.gov.mm/Article/Article2003/jan/jan31a.html</a>

Feasibility studies for the multipurpose Paunglaung dam project were conducted by Knappen-Tippetts Abbett (KTA) in 1953, the UNDP in 1964, New Japanese Consultants (NEWJEC) in 1976, and Norconsult in 1982, 1983, 1987 and 1990. By filling the dyke with rocks produced by the digging of the spillway, the cost of building the dam is being reduced. Additional costs are saved by not attaching a sluice gate to the spillway. Some of the special difficulties encountered in building a rock dam: frequent changing of the drill bits, machinery is frequently out of order with consequent shortage of spare parts, difficult terrain, heavy trucks have to be driven with great over narrow hilly roads slowing down the process, less equipment available because of the heavy costs involved. Special technologies used for the first time in building a dam in Myanmar include: high pressure pump washing in preparing the dam bed, mining technique in preparing the spillway, use of consolidation grouting and the anchor volt system.

NLM, 19/09/01. http://www.myanmar.gov.mm/NLM-2001/enlm/Sept19.htm

At the Paunglaung project site, Lt-Gen Khin Nyunt and party hear a report by the Irrig Dept's Win Maung on construction of the main rock-filled dam and spillways and building of irrigation facilities. MEPE project director Soe Myint, reports on construction of related structures including two tunnels and power intake, construction of the 230-KV power line, the 3,300-metre-long tunnel, power station and 37 different sizes of tunnels and plans for the installation of turbines and transformers on completion of the construction work. The visitors inspect the power intake structure undertaken by MEPE, building of the spillways, construction of the tunnels for power house, work at pressure shaft No 2 and construction of the main stone embankment by the Irrig Dept. The stone embankment dam is 430 ft high and 3,100 ft long. The dam will be able to irrigate 50,000 acres and generate 280 MW.

Yunnan Machinery I & E Co Ltd, [circa late 2002; <u>http://www.ymec.com.cn/en/hpp/project\_pl.htm</u>

The Paunglaung project was signed by YMEC in Oct 1998. YMEC has applied for an export credit and organized the implementation of the project which will be jointly built by Kunming Hydroelectric Investigation Design and Research Institute (KHIDI) of the State Power Corp of China.and the 14<sup>th</sup> Construction Bureau (FCB) of Water Resources and Hydropower of China. The construction of the project responsible by YMEC started from the end of 1998. . . . The Underground Powerhouse of this project is on a large scale,and technically complex. It is consisted of 32 tunnels with the overall excavation length of about 3 kilometres. The total contract value is US \$ 170 million, provided by Chinese Government on seller's credit basis. **Compiler's Note**: Photos of the intake structures and interior of the underground station are available on this site.

Ningbo Huyong Electric Power Material Co Ltd website [n.d.] <u>www.hydl-cn.com/en/aboutus.htm</u> Ningbo Electric Industry Bureau, Ningbo Huyong Electric Power Material Co Ltd of Ningbo City in Zhejiang Province produced the 230KV steel power transmission towers for the Paunglaung Hydroelectric Station of the State Power Industry Ministry of Myanmar.

Xinhua, 19/09/00. http://www.ibiblio.org/obl/docs/SW08.htm

The Export-Import Bank of China (Eximbank) has signed an agreement with MEPE to provide an export seller's loan worth 1 billion yuan (US\$ 120 million) to help build Myanmar's largest hydro-power project to date. The loan will enable the Yunnan Machinery and Equipment Import and Export Co (YMEC) tro provide power-generating equipment for the Paunglaung Hydro-electric Station which will have an installed capacity of 280,000 kilowatts. Prior to this, Eximbank approved another 60 million yuan (US \$ 7.2 million) loan for the project. The power station will supply one-third of the electricity for Myanmar when it is commissioned in 2003. YMEC clinched the US\$ 160-million dollar contract to supply machinery for the project with MEPE in 1998.

Myanmar Information Cte, 07/10/98. <u>www.ibiblio.org/obl/reg.burma/archives/199810/msg00166.html</u> An agreement on implementing Paunglaung hydro-electric power project was signed between MEPE of the EPM and YMEC at the International Business Centre on 6 October. MEPE, in cooperation with YMEC, has built 15 hydroelectric plants since 1990. The agreement for the Paunglaung project is worth about US\$ 160 and is the biggest economic co-operation project to date between Myanmar and China. Myanmar Information Cte, 27/09/97. <u>www.burmalibrary.org/reg.burma/archives/199709/msg00339.html</u> EPM Tin Htut toured Paunglaung hydro-electric power project. He said the completed diversion tunnel was the first of its kind built with integrated technology in Myanmar. He urged completion of the second diversion tunnel and other tasks as scheduled. Construction of the two diversion tunnels, each 33 ft wide, 46 ft high, 3,300 ft long, began in Jan 1996. The first tunnel was completed on 26 September.

#### NLM, 03/05/96. www.ibiblio.org/obl/docs3/BPS96-05.pdf

MEPE represented by MD U Zaw Win and NEWJEC Consultant Group of Kajima Corp of Japan, represented by Kajima Chairman Arkira Miyazaki, signed a contract to build two diversion tunnels for the 280-MW station of the Paunglaung hydel-power project.

#### WPD, 15/09/90. www.ibiblio.org/obl/docs3/BPS90-09.pdf

The Special Projects Implementation Committee, chaired by SLORC V-C Gen Than Shwe, met to review "hydel power and energy projects." Projects in the immediate future include the Biluchaung HEP project No 1 in 1992 (28 MW) and the Mann thermal generation project in 1993 (72 MW). Later projects planned include: Saing Din hydroelectric project, Buthidaung tsp; Paunglaung hydel power project, Pyinmana tsp (280 MW) at a cost of K 4,250 million (including US\$ 410 million) for power, and K 135 million (incl. US\$ 14 million) for irrigation of 40,000 acres; Bilin hydel power project, Mon State, (240 MW) at a cost of K 2,590 million (incl. US\$ 245 million); Kun Hydel Power Project, Pyu tsp, (84 MW), Yenwe multipurpose dam project, Kyauktada tsp (Bago), 16.2 MW and irrigation of 40,000 acres.

*Burma: Issues and Option in the Energy Sector: World Bank Report No 5416-BA:* June, 1985, p 18. www.wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1999/09/17/000009265\_3970723102606/Ren dered/INDEX/multi\_page.txt

An important project is the proposed Paunglaung I hydroelectric dam which has been the subject of detailed engineering and design studies. The project would have a significant irrigation component (21,520 ha) in addition to an installed power capacity of 280 MW (4 x 70 MW). Energy output would be 911 GWh, of which 342 GWh represents firm energy. The cost of the project is estimated at about US\$445 million, excluding the irrigation component. The average cost of generation for Paunglaung was estimated at 1981 prices to be 4.6 cents/kWh. If the irrigation benefits are included, the average cost would be reduced to 3.5 cents/kWh. Since completion of the design studies, a number of questions have been raised. First, as regards irrigation aspects, it is not clear that a proper optimization has been carried out in arriving at the recommended The second question relates to the reservoir capacity and operating regime -- the dry season scheme. operating regime for the recommended Paunglaung scheme provides peaking power of 197 MW for a duration of only 1.5 hours per day, which is not adequate for the daily load pattern presently experienced. Third, there is some question over the geology at Paunglaung and the way it could affect the costs of constructing a higher dam which incorporated recommended design changes. After discussion with Bank staff it has been concluded that further study of the irrigation component is warranted to see if the proposed area of 21.520 ha cannot be further increased. Regarding the reservoir capacity and operating regime of Paunglaung and the geology of the site, an independent consultant will study the possibility of adopting a steeper slope for dam height optimization. If the higher dam is feasible, the dry season peaking power and dkuration will be higher than in the currently proposed scheme. As an alternative, the consultant will need to study the possibility of increasing the high water level of the dam without altering its total height to gain additional storage. [Note 17: To 2 metres from the top of the dam instead of 3.5 metres]

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#### <u>Start 05</u>

#### **DAEWOO ELECTRONICS MYANMAR LIQUIDATED**

Xinhua, 11/01/05. www.burmanet.org/news/2005/01/11/

Daewoo International of South Korea has readjusted its business involvement in Myanmar by stopping its investment in electronic equipment production in the country and concentrating on new investment in oil and gas sector, according to the local Flower News journal Tuesday. Quoting the Myanmar Federation of Chamber of Commerce and Industry, the journal said the liquidation of the Myanmar-Daewoo Electronics Co

Ltd would not affect its other undertakings in the country such as oil and gas exploration and development in collaboration with the Myanmar energy authorities. Daewoo Electronics stepped into Myanmar not long after the latter opened to foreign investment in late 1988, working in cooperation with the Ministry of Industry No 2 under the basis of mutual benefit and undertaking production of TVs, washing machines and refrigerators in the country. In recent years, the Daewoo International has switched its engagement mainly to the oil and gas sector.

#### Additional references

Myanmar Times, 03/09/07. http://www.mmtimes.com/no382/b004.htm

South Korea's Daewoo International Corp. formally returned to Myanmar's consumer electronics market on August 25 with the opening of a Yangon showroom, almost a decade after the company pulled out due to financial woes. Daewoo has partnered with local electronics retail chain OK Myanmar to distribute its home appliances, including televisions, DVD players, refrigerators, washing machines and air conditioners. Daewoo International is a former trading unit of the now-defunct Daewoo Group, which collapsed due to corporate corruption and massive debt following the 1997 Asian financial crisis. Daewoo stopped exporting consumer electronics to Myanmar in 1998.

#### Burma Independent News Agency, 30/06/99.

#### http://www.ibiblio.org/obl/reg.burma/archives/199906/msg00659.html

On May 24th, workers at the 'Small Luxury' factory staged a peaceful, silent work stoppage to display their dissatisfaction with long working hours, high travel costs and low wages. With the prices of household necessities skyrocketing, the labour force at the factory has been trying for some time to get a response from the company to their demands but without result. Daewoo officials and their Burmese partners showed up to listen to the workers' requests. But Daewoo, well experienced in dealing with worker actions, advised the military against making any direct response at that time. Shortly afterwards, all the workers who had taken part in the work stoppage were dismissed from the company. Many of them report being watched and individually threatened since that time.

### Burma Net Brief Business Reports, 16/06/96.

# www.burmalibrary.org/reg.burma/archives/199604/msg00111.html

Daewoo Electronics will set up a general electronics plant in South Dagon, near Rangoon, with an investment of 20 million, the company announced. The plant will initially turn out 200,000 color TVs, 200,000 VCRs, 70,000 refrigerators, and an unspecified number of parts and components yearly starting next year. In a related move, the company plans to transfer color TV and VCR lines currently operating in Rangoon to South Dagon.

WPD, 05/12/92. http://www.ibiblio.org/obl/docs3/BPS92-12.pdf - doc p.21

Daewoo Electronics Myanmar Co Ltd has exported US\$90,000 of electronic connecting cables to Korea. 2 Korean technicians and 86 Myanmar workers are making the components, and about US \$100,000 has been invested. US\$2 million of components will be manufactured annually.

WPD, 08/08/92. <u>http://www.ibiblio.org/obl/docs3/BPS92-08.pdf</u> [document p.17]

Daewoo Electronics Myanmar Co Ltd (DEMCO) celebrated its first export of colour television sets made in Myanmar. DEMCO, founded on July 25, 1990 with an investment of US\$ 4 million, started production for the home market on Apr 01, 1991. Its first export order, for 14"-colour TVs was received in January 1992 and will begin 07 Aug 1991. MD Sun Ryang Chung said DEMCO has a capacity of 120,000 TV sets per year (color and black & white), plus 150,000 radio cassette players and 30,000 refrigerators. It has 154 employees, of whom five are Korean. Employment will rise to 250 by the end of the year.

Soe Tin Win, WPD, 9,21/04/91. <u>http://www.ibiblio.org/obl/docs3/BPS91-04.pdf</u> [document p.19] Daewoo Electronics Myanmar assembles TV's (14" and 20"), radios, cassette tape recorders, and refrigerators. Myanma Heavy Industries, the Myanmar partner in the joint enterprise, rents its former radio factories to the company for US\$ 50,000 per year. The company's refrigerators and two kinds of radio cassette recorders will go on sale in April and will sell for K 6,500. 14"-black-and-white TV sets will be available soon and will sell for K 19,650. Colour TVs, when available will sell at K 29,500. MD Chung says 20pc of the company's products will be sold in Myanmar with the rest going to the EC and America. The

company currently employs 97 Myanmar and 9 Korean workers. Another 50 workers will be added soon and the company expects to have a total of 200 by the end of 1991. 13 Myanmars were sent for training in Korea in August 1990. Pay ranges from K 1,100 to K 3,000 for an 8-hour day.

WPD, 04-06-90. <u>http://www.ibiblio.org/obl/docs3/BPS90-06.pdf</u> [document p.45]

Ministry of Trade Notification No. 12/90 of June 3 establishes the Daewoo Electronics Myanmar Co Ltd, a private joint venture established by Myanma Heavy Industries of Ministry of Industry No 2, and Daewoo Electronics Co Ltd of Korea, represented by President Yoon Young Suk, for "manufacturing and marketing of electric and electronic household products. Its capital is US\$ 12,000,000 (equivalent to K 80,400,000), divided into 12,000 shares of US\$ 1,000 (equivalent to K 6,700), of which Myanma Heavy Industries will hold 5,400 and Daewoo Electronics 6,600. Shares will be subscribed in US dollars.

#### WPD, 30-03-90. <u>http://www.ibiblio.org/obl/docs3/BPS90-03.pdf</u> [document p.39]

An agreement was signed by Kim Yong-Won, President of Daewoo Electronic Co and Chairman of the Daewoo Group of Korea Yoon Young-Suk with Myanma Heavy Industries to establish the Daewoo Electronics Myanmar Co Ltd as a joint venture, with a capital of US\$ 4 million divided 45-55% between the Myanmar and Daewoo partners.

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#### PROPOSAL FOR BARGE-BASED POWER PLANT AT MONYWA COPPER MINE

Monywa Copper Mine Electric Power Plant Project by BOL Scheme, Engineering Consulting Firms Association -- Japan, [late 2004]. http://www.ecfa.or.jp/japanese/act-pf/H16/minkatsu\_Myanmar\_Eng.pdf

**Note**: The resume that follows was prepared by the compendium compiler. The proposal it presents for a floating power plant to service the needs of the copper mine at Monywa is interesting in itself. But the document is of special interest for the information and analysis it provides about the challenges facing the electricity generating industry in Myanmar during the period 2001-03 when most of the data in the proposal was collected. Refer to the original for full details. The pages missing from the pdf version, are available in html format accessed through Google.

Ivanhoe Mines Ltd of Canada formed a joint venture with with Mining Enterprise No.1 of the Myanmar Government to develop mining sites at Sabetaung, Kyisintaung and Letpadaung near Monywa in 1996. A refinery was set up at the minesite using the advanced extraction-electrowinning (SX-EW) process to produce high quality 99.999% copper cathode. The mine is now one of the most efficient, low cost copper producers in the world. The J-V has 550 permanent employees and an additional 1,300 constructions/logistic related workers. It is the largest employer in Sagaing division. By the middle of 2004, copper production had reached 27,500 T year and was scheduled to increase to 39,000 T/year. The J-V is trying to expand capacity to 150,000 tons per year but due to several factors, including a severe shortage of electric power supply in Myanmar, has not been able to do so.

Although Myanmar has a 30,000-MW hydro power capacity potential, only 3pc cent of this potential has been developed, 70pc of the power generating equipment in 1999 was dependent on natural gas. Natural gas is available in Myanmar, but over 90pc of the gas produced is exported to Thailand. This shortage of natural gas domestically has existed for sometime and the amount available for electric power generation within the country is considered to be only 25pc to 30pc of the total demand. A number of short-term programs to ease the power shortage in the country were mapped out between 1998 and 2000, but only two thermoelectric projects, Ahlone steam plant (50 MW) and Hlawga steam plant (50 MW), and one hydroelectric project, Zawgyi II, have reached the production state. All other projects have been deferred for lack of funds. Three large projects dependent on natural gas at Kyaikto (300 MW) [in Mon state], at Ywama (300 MW) [in Yangon] and one dependent on delta offshore gas (200 MW) [in Ayeyawaddy division] have yet to be implemented. Only the Paunglaung project and three other hydroelectric generating projects are currently proceeding, but even these have been delayed.

According to forecasts prepared by ECFA [Engineering Consulting Firms Association - Japan], Myanmar will require a base-case power plant capacity to generate 1,787 MW in 2005, and 2,984 MW in 2010. MEPE is

considered to have a current operational power plant capacity of approximately 1,200 MW, which in all likelihood falls short of demand by at least 20pc to 30pc.

This is a critical issue for the Monywa copper mine. Because of favorable current and future prospects for copper market prices, a plan exists to expand mine production to 50,000 T/year within a few years from the current level of 27,500 T/year. Furthermore, the development of the Letpadaung mine site near the existing S & K pits that would bring an additional 120,000 T/year into production. Current electric power requirements by the mine and refining plant are about 20 MW which is supplied from the Kyunchaung (gas turbine) power station of MEPE. Based on the company's plan to develop the Letpadaung deposit, this is expected to increase to 100 MW by 2010 and will require a new 230-kV transmission line that will be installed by MEPE between Monywa and Mandalay in 2005-2006.

For this expansion to occur, a secure electric power supply system must be ensured. A possible timetable is shown in the Table bebw:

	2004	2006	2008	2010
1. Copper Production	30,000	50,000	80,000	150,000
(Tons)				
2. Electric Power	20	34	54	100
Requirement (MW)				

#### Copper Production and Expected Electric Power Requirement (MW)

#### Proposed Solution:

It is not clear when natural gas iin Myanmar will become available to fuel additional generating plants for domestic purposes. Moreover, there are no major consumers of heavy fuel oil in in the country, but diesel is widely used for power generators and transportation, Heavy fuel oil could be handled in a way similar to that of diesel oil except that heavy fuel oil requires heating to maintain proper fluidity for handling. The cost of heavy fuel oil is much cheaper than that of diesel oil. Given its generating capacity and the current situation in Myanmar, the introduction of heavy fuel oil as a fuel for power generation is highly recommended for immediate power development until sulfur-free natural gas becomes available for power generation at a reasonable price. Diesel engines can be operated safely with diesel oil or heavy fuel oil even though it normally contains a certain amount of sulfur. With some modifications and the addition of a gas injection system, a low speed diesel engine can also operate on natural gas. It can safely be said that the best medium-size power plant for Myanmar would be one that uses low speed diesel engine generators in areas remote from coal resources

Taking into account the additional power supply required for the next phases of the Monywa copper project and possible use in other areas of Myanmar, a low speed diesel engine power plant with a 60-MW generating capacity is recommended. To balance the need for periodical maintenance with the advantages of cost saving in having larger machines, four unts of around 15 MW each would be best. A barge-mounted diesel power plant (BMDPP) would offer great advantages. It could be built where specialized production facilities of a well-equipped shipyard are available and standardized technology and stringent schedule control could be utilized. It could be used even where construction facilities are minimal or access to the site by land is difficult. It would be easy to move from one location to another desired location where power demand is high and access waterways are available. Should the total power supply system in the country become so well developed that the BMDPP were to become redundant, it could be sold to another country.

The total project including the 60-MW barge power plant (US\$ 71.5 million) and transformers and adaptor set (US\$ 8 million) would cost an estimated US\$79,500,000 at the current market exchange rate of ¥110/US\$. Based on a life-time expectancy of 25 years for the plant, a heavy fuel oil price of US\$ 200 MT (or crude at \$ 45/bbl), a system oil price of US\$ 0.90 per litre, a cylinder oil price of US\$ 1.30/litre, a load factor of 8,000 hours/year, operation and maintenance costs of US\$ 0.0139/kWh and interest costs of 5.0pc/annum on the initial project costs, it is estimated that the power generating costs of a generator terminal of the BMDPP would be approximately US\$0.065/kWh.

The BMDPP could be financed by an independent power producer (IPP) either as a BOL (build, own, lease) or a BOT (build, own, transfer) scheme under existing laws in Myanmar. The BOT option would allow MEPE, the national power company, to obtain the plant at no cost to itself after 10 years of operation by the IPP. Under the lease agreement (BOL), the power plant would be leased to MEPE who would be required to operate it in the interests of the mining company for a period of at least ten years. The BOL option is preferable because MEPE could place the BMDPP anywhere it wanted in Myanamr to generate power for other customers, as long as it supplied the requirements of the Monywa Copper project from other sources. We consider that the BOL scheme would be less risky for investors, since it would not require a special swap agreement with MEPE who could supply the power to the mine in the most efficient way possible.f

#### Additional references

See above: <u>Ivanhoe looking</u> to Yeywa project for power supply (MT: 24/10/05)

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#### MON CREEK MULTI-PURPOSE DAM AND POWER STATION OPENED

NLM: 30/12/04 http://www.ibiblio.org/obl/docs2/NLM2004-12-30.pdf]

Mone creek multipurpose dam in Sedoktara township jointly constructed was opened on 29 December 2004 with an address by Chairman of the National Electric Power Development Project Work Committee PM Soe Win. The dam is located two miles north of Sedoktara in Minbu district where it was constructed on Mon Creek. The project was implemented to supply sufficient irrigation water, to boost summer paddy cultivation up to over 70,000 acres in the region, to prevent flooding and to generate 330 kWh per year. Mone creek dam is of an earthen type. The main dam is 4,320 ft long and the embankment 200 ft high. The dam has a water storage capacity of 674,400 acre ft and will irrigate 108,000 acres. Mon Creek hydel power station is 258 ft long, 128 ft wide and 110 ft high. Three turbine generators were installed at the station which will generate 75 MW. The project was successfully implemented by Construction Group No 8 of the ID and Construction Group No 1 of HPD.

In his address the PM said that the opening of the Mone Creek Multipurpose Dam would benefit the whole nation in addition to Magway division. Thanks to the dam, more water from Mon creek can be stored to irrigate crops the whole year round through Mezali diversion weir, so that over 100,000 acres of crops will get adequate amount of water annually. As the Mezali division weir could control Mon creek only to a certain degree in the past, farmers had to rely on North and South Mone creek canals to irrigate crops in turn. As a result the irrigation capacity then was only about 30,000 acres. Since the completion of the multipurpose dam, the irrigated areas in the region have more than tripled.

The erection of a hydroelectric power plant at the Mon creek dam is a great victory for the people in effectively utilizing the land and water resources of the western sector of Magway division. The power station at the dam is part of the electricity grid, which covers the entire nation. The feasibility study on extended utilization of the current of the creek has led to the Buywa hydelpower plant project upstream on Mone creek and Kyeeohn-Kyeewa project downstream tin he Mone Creek. These are now under way and together will be able to generate 120 MW. As a result the three projects along the creek will be able to supply sufficient water for agricultural purpose and generate nearly 200 MW.

**Compiler's Note**: Photos of the Mon creek dam and power station can be found in the print edition of NLM in which this article appeared.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-15: Myohaung Monechaung dam near Sidoktaya [20° 27' N, 94° 15' E], grid square reference: 11\8, 23\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-15.jpg</u> The Google Earth exposure of the dam area shows the extensive clearing that took place before the dam barrier was built.

#### Additional references

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In December 2004, the Mone Creek multipurpose project was opened about a year behind schedule in Sedoktara township. YMEC and CITIC worked on the project with funding support from the China Import-Export Bank (CIEB). Plant construction was coordinated between MEP and the Irrig Dept. The Mone plant has three 25-MW turbine-generator sets. The Mone project feasibility study led to the development of two other hydro plants, Buywa upstream and Kyeeohn-Kyeewa downstream. These plants are now under construction and when completed will supply 120 MW.

Kyaw Sein, NLM, 22/11/03. <u>http://www.myanmar.gov.mm/Article/Article2003/nov/nov22.htm</u> Heavy machinery at the project site in operation 22 hours a day. The only shut-down is for maintenance purposes two hours a day. Installation of the generating equipment and work on the buildings and highpressure conduits has been completed. 2,300 people are working onsite. The most difficult tasks involve finishing of the 3,625-ft-long diversion tunnel and and the 222-foot-deep afflux dam. Embankments around the main dam total 6,490 feet in length, including the 740-foot-long dyke No 1, the 1,430-foot-long dyke No 2 and the 4,320-foot-long, 200-foot high main dam, which will have a maximum water storage capacity of 674,400 acre feet and a dead water storage capacity of 110,000 acre feet. It covers an area of 10,620 acres.

Kyaw Sein, NLM, 05/07/03. <u>http://www.myanmar.gov.mm/Article/Article2003/july/july5a.html</u> Difficulties in transporting materials to the remote location of the Mon dam have delayed completion of project. The dam differs from others in that the separation wall was built with a mixture of sand and cement using plastic rather than iron. Another problem for the designers was that the diversion tunnel and hydel power tunnel had to built alongside a mountain with loose layers of rocks. The overflow tank -- 87 feet in diameter and 187 feet deep -- is the biggest yet built by Myanmar engineers. Twenty-one experts of CTTIC Technology Co Ltd of the PRC are participating in the project. A 132-kV line with 260 grid towers will connect the power plant with the Chauk power station. The Chauk station has provided power to the dam site during the period of construction.

Win Shwe, NLM, 06/02/03. http://www.myanmar.gov.mm/Article/Article2003/feb/feb06a.htm

Surveys for the project were conducted near Autpon Village in 1966 by MEPE with the assistance of technicians from China and in 1970 and 1972, under arrangements with the UNDP. The project was approved at a meeting of SPIC on 29/03/93; work started in 1997-98; the cost is estimated at K 1,680 mi llion and US\$ 32 million. Water stored at the dam will irrigate 108,000 acres of farmland via Mezali diversion weir originally built in 1905. Electric power generated will go to nearby towns and villages and to the power distribution network of the State; three 25-megawatt generators are being installed; the power plant will be able to generate 330 million kwh/yearl. The earthen dam has a catchment area of 1468 sq mi; the water level necessary for generating electric power is 359 feet; the spillway is 350 feet wide reinforced concrete, one high-pressure tunnels is 1568 feet long, the other three are 437 feet each; the tunnels are of concrete/steel type. 600 people are involved in construction operations. 75pc of the civil works and 30pc of the work on equipment installation have been completed; installation of steel plates in the large tunnel and steel pipes in the smaller tunnels is currently underway. Work on the 132 kV power line that wil link the power plant to the the sub-power station in Chauk is underway. **Compiler's Note**: A good photo of drilling operations on the intake tunnel accompanies the article.

#### Win Kyaw Oo, Myanmar Times, 02/12/02.

http://www.myanmar.gov.mm/myanmartimes/no144/myanmartimes8-144/

The multi-million dollar Mon hydro-electric dam is due to open in July-03, according to D-G Thein Tun of the Electric Power Dept. The project is costing US\$ 32 million for power generation equipment funded by loans provided by CITIC while the government is spending K 6 billion on engineering works. Work on The dam for the 75-MW project at Sidoktaya, 400 miles north-west of Yangon, is 2,166 yards long and 67 yards high. The diversion tunnel 1208 yards long and 37.4 feet in diameter, is the biggest of its kind in Myanmar. Asia World and Shwe Than Lwin companies were contracted to carry out earth-moving work associated with the dam. A contract was signed with the Myanmar Daewoo Construction Co early last month to provide extra earth-moving equipment. Although the dam is being built to generate hydro-power, it is also expected to provide water to irrigate more than 100,000 acres through a weir about 20 miles downstream.

Asia Pulse, 26/10/99. www.ibiblio.org/obl/reg.burma/archives/199911/msg00127.html

Hitachi Construction Machinery Co and Nichimen Corp have received an order from Ag & Irrig Ministry of Myanmar for 70 pieces of construction machinery. The equipment is for use in the construction of a dam for irrigation and hydroelectric power is being built 390 km north of Yangon. Construction began in 1998 and will be completed around 2003. Worth roughly 2 billion yen, the order includes a request for about 30 midsize hydraulic shovels. Nichimen will accept payment over a four-year period.

NLM, 17/04/99. http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n990417.htm

Gen Than Shwe inspects work on the diversion tunnel and spillway at the Mon creek dam project in Sedoktara township and presents fruit baskets to Japanese experts and technicians.

NLM, 21/11/98. http://mission.itu.ch/MISSIONS/Myanmar/98nlm/n981121.htm

MEPE and CITIC Technology Co Ltd of the PRC signed an agreement on implementation of the Mon creek hydroelectric power project and the Thaphanseik hydroelectric power project at the International Business Centre in Yangon on 20/11/98. Minister for Electric Power Tin Htut said the agreement is worth about US\$ 52 million.

### SEDAWGYI SUPPORT DAM SITE VISITED

NLM, 28/12/04. www.myanmar.gov.mm/NLM-2004/Dec04/enlm/Dec28 h14.html

Lt-Gen Thein Sein and party inspected the project site of Nanpet Dam, the supporting facility for Sedawgyi multi-purpose dam, in Madaya township. Director of Construction Group No 4 of the Irrig Dept U Maung Maung Tin and Director of Mandalay division Irrig Dept U Aye Thein reported on the project.

The water storage capacity of Sedawgyi multi-purpose dam, which was built in 1987, is only 363,000 acre feet. 800,000 acre feet of overflow water from the dam is diverted to the spillways each year. For full utilization of water from Chaungmagyi creek on which the Sedawgyi dam is built Nanpet dam is being implemented on Nanpet Creek [aka Nam Pok, Nam Pai], 12 miles upstream from the Sedawgyi dam. The supporting dam will be able to generate 60 MW and will contribute to the generation of electric power from Sedawgyi Dam.

At Sedawgyi dam officials reported on the condition of the dam and the generation of electric power. The dam is built across Chaungmagyi Creek and supplies water to over 100.000 acres of cultivable lands in Madaya, Patheingyi, Mandalay and Amarapura townships. Two turbines generate 12.5 MW each.

Topographic map reference: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-05: Maymyo Sedawgyi dam, near Sedaw [22° 19' N, 96° 19' E], grid square reference: 14\0, 25\8 Upper Sedawgyi dam, 12 mi north of Sedaw [22° 19' N, 96° 19' E], grid square reference: 14\3, 37\1 http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-5.jpg

The sluice gate of the dam and the reservoir are clearly visible on Google Earth at 22° 20' 50" N, 96° 16' E.

#### Additional references

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Upper Sedawgyi dam will be 73.2 m [240 ft] high and the power station with a planned capacity of 60 MW is expected to generate 315 million kWh annually. It is currently in the planning stage and will be carried out by the ID and HPID,

NLM, 19/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070319.htm

In Kyaukse, EPM No 2 Khin Maung Myint briefs Secretary-1 Thein Sein on the functions of the power stations near the Kyaukse industrial region and efforts to supply of power to Hsinmin cement plants and other factories there. The Ag & Irrig Minister submits a report on generating power from Hsedawgyi dam and supply of water to farmlands. Energy Minister Lun Thi reports on production of natural gas from production blocks and supply of natural gas to the factories.

NLM, 23/09/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060923.htm

Hsedawgyi supporting dam will be built 33 miles from Hsedawgyi dam in Madaya township. Chaungmagyi creek, where Hsedawgyi dam is situated, can provide more water than the water storage capacity of the dam. In addition to generating electricity and supplying irrigation water, 800,000 acre feet of water are being released from the dam. To make full use of water supply of Hsedawgyi creek, Hsedawgyi supporting dam project has to be undertaken. On completion, 60 MW of electricity can be generated and the Hsedawgyi dam will generate 60 million kWh of electricity.

NLM, 24/05/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010524.htm#(7)

Central Commander Ye Myint visits Sedawgyi dam; it can store 120,400 acre feet and irrigate 74,000 acres of summer paddy, 10,968 acres of summer sesamum and 1,253 acres of pre-monsoon long-staple cotton. He is briefed on water storage, irrigated plantations and power supply; he inspects the power plant.

WPD, 07/06/89. <u>http://www.ibiblio.org/obl/docs3/BPS89-06.pdf</u> [document p. 25] The Sedawgyi hydroelectric power plant in Madaya township was commissioned. It will also provide irrigation and flood control. Two 12.5-MW generators have been installed; the station has a capacity of 134 million units per year.

Far Eastern Economic Review, 17/05/84. [not available on-line] Sedawgyi dam begun in 1976-77 with a US\$ 45-million loan from the Asian Development Bank; work is being hampered by shortages of cement and diesel.

Water and Power Consultancy Services (India) Ltd (WAPCOS), website. <u>http://www.wapcos.net/intro.html</u> WAPCOS provided consultancy services to the Electric Power Corporation of Burma during the planning and building of the Sedawgyi hydro power project.

Myanmar Ministry of Agriculture and Irrigation, Dept of Irrigation, Irrigation Works in Myanmar. <u>http://www.irrigation.gov.mm/works/between1962and1988.html</u>

Sedawgyi Reservoir is in Madaya township of Mandalay division. The dam is 4,120 feet in length and its height is about 133 feet. Full-tank capacity of the reservoir is 363,000 acre-feet to be able to irrigate 127,000 acres of agricultural land. The main canal of the reservoir is 43 miles in length and its distributary canals are in total 584 miles long. 134 million kWh of hydro-power is being generated annually from this reservoir. The reservoir is the second largest one in Myanmar by its size. Sedawgyi Dam was constructed between 1976-77 and 1987-88.

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#### SPEEDY COMPLETION OF MANIPURA AND MYITTHA DAMS URGED

NLM: 22/12/04 [http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n041222.htm]

General Than Shwe and party arrived at Manipura multipurpose dam project to be implemented by the Irrig Dept in Falam township where they heard a report presented by Ag & Irrig Minister Htay Oo. He said a feasibility study is being conducted for the construction of a dam across the Manipura river where the averrage annual flow of water is 7 million acre-feet. The dam would not only benefit about 100,000 acres of farmland but also prevent annual floods in the lower part of Kalay. Moreover, it would be able to generate 540 MW, he added.

Construction Minister Saw Tun reported on matters related to the project area and the Manipura Bridge (Var Bridge) and Energy Minister Lun Thi on supply of fuel for the project. EPM Tin Htut reported on arrangements for the power plant and installation of power lines for the project. Afterwards, General Than Shwe urged officials concerned to complete the project as soon as possible because of its benefits for the Kalay, Kalewa and Gangaw regions. Then he inspected charts of the project, the current of the Manipura river and the site for implementing the project.

Afterwards, the visitors went to the site of Myittha dam to be implemented near Pyintha Village [22° 00' N, 94° 04' E] in Gangaw township where they heard a report presented by Minister Htay Oo on the salient points of the dam. Later, Energy Minister Lun Thi reported on arrangements for supply of fuel to the project. In response, General Than Shwe gave guidance, calling on officials concerned to fulfil the needs including fuel since the two dam projects are huge ones, and the Irrig Dept is to complete the tasks as soon as possible. Afterwards, Senior General Than Shwe and party inspected the site chosen for construction of the main embankment. Myittha Dam project will be implemented by Construction Group No 8 of the Irrig Dept. It will benefit 12,000 acres of farmland and generate 40 MW.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-07: Gangaw Manipur dam near Sihaung Myauk [22° 52' N, 94° 04' E], grid square reference: 6\2, 34\5 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-7.jpg</u> Topographic map reference: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-11: Mount Victoria Myittha dam near Pyintha [22° 00' N, 94° 04' E], grid square reference: 13/7, 23/2 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-11.jpg</u>

#### Additional references

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

Manipur dam and power station with a planned capacity of 340 MW are under implementation by the ID and HPID. It is expected to generate 1905 million kWh annually when it comes on line in 2010. Pyintha [Myittha] dam will be 62.5 m [215 ft] high. The power station with a planned capacity of 30 MW is expected to generate 170 million kWh annually. It is currently in the planning stage and will be carried out by the ID.

NLM, 30/07/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070730.htm

Deputy EPM No 1 Myo Myint checks sites chosen for the power station and embankment at the Manipur project. Work continues on the outlet to diversion tunnel No 2 and arrangements are being made for construction of the outlet to diversion tunnel No 1.

NLM, 27/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070527.htm

Lt-Gen Ye Myint and party . . . visit Myinttha dam project site. The dam will be 205 feet high and 29,750 feet long. It will be able to store 377,600 acre feet of water and generate 170 kWh of electricity and irrigate 12,000 acres.

DVB, 20/02/07. www.burmanet.org/news/2007/02/20/

Several villages in Gangaw township are being forcibly relocated by the Burmese military to make way for the Pyintha dam project, residents told DVB. Sabai, Kha Mahn, Yinma and Khin Mon villages have all been ordered to move by March 31 as a result of military plans to confiscate more than 3,500 acres of private land. "The place we are going to be relocated to is 'kyat' land which is not good for cultivation. We are still unable to get drinkable water from the wells there." a villager said. The Pyintha dam project was launched in 2003 and is due for completion by 2008. Large amounts of inhabited land are expected to be completely flooded once the dam is finished. But many of the villagers told to relocate have approached the issue pragmatically, saying they would not mind moving if their new land was better and they had more access to health care. "We must be given land that is fertile," the villager said.

NLM, 30/01/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070130.htm

PM Soe Win and party view the building of diversion tunnels and preparations for the Manipura multipurpose dam project in Kalay township. Director of Construction Group No 4 of the Irrig Dept U Victor reports on construction of the diversion tunnel and the hydel power tunnel.

NLM, 23/09/06. <u>www.myanmardigest.com/eng\_md/Sept23.html</u>

Manipura multi-purpose dam project will be implemented on Manipura river, 2.5 miles upstream from the Gabarni [Var] Bridge in Kale township. The dam will be 527 feet high and 2,444 feet long. It will prevent floods in the Myittha river valley, reduce floods caused by Chindwin river in the lower Kalewa region, irrigate 50,000 acres of farmland and generate 380 MW of electricity.

#### NLM, 12/04/06. www.mission.itu.ch/MISSIONS/Myanmar/06nlm/n060412.htm

Lt-Gen Ye Myint and party visit Manipura multi-purpose dam project site in Kalay township. The gravel-filled dam will be 2,444 feet long and 527 feet high. Water storage capacity at full brim will be 1.26 million acre feet. Four 95-MW turbines will generate 1,903 million kWh annually. The visitors proceeded to Myittha Dam project site near Pyintha Village in Gangaw township. The dam there will be 29,750 feet long and 205 feet high and have a storage capacity of 377,600 acre feet at full brim. It will be able to irrigate 12,000 acres and generate 170 million kWh annually

NLM, 03/12/05. http://www.ibiblio.org/obl/docs2/NLM2005-12-03.pdf

On arrival at the Myittha dam project near Pyintha village in Gangaw township, PM Soe Win hears reports on the various kinds of machinery to be used, the watershed areas, prospects for water supply, and geographical facts. He inspects construction of the diversion tunnel. **Compiler's note**: Good photos of the site are available in the print edition of NLM.

NLM, 03/12/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n051203.htm

PM Soe Win visits Manipura multi-purpose dam project in Kale township. Officials of the Irrig Dept report on pre-engineering tasks including the volume of water flowing in the Manipura river. Lt-Gen Ye Myint inquires about the connection between the watershed areas of the dam and the Var Bridge in Chin State. The project will be implemented on the Manipura River, downstream from the Gabarni Bridge on Kale-Gangaw Road in Kale Township. The dam will prevent flooding of the plains along the Myittha River including lower regions of Kalewa. It will benefit 50,000 acres of farmland and generate 300 MW.

NLM, 24/03/05. www.myanmar.gov.mm/NLM-2005/Mar05/enm/Mar24\_rg2.html

Lt-Gen Ye Myint inspects ground clearing work for the Manipura multi-purpose dam in Kalay township. The earth core, rock filled dam will be 2,600 feet long and 525 feet high. Its storage capacity will be 1.26 million acre-feet. It will have an outflow tunnel and another tunnel to run turbines that will generate 2,680 million kWh annually. It will prevent flooding of Myittha plain and lower regions of Kalewa and will irrigate 50,000 acres of crops.

NLM, 28/05/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040528.htm

Lt-Gen Ye Myint and party inspect the Myittha dam project. They are briefed on arrival of machinery and construction materials. The 29,750-foot-long and 205-foot-high dam will be able to irrigate 12,000 acres of arable land and contribute towards multiple cropping and mixed cropping in Gangaw township and generate 30 MW.

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# NAMWOK HYDROPOWER PLANT RE-OPENED

Shan Herald, September 2004. http://www.shanland.org/humanrights/2004/Commander\_subjects\_his\_subjects\_to\_fast.htm

More than 600 townspeople of Kengtung went through an ordeal of forced diet when they were ordered by its military commander to attend the inauguration of the city's hydroelectric power plant on 16 September, reports Pegasus from Maesai. The people had been ordered to arrive at the city hall by 06:30am although the ceremony started at 10:00am and went on until 2:00pm, when they were finally allowed to go home and break their fast.

According to the Lahu National Development Organization, the hydropower plant is in Mongkhawn, 10 miles south-west of Kengtung. It was originally completed in 1990 through a 50 million kyat international assistance program, but it soon broke down forcing the residents to rely on the daily three-hour power supply by the local government electricity board.

Early this year, Shwe Lin Star Company, the firm owned by Sai Leun (a.k.a Lin Mingxian), leader of the Mongla-based Special Region No 4, was contracted to build and renovate power plants in eastern Shan State at a total price of 300 million yuan (US\$37.5 million).

Power produced by the Mongkhawn will be free for the military and government personnel while other users will be required to pay K250 (US\$ 0.25) per unit.

#### Additional references

FBR, Lahu Relief Mission Report, 15/01/04. <u>http://www.dictatorwatch.org/articles/fbrlahu3.html</u> Although two power plants are supposed to be serving Kengtung, the administrative centre for eastern Shan state, both the Mongkhun [Mongkhawn] and Namlet hydropower stations are in disrepair. Effectively, there is no electricity in Keng Tong. At best, the residents occasionally get a dim light. Students have to buy candles from Thailand in order to study their lessons. It is very difficult for people to earn a living. Patients in the hospital also sleep without light. They are "full of grief and anxiety," said one of the patients.

NLM, 06/02/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020206.htm#(4)

Maj-Gen Soe Win of the Ministry of Defence and party inspected the Namwok hydroelectric power plant in the Monghkon region of Kengtung township. U Aye Kyaw, the state electrical engineer for Shan state and MEPE engineer Khin Maung Htay reported on the power plant, power supply and the site chosen for the next plant.

Report of the Commission of Inquiry appointed under article 26 of the Constitution of the International Labour Organization to examine the observance by Myanmar of the Forced Labour Convention, 1930, Geneva, 2 July 1998.

#### http://www.ilo.org/public/english/standards/relm/gb/docs/gb273/myanma3b.htm#(7)%20Other%20infrastructu re%20work

According to the report published by the ILO Commission of Inquiry, documentary evidence was presented to it of forced labour being used to construct "a major dam project in Shan state" (Section 447). The corresponding footnote (743) refers to a report received from the Karen Human Rights Group and names the project as "the Nam Wok (Mong Kwan) dam project near Kengtung, completed in 1994". The document is referred to as "Karen Human Rights Group, 001-0028; Heppner, XII/56-57".

**Compiler's note**: This is the only reference available to a dam at the site of Namwok hydro power plant.

NLM, 17/07/94. http://www.ibiblio.org/obl/docs3/BPS94-07.pdf [document, p. 19]

The K93.8 million Namwok Hydel Power Plant was inaugurated by SLORC Secretary-2 Lt-Gen. Tin Oo. It will generate 10.5 million kWh [annually], saving K11 million in costs for diesel oil, and will provide 24-hour power to Kengtung.

WPD, 30/11/91. http://www.ibiblio.org/obl/docs3/BPS91-11.pdf [document, p.24]

The Namlat creek hydroelectric power station in Kengtung township was inaugurated Novemberr 28. It will supply Kengtung with 24-hour per day electricity. This phase will supply 500 KW, while a 3,000 KW second phase on Namwok Creek will be completed in a year and a half. The State spent US\$130,000 and K14.7 million on the Namlat project; the Namwok project will cost US\$600,000 and K36 million.

Additional references for mini-hydropower stations in Shan State

See below: <u>'Meipan creek</u> hydropower plant inaugurated' (NLM: 16/05/02) 'Electricity generation in Myanmar by <u>state and division</u>' (Appendix 10)

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# PAUNGLAUNG PLANT TO SUPPLY MANDALAY WITH 24-HOUR ELECTRICITY

Zin Min, Myanmar Times, 16/08/04.

Mandalay will be guaranteed 24-hour electricity once the new Paunglaung hydroelectricity plant is running at full capacity, according to a Mandalay division government official. The new power plant has been running on one turbine since tests began on July 15, but once all four are running – which is expected next month – Mandalay will be energy sufficient with excess power for the national grid, the official says. "Within the next two months or so, all four turbines will begin to operate at full capacity and provide 24-hour electricity to Mandalay," he said, adding that the power plant will be able to produce 70 MW of electricity. Larger towns in

Ahead of the proposed full-scale operation of the plant, 32 power transformers will be required in Mandalay as part of the project. By last week, 28 were still required at a cost cost of about K 4 million each, the government official said. The Mandalay City Development Committee plans to buy 10 transformers soon, at a total cost of K 40 million, he added. Aside from the convenience the project will afford, the state and private sector are also looking forward to the boost the new power station will give to the local economy. "Many private clinics, hotels and supermarkets use air conditioners round-the-clock and often have to spend about K 80,000 a day on diesel (to power generators). When they get guaranteed electricity they will save money and this will make all of us happy," the official said.

# Additional references

See above: <u>Paunglaung</u> power plant Myanmar's first underground station (MT: 14/03/05)

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#### **BIOGAS POWER PLANTS SUPPLY ELECTRICITY TO RURAL AREAS**

Kyaw Thu and Khin Hninn Phyu, Myanmar Times, 16/08/04. http://www.myanmar.gov.mm/myanmartimes/no229MyanmarTimes12-229/013.htm

Biogas energy systems are playing an increasingly important role in supplying electricity to villages that are too remote to be connected to Myanmar's power grid, said an official from the Ministry of Science and Technology. "Myanmar is an agricultural country, and the abundance of cows means there is plenty of dung to use as fuel for biogas systems," said Dr Mya Mya Oo, a professor and the head of the Dept of Technology Promotion and Coordination under the ministry.

Biogas is produced by fermenting manure in a special tank called a 'digestor'. The process generates a gaseous mixture of methane and carbon dioxide, which is then burned at a power plant and converted to electricity.

The ministry built its first biogas power plant in the village of Panan in Kyaukse township, Mandalay Division, at the end of 2002. There are now biogas plants in 16 villages in Mandalay and Sagaing divisions, and 14 more are under construction. "We plan to use biogas to provide electricity to 54 more villages," said Dr Mya Mya Oo. "The project is aimed at villages that are far from cities and are difficult to supply with electricity using other methods," she said. Most of the villages benefiting from the project are in central Myanmar, where the cow dung needed to run biogas generators is readily available.

The generation of enough methane for six hours of electricity requires 840 kilograms of dung, the amount produced by about 80 cows in a day, which is then mixed with water and put into a special tank (called a digestor) to ferment and make the gas, Dr Mya Mya Oo said. The tanks – which are 17.2 feet wide and 13 feet high – cost K 2 million, but will last about 20 years, and the cost can generally be recovered within the first year of use, she said.

The biogas system can provide electricity to all households, monasteries and streets in a village for two hours in the morning and four hours after dark. The lives of people in villages without electricity end when darkness falls, but with a power supply life goes on, said Dr Mya Mya Oo. "With electricity at night, children can read and people can carry on their work even after dark, so life becomes more active for them," she said.

Another benefit of biogas power systems is that the dung left over in the tanks following fermentation can be used as a natural fertilizer, which can save farmers the cost of buying chemical fertilisers, she said. A village using the system can save K 2.3 million a year in fertiliser costs, and biogas burns cleanly and is renewable, so it helps protect the environment, Dr Mya Mya Oo said.

#### Additional references

NLM, 30/03/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070330.htm

The central fish farm of Yangon Command in Mingaladon township is breeding of 1.2 million fish in 67.92 acres of fish ponds, selling fresh water fry shrimps, raising 3,200 layer hens, breeding over 180 pigs and over 80 milch cows. Col Thaung Win of the Yangon Division Renewable Energy Research and Development Work Cte reports on generating electricity using bio-gas produced from animal waste and on arrangements for the use of the electricity as a wood-substitute fuel.

Editorial, WPD, 10/01/88. <u>http://www.ibiblio.org/obl/docs3/BPS88-01.pdf</u> The first of 15 bio-gas tanks has been inaugurated in Danubyu township. Over 110 are already in use in Irrawaddy division. "Extensive use of bio-gas will contribute much towards improving the social and economic standing of the people in the countryside."

See above:'Village rice husk power plant will serve as research centre' (MT: 24/09/07)<br/>'Plans for 7-milion-dollar rice husk power plant edge forward' (MT: 27/08/07)<br/>'Rice-husk generators slated for villages in Yangon division' (MT: 11/06/07)<br/>'Inventor co-op society exports first rice-husk generators' (MT: 21/08/06)<br/>'Interest growing in rice-husk generation' (MT: 10/07/06)<br/>'Paddy husk power plant tested to cut rice milling costs' (MT: 19/12/05)<br/>'Biomass gasifier used for tobacco curing in Myingyan' (TERI: 08/04)

See also the section on biomass energy in '<u>Electricity potential</u> of energy sources available in Myanmar'.

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#### BIOMASS GASIFIER USED FOR TOBACCO CURING IN MYINGYAN

Sunil Dhingra, "Use of Biomass Gassifier for Thermal Application in Myanmar", Aug 2004. New Delhi: The Energy and Resources Institute. <u>http://www.resourcesaver.com/file/toolmanager/O105UF1716.pdf</u>

Tobacco curing is a traditional industry practiced for a long time in Myingyan township in the central part of Myanmar. It is a good income generating business. Tobacco plantations are traditionally established on sediment and alluvial islands in and along the banks in Ayeyarwadi River. These temporary islands are formed after the rainy season and planting time is generally from October to January. Around Chin-byitkyin and Kokke villages, tobacco plantations are already in existence and hence it was decided to set up the biomass gasifier based on the tobacco-curing plant in the region.

Before attempting the design of the gasifier and associated components, a study was undertaken to assess the potential of different energy resources available and their suitability for gasification. Four agro residues, namely pigeon bean, cotton, sesame and maize stalks, are available in the region. Of the four, the pigeon bean stalk was found to be the most suitable for gasification purpose. A sample of the bean stalk was collected for chemical analysis. It was found that a surplus of more than 1,250 tonnes of pigeon bean stalk per annum is available in the village.

TERI team conducted a survey of the existing tobacco curing barns to assess fuel consumption and other process parameters in April 2003. The study revealed that there are more than 108 tobacco barns in operation in Myingyan township. Tobacco leaves have to be cured within 70 hours after picking. The curing season is usually from February to May. Within a season, each unit cures five times. In the year 2000-2001, tobacco green leaf production was about 5 million kg while cured leaf production was about 1 millon kg. In a plant, about 4100 kg of green tobacco leaf is used for each processing. The curing system uses hot air passing through pipes. Fuel wood consumption for a batch is about 7.5 -10 tons.

Based on the energy balance of the existing process, TERI team designed a gasifier system suitable for tobacco barn which burned fuel-wood. A down draft gasifier system of 50,000 kCal/h was fabricated and installed at Myingyan in January 2004. Comparative tests were conducted to assess its performance against that of a traditional system. The gasifier-based system reduced fuel consumption by more than 75pc. Time and productivity of the end produce also improved due to better burning.

Through this project, the gasifier technology was successfully introduced in Myingyan district for tobacco curing application. The biomass fuel for the gasifier is mainly local agricultural stalks abundant in the area. The technology is expected to extend to water pumping and rural electrification purposes. A three-day workshop was organised at the project site in August 2004 by TERI and the Myanmar Energy Ministry to share the project experience among member-countries and exchange information on gasifier applications and technologies in the BIMST-EC region.

In Myanmar, the use of gasifier technology could be further extended to community cooking and to the sericulture industry and other small rural industries. In future, the biomass gasifier technology could also be used to provide electricity in remote rural areas.

**Compiler's Note**: Consult the article for complete information, technical details, diagrams and photos.

#### Additional references

Xinhua, 25/07/07. http://www.indiaenews.com/asia/20070725/62355.htm

An India-built biogas plant in Myanmar has been completed and will be commissioned soon to electrify a village in northern Mandalay division, according to a Yangon Times report. The Pesinngone plant in Mingyan, built by India's Tele Corp, is a co-operation project of the sub-regional socio-economic group, BIMSTEC. 200 households in Kokke village will soon be electrified by the gas generated by the plant.

NLM, 18/08/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040818.htm

Under BIMSTEC energy co-operation programme, a workshop to sharieexperiences and to demonstrate the use of a biomass gasifier system for SMIs was held in NyaungU. Representatives from India, Sri Lanka, Myanmar and Thailand studied the functions of a biogasifier which was built in March 2004 in Kokke Village, Myingyan township. They also discussed the use of gas produced from biogas wastes in generating electricity, river-water pump projects and the development of biogasifier technology and energy co-operation among the BIMSTEC countries.

NLM, 18/03/04. <u>www.myanmargeneva.org/NLM2004/Eng04/3Mar/p1/040318n.pdf</u> Under joint sponsorship of the Myanmar Forest Dept and the Energy and Resources Institute of India (TERI) a pilot SMI industry run on bio-gas was opened at Kokke village in Myingyan district on 3 March.

See the reference listings under 'Biogas power plants supply electricity to rural areas' (MT: 16/08/04)

#### PRIVATE SECTOR PROMOTING INTEREST IN RENEWABLE ENERGY

Khin Hninn Phyu: Myanmar Times: 12/07/04 www.myanmar.gov.mm/myanmartimes/no224/MyanmarTimes12-224/020.htm

The private sector is playing an important role in efforts to promote the use in Myanmar of renewable energy sources, an issue highlighted at an ASEAN conference in Manila last month. Encouraging the wider use of indigenous and renewable energy sources was among the commitments made by energy ministers from ASEAN and its dialogue partners, China, Japan and South Korea at the June 9 conference. It was held to discuss ways of securing energy supplies in the region to minimise the impact on its economies of any volatile changes in the price of fossil-based fuels, such as oil and gas.

In Myanmar, technologies based on the sun, wind, water and even farm-waste are being developed and marketed by entrepreneurs whose interest in renewable energy is motivated partly by a concern for the environment. "If we don't use renewable resources instead of conventional energy sources, the environment will be affected," said U Kyaw Soe Win, who makes mini-hydro systems at the Ayethaya industrial zone at Taunggyi. "I became interested in this technology because it can be used efficiently for the benefit of the people and the environment," said U Kyaw Soe Win, whose company designs and makes mini-hydro systems capable of generating from five to 50 kilowatts. Apart from being sustainable, he said the advantages of hydro-power systems include lower maintenance and operational costs than those using fossil fuels.

Science Magazine publisher and well-known science writer, Theikpan Hmutin, says Myanmar has huge potential for developing hydro-power. "Hydro power is the most promising renewable energy source in Myanmar," he said, adding that a major concern about fossil fuels was the pollution they caused, which was contributing to global warming.

Apart from hydro-power, Theikpan Hmutin says there are also excellent prospects in Myanmar for harnessing the power of the sun to generate power. He said that while solar systems were durable and easy to maintain, many prospective users were put off by their high cost. Solar power is one of three energy sources being used in south-east Asia's first hybrid power system at the popular beach resort town of Chaungtha in Ayeyerwaddy division. The system, developed since 2000 in cooperation with the DHP and the Tokyo-based New Energy and Industrial Technology Development Organisation, also uses wind power and diesel generators.

Inventors are also developing bio-mass energy technology which uses agricultural waste as fuel. The technology offers a cheap power source, especially for farming communities, because huge amounts of the waste are available. They include abundant supplies of rice husks, said Theikpan Hmutin. The founder of the Myanmar Inventors' Cooperative Ltd, U Soe Tint Aung, says bio-mass systems – which produce power from gas created by the waste – provide a cheap alternative to diesel generators. U Soe Tint Aung says modifications carried out since 1995 to a bio-mass converter he developed have made it more efficient and easier to operate. The latest model consumes fewer rice husks to produce the same amount of energy as earlier versions and the gas it creates is not as offensive. "The cost of running a rice mill for a year using a diesel generator is nearly the same as that of an [entire] gas plant," U Soe Tint Aung said. "It can recover the cost of the capital outlay within a year."

Advocates of non-renewable energy say awareness needs to grow before the market for the technology will expand. "We should cooperate with the concerned government depts, participate in exhibitions and demonstrate these technologies to widen public knowledge of their benefits," said U Soe Tint Aung. An NGO, the Renewable Energy Association Myanmar (REAM), is one of the groups working to create greater awareness of the technology through activities involving the government, the private sector and other NGOs. REAM says the renewable energy can make an important contribution to raising standards in rural areas and in efforts to achieve sustainable development. "We can't achieve sustainable development without these technologies," a REAM spokesperson said.

#### Additional references

See above: 'Call for <u>energy co-operation</u>' (MT: 13/02/06) See below: 'Rural areas encouraged to make <u>greater use of renewable</u> energy' (MT: 05/01/04)

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#### HYDRO POWER PROJECTS NEARING COMPLETION

Myanmar Times, 28/06/04. http://www.myanmar.gov.mm/myanmartimes/no222MyanmarTimes12-222/

Two hydro power projects in central Myanmar are expected to be completed in July at a cost of about K23 billion, an official from the ID said last week. The department's director general, U Kyaw San Win, said the Paunglaung dam in Mandalay division and the Mon dam in Magwe division would have a combined capacity of 355 megawatts. The Paunglaung dam has four turbines each capable of generating 70 MW and three 25 MW turbines have been installed at the Mon dam.

A senior official from MEPE said it was unlikely that all seven turbines would go into operation immediately. U Kyaw San Win said electricity from the Paunglaung dam would be fed into the national grid through a relay station at Pyinmana. Power from the Mon project will be linked to the Chauk power station in Magwe division. MEPE has been providing about 560 MW nationally, according to an official from the power company.

U Kyaw San Win said work on the Mone dam began in 1995 and the Paunglaung project started three years later. He said work had begun last year on the Kyeeohn Kyeewa dam in Magwe division, which was due to begin generating power by the monsoon season in 2006. Construction would begin later this year on another five dam projects. Three of the dams will be for irrigation and the rest for generating electricity.

"We have been inviting tenders for technical and financial assistance for the new projects," said U Kyaw San Win. "Before we build a dam, we have to make extensive cost-benefit surveys; normally we recover costs more quickly from using a dam for irrigation than for generating power." He said using dams for irrigation produced more benefits than generating electricity. "Senior officials have instructed that the six projects are to be implemented as quickly as possible without placing much emphasis on benefit," U Kyaw San Win said.

#### Additional references

See above: 'Completion of hydropower plants assigned <u>highest priority</u>' (MT: 12/02/07) 'Government will <u>prioritize hydropower</u> projects over gas' (MT: 10/07/06) 'Generation facilities scheduled for <u>commissioning in 2002-2004</u>' (MT 07/01/02) 'More inputs needed to power a hydro future' (MT: 04/06/01)

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#### ELECTRONICS INDUSTRY SPREADING ROOTS IN INDUSTRIAL SECTOR

NLM, 06/06/04. <u>http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040606.htm</u>

A meeting of the Electronic Products Industries Supervisory Cte was held in conjunction with the Electronic Products Exhibition in Yangon. Among those in attendance were SPDC Secretary No 1 Soe Win and Minister for Science and Technology U Thaung as well as ministers, deputy ministers and senior military officers, officials of the SPDC Office, heads of departments, officials of the UMFCCI, and officials of organizations and electronic companies and guests.

Lt-Gen Soe Win, chairman of the committee, spoke of the importance of the electronics industry ito the industrial sector and of efforts to keep abreast of other nations. Encouragement is to be given in Myanmar to low level programming in the development of electronic industries. Myanmar produces electronic apparatus through three processes: those it develops through its own design system, the assembling of imported parts and the CMP system. The productive sector has not improved as much as it should due to various reasons. However, there are around 250 services, shops or training centres in the electronic sector in Yangon.

Only when the country is able to manufacture modern electronic products, will it be able to reduce its reliance on foreign countries, produce more import-substitute items and penetrate foreign markets. Discussions held prior to the committee meeting have shown the benefit of more contacts between State and private electronic entrepreneurs to exchange views, experiences and technical know-how. By bringing together electronic entrepreneurs from across the nation, a start has been made in the formation of an electronic association that will give a lift to the development of electronic industries and the manufacture of electronic products of an international standard. Private electronic entrepreneurs are urged to work together in producing quality products; to promote the CMP sector which will serve to producing skilled workers; to set up joint ventures that could obtaining technical know-how from abroad; and to undertake research works that would enable them to develop their own technical know-how.

CPT MinisterThein Zaw briefed the Committee on research and development tasks to be carried out by electronic companies and assistance to be provided in accord with the laws and disciplines. Minister U Thaung reported on turning out of technicians from universities, colleges and institutes under the Ministry of Science and Technology and assistance available to entrepreneurs.

Afterwards, U Myat Thin Aung of AA Electronics reported on electronic industrial development, U Kyaw Min of Earth Industrial on productivity systems and quality control, U Soe Myint of General Service Engineering on services for electronic control and automation systems, U Myint Zaw of T & D Co on electronic research and development, U Myint Zaw of Mectronics on the indigenous electronic industry, U Zaw Win of Fisca on promotion of an electronic park in Myanmar and other entrepreneurs on establishing an electronic

entrepreneurs association. Minister Thein Zaw and Deputy Minister for Science and Technology Chan Nyein also reported.

Booths with electronic apparatus on display at the exhibition included those of Queen Star Computer Centre, MMTEI, Hong Pang Group, Earth Industrial (Myanmar), AA Electronics, Master Power, Nibban Electric & Electronics, Linyama Electronic Gates, Electronics Sale & Service, Mectronic General Electrical Products, Trust & Development Co Ltd, Texcel U Pe Thein Electrical & Electronic, Toe Electric, Myanmar World Distribution, Fisca, PQ Electrical Engineering and the Directorate of Signals.

#### Additional references

See above:	Homegrown software industry struggles on (MT: 12/03/07)
	'Collaborate on contracts, ICT sector urged' (MT: 12/12/05)
See below:	'Software growth badly in need of human touch' (MT: 16/10/00)

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#### HYDRO-POWERING THE REGIME

Yuki Akimoto, Irrawaddy Magazine, June 2004. <u>www.irrawaddy.org/article.php?art\_id=3757</u>

See Appendix 8

#### THE ECONOMIC CASE AGAINST BIG DAMS

Editorial, Irrawaddy Magazine, June 2004. <u>www.irrawaddy.org/article.php?art\_id=3769</u>

Even disregarding the social and environmental problems caused by big dams, they tend to be a net-liability in economic terms—especially in developing countries. In 1998 the World Bank and the World Conservation Union (a Paris-based multilateral environmental agency) set up the World Commission on Dams, or WCD. One of its tasks was to assess the effectiveness of large dams. The US \$10 million study reviewed 125 dams in 56 countries and made in-depth case studies of eight large dams on five continents. The commission's report, released in November 2000, *Dams and Development: A New Framework for Decision-making*, made for sobering reading.

Dams, have on average, generated less power, irrigated less land and provided less water than forecast, and in some cases have increased the risk and severity of flooding (there is also evidence that mega-dams located on or near fault lines may increase the risk and severity of earthquakes — the huge weight of water seems to make tectonic plates less stable). Fifty five percent of projects with a hydro-power component generated less electricity than forecast. A quarter of the 28 dams that exceeded targets did so only because installed capacity was increased, which required a larger investment (irrigation and water supply dams performed even worse). "Large dams have demonstrated a marked tendency towards schedule delays and significant cost overruns", the WCD report stated. On average, the cost overrun of the 81 large dams reviewed by the commission was 56 percent. Half the dams in the sample also had construction delays of a year or more.

Evaluating the economic returns of dams was problematic, but the WCD was able to analyze the results of 20 hydro-power projects carried out by the World Bank, Asian Development Bank, or ADB, and African Development Bank. Of the 20, nine had Economic Internal Rates of Return, or EIRRs, of less than 10pc (infrastructure projects in developing countries are normally considered successful if their EIRRs exceed 10pc). The report estimated that 0.5 - 1 percent of world reservoir volume is lost to sedimentation annually. Silting tends to be a much worse problem in tropical climates than in temperate zones.

But how, one might ask, are developing countries to get cheap electricity?

Smaller and mid-sized hydro is less subject to cost overrun and construction delays, performs better and causes fewer environmental and social problems than big dams. Natural gas-fired generation is cheap and

fairly clean. Within a few years "clean coal"- burning power stations should be economically viable. With new, increasingly affordable technology, the world — particularly the developing world — is going to witness a paradigm shift in the way electricity is generated and distributed.

Wind power in good locations is now comparable in price to conventional generation techniques. The price of photovoltaics (solar power), although still too expensive to be economically viable, has dropped by 80pc over the last two decades and within a few years should be competitive, especially now that fuel-cell technology is increasingly affordable.

A number of farsighted, progressive companies, such as Ballard Power Systems of Canada, Siemens of Germany and Capstone Turbine of the US are making cheap micro-turbines of from 1kW to 10MW. Meanwhile, Swiss-Swedish firm ABB is working on developing "microgrids" that will electronically link together dozens of micro-power units, so doing away with the need for a National Grid.

Countries with poor electricity infrastructures such as Burma and Laos could benefit immensely from the technology leap, in the same manner that wireless telephony can benefit developing countries with farsighted leaderships. Unfortunately, as Burma proved with mobile phones, the problem isn't the technology — it's the leadership!

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#### HYDROPOWER PLANNED FOR BORDER INDUSTRIAL ZONES

Thet Hlaing, Myanmar Times, 31/05/04 http://www.myanmar.gov.mm/myanmartimes/no218/MyanmarTimes11-218/002.htm

Myanmar and Thailand have begun discussions on a project to establish industrial zones as part of an economic co-operation strategy agreed at a four-nation summit in Bagan in November 2003. Deputy D-G L Zaw Shan of the Directorate of Industrial Supervision and Inspection of the Ministry of Industry No 1 told the Myanmar Times that work on developing the three zones would begin soon and take up to two years. One of the zones would be developed in a 950 acre area around the Kayin State border town of Myawaddy while the others would be developed on 980 acres near the Kayin State town of Hpa-an, about 100 miles (166 kilometres) from the border and on a 680 acre site near Mawlamyine. The department is cooperating with the Industrial Estate Authority of Thailand in the project, U L Zaw Shan said.

The project forms part of a wide-ranging strategic cooperation program agreed by Myanmar, Thailand, Laos and Cambodia at the Bagan summit. Known as the Ayayar-waddy-Chao Phraya-Me-khong Economic Cooperation Strategy, it provides for cooperation in five strategic areas, including agriculture and industry. The other sectors are trade and investment, transport links, tourism cooperation and human resources development.

U L Zaw Shan said a delegation from the Industrial Estate Authority of Thailand will visit Myanmar soon to discuss details for developing the industrial zones. He was one of seven members of a delegation led by the Minister for Industry No 1 Aung Thaung that travelled to Bangkok on May 3 at the invitation of Thailand's Industry Minister, Mr Phinij Jaru-sombat, to promote investment opportunities in the zones.

The delegation had also explained the assistance that the Myanmar government would provide to Thai investors. As well as holding talks with Mr Phinij, the delegation discussed the project with officials from the Industrial Estate Authority of Thailand, the Thai Board of Investment, and the Federation of Thai Industries, as well as more than 60 Thai entrepreneurs, U L. Zaw Shan said.

U L. Zaw Shan said the government planned to establish two hydro-power facilities to supply electricity to the zones. One was near Hpa-an and the other was about 55 kilometres (35 miles) from Myeik.

U L. Zaw Shan said Thai investors were interested in establishing operations in the zones to make products for the Chinese and Indian markets. He said that as well as transferring technology to Myanmar, the zones would also create employment opportunities.

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#### PRIME MINISTER VISITS <u>KENGTAWNG FALLS</u>HYDROPOWER PROJECT

NLM, 26-05-04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040526.htm

General Khin Nyunt and party arrived at Kengtawng hydel power project being implemented by the MEP near Kengtawng waterfall on Namtein creek, 31 miles east of Mongnai in Loilem district. At the briefing hall, Deputy EPM Myo Myint reported on salient points regarding the project including geological conditions, current of Namtein creek, hydrological findings, construction of the diversion weir under the project, process for generating electricity, measures for installation of power lines.

Director U Soe Myint of HPD reported on the construction of No 1 diversion weir and the intake structure, construction of silt settling tank and other matters. Afterwards, the Prime Minister and party inspected the flow of Namtein creek and Kengtawng waterfall. The hydel power plant will be installed with three 18-megawatt turbines and it will be able to generate 472 million kilowatt hours annually. **Compiler's Note**: Pictures of the falls are available at <u>http://www.mrtv3.net.mm/pages/kengtaun.html</u>

**Topographic map references**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-14: Mong Pan Kengtawng Falls, 14 mi south of Ton Hoong [20° 45' N, 98° 21' E], grid square reference: 11\9, 28\0 Upper Kengtawng project, 10 mi south-west of Kengtawng [20° 45' N, 98° 17' E], grid sq ref: 12\0, 27\9 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-14.jpg</u> See also the map at <u>http://www.shanland.org/environment/2003/plant awaits power producer from.htm</u>

#### Additional references

NLM, 10/08/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070810.htm</u> Project Director U San Wai reports that 76.3% of the construction work on the Kentawng project has been covered.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In October 2002, preliminary work got underway on the Kengtawng hydroelectric project on Namtein Creek, 50km east of Mongnai. In June 2005, MEP signed agreements with CNEEC and Zhejiang Orient Holdings Group Ltd (ZOHG) for the purchase of construction materials and electrical equipment for the project. The total value of the contracts was US\$15 million. Three 18-MW units are being installed at the site with annual output expected to be about 470 GWh. Electricity will be supplied to southern Shan townships in Loilem and Langkho districts and to the national grid at 132kV. The power will also be distributed to other townships including Taunggyi via a new 66kV line. Kengtawng could be on-line in 2008.

NLM, 28/04/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070428.htm

The Kengtawng project covers 11 major tasks of which the construction of diversion dams Nos 1 and 2, the power intake building, the power intake canal, the silt lake and water channel are finished. The water control lake, pre-stressed pipeline, power plant, sub-power station and outlet channel of the plant are under construction. The whole project is 73pc complete. Arrangements are underway to undertake the Upper Kengtawng hydropower project on Namtein creek, 10 miles south-west of the town of Kengtawng. It will store water for the power station at Kengtawng Falls. A feasibility study indicates that it could also generate 60 MW. A detailed survey is to be carried out.

NLM, 06/11/06. www.myanmar-information.net/infosheet/2006/061106.htm

In Nanning in the PRC EPM No 1 Zaw Min meets with Chairman Zhao Ruolin and party of CNEEC about the timely arrival of electronic and mechanical equipment for Yenwe, Yeywa, Khabaung and Kengtawng hydel power projects.

NLM, 07/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060607.htm

Two small-scale power stations which generate 135 kW to be used for construction tasks at the project are underway. Work continues on two concrete diversion dams and two bridges across Nanttain creek. The project will supply power to Namsang, Laikha, Panglong and Loilem in Loilem District and to Mongnai,

Langkho and Mongpan through Namsang sub-power station. Surplus power is to be supplied to the national power grid through Kalaw sub-power station.

NLM, 03/01/06. <u>http://http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060103.htm</u> Work continuing on No 1 and 2 diversion weirs, intake structure, canal and other facilities. Project is 46pc complete

MIC, 23/08/05. <u>http://www.myanmar-information.net/infosheet/2005/050823.htm</u> HPD signed a 4.56-million-dollar contract with Zhejiang Orient Holdings Group Limited- ZOHG to buy 132 kv cables and electrical equipment from China.

NLM, 17/06/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050617.htm

HPD signed two agreements with CNEEC and ZHOG for the purchase of construction materials and electrical equipment for the Kengtawng project Under the agreement with the CNEEC-ZOHG consortium, the HPD will purchase generators, transformers and electrical equipment worth US\$11.5 million. Under the deal with CNEEC, HPD will also buy ironwork valued at US\$3.5 million from CNEEC.

Shan Herald, 08/06/04.

http://206.225.87.154:9080/live/shan/articles/environment/2004/Kengtawng\_to\_light\_Shan\_State\_South\_by\_2006.htm

Burma's military authorities recently postponed the startup of the Kengtawng Falls power station from 2004 to 2006, according to sources from Kengtawng, a sub-township 100 miles east of Taunggyi, where they have been trying to harness the Zong-arng waterfalls since 2001. A trader said the source of the information was U Nyi Nyi Aung, sub township officer. "When we asked him why, he just told us there were some technical problems." Bowing to the advice of the Japanese experts to preserve the natural beauty as much as possible, Burmese engineers have constructed a diversion two-and-a-half miles long, a local quoted a government official as saying.

NLM, 01/08/03. http://http://www.myanmar.gov.mm/Article/Article2003/aug/Aug01b.htm

Preparatory tasks are being carried out to build a hydel power station at the 410-foot-high Kengtawng falls on Nanttain creek about 30 miles east of the town of Mongnai. The flow of water along the 210-mile-long creek is about 3,500 feet per second. The reinforced concrete hydel power plant at Kengtawng Falls will be 175 ft by 120 ft and 90 ft high. The project includes a 150-ft-long and 12-ft-high concrete weir, a 4-ft-long and 6-ft-high under sluice, a 60-ft-long, 40-ft-wide and 32-ft-high intake structure, a 6,560-ft-long, 15-ft-wide and 12-ft-high perpendicular intake channel, a 360-ft-long, 80-ft-wide and 20-ft high storage tank and a 1,500-ft-long and 10.5-ft-wide steel pipe. The project started in 2002-03 and will be completed in 2004-05. The Department of Electric Power will install power 66-kV power lines along a 130-mile route from Kengtawng Falls to Taunggyi. A total of four sub-power stations -- an 11/66-kV station in Kengtawng, a 66/11-kV-5M station in Mongnai, a 66/11-kV 30-MVA station in Namsang and a 66/11-kV 10-MVA station in Loilem -- will be built to supply electricity to Mongnai, Lankho, Mongpan, Namhsan, Loilem, Mongpun and Taunggyi from Kengtwang and to Panglong and Laikha from Loilem.

NLM, 20/05/03. http://http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030520.htm

The Kengtawng project will be undertaken without tarnishing the natural beauty of the waterfalls and its environs. Three 18-MW turbines capable of generating 472 million kWh annually will be installed. The power will also be distributed to 11 townships including Taunggyi after the extension of a 66-kV line.

NLM, 01/01/03. http://www.myanmar.gov.mm/Article/Article2003/jan/jan1d.html

A survey was conducted for implementation of Kengtaung hydel power project at Kengtaung waterfalls on Nantim creek, 31 miles east of Mongnai. Construction is under way. Three turbines will generate 30 MW in the first phase of the project, a 15-MW turbine will be added in the second phase.

Shan Herald, 28/09/02. <u>http://:www.burmaissues.org/En/Old</u>

A ten-man team of Japanese engineers was recently at Shan State's biggest waterfall on an initial surveying trip, reported local sources coming across the border. The team arrived on 19 September and spent about three hours at Zong-arng, the 975-ft high chute with a probable generating capacity of 60MW, before returning to Taunggyi. During their three day visit, the Japanese tema inspected the western part of Zong-

arng, 14 miles south of Tonhoong, the sub-township seat. The visit followed the abandonment of the project by Chinese engineers in December 2001 after 62 people including 19 Chinese, 21 Burmese employees and 22 Burmese soldiers died under mysterious circumstances within a span of one month.

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#### THAN SHWE ON <u>KEY ROLE OF ELECTRICITY</u> FOR NATIONAL DEVELOPMENT

NLM, 28/04/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040428.htm

A meeting concerned with the co-ordination of national electric power development was held at the Office of the Commander-in-Chief (Army) with an address by General Than Shwe. He said the electricity sector is like a driving force that plays a key role in national development. There is a close connection between electric power development and the socio-economic progress of the nation. Step-by-step implementation of power development projects must be based on national resources and other conditions in the nation.

The electric power sector has two main subsectors: projects covered by the national grid and those related to regional use. The projects included in the national grid have to do with the whole nation and the supply of electricity to national hubs and the main industrial zones. The regional projects are for the economic and social development of the respective regions. An integrated plan must be drawn for the harmonious development of the two sectors. Only then will Myanmar become a modern and developed industrial nation. The Government is striving to implement the projects, although the nation is not fully enjoying sufficiency in all sectors. All departments concerned are required to collectively render assistance for the projects. All should understand the how the various projects fit into the overall situation of the nation. The key departments will have to make earnest efforts in implementing the projects and the related departments will have to provide effective support for them. Only then will the the projects be completed within the four or five years needed to achieve sustainable development.

EPM Tin Htut, the secretary of the co-ordination committee, reported on the major current and future projects covered by the grid, present and future regional projects, the grid and sub-power stations, and gas-fired power stations.

In giving guidance, Gen Than Shwe noted that as some electric power projects are to be completed soon, the domestic power demand in the country would be fulfilled commensurately by the end of 2004. Thrift measures with regard to power consumption were to be taken and efforts made for the early completion of new electric power projects.

Eleven major power undertakings connected with the national power grid are currently underway: the 75-MW Mon creek HE project in Setoketara township, the 280-MW Paunglaung HE project in Pyinmana township, the 120-MW Tikyit coal-fired project in Pinlaung township, the 25-MW Yenwe creek HE project in Kyaukdaga township, the 400-MW Shweli HE project in Namhkam township, the 54-MW Kengtawng falls HE power project in Monai township, the 40-MW Phyu Creek HE project in Phyu township, the 30-MW Khabaung HE project in Toungoo township, the 60-MW Kun creek HE project in Phyu township, the 75-MW Shwegyin HE project in Shwegyin township and the 790-MW Yeywa HE project in Kyaukse township. Of these the Mon creek and Paunglaung river HE power projects and the Tikyit coal-fired power project will be opened soon. Together the three will be able to generate 475 MW.

Other major electric power undertakings are the 1,200-MW Htamanthi project in Homelin township, the 400-MW Mawleik project in Mawleik township, the 660-MW Shwesarye project in Budalin township, the 84-MW Upper Paunglaung project in Pyinmana township, the 48-MW Nancho project in Pyinmana township, the 65-MW Upper Sedawgyi project in Madaya township, the 60-MW Kyi-on-kyi-wa project in Setoketara township, the 60-MW Bu Village (Mone) project in Magway division, the 36-MW Namtu project in Namtu township, the 7,110-MW Tarsan (Thanlwin) project in Shan state, the 60-MW Pyaungsho project and the 160-MW Namlan project both in Nawnghkio township, the 48-MW Biluchaung No 3 project in Loikaw township, the 160-MW Bawgata project in Kyaukkyi township, the 150-MW Thaukyaykhat project in Thandaung township, the 600megawatt Hatkyi project in Kamamaung Village in Kayin state, the 280-MW Bilin project in Bilin township, the 600-MW Taninthayi project in Taninthayidivision and the 3,100-MW Ayeyawady Myitsone project in Myitkyina township. For regional consumption, the hydro-electric power undertakings include the Tabatyan and Mali Creek projects in Kachin state and the Yazagyo project in Kalay township. These three projects will generate 38.5 MW. Other works planned include the Pyintha, Pani creek (Shwe creek) and Mindon projects in Magway division, the Nanlway project in Shan state east, the Thade creek, Thandwe, Kyeintali and An creek projects in Rakhine state, the Dayaing creek (Paingkyone) project in Kayin state, and the Anyapya, Namnoi, Thakyat (Myeik) and Theinkhun projects in Taninthayi division. These 13 projects will be able to generate 342 MW when completed.

### Additional references

See above:'Completion of hydropower plants assigned highest priority'(MT: 12/02/07)'Inventory of generation facilities distribution grids and projects'(NLM: 30/07/06)See below:'Formation of work committee for electric power development'(NLM: 01/04/04)

NLM, 23/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060723.htm

From a speech by PM Soe Win to the Industrial Development Cte: The Government is making arrangements for the development of the electric power sector in conformity with that of the industrial sector. . . . At present, localized and nationalized plans are being implemented to carry out production and supply of power. The Government's large- and medium-scale hydel power projects will have to generate about 5,000 megawatts. Presently, these hydel power plants are producing 1,500 megawatts, a significant increase if compared to the past. Furthermore, the plan is being carried out to extend the national power grid in order to connect it to the hydel power projects under construction.

NLM, 30/12/04. http://www.ibiblio.org/obl/docs2/NLM2004-12-30.pdf

From a speech by PM Soe Win at the opening of the Mon Creek dam and power station: Power consumption in the nation is growing at 15pc annually. Yangon alone consumes about 450 MW at present, up from about 130 MW 15 years ago. The Government has been implementing projects in accord with the guidance of the Head of State to generate 2,000 more MW during the current five-year plan. The Government with the collective participation of the ministries concerned founded the Leading Committee to Develop National Power Project and the work committee.

NLM, 19/11/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021119.htm

From a speech by Gen Than Shwe at the AGM of the USDA: Projects are being implemented simultaneously to meet the rising need of electricity, which is the result of extension of industrial enterprises and rapid development of manufacturing and service industries and urban development. Before 1988, hydel-power and natural gas burning power plants generated 588 MW but the power plants built after 1988 are generating an additional 560 MW. To fully meet the electricity needs of the public and industries, nine hydel power plants with a capacity of 1,790 MW and a steam power plant with a capacity of 120 MW -- totalling 1,910 MW -- are under construction. In addition to these projects, it has been planned to build 5 hydel power plants and one steam power plant in the period from 2006-2007 to 2010-2011. These plants will be capable of generating 5,468 MW. However, it is necessary not only to produce more electricity but also to use it systematically. The use of electricity in government offices has been sharply reduced. This measure is aimed at supplying more electricity to the public and industrial enterprises.

NLM, 27/12/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n011227.htm

From a speech by Gen Than Shwe at the opening of USDA study courses: Electric power supply projects have been implemented to increase the ratio of the industrial sector for national economic growth. 26 power projects have been implemented during the period of over ten years; and large-scale power projects are also being implemented at present. The power demands of the extending industries, other sectors and the social sector will be fulfilled when the long-term and medium-term power projects are completed. Economic infrastructure development directly contributes to progress of the economic power. The aims of the third five-year short-term national economic plan from 2001-2002 to 2005-2006 are 1) to extend agro-based industries; 2) to develop the power sector in accord with the growing demand of the industrial sector; 3) to extend the agricultural and livestock breeding sectors to ensure domestic sufficiency and to boost exports; 4) to extend health and education tasks and 5) to develop the rural areas.

UN Conference Least Developed Countries, Brussels, 14-20 May 2001.

http://www.un.org/events/ldc3/conference/address/myanmar17\_e.htm

From a speech by Myanmar's National Planning Minister U Soe Tha: One of the main aims of the current Five-Year Plan from 2001 to 2005 is to develop the power and energy sectors. In Myanmar, the electricity supply system is based on hydropower and gas turbine stations. The average annual growth rate in electricity generation over the past ten years has been 11.4pc, and sales have grown at the same rate. To promote the capacity utilization of electric power, Myanmar plans to commission four gas turbine projects and eight hydropower projects during the current Five-Year Plan. The government, with the participation of private sector, plans to invest more in infrastructure development endeavours.

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#### COPING WITH POWER BLACK-OUTS IN RANGOON

Myo Myint Aung, Mizzima News, 27/04/04. http://www.ibiblio.org/obl/docs/BNI2004-05-03.htm

Private power suppliers in Rangoon are in high demand as the city's power supply fails every alternate day. A sales woman of the Rangoon-based Twin Star Gen-set Co told Mizzima News that the demand for the portable generators depends on the number of containers that arrive. No matter how many come, they get sold-out. Supply of electricity in Rangoon has been on an alternate day schedule since February causing people to rely more on generators. People in the slums who cannot afford to use private generators are forced to buy electricity from neighbors who own generators.

While Chinese-made inverters cost about K50,000, depending on the category, portable generators from the PRC ranging from K90,000 to K1 million, are in highest demand. Japanese made gen-sets range from K 900,000 to K 12,00,000.

"Previously electricity never failed in the business districts of Rangoon, but nowadays almost everywhere there are regularly power blackouts," said a salesman at Seiko Co Ltd in Rangoon's business district, speaking during a power failure in his office.

"Chinese made generators don't last and the good ones are very expensive. Petrol and diesel are so expensive that it is much cheaper to buy electricity from neighbors who can afford generators," said a resident of South Okalappa township, three of whose five family members are employed.

People who take electricity from neighbors who own generators are charged K40 daily for a tube light, and in some areas up to K60 per tube light, depending on the number of users. The fewer the users, the higher the fee. The current charge for a gallon of petrol or diesel is K1,800.

Water problems go with the regular power blackouts in Rangoon. People rush to put on their motors to pump as much water as they can while there is electricity. However, the pressure this generates in the power supply causes fluctuations in voltage, in turn causing damage to electronic equipment such as televisions and refrigerators.

"While Rangoon needs 400 MW daily, the actual amount of power available is only 390 MW," said an official from the Electricity Department. According to the official, the department schedules power supplies in most areas on alternate days. But some special areas are exempt from this restriction. These include the Konemyintha Yeiktha at 8<sup>th</sup> Mile and surrounding areas, the Shwetonkya Yeiktha in Bahan township, the People's Parliament building, the Minmanaing Yeiktha, the Rangoon Zoo and most of the city's parks. On the alternate day schedule, electricity gets cut off from 2.00pm until 2.00pm on the following day. But there are reports of power failures even on days for which electricity is scheduled.

People who cannot afford to buy Gen-sets or inverters and are unable to pay the to connect to their neighbors' energy sources must rely on candles for light at night. "It is worse in the slums, especially in South Dagon township," a resident of the township said. "Sometimes there is no electricity at all. So, most of us have to rely upon candles. We have to use charcoal for cooking."

General consumers are forced to pay for increases in production costs caused by the city's power failure. "Firms like ours cannot immediately increase the prices of our products because we compete with others. So, we are facing a set-back," said an official of of a magazine publisher.

Additional references:

See other entries under 'Consumer Concerns and Power Shortages' <u>PS</u> and 'Independent Producers' <u>IP</u> See above: '<u>Inverters</u> keep lights and TV sets running' (MT: 04/07/05) See below: 'Market for power <u>inverters expected to dwindle</u>' (MT: 29/03/04) '<u>Private operators</u> meet consumer need for alternative power service' (MT: 03/02/02)

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#### SHWEGYIN HYDROPOWER PROJECT SET IN CONFLICT ZONE

NLM, 24/04/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040424.htm

Lt-Gen Soe Win of the National Electric Power Development Project Work Cte, accompanied by various ministers and deputy ministers, visited the Shwegyin hydroelectric power project near Kyauknaga Village six miles north-east of Shwegyin town. At the briefing hall, Deputy EPM Myo Myint, reported on plans to build a zoned-type rock fill dam and on the laying of the foundation for the dam. The director of HPD, U Kyi Soe, informed the visitors that the separation wall was 70pc complete. He spoke of plans for the outflow pipe, power intake, spillway, sub-spillway, sub-power station and power station.

Soe Win said that increased power generation is especially needed at the present time to give extra impetus in building up Myanmar as a modern and developed nation. The State is giving priority to power projects. It is gathering capital to invest in hydroelectric power projects which need much financial power to implement. This is a time for electrical engineers to contribute their ability to the nation-building task. Efforts will have to be made for early completion of hydroelectric power projects including the Shwegyin Project.

Next, the visitors viewed the work going on in the project area including preparations for building the diversion tunnel, construction of the concrete separation wall, the condition of heavy machinery and quality of concrete used for the separation wall.

The Shwegyin project is one of several being implemented in the Sittoung Basin. It will generate 75 MW. The dam on Shwegyin creek is 3,610 feet long and 185 feet high.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-05: Toungoo Shwegyin dam, 6 mi north-east Shwegyin [17° 55' N, 96° 53' E], grid square reference: 8\8, 26\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg</u> See also the map at <u>http://www.khrg.org/maps/2007maps/nyaunglebin.gif</u>

#### Additional references

Minhy Zaw, Myanmar Times, 12/11/07. http://www.mmtimes.com/no392/n016.htm

A hydro-electric project near Kyauk Nagar village in Bago Division is now 40pc complete and is expected to start generating power in 2009, according to U Soe Aung, an assistant engineer of HPID of EPM No 1. The dam, about 10km (6 miles) north-east of Shwekyin, was started in 2002 to boost electricity supplies to the national grid. When finished the dam will be 3600 feet long and 185 feet high, with the capacity to store 1.685 million acre feet of water and generate 262 million kWh of electricity a year. "We've built the dam up to 108 feet now. It has been designed with three sluice gates to avoid structural failure and two penstocks between the power intake and power station to generate 75 MW using four turbines," U Soe Aung said. He said the government was collaborating with three domestic companies to ensure that the project was finished by the target date in 2009. "At present the area around the dam is peaceful and local transportation has improved since the project started as well. It is a pleasant place to work." **Compiler's note**: A good photo of the dam site accompanies the article.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07.
http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

Shwegyin dam and power station with a planned capacity of 75 MW is under implementation by the HPID. It will generate 268 million kWh annually when it comes on line in Dec 2008.

NLM, 08/11/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071108.htm</u> Project Director Shwe Khaing of Construction Group 4 of HPID of EPM No 1 reports to visiting generals that the project is 57.02pc complete. It is expected to generate 262 millions kWh yearly.

NLM, 23/08/07 <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070823.htm</u> Staff working on site have planted 3000 rubber seedlings and 350 mango plants in the project area, work on the project is 55% complete.

Free Burma Ranger Report, Nyaunglebin District, 09/08/07.

http://www.freeburmarangers.org/Reports/2007/20070808

The recently completed dam on the Shweygyin River has flooded more than 3,000 acres of orchards belonging to Karen villagers. Villagers have not received compensation for this loss of property.

Karen Human Rights Group, *Development by Decree: The politics of poverty and control in Karen State*, p. 35, (KHRG: April 2007). <u>http://www.khrg.org/khrg2007/khrg0701.pdf</u>

The Kyauk T'Gah (Shwegyin) hydro-electric dam along the Khay Loh (Shwegyin) river in Hsaw Htee (Shwegyin) township was completed at the start of January 2007. During the period of its construction, IB 57 and LIBs 349, 350, 589 and 598 of the SPDC army took control of security in the region around the dam site, patrolling the area, forcibly evicting the communities living there and restricting any civilians from approaching the dam site. Local villagers say those in charge were particularly anxious to prevent anyone from observing the engineers working at the dam site. A KHRG field researcher working in the area reported that the dam was constructed with backing from partners in China and Korea, so it may have been engineers from these countries working on the project whom the authorities hoped to shield from observation. As the dam construction drew to a completion, the water level of the Khay Loh River began to rise. By the start of 2007, the villages of Dta Nay Pah, Kyauk T'Gah, T'Nay Htah, Htee Khay Htah and Waw Ray were flooded and villagers were forced to move to higher ground, leaving behind their plantations of dog-fruit, coconut, tobacco, banana and betel nut underwater. When the rainy season begins in May and June the water level could rise even further, threatening the villages of Ywa Myo, Dta Leh Gkyoh, Aay Gk'Neh, Yoh Dah, Dta Yoh Baw, Dt'Nay Pah, Waw Goo and Htee Gkah Htah as well as Shwegyin town. Some villagers from these areas have already abandoned their homes in search of higher ground while others have gone to Shwegyin town, despite the danger of flooding there as well. No compensation has been paid to these villagers, nor were alternate village sites provided.

NLM, 14/02/07. www.myanmargeneva.org/07nlm/n070214.htm

Gen Soe Win visits the site of the Shwegyin hydel power plant and is on availability of fuel for the project. He views construction of the main spillway, the power intake building, also the sites for installation of the conduit and pre-stressed steel pipeline. Work continues on the embankment.

NLM, 01/01/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060101.htm

EPM Tin Htut visits the Shwegyin project site and looks into the construction of the water intake building, the main embankment and emergency spillway.

NLM, 13/03/05. http://www.myanmar.gov.mm/NLM-2005/Mar05/enlm/Mar13\_h1.html

Gen Than Shwe and party visit Shwegyin hydel power project and inspect samples of gravel, sand and earth from the site. They are briefed on plans for distribution of power through the grid, generation of power from four turbines that are expected to generate a total of 75 MW, as well as on the cost of the project. **Compiler's Note**: A good photo of the project site accompanies the article.

#### NLM, 16/03/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040316.htm

Lt-Gen Khin Nyunt and party visit Shwegyin Hydel Power Project site where they view work on the diversion conduit and the main dam. At the construction site of the concrete diaphragm wall they check quality control of soil cement and testing of the percentage of wax in the earth. Officials of High Tech Concrete Co Ltd

explain the procedures involved in the construction of the diaphragm including boring, clamshelling and the laying of concrete.

Golden Tri Star Co, Lanmadaw township, Yangon [n.d]. <u>www.gts-geotechnology.com</u> When the GTS team began geotechnical engineering jobs in 2003, it engaged in construction of the diaphragm wall of the Shwegyin hydropower project. Since then it has followed up with drilling and grouting work on the same project. GTS collaborates with Thailand Siam Tone Co, a branch of the Tone Corp, Japan.

NLM, 10/12/03. <u>http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n031210.htm</u> Lt-Gen Khin Maung Than of the MoD checks on construction of the main dam, outlet conduit, spillway and diaphragm wall. The project will distribute 83 megawatts to the State power grid and supply water to 11,500 acres of summer paddy.

EarthRights International with Karen Environmental & Social Action Network, *Capitalizing on Conflict: How Logging and Mining Contribute to Environmental Destruction in Burma*: October 2003.

#### http://www.earthrights.org/files/Reports/capitalizing.pdf

From 1975 to 1982, the area around Shwe Gin Township was targeted by the former Ne Win regime for its infamous "Four Cuts" (Pya Ley Pya) operations, an anti-insurgency technique intended to cut the links between civilians and anti-Rangoon resistance groups by stopping the flow of food, money, intelligence information, and recruits. Entire communities were forced to leave their ancestral lands and relocate to Burma army-controlled relocation sites without any compensation. Shortly after relocation, unharvested crops were destroyed. Existing food stores were confiscated and then re-issued in the form of rations. Homes were burned. "Free-fire" zones were also established which permitted Burma army troops to shoot civilians on sight if they violated the curfew. The violence transformed countless thousands of people into "internally displaced persons" (IDPs), and thousands more into refugees. 43 villages, all within five miles upstream of a site on the Shwe Gin river now being developed as a hydropower dam, were forcibly moved to a relocation site near the seat of the township during this period. By the mid-1980s, the situation had stabilized somewhat, and most people returned home to resume their lives. A dry-season offensive against the KNU/KNLA in 1988, however, prompted people to flee again and these villages were completely destroyed. Most of these villages are still empty today.

Plans for the hydropower dam near Kyaut Nagar on the Shwe Gin river were announced in 2001 by MEPE. According to local sources, the dam is to be built where two mountains named Mo So Kho and Ter Ther Kho (Se Le Taung) narrow the river channel considerably. They report that the dam is to be built with technical assistance from a Japanese company. Security is being provided by three military battalions. Since surveying and construction activities began, a strategic command headquarters has been established at the base of the Mo So Kho mountain on the east side of the river and military barracks while surveillance posts have been set up on the west side of the river.

Approximately 200 fruit orchards line the Shwe Gin River, and a substantial number of them specialize in growing 'shaut', a popular type of lemon-lime. It is calculated that one-third of Burma's shaut crop comes from this area where an estimated 3,000 acres are under cultivation upstream from the dam site. Each fruit sells for between K 30-50 in Burma's cities, making the crop a key source of income for local villagers. Other valuable cash crops include betel-nut, durian and rubber trees, planted during the British colonial period. When completed in 2005, the catchment area for the dam will not only destroy the fruit orchards which line the banks of the Shwe Gin River, it will also submerge potentially lucrative deposits of gold which have attracted large numbers of Shan and Chinese miners from other parts of the country. In 2003, the military announced all trees would be cut down between Kyaut Nagar and Sumuhte upstream of dam prior to inundating the area. no official plan for regulating how this large-scale clear-cutting is to occur has been announced.

NLM, 15/08/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030815.htm

Officials of the HPD report to Lt-Gen Shwe Mann and party on initial tasks of the Shwegyin project and the amount of electricity to be generated. The project will have two hydroelectric power stations. No 1 station will be installed with four 18.75-MW generators and No 2 station with one 8-MW generator.

NLM, 21/01/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030121.htm

The main Shwegin dam will be 4,200 feet long and 203 feet high; water storage capacity at full brim will be 2,040,000 acre feet. The spillway is of the gated ogee type and water the level will be 178 feet. Four turbines will generate 83 MW.

NLM, 05/11/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021105.htm

Shwekyin hydel power project is being undertaken near Kyauknaga Village of Shwekyin Township by Construction Group 4 of the HPD. Land preparations and earth work on the embankment are underway. The project is expected to generate 250 million kWh yearly

Ken McLean and Mahn Nay Myo, Earth Rights International (ERI), 13/09/02.

http://ftp.metalab.unc.edu/obl/show.php?cat=363&lo=t&sl=0

ERI has collected credible reports regarding the use of forced labor to construct a new hydroelectric dam on the Shwe Gin River, near Kyaut Nagar. This predominantly Karen area, north of Shwe Gin Township, is home to thousands of 'internally displaced people' who have been repeatedly forced out of their homes by the military junta's activities. According to villagers interviewed by an ERI fact-finding team in May 2002, soldiers routinely force them to work on the construction project. A local man said, "We can only come back after we finished the work in the camp. In the camp, they don't have water and food for the workers. The military orders the villagers to do what they want. The soldiers don't have any sympathy for the workers." Official information on the project, overseen by MEPE, is extremely difficult to obtain. In early 2001, a survey was conducted by four Japanese technicians working for an undisclosed company. Construction began shortly after and is to be completed in 2005. No social or environmental impact assessment was carried out prior to beginning construction. Reconnaissance of the area reveals the construction of roads, military barracks, a helicopter pad, as well as surveillance posts on the west side of the river. The area surrounding the dam site is now heavily militarized.

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### FORMATION OF WORK COMMITTEE FOR ELECTRIC POWER DEVELOPMENT

NLM, 01/04/04. www.myanmar.gov.mm/NLM-2004/Apr04/enm/Apr1\_h3.html

The Work Committee for National Electricity Development held a co-ordination meeting with an address by the chairman Lt-Gen Soe Win. Also present were Vice-Chairman Lt-Gen Thein Sein, members of the committee including Ag & Irrig Minister Nyunt Tin, Energy Minister Lun Thi, Finance & Revenue Minister HIa Tun, Cte Sec'y Electric Power Maj-Gen Tin Htut and others.

In his address, Lt-Gen Soe Win said two committees had been formed: the Leading Cte for National Electricity Development led by General Than Shwe and its counterpart the nine-member Work Cte with responsibility for the supervision and implementation of power projects. The work committee has two tasks: 1) of supervising the power projects and 2) of approving new projects.

By 1988, electricity generating capacity in Myanmar had reached 580 MW, with gas-fired plants contributing 300 MW (51pc); hydropower 38.8pc and steam (10.2pc). Since 1988, 34 new power stations with a total generating capacity of 560 MW had been built. Of these 28 were hydro power plants and six gas-fired power plants. uilt. The nation's power generation capacity at present had reached 1,200 MW, a two fold increase when compared with that of 1988.

Due to economic development and the rise in living standards, the generating capacity needed to fill the power requirements of Yangon has reached 450 MW, up from 130 MW in 1988. The Head of State has given guidance to add 2,000 additional megawatts during the period of the third five-year national economic plan and to give priority to hydro power projects. The Ministry of Energy has already laid down a 30-year strategic plan, covering five-year periods, to develop the electricity sector. There are plenty of hydropower projects to be implemented under this plan, but it is impossible for the Ministry of Electric Power alone to implement them because the task is so immense. They are to be undertaken through the combined efforts of the ministries concerned under the supervision of the State, Soe Win said.

For this reason, the government has formed the leading committee and work committees in order to systematically implement electric power development projects. The volume of water flowing in the streams

and rivers throughout the country is over 876 million acre feet. According to surveys conducted by experts, there are 268 locations at which nearly 40,000 megawatts can be generated through hydro electric power. At present, however, hydro electric power stations generate only 390 MW. Much remains to be done, he added.

Some projects lie in the power grid area. For example, the 280-MW Paunglaung and the Yeywa project in Mandalay division, both bigger than the Lawpita hydro-electric power station. Other projects such as the Yazagyo electric power project in Sagaing division are for regional development. The work committees are to provide necessary assistance for all projects by assigning the correct priority to each.

Afterwards, EPM Tin Htut, the secretary of the work committee, reported on hydro electric power projects to be completed in 2004 and in the coming four years. He also reported on power grid projects and sub-power stations to be completed in 2004 and over the next four years. Next, Ag & Irrig Minister Nyunt Tin reported on hydroelectric power projects being undertaken by that ministry and those being carried out in co-operation with the EPM. Lt-Gen Thein Sein said the Head of State had given guidance on the completion of certain projects during the next four years. The two power grid projects on the west and sides of the Yoma are to be carried out systematically.

#### Additional references

See above: <u>'Inventory</u> of generation facilities distribution grids and projects' (NLM: 30/07/06) 'General Than Shwe on <u>key role of electricity</u> in national development' (NLM: 28/04/04) 'Government drive to <u>conserve electricity</u>' (MT: 07-10-02)

#### NLM, 06/09/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030906.htm

SPDC Secretary No 1 Soe Win and Secretary No 2 Thein Sein meet with Electric Power Minister Tin Htut and are briefed on the work of the ministry. It is co-ordinating with the Ministry of Energy in acquiring gas and fuel for the production of electric power and with the Ministry of Industry No 1 to obtain cement and steel rods for its construction projects. Secretary Soe Win draws attention to the dramatic surge in the use of electricity and the need for the ministry to take systematic measures for the effective use of electricity in the productive sectors of the State. Secretary Thein Sein points out that national productive capacity, now at 1,200 MW, is expected to rise to about 2,000 MW by fiscal 2005-06 as more hydro electric projects come on-line. The ministry should see to the matter of having its engineering personnel boost their gualifications.

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#### THAKYET RIVER HYDROPOWER PROJECT INITIATED

Mergui-Tavoy District Information Unit (KNU), Monthly Human Rights Report, April 2004. http://www.ibiblio.org/obl/docs/MT2004-04.htm

Burma's military government has plans in place for the construction of a new hydroelectric dam on the Thakyet (Taket) river east of Tenasserim [Taninthayi] town in the Mergui district.

On 16/03/04, the Coastal Region Military Commander, Ohn Myint, and Col Soe Thet of the Strategic Command Centre and team arrived to inspect proposed sites for the dam. A week later Col Soe Thet and military engineering dept officials visited the Wablaw Kye rapids on the Thakyet river as the site best suited for construction of the dam They ordered Thakyet villagers to clear a space 150 yd long and 50 yards wide along both banks of the proposed site. Villagers were paid K1200 daily for their work while a survey was conducted of the surrounding area.

The military demanded that villagers from the Thakyet area, including the villages of Hswe Plaw (G'nan Gwin), Taung Bain, Kala Aik, Kywe Htaing Gone, La Ngu, Hsin Gaung, and Chauk Mile clear an area 150 feet square for a helipad at the top of Wablaw mountain. They also ordered the villagers to construct a new road between Hswe Plaw and the dam construction site. The planned road will be three miles long and will stretch along the existing foot track.

Villagers have learned that before dam construction starts, the military will set up security posts on mountaintops, other high places and along the banks of the Thakyet river. LIBs No 557 and 224 along with the militia unit of Nyaung Bin Gwin village provided security during the survey.

The dam is to be 500 feet high, and extend 300 yards across the river. It is supposed to take three years to complete. The military government will try to persuade Thai investors and the Thai government to invest in the project as a joint-venture. A source said the SPDC plans to borrow 1,500 million baht from the Thai government for the venture. Construction experts from China will be hired to work on the project. Surplus water from the reservoir will be diverted to the Baw Kru Hkee and Tha Baw Leik Hpo areas when the dam is completed.

Villagers along the river are worried about their future if the dam is constructed. They believe their communication systems will face difficulties and that their land and plantations within the reservoir area will be lost. The villagers do not want the dam to be built, but they are fearful of voicing their concerns. Due to the onset of the rainy season construction work has not yet started, but the people are worried about what will happened when the dry season arrives.

**Topographic map reference: Thailand** 1:250,000: Series L509, U.S. Army Map: ND 47-15: Hua Hin Thagyet dam, 14 mi east of Tenasserim [12° 05' N, 99° 01' E], grid square reference: 13/4, 5/2 <a href="http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-nd47-15.jpg">http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-nd47-15.jpg</a>

#### Additional references

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Thagyet hydropower project with a planned capacity of 20 MW is expected to generate 95 million kWh annually. It is currently in the planning stage and will be carried out by the HPID.

NLM, 30/07/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm</u> Plans are under way to implement 15 hydel power projects such as the 20-MW Thakyet hydel power plant in Taninthayi township.

NLM, 28/12/04. <u>http://www.myanmar.gov.mm/NLM-2004/Dec04/Dec28.html</u> From a report of the meeting of SPIC on 27/12/04: Thakyet hydel power project is located on Thakyet Creek 14 miles east of the town of Taninthayi. A 20-MW generator wll generate at least 11 MW.

See above: 'Hydropower planned for <u>border industrial zones</u>' (MT: 31/05/04)

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#### CONSTRUCTION FUELS WIRE AND CABLE MARKET

Sandar Linn, Myanmar Times, Electronics Supplement, 29/03/04 http://www.myanmar.gov.mm/myanmartimes/no210MyanmarTimes11-210/e17.htm

The cable and wire industry has become increasingly competitive, with local manufacturers gaining bigger market shares than imported products, industry sources said. Industry members estimate that local producers occupy about 70pc of the market as a result of increasing demand from industrial developments and private construction companies over the past five years. Despite gaining ground, however, local products are often overlooked in favor of cheaper and higher quality imports from China, Malaysia and Taiwan.

A dozen wire and cable brands are available on the market, including popular domestic brands Golden Lion, Standard, Hong Pang, ABC and Asia Golden Myanmar. "Locally manufactured brands are mostly used by rural people who make up 60 per cent of local wire buyers," said U Aung Khaing, the marketing manager of Golden Lion Wire Co., Ltd, the first private wire and cable manufacturer in Myanmar. "But imported brands are used for big projects and national projects such as the development of new hydropower plants and construction of dams," said U Aung Khaing. He said the price of copper, a basic raw material for wire, has increased by 30 per cent internationally as a result of increased demand. "The more the nation's property develops, the more demand there will be for wire and cable," he said.

However, U Aung Khaing said that wire and cable sales levels have not fully recovered in comparison to previous years when the construction industry was more active. He said five years ago development levels were greater, but despite falls in construction, the industry is now able to produce domestic and industrial use wire as well as overhead power cables.

#### Additional references

See above: <u>'Cable factory</u> and foundry opened in Indagaw industrial zone' (NLM: 04/04/05) See below: <u>'Wire and cable producers</u> find ready market in Myanmar' (MT: 25/08/03)

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#### MARKET FOR POWER INVERTERS EXPECTED TO DWINDLE

Myo Theingi Cho, Myanmar Times, 29/03/04. www.myanmar.gov.mm/myanmartimes/no210/MyanmarTimes11-210/e23.htm

The market for power inverters in Myanmar is expected to dwindle over the next several years as the government works towards its objective of supplying regular electricity to the public, industry sources said. Inverters convert direct current (DC) to alternating current (AC), storing energy for use during blackout periods.

"In the next few years, electricity from MEPE will be available 24 hours a day, so the inverter market will probably diminish," said U Pe Thein, the owner of the UPT Electric Equipment Manufacturing and Trading Company, which was established in 1980. The firm is therefore focusing on the production of heavy transformers, which will gain a wider market when electric power supplies are expanded.

"We started selling inverters imported from China about seven years ago because there were no local manufacturers in Myanmar," said U Pe Thein. For the past four years the company has produced its own inverters based on Chinese technology. "Inverters made in China are good, but the workmanship is poor and many fell apart during transportation across the border, so we studied their design and began making our own," said U Pe Thein.

According to U Pe Thein, 90 per cent of the market was made up of Chinese goods when people started using inverters in Myanmar in 1997. Gradually, however, local entrepreneurs began manufacturing their own inverters and created a more competitive market. U Pe Thein said his company now occupies about 10 per cent of the market share, with other local manufacturers also taking over portions of the market share once dominated by Chinese products.

UPT produces three kinds of inverters – rated at 300, 500 and 1000 voltage amperes (VA) – which range in cost from K23,000 to K35,000. About 40 per cent of households in Yangon use power inverters, U Pe Thein said. UPT experienced its best sales in 1999, when it sold about 200 devices a month.

Dr Aung Thein, the general manager at Shwe Paho Industy, said that the company enjoyed its best inverter sales in 2001. "The market situation depends on the supply of power provided by MEPE," said Dr Aung Thein. He agreed with U Pe Thein, saying that the inverter market will become unstable in coming years because of the nation's economic policy of improving electricity supplies. "We intend to begin producing electric appliances, which will be more widely used once a steady power supply is available," said Dr Aung Thein.

#### Additional references:

See above: <u>'Inverters</u> keep lights and TV sets running' (MT: 04/07/05)

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#### LOCAL TV MANUFACTURER TAKES ON INTERNATIONAL COMPETITORS

Business Tank, March 2004. [Transcript of the original interview is no longer available on-line]

Adapted from an interview with U Than Win Aung, the managing director of STAR TV.

STAR TV first began produding TV sets and VCDs at its factory in the Hlaingthaya IZ in 1999 with the purpose of providing these goods to customers in Myanmar at prices that were at least 25pc below those of imported electronic products of similar quality. The company also provides after sales service for its products. It has more than 300 employees engaged in the production, distribution and financing of its operations. STAR TV has plans to extend its product line to air conditioners, DVD players and water dispensers.

In its first five years of operation, the company has produced about 50,000 TV sets including 14" and 17" black/white models, and 14", 21", 25", 29" and flat-monitor color TVs, as well as 25,000 VCD players in six different models. Electrical and electronics parts are imported mainly from Korea, Taiwan, Singapore, Hong Kong, China and Thailand.

An fully equipped automatic assembly line was imported from Korea using Korean engineers and technicians who passed on their skills to Myanmar engineers, technicians and workers once the plant was set up. Myanmar engineers and technicians have also attended workshops and training session in Korea, Singapore, Thailand and Malaysia.

Daewoo Electronics was also producing TVs for the local market in a joint-venture operation with the government, but ceased production several years ago. A Toshiba factory stopped production after only a year in operation.

STAR TV uses the same materials as other international brands with Korean technology, so we can assure the quality of our products. One of our main problems is having to rely on imported parts for our products. The parts we use are now classified as luxury goods so we can only qualify for a 25pc import licence. To be able to order the necessary parts, we have to get a thousand at a time.

We provide a two-year warranty for our products and spare parts are always available. These parts are from the same factories that produce for Korean and Japanese brands. Since our prices are about 25pc cheaper than foreign imports, it makes our products affordable by middle class as well as top-income households. All our goods are made using the Korean automatic assembly line that applies ISO standards. For detailed inspection, we have six pattern generators and six transmission systems. We have also replaced the manual system for balancing color TVs with a computerized system.

The competition in this industry is very intense. We have to compete with Japanese and Korean brands that are imported illegally into Myanmar. These much cheaper as they do not have to pay legal fees, custom duties, sales tax and income tax like we do. So these products generally sell for 25pc less than our CIF value.

Some of my acquaintances used to ask me why I invested so much money in an industry that has such a low rate of return, instead of importing TVs from abroad. It is quite true that I could earn instant returns with higher profits. In order to earn foreign income, we have to build factories and machinery for both export and local markets. We also have to invest hard currency for import license applications and for an LC account. Besides the investment for raw material stock as well as finished goods stock and the amounts that have to do with deferred payments to distributors, the total indebtedness has aggregated to about three billon kyats. Sometimes the profit doesn't even match the bank interest rate. But for me, high returns are not important for the time being. What is more important is to be able to operate in the long-run and to build up awareness of the quality of the STAR brand.

The main objective in establishing this factory is in accord with government policy which is being encouraged so much. On the other hand, the costs of the duty we have to pay for assembling a TV here are about the same as those for importing TVs from abroad. I have learned that electronic goods production needs high technology as well as high investment. We have encountered some difficulties in technology and we will have to make a greater capital investment. Nevertheless, we are getting ourselves deeply into this for the sake of globalisation.

#### Additional references

See also, Ye Lwin, 'Electronics overview for 2007' in the Myanmar Times 'Electronics' supplement (12/03/07). http://mmtimes.com/feature/electronic/e015.htm

Televisions were once considered a luxury in Myanmar but have come to be regarded as an essential for providing entertainment and information, said U Than Win Aung, the MD of the STAR TV factory in Hlaingthaya IZ. The growing demand for electrical appliances coincided with the rise in living standards, said U Than Win Aung. Consumers with disposable incomes opted to buy televisions for entertainment, information and education, he said. It is estimated that nearly all households in Yangon and about 60 per cent of those in rural areas have a television.

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#### SHWESAYAYHYDROPOWER PROJECT UNDER DETAILED FEASIBILITY STUDY

NLM, 07/02/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040207.htm

On the 3rd and 4th of February, General Maung Aye and party went to inspect Shwesayay hydro-power project in Shwesayay defile on the Chindwin River close to where Budalin and Kani townships meet. At the briefing hall of the project, EPM Tin Htut reported that Sagaing Division has 21 sites where hydro-electric power projects capable of generating 2,400 MW could be implemented. Hydro projects already operating include Zee Creek station in Kalay township that can generate 1.26 MW, Lahe station in Lahe township (0.05 MW) and Thaphanseik station in Kyunhla township (30 MW). In various stages of planning are the Htamanthi, Homalin, Mawlaik and Shwesayay projects along the Chinwin. Surveyors estimate that Htamanthi hydro-electric power project will be able to produce over 1,200 MW of electricity. Because of the magnitude of work and vast amount of investment needed, preliminary surveys for the Htamanthi project are being conducted in co-operation with India.

U Win Kyaw, D-G of the HPD reported on four different ways of constructing an embankment on the Chindwin River for the Shwesayay dam. Next, Ag & Iriig Minister Nyunt Tin reported on the current speed of Chindwin river and matters related to Htamanthi project and the feasibility study for construction of Shwesayay dam and its benefits.

In response, Gen Maung Aye said that efforts are under way to develop more than 2,000 megawatts to fulfil the electricity needs of the State during the third five-year short-term. He urged officials to carry out preliminary engineering tasks at the same time as they prepared the detailed surveys needed for Shwesayay project. Later, he inspected stone samples from the site chosen for the project.

The following day General Maung Aye and party returned to Shwesayay village in Budalin township where they heard reports on the preliminary engineering works being carried out at the site, movement of watercraft in the Chindwin and the drifting of timber and bamboo rafts in the river.

The Shwesayay project will be implemented on the Shwesayay riverlet of the Chindwin nearly 20 miles north of Monywa. According to the initial feasibility study, the project will be able to generate over 600 MW. Moreover, it will provide water for irrigating 25pc of two million acres of cultivable land all year round. It will be a joint project of the Irrigation and HP departments.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-08: Shwebo Shwesayay dam near Shwezaye village [22° 20' N, 95° 0'0' E], grid square reference: 14/1 24/3 <a href="http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-8.jpg">http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-8.jpg</a>

NLM, 30/07/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm</u> Planning for the 660-megawatt Shwesayay hydel power plant in Budalin township, along with 14 other hydroelectric projects, still underway.

NLM, 15/06/04. www.myanmar.gov.mm/NLM-2004/Jun04/enlm/Jun15 h1.html

Gen Khin Nyunt and party visit site of Chindwin River (Shwesaye) dam in Budalin township. They are briefed on the speed of the current in the Chindwin, the reliability of the river water for agriculture on both banks and the findings of the feasibility study related to the construction of a dam in the Shwesaye region. Of particular interest are the findings of a geological survey of the chosen site and the arrangements for diversion of the water of the Chindwin to build the dam.

NLM, 10/04/04. <u>http://www.myanmar.gov.mm/Article/Article2004/Apr/Apr10a.htm</u> Currently, the annual flow volume of the Chindwin river is 115 million acre-feet.

NLM, 23/03/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040323.htm

Lt-Gen Soe Win and party visit the Shwesayay project site. It is part of the Chindwin - Ayeyawady all-round development project. They are briefed on the geological survey of the site and the hydropower and irrigation aspects of the project. A gravel-filled dam, 3,280 feet long and 130 feet high, will be built at the Shwesayay defile of the Chindwin. It is expected to generate 660 MW and benefit 150,000 acres of farmland. A basket of fruit is presented to Mr Yoshizu, assistant GM of the Kansai Co. Other hydro-electric projects in the Chindwin basin include Homalin, Uyu creek, Batvar, Htamanthi, Mawlaik and Nay-ritsara.

### <u>Start 04</u>

#### RURAL AREAS ENCOURAGED TO MAKE <u>GREATER USE OF RENEWABLE</u> ENERGY

Kyaw Naing, Myanmar Times, 05/01/04. http://www.myanmar.gov.mm/myanmartimes/no198/MyanmarTimes10-198/

Renewable energy has the potential to make a significant contribution to socio-economic development in rural areas, says a freelance consultant to Myanmar NGOs involved in environmental activities. U Aung Myint, the team leader of the Renewable Energy Association of Myanmar, said that despite a high initial investment, the use of energy generated by the sun, wind, water and plant matter (biomass), can bring long-term benefits to rural people, who comprise about 70pc of the population.

In cooperation with international donors, REAM is involved in building solar battery charging facilities, windpower stations and mini-hydro power plants. "We have built nearly thirty solar battery charging facilities, three mini-hydro power plants and three wind farms in rural areas," U Aung Myint said. Most of the projects were funded by the Japanese government, he said.

REAM, which is affiliated with Friends of Rain Forests Myanmar, is active as a project facilitator as well as working to promote the use of renewable energy. U Aung Myint, a retired marine biologist, has presented nine papers on the use of renewable energy since 1992. He said his research has found that generating up to 1.5 kilowatts using solar batteries costs about K6,800 a watt. Solar powered pumps capable of generating up to 1.2 kilowatts can pump 60 gallons of water an hour from artesian wells up to 120-feet deep at a cost of between K9000 to K12,000, U Aung Myint said.

#### Additional references

MT, 07/11/05. <u>http://www.myanmar.gov.mm/myanmartimes/no291/MyanmarTimes15-291/thinking.htm</u>

Interview with U Aung Myint, Secretary of Renewable Energy Association Myanmar (REAM) REAM was formed in 1993 by people interested in renewable energy, including retired public servants and private sector entrepreneurs. Our challenges include building up our funding base and attracting members with appropriate qualifications. Interest is renewable energy is growing, especially among decision-makers and intellectuals because of the high price of fossil fuels. At present, the most important thing we need is proper policy guidelines. Co-operation among government depts, NGOs, the private sector and international organisations is also needed. It is also important to promote awareness among the public. Sometimes, we encounter difficulties getting the co-operation of local village leaders and communities because they lack understanding about renewable energy technology. The use of renewable energy sources is of great benefit because it reduces reliance on fossil fuels, thus helping to conserve the environment. Solar, hydro and biomass energy are the most viable forms of renewable energy for Myanmar. But their effectiveness depends on such factors as where and how they are used. Hydro-power is the most widely used source of renewable energy. There are mini-hydro power stations in Shan, Chin and Kachin states and also in coastal areas and the central dry zone. Biomass energy is popular in rural areas, where agriculture and plant residues are easily available. There is also some limited use of solar electric power.

Myanmar Ministry of Foreign Affairs, News and Views from Myanmar, 18/08/04. www.mofa.gov.mm/news/aug18\_04\_wed7.html

Under the BIMSTEC energy co-operation programme, a workshop for sharing experiences on the use biomass gasifier systems by SMIs and on the application gasifier technologies in the BIMSTEC region was held in NyaungU on 16 August 2004. It was attended by government ministry peronnel, staff from REAM and NGOs and representatives of BIMSTEC member countries, India, Myanmar, Sri Lanka and Thailand. Workshop participants studied the functions of a biogasifier which was built in March 2004 in Kokke Village, Myingyan township. They discussed the use of biogas produced from animal and vegetable wastes in generating electricity and river-water pump projects.

See aabove: 'Call for <u>energy co-operation</u>' (Myanmar Times: 13/02/06) <u>'Private sector promoting</u> interest in renewable energy' (MT: 12/07/04)

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#### LOCAL BATTERY BRANDS COMPETE WITH IMPORTS

Ye Lwin, Myanmar Times, 24/11/03. www.myanmar.gov.mm/myanmartimes/no193/MyanmarTimes10-193/19322.htm

The local battery industry plays an important role in Myanmar's developing economy with cars, small businesses and remote villages, relying on the power that batteries supply. The battery industry is divided into equal halves with 50pc of the batteries produced in Myanmar while the other half is imported from overseas. High quality foreign batteries are imported from neighboring countries such as India, South Korea, China and other ASEAN member countries. However, despite import competition, local entrepreneurs are committed to manufacturing batteries, in order to fill local demand. In urban areas, quality locally-made batteries are produced by private factories in the city's industrial zones. Most of the battery factories are in the Hlaingthaya and Shwepyitha industrial areas.

U Zayar Win, marketing manager of Toyo Battery said local businesses are able to keep up against foreign competition. "We occupy from 15 to 20pc of market share in the Myanmar battery market. Our major competitors are 3K Battery and GS Battery from Thailand and Top from China. Although our products are made in Myanmar, we are able to hold our own against foreign imports," he said.

There are more than 50 local battery manufacturers in Myanmar and local battery businesspeople are doubling their efforts to upgrade their products and manufacture international standard batteries with modern technology. However, the 'home-made' batteries in Myanmar are often not particularly durable. Due to the low quality, the price of these 'home made' batteries is a lot lower. According to U Nyein, who operates a cottage battery industry in South Dagon Myothit township, his batteries are made at home using traditional methods. But he can't manufacture products of a quality suitable for the Myanmar commercial market. "Extending our productivity is out of question because of the introduction of hi-tech batteries from abroad," said U Nyein. But U Nyein said that community members bought home-made batteries from his shop as they cannot afford the expensive foreign batteries. "I produce 2,500 batteries a year, and there are many businesses like mine in my community. We cannot manufacture international quality batteries because foreign products make the market too competitive," he added.

There are many foreign brands available, for example, 3K, GS, Panasonic, FB, Volta, Watta, Tokyo, Energy, National, Star Top and Incoe from Korea, Malaysia, Thailand and Japan. These brands are expensive compared with Myanmar brands and many people believe they are more reliable when it comes to quality and durability. However, since many people find that the foreign brands are out of their price range, local manufacturers will continue to supply a niche in the battery market.

#### Addtional references

See above: 'Rising world lead prices zap Yangon <u>battery market</u>' (MT: 10/09/07)

NLM: 18/07/04 http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040718.htm

SPDC Sec'y No 2 Thein Sein and officials of the SPDC office visit the Byanhlwar dry cell factory owned by the Myanmar War Vets Organization where they are welcomed by MWVO V-C Vice-Admiral Kyi Min (retd) and Factory Manager Lt-Col Khin Maung Gyi (retd). At the factory on Kinwunmingyi Road in Shwepyitha IZ, Lt-Gen Thein Sein inspects a display of production process of D- and AA-size batteries. Afterwards the manager reports on investment, test operation of the factory, production on a commercial scale, the kinds of dry cells being produced, the raw materials used, power supply, distribution of finished products, income, strength of staff and requirements. He is told to conduct technical courses, arrange for substitute parts needed for the factory, market quality products, take fire preventive measures, observe worksite safety, and spend carefully. Secretary No 2 and party then inspect the production process and warehouses. The factory employs 127 staff and produces 7,200 D and AA sizes dry cells per hour which are available on local markets and in the Winthuza Shops of the Ministry of Industry No 1

Toyo Battery Myanmar website information. <u>www.toyobatterymyanmar.com/profile.htm</u> Proven Technology Industry CoLtd, (PTI), a private limited company based in Yangon, wholly owned by Myanmar citizens, incorporated in Myanmar in 1996, manufactures and distributes Toyo lead acid automobile batteries, industrial standard batteries and other specialized batteries. The batteries conform to ISO 9001:2000 standard. The factory located in Block-94(A+B), 42nd Qtr, Kha Yae Pin St., Industrial Estate, Shwepyitha township

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## MYANMAR REPORT TO MEKONG EXPERTS ON POWER TRADE

Ninth Meeting of the Experts Group on Power Interconnection and Trade (EGP-9): Greater Mekong Subregion: Summary of Proceedings, (Guanzhou, PRC, 18/11/03) http://www.adb.org/Documents/Events/Mekong/Proceedings/egp9.asp

Section 22. Dr. Thein Tun, Director General, Ministry of Electric Power (EPM), recalled that the EPM was established in November 1997 to promote effective operation of the power sector. He said that MEPE was put under the EPM and that a newly established Dept of Electric Power acted as policy-making body as well as Secretariat to the Ministry. In January 2002, he noted that the DHP had been established to increase capacity for implementing hydropower projects. He gave a quick review of the policy and strategies of the MEP and presented the demand and supply situation of Myanmar's power industry. He gave the demand forecast for the next 10 years. He stressed that to meet future power demand, the MEP had laid down a 5-year short term and a 30-year long-term strategic plan. The first was to meet rapidly rising domestic demand, and consisted of plans to develop 14 hydropower stations and a coal- fired thermal plant, and 28 transmission lines and substations. He enumerated the objectives of the 30-year plan, which is to consider power trade with GMS, ASEAN and the BIMSTEC region.

Section 23. He then briefed the delegates on the estimated investment costs for the generating projects in the first five-year plan and the financing status for these projects. He said that of the estimated costs of \$1,092.52 million, financing had been secured for about \$777.52 million. For the transmission projects, of an estimated total cost of \$423.92 million, \$91.92 million had already been contracted. Financing came mostly from the government's own funds, suppliers' credits, and Chinese and Japanese grants. He noted that little or no direct foreign investment went into the power sector due to heavily subsidized power prices. He showed the current electricity tariffs, which the MEP was tasked to propose but which needed government approval to become effective. He explained that for households, the rate is subsidized up to 200 kWh

month, but they are charged 25 kyat/ kWh thereafter, at the same rate as industrial and commercial consumers pay for all their usage. He proceeded to discuss the export oriented projects in which foreign investors had shown interest, since they could get commercial tariffs for the power produced by projects such as the Tasang (7110 MW) and the Hutgyi (400 MW) on the Salween, and the Tamanthi (1,200 MW) on the Chindwin. He concluded by stating that incentives, with regard to electricity tariffs, were required to enable private investors supply power on commercial basis. Further power sector deregulation and establishment of institutional framework for IPPs were required to attract foreign investment and private participation in the power market.

Section 24. Mr. Chavalit asked about the progress of Myanmar-Thailand power trade. Dr. Thein Tun replied that an MOU was signed between Myanmar and Thailand for the former to supply 1,500 MW to Thailand by 2010. He said the most advanced among the export hydropower projects is Tasang. Mr. Tran Minh Huan asked about the BOOT power projects and the extent of local firms' participation in these. Dr. Thein Tun replied that the lack of foreign exchange limits local firms' involvement in the power sector.

#### Additional references

See below: 'Power purchase <u>deal between Thailand and Burma</u> on the way (Nation: 27/05/97)

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#### SHWELI TRANSMISSION LINE CONTRACT SIGNED

People/s Daily Online, 10/10/03.

**Compiler's Note**: Access this article through a Google search using the original headline: 'China, Myanmar sign contract on power transmission'.

A Sichuan company in the PRC and Myanmar electric power authorities signed a contract in Yangon on provision of equipment to the Myanmar side for a double transmission line project. The contract is between the Sichuan Machinery and Equipment (I & E) Co Ltd of China and MEPE.

Having a total length of 356 kilometers (km), the 230-kilovolt (kv) double transmission line will extend from the Ruili [Shweli] power plant in northern [Shan state] to Mandalay, Myanmar's second largest city in the [central part of the country]. Besides equipment for the transmission line, the Chinese side will also provide equipment to three other sub-stations covered by the transmission line. Under the contract, the Chinese side is also responsible for supervision of the project site, technical services and personnel training. The US\$34.72-million project will be completed in 22 months.

Construction of the Ruili [Shweli] hydropower plant will start in November this year and be completed over a 42-month period. It is located in northern Shan state, 90 km from the border town of Ruili in the PRC. The installed generating capacity of the plant will be 400 MW and it is expected to produce nearly 3,022 million kWh annually.

Myanmar, which has a serious shortage of electric power, has a total installed generating capacity of 1,165 MW. The country's power transmission lines are outdated and unable to meet the requirements for daily life and economic development. The Shweli line will greatly raise Myanmar's power transmission capacity. On behalf of respective sides, Yao Yuning, president of the Chinese Sichuan company, and Sann Oo, managing-director of MEPE, signed the contract.

#### Additional references

Palaung (Ta'ang) Youth Network Group, *Under the Boot*, December 2007. pp 40 – 41. <u>http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf</u>

Beginning in Dec 2006, LIB 130 of the Myanmar Army based in Mantong required 30 Palaung villages to rebuild the road from Mantong to Namkham. The road follows a planned transmission line route. The chairmen of all large village councils along the road had to ensure that each household send one person to work on the road for a month at a time. Over 300 villagers have worked on road so far without the help of

machinery. In 2006, another line was started from Namtu to Mansan. Since Feb 2007, an estimated 27 villages had had to send one labourer from each household to improve the road from Mantong that will follow the power line route. Each village is responsible for a 5-mile stretch of the road. On May 21, 2007, the Commander of the Myanmar Army's north-east district ordered LIB 130 to commandeer 15 trucks in Mantong to carry electric and materials for building pylons from Lashio to construction sites in Namtu. The owners of the trucks had to provide the their own petrol and were not re-imbursed for the use of the vehicles.

#### NLM, 01/10/07. http://www.ibiblio.org/obl/docs4/NLM2007-10-01.pdf

EPM No 2 Khin Maung Myint met with Wang Tao of Sichuan Machinery & Equipment (I & E) Co Ltd of the PRC at the ministry here on 28 September. Also present at the call were Director-General Dr Thein Tun of Electric Power Department, Managing Director U Tin Aung of Electric Power Supply Enterprise and officials. The minister explained facts about Shweli-Mansan-Shwesaryan 230-kV power grid. Next, the minister and Mr Wang Tao discussed matters related to the project.

#### NLM, 14/09/07. http://www.ibiblio.org/obl/docs4/NLM2007-09-14.pdf

EPM No 2 Khin Maung Myint and officials inspect the main power station at Mansan, included in the 230–KV Shweli-Mansan-Shwesaryan power-line project, and sub-power stations on 10 September. Project Manager U Aung Kyaw Oo briefs the Minister on completion of the approach road along the power line, the stockpile of gravel and sand and 'accomplishment of the towers'. MD U Tin Aung of Electric Power Distribution Enterprise and Director of Myanma Electric Power Supply Project (North) U Tin Shwe also report. The minister gives instructions on use of quality materials and timely completion of the construction of main power station. Afterwards they inspect work on the 230-kV Shweli-Mansan-Shwesaryan grid near Sakhantha village between Kyaukme and Nawnghkio which is being carried out by Original Group Co Ltd.

#### NLM, 13/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070613.htm

While in Kunming, EPM No 2 Khin Maung Myint met the chairman of Sichun Machinery and Equipment (I & E) Co Ltd, Yao Yuning, in Kunming and discussed the supply of materials for the Shweli power line and timely completion of the project.

NLM, 04/01/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070104.htm</u> Central China Power Grid International Economic & Trade Co Ltd and MEPE of EPM No 2 sign a contract for the purchase of elec appliances for the Belin-Monywa-Meiktila-Taungdwingyi 230-KV power line and the Shweli, Mongsan and Shwesaryan sub-power stations on 30 December.

#### NLM, 25/12/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061225.htm

At Kyimyindine Station in Yangon materials for building the twin bundle double-circuit towers along the 230kV Shweli-Mansi power line are loaded onto a train.

#### Kayan Soe Myint, NLM, 09/08/03. http://www.myanmar.gov.mm/Article/Article2003/aug/Aug09b.htm

With a view to expanding the scope of power supply to the towns and villages along the Union Highway, including Lashio, Muse and Namkham in Shan State (North), Bhamo and its surrounding areas in Kachin State, and industrial enterprises in Mandalay and Monywa in central Myanmar, the HPD under MEP is making arrangements for the Shweli hydelpower station near Mantet Village, 17 miles south-west of Namkham in Muse District. To distribute the electricity, sub-power stations and nine power lines: the 217-mile Shweli-Mandalay line, the 135-mile Mandalay-Monywa line, the 53-mile Namtu-Hsipaw-Kyaukme line, the 23-mile Namtu-Lashio line, the 47-mile Shweli-Namkham-Muse line, the 50-mile Shweli-Kutkai line, the 46-mile Shweli-Bhamo line, the 12-mile Muse-Kyugok line and the 18-mile Kutkai-Hsenwi line will be constructed. These lines and sub-power stations will also provide power to the copper mine in Monywa, the Namtu mine, a new nickel mine in Thabeikkyin and projects and factories in Upper Myanmar.

See above: '<u>China's first BOT</u> hydropower project in Myanmar revs up' (Mekong News: 30/12/06) See below: 'Contract for Shweli hydropower project <u>signed with YMEC</u>' (NLM: 09/08/03)

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#### LOCALLY-MADE STOVES AND OVENS FIND FAVOUR

#### Yin Min Tun, Myanmar Times, 06/10/03. http://www.myanmar.gov.mm/myanmartimes/no186/MyanmarTimes10-186/e11.htm

Locally-assembled cooking appliances that combine the use imported parts with local materials make the end product more affordable and give them a big advantage over fully-imported brands, a Myanmar Times survey found. Duwon Electric, which began making electric stoves in 1987, said it had been enjoying stable sales figures even during slower economic times. "People have come to recognise our Duwon brand which acquired a large market share from 1990 onwards," said U Zayar Min Thu, sales manager for the company. The prices of a Duwon electrical stove range between K3,000 to K6,000, depending on the quality of the coils and switches used, and their cooking capacity.

Models that use a stone frame have lower prices than those that use more expensive raw materials like aluminium. "Stone frame stoves can withstand heavy weights and are more affordable for most Myanmar people," U Zayar Min Thu said. By using raw materials and spare parts from Myanmar, local products can be sold at low prices and gain high sales volume, he added. Duwon distribute their stoves all over the country. Sales in Yangon are only half of the combined sales in other cities. "Our sales numbers have risen three times in the past three years," U Zayar Min Thu said.

Another stove maker, Daw Tin Tin, began assembling her Kabar Kyaw electric stoves just last year when she learned of the success of local manufacturers. The Kabar Kyaw stoves are available with aluminium iron and stone frames, and appeal to a wide range of consumers. "Most of our sales in the Yangon market are in suburban areas like Dagon Myothit and Thaketa townships where products that are affordable are needed," said Daw Tin Tin. The price of a Kabar Kyaw stove ranges from K1,000 for a stove made of iron, to K9,000 for a stove made of aluminium. 70pc of Kabar Kyaw's sales are in Yangon, with the balance coming from Mandalay, Pathein, Mawlamyine and other regional cities.

Daw Mya Mya is another entrepreneur in the stove market. Her brand, Aung Myanmar, also comes with iron, aluminium or stone frames. Sales for Aung Myanmar have 'cooled' during the past three years, according to Daw Mya Mya, but rainy season peak sales were keeping the company profitable.

Distributors of imported stoves say the success of local products may be due in part to the fact that local consumers are not acquainted with the new technologies included in their products. "Myanmar people don't like equipment that is a little bit complicated to use," said U Kyaw Kyaw, a supplier of the Khind brand of electrical appliances such as microwaves from Malaysia. "Hotplates and ovens which they are accustomed to are much easier to use," he said. But he believes consumers will become more interested in the newer types of kitchen appliances as time goes on and consumer-spending power increases. "We rely on the quality and reasonable prices of our products and hope that eventually this will lead to greater demand on the part of consumers," he told the Myanmar Times.

Casa Yangon Ltd supplies Italian-made home appliances imported through Singapore. Most of its sales are to construction companies who build them into the kitchens in apartments or housing estates. Casa Yangon's sales manager, U Maung Maung Htun, said that electrical appliance purchases were all about what people can afford. "The general spending power of most clients excluding construction companies is just over K10,000," he said. "Most imported hotplates and ovens ranged from K12,000 to more than K100,000 for a gas oven and stovetop." He said that many clients liked to have both gas and electrical appliances because of inconsistent electricity supply in some places. He also noted that hotplates, ovens and stovetops are widely used but microwaves are not.

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**POWER FLUCTUATIONS STILL KEEP ELECTRICAL SUPPLY SHOPS BUSY** Nyi Nyi Aung, Myanmar Times, 06/10/03. http://www.myanmar.gov.mm/myanmartimes/no186/MyanmarTimes10-186/e10.htm

The market for voltage regulators has slowed over the past five years, as the supply of direct current has become more consistent, according to electronic industry sources. The regulators, which are used to stabilise direct-current voltage were first introduced into into the Myanmar market in the early 1980s. Since

then, models imported from Japan and China have largely been replaced by locally-made products whose design is more inappropriate to the Myanmar market.

U Pe Thein of UPT Electrical and Electronic Manufacturing Co-op Society Ltd said the different ranges of power fluctuations around the country meant regulators needed to have a wide range of voltage rates. "Increasing power supply is not enough to make voltage regulators completely redundant. Power distribution is much more important." He said UPT regulators had 50pc market share when they were first manufactured but now had only about 10pc as more competitors entered the market. UPT is attempting to diversify, and is now focusing on producing high voltage transformers as the co-op see a better future in this market. "To have good electricity distribution you need high voltage transformers everywhere. This also means that low voltage transmission lines will be replaced by higher ones," U Pe Thein said. Good distribution meant not losing so much power in distribution lines, he said.

So far only two other companies in Yangon are producing high voltage transformers with a capacity up to a thousand kilo-volt-amperes (kVA). U Pe Thein said his voltage regulators' peak season was from October to April in which 85pc of total sales were made. UPT produces manual and auto-voltage regulators having capacities of 5 and 10 kVA with auto-voltage regulators making up about 60pc of total sales.

U Aung Kyi Sein, MD of Duwon Electric, said 60pc of Duwon voltage regulators sold are manual, while manual-plus-auto voltage regulators make up 30pc of sales, and the rest is balanced by the sale of auto voltage regulators. Manual voltage regulators are more robust than auto voltage regulators, which are suitable only for low current-fluctuation areas, he said. Duwon produces 24 varieties of voltage regulators with prices ranging from K24,000 to K260,000. U Aung Kyi Sein said more customers bought Duwon voltage regulators in the hot season because electronic products like air conditioners and fans were used more during that time of the year.

He said Duwon inverters, devices for converting direct current into alternating current that were first produced by the company in 1997, have become their big seller. Inverters make up 70pc of the Duwon's total sales, he said. The company produces five other products including voltage regulators. "Duwon inverters are more robust and have more functions than other inverters in the market, so we enjoy 50pc of the inverter market," U Aung Kyi Sein said. He said though the market for inverters is growing, the future is uncertain as inverters are only temporarily needed before the electricity supply becomes consistent.

#### Additional references

See below: 'Local transformer manufacturers face <u>tough competition</u>' (MT: 27-01-03) 'Voltage regulator sales brisk' (MT: 01/08/05) <u>www.myanmar.com/myanmartimes/MyanmarTimes14-277/b001.htm</u> 'Power fluctuations – finding the answer with regulators' (MT: 31/07/00) <u>www.myanmar.gov.mm/myanmartimes/no22/power\_fuctuations-finding.htm</u>

SOLAR POWER SEEN AS SOLUTION FOR REMOTE VILLAGES

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Kyaw Naing, Myanmar Times, 06/10/03. http://www.myanmar.gov.mm/myanmartimes/no186MyanmarTimes10-186

Subsidies, technical support and greater awareness are needed to speed the development of alternative energy sources in Myanmar, an industry spokesman said last week. One of the leaders in the field, U Win Khaing, managing director of Myanmar Solar Energy System, a subsidiary of United Engineering, is enthusiastic about the future of solar power as an alternative power source in this country. "Myanmar has great potential for utilising solar energy which is a free energy source. It could provide an immediate solution for remote villages that are not connected to the national electricity grid".

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U Win Khaing said that solar power could help raise socio-economic standards for people living in remote areas, where it is difficult and costly to install overhead power lines. "Of a total population of 52 million,

about 70pc of the people in Myanmar live in rural areas. There are nearly 13,000 villages in the country, some of which still need to have access to electricity," he said.

Myanmar's average sunlight-hours range from 5.2 to 7.45 a day – more than sufficient to make effective use of a solar power system. In many cases, a solar power system alone can provide sufficient electricity to meet the requirements of an average rural household. The main reason solar energy is not used more widely at present is that purchase and installation costs are still too high for most of those living in rural areas.

The FISCA Co distributes 12 watt, 50 watt and 75 watt solar panels manufactured in China and India. A complete set including a solar panel, battery, DC/AC current inverter and other accessories ranges in price from US\$650 to \$900. The Sunpower Co which distributes Siemen solar products is another of five companies that promote the use of solar power in Myanmar. Their 75-watt system costs about K550,000. Its 75-watt panel when combined with a 120 ampere battery can power three 20-watt lights and a television set for about four hours, while a 50-watt panel with a 70 ampere battery can power three 10-watt lights and a television set for about three hours.

Solar energy usage in Myanmar is still very low, but it is currently used to charge battery back-up systems for radio telephones, telephone switchboards, television relay stations, water pumping stations and solar freezers for hospitals in rural areas. "Wider use of solar power can be implemented in many ways: from installing a village or community-based solar power generation system funded by contributions from residents; through to individuals installing their own solar power system as an alternative to relying solely on power drawn from the national grid," U Win Khaing said.

#### Additional references

Khin Su Wai, Myanmar Times, 02/07/07. <u>www.mmtimes.com/no373/n019.htm</u>

Sales of solar panels have risen sharply in the past five years, with most buyers coming from rural areas not linked to the national electricity grid. The Myanmar Sustainable Energy System company in the Yadanamon housing estate in Hlaing township, says it sells about nine 50-watt solar panels a month. Sales have more than doubled since the company began selling the panels in 2003, according to assistant GM Soe Thein Tun. "Fifty per cent of our sales are to individual buyers in rural areas, with the rest going to NGOs and welfare groups," he said. Earth Computer Systems Ltd on Sule Pagoda Road in Kyauktada township, said monthly sales had reached at least 10 solar panels, up from barely one when it began selling the alternative energy devices in 2002. "Most of our customers live in rural areas of Yangon and Mandalay divisions and Shan State," said a spokesperson, adding that its best selling panel generated 40W. Solar panels cost about K10,000 a watt, with the top-selling brands made in India and China. More expensive brands from Japan, Australia, Germany and the U.S. are also available. U Aung Myint of REAM urges potential buyers to consider the long-term advantages. "Solar panels involve a high initial investment but they generate power for 20 to 30 years so they offer considerable savings over the long term compared to running a generator."

#### NLM: 26/04/06 http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060426.htm

Under the Ayeyawady-Chao Phraya-Mekong Economic Cooperation Strategy, equipment related to a project for generating solar energy to supply power to the Kyaikhtiyo Pagoda was handed over by D-G of the Dept of Alternative Energy Development and Efficiency of Thailand, Siriporn Sailasutaand, to the Pagoda Board of Trustees. At the auspicious time, the cornerstone laying ceremony for the project was held in the presence of the energy ministers of Thailand and Myanmar. The power generated will be used for the pagoda.

Flower News: 29/03/06 www.ibiblio.org/obl/docs3/Flower2006.htm

Friends of the Rainforest in Myanmar have completed a project to supply solar power electricity to 250 households in Thangyigone village in the Mt Popa area. The project began in December 2006 in collaboration with REAM. The project cost more than K100 million; it was funded by the British Embassy.

Refocus Volume 6, Issue 1, Jan-Feb 2005, pp 46-48. www.globalgiving.com/pfil/1721/projdoc.pdf

The Karen Health and Welfare Dept manages 26 remote clinics, scattered across 600 miles, to serve the needs of internally displaced people who have been forced to flee their villages, but remain within Burma. Seventy-five medics work at these clinics, roaming the forests as "backpack medics" and attending to the

medical needs of thousands of people. The clinics did not have electricity due to their remote location, far from the national electrical grid and without easy access to fuel for generators. Solar photovoltaic (PV) power proved to be the perfect solution to electrify these remote clinics because it can be transported, owned, and operated at the clinic level. To make sure that the clinics have reliable lighting, we selected and designed special PV systems, and held intensive training for system operators. The systems were designed for 1) high reliability, even during rainy season and 2) mobility so that they could be carried, by foot, to the clinics and moved when the security situation demanded. Each system consists of a 110 watt solar PV panel, a 12-volt 125 ampere-hour deep cycle battery specially designed for solar home systems, two 12-volt, 20-watt, fluorescent lights, and a 1-watt LED that is used as a night light. The charge controller, switches, and strain-relief terminal strips are housed within a rugged cabinet so that the system is durable and relatively 'plug and play'. The system powers the lights and a DC receptacle for charging the batteries of two-way radios, lap-top computers, and other devices. For the project, two medics from each of the clinics crossed into Thailand, where solar training was held. Instructors from Green Empowerment and Palang Thai taught them the practical aspects of solar power. The trainings combined classroom instruction with handson construction of the systems. The class covered the ins and outs of basic electricity (volts, amps, watts, and watt hours) and photovoltaic systems (how to maximize solar panel output, the importance of thick wi res and good contacts, maintenance of lead acid batteries and optimal load management). Participants then built the systems from scratch, learning to assemble and disassemble them, and fix technical problems that could arise. The participants carried the systems through the jungle back to the hidden clinics and installed the systems themselves. The word has spread among medics and patients about the advantages of solar power and now there are five more at clinics in areas where the risk of army attacks is low enough for them to be safely installed. [Photos illustrate an installed system]

Maw Maw San, Myanmar Times, 09/02/04. <a href="https://www.myanmar.gov.mm/myanmartimes/no203/MyanmarTimes11-203/013.htm">www.myanmar.gov.mm/myanmartimes/no203/MyanmarTimes11-203/013.htm</a>

U Win Khaing, MD of the Myanmar Solar Energy System, said solar energy was attractive to consumers because it was cheap and reliable. Its potential was huge for remote areas not yet connected to the national electricity grid. Myanmar Solar Energy System became involved in promoting solar energy use because of its growing popularity in some other Asian countries, including Japan. Sun Power started its solar energy business in 1997. GM Ni Ni Than, said consumers were initially reluctant to use solar energy because they were not familiar with it and due to installation costs as high as K500,000 for a system capable of producing 50 watts of power. "After installing the systems, people do not need to spend any more money and there are no fees for the power. We guarantee that our systems will last for 25 years," she said. Solar power is also attracting increasing interest among urban residents and was promoted during the recent ICT Week in Yangon.

United Engineering website information [n.d.]. http://www.united-engineering.net/MSESStuff/remote1.htm In Yan Myo Aung, an isolated village [near] the India-Myanmar border, 500 families are beginning to enjoy the benefits of power and light thanks to solar energy. Home solar units have been installed for the entire village. Every home involved in the project is equipped with a fluorescent light switch, wires and connectors and a discharge protector. The important thing in remote villages is to keep the power system simple and dependable In this program each of the homes, as well as the street lighting and communal buildings, is supplied with its own self-contained solar power system. The program was selected because the remote location of the village makes it difficult to obtain fuel needed for other electrical generations systems and the hiah cost of connecting the area to the transmission arid. Note also: http://publishedforscholar.wordpress.com/2006/12/18/india-myanmar-relations/

As part of an S&T co-operation programme, solar electrification of a village in upper Myanmar was completed in October 2002 by Central Electronics Limited (CEL).

See also: www.mnre.gov.in/annualreport/2002\_2003\_English/ch10\_pg2.htm

See below: 'Alternative energy project uses <u>three power sources</u>' (MT: 06/01/03) See also the section on solar energy in '<u>Electricity potential</u> of energy sources available in Myanmar'. See also: 'Solar power systems' <u>www.myanmaryellowpages.biz/indexes/s/s036.htm</u>

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#### KHABAUNG MULTIPURPOSE DAM PROJECT LONG OVERDUE

Khabaung multipurpose dam project under construction in Ottwin township is included in the Sittoung Valley Development Project. The project site is located in the middle of thick forest in the Bago *yoma*, in a region once under the control of Burma Communist Party. The Khabaung creek across which the dam is being built, is a tributary of the Sittoung river and has a strong current. The project is expected to contribute not only to agriculture in the area but also to flood prevention. It will also generate electric power.

The Sittoung valley, stretching from Myohla to the Gulf of Mottama, is blessed with good soil. Paddy, sugarcane, sesamum, groundnut, maize, chili, beans and pulses, vegetables, bananas, fruits, coconut, tobacco, nipa palm (Nipa fruticans), jute and rubber, are all grown in the region.

The multipurpose dam is about one and a quarter miles downstream of the confluence of Khabaung creek and Praing creek. A diversion weir is located five miles downstream from the dam which will irrigate 135,000 acres of paddy fields in Toungoo and Ottwin townships. The dam -- with a length of 920 feet and height of 200 feet -- will have a maximum water storage capacity of 878,570 acre feet at full brim. Its spillway is 900 feet long and 100 feet wide. Maximum area of the lake is 14,657 acres. The power facility connected with the dam will generate 20 MW of electricity and is expected to produce 65.4 million kWh of electricity annually.

A feasibility study for the dam was jointly carried out by experts of the UNDP and Myanmar engineers as long ago as 1963. Actual construction only got started got started in the open season of 2000-2001. Work on the diversion tunnel started in December 2001. By April 2002, 54 steel ribs had been installed. The project is targeted for completion in December 2003.

Personnel at the dam site are discharging their duties with perseverance in the face of extreme hardship caused by the weather and geographical conditions. They include 47 civil personnel, 34 mechanical staffers, eight geological personnel, four quality control staff and 120 skilled workers. They receive an extra bonus of K1,000 per month. Rice is also provided to them.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-05: Toungoo Khabaung, 15 mi north-west of Oktwin [18° 49' N, 96° 26' E], grid square reference: 9\9, 25\6 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg</u>

#### Additional references

NLM, 27/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071227.htm

Project Director Maw Tha Htwe and Mechanical and Electrical Installation Director Khin Maung Win brief EPM No 1 Zaw Min, Dep Min Myo Myint and D-G Hoke Kyi of the HAD on construction of the power plant and installation of machinery at the Khabaung hydropower project in Toungoo township. They check the power control rooms, laying of underground cables, work on the switchyard, installation of porcelain balls, placing of concrete on steel pipelines, digging of the outlet canal of the power plant and dredging of Khabaung creek. The project is 90pc complete.

NLM, 10/11/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071110.htm

EPM No 1 Zaw Min briefed by Dir U Maw Tha Htwe of Construction Gp 3 and Dir of the Mechanical and Electric Installation Division Khin Maung Win. Construction of the power plant, installation of the generators, turbines and penal, building of the switch yard and penstock pipes is ongoing. The power plant is expected to generate 120 million kWh yearly. The is 88pc complete and will be finished in the 2007-08 financial year.

NLM, 28/09/07. <u>http://www.ibiblio.org/obl/docs4/NLM2007-09-28.pdf</u> Khabaung creek hydropower project is more than 86pc complete. It will be able to generate 117 million kWh a year.

NLM, 10/09/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070910.htm

U Soe Tha, Minister for National Planning and Economic Development, signed a loan agreement for agricultural development at the Thonze and Khabaung dam projects with the OPEC Fund for International

(OFID) at Vienna on 06/09/07. In Vienna, the minister met with various officials of OFID on matters related to the development of the agriculture and electric sectors and co-operation with OPEC.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07.

http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Khabaung dam and power station with a planned capacity of 30 MW is under implementation by the ID and HPID. It will generate 120 million kWh annually when it comes on line in Dec 2007.

China Heavy Machinery Corp, 30/04/07. <u>http://www.chmc2003.net/news.do?cmd=show&id=1666</u> A CHMC news release in Chinese about construction activities at the Khabaung hydropower plant. The initial phase of construction was completed in April 2007.

NLM, 14/02/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070214.htm</u> Gen Soe Win visits the Khabaung project which is 80pc complete. Work continues on the embankment and spillway. Construction of the water tunnel and power plant is ongoing.

NLM, 04/12/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061204.htm</u> EPM No 1 Zaw Min is briefed on the construction of the water-intake and sluice gate, building of the hydel power plant and placing of the steel pipe lines. He meets with foreign experts and officials and gives instructions on the timely arrival of imported machinery. Work on the project is 73pc complete.

NLM, 06/11/06. www.myanmar-information.net/infosheet/2006/061106.htm

In Nanning in the PRC, EPM No 1 Zaw Min meets with Chairman Zhao Ruolin and party of China National Electric Equipment Corp about the timely arrival of electronic and mechanical equipment for Yenwe, Yeywa, Khabaung and Kengtawng hydel power projects. V-C Zhu Xu and party of China National Heavy Machinery Corp call on the minister and discussed timely sending of electronic and mechanical equipment and hydraulic steel structure for the Kun and Khabaung hydelpower projects.

NLM, 27/05/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060527.htm

EPM No 1 Zaw Min nspects construction of the power plant, water tunnel, sluice gate and embankment at the Khabaung hydel power project, 15 miles west of Ottwin. Two 15-MW generators will produce 120 million kWh yearly.

NLM, 24/04/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040424.htm

Gen Soe Win and party visit the Khabaung project and inspect work on the main embankment, the inlet and outlet portals of the diversion tunnel and the site chosen for the power station. It will e constructed by Construction Gp 3 of the HPD. The dam will irrigate 100,000 acres of arable land and generate 30 MW.

NLM, 08/11/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021108.htm

EPM Tin Htut is briefed on the construction of the horseshoe-shaped [diversion] tunnel, 1,200 feet long and 13.12 feet wide, as well as plans for the saddle dyke and regulating dam.

NLM, 18/01/01. <u>http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010118.htm</u> Gen Than Shwe and party visit site of the main dam on Khabaung creek, 2 km west of the confluence of Khabaung and Praing Creeks. The earth barrier will be 700 feet long and 172 feet high. It will irrigate 198,100 acres of crops on 135,000 acres of land and will generate 30 MW.

NLM, 27/12/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n001227.htm

D-G Kyaw San Win of the Irrig Dept briefs Ag & Irrig Minister on arrangements for construction of the Khabaung multi-purpose dam and the building of the embankment, conduit and spillway.

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VILLAGE ELECTRIFICATION COMMITTEES

JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan, *The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summa*ry, pp 27, 28, 30, 31, September 2003

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&seqno=1

Village Electrification Committees (VECs) play a role in developing, operating, managing and maintaining small isolated rural electrification schemes. Existing committees have usually been set up on an ad hoc basis with some external assistance, e.g., from MEPE, an NGO, the Co-op Ministry or an equipment/technology supplier. Operation and maintenance of existing isolated electrification systems in rural areas of Myanmar (i.e. all systems outside the grid) is generally carried out by either MEPE or VECs. The isolated systems operated and maintained by MEPE are either small hydropower schemes or diesel generator plants. The systems operated and maintained by VECs cover a wider range of types e.g., micro hydro, solar power (battery charging or village water supply), and biomass (rice husk) schemes. Common problems currently affecting the operation and maintenance of both government and village rural electrification have been identified and demonstrate that there is a need for guidance, training and technical support from outside the village. But the initial investment cost, which is several times larger than the amount one household can afford at a single harvest-time, is the bottleneck of most village rural electrification schemes. Financial resources for villagers are very limited — self-funding, suppliers' credit, co-operative bank loan, donation, and Myanmar Agriculture Development Bank loan - and most villages have to rely on self-funding. In fact, according to examples of village hydro, the typical construction cost is about US\$130 per household, which is too large for one household to pay in a year, and they need to be able to make several payments over two to three years. A financing system such as a rural electrification fund for small-scale short-term loans would greatly improve the prospects of village rural electrification schemes. For their part, local experts and contractors worry about the ability and willingness of the villagers to pay for the power plant once constructed. Because there is no competitive market for rural electrification, the price and quality of these schemes are a matter of mutual trust between the villagers and the expert/contractor. In this regard, it is proposed that a completion guarantee system be established to support villagers in making the final decision for implementing electrification schemes.

#### Additional references

#### Myanmar Times, 13/09/04. [not available on-line]

The first power plant in Bago division to generate electricity from rice husks was officially opened in Bine-dar village, Nyaunglaypin township, on August 9. The plant is capable of producing 50 kilowatts of energy for 426 households. It was established by the village electrification committee with the support of the township USDA. Before the plant was set up, some villagers relied on small and expensive diesel generators for electricity. Because of the cost, many households had no electricity. The plant cost K10.5 million to build, about K 6 million of which was paid with a loan from the Co-operative Bank. The village electrification committee raised the balance of the funds.

#### MANUFACTURE OF SMALL HYDRO TURBINES IN MYANMAR

JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan, *The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summary*, pp 16-17, September 2003 <a href="http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshistel">http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshistel</a>

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In Myanmar, equipment for small hydros is manufactured in MEPE's workshops as well as in private workshops as shown below:

#### Table 4 Workshops Manufacturing Small Hydros Inspected by the Study Team

Workshops	Installations	Remarks
1. MEPE workstation in Yangon	30	A total output at 13,548 kW, average station output at 450 kW, including imported equipment

2. U Khun Kyaw, Rural Development Group, Taunggyi	33	Has manufactured and installed small hydros & Hydroelectric Implementation of 5-75kW since 198, and accumulated adequate technology which can be the model for proposed Village RE schemes
3. U Kyaw Kyaw, U Taing Kyaw workshops, Sein Pann Industrial Co-op Ltd, Mandalay	9	Manufactured and installed five Pelton turbines each in Kachin State in 1983; Manafactured two Crossflow turbines of 5-10 kW in 1987; Manafacturing Frncis and propeller turbines in 2002
4. U Paung Kyaw workshops, Sein Pann Industrial Co-op Ltd & Hydroelectric Implementation Group, Mandalay	30	Has manufactured Pelton turbines of 5-50 kW since 1983 for Northern Shan State
5. U Chit Hla and Sons, Ayethaya Industrial Zone, Shan State	56	Has manufactured pico turbine of 5-20 kW since 1989

In addition, there are many workshops manufacturing 2 kW generators, casting foundry, steel products, in IZs in Yangon. Among others, Triangle Link Engineering Co., Ltd., Yangon has good experience in producing penstock pipes, gates, and screens for small to medium hydros. They also have the capacity to manufacture turbines of 100 kW class if provided with a design.

There are also contractors for building small hydros including transmission and distribution lines. These include Rural Development & Hydroelectric Implementation Group (RDHIG), Taunggyi, Shan State, and Aung Pyi Tun (APT), Yangon.

JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan, *The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Supporting Report Volume 8: Interviews/Field Surveys in Villages for Rural Electrification: Feb 2001-Nov 2002*, pp 75-77.

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159779&volno=0000000000&filename=11734175\_03.pdf&seqno=3

This memo is the record of an interview conducted by two Japanese field researchers with U Khun Kyaw, an electrical engineer who owns and operates a workshop that produces turbines for use in rural areas of Shan state. The workshop is located in the industrial area of Nyaung Shwe (Yawnghwe) near Inle Iake. U Khun Kyaw is a specialist with twenty years experience in producing and installing Pelton, cross-flow and propeller turbines up to 100 kW. Details of the parts produced in the workshop are provided. Generators are imported from two companies in China that have dealerships in nearby Taunggyi. Planning and design of the turbines, as well as production and installation, are carried out by U Khun Kyaw, including discharge measurement, head measurement, cost estimate for the project and drawings, at a commission of 5% of the capital cost. Cost in 2001 when the interview was conducted were estimated at about K 300,000 per kW. Photos accompanying the memo show Kaplan and cross-flow turbines, casing for a Pelton turbine and installation of a rural hydro system.

#### Additional References

Khin Hninn Phyu, Myanmar Times, 12/07/04.

www.myanmar.gov.mm/myanmartimes/no224/MyanmarTmes12-224/020.htm

In Myanmar, technologies based on the sun, wind, water and even farm-waste are being developed and marketed by entrepreneurs whose interest in renewable energy is motivated partly by a concern for the environment. "If we don't use renewable resources instead of conventional energy sources, the environment will be affected," said U Kyaw Soe Win, who makes mini-hydro systems at the Ayethaya IZ near Taunggyi. "I became interested in this technology because it can be used efficiently for the benefit of the people and the environment," said U Kyaw Soe Win whose company designs and makes mini-hydro systems capable of generating from five to 50 kilowatts. Apart from being sustainable, he said the advantages of hydro-power systems included lower maintenance and operational costs than those using fossil fuels.

NLM, 14/06/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040614.htm

PM Khin Nyunt and party arrived Kalay Industrial Zone where they heard reports on the assembly of automobiles and the manufacture of hydro electric turbines and agricultural equipment by U Aung Min, V-C of the zone supervisory committee.

NLM, 21/05/03. <u>http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030521.htm</u> Lt-Gen Soe Win arrived at Kyaw Soe Win hydro-electric power engine factory [in Ayethaya Industrial Zone in Taunggyi] and inspected the generators ranging from 50 to 150 kilowatts.

See above: <u>'Mini hydropower plants</u> planned for rural areas' (MT: 08/08/05)

#### PYU MULTI-PURPOSE DAM PROJECT IN THE OFFING

Khin Maung Than, NLM, 29/08/03. http://www.myanmar.gov.mm/Article/Article2003/aug/Aug29b.htm

The Pyu multi-purpose dam project in Pyu township was launched in 2001-2002 for the development of the Sittoung Valley. The project is 11 miles west of MP No 145 on the Yangon-Mandalay highway. It was started in the open season of 2001-2002 and will be completed in four years.

The stone-filled embankment of the dam across the swift-running Pyu creek is 1,020 feet long and 245 feet high. The 115-foot long, 20-foot high diversion weir of the dam is of the ogee type. The 2,520 feet long diversion tunnel is also of the ogee type. The maximum storage capacity of the dam is 632,533 acre feet. The project will benefit 120,000 acres of paddy and other crops in Oktwin and Zeyawady townships, Bago Division. The main canal of the dam is 41.2 miles long and the tributary canal 19.6 miles long. The region where the project is being implemented has an annual average rainfall of 100 inches

An electric power station at the dam will be able to generate 32 MW, thereby contributing to development of the village-tracts nearby.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-05: Toungoo Pyu creek dam, 15 mi north-west of Pyu [18° 29' N, 96° 26' E], grid square reference: 9\5, 25\6 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg</u>

#### Additional references

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Pyu dam and power station with a planned capacity of 40 MW is under implementation by the ID and HPID. It will generate 120 million kWh annually when it comes on line in Dec 2008.

NLM, 20/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070220.htm

EPM No 1 Zaw Min and project director U Maw Tha Htwe look into the building of the water intake structure and intake tunnel. 99pc of the earth work on the intake tunnel has been covered as have 36pc of the concrete tasks on the water intake structure. Work on the sluice gate is 70pc complete. Generators in the power plant will have a capacity of 40 MW and will produce 121 million kWh yearly.

China Gezhouba Group Corp (CGGC) website info, [n.d.] <u>http://www.gzbgj.com/english\_n/news08.htm</u> Contract for the design and supply of electrical and mechanical equipment for Phyu hydropower project was signed on 31/07/07. Chen Bangfeng, V-P of China Gezhouba attended the signing. The project is located 180 km south of Naypyitaw. CGGC is responsible for the design and supply of two hydraulic generating units with a capacity of 20 MW each. Supply time is 21 months.

#### NLM, 03/02/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070203.htm

A contract was signed for the purchase of electrical and mechanical equipment and the hydraulic steel structures to be used at Pyu creek hydel power project between HPD and China Gezhouba at EPM No 1 on

31 January. D-G U Aung Koe Shwe of HPD and Chief Engineer Wang Yimin of CGGC signed. The project is seven miles west of Pyu. The power station will be equipped with two 20-MW generators.

NLM, 08/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061108.htm

Laying of concrete on the inner surface of the diversion tunnel is underway. It is 13 feet in diameter and 2,477 feet long. Preparatory tasks are being carried out to build the earth dam. The spillway is under construction. Director U Tint Lwin of Construction Gp No 3 of the HPD reports on the intake structure.

Yangon Times, 02/03/06. [not available on-line]

The Phyu-chaung multipurpose dam project is built on a fault line. Japanese experts will collaborate in building the dam to ensure that it is able to withstand earthquakes.

NLM, 20/07/05. <u>http://groups.yahoo.com/group/myanmar\_information/message/12285</u>

Reports on the digging of the 2,477-foot-long diversion tunnel and arrangements for construction of the spillway by the Irrig Dept and construction of the power intake structure by the HPD. The Pyuchaung multipurpose dam project will irrigate 100,000 acres and and is expected to generate 121 million kWh a year.

NLM, 24/04/04. <u>http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040424.htm</u> At the site of the Pyu creek multi-purpose dam project Lt-Gen Soe Win hears about the construction of a 755-metre-long diversion tunnel, an intake tunnel and hydropower buildings. It is expected to generate 40 MW.

NLM, 18/01/01. <u>http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010118.htm</u> Gen Than Shwe is briefed on plans for the dam and the generation of hydro-electric power. The project located on Phyu Creek 15 miles west of the town of Phyu. It will be 1,000 feet long and 180 feet high, and

will irrigate 270,000 acres of crops on 147,000 acres. The power plant will and generate 65 MW.

NLM: 27/12/00. <u>http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n001227.htm</u> Land preparations are underway at the site of the Phyu creek multi-purpose dam project.

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#### WIRE AND CABLE PRODUCERS FIND READY MARKET IN MYANMAR

Kyaw Naing, Myanmar Times, 25/08/03 http://www.myanmar.gov.mm/myanmartimes/no180MyanmarTimes9-180/024.htm

Myanmar is a country of dreams and potential prosperity for those companies who are selling electric cable. The truth is upgrading of the telecommunications and electrical network was virtually ignored until the government gave the signal to move towards a free market system sometime in the 90s. Then it became obvious that movement towards a more modern nation would require drastic attention particularly to energy systems. Naturally, these manufacturers and suppliers are optimistic about the future primarily because there has been an explosion in the creation of industrial zones and large scale real estate development -- plus a population that increasingly demands to be "hooked up" to power.

The raw material for cabling is mostly sourced from China and other Asian countries, notably Thailand. But, with the establishment of industrial complexes in the outer suburbs of Yangon local production has increased. Manufactured wires and cables now make up the majority of the market in recent years due to lower price and competitive quality against imported goods.

Who are the players in the market? According to Myanmar Times research there are about 10 brands of wires are available in the market including Pirelli (Italy), Hong Pang (local), Golden Lion (local), Waisin (Taiwan), Myanmar Cable (local), Sigma (local), Golden Stenship, A, Standard and Ka-Sa-La (State-owned). Local manufacturers generally produce low voltage power cables, copper wires and communication cables. They continue to rely on imported raw materials.

Hong Pang Company, a local outfit, is producing cable and wire for households and industrial use from its base in Sagaing, Mandalay Division. "Distribution started in 1998. We are producing PVC house wiring

cables, PVC single core and multi-core cables and communication cables. We have branch offices and sales centres in Yangon, Mandalay, Taung-gyi, Magway, Myitkyina and Kengtung. Sales of our cables have increased for three years running," said a spokesperson for the company, who declined to be named."

Golden Lion company is another player. Sales Manager U Aung Khaing said his company has been producing 36 types of wire and cable from their factory in Hlaing Thaya Industrial Zone-4 since 1996. "We are also producing millimeter gauge wires under the brand name of Universe. The best selling wires are low voltage wires for household use such as 3/029, 3/036, 7/029 and 7/036. We distribute our products through agents all over the country.

Sales manager Daw Win Wa Hlaing of Pyan Hlwa electrical appliance shop said her company had been engaged in wire business since 1985. "The retail price for a 100-foot coil of 3/029 single cover wire is nearly K3000. A coil of larger size 7/044 single cover wire is priced around K13,000."

See above:	'Cable factory and foundry opened in Indag	aw industrial zone'	(NLM: 04/04/05)
	'Construction fuels wire and cable market'	(MT: 29/03/04)	

See also: 'Asian Golden Myanmar cable wire factory in Shwepyitha IZ' (NLM: 30/05/07) http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070530.htm 'New factory of Golden Lion Wire opens' (NLM: 05-03-07) http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070305.htm 'Boom predicted for local wire and cable', Myanmar Times: 06/10/03 www.myanmar.gov.mm/myanmartimes/no186/MyanmarTimes10-186/e06.htm 'Texcel producing import-substitute electrical goods' (NLM: 24/09/03) http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030924.htm 'Hong Pang Electronic to producei wide variety of electrical goods' (NLM: 20/05/01) http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010520.htm#(3) 'Electrical wire makers seek standard taxes' (MT: 11/12/00) http://www.myanmar.gov.mm/myanmartimes/no41/industry.htm 'Sigma Cable factory to increase exports' (Myabuzz: 09/11/99) www.ibiblio.org/obl/reg.burma/archives/199911/msg00679.html

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#### CONTRACT FOR SHWELI HYDROPOWER PROJECT SIGNED WITH YMEC

NLM: 09/08/03 [http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030809.htm]

The Hydro-electric Power Department of the EPM entered into a contract with the Yunnan Machinery and Equipment (I&E) Corp (YMEC) of the PRC to implement the Shweli hydel power project on the Shweli river in Namhkam township. Present at the signing ceremony were ministers, deputy ministers responsible personnel of the SPDC office, dept heads, Vice-Governor of Yunnan Province Shao Qiwei, provincial representatives, YMEC Chairman Feng Ke, officials, and guests.

EPM Tin Htut said Myanmar and the PRC have enjoyed perpetual friendship and been good neighbours for so many years. Likewise, MEPE and the YMEC have been working together since 1991 when the construction project of the Kyein Khayankha power station started. Among the other small and medium power projects in which YMEC had taken part were the construction of the Namhmyaw, Namwok, Zawgyi No 1 and Zaungtu power stations. It is also cooperating in the construction of the 280-MW Paunglaung hydel power station. In keeping with the guidance of the Head of State, the EPM keeps hammering away continually on projects to generate electricity, the much-needed linchpin for the development of the economic, productive and social sectors. The Shweli hydel power station would always represent a milestone of co-operation between Myanmar and China and would also serve as a monument to the friendship between the countries, he said.

Next, Vice-governor Shao Qiwei spoke and D-G of the HPD Win Kyaw and Chairman Feng Ke signed the contract and exchanged documents. Under the contract, the Chinese side will undertake the construction of a concrete diversion weir, an underground tunnel and high-pressured steel pipelines and the installation of

turbine-generators, transformers and electrical appliances within a period of three years. The contract is worth US\$150 million, and prompt payment will be made in respect of the accomplishment of the task. The digging of the diversion tunnel and the construction of the power station and subpower station will be undertaken by the HPD at a cost of some US\$ 26 million, based on mutual friendship and cooperation.

Preliminary engineering work for the Shweli hydel power station project is underway on the Shweli river, 15 miles south-west of Namhkam town in northern Shan State. The hydel power station will generate 3,042 million units of electricity every year which it will distribute all over Myanmar. A 217-mile-long double 230 kV cable line will carry power to Namtu, Hsipaw, Kyaukme and Pyin U Lwin towns where it will be distributed using 66-kV cables; Separate 66-kV cable lines will be constructed from Shweli to and Muse, Nanhkam and Kutkai in northern Shan State and Bhamo in Kachin State. Thanks to the Shweli power station, industries and copper mining work around Mandalay and Monywa will have an abundance of electricity. Now that designs necessary for the Shweli power station project have been drawn, the construction of an approach road and project preparatory work are under way.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-01: Mong Mit Shweli no 1 hydropower project near Man Tat village [23° 41'N, 97° 29' E], grid square reference: 12\1, 23\3 Upper Buywa dam near Thukaungkyin village [co-ordinates n.a.], grid square reference: 7\4, 38\3 http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-1.jpg

See also maps *Under the Boot*, published by the Palaung (Ta'ang) Youth Network Group, Dec 2007, pp 11, 14, <u>http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf</u>

#### Addtional references

See above: <u>'China's first BOT</u> hydropower project in Myanmar revs up' (Mekong News: 30/12/06) '<u>Shweli Transmission</u> Line Contract Signed (People/s Daily Online: 10/10/03)

Hydropowering the Regime, Irrawaddy, June 2004. <u>http://www.irrawaddy.org/aviewer.asp?a=3757&z=102</u> In 2000-2001, Tokyo Electric Power Services Company, a subsidiary of Japan's largest private electricity firm, the Tokyo Electric Power Company, conducted a feasibility study of the Shweli hydro-power project in Shan State.

Kayan Soe Myint, NLM, 09/08/03. <u>http://www.myanmar.gov.mm/Article/Article2003/aug/Aug09b.htm</u> Arrangements are being made for the construction of the Shweli hydel-power station near Mantet Village, 17 miles southwest of Namkham. It will be able to generate 3,042 million kWh a year. The Shweli river rises in Yunnan province and passes through Muse and Namkham before emptying into the Ayeyawady river in Myanmar. At a place, 15 miles southwest of Namkham, there is a 1,000-foot high waterfalls. The hydel power station will be built using these resources. The HPD has hired the consulting engineering group of YMEC of the PRC for US\$1.15 million. An MoU for the project was signed on 26/02/02.

NLM, 01/08/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020801.htm

A feasibility study for the the Shweli hydel power project has been carried out jointly by engineers of EPM, Kunming Hydro-electric Investigation Design and Research Institute, Daewoo Co Ltd, YMEC and Tokyo Electric Power Co of Japan. 200 MW will be produced in the first phase and 200 MW in the second phase. Electrical power generated will be distributed to Mandalay, Monywa, Muse, Namkhan, Kyugok, Lashio and Bhamo.

NLM, 23/02/02. www.myanmar.gov.mm/NLM-2002/enm/Feb23.htm

EPM Tin Htut visited the Shweli hydro-electric power project that will implemented on the Shweli River in Nankham township on 19 February. Construction of a 28-mile-long earth road linking Nankham and the project site is underway and arrangements are being to surface it with gravel. The minister gave instructions on the building of roads and bridges to convey materials and machinery for the project and called for implementation of the project in the open season. He also inspected the sites chosen for construction of the power plant, a diversion tunnel and an embankment and condition of the route along which power lines will be installed.

NLM, 11/05/01. www.myanmar.gov.mm/NLM-2001/enm/May11.htm

EPM Tin Htut visits the the Shweli hydel power project 29 miles from Hinlon village in Namkham township on 06/05/01 and inspects sites for the construction of a power plant and a diversion weir. In the briefing hall, officials of MEPE report on arrangements and preparations for project tasks.

# Palaung (Ta'ang) Youth Network Group, *Under the Boot*, December 2007. pp 18, 24, 30, 32. <u>http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf</u>

As soon as the military base was finished in Mantet, the Asia World Co set up a work camp near the village and began construction of the main road to the project area. Mantet villagers were required to work on the road construction project undertaken by Asia World Co beginning in 2001. They were promised the going dailywage rate of K1,500 (US\$ 1.25) but in the end they were paid K800 (US\$ 0.66) by LIB 144. One person from each household in the village was also forced to build a road from the village to the first project camp in 2002. Groups of 20-25 were sent in turn. Although the villagers had to work on the road, they could get jobs at the project site itself. These were reserved for Chinese workers. . . . In 2002, Asia World Co built a road connecting the dam site to the military base through local residents' tea and paddy farms. Roads were also built over irrigation canals, effectively ruining crop production. Some farm lands have become a dumping ground in the process of excavating tunnels for the project. In all approximately half of the entire village has been impacted by land loss or construction since the commencement of the project. . . . In addition to the damage to the farmlands, the deforestation at the dam site and the dynamiting along the tunnel route have cause many wild to disappear. Soldiers and others have also killed and captured wild animals.

# Palaung (Ta'ang) Youth Network Group, *Under the Boot*, December 2007. pp 13, 18 – 23. <u>http://www.salweenwatch.org/downloads/UndertheBootEnglish.pdf</u>

Towards the of the year 2000, soldiers of the Myanmar Army's LIB 144 arrived in Mantet village in the project area and began to set up a base adjacent to the village gate. The soldiers immediately seized local lands and ordered local farmers to clear the area and build a camp. According to one local farmer interview by PYNG, "they treated us like slaves: we had to what they ordered. . . . The village headman could only breathe easily when the villagters complied with the orders, otherwise he would be punched and beaten".... . Inside the camp a backhoe ws used to rip open a swath in the hill to set up a target practice area for the soldiers. . . . "All the bamboo near the village was cut down and used to cover the barracks." Afterwards, the battalion took over fertile farmlands for its own crop production. They rooted out seedlings planted by local farmers and put in their own. Once the military camp was finished and the farm was set up, roads to and from the base camp were built and checkpoints erected. Since then villagers have had to inform authorities if they wish to go outside the village either to market in Namkhm or even to their fields.... Every day columns of troops line up and conduct drills, marching through the village. People are anxious and agraid to go to their tea farms, paddy frarms or hunting and fishing areas outside the village.... Soldiers use their positions of power the to extract money, assets and materials from the villagers. . . . Women and girls are particularly frightened and reluctant to go far from their houses. Parents fear letting their daughters go out and are constantly worrying about them.

CO-OP DEPARTMENT ASSISTING VILLAGES WITH POWER SUPPLY Yin Min Tun, Myanmar Times, 04/08/03.

http://www.myanmar.gov.mm/myanmartimes/no177/Myanmartimes9-177/

Nearly 120 villages throughout Myanmar have been supplied with electricity during the past 18 months as part of a rural development project involving the Dept of Co-operatives. The department's deputy-director, U Htain Win, said the project had benefitted more than 12,000 households in 12 states and divisions. U Htain Win said power was also being supplied to small enterprises and cottage industries, such as rice mills and battery charging businesses.

The project to increase the supply of electricity in rural areas has been intensified since early last year under the instructions of the Ministry of Cooperatives.

U Htain Win said the extra 100,000 kilowatt hours provided over the past 18 months was produced by 128 generators. Of these, 105 were diesel-powered, 20 hydro-generated and three used gas from burning paddy

husks. "About 122 co-op associations organised villagers to take part," he said. "The associations determine the needs of each community and choose the method of generating power which best suits each area," U Htain Win said.

U Htain Win said the electricity produced could only be used for lighting, televisions and video players. Usage cost depends on how the power was generated. The cheapest monthly fee for using electricity generated from burning paddy husks was K500 and K150 for hydro-electricity. The cost of using electricity from diesel-powered generators depended on the price and availability of the fuel used.

#### Additional references

See above: <u>'Village electrification committees</u>' (JICA: Sept 2003)

#### <u>KYEE-OHN KYEE-WA</u> MULTI-PURPOSE DAM ON MON CREEK UNDERWAY NLM, 01/0703. <u>http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030701.htm</u>

The Kyee-ohn Kyee-wa multi-purpose dam project is being implemented in Pwintbyu township. The dam will be across Mone creek near Wunlo village about five miles above Mezali diversion weir in Pwintbyu township and about 15 miles below the Mone creek multi-purpose dam in Sedoktara township. It will be 164 feet high and 3,280 feet long.

The Kyee-ohn kyee-wa dam will be able to utilize the water that flows into Mon creek in the area below the dam in Sedoktara township with the flow of water from Sedoktara dam and supply the water in a controlled way through the canals that are fed by the Mezali diversion weir. A power plant at the Kyee-ohn kyeewa dam will be able to generate 60 MW of electricity.

Kyee-ohn Kyee-wa multi-purpose dam project is being built at an estimated cost of over K6,000 million and US\$ 56 million.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-15: Myohaung Buywa dam near Buywa village [20° 39' N, 94° 10' E], grid square reference: 12\1, 23\3 Upper Buywa dam near Thukaungkyin village [co-ordinates n.a.], grid square reference: 12\3, 23\2 [?] Kyee-ohn Kyee-wa dam near Wunlo village [20° 20' N, 94° 25' E], grid square reference: 11\7, 23\6 http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-15.jpg

#### Additional references

See above: 'Dam quartet on Mone creek headed by <u>Upper Buywa project</u>' (NLM: 18/12/07) '<u>Mon creek</u> multi-purpose dam and power station opened' (NLM: 30/12/04)

NLM, 18/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071218.htm

Gen Than Shwe and party visit Kyee-ohn Kyee-wa multipurpose dam project. He wants the project completed as soon as possible. Heavy machinery is to be used extensively to speed the work on the the main embankment and spillway. The visitors inspect the sites chosen for construction of the water intake building and the hydel power plant. Upon completion, the dam will be able to generate 74 megawatts and together with the other three dams along Mone Creek it should be possible to generate 341 MW in total.

NLM, 07/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071207.htm

A&IM Htay Oo visits Kyee-ohn Kyee-wa Multi-purpose dam project near Wunlo village in Pwintbyu township. Work continue on the concrete spillway measuring 1,100 feet by 326 feet. Preparations are underway for the installation of the pre-stressed steel pipelines and construction of the power plant. The main embankment is 3,280 feet long and 164 feet high. Besides generating electricity, the dam will supply water to 96,777 acres of farmland through Mezali dam, five miles downstream and will irrigate over 70,000 acres of summer paddy.

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07.

http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Kyee-ohn Kyee-wa dam and power station with a planned capacity of 70 MW is under implementation by the ID. It will generate 130 million kWh annually when it comes on line in 2008.

NLM, 24/05/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070524.htm</u> Construction of the spillway of the Kyee-ohn Kyeewa dam, the diversion canal and the separation wall near the site for the power station is proceeding. The hydropower plant will be installed with two 37-MW generators.

NLM, 19/03/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070319.htm</u> Kyee-ohn Kyeewa multi-purpose dam project is 50% complete. Arrangements have been made for installation of power lines from the Monechaung project and for the supply of cement to the project. Kyeeohn-kyeewa Dam will irrigate over 96,000 acres of farmlands and generate 74 MW.

Economic & Commercial Counsellor's Office of PRC Embassy in Myanmar, 28/12/06. http://mm.mofcom.gov.cn/aarticle/jmxw/200612/20061204169209.html

On 27 December 2006, a contract for the supply and delivery of machinery and equipment for the Kyee-ohn Kyeewa hydropower project was signed at the Irrig Dept in Yangon. The contract was signed by U Kyaw San Win for the Irrig Dept and President Huang Yixiang of Guangdong New Technology (I&E) Corp. It took four year to negotiate the contract which is valued at EU\$13.8 million. The generating plant will have an installed capacity of 75 MW.

NLM, 17/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060617.htm

Lt-Gen Ye Myint of the Defence Dept checks on construction of Kyee-ohn Kyeewa dam in Pwintbyu township. The multi-purpose dam will have a storage capacity of 463,000 acre feet. The power plant is expected to produce 330 million kilowatts per year. It will irrigate over 96,777 acres.

MT, 12/07/04. http://www.myanmar.gov.mm/myanmartimes/no224/MyanmarTimes12-224/021.htm

A loan worth US\$ 20 million from the China Guangdong New Technology (I&E)Zhuhai Corp will fund the purchase of machinery for the Kyee-ohn Kyee-wa hydro-power project. The loan agreement was signed at the Irrigation Department on July 7th. The department's D-G, U Kyaw San Win, said the loan, repayable in seven years, would be used to buy turbines, switching equipment, sluice gates and other machinery from the corporation. U Kyaw San Win said the corporation would supply the machinery within three months and be responsible for its installation, which is expected to begin in November and take 20 months to complete. The ID has begun engineering work at the project site. Three turbines capable of producing 60 MW will installed. The director of the procurement branch of the dept, U Myo Nyunt, said China Guangdong New Technology was one of four companies which tendered to supply the machinery. He said 15 international companies were invited to tender for the project: six each from China and Japan and one each from India, Germany and South Korea.

MT, 28/06/04. <u>http://www.myanmar.gov.mm/myanmartimes/no222MyanmarTimes12-222/011.htm</u> D-G Kyaw San Win of the Irrig Dept said work had begun in 2003 on the Kyee-ohn Kyeewa dam in Magwe division. It is due to begin generating power by the monsoon season of 2006.

NLM, 11/01/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020111.htm

The A&IM inspects the site of a dam on Mone Creek about 15 miles downstream from the Mone creek multipurpose dam. He is briefed on water storage capacity, location of the main embankment, design, possibility of power generation, availability of water for cultivable land and the construction work plan. According to the feasibility study, about 300 million kWh will be generated annually and about 0.108 million acres of land will be irrigated.

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#### POTENTIAL IMPACTS OF THE WEIGYI AND DAGWIN HYDROPOWER DAMS

Foundation for Ecological Recovery: *Briefing Paper: Salween Hydropower Project (Thai–Burma border)*, June 2003. <u>http://www.terraper.org/articles/BriefingSalweenThai-BurmaJune03.pdf</u>

EGAT together with the Burmese gov't is currently reviewing two hydropower dams and plants on the Salween river along the stretch where the river forms the joint boundary between the Thailand and Burma. They are jointly referred to as the 'Salween Hydropower Project'. EGAT, on behalf of the Thai Government, is proposing itself as the sole investor. It will share half of the profits with Burma.

According to information provided by EGAT to the Thai Senate Commission on Foreign Affairs on 12 Feb 2003, the proposed Upper Salween dam [i.e. Weigyi:] would be located at 18° 19' N, 97° 33' E, above the O Loh checkpoint of the Salween sanctuary and 14 km upstream from Sob Ngae in the Mae Sariang district. The dam would tap have a catchment area of 293,200 sq km. Annual inflow into the dam is estimated at 118,627 million cu metres. The high water level of the reservoir would be 220 m above sea level and its gross storage capacity would be 21,000 million cu m. The height of the dam barrier would be 168 m and its length, 570 m, The installed capacity of the power plant at the dam would be 4,540 MW, with firm power estimated at 2,139.75 MW and annual energy production at 29,217 GWh, and a firm energy commitment of 18,744 GWh.

The Lower Salween Dam [i.e. Dagwin] would be located at 18° 04' N, 97° 41' E, near Ban Tha Ta Fang, 15 km upstream from Ban Mae Sam Lab in Mae Sariang district of Mae Hong Son province in Thailand. It would have a catchment area of 294,500 sq. km with an annual inflow of 118,627 million cu m. Its high water level would 86 m above sea level, and it would have gross storage capacity of 245 million cu m. The height of the dam would be 49 m, its length, 379.5 m. The power plant at the dam would have an installed capacity of 792 MW, with firm power estimated at 476.61 MW. Annual energy production could reach 5,422.49 GWh and the firm energy commitement would be 4,175.12 GWh. The Dagwin dam would serve mainly as a regulating facility, trapping large amounts of water released by the Weigyi dam during peak hours which would be pumped back to the upper dam in off-peak hours.

The presentation made to the Thai Senate committee appears to reflect the results of preliminary studies made by EGAT in 1981, by Japan's Electric Power Development Co (EPDC) in 1992 and Norconsult in 1994. EGAT has also disclosed that about 10,000 million baht are to be spent on a feasibility study, a social and environmental impact assessment and measures to mitigate project impacts. Another contingency budget of about 100,000 million baht is to be set aside for an Environmental Fund. EGAT has also included the planned electricity generation from the Salween Dams in its draft Power Development Plan (PDP) for 2003-2016. According to the plan the two dams would be able to supply electricity by 2013 with total generating capacity of 5,400 MW to be reached by 2016. The construction costs of the combined Weigyi and Dagwin dams and power plants is estimated at 277 billion baht (US\$ 6,150 million).

Impacts [as outlined by the briefing paper] [abridged]

The reservoir of the upper Salween (Weigyi) Dam will be about 380 km long, of which 56 km will be in Thailand. The reservoir will flood about 960 sq. km (600,000 rai). Construction will affect the ecosystem of the Salween watershed, one of the most fertile and ecologically unique areas of the world. This area is regarded as an ecological transition zone between the Indo-Chinese subregion and the Sino-Himalayan or Indian subregion. Construction of the upper Salween Dam will also flood about 20,000 rai of the Salween wildlife sanctuary, where plant and animal species from the Himalayas and high mountains along the Salween and Mekong Rivers are found. This flooding will threaten the habitats of at least 235 wild animal species. The project will also threaten numerous fish species found in the Salween River, including several migratory species.

In Thailand the project will affect the livelihoods of people residing in several villages within the wildlife sanctuary as well as communities on a number of tributaries that run into the Salween River. The Lower Salween dam will flood over 3,540 rai and directly impact the Salween National Park and the livelihoods of people residing in three villages there. In Burma, the reservoir created by the Upper Salween dam will flood Sa Luang town in Kayah state, land occupied by Karenni communities and parts of Shan state which is the home of the Shan/Tai people. Presently, these areas are vacant because of serious conflicts. Meanwhile, Burmese soldiers are forcing people out of the planned reservoir area. Most people have fled the violent suppression to refugee camps in Thailand. However, once the dam is built refugees' land will be permanently flooded so they will have no home to return to.

Although Thailand would reportedly save about 31,000 million baht annually in electricity costs through construction of the dams and power plants, it is debatable whether these savings would outweigh the loss of natural forest and human habitat on about 600,000 rai of land. Similar impacts were found in the case of the Yadana gas pipeline project. The Thai Government had to support refugees evicted from the construction area who suffered from rape, violent suppression, and violation of civil rights. Inevitably, Thailand has been accused of supporting the civil right violations in Burma.

EGAT's initial study of the impact of the dams was carried out on the Thai side only. According to the study, the Upper and Lower Salween Dams would flood only about 19,000 and 4,000 rai in Thailand. This can only be interpreted as a distortion of information since EGAT once mentioned that the Upper Salween dam would flood as much as 51,700 rai on the Thai side. Details about flooding in Burma and the Pai River basin which will affect almost 20 communities have not been revealed. It must be doubted that EGAT will take the impact assessment seriously or put any effort into seeking potential solutions, especially on the Burma side, both in the reservoir area and in the lower reaches of the Salween.

**Topographic map references**: Thailand 1:250,000: Series L509, U.S. Army Map: NE 47-06: Chiang Mai Weiggyi dam, just west of Hokki [18° 18' 49" N, 97° 34' 49" E], grid square reference: 20\2, 3\4 Dagwin dam, near Dagwin [18° 04' 07" N, 97° 40' 55" E], grid square reference: 19\9, 3\6 <u>http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-ne47-6.jpg</u>

#### Additional references

See above:'Tribe's home to be a valley of the dammed' (London Times: 22/03/06)<br/>'The Weigyi dam: A great barrier and a way to safety' (KDRG: March 2006)<br/>'Myanmar's tremendous potential for energy export' (MT: 12/06/00)<br/>'Power purchase deal between Thailand and Burma on the way' (Nation: 27/05/97)<br/>'Lawpita power plants and associated dams' (Various: Appendix 1)

Watcharaphong Thongrung, The Nation (Bangkok), 27/10/03.

#### www.burmanet.org/bnn\_archives/2003/20031027.txt

The Thai Energy Ministry (TEM) has ordered EGAT to indefinitely suspend talks on its investment in the controversial Salween hydropower project in Burma, after EGAT distributed information about the project at recent meetings of the Asia-Pacific Economic Conference (APEC). The project is a sensitive issue that requires a more detailed study of its potential social, economic and environmental impacts, said the permanent secretary of TEM, Cherdpong Sirivith. The Salween project is a massive power-generation programme, originally designed to generate 500 MW. It will need an investment of about Bt200 billion. EGAT would be the main investor in the joint venture with the Burmese government and it is seeking support from foreign partners. EGAT governor Sitthiporn Ratanophas said it was vital to push for the Salween project because it would provide relatively cheap power to the region. The Exim Bank of China and the China National Machinery Electric Corp have expressed interest in participating in the Salween project and have held preliminary talks with EGAT.

World Rainforest Movement Bulletin, February 2003. <u>www.wrm.org.uy/bulletin/67/Burma.html</u>

Recently, plans by EGAT to build the Weigyi dam on the Salween river between Thailand's Maehongson Province and Burma's Karen State have been revived. Weigyi ('Great Whirlpool') will be 168 meters high, with a generating capacity of 4,540 MW at an estimated cost of US\$ 6 billion. TERRA (Towards Ecological Recovery and Regional Alliance), a Thailand based NGO, says the reservoir, with a normal high water level of 220 m will backflood as far as 380-400 km to the north and will inundate an estimated 15,000 - 20,000 acres. Thousands of Karenni people in Kayah state in Burma will be displaced. The extent of the damage remains to be investigated, although an EGAT report to the Thai Senate Foreign Relations Committee indicated probable destruction of thousands of acres of forest areas on both sides of the Salween. Besides the hydropower potential of the dam, Thailand plans to divert water from it towards the Bhumipol dam and power plant which have never operated at full capacity since completion in 1994. Shans, Karens and Karennis have voiced their condemnation of Thailand's dam projects along the Salween since 1993. "This is a life and death issue," says a Karenni representative. "The Weigyi Dam would split the Karenni in two. It would be the final nail in our coffin. Damming the Salween affects us in so many ways: economically,

socially, culturally, environmentally. It will break the Karennis' rice pot." The Weigyi dam still requires official approval from Rangoon.

Images Asia - TERRA Report, November 1999.

http://www.angelfire.com/rock3/shanyouth/body/status-of-salween-dam-plans.html

Two sites identified for construction of large dams on the Salween are the 792-MW Dagwin hydropower and water diversion dam and the 4540-MW Weigyi hydropower dam, respectively 30 km and 60 km north of the Salween - Moei confluence. In February 1999, the Thai government approved Bt185 million in funding for studies of the feasibility of diverting water from the Salween River Basin to the Chaophraya River Basin. The Dagwin site is one of these. However most of the studies have focussed on the Moei and its tributaries.

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#### SITTWAY POWER COMPANY PLAGUED BYDIESEL DEFICIT

Narinjara News, 25/03/03. http://www.ibiblio.org/obl/docs/NN2003-03-03.htm

The power sector in Rakhine State, ... is in utter jeopardy due to the inability on part of the ruling SPDC junta to run the power houses, reports our correspondent from Sittwe, the state capital. Though the junta made a formal agreement to privatise the power house and the entire power distribution network with the privately owned Innbaukwa Co starting in January, the junta's plan fell flat on its face for a number of reasons, said a source in the State Electricity Department.

After getting the monopoly to run the powerhouse the private company announced that it would distribute power by charging each of its customers K60,000. "The plan was very high-sounding from the very beginning," said the official. "Where for the lack of necessary fuel oil the diesel power houses in the state could not be run more than three hours a day, the commitment by the private company to supply electricity round the clock seemed to be far-fetched. First the supply of fuel oil: where a number of government offices are not getting adequate fuel to run their vehicles, how could the company overnight ensure the smooth supply of fuel oil?" he said.

In the absence of a viable power source, the well-to-do residents of Sittwe are making a brisk business by making use of small and portable generators. From the neighbours many of the owners charge as much as K 300 for each of the bare bulbs, K 700 for two feet long fluorescent tubes in a month, while the power supply is maintained for barely three and a half hours a day between six and nine thirty in the evening.

The absence of power has wreaked havoc in the industrial sector forcing some small workshops to go out of business. In the State General Hospital the patients have had to buy fuel oil for surgeries, the official said. Students who lack electricity to carry on their studies are among the most affected.

A well-known businessman commented: "The SPDC junta boasts about the development they have brought to the border areas, but it's easy to see how ineffectual they are when it comes the absence of something as basic as electric power. Though there is a vast potential for natural gas in the coastal waters of Rakhine state, the Burmese junta doesn't take that into consideration when it talks about development in this state.

#### Additional references

NLM, 23/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071223.htm

EPM No 2 Khin Maung Myint meets with State/District/Township level service personnel at the office of the Rakhine State Electrical Engineer in Sittway where he hears reports on the distribution of electricity from department-owned generators and privately-owned paddy husk-fired power stations. The minister gives instructions on producing more electricity in Rakhine state.

#### Narinjara, 11/07/07. http://www.narinjara.com/details.asp?id=1340

Municipal authorities in Akyab (Sittway) are collecting K300 per kWh for power, plus a levy of K500 for the power meter box. Townspeople resent the meter box charge because they feel it is being used to pay for power used by the gov't and the army. But they pay it because they are afraid the authorities will cut off their electricity, if they don't. The electricity supply in the city is irregular and people often set up small power

plants themselves using paddy husks as fuel instead of petrol. Despite the constant interruptions in power supply the meter levy is collected without fail.

Aung Hla Tun, Reuters, 09/04/07. http://www.burmanet.org/news/2007/04/09/

Residents of Sittwe, the capital of the northwestern state of Rakhine which is home to Myanmar's vast offshore natural gas reserves, say they have not received any state electricity for a decade. Private companies sell power at 300 kyat (\$0.24 at black market rates) a unit, compared with 25 kyat in Yangon, and even then the lights are only on from 7 p.m. to 10 p.m. -- just long enough for the junta's propaganda blitz on state-run MRTV. "As soon as MRTV's evening news ends, the blackout starts," Sittwe resident Ko Aung Khine told Reuters.

Narinjara, 11/10/06. <u>http://www.narinjara.com/details.asp?id=963</u>

Burmese military authorities are expected to invite Bangladeshi entrepreneurs to invest in a 'special industrial zone' to be set up in Arakan State. The zone which is intended to foster business ties with Bangladesh has been in the planning stage for a long time. A few years ago an area was set aside for an IZ near the banks of Satrakya creek in Akyab (Sittway) However, it never got off the ground due to many obstacles, not the least of which is a lack of electric power. Akyab, despite being the capital of the state, receives electricity for only two hours during the evening, and many small industries have had to close due to the shortage of power.

Narinjara, 24/07/03. http://www.ibiblio.org/obl/docs/NN2003-07-24.htm

A newly formed local Electricity Committee headed by the Western Commander has been entrusted with the responsibility of 'lighting up' Sittwe. But so far the only power the people are getting is for three hours in the evenings every other day. The monthly charge has been fixed at a rate between K3,000 and K4,000, about the same as the monthly salary of an ordinary state employee. Last year the military regime handed over the power generation and marketing to Innbaukwa, a private company, Inn-bauk-wa, which started out by collecting a connection fee of K 7,000 from all households. But they couldn't run the system properly because the government cancelled the company's licence to market fuel oils in the state and gave the diesel marketing licence to Ubaing Ltd, a company owned by the military. "The marketing of fuel oils by the Ubaing goes through a channel of corruption, making diesel and gasoline fuels including lubricants many times more costly than the actual price, and rendering the supply chain miserable," said the owner of a transport company. As a result, Innbaukwa was forced to return all the money it had collected as power connection fees to the depositors. "Even under colonial rule, we used to get 24-hour electricity in Sittway. Without electricity, the education of our children and the growth of business and industry are suffering. Our computers are idle and many householders are using their fridges as cupboards! Our life is so miserable that we cannot even use the basic household appliances," said a doctor in the State hospital. He said that when the hospital generator is needed for an emergency operation they have to collect the money from the patient to buy the diesel to operate the generator. The patients call the doctors 'extortionists'. "We have no other option," he said.

Narinjara News, 24/10/2001. [not available on-line]

Privately run rice mills, ice factories, printing presses, cold drink industries and machine shops throughout Rakhine State have been forced to shut down one by one due to a power shortage. The usual timetable for supply of power in Sittwe is from 7 to 9:30 p.m.every third day. Only on days when top-ranking SPDC officials come on a visit is the power left on all night. Though the diesel fuel supply to Rakhine State has dwindled during the last couple of years the theft of diesel fuel has increased in government institutions, including the power department.

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#### MANDALAY MARKET FAVOURS LOCALSATELLITE DISHES

Kyaw Naing, Myanmar Times, 03/02/03. <u>http://www.ibiblio.org/obl/docs3/MT152.htm</u> Sattelite dishes made in Mandalay have taken a big share of the market in upper Myanmar, say market sources. They said eight-foot models are the most popular. The best selling brands in upper Myanmar are Infostar, Johnsa, Zarni, Master, and Standard. Infostar has the biggest share of the market, says U Soe Tint, owner of Mandalay's Wave Electronic Shop. "There are four or five antenna producers in Mandalay, and Infostar, Style and Zarni brands sell well. The dishes are also produced in Yangon, but those made in Mandalay are better quality and sell in Yangon where demand is higher," Ko Thein Win, owner of Shwe Rasu Electronic Shop, told the Myanmar Times last week.

"In the past, eight-foot dish antennas came from Thailand but those dishes are about twice the price. They cost over K100,000, while the locally made versions sell at about K50,000. "Hence, Myanmar brands are widely used. There were some difficulties in tuning them in the past, but now the quality is the same," U Soe Tint said. A dish together with a digital or analog receiver and other equipment is needed to receive television broadcasts from satellites. An analog receiver is priced at about K25,000, and a digital receiver costs K60,000.

Digital receiver brands available include Cheita, Prosat, Innovia, and Nextway. "Innovia is widely used. Cheita has also won popularity for its ease of tuning. It can be used along with Japanese domestic televisions," Ko A Nge Lay, an electrician who installs the dishes, told MT. "It takes about four hours to install a satellite dish. We charge K10,000 for installation in Mandalay, more elsewhere," "A complete antenna set costs about K190, 000, and it can tune in to nearly 200 free channels from 13 to 16 satellites. Most of the channels are Indian and Chinese."

Indonesia's TV7 channel is the most popular because it broadcasts football matches, but only some dishes can receive it, " added U Soe Tint. "People are interested in football matches, and antennas sell like hot cakes during the World Cup. But sales have decreased recently to about four or five units a month. Sales will increase if installation licenses are issued," an electronics store owner told MT. "Two-foot satellite dishes are imported from Thailand, but are too expensive for most people. Installation costs about K700,000, and cards which can be bought in Yangon cost about K400,000 a year. Channels can be difficult to tune during bad weather, " he added.

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#### LOCAL TRANSFORMER MANUFACTURERS FACE TOUGH COMPETITION

Win Nyunt Lwin, Myanmar Times, 27-01-03. http://www.myanmar.gov.mm/myanmartimes/no151/business/02.htm

Government endeavours to reduce transformer imports have resulted in a call for increased domestic production. Locally made transformers ranging from 50 kVA to 10 MVA have the capacity to fulfill all Myanmar's needs. There are two manufacturers of transformers: Myanmar Ekarat Transformer Co Ltd, a J-V between the Ministry of Industry No 2 and Ekarat Engineering plc of Thailand, and the locally-owned Soe Electric and Machinery Co Ltd.

U Saw Myaing, MD of Soe Electric said they had developed a 5 MVA 33/6.6 kV transformer in 2000, a 10 MVA 33/11 kV transformer in 2001 and planned to produce 20 to 47 MVA giant transformers in 2002. Their current production averages 30 transformers a month. He said 50pc of the materials needed are imported through Thailand and Singapore from the USA, Italy and Japan. The rest of the components are produced domestically. Current production levels represent US\$500,000 in import replacements.

Ekarat produces an average of 20 transformers a month using 90pc imported materials from Germany and Japan. Both domestic transformer manufacturers are working below optimal production capacity and are ready to satisfy greater demand. According to U Myin Maung Htun, GM of Ekarat, more transformers will be necessary with the increase in power usage as new hydro-electric power projects come on line. The importation of transformers has been banned except when a trading company wins a tender issued by a government ministry.

Because of the imposition of a 20pc commercial tax on the local manufacturing sector, domestic producers often find it difficult to compete with import trading companies when tenders are called by government ministries. For an import and trading company, imported goods only attract a customs duty at the rate of one per cent calculated in kyat at an official exchange rate of K100 to the US dollar. They must also pay a further commercial tax of two per cent on the total price. But according to U Maung Maung Khun, Managing

Director of KKA Export and Import Company, the domestic products are effective, easily serviced and competitively priced.

#### Additional references

See above: 'Myanmar <u>exports first</u> domestic transformer' (MT: 30/05/05) '<u>Power fluctuations</u> still keep electrical supply shops busy (MT: 06/10/03)

**For Soe Electric and Machine Tools Co Ltd** (aka Soe Electronics) see the company's well-developed, upto-date website <u>http://www.soeelectric.com/</u>. Although the company profile is in Burmese, most of the rest of the information is in English. Soe Electric has ISO 9001 certification. See also the following:

NLM, 07/07/07. http://myanmargeneva.org/NLM2007/eng/7Jul/n070707.pdf

Transformers and accessories produced by Soe Electric and Machine Tools Co Ltd are to be used at new government facilities at Nay Pyi Taw and Tatkon. Installation and production of 5000 kVA 33/11 KV transformers is underway.

NLM, 14/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060614.htm

During a visit to the Soe Electronics factory by the newly appointed EPM No 2, MD Soe Tint reports that the factory was established in 1983-84 and started assembling transformers in 1989. It now has a staff of of 250 and is one the lead players in the industrial sector in Myanmar. New and standarized models are being introduced; some parts are domestically produced. The minister checks 47-MVA generators and corrugated radiator fins that are under production. He urges increased production of transformers.

NLM, 29/08/022. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020829.htm

Soe Electric and Machinery Co Ltd is currently manufacturing transformers with capacities ranging from 50 kVA to 20 MVA. It also repairs other power and distribution transformers made in various countries.

NLM, 30/06/01. <u>http://mission.itu.ch/MISSIONS/Myanmar/01nlm/N010630.htm</u> The factory of Soe Electric and Machinery Co Ltd in Industrial Zone 1 of South Dagon township is producing transformers ranging from 50 kVA to 500 kVA.

#### For **Myanmar Ekarat Transformer** see the following:

NLM, 05/09/07. <u>http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070905.htm</u> Myanmar Ekarat Transformer Co Ltd produces from 30 to 100 high-quality transformers monthly,

#### Chatrudee Theparat, Bangkok Post, 13/03/06.

http://www.redorbit.com/news/technology/426190/firm\_sees\_future\_in\_solar\_cells\_ekarat\_plc\_divests\_foreig\_n/index.html

Ekarat Engineering Plc, a manufacturer of distribution transformers, has divested its foreign investments to focus on the alternative energy business, particularly on supplying solar cells to the European and Asian markets. Chairman Kietphong Noichaiboon said Ekarat Engineering had sold its Bt60million-joint investment Ekarat Transformer Co (Myanmar), in Burma. The company has also sold a holding worth about 50 million baht in Nepal and cancelled a Bt200million investment in manufacturing transformers in Bahrain, which it announced last year. Mr Kietphong said the divestment was a part of a plan to raise 1.5 billion baht, primarily for the construction of south-east Asia's first solar-cell factory operated by Ekarat Solar Co.

Myanmar Ministry of Industry No 2 website information. <u>www.industry2.gov.mm/JV.htm</u>

Myanmar Ekarat Transformer Co Ltd was established in 1999 under a joint venture agreement between Myanma Machine Tools & Electrical Industries (MMTEI) of the Ministry of Industry No 2 and Ekarat Engineering Public Co Ltd of Thailand. The equity ratio is: MMTEI: 40%, Ekarat Engineering: 60%. The factory in South Dagon Industrial Zone No 1 manufactures distribution transformers.

NLM, 02/12/00. <u>http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n001202.htm#(5)</u>

#### MIC, 03/12/98. [not available on-line]

Myanmar Machine Tool and Electrical Industry of the Ministry of Industry No 2 and Ekarat Engineering Public Co Ltd of Thailand agreed to set up Myanmar Ekarat Transformer Co Ltd (aka A Caret) on 02 December at Sedona Hotel. The Minister for Industry No 2 and the chairman of the Thai company, Mr Kietphong Noichaiboon spoke on the occasion. The Managing Director of MMTEI and the Managing Director of the company Dr Wiwat Sangtian signed the contract. The Secretary of the Myanmar Investment Commission presented a permit to Mr Kietphong Noichaiboon.

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#### <u>Start 03</u>

#### ALTERNATIVE ENERGY PROJECT USES THREE POWER SOURCES

Myo Lwin, Myanmar Times, 06/01/03. <u>http://www.myanmar.gov.mm/myanmartimes/no148/myanmartimes8-148/</u>

An electricity generation project that combines the use of wind and solar power with diesel generators is being developed at Chaungtha, a popular beach resort in Ayeyarwaddy division. The Dept of Electric Power said the project would benefit more than 100 households when it goes on stream in March. The department is working jointly with the Tokyo-based New Energy and Industrial Technology Development Organisation on the project, which is aimed at demonstrating the effectiveness of using the three power sources in combination.

The solar system and diesel generator have already been installed and work is continuing on the 22-metrehigh wind turbine, according to Chaungtha township electrical engineer U Soe Moe. Completion of the installation of the turbine is expected in March when a trial of the system will begin, U Soe Moe told Myanmar Times. He said that when the hybrid power supply system is fully operational it will provide power to 130 households for 17 hours a day, up from the current four hours daily. The installed capacity of the system would be 180 kW, still short of the power needed by the resort town's 13 hotels, which use generators of up to 100 kW, U Soe Moe said.

He said even though the project would improve the living conditions of the townspeople, the main purpose of the project was for research. "NEDO is keen to do research on how the power supply from three sources with different frequencies and different voltages will work and how improvements can be made," U Soe Moe said, adding that Myanmar technicians working on the project were gaining valuable experience in the use of alternative power sources. After carrying out a one-year feasibility study, NEDO installed the diesel generator in late 2000 and completed the solar system last November. U Soe Moe quoted Japanese experts working on the project as saying it was the first of its kind in south-east Asia. Sources in Chaungtha said the project would cost about K700 million. Chaungtha, with a population of about 6,000, has become an increasingly popular beach holiday destination in recent years.

#### Additional references

See above: <u>Solar power</u> seen as solution for remote villages' (MT: 06/10/03) 'Wind power <u>system ideal</u> for villages, says engineer' (MT: 05/12/05)

See also the proposal for combining the use of a rice-husk gas-fired system with a battery charging system in the model village Hsamalauk in the additional references to '<u>Interest growing</u> in rice-husk generation' (MT: 10/07/06).

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PROMISING POWER SECTOR ATTRACTS PRIVATE INVESTMENT

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Win Kyaw Oo, Myanmar Times, 23/12/02.

This article is not available in the on-line edition of the Myanmar Times for this date.

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#### MAWLAMYAING POWER STATION OPERATING AT REDUCED CAPACITY

NLM, 27/10/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021027.htm

Chief of Armed Forces Training Lt-Gen Kyaw Win and party discussed efficient use of electricity and fuel in meeting with South-east Commander Thura Myint Aung, at the guest house of the command [in Mawlamyaing] on 22 October. Thura Myint Aung said power was supplied to 19 wards in [Mawlamyaing] township around the clock with 9.5 MW instead of 12 MW. The power was supplied to the IZs in the afternoon and to the residential quarters in the evening. Arrangements have been made for supply of power to the IZs late in the evening. Fuel was sold to trucks transporting commodities, he said.

Lt-Gen Kyaw Win said the project for the efficient use of power and fuel is being implemented nationwide in accord with the guidance of the Head of State. He spoke about thye switching of security lights, use of one switch for one fluorescent lamp system, taking actions against those who sold fuel oil illegally and submitting a report on use of electricity to the Office of Armed Forces Training.

#### Addtional references

IMNA, 31/08/07. <u>http://www.monnews-imna.com/2007/augupdate.php?ID=736</u> The 'Weekly Eleven' journal recently reported that the Moulmein and Thaton electric power stations and other factories in Mon State are operating on natural gas to cut expenses in half.

MIC, 30/07/06. <u>www.myanmar-information.net/infosheet/2006/060730.htm</u> Steam-powered stations are Ahlon, Hlawga, Ywama, Thakayta, Tikyit and Mawlamyine. These power stations are currently generating 285 MW.

NLM, 27/07/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060727.htm</u> During his inspection tour of Mawlamyine power station near Ngantay Village on the Mawlamyine-Kyaikmaraw road, the Minister for EP No.2 underscored the need for maintenance of the machines.

Salween Watch, November 1999. <u>www.ibiblio.org/obl/docs/SW03.htm</u> Mawlamyaing Thermal Power Plant, 12 MW, in operation since 1980.

BurmaNet News, 28/08/94. www.ibiblio.org/obl/reg.burma/archives/199408/msg00067.html China will supply spare parts for the electric power station in the Mon state capital of Moulmein. Tin Maung Maung Than, "Burma's Energy Use: Perils and Promises" in *Southeast Asian Affairs 1986*, Institute of Southeast Asian Studies, 1986, p. 84. [not available on-line] The thermal power station in Moulmein was constructed with part of a PRC loan covering various industrial projects.

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#### GOVERNMENT DRIVE TO CONSERVE ELECTRICITY

Win Kyaw Oo, Myanmar Times, 07-10-02. [not available on-line]

All government departments in Yangon have launched a campaign to conserve electricity in their work places. The campaign has resulted from instructions issued by government leaders for the efficient use of electricity. It follows the supply of 24-hour electricity to most of the 33 townships in the Yangon municipal area since late last month.

Government work places have been directed to rely on natural light as much as possible. Production and service enterprises are to use the minimum amount of power needed for their operations while all work
As part of the campaign to conserve electricity, MEPE has begun checking on usage by the public. "We've found that some residents and businesses, such as restaurants, use unauthorised connections so we have temporarily cut off the power supply to their buildings," a departmental official said.

In another move to conserve electricity, low-voltage lamps have been fitted to most street lamps throughout the city. The public is also being urged to conserve fuel.

The Myanma Petroleum Product Enterprise said if the owners of the country's 450,000 vehicles reduced fuel consumption by a gallon a month it would result in monthly foreign exchange savings of US\$5.5 million. "That is enough to build a 1300-metre-long bridge," the agency said.

**Compiler's Note**: The campaign to conserve electricity referred to in this article seems to have been driven mainly by rising world prices for crude oil and the consequent crisis created by heavy subsidization of prices for diesel and other fuels in Myanmar. The Supervisory Committee for Utilization of Power and Fuel chaired by the SPDC's Lt-Gen Kyaw Win was the body formed to direct the campaign. References to the committee disappear after June 2006.

## Additional references

NLM, 07/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060607.htm

Lt-Gen Kyaw Win of the Ministry of Defence, accompanied by senior military officers and officials of the SPDC office met with responsible personnel at the Mandalay DPDC hall and discussed the use of electricity and fuel. In his address, Lt-Gen Kyaw Win said EPM No 2 was taking steps to increase the generation of of electricity. As a strategic region for the nation, Mandalay division was to make efforts to minimize loss and wastage of electricity and to give priority to supplying power to industrial zones. Manager Kyaw Thuang of MEPE for Mandalay reported on distribution of electricity in the division and on steps being taken to prevent the loss and wastage of power. Later, GM Tun Myint Oo of MOGE for Upper Myanmar reported on obtaining and distribution of fuel in the division while other officials reported on the sal e of CNG to CNG-used vehicles. In response, Lt-Gen Kyaw Win called on officials to co-operate with local authorities in the inspection of fuel tanks and to make relentless efforts in discharging their duties to the State.

#### NLM, 22/05/03. www.myanmar.gov.mm/NLM-2003/enlm/may22\_rg4html

The Supervisory Committee for Use of Electricity and Fuel holds a work coordination meeting at the Ministry of Electric Power in Ahlon township. It is attended by the Ministers for Home Affairs and Electric Power and Energy, as well as deputy ministers, the vice-mayor of Yangon and dept officials. Chairman Kyaw Win delivers a speech, saying that "though measures could be taken for more supply of electricity to industrial zones, efforts were needed to fulfil the public consumption of electricity". He calls for ways and means to generate and distribute more electricity. EPM Tin Htut reports on prospects for increased generation of electricity at the hydro-electric power stations, as well as at natural gas power stations under repair, and on the installation of machinery at the hydel-power and coal-fired stations. The stations, which will come on stream in the current fiscal year (03-04), will add an additional generating capacity of 335 MW to the system. Energy Minister Lun Thi reports on increased production of natural gas and fuel. MEPE MD San Oo speaks about the temporary interruption of electricity due to the shifting of lamp-posts and the severing of underground cables when road were under construction. MEPE Director Myo Naing reports on an increase in revenues due to exposing cases of the illegal use of electricity in the 2003-2004 financial year.

#### NLM, 27/02/03. http://www.myanmar.gov.mm/NLM-2003/enlm/feb27\_rg1.html

At a work coordination meeting of the Supervisory Committee for the Efficient Use of Electricity and Fuel, Lt-Gen Kyaw Win says that electric power plants need to generate at full capacity in order to supply enough electricity; it is necessary to coordinate with respective depts to ensure supply of gas and fuel. Supervisory measures were to be taken for minimizing loss and wastage. Energy Minister Lun Thi reports on the production and distribution of gas and fuel and on arrangements to boost production. Kyaw Win gives instructions on co-operation among depts to boost production of electricity.

#### NLM: 21/12/02. www.myanmar.gov.mm/NLM-2002/Dec21html

The Electricity and Fuel Utilization Supervisory Cte meets at the EPM offices. Chairman Kyaw Win says that efficient use of electricity and fuel, has saved the nation over K 551.8 million in the three-month period [since the formation of the committee]. Arrangements have been made to minimize power and fuel wastage and to use them more effectively in the production and public sectors. Other ministries besides the EPand Energy ministries are required to render assistance to the cte. MEPE officials report on the capacity of the gas-fired power stations and the hydel power stations to generate and supply electricity, on the supply of natural gas and power distribution and on efforts to realize the targets of the EPM. Deputy EPM Thein Aung explains production and distribution of fuel and natural gas and supply of fuel and gas to the EPM.

See above: <u>'Formation of work committeee</u> for electric power development' (NLM: 01/04/04) '<u>Mawlamyaing power station</u> operating at reduced capacity' (NLM: 27/10/02) See below: <u>'Pipeline to solve</u> electricity shortages' (MT: 16/09/02)

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# **PIPELINE TO SOLVE ELECTRICITY SHORTAGES**

Thet Khaing, Myanmar Times, 16/09/02. [not available on-line]

Work has begun on a natural gas pipeline which the government says is expected to ease an electricity supply shortage in Yangon within about two months. A media conference in Yangon last Thursday was told the pipeline would overcome supply shortages at two gas-powered electricity generating stations on the outskirts of the capital.

The deputy chief of Military Intelligence, Maj Gen Kyaw Win, said the shortages were the cause of disruptions to the electricity network in some parts of Yangon.

An official from the EPM said the project involved extending a pipeline to Yangon from Thaton, where gas from the Yadana offshore field is used as an energy source at a cement factory. U Aung Koe Shwe, said the extension would be linked to gas-fired generators at Hlawga, north of Yangon, and the Ahlone power station in the south-west opart of the city. He said the two power stations needed another 60 million cf/d of gas to operate at capacity. He said the gas would be bought from the French energy giant, TotalFinaElf, which operates the Yadana field jointly with MOGE. U Aung Koe Shwe said the generators supplying electricity for Yangon were producing about 285 MW per hour, about 100 MW short of the city's needs.

The media conference was also told that the national supply was expected to improve in the next two years when three new power stations come on stream. Kyaw Win said the total national output of 580 MW an hour was about 220 MW short of system needs. He said the three stations, one each in Mandalay and Magwe divisions and another in Shan state, would generate 475 MW when completed in 2004.

The government is also upgrading a hydro-electric plant at Lawpita in Kayah State with a US\$28 million grant from Japan. The plant was built in the 1950s using war reparation funds from Japan.

#### Additional references

See above: 'Gas in <u>short supply</u> to meet demand for electricity (MT: 17/09/07) '<u>More gas needed</u> for 24/7 power in Yangon (MT: 02/07/07) 'Electricity supplies get boost from <u>YESB plan</u>' (MT: 24/07/06)

Kyaw Thu, Myanmar Times, 27/08/07. http://www.mmtimes.com/no381/n009.htm

Two towers used to transmit power to the national grid were destroyed and a third damaged in an attack by anti-government insurgents [in Thandaung township?] in Kayin (Karen) state on August 14. The explosives destroyed towers 206 and 208, and nearly pulled down tower 205, so Yangon lost 90 MW due to the destruction of power lines that carry electricity to the city, a YESB official said. Some of the electricity shortfall has been overcome by increasing the supply of natural gas to city's gas turbines. "We have been getting an additional 6.1 million cf/d from the Energy Ministry so we have been able to increase the electricity output from the gas turbines to partially compensate for the power lost by the explosion," he said.

would take "at least one week" to repair the towers because they were located in a remote, mountainous region where heavy rain and mudslides can hinder work. Meanwhile, the reduction in power supplies has forced YESB to supply power to townships according to a rotating system. The townships have been divided into three groups, with two groups receiving 18 hours of electricity and one group getting 12 hours on any given day.

Kyaw Thu, MT, 02/10/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-336/h003.htm</u> Repairs have been completed on a pipeline that supplies natural gas to four power plants in Yangon, said an official from the Ministry of Energy on Sept 25. Problems with the pipeline, which was shut down Sept 23 for repairs, were blamed for blackouts in Yangon. The 320-km (199-mile) pipeline carries 3.1 million cu m (110 million cu ft) of gas per day to Yangon's Ywama gas control station from the Yadana gas project in Tanintharyi division.

Xinhua, 18/09/02. www.gasandoil.com/GOC/news/nts24231.htm

Myanmar's installed electric power generating capacity has reached 1,149 MW, according to figures released by the EPM. Of this total, 588.3 MW were in place before the present government took power in 1988, while 560.9 MW have been added since. Of the electricity produced in the country, natural gas fuels 698.7 MW (60.8pc), followed by hydropower which generates 390.6 MW (34pc), while the rest is produced by steam power. There are 42 hydropower plants, 14 natural gas plants and three steam plants. The government has laid down a five-year plan (2001-02 to 2005-06) to build nine hydropower plants which will have have a generating capacity of 5,862.4 MW. It is estimated that by 2005-06 when all the targeted plants are completed, the country will have a total generating capacity of 8,981.67 MW. There is currently a serious shortage of electric power. Even foreign embassies and organizations do not receive normal power supply and frequently have to depend on their own power generators to carry out normal functions. The power shortage has had a major negative impact on the country's economic development and ability to attract foreign investment.

NLM, 13/09/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020913.htm#2\_

At the regular press conference with local and foreign correspondents at the Tatmadaw Guest House in Yangon, Vice-Chief of Military Intelligence Kyaw Win explained matters related to the electric power projects of the EPM already completed, under construction and in the planing stage. He said the Government is aware of the difficulties relating to the power supply system. Only about 60 MW of electricity was produced before 1988, but by relying on its own resources, the government had added over 450 MW since. Furthermore, large and medium hydel power stations are under construction that will produce over 3,000 MW by 2006. Some of these will be completed in 2003-04, when over 500 MW will will be added to the system.

AFP, 12/09/02. www.burmalibrary.org/TinKyi/archives/2002-09/msg00012.html

Myanmar's military junta said Thursday it planned to build more gas turbines and purchase gas from France's TotalFinaElf in a bid to end the country's chronic electricity shortages. Authorities were now constructing new generators, which would be brought on stream by 2006, deputy chief of military intelligence Major General Kyaw Win told reporters. "We estimate that by then our generators will be providing over 1,900 megawatts of electricity, far more than enough for our needs," he said. Electricity supply currently available to the entire country is now less than 560 MW, well below demand of 800 MW, he said. "Production has not been able to keep up with consumption, as demand, especially by the industrial sector, increased dramatically." The capital started experiencing acute power shortages when two of the three main gas turbines providing electricity shut down due to a depletion in offshore gas reserves, an energy ministry official said. Supply from the reserves should be resumed by November or December, he added.

Xinhua, 03/09/02. www.burmalibrary.org/TinKyi/archives/2002-09/msg00002.html

Myanmar produced 8,787.4 million cu m of natural gas in fiscal 2001-02, of which 6,713.4 million cu m (76.3pc) were exported to earn hard currency, with the being reserved for domestic use, including for electricity generation. Electricity yielded by natural gas represents 54pc of the total produced in the country. In 2001-02, 3,072.69 million kWh were generated by gas of a total of 5,671.78 million kWh generated by MEPE.

U Kyaw Nyein, "Union of Myanmar: Ministry of Energy" in *Petromin*, Jan-Feb 2002, p. 10

http://www.petronas.com.my/intranet/ascope/ascope.nsf/3b269571c10e71e5482568960033edc8/d9b264568 8f00ced48256b05001451f1/\$FILE/Myanmar.pdf

A total of about 1200 miles land pipeline has been laid by MOGE's own pipe laying fleet for domestic gas transmission. The pipeline size varies from 6" up to 20". Recently 180 miles of 20" pipeline was successfully constructed by MOGE's national team, from Kanbauk to Myainggale where a new cement factory has just been completed. The gas is being transmitted from the offshore Yadana field through the Kanbauk pipeline centre. The current inland gas production is being supplied to gas turbines (65%), urea plants (16%), while the rest goes to cement factories, refineries and other industries.

NLM, 17/10/93. http://www.ibiblio.org/obl/docs3/BPS93-10.pdf [document p. 38]

Minister for Energy U Khin Maung Thein inspected laying of gas pipelines along the Sittaung-Thaton-Myainggalay natural gas pipelines project in Kyaikhto township. Natural gas from the Aphyauk wells will be sent to a power station and tyre factory in Thaton, and a cement factory in Myainggalay.

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#### **BAWGATA CREEK**WILL BE DAMMED TO PRODUCE ELECTRIC POWER

NLM, 10/09/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020910.htm

On 9 September morning, Maj-Gen Khin Maung Than of the Defence Dept and A&IM Nyunt Tin party over saw the site for construction of the Bawgata Dam project near Muthe village in Kyaukkyi Township. Director-General U Kyaw San Win of ID reported on location of the project and aims and facts of the project. The dam will be located on Bawgata Creek, 11 miles [east of] Kyaukkyi. The project will be implemented with the aims of storing water from Bawgata Creek in an 1,800-foot long, 230-foot high dam and generating 500 million kWh annually. On completion of the project, the dam will contribute towards development of the region.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-05: Toungoo Bawgata creek dam, 11 miles east of Kyaukkyi [18° 19' N, 96° 46' E], grid square reference: 9\2, 26\4 [?] <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg</u> See also the map of the Nyaunglebin (Kler Lweh Htoo) District on the KHRG website where the Karen name of the Bawgata creek is given as 'Theh Loh'. <u>http://www.khrg.org/maps/2007maps/nyaunglebin 72dpi.jpg</u>

#### Additional references

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. <u>http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf</u>

The Bawgata dam is not mentioned as either under implementation or planning.

NLM, 30/07/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm</u> Plans are under way to implement 15 hydel power projects such as 160-megawatt Kawgata [sic] hydel power plant in Kyaukkyi township of Bago division.

KHRG, Toungoo District: Update on the Dam on the Day Loh River, 30/05/06.

http://www.khrg.org/khrg2006/khrg06b5.html

In the Nyaunglebin district, the SPDC plans to build two more hydropower plants, officially referred to as the Bawgata (Baw Ka Hta) hydropower project and the Shwe Kyin (Shwegyin) hydropower project. According to the website of the Ministry of Electric Power both of these projects are commissioned to begin construction later this year and are reported to be presently "under feasibility study and design by Kansai Electric Power Co. Japan".

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#### MALAYSIAN COMPANY TO BUILD MINI-HYDRO POWER PLANTS

Myo Lwin, Myanmar Times, 02/09/02. [not available on-line]

The Myanmar government and an engineering giant from Malaysia on August 19 signed an MoU for the construction of two mini-hydroelectric power plants in Yangon Division, according to a senior government official. The MoU was signed between Tepat Teknk and the Irrigation Dept of the Ag & Irrig Ministry. The sites planned for the plants are at Phaunggyi village in Hlegu township and Konpawsu village in Taikkyi township at irrigation dams built across the Ngamoeyeik and Tabuha creeks respectively.

Director U Lun Maung of the Irrigation Dept said the two power plants would produce up to 5.4 MW of electricity. "At the moment, they are making surveys for the Ngamoeyeik project where the power plant is estimated to cost about US\$2 million," he told the Myanmar Times last week.

Under the plan, the Tepat Teknik would supply the necessary machinery and be responsible for installation and commissioning while the Irrig Dept would handle the civil works. "This would be a first for Tepat Teknik which would implement the project together with its local partner, Fortune International," said U Lun Maung.

"Currently the Malaysian engineers are making surveys to prepare a design proposal which will include the estimated cost. The project will then be submitted to the government," U Lun Maung said. He said the plant could be expected to start in about six months while the Tabuhla creek project would be considered later by the Malaysians.

Compiler's note: Apparently, the Ngamoeyek project never got beyond the planning stage.

## Additional references

Myanmar Times: 16/09/02 [not available on-line]

Discussions are continuing with the Malaysian firm Tepak Teknik on a proposal to generate up to two MW of electricity from the Ngamoeyeik dam.

Myanmar Times: 10/12/01 www.myanmar.gov.mm/myanmartimes/no93/myanmartmes5-93/

Malaysian engineering giant Tepat Teknik has reached a technical collaboration agreement with Fortune International whose core business is the importation and installation of elevators. The Yangon company is also involved in sugar plantations and general trading. The two companies will work together in high technology metal fabrication, factory upgrades and construction projects in the electricity and oil and gas industries. There are also plans to enter the property sector and both sides are also interested in the food processing industry. For the time being, Tepat Teknik will focus on human resource development in its relationship with the Yangon company, but according to Fortune International's managing director, U Mya Han, the two sides also see opportunities in engineering projects related to the agriculture sector. Other plans include building a factory in the Hlaingthayar IZ to jointly produce machinery for agro-industries and the energy sector.

NLM: 10/04/01 http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010410.htm

Yangon Commander Khin Maung Than arrived at the agricultural site of Fortune International Ltd in Magari and Tabuhla regions of Taikkyi township where officials of Fortune International Ltd reported on progress of land reclamation in the Magari region and cultivation matters. Factory Manager of Okkan Sugar Mill U Tun Aung Kyaw reported on sugar production and construction of the road running from sugar-cane plantations to the mill. Fortune International Ltd has planed to reclaim 11,481 acres of land in Magari and Chaungsauk Tabuhla regions. Of a targeted 8,030 acres, 1,200 acres have been put under monsoon paddy and 6,530 acres under other crops. Duing the current sugarcane season, Fortune International has sent over 5,000 tons of sugarcane to the sugar mill.

Irrigation Dept, Myanmar Ministry of Agriculture and Irrigation website information, [n.d.].

www.irrigation.gov.mm/works/majorirrigationworksconstructed.html

Ngamoeyeik Dam in Hlegu township straddles Ngamoeyeik Chaung. It is 6,100 ft long and 75 ft high. With a storage capacity of 180,000 acre-feet of water, it has an irrigation potential of 70,000 acres of command area and 126,000 acres of cropping area. It also provides 90 million gallons of water daily to the city of Yangon. It was inaugurated in March 1995 Tabuhla Dam in Taikkyi township spans 1,305 feet on Okkan Chaung and has a height of 95 feet, At full capacity it can hold 194,600 acre-feet of water, with feasibilities of irrigating a

command area of 52,000 acres and 104,000 acres of cropping area. The dam came into operation in May 1995

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#### **REVIEW OF ELECTRIC POWER** <u>DEVELOPMENTS UP TO 2000</u> Business Tank, July 2002. http://mission.itu.ch/MISSIONS/Myanmar/t&b/electric htm.html

Electricity usage in Myanmar started in 1908 when the British colonial authorities allowed private operators to supply electricity to urban areas. Some local businesses were able to generate and supply electricity to towns and cities due to very small population in those times. Rural electrification was almost unknown.

After Myanmar attained independence in 1948, the government established an 'Electricity Supply Board' in 1951, which held a monopoly in the electric power sector. A major electrification scheme was the construction of hydroelectric facilities in Kayah state, then an isolated outpost in the far reaches of Myanmar. This Lawpita project was a massive undertaking, financed in part by war reparation funds provided by the Japanese government. The project was implemented under very difficult conditions.

At the time Myanmar was self-sufficient in electricity. But the doubling of the population from 16.8 million in pre-war years to 35.3 million by 1983 meant that demand outstripped supply. The Electricity Supply Board was re-organized as the 'Electric Power Corporation' (EPC) in 1972 by the Revolutionary Council Government. The Ministry of Energy, formed in 1985, was responsible for exploration of oil and gas as well as electricity generation and distribution throughout the country. Finally, an independent entity was created by the State Law and Order Restoration Council government on the 15th November 1997 to deal more effectively with the electric power sector. Since then, the EPM and the state-owned MEPE under the ministry are responsible for the generation, transmission and distribution of electricity.

The objective of the ministry is to supply electricity from hydro power sources but by gas turbines are still provide the greater of the installed generating capacity, (46.37pc). Of the total 4,508.29 million kWh generated in fiscal 1999-2000, gas turbines produced 2,840.07 million kWh, while only 959.46 million kWh was generated by hydropower. Most of the gas turbines and combined cycle plants are located in and around Yangon.

	Grid System	Isolated	Total	Per cent
Installed Capacity	1032.57	140.73	1173.30	100
Hydroelectric	327.00	33.32	360.32	30.71
Gas Turbines	508.10	35.89	543.99	46.37
Steam Turbines	172.50	31.10	203.60	17.35
Diesel	24.97	40.42	65.39	5.57
	(standby)			

#### Installed Capacity (MW) for the year 1999-2000

Myanmar is topographically endowed with abundant hydropower resources due to numerous river systems that occurred throughout the country. The World Bank estimates that more than 100,000 MW could be produced. MEPE has identified 267 sites with a generating capacity of 39,624 MW for development. Existing hydropower stations contribute only 320 MW, a mere one per cen of MEPE's projected total. Available hydro resources in each state and division are as follows:

No.	State / Division	No of Locations	Potential Installed capacity (MW)
1.	Kachin	39	2,061
2.	Kayah	7	3,909
3.	Kayin	21	17,021
4.	Chin	22	1,312
5.	Sagaing	21	2,399
6.	Tanintharyi	14	692

7.	Bago	11	387
8.	Magwe	8	123
9.	Mandalay	17	3,482
10.	Mon	10	292
11.	Rakhine	14	247
12.	Shan	83	7,699
	Totals	267	39,624

About 27 medium and small scale hydroelectricity stations have been constructed since1988 during the tenure of the SLORC and SPDC governments. The generating capacity of these projects is 131.14 MW. The most noteworthy ones were Sedawgyi in Madaya township(25 MW), Baluchaung No.1 in Loikaw township (28 MW), Zawgyi No 1 in Shan state (18 MW) and Zaungtu in Bago division (20 MW). Feasibility studies for these projects were carried out during the time of the Socialist government but actual implementation began years later. The power sector comprise only 1.074pc of the GDP in 1999-2000 calculated at 1985-86 constant prices. The state sector investment in electricity projects comprised a paltry 4.31pc of the total budget in 1998-99, because of the priority given to the development of the agriculture sector and transportation infrastructure within the country.

Huge economic losses resulted in 1998 when water levels at major hydroelectric dams dropped due to the impact of the El Nino weather phenomenon. To meet power needs of the growing population of more than 50 million, the government has launched a number of large scale projects, The aim is to add another 2, 000 MW of generating capacity over the next five years. One of the mammoth projects underwayu is the Paunglaung hydel scheme, 14 miles east of Pyinmana in Mandalay division. The 430-foot-high dam there will have a storage capacity of 560,000 acre-feet and the turbines of the power station will have a capacity of 280 MW. Power generation is slated to start in December 2003. An eve larger project is underway at Yeywa, near Mandalay where four 195-MW turbines will be installed.

#### Additional references

See below: <u>'History</u> of the electrical industry in Burma/Myanmar: Notes' (Appendix 14)

# POWER STATION AT THE<u>THAPHANSEIK</u> DAM COMMISSIONED INTO SERVICE

NLM, 19/06/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020619.htm

The power station at the Thaphanseik Dam near Thaphanseik village, Kyunhla township, has been commissioned into service. Installed at the Thaphanseik Dam lying 12 miles west of Kyunhla, the power station has three 10-MW turbines. It was built at a cost of K 1,375 million and US\$20 million.

Maj-Gen Ye Myint of the Ministry of Defence said the power station was installed at the Thaphanseik Dam which was opened in April 2001. The massive dam is over four miles long, and reportedly the longest in south-east Asia. Arrangements have been made to irrigate crops in Shwebo, KhinU, Kanbalu, Taze, YeU and Dabayin townships and even Budalin and Ayadaw townships. The dam will irrigate about 530,000 acres of crops. The three turbines at the power station are capable of generating 30 MW of electricity, fulfilling the nation's power needs to a certain degree. Myanmar engineers and technicians implemented the project on self-reliance with the leadership of the State. Forty-eight pump stations have been installed along the banks of Ayeyawady, Chindwin and Mu rivers. Over 600 small-scale dams and reservoirs have been built with the cooperation of people in rural areas. When completed, Yebutalin, Indaw and Nyaungbingyi water pumping stations will irrigate more than 60,000 acres of crops. The electricity generated from Thaphanseik Dam will supply power to these stations.

North-west Commander Soe Naing said that it is a matter of special pride that the Thaphanseik facility is the first multi-purpose dam in Sagaing Division. Surveys are underway to implement others such as the Htamanthi, Yuwa and Shwesaray hydel power projects along the Chindwin River.

EPM Tin Htut said that electric power plays a vital role in economic, social and production sectors. The EPM is facing a great challenge in supplying to the increasing demand for electric power in the nation.. The ministry is making efforts day in, day out, to implement medium scale and large scale electric power projects. During the five-year plan that started in 2001-2002 plans were laid down to generate an additional 2,000 MW. Altogether 21 projects are underway to that will use hydro, natural gas, diesel, steam and coal to generate electrictricity for national development. In the long run, it will be the most cost-saving to develop the immense hydro power resources that Myanmar is endowed with. According to feasibility studies, about 40,000 megawatts can be generated from creeks and rivers including the Mu River. However, to implement a hydel power project, a huge sum of money is needed and it takes a long time as well. So the State had to spend K1,155 million and US\$20million on Thaphanseik hydel power project which took about four years to build.

Chairman Sun Xiao Wen of CITIC Technology Co Ltd of the PRC spoke words of thanks. On behalf of local residents, Shwebo District USDA Secretary U Tin Myint also thanked the State for construction of the power station. Afterwards, Maj-Gen Ye Myint presented a gift to Chairman Sun Xiao Wen and gifts of honour to the personnel who took part in construction of the project.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 46-04: Wuntho Thapanzeik dam near Poktaw village [23° 12' N, 95° 22' E], grid square reference: 6/7, 36/0 <a href="http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-4.jpg">http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf46-4.jpg</a> The sluice gates are easily located on Google Earth at 23° 13' N, 95° 22' E along with the dam barrier and large reservoir behind the dam.

#### Additional references

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In June 2002, MEP announced the completion of the Thaphanseik hydroelectric plant on the Mu River in Kanbalu township. The plant has three 10-MW sets and was built for about \$20mn by CITIC. The China limport-Export Bank (CIEB) provided a seller's export credit.

NLM, 25/02/05. http://mission.itu.ch/MISSIONS/Myanmar/05nlm/n050225.htm

Gen Maung Aye and party visit the Thaphanseik Dam and are briefed on the flow of water into the dam, annual rainfall. Maung Aye emphasizes the need for effective forest conservation in the watershed areas. He warns that the failure to meet the irrigation targets for the hundreds of thousands of acres fed by the waters of the dam, as well as the power generation targets, would lie in the areas above the dam. He calls for records to be kept that show the relation between the rainfall in the various townships in the region and the inflow of water into the reservoir.

MT, 03/06/02. <u>www.myanmar.gov.mm/myanmartimes/no118/myanmartimes6-118/Briefs/briefs.htm</u> Two of the generators at the Thapanseik power station are in operation on a trial basis. The plant was scheduled to open in May 2002, but the start-up has been delayed due to late delivery of some equipment.

NLM, 02/03/02. <u>www.myanmar.gov.mm/NLM-2002/enm/March2.htm</u> Gen Maung Aye is briefed on the installation of cables to link the power generated by the station with the national grid system and on the construction of a sub-power station.

NLM, 18/04/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010418.htm

Thaphanseik multi-purpose dam was commissioned into service. It is the largest of its kind in Myanmar, and iwill irrigate 500,000 acres and generate 30 MW. It is the main facility supplying water to Kindat diversion dam that was opened in March 1997. Presently, only 30pc of the 2.8 million acre feet that flow along the Mu River is being used for agricultural production. The Thaphanseik dam will make it possible to cultivate two crops in the summer season. Survey work for the project was first undertaken 40 years ago. The earth dam is 22,578 feet long and 108 feet high. Maximum water storage capacity is 2,888,000 acre feet. The surface area of the dam at full brim is 106,200 acres; its main spillway is of Ogee type; it has 12 sluice gates each measuring 15 feet by 30 feet. The total cost of the project is over K7,500million.

NLM, 12/10/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n001012.htm

Thaphanseik multi-purpose dam on the Mu River is intended to feed Kindat diversion dam nine miles downstream in order to irrigate 150,000 acres. It will also irrigate 350,000 acres fed by the Kabo dam. The right canal of Kindat diversion dam will irrigate over 10,400 acres through Budalin canal and 14,800 acres through Ayadaw canal. Altogether, 520,000 acres will opened up for double and mixed cropping through the storage facilities of Thaphanseik dam. The hydro-electric power station will supply 117.2 million kWh annually, Work is underway on the diversion canal, three coffer dams, the irrigation outlet, the hydro-electric power station and three penstock as well as a concrete structure connecting the main power station and the penstocks, 12 radial gates with ogee-type sluice gates, the main and auxiliary spillways and the main structure of the dam.

NLM, 26/07/99. http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n990726.htm

The Ag & Irrig Minister, EP Minister and the PRC ambassador inspect Mone Creek, Paunglaung and Thaphanseik multi-purpose reservoir projects and the construction of diversion tunnels for power generation. At the Thaphanseik project, they visit the site chosen for construction of the hydroelectric power station and inspect construction of the service and auxiliary spillways.

NLM, 21/11/98. http://mission.itu.ch/MISSIONS/Myanmar/98nlm/n981121.htm

MEPE and CITIC Technology Co Ltd of the PRC signed an agreement on implementation of the Mon creek hydroelectric power project and the Thaphanseik hydroelectric power project at the International Business Centre in Yangon on 20/11/98. Minister for Electric Power Tin Htut said the agreement is worth about US\$ 52 million.

WPD, 04/08/90. http://www.ibiblio.org/obl/docs3/BPS90-08.pdf

Gen Than Shwe chairs a co-ordination meeting of SPIC and outlines major irrigation projects, including notably the Mu river valley irrigation development project. Among the various projects, priority will be given to the Mu river valley project and the multi-purpose Yenwe dam project.

Aung-Thwin, Michael, *Heartland of Burma: Foundations of the Pre-Colonial Burmese State*, (Centre for Southeast Asian Studies, Northern Illinois University, 1990) pp. 22 - 26; A review of the irrigation works in the Mu valley which have existed since times of antiquity. Maps are available on pp 72 - 73.

**Compiler's Note**: In the late 1960s, the Burmese government commissioned a study under the auspices of the UNDP concerned with the re-furbishing of the irrigation system developed during British colonial times in the Mu valley. This study focused mainly on agricultural considerations but it also included the production of hydro-electricity. The study is reviewed in *'Management Science in the Developing Countries: A Comparative Approach to Irrigation Feasibility'* by C.J. Rose (Management Science, Vol. 20, No. 4, Applications Series, Part 1, [Dec., 1973], pp. 423-438. This study, carried out by European Operational Research and Italconsult SpA, appears to have formed the basis for the construction of the Thaphanseik dam and power plant.

#### MEIPAN CREEK HYDROPOWER PLANT INAUGURATED

NLM, 16/05/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020516.htm#(%203%20)

The inauguration ceremony of the Meipan creek hydel power plant was held at the power plant in Monghsat township, attended by Maj-Gen Aung Htwe of the Ministry of Defence. He said the government was putting special emphasis on development tasks in the border areas where the national races predominated. Meipan creek hydel power plant will supply power to the town of Monghsat and surrounding villages and contribute to the growth of cottage industries in the region. He urged local people to safeguard it and to maintain its durability.

EPM Tin Htut explained the construction of power plants all over the country and how Meipan creek power plant came to be built. U Ar Gah, an Akha national and USDA executive, spoke words of thanks.

Afterwards, Maj-Gen Aung Htwe presented a cash award for the workers of the EPM to U Tha Aung who is in charge of the Meipan creek plant. It was was built at a cost of K150 million and US\$ 0.32 million. Two 600 kW generators are installed at the plant which will supply power to Monghsat and surrounding villages all day. The power plant is the 15th in Shan State built by the EPM.

## Additional references

Xinhua, 16/05/02. http://www.highbeam.com/doc/1G1-86217627.html

Myanmar has added a new hydropower plant in the country's eastern Shan state, bringing the total number of such plants built in the state to 15, according to a report of the Myanmar EPM. The Meipan creek hydropower plant in Monghsat township, put into service on Tuesday, was built at a cost of K150 million (US\$0.31 million) plus US\$320,000), the report said. The plant, installed with two 600-kilowatt generators, can supply electricity to Monghsat and its surrounding areas where cottage industries are being extended.

See above:'Namwok hydropower plant re-opened' (SHAN: 09/04)See below:'Electricity generation in Myanmar by state and division' (Appendix 10)

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#### **PRIVATE OPERATORS** MEET CONSUMER NEED FOR ALTERNATIVE POWER SERVICE

Win Kyaw Oo, Myanmar Times, 03/02/02. http://www.ibiblio.org/obl/docs3/MT100.htm

Small-scale independent operators are filling a niche market in Yangon for electricity supply. They include U Thein Tan of Thaketa township, in south-east Yangon, who has invested K3 million in two 5kW fgenerators to supply power to residents of his community. U Thein Tan, whose operation is one of several throughout the metropolitan area, said the independent suppliers wanted to contribute to their communities by supplying power during blackouts. "Most of these projects are for the convenience of the community rather than for commercial benefit," he said.

The independent suppliers apply for oral permission from township councils and MEPE. They also reach agreements with those who want to be connected to their generators. Most subscribers are limited to enough power for one two-foot fluorescent light, but some are entitled to buy electricity for appliances such as TV sets. The cost of supplying six hours of power for a light is K40 and for a TV set, K60. This is about four times as expensive as the cost of power from the state utility, U Thein Tan said. He said subscribers were provided with wiring and lights.

"Business is expected to be good until the end of 2004, when several state power supply projects will have been completed," U Thein Tan said. Power shortages are a common problem in many developing countries and Myanmar is no exception, he said. Large scale private power suppliers could ease such supply problems but their costs would be much higher than state utilities, he said.

Addtional references

See above: 'Coping with power <u>black-outs in Rangoon</u>' (Mizzima News: 27/04/04) <u>'Premium rates</u> for electricity in Mon state villages' (IMNA: 03/08/07)

Alfred Oehlers, Behind Burma's Fuel Price Rise, IRROL, 22/08/07. http://www.irrawaddy.org/article.php?art\_id=8318

To fully understand the pressures behind the [recent] increase in fuel prices [in Burma], it is important to consider some deeper structural characteristics of the Burmese economy and oil and gas sector. To begin, one bold fact: Burma is essentially a diesel-powered economy. We see this in the buses, trains and trucks that rumble around the country. We also see this in the dilapidated power plants that sometimes generate electricity. Most of all, we see this in the ubiquitous portable generators that exist in nearly every home, factory and shop that can afford one. For a long time now, diesel prices have been kept artificially low through subsidies. And as demand for diesel has continued to grow in tandem with an expanding economy, the amount spent on these subsidies has similarly expanded, posing an ever increasing strain on the regime's finances. In an attempt to increase the supply of diesel, the regime attempted to encourage

greater crude oil output from the domestic oil industry in recent years. This has not met with great success, as onshore wells are declining in productivity (the "peak oil" phenomenon) and there are few, if any, offshore wells. In any case, sources suggest, even if higher volumes of crude could be obtained domestically, another bottleneck would have developed around the available refining capacity in Burma. Burma's ageing refineries simply cannot refine crude volumes sufficient to meet demand. These refineries, in addition, are incapable of refining crude from other sources with different sulfur content, thus ruling out imports of crude to augment domestic supplies. The only solution then, is to import diesel. And as this is usually done at spot market prices, it is an extremely costly solution. . . . [Moreover,] rising imports of diesel, gasoline and gas products at escalating prices cannot be paid for from existing gas revenues. Nor can an already weak state budget—depleted by projects such as a new capital—absorb such rising costs. The only solution is to slash the subsidies and raise fuel prices.

#### Kumudra WJ, 23/01/04 [as excerpted in the Myanmar Times, 02/02/04].

#### http://www.myanmar.gov.mm/myanmartimes/no202/MyanmarTimes11-202/media.htm

Small-scale businesses that use diesel-powered generators are becoming increasingly important as suppliers of electricity in townships on Yangon's outskirts, reports Kamudra journal. The report said that in Hlaingthaya generators supply power to households for seven hours a day: from 4am to 6am and from 6pm to 11pm. It said the minimum cost of the electricity is K40 a day, enough to illuminate a two-foot-long fluorescent light. For K180 a day, the systems provide enough power for a TV set, a video player and a fluorescent light. The businesses collect their charges daily or monthly. Similar businesses are operating at Dala, Shwepyitha and South Dagon townships, on the capital's outskirts, and elsewhere in Yangon division at Shwepaukkan, Twante, Kwunchankon, Htantabin, Hmawbi and Taikkyi.

#### NLM, 06/07/03. http://mission.itu.ch/MISSIONS/Myanmar/03nlm/n030706.htm

From a speech by the Minister of Co-operatives: As regards the promotion of living standards of the rural people, co-operatives are extensively carrying out the supply of electricity. Electric power is being supplied to rural areas with 126 generators including hydro-electric power plants. To be exact, these generators are supplying electricity to 119 villages in 93 townships in 12 states and divisions. Plans are under way to supply more electricity to the rural areas.

#### NLM, 13/09/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020913.htm

At a press conference with local and foreign correspondents, Vice-Chief of Military Intelligence Kyaw Win explained matters related to the power supply station projects of the EPM. He said over 450 MW can be produced on self-reliance, and the Government is always seeking ways and means to solve difficulties.

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# MYANMAR CONFIRMS PLANS TO BUILD NUCLEAR RESEARCH REACTOR

AFP, 22/01/02 http://www.spacedaily.com/news/nuclear-civil-02b.html

The military regime in Myanmar (Burma) is planning to build a nuclear research reactor and is in negotiations with Russia over the facility, Deputy Foreign Minister Khin Maung Win has confirmed. In a statement issued late Monday, Khin Maung Win said the junta had informed the International Atomic Energy Agency (IAEA) of its intention to construct the reactor which would be used "for peaceful purposes". "The Myanmar government is striving to acquire modern technology in all fields, including maritime, aerospace, medical and nuclear," he said in the statement. "It is in the light of these considerations that Myanmar made enquiries for the possibility of setting up a nuclear research reactor. A proposal has since been received from the Russian Federation."

Russia said last February that it planned to enter talks with Myanmar on building a nuclear reactor in the Southeast Asian country for scientific purposes. Media reports have said that hundreds of Myanmar scientists are presently in Russia receiving nuclear training.

Khin Maung Win said that under the Non-Proliferation Treaty which Myanmar signed in 1992, it had the right to pursue "the peaceful use and application of nuclear technology". "All our neighbouring countries, with the exception of Laos, are already reaping the benefits from nuclear research reactors operating in their

However, the development is likely to raise concerns among western governments who view military-run Myanmar as a pariah regime due to its poor human rights record and refusal to make democratic reforms. There will also be questions over whether Myanmar, whose economy has been brought to its knees by heavy international sanctions, can afford such a facility.

Khin Maung Win denied media reports that Myanmar has secretly brought two Pakistani nuclear scientists into the country to help it fulfil its nuclear ambitions. "The Myanmar government categorically states once again that no nuclear scientists from Pakistan have been given sanctuary in Myanmar," he said. However, he said Myanmar scientists had been trained by the IAEA "in the application of nuclear technology for peaceful purposes".

Thailand's Bangkok Post has reported that the Vienna-based IAEA was concerned about the plans to build a reactor in Myanmar and had asked Moscow to provide details of the negotiations. It said Myanmar had approached the IAEA in September with its plans to acquire a reactor, and that two months later a team from the organisation made an inspection visit. The team concluded that the country's safety standards were "well below the minimum the body would regard as acceptable," it quoted an unnamed IAEA official as saying.

## Additional references

**Compiler's note**: From time to time, media stories surface that the military government of Burma has set up deals with foreign powers, notably the Russian and North Korean governments and their energy agencies, that would enble it to acquire the necessary technology, raw materials and assistance to set up a nuclear research centre leading to the eventual construction of a nuclear reactor. In May 2006, for example, Reuters reported Russia's atomic energy agency, Rosatom, had signed a deal to build a nuclear research reactor in Myanmar that would include a 10-MW nuclear reactor with low enriched uranium consisting of less than 20pc uranium-235. Myanmar commentaries on these stories usually focus on the potential use of a nuclear reactor for medical research purposes. The only references discovered to research leading to the possible use of nuclear energy for the generation of electricity are included below.

## NLM: 22/01/02 http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020122.htm

Replying to queries on the nuclear power issue during a press conference at the Tatmadaw Guest House in Yangon, Deputy Minister for Foreign Affairs Khin Maung Win said that the Ministry of Science and Technology had informed Director-General M El Baradei of the International Atomic Energy Agency (IAEA) that Myanmar intended to build a nuclear research reactor and had asked the IAEA for advice and assistance. In response the IAEA had sent a delegation to Myanmar from 18 to 21 June, 2001 who reported that Myanmar's consideration of building a nuclear research reactor was based on peaceful purposes such as ... "performing feasibility study for generation of electricity from nuclear power".

Energy Planning Department, Myanmar Ministry of Energy, website information, 2001.

# http://www.energy.gov.mm/Nucear\_1.htm

With the rapid growth in economic development and the pressing demand of the existing supply-demand gap and the responsibility to cope with future electricity requirements, the need arises to conduct studies for alternate energy sources capable of producing power in high volume and densities. Power generation plans in Myanmar have all along been based on hydropower and gas-based generation and consideration is made to use nuclear power for future generation of electricity only as an option. It is believed that future demands of electricity can be met with available natural gas resources and future development of hydropower resources, of which less than one percent of its potential has been utilized up to the present. As nuclear energy is not environmentally friendly and development of nuclear power requires high technology and also is capital intensive, Myanmar is only at the stage of initiating study on nuclear energy as an ongoing programme on alternative energy sources.

See also the section on nuclear energy in 'Electricity potential of energy sources available in Myanmar'.

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#### **GENERATION FACILITIES SCHEDULED FOR COMMISSIONING IN 2002-2004**

Win Kyaw Oo, Myanmar Times, 07/01/02. http://www.ibiblio.org/obl/docs3/MT097.htm

Five hydro-electricity plants with a total generating capacity of 470 MW are due to go into operation by the end of 2004, according to a senior government official. "The plants are part of a move to realise more than 10 planned projects aimed at generating an extra 2000 MW during the next five years," said Dr Thein Tun, the director-general of the Department of Electric Power. He said more than half of the projects were due to be completed by the end of 2006.

As reported in the Myanmar Times of 29/10/01 (see below), a 30-MW hydro-electric power station near Kantbalu township in Sagaing Division is due to be commissioned early this year.

Another two hydro-power stations are due to go into operation in 2003. They are a 280 MW facility near Pyinmana township in Mandalay Division and a 25 MW station near Nyaung-laybin township in Bago Division. Two plants will be commissioned in 2004 – a 75 MW facility in the Magway Division township of Saytottaya and a 60 MW station in the Bago Division township of Phyu. Dr Thein Tun said tenders would be called early in 2002 for the supply of turbines and other machinery for the two plants in Bago Division.

The supply and installation of machinery is the biggest expense of a hydro-electricity project. The cost of machinery needed to generate each megawatt averages between US\$500,000 to \$800,000.

#### Additional references

See above:	'Completion of hydropower plants assigned <u>highest priority</u> ' (MT: 12/02/07)
	'Government will prioritize hydropower projects over gas' (MT: 10/07/06)
	'Hydropower project nearing completion' (MT: 28/06/04)
See below:	'More inputs needed to power a hydro future' (MT: 04/06/01)

NLM, 19/11/02. http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n021119.htm

General Than Shwe speaking to the AGM of the USDA: Nine hydel power plants with a capacity of 1,790 MW and a steam power plant with a capacity of 120 MW -- totalling 1,910 MW -- are under construction. Three of these projects, namely, Paunglaung, Mon Creek and Tikyit power plants will be completed soon and they will generate 475 MW. In addition to these projects, it is planned to build five hydel power plants and a steam power plant during the period from 2006-2007 to 2010-2011. The plants will be capable of generating 5,468 MW. The completion of one power plant after another will surely help strengthen the economic power of the nation. It is necessary not only to produce more electricity but also to use it systematically. The use of electricity in government offices has been sharply reduced and this measure is aimed at supplying more electricity to the public and industrial enterprises.

Win Kyaw Oo, Myanmar Times, 29/10/01. http://www.myanmar.gov.mm/myanmartimes/no87/ Electricity output will rise sharply in the coming years as more hydro-power stations come on stream, according to D-G Thein Tun of the Department of Electric Power. More than 12 power stations are at various stages of development, with three capable of producing a total of 225 MW due to be completed by the end of 2004. They include a 30-MW hydro-power station in Kyunhla township in Sagaing division which is due to go into operation early next year. A 75-MW hydro-power station near Saytottaya [Sedoktaya] in Magway division as well as a coal-fired power station in southern Shan state capable of producing 120 MW are expected to be commissioned in 2003. Meanwhile, site clearing work is well underway for a big hydro-power station to be built on the Myitnge river in Kyaukse township, south-east of Mandalay, which will generate 700 MW. It will begin generating electricity after the first of four 175 megawatt turbines is installed. Dr Thein Tun said there were also prospects for extending the number of gas-powered stations, subject to the availability of adequate supplies of natural gas. As reported in Myanmar Times (04/0601), extra financial and human resources and equipment will be needed to complete more than 10 projects aimed at generating an extra 2000 megawatts over the next five years. Out of a current supply of about 1000 MW in the national grid, hydro-power accounts for about 300 MW. Financial contributions for power projects come in the form of aid grants and soft loans from such countries as Japan and China.

WPD, 15/09/90. http://www.ibiblio.org/obl/docs3/BPS90-09.pdf [document p. 31]

The Special Projects Implementation Committee, chaired by SLORC V-C Gen Than Shwe, met to review hydel power and energy projects. Power generated has grown from 840 million "power units" in 1976-77 to 1,489 million in 1989-90, for an annual increase of about 10%. MEPE supplies power in two ways: 621 MW high tension and 186 MW [not connected to the grid?]. The high tension line system is 621.46 MW and will increase to 721.46 MW in 1992-94, with the coming on-line of the Biluchaung hydroelectric power project No 1 in 1992 (28 MW) and the Mann thermal generation project (72 MW) in 1993. Firm capacity will then be about 562.91 MW. More capacity will be needed later. Projects planned for later include: Saingdin hydroelectric project in Buthidaung township (15 MW) which will serve 10 northern townships in Rakhine state, rather than providing 76.5 MW of industrial power as originally anticipated in 1956. Cost will be K 335 million (including US\$ 32 million); Paunglaung hydel power project (280 MW) in Pyinmana township which will cost K 4,250 million (incl. US\$ 410 million) for power, and K 135 million (incl. US\$ 14 million) for irrigation of 40,000 acres; Bilin hydel power project (84 MW) in Pyu township in Bago division which will cost will K 1,110 million); Yenwe multipurpose dam project (16.2 MW) in Kyauktada township in Bago division including irrigation of 40,000 acres. There are 151 potential hydroelectric sites in Myanmar.

WPD, 04/08/90. <u>http://www.ibiblio.org/obl/docs3/BPS90-08.pdf</u> [document p. 21] SLORC Vice Chairman Gen Than Shwe chaired the co-ordination meeting of the Special Projects Implementation Committee. He outlined major irrigation projects. Following discussions, Than Shwe said priority would be given to the Mu river valley project and the multi-purpose Yenwe dam project.

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# GAS FIRED ELECTRIC POWER PLANT AT THATON UPGRADED

Win Kyaw Oo, Myanmar Times, 01/10/01. http://www.myanmar.gov.mm/myanmartimes/no83/

Cement production is set to rise following a decision by Myanma Electric Power Enterprises to increase the capacity of a gas-fired electricity station in Thaton, about 100 miles east of Yangon. The director-general of the Dept of Electric Power, Dr Thein Tun, said an upgrading project at the station, which supplies Thaton and the nearby towns of Mawlamyine and Pa-an, would increase its output from 18-MW to 51-MW. The upgrading work was expected to be finished soon, he said. "The station will mainly supply power to nearby cement processing works, including a new, 4000-ton factory that will go into service soon," Dr Thein Tun said.

The upgrade at the station has involved the transfer of equipment from a station at Myanaung, a town more than 100 miles north of the capital. Dr Thein Tun said the upgrade has been made possible by an increase in the gas supply available at Thaton. The supply will come through a pipeline attached to the pipeline linking Thailand with Myanmar's major offshore reserves, Yadanar and Yetagon.

#### Additional references

See above: '<u>Pipeline to solve</u> electricity shortages' (Myanmar Times: 16/09/02)

IMNA, 31/08/07. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=2373&Itemid=6</u> The 'Weekly Eleven' journal recently reported that Moulmein and Thaton electric power stations and other factories in Mon State are operating on natural gas to cut expenses in half.

NLM, 25/09/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010925.htm

EPM Tin Htut and MEPE MD Yan Naing inspected the generating of electricity at full capacity by No 1 Power Plant and the test-run of No 2 Power Plant at Thaton power plant extension project in Mon State on 21 September. In meeting with officials at the briefing hall, the minister said the two power plants had been installed ahead of schedule. He spoke of the need to run the power plants at full capacity and generating electricity as soon as natural gas is available. He also gave instructions on the generation of electricity in coordination with No 3 power plant which is already producing power, on the construction of power lines and on the supply of enough electricity to the cement plants. On 22 September, the minister returned to the Thaton power pant and inspected three steam turbines there. He gave instructions on timely completion of repairs to the No 2 Boiler, repair of another boiler to be kept ready for use, the storing of required machinery and on innovative measures to be taken.

NLM, 17/08/01. www.myanmargeneva.org/01nlm/n010817.htm

EPM Tin Htut, accompanied by Adviser to the Ministry U Bo Kyin and officials, arrived at the natural gas power plant extension project in Thaton where they inspected the test-run of the No 1 power plant and the installation of No 2 power plant. The minister urged those responsible to finish the installation of the No 2 power plant ahead of schedule.

NLM, 28/02/94. <u>http://www.ibiblio.org/obl/docs3/BPS94-02.pdf</u> [document, p 29] By the end of March, 1994, the following pipelines are due for completion: Aphyauk-Ywama (42 miles, 14"), Sittaung-Thaton (45 miles, 10"; 21 miles, 8"), Thaton-Myainggalay (16 miles, 6") and Pyay Oil Field-Seiktha Methanol Plant (12 miles, 10"). Upon completion, the Aphyauk gas field will distribute 80-100 million cf/d to Pyay, Yangon, Sittaung, Thaton, and Myainggalay.

NLM, 17/10/93. <u>http://www.ibiblio.org/obl/docs3/BPS93-10.pdf</u> [document, p 38] Minister for Energy U Khin Maung Thein inspected laying of gas pipelines along the Sittaung-Thaton-Myainggalay in Kyaikhto township. The natural gas from the Aphyauk wells will be sent to a power station and tyre factory in Thaton, and a cement factory in Myainggalay.

WPD, 25/09/87. <u>http://www.ibiblio.org/obl/docs3/BPS87-09.pdf</u> [document, p 11] The Thaton thermal project, launched in 1980-81 and now completed, is providing electricity to the Thaton tyre and rubber products factory and the Myainggale cement factory in Karen State.

Tin Maung Maung Than, "Burma's Energy Use: Perils and Promises" in *Southeast Asian Affairs 1986*, (Institute of Southeast Asian Studies, 1986), p 84. [not available on-line]

The Thaton gas turbine power station, being implemented under the Fourth Four-Year Plan (targeted for completion in 1985/86), was aided by a British Ioan. The thermal power station (6 MW X 3) under construction there will provide electricity for local industries. It was partly funded partly by a US\$10 million Ioan from Czechoslovakia.

World Bank, *Burma: Issues and Options in Energy Sector*, June, 1985, p 54. www.wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1999/09/17/000009265\_3970723102606/Ren dered/INDEX/multi\_page.txt

There are plans to convert the Thaton thermal power plant from fuel oil to natural gas. The gas will be supplied through a pipeline from the Payagon field via Thilawa, Sittaung and Thaton. It will use 9,400 TOE.

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#### EARTH INDUSTRIAL SUBCONTRACTING FOR ELECTRONICS MANUFACTURERS

Business Tank, 15/08/01. [not available on-line]

In the Myanmar manufacturing sector, Earth Industrial (Myanmar) Ltd is the only one-hundred-percent locally-owned electronics producer. Other industrial concerns are mainly concentrated on manufacturing consumer products, garments and production of foodstuffs. Very few are involved in the electronics sector and fewer still are wholly capitalized and managed by local Myanmar entrepreneurs.

"Earth Industrial has established three facilities in this South Dagon Industrial Zone No 1, namely the transformer factory, power supply factory and thermal cutoff factory. The transformer factory was opened in December 1997. Our latest addition, the power supply factory, was completed as recently as September 2000," explained the company director U Nyein Chan Soe Win. He was conducting a tour around the company's 96,000 sq m facility at Plot No.23 where two shifts of over 1000 workers churn out miniature transformers. Another hundred workers produce printed circuit boards and adaptors in the power supply facility.

Earth Industrial gets orders from the Malaysian electronics goods manufacturer, Tamura Electronics Co Ltd, under the subcontracting system. "Our plants operate according to international standards and norms. We tried very hard to obtain ISO 2002," noted U Myint Swe. "As a result of the co-operative efforts of management and workers, we received ISO 2002 [in] December," he said proudly pointing to a certificate hanging in a glassed frame on the wall.

Beside the ISO certificate were others such as those from JQA (Japan Quality Assurance), UL (Underwriter's Laboratory), CSA (Canadian Safety Association) and TUV. "ISO is given for quality assurance while others are for safety purposes. For safety reasons, audit groups from different countries and associations came here to check on production factors and the use of materials. The production methods and the materials utilized must be in conformity with the criteria and safety standards of these associations," explained Quality Control Manager U Kyaw Min.

Their suppliers accepted up to a 3.0pc rejection rate when the factory made its first run. Then management tried to reduce the waste and rejection rates further. The 3 per cent rate was reduced to 2.0pc. Now they are aiming for 0.7pc, noted to U Kyaw Min. "We all follow the ISO and other reference standards," he explained confidently. He went on to say that Tamura (Malaysia) has brought other manufacturers in Malaysia to Myanmar. "They thoroughly reviewed our production processes and as they are satisfied, with our capabilities, we received production orders too. The auditors are satisfied as we test our products for quality assurance by using the latest computer systems," noted U Nyein Chan Soe Win, pointing to workers engaged in quality control.

While the "Earth Industries" is presently engaged in sub-contracting for others, their ultimate aim is to get in involved in producing under direct order according to their own design. Nyein Chan continued, "We have picked up the technology by doing sub-contracting work. But gradually, we are making our way towards the point where we find our own materials and markets. Eventually, we want to carry out our own design work. Electronics industries are gradually being relocated from newly industrialized economies to developing states. The most notable aspect is the emergence of electronic manufacturing facilities in China and Vietnam within the past few years.

See also the website of the Earth Industries Group. <u>http://www.earth.com.mm/</u>

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# MYANMAR TAKES MEASURES TO TACKLE POWER SHORTAGE PROBLEM

Duan Tingchang, Xinhua, 26/06/01.

The shortage of electric power is a major difficult problem which the Myanmar government has long been facing. It has not only restrained the country's economic development but has also brought extreme inconvenience to the daily life of the people.

Since assuming state power in September 1988, the Myanmar government has taken four main measures to solve this problem. Firstly, by breaking the monopoly of the state on the electric power industry and encouraging co-operatives and private enterprises to engage in the exploitation of electric power resources on an appropriate scale. The monopoly on the electric power industry had been in place for a long time. But starting in 1994 a policy which allowed co-ops and private entrepreneurs to build small-scale hydropower stations was introduced. Under this policy co-ops can set up small hydropower stations with a capacity up to 750 kW and private entrepreneurs can establish stations up to a maximum of 3,000 kW. This has marked a major step forward.

Secondly, by strengthening co-operation with foreign countries in the exploitation of electric power. In October 1998, YMEC of China and the state-run MEPE signed a contract to work together in building the Paunglaung hydropower plant with an installed generating capacity of up to 280 MW. Now under implementation, this project is expected to provide 25pc of the country's domestic power consumption on completion. Similarly, in November 1998, CITIC and MEPE endorsed a contract on the implementation of the Thanphanseik and Mone power stations. The installed generating capacity of these two smaller

hydropower plants are respectively 30 MW and 75 MW. In addition, Japan announced in May this year that due to failures in maintenance and outdated equipment a the Lawpita hydropower station, built by in the 1960s, that the Japanese government would extend Y3.5 billion (US\$ 28.6 million) in aid for this station.

Thirdly, by a steep raise in electricity charges. Beginning in February 1999, Myanmar boosted the monthly charges for electricity. These are now collected on the basis of K 2.5 for the first 50 units, K10.0 for consumption between 51 and 200 units, and K 25.0 for 201 units or more. Electricity charges at K 30.0 per unit experience the sharpest rise.

According to the figures published by Myanmar's Central Statistical Organization, as of 2000, the installed generating capacity of the MEPE came to 1,172 mw, an increase of 509 MKW 43.4pc from 1988. Gas power plants increased by 255 Mw, steam power rose by 143 MW, and hydropower by 111 MW. In 2000, MEPE generated 5.028 billion kWh, up 55pc from 2.226 kWh generated 13 years ago.

In spite of some achievements in easing the shortage of electricity in the country Myanmar is far from meeting domestic demand and its economic development continues to be restricted.

#### Additional references

See above: <u>'Gas in short supply</u> to meet demand for electricity' (MT: 17/09/07)

'Myanmar learns to live with the <u>lights out</u>' (Reuters: 09/04/07) 'Power supply improves after <u>years of abnormal status</u>' (Xinhua: 02/09/06)

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## MORE INPUTS NEEDED TO POWER A HYDRO FUTURE

Win Kyaw Oo, Myanmar Times, 04/06/01. http://www.myanmar.gov.mm/myanmartimes/no66/Health/1.htm

Myanmar's hydroelectric industry is "in need of inputs like development machinery, human resources and financial resources, including hard currency", to realise more than 10 planned projects aimed at generating an additional 2000 MW over the next five years, according to U Win Kyaw, deputy chief engineer of MEPE.

The country is endowed with potentially vast hydropower resources. According to preliminary studies, hydropower resources identified to date are about 37,000 MW, of which about 25,000 MW will be large scale production. For the time being, there are seven hydropower stations supplying power for both domestic and industrial use. Out of the 870 MW in supply, 327 MW is hydropower and the rest is of power generation by gas, oil and coal combined. Hydropower supply depends on the availability of rainfall. The plants currently generating hydropower are Beluchaung No 1 and No 2, Kintar, Sedawgyi, Zawgyi No 1 and No 2, and Zaungtu. In addition, technology and financial resources for 12 plants under construction are being provided by state. With enhanced participation by the private sector, the potential also exists for the export of surplus power.

Although the electricity tariff is metered at different rates for different consumption categories – K0.5 per kilowatt hour (kWh), K10 per kWh and K25 per kWh – the average payment to MEPE is at K5.5 per kWh. "If we increase the present tariff rate, there will be other side-effects such as a rise in the prices of consumer goods because of a conditional increment in their production costs," he said. The electric power sector is the most highly subsidised of all those supported by the government, including the telecom sector. But the need in the industry now is for finance and expertise. The supply and installation of machinery is the most expensive overhead in the development of a new plant – on average US\$0.5 million to \$0.8 million to generate one MW. It is perhaps for that reason that in Myanmar the development of the hydropower sector has lagged behind other infrastructure development like the construction of roads and bridges. "Such developments do not need much foreign exchange," U Win Kyaw said.

At present, financial contributions to power projects comes in the form of aid grants and soft loans from countries like Japan and China. Local developers are invited to participate wherever possible, for instance in the construction of dams, access roads to power plants, office buildings. "The formation of a power-

development consortium of local investors and MEPE is now under discussion," U Win Kyaw told the Myanmar Times. In a case such as that of the large Yeywa plant in Mandalay division, matters like the construction of access roads and the preparation of tender documents that involve the private sector in supplying materials and equipment have been undertaken in consultation with a European firm.

In the distribution of power, there are some technical losses from the grid. There are several mitigating factors including the size and length of transmission lines. Apart from such technical loss, there exist non-technical losses related to human error and opportunism, as is experienced in other developing countries like the incorrect reading of units consumed and the illegal sourcing of electricity direct from transmission lines. In Thailand and Malaysia, technical and non-technical losses combined account for the loss of 12-15pc of output. In Japan, the figure is 6 -7pc. "As part of the measures to overcome such losses, MEPE has campaigned to replace old unit meters with new ones," U Win Kyaw said.

According to a paper prepared by a Japanese expert, who declined to be named, issues facing the sector included generation capacity, circuits in main high voltage transmission lines and distribution facilities in urban areas. The development issues to be addressed, according to the paper, included the limited availability of capital funds, the financial viability of foreign investments, poor access and security constraints, and agreements on the use of water resources.

Sr. No.	Power Plant	Capacity (MW)	Capacity	Energy (GWh)
1	Thaphanseik	Sagaing	30	117
2	Paunglaung	Mandalay	280	911
3	Mone-chaung	Magwe	75	330
4	Yeywa	Mandalay	700	3316
5	Kunchaung	Bago East	60	190
6	Yenwe	Bago East	25	123
7	Khabaung	Bago East	30	125
8	Phyuchaung	Bago East	65	260
9	Shwekyin	Bago East	120	400
10	Bawgata	Bago East	160	500
11	Thaukyekhat	Kayin	150	780
12	Shweli	Shan North	300	2090

#### Additional references

See above:'Completion of hydropower plants assigned highest priority' (MT: 12/02/07)<br/>'Government will prioritize hydropower projects over gas' (MT: 10/07/06)<br/>'Hydropower project nearing completion' (MT: 28/06/04)<br/>'Generation facilities scheduled for commissioning in 2002-2004' (MT 07/01/02)<br/>'Invitation for foreign investment in electric power sector' (GUM: circa 1998)

 FLUORESCENT LIGHT MANUFACTURER
 TAKES ON IMPORTERS

 Moe Zaw Myint, Myanmar Times, 21/05/01.
 http://www.myanmar.gov.mm/myanmartimes/no64/

After many years of import domination in the fluorescent lamp industry, the proprietors of a new privatelyowned factory are hoping to cater to the lion's share of demand in the local market and to begin to penetrate the global market. Local demand for the lamps is about 500,000 a month but output from the only existing production plant had been enough to satisfy only a few percentage points of that figure.

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The government-owned production plant in Thanlyin township, run by Myanma Heavy Industries under Ministry of Industry No 2, had been hampered by the absence of high technology and low productivity levels. Most of the local demand was supplied by imports from Thai, Indonesian, Chinese, Korean and Indian sources. About six months ago, however, the government factory began operating in partnership with the Myanmar Lighting Manufacturing Co. Sales of the existing 'National' brand, and the new 'Super Lamp, jumped swiftly to lift the factory's market share from just 7pc to about 25pc.

Not content with that, however, Myanmar Lighting set up a new fluorescent factory in Shwepyitha IZ which has now been in operation for two months. In that short time it has taken another 15pc of the market away from imports. "There is no questioning our ability to be able to compete with imported products in either quality or price," said U Sein Wan, Chairman and CEO of Myanmar Lighting. "There are about 50 brands on the market. Except for the local 'National' and 'Super Lamp' brands, the rest are imported and most of them are low quality."

The production from the two factories – more than nine million units a year – easily exceeds the local demand for about five million lamps annually. U Sein Wan told the Myanmar Times that he intended to export the surplus and put in an additional assembly line to manufacture three kinds of electronic accessories such as chokes and starters in 2002. He intends to export the lamps first to Singapore and then to the Philippines and Pakistan in the near future. "As a first step, I will export my lamps at very competitive prices in order to enable the people in those countries to appreciate the high quality of our lamps," he said. U Sein Wan has been surveying the market for the past two years and is himself an importer and distributor of a fluorescent light brand.

"My arch rivals are the most popular brands like Silver Light, Philips and National," he said. "But my products are very competitive in both quality and prices compared to the others in the local market. Last month, I sold my lamps for K240 and K315 for the T-12 two-foot and four-foot lamps, whereas Silver Light stood at K350 and K400 respectively. But their quality is no better than mine. So I am strongly confident that people will prefer mine in the near future. The market share will be enhanced since my products have been selling as quickly as they can be produced," he said.

U Sein Wan has an extensive commercial background in the construction and fisheries industries and the manufacture of soft drink. Clarifying his decision to invest in the lamp business, he remarked, "When we were doing construction business, we needed a lot of fluorescent lamps and we found that most of the ones we used were not as long-lasting as they should be. At the time the quality and production capacity of the government's fluorescent lamp factory were very low," he said. As a result, his company and the government factory decided to co-operate to produce quality products.

Under the terms of agreement, Myanmar Lighting had to renovate the Japan-made machinery from the 1960's in the government factory in return for a lease to to operate the factory for a seven-year period. The overhaul cost K120 million (about US\$300,000). Current production is 450 lamps an hour, about twenty times previous production capacity.

In addition, based on an initial investment of \$3 million, Myanmar Lighting set up a new factory equipped with Korean-made KUMHO machinery that uses Japanese high-tech equipment. The new factory in Shwepyitha township can produce up to 1,200 lamps an hour. The current staff of 80, including 25 factory workers, is producing is producing about 9,000 T10 two-foot fluorescent lamps a day, about one-third of full capacity. The other factory taken over from the government is working two 9-hour shifts producing 9,000 two- and four-foot lamps a day. All the raw materials for the two factories are imported.

U Sein Wan gave his assessment of the lamp market: "Currently, some businessmen are speculating on the market and stocking up on the assumption that prices will are going to go up." He said he intended to sell his products only to retailers who will distribute them to the end-users. "The durability of the fluorescent lamps from my factory is 6,000 hours. But it is a little bit difficult to tell how long they will actually last because of the fluctuations in the power supply," he said.

#### Additional references

NLM, 08/10/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n001008.htm#(

Minister for Industry No 2 Saw Lwin visits the electric bulb and fluorescent workshop in the applicance factory of MMTEI in Mayangon township and is briefed on preparations to increase production of quality fluorescent tubes.

Myanmar Lighting Company website information [n.d.]. <u>www.myanmarlighting.com/about.htm</u>

#### MT, 0610/03. <u>www.myanmar.gov.mm/myanmartimes/no186/MyanmarTimes10-186/e05.htm</u> 'Chinese lighting products illuminate local market'

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#### SPECIAL PRIVILEGES ALLEGED IN ELECTRICITY DISTRIBUTION SYSTEM

Thaung Htun, UN Affairs Representative, NCGUB: 21/05/01 www.ncgub.net/

The refurbishment of the Lawpita hydroelectric power generation plant alone is not enough to resolve the power problem in Burma. Even with full power generation of 180 MW from Lawpita, an increase of 27% more power, the total national power generation is only about 620 MW --a figure way below the current national demand of more than 1200 MW.

What is more disturbing is the current electricity distribution system in Burma and to figure out if the increase in power supply would really reach the intended people. Current electricity distribution incorporates a system of special privileges and prioritization that is discriminatory to ordinary citizens. Selective groups of people or certain categories enjoy reduced tariffs or simply pay no tariff at all at the expense of ordinary consumers.

For instance:

 A special distribution network or power grid for the residences of top military personnel and government ministers get special privileges and priority and a constant supply of electricity with reduced tariff or no tariff.
 Military establishments all over the country enjoy special privileges and given priority and a constant supply of electricity with reduced tariff or no tariff.

(3) Factories and businesses owned and controlled by the Ministry of Defense enjoy a constant supply of electricity with reduced tariff or no tariff.

(4) Factories and business owned and controlled by various army, navy, and air force divisions, battalions, and regiments enjoy a constant supply of electricity with reduced tariff or no tariff.

(5) Factories and businesses owned and controlled by the Myanmar Economic Holdings Enterprise, MEHE, (run by the Defense Services) enjoy a constant supply of electricity with reduced tariffs.

(6) Factories and businesses jointly owned by foreign investors and MEHE enjoy a constant supply of electricity but with an electricity tariff of 0.80 per unit payable in Foreign Exchange Certificate to the MEHE.

(7) Factories and businesses owned and controlled by the military-organized and managed Union Solidarity Development Association, a so-called civic association, enjoy a constant supply of electricity with reduced tariffs.

#### Additional references

See above: Electricity <u>rates raised</u>, subsidies for civil servants dropped (AP: 15/05/06) See below: 'Myanmar reels under <u>huge electricity price hike</u>' (AFP: 03/08/99)

#### ELECTRICITY POTENTIAL OF ENERGY SOURCES AVAILABLE IN MYANMAR

From information posted on the Myanmar Energy Ministry website in 2001 http://www.energy.gov.mm/eficiency\_conservation\_sustainability.htm

Electricity generation in Myanmar has doubled over the last 10 years. In fiscal 1988-89, the total generated was 2226 GWh, whereas in fiscal 1999-2000 it had increased to 4508 GWh. The average annual growth rate during these years was 6.81pc per year.

#### Hydroelectricity

The hydropower potential of the country is estimated to be more than 100,000 MW on an installed basis. MEPE has identified more than 200 potential hydropower sites through out the country with a total installed capacity of 38,000 MW.

Even though Myanmar has abundant potential for hydro electricity, the installed hydropower capacity is currently only 360.32 MW, constituting about 31pc of total installed power capacity. The generation of electricity from hydropower plants during 1999-2000 has amounted to approximately 959.46 million kWh or about 21pc of the total generated. There have been delays in the exploitation of hydropower reserves because of the high capital investment requirement. In the past several years, the contribution of hydro electricity is about 3pc - 5pc of the country's total energy consumption.

MEPE has developed 26 mini and 9 medium size hydropower projects whose capacities are between 24 kW and 5,000 kW, mostly in remote border areas.

See above: 'Government will <u>prioritize hydropower</u> projects over gas' (MT: 10/07/06)

#### Wind Energy

Use of wind energy is at a very initial stage in Myanmar. The potential available wind energy is around 365.1 terra watt hours (TWh) per year. Due to the high initial investment costs, wind energy has been harnessed only on an experimental and research phase. The promising areas for the use of wind energy sources are the hilly regions of Chin and Shan states, the coastal region and central parts of the country. Currently available data on wind energy sources are not enough to evaluate suitable sites for construction of wind turbines. Judging from existing data collected by the Dept of Meteorology and Hydrology, the western part of the country has the best potential for development of wind power. The evaluation of wind energy resources using modern acquisition systems has been conducted since 1998.

Myanma Scientific and Technological Research Dept of the Ministry of Science and Technology has carried out research and development activity related to the utilzation of wind energy. Studies and research were also conducted by the Dept of Physics at Yangon University. The Dept of Electric Power and MEPE of the EPM in cooperation with yjr New Energy and Industrial Technology Development Organisation of Japan has constructed meteorological observation stations and installed wind and solar measuring equipment at sites in both central and lower Myanmar to collect data and to conduct feasibility studies for a wind and solar power hybrid system. The results obtained from these investigations indicate that the most feasible areas for harnessing energy using wind turbines would be in locations with an average wind speed of between 5.6 m to 7.4 m per second where the outputs would yield in the range of 55kW to 225 kW.

See above: <u>'Wind energy</u> boost rural development' (MT: 05/03/07)

#### Solar Energy

Use of solar energy in Myanmar is at a very initial stage. Potential available solar energy of Myanmar is around 51973.8 TWh/year. As with wind energy, the expense of initial investment costs has meant that solar energy has remained in a research and development phase. Solar energy is abundantly available in the central dry zone area of the country. Experimental measurements showed a radiation intensity of more than 5 kWh/sq m/day during the dry season.

Except for small experimental systems installed with the co-operation of foreign participants, the use of photovoltaic power has not yet developed in Myanmar. Where it has been introduced in rural areas, solar energy has been collected through the use of photovoltaic cells to generate electricity for charging batteries and for driving motors to pump water for irrigation, but this has only been done on an individual basis.

See above: <u>Solar power</u> seen as solution for remote villages' (MT: 06/10/03)

#### Geothermal Energy

Myanmar has abundant geothermal resources. A total of 93 locations have been identified throughout the country. Of these, 43 of them were investigated by MOGE and MEPE in co-operation with the Electric Power Development Co Ltd of Japan, the U.S company Unocal and Caithness Resources Inc of the U.S. Water samples were taken from hot springs and chemical and X-ray diffraction analysis were carried out on the samples.

## Nuclear Energy

Plans for the use of nuclear energy are at a very early stage in Myanmar. However, some studies are are underay. Hydropower and gas-based generation are the preferred sources for generating electricity. But demand for electricity has increased rapidly and studies are being conducted for alternative energy sources including nuclear energy. Since nuclear energy is not an environmentally friendly source of energy and malfunctions in nuclear plants could create drastic problems, nuclear power would only be considered as a last resort. Nevertheless requests have been made to possible sources both inside and outside the country for assistance in carrying out studies related to the social and economic aspects of the peaceful use of nuclear power including the following: 1) Study of the development of radioactive ore known to exist in the country; 2) Building in-house capability that would assist in long-term planning for the use of nuclear energy.

See above: 'Myanmar confirms plans to build <u>nuclear research</u> reactor (AFP: 20/01/02)

#### Biomass

Biogas generation from animal residue is encouraged in rural areas. Since 1980 biogas generation has used as a substitute for fuelwood where wood is scarce in the central Myanmar region. Biodigesters serve to prevent deforestation and to control pollution. The residues from biodigesters can be utilized as fertilizer.

See above: <u>Biogas power plants</u> supply electricity to rural areas' (MT: 16/08/04)

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## EXPERTS DIFFER OVER HOW TO FINANCE IMPROVEMENTS IN POWER SUPPLY

Myanmar Times, 11/12/00. http://www.myanmar.gov.mm/myanmartimes/no41/fix\_energy.htm

Ways and means of improving the use Myanmar's energy systems were the subject of a seminar held in Yangon earlier this month. The event was sponsored by the Office of Strategic Studies of the Ministry of Defence and a Japanese research organization, the Association for Communication of Transcultural Study. Delegates to the seminar also considered how Japan could be of assistance to Myanmar in the utilization of its abundant renewable and non-renewable energy sources.

In order to stimulate growth, Myanmar needs to integrate its economy more closely with developments in neighbouring countries, the region and the rest of the world, Fuse Kazuo of Japan's Electric Power Development Corp told seminar delegates. He also said consumers would be willing to pay more in order to access improved electric power supply. Electricity tariffs in Myanmar fall into a number of different categories: general residential consumers; government organizations, public servants and pensioners; and commercial and industrial consumers. However, half of all the electricity is supplied to consumers who use no more than 200 kWh per month and pay only 0.5 kyat per kWh. A survey conducted by a local market research group, the results of which were discussed at the seminar, found that consumers would be willing to pay a non-classified market rate if it would mean uninterrupted electric power service. "0.5 kyat per kWh is very low," Mr Kazuo said. "The rate should be consistent with the willingness of consumers to pay, if the power supply is reliable and continuous."

Dr Thein Tun, a government official, disagreed. He said the existing policy was that the affordability of power for consumers should be a key consideration in calculating charges. Dr Thein Tun suggested that infrastructural problems were more deserving of attention. "The distribution system is antequated, he said, and one-third of the total power generated is wasted due to system losses." He said that frequent power outages were weakening the country's economic activities. It was important to upgrade the present distribution lines and to connect the grids with those in neighbouring countries. Myanmar should be armed with a vision to export power.

Dr Thein Tun drew attention to the use of diesel-powered generators the Department of Electric Power and MEPE in rural areas not reached by the national grid. He said 224 diesel generator sets have been installed in 161 villages with a total capacity of 8.367 MW. "Some local entrepreneurs have been running power supply businesses, deploying diesel generators to towns including Muse, Kawthaung and Myeik. MEPE has developed 34 mini and medium hydroelectric power projects with generating capacities ranging from 24kW to 5000kW. Most of these are located in the northern and eastern parts of the country.

At present, 63pc of the electricity supply in Myanmar is sourced from gas-based generation, followed by 21.27pc from hydro, 14.49pc from thermal and 1.24pc from diesel. Even though Myanmar has abundant potential for hydroelectricity, the installed hydropower capacity is only 360.32 MW, constituting 31pc of the total installed power capacity. The power generated from hydro plants in fiscal 1999-2000 was 959.46 million kWh, accounting for about 21pc of the total generated. "There have been delays in the exploitation of hydropower reserves because of the high capital investment requirement," Dr Thein Tun said.

The total energy consumption during 1988-89 in Myanmar was 69,160 thousand barrels oil equivalent (kBOE), and increased up to 91,887 kBOE in 1999-2000. The average annual growth rate has been in the order of 2.64pc. "Compared with Thailand or Malaysia, our use of energy is still very low," said Dr Thein Tun. Increased availability of alternative commercial energies like gas would have a positive impact on energy sufficiency. Natural gas supply has jumped significantly from 6,463 kBOE in 1988-89 to 9,567 kBOE in 1999-2000 with an average annual growth rate of 4.3pc. Crude oil consumption has also increased from 4,299 kBOE in 1988-89 to 20,599 KBOE in 1999-2000, representing an average annual growth rate of 15.43pc. The use of gasoline was growing at about 10pc per year, and more recently the rate had increase to an average 23pc per year. In the natural gas sector, consumption has been steadily growing about 10pc per year, depending mainly on the availability of new supplies.

One breakthrough in the government's policy has been the granting of allowance for multinational companies to explore and produce petroleum in the country, on a production share basis with MOGE. Currently both onshore and offshore contracts are active, with results in discoveries of new oil and gas reserves. They include, onshore, Aphyauk Gas Field, Kyaukkwet Oil Field and Nyaungdon Gas Field and, offshore, Yadana, Sein and Padamya Gas Fields and the Yetagun Gas Field. "Myanmar should develop combined cycle power plants with the use of gas also," said one Japanese official at the seminar. Biomass energy demand and supply was almost stable over the 10 years to 1998, but has declined noticeably following the introduction of differential tariffs in that year.

Additional references

See above:'Electricity rates raised, subsidies for civil servants dropped' (AP: 15/05/06)<br/>'Special privileges alleged in electricity distribution system (NCGUB: 21/05/01)<br/>'Generation, distribution, consumption of electricity in Myanmar' (World Bank: 18/08/99)<br/>'Myanmar reels under huge electricity price hike' (AFP: 03/08/99)

#### SOFTWARE GROWTH BADLY IN NEED OF HUMAN TOUCH

Myanmar Times, 16/10/00. http://www.myanmar.gov.mm/myanmartimes/no33/software\_growth.htm

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Myanmar's computer business community is watching the global information technology (IT) industry expand at a phenomenal rate, and wanting a piece of the action. But the key issue confronting local efforts to find a niche in software development is – perhaps ironically – people.

"We are trying to establish a software industry in Myanmar," said U Thein Oo of ACE Data System. "There are many applications in the IT industry that are growing at an alarming rate. IT is a dominant industry on a global scale in terms of capital, labour and profit. We will be left behind unless we make a tremendous effort, now, to catch up with the world. Myanmar faces being left behind unless tremendous effort is made now "What we need is the human resources that will give us the capability to develop software," he said, adding that in his opinion there are currently no more than five proficient programmers in the country.

There is a reasonable level of interest and skill in program languages like Oracle, Java and Visual Basics but a shortfall in the attitude or quality consciousness that should accompany the technical know-how, he said – like recognising the importance of a job's timely completion. And the industry was not yet sufficiently well versed in applications like banking and tourism operations, he said.

But U Tun Thura Thet, MD of Myanmar Information Technology, believes the solution could be a simple matter of practice. "All that local software technicians need is to be in an environment where they will have exposure to developing such applications," he said. There are some firms here that focus on software development and they are perhaps in the best position to provide on-the-job training to newly-appointed technicians. Typically, those technicians have graduated from local computer science institutes that are not yet producing highly competent programmers. It takes a software firm about six months to train fresh graduates to proficiency. Analytical skills are also needed to develop application software for industries like banking and hotels.

Currently, local firms are using SQL server in Database and Visual Basis in programming languages. Other software like Java and C+ is also used, but rarely. Most programmers know software like Java, but their knowledge is insufficiently advanced for the development of application software for customers. "We co-operate with local institutions like the University of Computer Science to run a project when we fall short of programmers," said Tun Thura Thet.

Recently, a Japanese firm sought local operators here to co-operate on the domestic development of software. The project needed a workforce of about 50 people. It did not happen, but the Japanese firm at least put the idea of human resource development in the industry under the spotlight, said Tun Thura Thet. On the flipside of the coin, software development jobs in Myanmar are scarce – a situation which exacerbated the difficulty of producing experienced programmers. What might help overcome the problem, according to industry sources, would be the establishment of a taskforce to source expatriate trainers and projects, and to send local programmers to overseas training houses.

"According to my experience, very fluent programmers are not interested in training others," said Tun Thura Thet. What Myanmar also needs, industry players told Myanmar Times, is an efficient telecommunication infrastructure operated in conjunction with a counterpart like Japan. Last but not least, said observers, Myanmar should follow the lead of its very successful neighbour, India, and establish a software 'park' to replace isolated, scattered firms with a cohesive, geographically focused industry. Software parks in India and Malaysia, have been set up with government support through commercial tax breaks, 100pc foreign investment provision and power subsidies.

"It would be very fruitful if our government was able to create such a workable environment," said Tun Thura Thet. Another challenge faced by the local industry is access to the Internet, on which software is increasingly developed." Without having experience in operating the Internet, a programmer will not be able to prepare software applications to be used in the Net," said Tun Thura Thet. He cited the example of Hong Kong, where software houses have an apparently insatiable demand for well-versed programmers to create web pages.

# Additional references

See above: <u>'Homegrown software</u> industry struggles on' (MT: 12/03/07) 'Collaborate on contracts, <u>ICT sector</u> urged' (MT: 12/12/05) 'Electronics industry <u>spreading roots</u> in industrial sector' (NLM: 06/06/04)

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#### POWER PARTS PROVE LUCRATIVE BUSINESS FOR GUNKUL ENGINEERING

Myanmar Times, 28/08/00. www.myanmar.gov.mm/myanmartimes/no26/power\_pats.htm

Most Myanmar industry sectors have yet to fully recover from the losses sustained as a result of the mid-1997 economic downturn. But for some firms the damage was minor and now, with government infrastructure projects underway around the country, electrical and construction components suppliers are 241

among those faring well. The Thai-based Gunkul Engineering company has been doing business in Myanmar for four years, the last two of which has seen its reputation consolidate and its business grow.

"We sold US\$1 million worth of our products last year," said company representative Zeya Thura Mon. "It is expected that our sales revenue will climb to US\$2.5 million this year." Gunkul supplies and installs engineering equipment, mainly to power sub-stations. Its main client is MEPE, successful tenders for which provide half the firm's annual revenue.

Unsurprisingly, given its corporate roots, most of the company's materials come from Thailand, including its Tira-Thai transformers. "The Tira-Thai has been chosen because the other two big Thai transformer companies, Ekarat and ABB, have their agents here," Zeya Thura Mon said. It also imports components from Japan and European countries and sometimes, when Gunkul needs to keep its prices low to win a competitive tender, from India.

"We include isome Indian products like high-tension circuit breakers in our bids," Zeya Thura Mon said. "They meet the required standard and are cost-effective as well." But there is a knack to doing business with Indian firms, he said. "In a country where people negotiate over the price even when buying onions, we have to haggle over the price of a product with them. "They will initially ask for K10 when they are ready to sell a a third of the asking price."

Gunkul's main competitors in Myanmar are LG, Siemens and ABB. Zeya Thura Mon said the firm sought to gain the competitive edge by remaining a small, moving target. Ours is a small firm, so our overhead costs are much lower," he said. "And being a trading company, we need not stick to a particular product line. "We tender our bids offering different prices for different products in a package."

Offering diversified products with different costs, and being flexible on prices quoted, is an important strategy in winning contracts, he said. "Normally, we submit two bids with different price ranges. Products included in the higher bid usually come from the west, especially Germany. "Being in the business for the past four years, we can roughly estimate whether high-quality products will be sought for a certain project." The price given in the tender is not necessarily final and some negotiations take place before a deal is finally struck," he added. "We win bids the values of which range between \$100,000 and \$200,000. Bids with higher values, like millions, usually go to multinational corporations. But it is not true that price competitiveness is the sole factor in winning a bid."

"Sometimes high-quality products are sought for certain projects," Zeya Thura Mon said. A lack of marketing knowledge is foremost among the company's weaknesses as an industry player, he said. "I think that marketing skills of our staff should be developed. Training is given to all our staff including myself."

#### Addtional references

For Gunkul Engineering see company website: <u>http://www.gkmyanmar.com/privacy.html</u> and especially <u>http://www.gkmyanmar.com/group\_myanmar.html</u> Gunkul Power Systems deals with electrical transmission and distribution towers and lines and the installation and maintenance of electrical substations. A list of projects currently underway indicates the equipping of a number of substations and power lines for MEPE in various parts of the country.

#### NLM: 29/06/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070629.htm

A ceremony to sign a contract between MEPE and Gunkul Engineering Co Ltd was held at the Royal Kumutra Hotel, on 26 June. Those present included EPM No 2 Khin Maung Myint, EPM No 1 Zaw Min, D-G of the Dept of Electric Power Dr Thein Tun, MEPE MD Dr San Oo, EPSE MD Tin Aung and officials of Gunkul Co Ltd. Resident representative U Zeya Thura Mon of Gunkul Engineering Co Ltd spoke words of thanks. After signing the agreement, MD San Oo and Mr Gunkul exchanged documents.

#### MYANMAR'S TREMENDOUS POTENTIAL FOR ENERGY EXPORT

Myanmar Times, 12/06/00. http://www.myanmar.gov.mm/myanmartimes/no15/enormous\_potential.htm

Myanmar has tremendous potential for natural gas and renewable energy which is yet to be explored," said U Soe Myint, D-G of Energy Planning Dept. "In fact we have only developed one per cent of the hydroelectric power from our resources." He was chairing a two-day meeting of the Energy Co-operation Program of BIMST-EC regional grouping, and was hosting the group's Experts/Officials meeting in Yangon last week. U Soe Myint said the main objective of the meeting was to draw up a plan on energy sector co-operation and natural gas infrastructure development in the member nations.

BIMST-EC (Bangladesh, India, Myanmar, Sri Lanka, Thailand-Economic Co-operation) was formed in 1997 provide links in economic co-operation between South Asia and South East Asia. According to U Soe Myint special emphasis was given in the meeting to renewable energy projects, especially in the areas beyond the reach of conventional grid electricity and fossil fuel sources.

Asked about the possibilities for commercialising Myanmar's hydroelectric sources, U Soe Myint said that Myanmar would be in position to export hydropower to northeast India after a proposed project expected to cost in the area of US\$1 billion could be substantiated. "In five years' time we could be ready, he said. Rajendra K Pachauri, an expert from the New Delhi-based Teri group said he was impressed by the project under consideration. "This is very exciting prospect," he said. "There is enormous potential for Myanmar and India on energy generation.

U Soe Myint pointed to three-hydropower projects currently underway in Myanmar for exporting to Thailand soon. He also spoke about Myanmar's ongoing natural gas exporting project and the forthcoming deal with Thailand for exporting Myanmar natural gas from the Yedagun well. "Since 1998 we have been exporting to Thailand a total of 525 million cubic feet of natural gas per day," he said, "and we are expecting to export another 200 million cubic feet per day to Thailand from the Yedagun well," he said. Mr Pachauri also spoke on the possibilities of building an undersea gas pipeline, for exporting Myanmar's natural gas to India. India, he said, needs more natural gas for its domestic and industrial use.

The meeting approved a range of issues, including the setting up of a task force for improving natural gas infrastructure, setting up of a BIMST-EC web page and the establishment of an energy information sector in Myanmar. All initiatives will be put up at next month's ministerial meeting of the group.

#### Additional references

See above:'Myanmar, Thailand begin work on controversial Tasang dam' (AFP: 05/04/07)<br/>'Plans for Htamanthi dam project on Chindwin near finalization (MT: 28/08/06)<br/>'Tribe's home to be a valley of the dammed' (London Times: 22/03/06)<br/>'Hydropower Dept and EGAT ink agreement on Hutgyi project (NLM: 10/12/05)<br/>'Power purchase deal between Thailand and Burma on the way' (Nation: 27/05/97)

CHRONOLOGY OF THE CANCELED <u>LIGNITE POWER PLANT</u> AT TACHILEK

NLM, 10/05/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n000510.htm

Vice-Chairman of the State Peace and Development Council Deputy Commander-in-Chief of Defence Services Commander-in-Chief (Army) General Maung Aye attended the cornerstone laying ceremony of a coal-fired power station to be built by Golden Triangle Hydro Electric Power Pte Ltd under Mayflower Group in Tachilek this morning (09/05/00). At the auspicious time, SPDC Secretary No 2 Lt-Gen Tin Oo laid the foundation and sprinkled scented water on it. Secretary No 2 laid the gem casket and stone plaque and sprinkled scented water over it. Minister Maj-Gen Tin Htut unveiled the stone plaque. Afterwards, General Maung Aye performed rituals of golden and silver showers to mark the ceremony.

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Commander Maj-Gen Thein Sein, Minister Maj-Gen Tin Htut and Chairman U Kyaw Win reported on the construction of the power station. General Maung Aye gave instructions. The 12-megawatt coal-fired power station will be built on 24.42 acres of land on the bank of Maikhaungno Creek, 1.5 miles north of Tachilek. The station will generate more power than the township needs and it will also supply power to Tachilek and

its environs. It will cost over K 2 billion including more than six million [dollars for equipment purchased from a foreign country].

## Additional references

See above: 'Troubled history of <u>power supply at Tachilek</u>' (Shan Herald: 25/08/06)

Items below without a URL up to the middle of June 2001 are taken from a special edition of Rebound 88 devoted to Thai opposition to the lignite power plant project. The news items have been edited for clarity and abbreviated. For complete details consult the original version. <u>www.rebound88.net/sp/ngb/sthai54.html</u>

01/08/00: Nakhon Chiang Rai newspaper headlines the Burmese lignite power plant project, identifying it as a heavily toxic threat to the conomy of Mae Sai, the Thai border town a few kilometres south of Tachilek. The paper says the lignite power plant will adapt the most recent Chinese technology. Chinese engineers are quoted as saying that the plant will not create dust or emit acid. Water from the cooling system, the paper says, can be sold in the market as drinking grade water. But the paper also quotes a lignite expert who says a lignite-fired power plant needs the most recent technology to be truly clean. He does not believe that the Chinese technology is as advanced as that which is being used in Europe, which costs much more and requires highly expert engineers. The expert says the plant will emit dust and residents of Mae Sai will suffer, particularly in the winter. Authorities, he says, should meet to discuss ways to preserve not only the environment but also international relationships. The plant's lignite source will be a mine in Mong Hpayak, 100 kms north of Tachilek. The expert says the lignite mine at Mong Hpayak was surveyed by a Thai private company and inspected by Chiang Mai University experts. Their reports indicate that some of the lignite will provide unstable heat, while some of the lignite can provide from 3,000 to 4,000 kcal/kg. The news does not attract much attention in Mae Sai.

30/08/00: A minority of Mae Sai residents is aware of the power plant's specifications. However, several residents from different walks of life meet to discuss the pros and cons of the project. They agree to name their association the Rak Mae Sai Group (Love Mae Sai Group). The group remains unsure of the project and agrees to wait until the generators are transported by road through the Mae Sai district.

01/09/00: In its first edition, the local fortnightly paper Siang Seriphap (Independence News) headlines Burma's promise that the lignite power plant is pollution-free. The paper says Mae Sai residents fear the project will degrade the environment, as well as tourism and trade at the border. The project's engineers are quoted as saying that a device will clean the smoke of its sulfur dioxide content down to 0.01pc and release it through a 80-metre high chimney. They say [the ash] will be kept for use in a future cement plant. Chinese engineers claim that while the Mae Moh lignite power plant in Thailand can produce 2,625 megawatts of electricity from its 13 plants with 13 chimneys, Tachilek's plant will produce 12 megawatts from one plant with one chimney. They claim that pollution at Tachilek will be negligible.

05/09/00: The Rak Mae Sai Group meets and agrees to inform the district why a protest is in order. They will highlight the possible environmental effects of the project. They agree to meet at Baan Sob Kok School, where residents have suffered sulfur dioxide emissions from tobacco drying kilns.

10/02/01: Following several rounds of mortar fire from Tachilek landing in the Mae Sai market, authorities close the Mae Sai border pass. The mortar fire came from a Burmese military operation against positions near the border occupied by a dissident Shan ethnic army.

19/04/01: Word spreads around Mae Sai district that trailer trucks carrying containers filled with the Chinesemade coal power generators and equipment for the Tachilek lignite-fuel power plant are arriving. Members of the Rak Mae Sai group agree to stop the trucks from entering Tachilek.

20/04/01: Early in the morning on Phaholyothin Highway, a two-kilometre long convoy of trucks carrying 44 containers lines up, stretching all the way from the Wiang Phang Kham tobacco drying kilns to Baan Pa Mhuad School in Tambon Wiang Phang Kham. Later in the morning, the Pha Muang Military Task Force of the Thai army orders the convoy to move to a golf driving range at Baan Nam Jam in Mae Sai. Meanwhile, the Mae Sai Conservation Group and about 1,000 residents rally at the Sai River Bridge, which links Tachilek

and Mae Sai. In the afternoon, Chiang Rai governor Samrerng Boonyopakorn and Mae Sai district chief Decha Sathaphol arrive at the bridge. The governor tells the protesters that the Thai government will never allow the power generators and equipment into Burma. The protesters move to Baan Nam Jam, where the convoy is parked.

Nation (Bangkok): 23/04/01 [http://www.ibiblio.org/obl/docs/SW10.htm]

Thailand's PM Thaksin Shinawatra expresses concern over the planned lignite power plant in Burma's border town of Tachilek, says it will be detrimental to the environment in both countries if Rangoon goes through with the plan. Thailand will raise the issue with the Burmese government but Thaksin dismisses suggestions the incident will further strain already tense bilateral ties following cross-border shelling between the two countries' armies in February. The premier's statement comes a day after he ordered 44 containers of equipment heading for the power plant to return to a pier in Samut Prakarn's Pappadaeng district to be shipped back to China. Local residents in Mae Sai district had threatened to burn the 44 containers parked just kilometres away from the Mae Sai-Tachilek border crossing. Many villagers, still upset over cross-border shelling in their area two months ago, have called on authorities to open the containers, which they suspect of containing precursor chemicals bound for clandestine methamphetamine drug labs belonging to a Wa armed group. Pang Pholchai, a leading environmentalist in Chiang Rai, says local residents are stepping up their campaign against the planned power plant and called on the government to intervene on their behalf. Third Army deputy commander Maj-Gen Chamlong Phothong has compared the planned power plant to the one in Lampand's Mae Moh district, where hundreds of local villagers have been admitted to hospital over the years after being exposed to pollution generated by the plant. Pang says the planned 24-megawatt Burmese plant would need to be 80 kilometres from the border to be considered safe for Mae Sai residents. Its current location would be too close for comfort, especially in the cold season when the wind blew from Burma to Thailand.

24/04/01: The Rak Mae Sai Group meets and agrees that any sulfur dioxide emissions will fall on Mae Sai and Mae Chan districts. A member of the group says that over 50 million baht has been spent on the plant's construction. If the generator equipment gets through, any protest will be useless.

27/04/01: Leaders of the Rak Mae Sai Group hand over the signatures of Mae Sai residents to Thai PM Thasksin Shinawatra and other relevant ministers at Government House, calling on the Burmese government to relocate the project away from community areas in both countries.

01/05/01: MP Ithidej writes to ask MP Sermsak Karun, chairman of the extraordinary House committee studying problems along the Thai border, asking him to look into the problems of the lignite-fired power plant in Tachilek.

08/05/01: Posters and banners are hung along a two-kilometre stretch of Phaholyothin Road leading to the Sai River Bridge. The banners attack the lignite power plant and ask the government to look into its effects on Mae Sai residents.

25-26/05/01: The extraordinary House committee of the Thai Parliament arrives in Mae Sai on a fact-finding mission.

29/05/01: Over 500 Mae Sai residents attend a meeting in the district to discuss the effects of the lignite power plant and work out what to do if Burma permanently closes the border.

19/06/01: The Mae Sai border remains closed despite reports that Burmese authorities will reopen it following Premier Thaksin's state visit to Burma.

Nation (Bangkok), 25/06/01. <u>http://www.ibiblio.org/obl/reg.burma/archives/200106/msg00095.html</u> Thai-Burma border at Tachilek re-opens following a conciliatory visit to Rangoon and meeting with General Than Shwe by Thai PM Thaksin Shinawatra. Mae Sai residents are delighted at border reopening but some continue to worry about the building of the lignite power station. Prapan Srivichai of the Rak Mae Sai Group urges that the station be moved at least 80 kilometres away. "We're not against the reopening of borders, but we'd like negotiations on the power station to proceed for the safety of Mae Sai residents."

#### Bangkok Post, 22/11/01. [not available on-line]

Thai Defence Minister Chavalit Yongchaiyudh has backed China's request for Thailand to allow the shipment of power generators through Mae Sai district to Burma. The generator parts are intended for a lignitepowered electricity generating plant in the Burmese border town of Tachilek. China and Burma have made several requests for the shipment of parts via the Mae Sai border checkpoint. Both confirm the power plant will not cause any adverse environmental impact on the Thai border. Officials sent by Chavalit to inspect the plant found that old technologies were already replaced with new ones. According to the Defence Minister it is difficult to block the shipment from crossing the border since the Mae Sai checkpoint has been reopened. A meeting of the National Security Council has been called to discuss China's request.

Theerawat Khamthita, Bangkok Post, 28/11/01. <u>http://rebound88.tripod.com/01/nov/28.html#story7</u>

The Rak Mae Sai group wants PM Thaksin Shinawatra to convince Burma to scrap the planned coal-fired power plant on the border or take responsibility for the environmental consequences. Burma has reportedly sent a letter to the Thai Foreign Ministry saying the contractor guarantees the generators meet international industrial standards. Thai Pollution Control Department chief Sirithan Pairojbariboon says checks found the generators used newer technology than the Mae Moh plant. Since the plant at Tachilek would be 200 times smaller than the one at Mae Moh, the environmental effects will be minimal. The Thai government may opt to ask Burma to move the plant 30km away from the border.

Nation (Bangkok), 20/12 01. www.burmalibrary.org/TinKyi/archives/2001-12/msq00008.html

Mae Sai conservationists express surprise at reports the Burmese military junta has ordered a halt to the construction of a lignite power plant in Tachilek. The Tachilek commander say the SPDC gave no clear reason for the order, but construction of the almost-completed plant has stopped. It is unclear whether the order will close the power plant permanently. The controversial lignite power electrical plant is at the core of a conflict between local residents in Mae Sai and Burmese authorities in Tachilek over fears about pollution from the plant. In April, an environmentalist group, Rak Mae Sai, organised a series of protests to oppose the construction. Transportation of equipment from China via Thai soil has been halted since then. The conflict then moved to the construction site - about five kilometres from the Thai border - in November. The group is insisting the power plant be moved at least 50 kilometres from the Thai border, and that compensation be paid if the plant pollutes Mae Sai. A Thai official says the latest move signals that the Burmese junta wants good relations with Thailand.

Platts Myanmar Country Energy Profile. [mid-2007]. For access information, see Power Profile

In May 2000, the cornerstone was laid for what was to be Myanmar's first coal-fired power plant, a 12-MW facility near the border town of Tachilek, in eastern Shan state. The \$6.25 million plant was promoted by Golden Triangle Hydro Electric Power Pte Ltd, an affiliate or subsidiary of Myanmar's Mayflower Group which in turn is (or was) one of the country's most prominent private-sector financial and industrial groups. The site is on the bank of Maikhaungno Creek, about 2 km north of Tachilek and two 6-MW generating units with Chinese equipment were specified. In April 2001, the construction work was interrupted by Thai protests over the plant's environmental impacts and 44 containers of plant equipment were ordered returned to the docks at the Thai port of Samut Prakarn to be shipped back to China. In May 2004, Mayflower's banking operation was placed under restriction due to allegations of money laundering and other improprieties, although it is not known what if any impact this may have had on the power project. The current status of the Tachileik power project is obscure.

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#### ZAUNGTU HYDROELECTRIC PLANT OPENED ON UPPER BAGO RIVER

NLM, 23/03/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n000323.htm#(4)

Zaungtu dam and hydel power plant, newly built by the EPM on the Bago river near Taikkyi village in Bago township was inaugurated on 22/03/00. The inauguration was attended by SPDC Secretary No 2 Tin Oo, various ministers, officers, officials, D-G Yang Shu Wei of the Yunnan Bureau of Machinery Building Industry, and the YMEC Chairman Lin Zayou, and officials. Ltr-Gen Tin Oo presented gifts to YMEC personnel through Project Engineer Zhang Ning, to MD Tae-Chul Shin who provided machinery for the earth work, and to Chief Engineer San Oo and officials of MEPE.

Zaungtu Dam is 5,896 feet long and 147 feet high The catchment, area of the dam is 330,000 acre feet. It can irrigate 36,250 acres of land. Two 10-MW generators are installed al the hydel power plant. It can generate 76.3 million kWh a year. It was built at a cost of over K4.3 billion.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-09: Pegu Zaungtu dam, near Dawe village [17° 45' N, 96° 14' E], grid square reference: 8\5, 25\5 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-9.jpg</u> The dam barrier and large reservoir are clearly visible on Googe Earth.

**Compiler's note**: A good photo of the exterior of the Zaungtu plant is included in an article on page 11 of the 11/10/07 print edition of the NLM. <u>http://myanmargeneva.org/NLM2007/eng/10oct/n071011.pdf</u>

#### Additional references

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In March 2000, the EPM completed the 20-MW Zaungtu hydro project in Bago division, 100km from Yangon. The multipurpose project on the Bago River was built under a contract dating from December 1994 between YMEC and EPM. YMEC provided all machinery and engineering services while EPM took responsibility for civil works.

U Zaw, NLM, 14/10/01 http://www.myanmar.gov.mm/Article/Article2001/Oct/oct14.html On 8 October, I again had a chance of visiting the Zaungtu hydro-electric plant together with SPDC Secretary No 3 Win Myint and ministers who went there in connection with the establishment of a pulp factory in the dam area. When MEPE began work on the Zaung dam in 1993, twenty years had passed since the building of the Moebye dam and Lawpita No 2 hydro-electric plant, the only other project it had undertaken. At the time MEPE did not have technicians with experience in building dams and sufficient machinery. So it had to strengthen its staff and collect machinery. Construction of the dams at the Hsedawgyi and Kinda hydroelectric power projects in the 1980s was undertaken by the ID, although MEPE was responsible for building the hydro-electric plants. The area in Bago township where the Zaungtu project was implemented was difficult of access. Because rainfall in the area is over one hundred inches a year, it was inundated during the rainy season and the only mode of transport was by river. The Phayagyi-Bawnatgyi-Zeedaw-Zaungtu-Taikkyi motor road leading to the project was built with great difficulty with the co-operation of division, district and township authorities and the Tatmadaw. Construction of the dam was a mammoth task. High technology was required to build the power plant. At the opening ceremony, Lt-Gen Tin Oo said, "The emergence of the Zaungtu multipurpose project has brought about the taming of Bago river, the currents of which are very wild during the rainy season. This is not only a hydroelectric project but one that will supply water for agriculture and prevent cities, villages and cultivated lands from flooding." There are two 10-MW turbines at Zaungtu station and water is being supplied to over 36,000 acres through the Zaungtu diversion weir. The building of the dam has also brought about convenient transport along Bago river. It is said that the annual volume of water flowing in the river is about 6.5 million acre-feet. Zaungtu dam can catch only five percent of the total water volume. The annual total volume of water flowing along the rivers in the nation including the Ayeyawady, the Chindwin, the Thanlwin and the Sittaung is over 870 million acre-feet. According to a survey, 40,000 MW could be generated at 267 different places. At present only about 400 MW are being generated by hydroelectric plants. The Zaungtu project alone cost about K 4,357 million including foreign exchange and it took about six years to complete the project. Efforts are now being made to complete the Paunglaung, Monchaung and Thaphanseik projects.

Yunnan Machinery (I&E) Co Ltd, [n.d.]. <u>http://www.ymec.com.cn/en/hpp/Project\_zd.htm</u> A picture of the exterior of the Zaungtu hydropower station is available on this site.

#### Reuters, 23/03/00. [not available on-line]

Myanmar has opened a new 20-MW hydroelectricity plant, bringing the country's power supply to 750 MW, officials said. The plant in Bago township is about 95 miles (150 km) north of Yangon. Implementation of the project began in January 1994, and it cost a total of US\$21.21 million plus K4,300 million (\$13.23 million). Equipment for the plant was imported from China. Myanmar's electricity supply has increased from 400 MW in 1988. But the official said only 15pc of Myanmar's population of more than 48 million had access

to electricity. Myanmar has only harnessed about one percent of its total hydropower potential. Three major hydropower projects are due to be completed over the next two to three years, adding another 385 MW.

WPD, 06,07/04/93. <u>http://www.ibiblio.org/obl/docs3/BPS93-04.pdf</u> Work on the Zaungtu hydro-electric project and dam was launched together with the inauguration of the related 39-mile Bawnatkyi-Zaungtu-Taikkyi road on 15/03/93. The project, which will generate 5 MW and irrigate 30,000 acres, is 36 miles north of Bago.

WPD, 14,23/03/93. <u>http://www.ibiblio.org/obl/docs3/BPS93-03.pdf</u> Reference to an article by Soe Myat on the Zaungtu hydro-electric power station, a new project in Bago division.

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## <u>Start 00</u>

## ZAWGYI NO 2 HYDROPOWER STATION LAUNCHED

NLM, 17/03/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n000317.htm

Zawgyi hydel power station No 2 in Yaksauk [Lawsawk] township was commissioned into service with an address by SPDC Secretary No 2 Tin Oo. The power station is connected to the Zawgyi dam which is located about 28 miles north of Yaksauk town.

There are now three hydel power plants on Zawgyi Creek. The first, Tatkyi station, is located about five miles north-east of Yaksauk. It can generate about one megawatt of electricity. The second, known as No 1 Zawgyi hydel power station, also in Yaksauk township can generate about 18 MW. The power generated by these stations is supplied to the Taunggyi region through the national power grid. Power generation by No 2 station will depend on the amount of water to be released for irrigation. The project gives priority to agriculture.

Lt-Gen Tin Oo said that dams have been built for irrigation purposes on Zawgyi creek since King Anawrahta's time. The creek originates in Shan state and flows through Kyaukse district before emptying into the Ayeyawaddy. Zawgyi Dam will supply water to crops on 11,000 acres year round, but if all acreage of mixed crops is counted, a total of 170,000 acres is being irrigated. The dam will add an additional 8,000 acres and supply power.

EPM Tin Htut said that Zawgyi No 2 is the 14th power station built in Shan state. The intake structure, filter, sluices, pressurized steel pipes and related facilities were bought from YMEC and the turbines, generators and other machinery from the China Shanghai Corp for Foreign Economic and Technological Co-operation (SFECO) of the PRC under contracts. The entire project was completed in October 1998 when test runs began. Zawgyi No 2 station is Installed with two 6-MW turbines. The station can generate 30 million kilowatt-hours of electricity annually. Power generated from Zawgyi hydel power station No 2 will be supplied to the national grid together with that generated by No 1 Zawgyi plant through a 17-mile 66 kV line. The earthen dam is 2.550 feet long and 145 feet high. The estimated cost of the project was US\$18 million plus K493.3 million. But the actual cost of US\$10.1 million plus K51.41 million was less than the targeted amount.

Minister Tin Htut and SFECO Chairman Li Shun Shan formally launched the power station.

**Topographic map references**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-09: Mandalay Zawgyi No 1 power station, near Monhaing [21° 23' N, 96° 54' E], grid sq ref: 12\9, 26\4 [?] Zawgyi No 2 dam and power station, near Indaw [21° 32' N, 96° 53' E], grid sq ref: 13/1, 26\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-9.jpg</u>

The sluice gate of the Zawgyi dam at Indaw is visible on Google Earth at 21° 34' N, 96° 52' E as well as the large reservoir.

#### Additional references

See above: <u>'Myogyi multi-purpose dam</u> to harness waters of the Zawgyi' (NLM: 25/12/06)

NLM, 30/11/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071130.htm

D-G Aung Koe Shwe of HPID and Pres Feng Ke of YMEC of the PRC for the purchase of materials neede for the implementation of Zawgyi No 1, Dattawgyaing and Wetwun hydropower projects. The equipment purchased will allow for the projects to proceed on time.

NLM, 06/11/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061106.htm</u> EPM No 1 Zaw Min receives Chairman Feng Ke of YMEC at Wharton International Hotel in Nanning on 29 October. They discuss matters related to Shweli No 1, Upper Paunglaung, Nancho, Wetwun, Dattawgyaing and Zawgyi No 1 hydel power plants.

NLM, 16/10/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061019.htm

Eastern Commander Thaung Aye oversees functions of Tatgyi hydel power plant, then goes on to No 1 and No 2 Zawgyi plant. He checks on the maintenance and supply of power of the power plants and water facilities at Zawgyi dam. No 1 station has three 6-MW generators and No 2 station has two 6-MW generators. No 2 Zawgyi plant is supplying power to Yaksawk township and Bahtoo station. Zawgyi dam is irrigating Meiktila and Kyaukse regions for agricultural purposes.

NLM, 23/09/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060923.htm

Kengkham multi-purpose dam project will be implemented on Namat creek near Kengkham village in Yaksawk [Lawsawk] township. It will generate 6 MW and store water so that the Zawgyi dam can generate more electricity. Moreover, the water supplied by Kengkham dam, will enable the Myogyi dam, presently under construction, to generate about 30 MW and provide 990,000 acres feet of water for the greening of the Meikhtila plains. **Compiler's note**: It would appear that this represents an ambitious plan to divert water from the Nam Et in the Myitnge watershed to the Zawgyi dam at Indaw. See Google Earth for the location of Kengkham on the Nam Et and its proximity to the Zawgyi reservoir.

NLM, 09/05/04. http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040509.htm

General Maung Aye and party inspect Zawgyi hydroelectric power plant in Yaksawk township. EPM Tin Htut reports on the annual generating capacity at the plant. Gen Maung Aye responds that the two functions of Zawgyi dam, that of supplying water for agricultural purpose and of generating electricity need to be well co-ordinated.

Yunnan Machinery (I&E) Co Ltd <u>http://www.ymec.com.cn/en/hpp/Project\_zj.htm</u> A picture of the exterior of Zawgyi No 2 hydropower station is available on this website.

NLM, 16/06/99. www.myanmargeneva.org/99nlm/n990516.htm

Gen Maung Aye and SPDC Secretary No 2 Tin Oo visit the Zawgyi reservoir and power station in Indaw village. EPM Tin Htut and Project Manager U Ba Si report on progress. Zawgyi reservoir hydroelectric power project is being implemented for irrigation and power generation. Station No 2 will have two 6-MW turbines. Operations at Zawgyi Station No 1 started up in October 1998. It is supplying power to Aungthabye sub-power station.

NLM, 16/08/98. http://www.myanmargeneva.org/98nlm/n980816.htm

Gen Maung Aye and SPDC Sec'y No 2 Tin Oo inspect Zawgyi hydel power project in Yaksauk [Lawksawk] township. The project is being implemented by MEPE near Indaw Village, 28 miles north of Yaksauk town on Zawgyi creek. They view the installation of machinery and construction of the control room and main station. A fruit basket is presented to Zhang Jiming for the technicians of the Shanghai Co who are engaged on the project. Zawgyi dam was commissioned in May 1997. The hydel power project, will generate 30 million kWh of electricity annually. Efforts are being made to complete the hydel power project in September.

#### NLM, 25-06-95. [not available on-line]

Gen Maung Aye inspects Zawgyi hydro-electric power project, 18 km north of Lawksawk. It is the largest hydro project ever undertaken by MEPE.

NLM, 20/02/94. www.ibiblio.org/obl/docs3/BPS94-02.pdf

Zawgyi creek area is to become brilliant with light, according to an article on the hydroelectric project north of Lawksawk in Shan state by Lwin Hein Aung.

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#### COMBINED CYCLE POWER PLANT IN AHLON TOWNSHIP OPENED

MIC, 15/09/99. [not available on-line]

The combined cycle power plant (Ahlon) of MEPE was commissioned into service on 14 September. The ministry is building more natural-gas-powered plants, hydel power plants and combined cycle power plants to meet the nation's growing power demand. Power consumption at present is 750 MW, up over 200pc from 330 MW in 1988. Plans are being laid for more power projects as indicated by a rise in power comsumption.

The EPM reached an agreement with Marubeni Corp on 24 March 1997 to install two combined cycle power plants, each with 54-MW capacity, at Ahlon and Hlawga. The combined cycle power plants do not need to burn extra fuel but generate power by recycling waste heat from nearby gas-powered plants.

The combined efforts of Myanmar, Japanese and German engineers made it possible to complete the building of the plant and installation of machinery by 31 July 1999, three months ahead of the targeted date in October 1999. Test -run of the plant was completed in August and the plant started to supply power to the national grid on 1 September 1999. The initial cost estimate of the project was US\$27.71 million and K680 million. The actual cost in local currency was K649.77 million.

Senior MD Tadashi Nishio of Marubeni Corp which supplied the machinery explained matters related to the plant. It use waste heat from three 33-MW gas-fired turbines at the Ahlon station which is generating 350 million kWh of electricity annually.

**Compiler's note**: A slightly different version of this article was published in NLM on 15/09/99 and is available at <u>www.burmalibrary.org/NLM/archives/1999-09/msg00014.html</u>

#### Additional references

NLM, 22/08/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070822.htm

One of three natural gas-powered turbines at the Ahlon station broke down. In spite of this the station has received over 10 million cu ft of natural gas and generated 40 MW. Experts will be involved in repairing the turbine.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u>. In May [September?] 1999, EPM inaugurated a 50-MW steam set at the Ahlone combined-cycle plant. The steam cycle equipment was built by Marubeni Corp under a contract signed in March 1997. Two HRSGs of NEM design built by Kawasaki Heavy Industries are installed along with a turbine from ABB, each string behind three Frame 6B machines supplied in 1996 by European Gas Turbines.

NLM, 26/04/05. http://www.myanmar.gov.mm/Article/Article2005/April05/April26a.htm

NLM, 27/04/05. http://www.myanmar.gov.mm/Article/Article2005/April05/April27a.htm

Myanmar launched its first-ever drive to distribute electricity to the people in the post-independence period with the use of two coal-fired power plants — a coal-fired power plant (30 MW) in Yangon [Ahlon], and the other in Ywama. The turbines could generate 10 MW each.

## Myanmar Times, 23/09/02. [not available on-line]

Repairs to transformers at Ahlon power station will result in another 100 MW being available to Yangon from 02/09/02. Six downtown townships: Botataung, Kyauktada, Lanmadaw, Latha, Pabedan and Pazundaung have been receiving uninterrupted supply since 18/09/02.

MyaBuzz: 16/09/99 [not available on-line]

Marubeni Corporation, Kawasaki Heavy Industry of Japan and ABB of Germany contributed machinery and technical assistance for the new power plant inaugurated in Yangon's Ahlone district 14/09/99.

Kawasaki Plant Systems, [undated]. <u>www.khi.co.jp/kplant/english/products/PowerPlant/01.html</u> In 1997 Kawasaki was awarded a turnkey contract to install an F6-3 GE steam turbine as a combined cyle add-on to MEPE's natural gas turbine plant at Ahlone [in Yangon]. The contract was completed in 1999 raising the total installed capacity at plant to 154 MW.

NLM, 14/04/95. <u>http://www.ibiblio.org/obl/docs3/BPS95-04.pdf</u> [document, p 89] Two natural gas-powered generators, with a capacity of 66 MW, built at a cost of K 437.3 million by MEPE, were inaugurated in Ahlon township. They will supply power to the Yangon grid.

NLM, 21/10/94. <u>http://www.ibiblio.org/obl/docs3/BPS94-10.pdf</u> [document, p 24] An agreement was signed by MEPE MD Thaung Sein and M. Bernard Mouzimannof European Gas Turbines of France. The latter will the machinery for the 100-MW power plant near the main power sub-station in Yangon. It will be built in seven months and go on line in May 1995.

NLM, 10/06/94. <u>http://www.ibiblio.org/obl/docs3/BPS94-06.pdf</u> [document, p.29] A contract was signed between MEPE and European Gas Turbines SA (GEC Alsthom) of France represented by Richard Bergart, for the import of equipment for three 33-megawatt gas turbines to be built in Ahlon Power Station. They will use natural gas from the Aphyauk gas field, and go on line in December. Another 100 megawatt power station will be built later.

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## COMBINED CYCLE POWER PLANT LAUNCHED AT HLAWGA

Reuters, 02/05/99. http://www.burmalibrary.org/reg.burma/archives/199905/msg00047.html

Myanmar's EPM has launched a \$28.3 million joint-venture thermal power plant in an effort to ease the country's acute power shortage. The official Myanmar News Agency said the 54-MW combined cycle power plant at Hlawga, 20 km (12 miles) north of the capital Yangon, was inaugurated on Saturday by EPM Tin Htut. Japan's Marubeni Corp built the plant.

MNA quoted Tin Htut as saying Myanmar's current daily power consumption had reached 750 MW against 330 MW in 1988. He said the country's existing eight natural gas power stations and six hydro-electric plants were producing a combined 680 MW a day.

Myanmar's power shortage, aggravated by reduced water levels in hydro-electric dams, has forced Yangon to ration power, and the capital's residents have received an average of 10 hours of electricity daily over the past year.

#### Additional references

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u>. In May 1999, MEPE inaugurated a 50-MW steam set at the Hlawga combined-cycle plant. The steam cycle equipment was built by Marubeni Corp under a contract signed in March 1997. Two HRSGs of NEM design built by Kawasaki Heavy Industries are installed along with a turbine from ABB, each string behind three Frame 6B machines supplied in 1996 by European Gas Turbines.

NLM, 08/05/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070508.htm

Chief Engineer U Nyunt Aung briefs EPM No. 2 on conversion of UXL MOPS System of Boiler Control to Centum CS 3000 System at the Hlawga power station. Station Manager Thein Zaw reports on collection of gas, the running of the station at full capacity and supply of power.

NLM, 04/01/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070104.htm

At Hlawga gas turbine factory, the manager briefs EPM No 2 on natural gas, generation of electric power, and consumption of electricity. Deputy Chief Engineer Nyo Win of YESB reports on requirements of

electricity at No 3 Steel Mill, and Chief Engineer Tun Aye on the supply of power through the 66kV power line from Hlawga gas turbine and the 33kV power line from Ywama power station. No 3 Steel Mill Manager Col Tin Soe reports on supply of electricity for iron casting.

NLM, 04/08/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060804.htm

EPM No. 2 is briefed on power supply and decline in voltage by MD San Oo of MEPE at Hlawga Sub-power Station. Maintenance tasks underway at Bank 1 transformer of the gas turbine, Work on the new 230-kV Thakayta-Thanlyin power line is ongoing, as well as the extension of the 66-kV line in the switching yard of the gas turbine.

Myanmar Times, 23/09/02. [not available on-line]

A new supply of natural gas to the Hlawga power station in Mindalardon township has enabled it to increase output to 100 MW. This means the Hlawga plant will no longer have to rely on diesel to generate power. The pipeline has doubled the amount of gas supplied to the city. It is connected to line which carries gas from the Yadana field to Thailand at Kanbauk in Tanintharyi division. The pipeline extends to Kyaukse, where it supplies natural gas to a number of industrial projects. The decision to increase gas supplies to Yangon followed an agreement between the ministries of energy and electric power aimed at improving the power supply in the capital. Four generating plants that serve Yangon are equipped with a total nine gas-powered turbines that can produce 260 MW.

Myanmar Times, 16/09/02. [not available on-line]

Up to the present the Hlawga power plant has been supplied with natural gas piped from the Apyauk field discovered in 1993.

Kawasaki Plant Systems, [undated]. <u>www.khi.co.jp/kplant/english/products/PowerPlant/01.html</u> In 1997 Kawasaki was awarded a turnkey contract to install an F6-3 GE steam turbine as a combined cycle add-on to MEPE's natural gas turbine plant at Hlawga. The contract was completed in 1999 raising the total installed capacity at plant to 154 MW.

NLM, 23/01/96. <u>http://www.ibiblio.org/obl/docs3/BPS96-01.pdf</u> [document, p 39] Gen Than Shwe attended the commissioning of the Hlawga natural gas power station. The station, built by European Gas Turbines (GEC Alsthom) of France, was completed in 10 months at a total cost of K430 million. The two turbines installed will provide 66 MW to the Yangon and national power grids. A third turbine will be completed by February 15th. Myanmar's annual power consumption has been rising by 15-20pc a year.

# GENERATION, DISTRIBUTION, CONSUMPTION OF <u>ELECTRICITY IN MYANMAR</u>

World Bank, Myanmar: An Economic and Social Assessment (Draft version), 18/08/99, pp 100 – 103.

The power sector comes under the EPM. MEPE, a state enterprise, has a legal monopoly on all aspects of the business. Supply is severely constrained resulting in significant load shedding and requiring most investors to provide their own electricity generating facilities. Prices have been increased recently in an effort to better manage demand. Only about 20pc of the population has access to electricity, according to MEPE. This may be overstated, however, since MEPE has only one million customers. Even if one were use an average household size of six, no more than 12.5% of the population would have electric power in their homes. Most customers are metered, and MEPE estimates that only about 25pc of the meters are seriously defective. This compares favorably with the situation in most parts of Africa and South Asia where meters are comparatively rare and those that are in place do not work.

Drought hit electricity generation hard in 1998/99 and hydro output was almost cut in half compared with the previous year. Consumption was flat, however; according to MEPE aggressive action was taken to stem losses. Unit costs are low, due to low marginal costs of running hydro and cheap gas; but prices are even lower, and the big difference between the two in 1998/99 is due to increased diesel purchases. MEPE results should improve this fiscal year as they get the full benefit of the significant tariff increase.

	4004/05	4005/00	4000/07	4007/00	4000/00
	1994/95	1995/96	1996/97	1997/98	1998/99
Generation	3,632	3,763	4,130	4,834	4,107
(millions of kWh)					
- Hydroelectricity	1,659	1,596	1,622	1,700	902
- Steam	79	63	59	215	229
- Gas	1,852	2,061	2,409	2,866	2,922
- Diesel	42	43	40	53	54
Consumption	2,258	2,325	2,532	2,788	2,722
(millions of kWh)					
Domestic	983	972	1,089	1,206	1,119
Industrial	863	876	876	914	949
Hospitals, offices	302	340	393	473	511
schools					
Other	70	74	76	83	89
Departmental Use	40	63	98	112	104
Losses	1,374	1,438	1,598	2,046	1,335
(millions of kWh)					
Losses (percentage	37.8	38.2	38.7	42.3	32.5
Unit sales price	0.92	1.28	1.31	1.38	1.48
(K per kWh)					
Unit cost (K per kWh)	0.61	0.78	0.83	1.22	2.07

## Table 6.4 Generation, Consumption and Losses of Electricity, 1994/95 to 1998/99

Source: Department of Electric Power

Over half of MEPE's installed capacity is gas-fired, although shortages of gas have forced MEPE to use more expensive liquid fuels in recent years. Peak demand hit about 750 MW in 1998/99 when drought reduced available hydro-electric capacity. As a result, the strain on MEPE's facilities has increased significantly. Several measures have been taken to re-balance the system. MEPE will commission two new 54-MW combined cycle gas turbines in 1999. More importantly, as of 1 March 1999, MEPE raised its top rates from K2.5/kWh by ten times, to K25/kwh. However, this rate applies only to non-government users and leaves the rates for state enterprises, government depts and religious buildings far below cost. State enterprises, for example, pay only K0.5/kWh. Foreign exchange earners pay US\$0.08/kwh under the new rates. The new rates are the first tariff increase since 1994. MEPE says this tariff increase cut peak hot season demand in Yangon from 330 MW in 1998 to 300 MW in 1999.

Type of Capacity	Integrated Network	Isolated	Total	Percentage
Hydro-electric	307.00	33.32	340.32	32.76
Gas Turbine (32 units)	508.10	35.89	543.99	52.36
Steam turbines	34.50	31.10	65.60	6.31
Diesel	16.22	72.74	88.96	8.56
Total	865.82	173.05	1,038.87	100.00

Source: MEPE

MEPE has 385 MW of hydro capacity in the early stages of construction by Chinese firms, which could be on-line in three to fours years. Progress on these projects cannot be confirmed, and it is not clear how these are being financed.

Faced with a difficult financial situation, MEPE has begun to restructure the Myanmar electric power sector. Electricity distribution in the townships that make up downtown Yangon is now being run by the Cho Cho group, under a medium-term management contract which has been running since 1996 and extended once. Cho Cho, for its efforts, receives K0.15 per kWh on collections, but does not have capital investment obligations. MEPE also turned to private groups to supply diesel fuel for its gas turbines. They were paid
K25 per kWh generated with the fuel. This arrangement lay behind the recent tariff increase and reflects the difficulty that MEPE can have in securing fuel supplies through the normal channels.

MEPE has also been active in creating what essentially profit centers within its distribution and retail supply operation. Management control has been devolved to the local distribution area in a total of 22 townships in Yangon, Mandalay and other areas. While MEPE continues tro pay base salaries, the profit center gets to keep a margin of K0.15 per kWh, which is paid out in the form of employee bonuses.

A process similar to municipalization is also underway, with some isolated systems being tranferred to township councils. In these cases MEPE supplies the diesel to run the generators, but otherwise all operations and employees are the responsibility of the local authorities.

Additional references on rates and financing of electric power projects

See above:'Electricity <u>rates raised</u>, subsidies for civil servants dropped' (AP: 15/05/06)<br/>
'Special privileges alleged in electricity distribution system (NCGUB: 21/05/01)<br/>
'Experts differ over how to finance improvements in power supply' (MT: 11/12/00)<br/>
'Generation, distribution, consumption of <u>electricity in Myanmar'</u> (World Bank: 18/08/99)<br/>
See below:See below:Myanmar reels under <u>huge electricity price hike</u>' (AFP: 03/08/99)

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# MYANMAR REELS UNDER HUGE ELECTRICITY PRICE HIKE

AFP, 03/08/99. www.burmalibrary.org/reg.burma/archives/199908/msg00336.htm

Myanmar is reeling under a 1,000pc power price rise imposed in recent months which has forced people back to coal stoves even as the ruling junta tries to modernise the country, Yangon residents said. Residents are expressing horror at the soaring price of electricity, which has jumped from K2.5 (US\$0.42 dollars at the official exchange rate) per unit to K 25 in the past two months. The price hike is aimed at encouraging thrifty use of the crumbling electricity grid, which is plagued by daily blackouts affecting thousands of homes.

The price rise has hit low-paid public servants the hardest. One public employee was presented with an electricity bill worth his entire annual salary of K12,000. One kyat is worth around six dollars at official rates, but on the thriving black market the currency changes hands at more than 350 to the greenback.

"We are totally dependant on cheap locally made electric stoves, but now we discover that they consume huge amounts of electricity," one housewife told AFP. "We've thrown away the electric hotplate and have gone back to wood-charcoal cooking, which is time-consuming," she said. The cost of wood-charcoal and gas has skyrocketed as residents search for cheaper alternatives to electricity. Many businesses and shops have tried to sidestep the price rises by turning to small diesel generators, which belch fumes and smoke into the city streets.

Electricity has been subsidised by the military government at a huge loss, which the junta can ill afford as it struggles to revive the economy. Diplomats say Myanmar's economy has descended into a crisis brought on by an investment drought triggered by Asia's financial turmoil and Western sanctions imposed to punish alleged human rights abuses. The investment shortage means there is little cash for desperately needed spending on antiquated infrastructure.

### Additional references

See above: 'Electricity <u>rates raised</u>, subsidies for civil servants dropped' (AP: 15/05/06) '<u>Special privileges</u> alleged in electricity distribution system (NCGUB: 21/05/01) '<u>Experts differ</u> over how to finance improvements in power supply' (MT: 11/12/00) 'Generation, distribution, consumption of <u>electricity in Myanmar'</u> (World Bank: 18/08/99)

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# **INVITATION FOR FOREIGN INVESTMENT** IN ELECTRIC POWER SECTOR

Myanmar government website official information, [undated, circa 1998]. [not available on-line]

Section 66. Electric power: Much emphasis and priority is placed on the development of the electric power sector because of its vital importance to the nation's social and economic development.

Section 67. Although Myanmar has an abundance of hydropower potential, other sources of power generation such as gas-based generation systems should also be developed on a parallel basis to meet the base load power requirement for the short term, and peak shaving purposes for the longer term. Section 68. The [Electric Power] Ministry invites foreign participations for joint development of the following major hydropower projects which are under various stages of implementation and planning:-

Project	State or Division	Capacity (MW)	Remarks
Nam Mae Sai	Shan	8.2	Under implementation on BOOT basis by
			May Flower Co Ltd - a local company
			entrusted by MEPE
Nam Kok	Shan	150	Under feasibility study by NEWJEC Inc,
			assigned by a developer group of
			Japanese and Thai companies
Zaungtu	Bago	20	Under construction
Yenwe	Bago	16.2	Feasibility study completed
Kun	Bago	84	Under feasibility study by a Chinese
			company
Pyu	Bago	65	Under preliminary study
Kabaung	Bago	30	Preliminary study completed
Paunglaung	Mandalay	280	Under construction
Yeywa	Mandalay	600	Pre-feasibility study completed
Baluchaung 3	Kayah	48	Feasibility study completed by NEWJEC
			Inc of Japan
Thaukyegat	Kayin	150	Pre-design report completed
Bawgada	Kayin	160	Preliminary study
Hutgyi	Kayin	300	Under study for development by a
			developer group of (Thanlwin) Japanese
			and Thai companies
Thaungyin - Moei III	Kayin	250	Office study
Thaungyin - Moei II	Kayin	120	Office study
Thaungyin – Moei I	Kayin	70	Office study
Bilin	Mon	240	Feasibility study completed
Tamanthi	Sagaing	1,200	Pre-feasibility study
Khlongkra	Tanintharyi	130	Office study

Section 69. Electric generation had increased from about 2,226 GWH in 1988/89 to about 4,000 GWH in 1996/97. The peak demand also increased from about 332 MW in 1988/89 to about 680 MW in 1996/97 showing doubling of demand in 8 years. The average annual growth is about 15 percent, but an increase in the annual growth rate to about 20% is yet to be expected due to the current trend in the industrial and commercial sectors.

Section 70. The Ministry of Energy, since early 1994 welcomes private sector participation in the power sector. Investment opportunities include taking-over of existing generation, transmission and distribution facilities from MEPE on mutually agreed terms and conditions as well as in building new power plants, transmission and distribution facilities either on BOT or joint venture basis. Since then MEPE had been discussing with several interested parties private participation in various areas of the power sector. Section 71. The Myama Industrial Development Committee (MIDC) formed by Myanmar government started with ambitious plans which include establishment of 14 industrial zones in the areas crucial for industrial development. Investment for power supply facility within the said industrial zones on IPP basis can be discussed with MIDC and MEPE.

Section 72. MoU between the Government of the Union of Myanmar and Kingdom of Thailand for power sales of about 1,500 MW by the year 2010 from Myanmar to Thailand was signed in July 1997in Bangkok.

Committees for both sides were formed for efficient implementation of the power purchase program in accordance with the said MOU. This MOU will open up more investment opportunities in power sector especially within the Thanlwin and Mekong river basin.

Section 73. The Ministry of Energy has been emphasising the possibility of exporting electric power as a value-added product by constructing a 1,500-MW gas turbine generation plant in Tanintharyi division using the present and future discoveries of natural gas from the Myanmar Offshore areas. Interested parties from the short-list during the conceptual discussion stage were invited by MEPE to put up their proposal as to how they could proceed for realization of the said project.

Section 74. Apart from Thailand, the Myanmar Ministry of Energy is also discussing with the interested parties for export of electric power to India which has indicated a willingness to purchase it.

Section 75. As Myanmar is a member of both the Greater Mekong Subregion (GMS) countries and also of ASEAN regional cooperation among member countries will also open up bright investment opportunities in the present and future power sector.

# Additional references

See above: 'Foreign <u>consultants for private hydro</u> projects' (MT: 26/11/07) 'More inputs needed to power a <u>hydro future</u>' (MT: 04/06/01)

Myanmar Snap Trade Directory, [undated, circa 1999]. <u>http://www.myanmarsnap.com/investment07.asp</u> Myanmar has an abundance of hydropower potential of more than 100,000 MW and huge reserve of offshore natural gas. Development of hydropower involves high capital costs and long lead time for construction in contrast to gas turbines and combined cycle power plant. In order to meet future demand hydropower has to be developed on long term basis and gas turbines will have to be built as a stop-gap measure. The abundance of hydropower potential enables Myanmar to consider development of hydropower projects not only for domestic power supply but also for export to the neighbouring countries. The Ministry invites foreign participation for the development of the following major hydropower projects which are under various stages of implementation and planning:-

Project	Capacity	Remarks
Paunglaung	280 MW	Detailed engineering design completed. Tunnels under construction by
		Kajima and NEWJEC. Contract signed with YMEC of China for
		construction of electro-mechanical developments and financing.
Yeywa	600 MW	Preliminary study has been completed. Nippon Koei is doing the feasibility
		study, to be completed by end of 1999
Mone	75 MW	Contract signed with CITIC of China
Thapanseik	30 MW	Contract signed with CITIC of China
Tamanthi	1,200 MW	Prefeasibility study
Kun	84 MW	Feasibility study completed by China Nat'l Agricultural Machinery Corp
Pyu	65 MW	Under preliminary study
Kabaung	30 MW	Under preliminary study
Bilin	280 MW	Preliminary report completed by Nippon Koei. Feasibility study to be
		undertaken
Nam Kok	60 MW	Feasibility study with Marubeni, MDX, Ital-Thai developers. To be
		developed mainly for export to Thailand
Baluchaung	48 MW	Feasibility study completed by NEWJEC
No 3		
Thanlwin	3,500 MW	Office study
(Ywathit)		
Thaukyegat	150 MW	Pre-design report completed. Feasibility study to start
Bawgata	160 MW	Preliminary study
Thanlwin	400 MW	Prefeasibility study proposed by Marubeni/NEWJEC-led consortium. To be
(Hutkyi)		developed mainly for export to Thailand.
Tanintharyi	600 MW	Preliminary study by Nippon Koei under negotiation
		To be developed for export to Thailand

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# SOUTH KOREAN CONSORTIUM WINS ELECTRICAL SUPPLY CONTRACT

Korea Herald, 29-05-97. [not available on-line]

A consortium of three Korean general trading companies (GTCs) has won a \$15 million contract to supply electrical machinery and equipment to Myanmar [Burma], company officials said yesterday. In what the officials said is another case of strategic alliance among domestic competitors, Hyundai Corp, Daewoo Corp and LG International Corp will jointly supply electric wires, transformers, insulators, circuit breakers and street lamps to the south-east Asian country by December.

Representatives of the consortium signed the contract with MEPE in Yangon Thursday. The contract will be financed with the low-cost loans from the Korean government's Economic Development Cooperation Fund (EDCF), said an official at Daewoo Corp. "It's a good illustration of domestic trading giants developing overseas markets through mutual co-operation," said the official. The three companies plan to go all out to secure more business opportunities in Myanmar and neighboring countries.

It is the second Myanmar project for Daewoo, which supplied \$5 million worth of power transmission and distribution equipment to the country in 1995, the company official said. Daewoo was the largest Korean exporter to Myanmar with \$40 million last year, followed by Hyundai's \$16.5 million and LG's \$8 million, he added.

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# POWER PURCHASE <u>DEAL BETWEEN THAILAND AND BURMA</u> ON THE WAY

Pichaya Changsorn, Nation (Bangkok), 27/05/97. www.burmalibrary.org/reg.burma/archives/199705/msg00507.html

Thailand is scheduled to sign an MoU in July with Burma for the purchase of 1,500 MW of electricity by the year 2010, Minister Sompong Amornvivat of the PM's office, said. It will be the first direct power purchase agreement between Thailand and its western neighbour. But Thailand signed MoUs with Laos in 1993 and 1996 for the purchase 1,500 MW of power by 2000 and 1,500 MW by 2006, respectively.

The announcement followed a visit by PM Chavalit Yongchaiyudh and Sompong, who is responsible for energy affairs, to Rangoon about three weeks ago. "This broad policy framework and scope for bilateral cooperation in the power sector will be formalised in an MoU to be signed by the two governments in July," Sompong said. In the medium term, he said, the programme will concentrate on power purchases from small projects which are relatively easy to develop such as Nam Kok. Over the long term, the programme will more fully utilise the potential of resources such as the Salween river in Burma, for example.

According to the National Energy Policy Office (NEPO), potential projects in Burma for electricity supply to Thailand include the 150-MW Nam Kok project to be developed by the consortium of MDX Plc, Italian-Thai Development Plc and Marubeni of Japan, and the 400-MW Hutgyi project on the lower Salween river.

Preliminary studies of 196 hydro-electric projects by the Burmese junta indicate a potential for generating 38,000 MW, while the country's total technical potential for energy production is estimated at 100,000 MW, NEPO said. Previously, the Petroleum Authority of Thailand signed contracts to purchase natural gas from Burma's two gas fields, which are scheduled to supply power plants in Ratchaburi from mid-1998 and 1999, respectively.

With insufficient indigenous resources, Thailand's energy master plan has adopted its resource-rich neighbouring countries, including Malaysia, Cambodia, Burma, Laos, China and Indonesia, as sources of gas and electricity. The minister said preliminary discussion has also taken place with officials of Yunnan province in China. "It is envisaged that Thailand will buy 1,200 MW from China's Jinghong project towards the end of the next decade," Sompong said. MDX and Yunnan Electric is undertaking a feasibility study for the hydro electric Jinghong project. Located 400 kilometres from the Thai upper North border, the Jinghong dam is expected to supply 1,200 MW out of its total 1,500 MW output to Thailand.

The Asian Development Bank estimates Yunnan has a hydro-electric power generating potential of 90,000 MW, comprising 40,940 MW from the Jinsha river, 22,260 MW from Lancang river, 13,900 MW from the Nujang river and 12,900 MW from tributary river projects.

As for Laos, EGAT has signed power purchase agreements for the 210-MW Nam Theun-Hinboun project and concluded power tariff talks on two other projects, namely the Houay Ho (143 MW) and Hongsa Lignite (608 MW). It is also negotiating with the developers of the Nam Hgum No 3 (460 MW) and Nam Ngum No 2 (615 MW) projects. The National Energy Policy Council is scheduled to approve the draft power purchase agreement for the Houay Ho project at its next meeting on June 2.

# Additional references

BKK Post, 18/01/99. http://www.ibiblio.org/obl/reg.burma/archives/199901/msg00272.html

Burma wants to purchase power from Thailand through a counter-trade deal, possibly starting from the end of 2001. The issue of Rangoon buying at least 100 MW was discussed last Wednesday in Rangoon by Thai and Burmese energy authorities. Viravat Chlayon, governor of EGAT, said both EGAT and MEPE agreed to pursue studies on the purchase. EGAT has to investigate whether it is economical to invest heavily in building transmission lines to the Burmese border and what sort of goods Rangoon can offer as payment for the power sale. EGAT welcomed the proposed sale to Burma as it would help Egat reduce its excess generating capacity. The surplus capacity is expected to soar to more than 50% in 2001. For Burma, purchasing power from Thailand is easier than finding finance to build new power plants. Burma has a generating capacity of merely 1,000 MW, 13 times less than Thailand. Results of the studies would be presented in March when both parties are scheduled to meet again.

Myanmar government website official information, [undated, circa 1998]. [not available on-line] Section 77. An MoU between the Government of the Union of Myanmar and Kingdom of Thailand for power sales of about 1,500 MW by the year 2010 from Myanmar to Thailand was signed in July, 1997 in Bangkok. Committees for both sides were formed for efficient implementation of the power purchase program in accordance with the said MOU. This MoU will open up more investment opportunities in the power sector especially within the Thanlwin and Mekong river basin.

See above: 'Myanmar, Thailand begin work on <u>controversial Tasang</u> dam' (AFP: 05/04/07) <u>'Tribe's home</u> to be a valley of the dammed' (London Times: 22/03/06) 'Hydropower Dept and EGAT ink agreement on <u>Hutgyi</u> project (NLM: 10/12/05)

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### BURMA EYES PRIVATE POWER PRODUCERS

U Myo Myint, Nation (Bangkok), 13/02/96 http://www.ibiblio.org/obl/reg.burma/archives/199602/msg00138.html

Electricity utilization in Burma has been increasing every year. Increases in the annual growth rate of up to 20pc are expected due to the market oriented economic policy adopted by the government that encourages development in the industrial, agricultural and commercials sectors. Until now, the electricity sector has been run solely by the state owned MEPE. To meet the rapid growth in electricity demand, the government alone cannot contribute the needed investment. Consequently, local and foreign investors are invited to participate in wholly-owned or joint ventures with MEPE in its gradual turn toward commercialization of the power sector.

MEPE, under the Ministry of Energy, is fully responsible for the generation, transmission, distribution and sale of electricity within Burma. It includes investigation, planning design and project implementation. The head office of MEPE is located in Rangoon. There are six departments; Planning, Hydro-electric Construction, Operations, Materials Planning, Finance and Administration.

The present electricity requirements of the country are fulfilled by generation from hydro-power and thermal power consisting of gas turbines, steam turbines and diesel generating sets. Electricity generation in Burma

has increased from about 2,676 GWh in 1991-92 to about 3,647 GWh in 1995-96. The average annual growth rate was about nine per cent.

Gas turbine generating sets have been installed in the national grid system (i.e., the interconnected system) as a stop-gap measure before major hydro-electric power stations, with their long lead times, become operational. The first gas turbine power station at Kyunchaung was completed and commissioned in 1974.

Recently, two new gas turbine power stations, each with an installed capacity of three units of 33 MW, were installed in Rangoon to meet the growing demand for electricity. The first gas turbine station located in Ahlone was commissioned in April 1995 and has been generating its full installed capacity since the end of May 1995. The second gas turbine station, located in Hlawga, was commissioned in January 1996. Plans have been made by MEPE for installation of combined cycle plants in both of these stations. Completion is scheduled for the 1997-98 fiscal year. The installation of a combined cycle plant (34.9 MW) at the Thakayta gas-turbine generating station, which has an initial installed capacity of 57 MW is also underway and completion is expected by the year 1996-97.

In areas of supply from isolated generating stations, the sources for electricity are mostly diesel power stations, micro-mini hydro-electric power stations and a few medium capacity gas turbines and steam power stations. The majority of these are operated as isolated rural electrification stations and only a few operate as central stations distributing to neighbouring towns and villages.

As mentioned earlier, the peak load within the grid system is about 610 MW at present. However, there are lots of housing projects, industrial zones, agricultural and commercial sectors waiting for power supply. The demand from these could amount to 430 MW for a total potential demand of around 1,000 MW. This is expected to grow at an annual rate of 20pc toward the year 2000. But for case study, a conservative growth rate of 10pc per annum is applied.

Burma is blessed with abundant water supply resources within its territorial area of about 677,000 sq km, over half of which is highland bisected by north-south trending mountain ranges combined with heavy rainfall from the southwest monsoon. The highest hydro potential lies in the Chindwin, Irrawaddy, Sittoung and Thanlwin river basins. According to preliminary studies, the major hydro-power resources are about 37,000 MW, of which about 25,000 MW are of large scale while the remainder are of medium and small scale. The total developed capacity of theses renewable energy hydro power resources, existing as well as under implementation, is about 316 MW only. This is less than one per cent of the country's potential, leaving the remaining 99pc still available for implementation of their electricity generating capacity by both the government and private sectors.

There is also a number of promising sites for hydropower developments which are of such magnitude that the economic feasibility of exploiting them for the domestic market alone may not be adequate. Those along the border with Thailand are under consideration for energy export. Extensive basin studies of the hydropower sites along the Thanlwin river should be undertaken in order to make the best use of water resources available in the sub-region.

Besides hydropower potential, Burma is estimated to have total coal resources of 200 to 230 million tonnes in numerous deposits, mostly of sub-bituminous rank, and mainly in the northern regions. Presently, there are only two mines in production. The underground Kalewa coal mine and the open-cut Namma coal mines are producing about 12,900 tonnes per year and 25,810 tonnes per year respectively. The Kalewa deposits are the only significant ones for future coal development at the present time. The highly volatile content and good burning characteristics make it ideally suited for pulverized fuel of flautist bed boiler operations for power generation. A mine mouth electricity generation plant of about 200 MW is estimated from preliminary studies, but detailed exploration to determine the reserves in place is essential before such a project could go ahead. Namma Coal mine, however, is a short term operation, lacking reserves for any major expansion.

In early 1994, permission for the private sector to participate in the power sector or to implement activities jointly with the government was introduced. The Kalewa coal deposit is available for private sector investment. Due to its highly volatile content and good burning characteristics it is ideally suited to certain types of boilers for power generation. However its easily friable nature and the limited feasibility of

transporting the coal over long distances mean that the power generating station would need to be located close to the Kalewa mine.

Natural gas offers the most exciting area in the Burmese energy scene. The present limited on-shore gas reserves will be sufficient only for the two 100-MW gas turbine power stations in Rangoon. MEPE is willing to operate these two power stations in a joint-venture with a foreign investor. Substantial investments are also needed to convert the two new 100-MW stations as well as older gas turbine power plants to combined cycle operations. This would add some 200 MW to their generating capacity. Discussions have already been held with several interested foreign companies to form a joint venture for the 100-MW gas turbine power plant in Ahlone. However, the prevailing low tariffs in local currency and the limited number of customers who pay in foreign currency has held back the commercialization process.

Compiler's Note: At the time of writing, U Myo Myint was Assistant chief engineer of MEPE.

### Additional references

ASEAN Centre for Energy, [circa 2001].

http://www.aseanenergy.org/energy\_sector/electricity/myanmar/private\_sector\_part.htm

Information provided by MEPE: In early 1994 permission was given for the private sector to participate in the power sector or to implement activities jointly with the government. Since then MEPE has been in discussions with several interested parties, both local and foreign, about private participation In various areas of the power sector. However, the low tariffs in local currency and the small number of consumers paying in foreign currency have served as draw-backs to the commercialization process. The tariff was increased in September 1994 for the first time in 40 years. It was raised fivefold from K0.50 to K2.5 per kWh for domestic users and K3.0 per kWh for commercial and industrial users. The tariff in foreign currency for foreign and export-oriented companies is US\$0.08 per kWh. Even after this increase, the tariff in local currency is well below the commercial rates needed to make power generation profitable. Recently the tariff was further raised from K2.50 per kWh to K25 per kWh for commercial and industrial consumers and for domestic users who use above 200 kWh per month. Pursuant to the increase in tariff, many local and foreign companies have showed great interest in private participation in the power generation sector. For the time-being only the following local companies are involved with investments in the power sector on a BOOT (Built-Own-Operate-Transfer) basis: (1) Golden Triangle Co Ltd will build a coal-fired power station with two 6-MW generators in Tachileik township; (2) Buga Co Ltd will build a hydropower station in Waingmaw township near Myitkyina with two 12-MW generators.

See above: <u>'Invitation for foreign investment</u> in electric power sector' (GUM: circa 1998) See also: Tin Shein and Kyaw Kyaw, *"Private participation in Myanmar's power sector"*, in *Energy for Sustainable Development, 3, no* 6 (Mar 1997), pp 97-101. <u>http://www.esd-journal.org/vol%203\_issue6.html</u>

### YADANA GAS WILL FIRE ELECTRIC POWER PLANTS IN MYANMAR

Myanmar Perspectives: September 1995 http://www.myanmar.gov.mm/Perspective/persp1995/9-95/yad.htm

MOGE has established joint ventures with foreign firms such as Total of France, Unocal of the U.S. and PTTEP of Thailand. A project to export natural gas to foreign countries will commence at the end of 1998. The Yadana natural gas wells are in the M-12 and M- 6 offshore blocks in the Mottama sea between 15° 17" N and 95° 10" E. The field is 460 km south-west of Yangon city and 90 km from the nearest coast. The location of the field was established by survey data analysis in 1982. Market developments made it feasible to establish a joint-venture operation with Total of France in July 1992.

The Yadana wells are based in a deposit of 6.7 billion cu ft natural gas of which 5.7 billion cu ft can be exploited. It is planned to exploit 650 million cu ft of natural gas daily. Of this amount, 525 million cu ft will be taken up by PTT for export to Thailand through a 420-km-long, 36-inch diameter pipeline. The sale of natural gas to Thailand will begin in 1998 and last for 30 years. By exploiting 5.7 billion cubic feet of natural

gas from the Yadana wells, MOGE will earn US\$450,000 daily. Over the 30-year period MOGE will earn a total of US\$4,900 million.

The remaining 125 million cu ft of natural gas extracted daily from the Yadana field will be available for consumption within Myanmar. Of this amount, 105 million cu ft will be used in a 200-MW power generating plant that will supply electricity to a fertilizer plant producing 1,750 metric tons daily. The other 20 million cu ft of natural gas will be used by a 65-MW power generating plant at Kanbauk that will supply electricity to Mon and Kayin states and Tanintharyi division. The estimated cost of this project is about US\$600 million. As of the 31st August 1995, a total of 35 proposals from various nations have been received for projects related to the use of the Yadana gas in Myanmar.

# Additional references

See below: 'Use of <u>Yadana gas for power generation</u> and industry: Chronology (Appendix 6)

# Additional references to a domestic oriented gas-turbine power plant in Kanbauk

Unocal Corporation, 22/04/96. www.secinfo.com/drdbh.91Bu.htm

The Yadana project has a socio-economic development component specifically designed to provide job opportunities, improve living standards and promote viable, long-term economic development for villages in the pipeline region. Yadana gas may also fuel a possible 75-MW power plant in southern Myanmar. Together, these projects will provide significant economic benefits for a country that is heavily agrarian and short on energy supplies.

MIC, 21/07/97. http://www.burmalibrary.org/reg.burma/archives/199707/msg00388.html

Energy Minister Khin Maung Thein attended the cornerstone laying ceremony for a natural gas power station in the Kanbauk region and the installation of a 66-kV power line from Kanbauk to Dawei. The Kanbauk power station will use natural gas from the Yadana field to supply electricity to Dawei, Kanbauk and environs as well as the Ye and Myek regions.

MIC, 22/08/97. <u>http://www.ibiblio.org/obl/reg.burma/archives/199708/msg00246.html</u> MEPE signed an agreement with Genting Power Holdings Ltd of Malaysia to generate and distribute power in the Kanbauk region of Yebyu township at the Ministry of Energy on 20 August.

UN Mission of the Myanmar government, Geneva website information, [undated, circa mid-1998]. http://mission.itu.ch/MISSIONS/Myanmar/t&b/gas-oil.html

The Yadana natural gas field will produce 650 million cu ft/day of natural gas of which 525 million cu ft will be sold to Thailand with effect from July 1998. The remaining 125 million cubic feet of natural gas will be utilized within Myanmar for power generation and production of chemical fertilizers. Twenty million cu ft of natural gas will be used to operate a 36-MW generating plant that will provide power for the Ye, Kanbauk, Dawei and Myeik regions. MEPE and Genting Power Holding Ltd of Malaysia signed an agreement for this plant on 20/08/97.

U.N.O. Consultant Geotechnical Engineering Group, website info, [undated, circa 1999]. http://www.consultantgeotech.net/our\_project.htm

U.N.O. carried out a geotechnical survey for a gas turbine power station at Kanbauk in Yebyu township, commissioned by MEPE.

Total Myanmar, Yadana: An Industrial Development Project in Myanmar: 2002 <u>http://www.total.com/static/en/medias/topic521/TFE\_2002\_en\_myanmar.pdf</u> Report of the socio-economic program: Nine villages in the pipeline corridor to Thailand have been supplied with electricity.

Corporate Engagement Project: *Field Report:Third Visit: Yadana Gas Transpotation Project: Nov-Dec 2003.* <u>http://www.cdainc.com/publications/cep/fieldvisits/cepVisit09MyanmarBurma3.pdf</u>

One of the continuously recurring wishes of people interviewed both in the pipeline corridor and in Yangon is to have more access to electricity. Several people in Yangon expressed their frustration that the pipeline

serves to "give away the natural resources we so badly need ourselves." The shortage of electricity and of gas for cooking are repeatedly mentioned as putting a heavy burden on people's lives. At the same time, people see little benefit from the revenues generated by the pipeline or from the export of the gas to Thailand. In the pipeline area, one option open to Total and its partners would be to discuss with the Myanmar government the revamping of an electrification scheme. There is an electrical reticulation system designed and partially constructed to provide power to some communities in the pipeline corridor and beyond. Electricity poles have been constructed and a site is still available for a small power plant. Completing this installation would provide an improvement to the guality of life for people well beyond the pipeline corridor. On the other hand, if the government limits the provision of electricity only to some villages in the corridor, it may cause jealousy from villages that do not get power. Total could discuss with the government the options available to install, operate and maintain a gas turbine in the area. This would be an opportunity for the government to demonstrate a project where gas revenue is re-invested in a way that improves the quality of life for many people. Compiler's Note: According to its statement of purpose, "the objective of the Corporate Engagement Project (CEP) is to provide managers with clear ideas about how their work with communities relates to the broader sociopolitical environment and to develop practical management tools for supporting stable and productive relations in the societies where corporations work. CEP field visits are undertaken to help corporations gain new insight into the positive and negative impacts of their daily activities on the local and national context." Clearly, such projects are engaged in under contract with the companies themselves.

### Corporate Engagement Project, *Field Report, Fourth Visit: Yadana Gas Transportation Project: April 2005* <u>http://cdainc.com/publications/cep/fieldvisits/cepVisit16MyanmarBurma4.pdf</u>

If not used for another purpose, by the end of 2005 Total will have to hand over a base camp in Kanbauk which currently houses contractor staff. Ideas that were mentioned as alternative purposes for the camp include offering the facility to an NGO that wants to establish a vocational training center for people with physical disabilities. The NGO currently offers two-week courses and wants to expand activities due to the success of the programor, if the camp could be supplied with gas and a turbine (which are both technically feasible), the facility could become the only public place in the region that has a reliable power supply. It could serve as a business development area for entrepreneurs needing electricity (ice making, welding, etc).

### Total Myanmar, A Sustained Commitment, 2006.

# http://burma.total.com/en/publications/sustained\_commitment.pdf [document, p 27]

Another issue is energy. Although the pipeline region has no collective electricity grid, power is provided in some areas by solar panels financed by the project's social program, or by generators that some villagers have acquired. The lack of access to energy hampers agricultural product processing operations. A variety of options is being considered to remedy this situation.

# Additional references to a mega-sized, export-oriented gas-turbine power plant in Kanbauk

# National Energy Policy Office of Thailand, *Electricity Supply Industry Reform and Thailand Power Pool*, November 2000. <u>http://www.eppo.go.th/power/FF-E/pw-reform-1-main-E.html</u>

On 4 July 1997, the governments of Thailand and the Union of Myanmar co-signed an MoU on power purchase from the Union of Myanmar. Under the MoU, both parties will promote and co-operate in the power project development in Myanmar in order to sell 1,500 MW of electricity to Thailand by 2010. To give effect to this, each government has appointed a committee to implement the project and to negotiate in detail the principles agreed upon in the MoU. Following the committee's meetings, the Myanmar side has offered to sell electricity from four projects to Thailand, namely: 1) the Nam Kok project, with an installed capacity of 42 MW and a transmission line routing via the Mai Sai district in Chiang Mai province; 2) the Hutgyi project, with an installed capacity of 300 MW and a transmission line routing via the Mai Sod district in Tak province; 3) the Tasang Project, with an installed capacity of 3,300 MW and a transmission line routing via the Mai Aye district in Chiang Mai province; 4) the Kanbauk project, with an installed capacity of 1,500 MW and a transmission line routing via the Mai Aye district in Chiang Mai province; 4) the Kanbauk project, with an installed capacity of 1,500 MW and a transmission line routing via the Mai Aye district in Chiang Mai province; 4) the Kanbauk project, with an installed capacity of 1,500 MW and a transmission line routing via the Mai Aye district in Chiang Mai province; 4) the Kanbauk project, with an installed capacity of 1,500 MW and a transmission line routing via the Mai Aye

### NEWJEC website information. [undated, circa 2000] www.ecfa.or.jp/english/pdf/newjec.pdf

In 1998/99, NEWJEC carried out a feasibility study for a combined cycle gas-turbine project (1,500 MW) at Kanbauk. The study was commissioned by the Myanmar government and EGCO, a subsidiary of Thailand's

EGAT. NEWJEC, a subsidiary of the Kansai Electric Power Co Inc in Japan, specializes in engineering services of various kinds for power projects.

Myanmar Snap Trade Directory, [undated, circa 1999]. <u>http://www.myanmarsnap.com/investment07.asp</u> An MOU between the Government of the Union of Myanmar and the Kingdom of Thailand for power sales of about 1,500 MW by the year 2010 from Myanmar to Thailand was signed in July 1997 in Bangkok. Committees for both sides were formed for efficient implementation of the power purchase program in accordance with the MoU. This will open up investment opportunities in the power sector in the Thanlwin and Mekong river basins and transmission interconnection between the countries in the region. With the discovery of more gas reserves in the offshore blocks of the Gulf of Moattama [i.e., Yetagun], MEPE is discussing possible construction of a 1,500-MW combined cycle plant in the Dawei-Kanbauk area with PEA and EGAT of Thailand. and. Pre-feasibility study of this project had already completed by a consortium of Thai companies led by EGCO in co-operation with the Myanmar EPM.

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#### Start90s

#### THAI LOGGING FIRM STRIKES DEAL FOR HYDROPOWER DAMS

Sasithorn Ongdee, Nation (Bangkok), 24/01/94. http://burmalibrary.org/reg.burma/archives/199401/msg00067.html

Onk Mining and Construction Co (ONK), a little-known Thai logging firm with business interests in Burma, has landed a deal with Rangoon to build hydro-electric dams, roads and a port at a combined cost of Bt17.5billion (US\$700 million), according ONK chairman Krin Pongpatchote. The recently signed MoU calls for the implementation of four projects. Two are for building hydropower dams at Nam Ruak and Nam Kok in eastern Shan state having a capacity of 25 MW and 100 MW respectively. The third is for a road between Kengtung and Mong Yai and fourth is for the construction of port at Thilawa near Rangoon.

The dam projects will require a combined investment of about Bt10 billion (US\$ 400 million). The Nam Ruak dam with a catchment area of 900 sq km will irrigate 16,000 h and supply 25 MW of electric power. The Nam Kok dam with a catchment area of 2.920 sq km will irrigate 64,000 h and supply 100 MW to both Burma and Thailand. It will take about 6-8 years to complete construction of the two dams. Krin said Rangoon is expected to sign the joint venture agreement with the company by March of this year. Both sides are still negotiating details of the agreements. The Shan State Development General Trading Co Ltd, a state-owned firm in Burma, will be responsible for the dam projects. It has already issued a letter of intent for ONK to undertake construction.

Krin said his company will hold the majority stake in the two dam projects. Japanese trading giant Kanematsu (Thailand) Co Ltd, Works Consultant and Service Corp, First Federal Banking Corp and American Product Distribution Co (Wisconsin) have been invited to hold shares in the dam projects. Should they become partners, they will be expected to provide capital, machinery and specialists to implement the construction, with each holding an equal stake.

Burma will buy 10pc of the electricity generated by both dams; the rest will be sold to the EGAT. ONK has held talks with the EGAT governor and other officials on the planned sale of electricity to Thailand. Last week, EGAT agreed in principle to buy the power, according to Krin. Both sides will conduct field trips to the sites to survey possible power transmission routes across the border.

Earlier other Thai companies such as Loxley (Bangkok), West Group and firms affiliated with Thai politicians approached Rangoon with similar deals, but none was successful, Krin claimed. Although ONK Mining and Construction is not well-known in Thailand, it is an active firm in the international logging business. Registered in Thailand with a capital of Bt500 million, it was originally a building contractor. The company now has five or six subsidiaries, mostly involved in logging in Burma.

### Additional references

#### Shan Herald, 13/03/04.

http://www.shanland.org/environment/2004/opening\_survey\_on\_the\_kok\_begins.htm/

A preliminary examination of the headwaters of the Kok river has been undertaken as a result of the recently signed MoU on the damming of the Kok and the Maesai rivers. On 04/03/04 a party including soldiers of IBs 49 and 43, accompanied by 18 elders from Monghsat went to the Hpala mountains where the Kok originates. Many photos were taken at Ho Namkok (the Kok's head) and later at a 20-meter-high waterfall.

Ranjana Wangvipula, Bangkok Post, 25/02/04. www.searin.org/Th/SWD/SWDnE15.htm

Thailand and Burma have signed an MoU that authorizes a joint study of the feasibility of damming two rivers they share for irrigation. The planned dams would create reservoirs on Burmese soil where the Kok and Sai rivers originate and enter Thailand in the northern provinces of Chiang Mai and Chiang Rai respectively. Natural Resources and Environment Minister Praphat Panyachartrak said the project would benefit thousands of sq km of farmland in both countries. The study may include a plan to build hydro-electric dams. Environmental activist Nikom Putta, of the Chiang Mai-based Ping watershed management project, warned that northern forest areas faced a problem of rapid soil erosion, causing sediment to accumulate in dams at a higher rate than at other dams and reducing their lifespan. Chainarong Sretthachau, director of the Southeast Asia Rivers Network, said construction of the dams would impact adversely on minority groups in Burma. He suspected the plan was linked to power plant projects supported by a Japanese electric power development company that had pushed for construction of dams on the Kok, Kra, Moei, Sai and Salween rivers near the border beween the two countries.

Images Asia – Terra, Report on Status of Salween (Thanlwin) Dam Plans, Nov 1999.

# www.ibiblio.org/obl/docs/SW03.htm

According to a leaked EGAT document entitled 'Status of the Hydropower Projects to be implemented for Power Export to Thailand', dated 24/12/98, the Nam Kok hydropower project will be located about 64 km south of Mong Hsat in eastern Shan state and about 5 km north of the Thai-Burma border. A feasibility study carried out by NEWJEC Inc.for MDX, Italian-Thai Development and Marubeni was expected to be available by the end of December 1998. A draft version of the feasibility report indicates the installed capacity was set at 42 MW, and expected production at 230 million kWh annually. The financial feasibility of the project was evaluated as marginal due to the unfavourable topographical and geological conditions of the dam site.

NEWJEC Inc, [undated, circa 1999] www.ecfa.or.jp/english/pdf/newjec.pdf

In 1997/98, NEWJEC Inc, a subsidiary of Kansai Electric Power Co of Japan, carried out a feasibility study of the 55-MW Nam Kok hydro-electric power project, commissioned by an IPP (Independent Power Producer group).

Nation (Bangkok), 27/05/97. <u>http://www.ibiblio.org/obl/reg.burma/archives/199705/msg00507.html</u> Thailand is scheduled to sign an MoU in July with Burma for the purchase of 1,500 MW of electricity by 2010. According to the National Energy Policy Office, potential projects in Burma to supply electricity to Thailand include the 150-MW Nam Kok project to be developed by the consortium of MDX Plc, Italian-Thai Development Plc and Marubeni of Japan, and the 400-MW Hutgyi project on the lower Salween.

NLM, 15/09/96. <u>http://www.ibiblio.org/obl/docs3/BPS96-09.pdf</u> [document, p 49] Developer Group, a joint endeavour of Marubeni Corp of Japan, MDX Group of Thailand, and Italian-Thai Development Co signed a contract with MEPE, represented by MD Zaw Win, to conduct a feasibility survey of the 200-MW Namkok hydroelectric power project near Monghsat.

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### Appendix 1

#### LAWPITA POWER PLANTS AND ASSOCIATED DAMS

The information available about the hydropower facilities at Lawpita in Kayah state (Karenni) and the Moebye and Dawtacha dams has been divided into five sections:

A) Brief Chronology of the Lawpita power stations and associated dams;

B) Selected passages from Part II of the report 'Dammed by Burma's Generals' published by the Karenni Development Research Group;

C) Information taken from the websites of Japanese corporations engaged in projects related to the Lawpita power plants;

D) Reference material from various publications related to the power plants at Lawpita arranged in reverse chronological order;

E) Documents related to the controversy surrounding a Japanese loan for repairs to the generating facilities at Lawpita Plant No 2 in 2001-02.

E) Selected passages from 'Baluchaung No. 2 Power Station Renovation Project', a post evaluation report of the generator renovation project at Lawpita No 2 in 1989-90, published in May, 2002.

# A) Brief <u>Chronology of the Lawpita</u> power stations and associated dams (adapted from 'Dammed by Burma's Generals')

Year	Important Events
1950	Planning begins for Lawpita falls hydropower project as part of Japanese war reparations
1954	Japanese government approves the budget for the project. Feasibility and design studies
	begin
1960	Lawpita Hydropower Plant No 2 opened; three generators with total capacity of 84 MW
1962	Construction of Mobye Dam begins but is halted because of the military coup
	Villages are ordered to move but most do not comply.
1966	Construction of Mobye dam resumes; 2,000 workers brought from central Burma
1970	Construction of Mobye dam completed
1970-72	Eight thousand households in Pekhon township forced to move as reservoir fills up
1974	Second phase of Plant No 2 completed
	Total generating capacity boosted to 168 MW
1981	Loan agreement signed with Japan to construct Lawpita Plant No 1
1984	Design studies for project to construct facilities related to Plant No 1
1986-94	Renovation of Plant No 2 undertaken with Japanese assistance
1988-92	Datawcha dam linked to Plant No 1 built
1992	Plant No 1 is completed; it has two generators and a total installed capacity of 28 MW.
1994-95	Feasibility study undertaken for Baluchaung hydropower project No 3 (48 MW)
1999-00	Studies determine further repairs to turbines at Plant No 2 necessary
2001	News that Japan will provide aid amounting to ¥3.5 billion (\$28.6 million) for rehabilitation of
	turbines at Plant No 2 stirs public discussion
2002	Official announcement by Japan of a grant of ¥626 million for repair work at Plant No 2
	Loan is tied to release from house arrest of NLD leader Daw Aung San Suu Kyi

**Topographic map references**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-01: Pyinmana Mobye dam, just north of Mong Pai [19° 44' N, 97° 05' E], grid square reference: 10\9, 26\6 Datacha dam, near Datacha [19° 39' N, 97° 16' E], grid square reference: 10\8, 26\8 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-1.jpg</u>

Google Earth clearly shows the Mobye dam sluice gate and barrier at 19° 46' 42" N, 97° 05' 27" E, the Dawtacha dam (not so clearly) at 19° 38' 53" N, 97° 17' 17" E, the No 1 Lawpita power station at 19° 38' 55" N, 97° 17' 26" and the Lawpita No 2 penstocks and power station at 19° 38' 15" N, 97° 18' 04". The map titled Impact from the Lawpita Hydropower Project on page 34 of *Dammed by Burma's Generals* gives a bird's eye view of the four locations in stylized form. http://www.burmacampaign.org.uk/reports/Damned by Burma%27s Generals.pdf [doc p 44]

**B)** Selected <u>passages from 'Dammed</u> by Burma's Generals', Part II, pp 25-49 Karenni Development Research Group, *Dammed by Burma's Generals: The Karenni Experience with Hydropower Development From Lawpita to the Salween*, March 2006. <u>http://www.burmacampaign.org.uk/reports/Damned by Burma%27s Generals.pdf</u> The first large hydropower project in Burma was built on the Balu river at Lawpita Falls in Karenni State nearly fifty years ago without any consultation with the Karenni people. The Balu *chaung* flows out from Inle lake in Burma's Shan state; it is a tributary of the Pawn river, itself a tributary of the Salween, one of the great rivers of Asia. Before the hydropower project, the the Balu *chaung*, moved down sometimes swiftly, sometimes gradually, into the deeply cut valley of the Pawn river some 670 m below. The Lawpita falls a series of spectacular cascades in three groups of waterfalls was the most spectacular part of the descent of the Balu *chaung*. The waterfalls and rapids are spread out over a total of 19 km with some sections dropping long distances off oddly carved and encrusted limestone formations. The wider area around the falls features caves, sinkholes and high limestone escarpments. The natural beauty of the falls has been largely lost as a result of the construction of the dams and the diversion of the bulk of the water flow.

The idea of harnessing the natural drop of Lawpita falls for the production of hydropower was initiated in 1950 in accord with a bilateral war reparation agreement between Japan and Burma. Lawpita was the first large-scale hydropower project in the country and to this day the plants remain one of the most important sources of electricity for central Burma. Despite its name, Plant No. 2 was the first power station to become operational. It was built in two stages each consisting of the installation of three 16-MW generators that operate on a rotational basis to produce 168 MW of power. It is located on the highest of the cascades of Lawpita Falls, some 40 km south-east of the Moebye dam. Both plants are known locally as "Lawpita Plants No 1 and No 2", while internationally they are known as "Baluchaung I and II."

Mobye dam was built on the Balu *chaung* in order to divert water to the hydropower plants. The dam --11 meters in height according to some who worked on its construction -- is on the border of Karenni and Shan states. Nearly all of the reservoir lies inside Shan state. It stretches south from Inle lake about 60 km and has an average width of three to five km, covering a total area of approximately 207 sq km -- almost 25% bigger than Inle lake itself. Water is diverted from the reservoir to the plants in order to generate power.

An article in the state-owned newspaper Bo Tahtaw of 21 June 1969, explained: "When the Lawpita project is expanded, the aim is not only to utilize the power stations but also to give water to over 25,000 acres of fallow lands for agriculture. This project will also create work for the people of Mobye and Kayah State." These visions and promises have not been realized. Far from bringing development to the Kayah people, the utilization of water for the power plants has caused water shortages and robbed local farmers of control over a vital resource. The authorities have made it clear that power generation is more important than farmers' needs.

After the construction of Plant No 2, farmers were not permitted to draw sufficient amounts of water from the Balu *chaung* with traditional water scooping wheels, particularly when water levels were low. This low-tech system of irrigation had been used for generations and when it was cut off, crop production was severely impacted and the traditional patterns of subsistence farming were shattered. Power station engineers determined the supply of river water without consulting local farmers and residents. These decisions were made by engineers from different sections of the plant, according to how much water they needed for efficient electricity generation. The mechanical and irrigation engineers would submit their proposed [water] management solutions to the authorities. The order would then come from the BSPP [Burmese Socialist People's Party] forbidding the farmer or villagers use of water upstream from the plant. Electricity for Rangoon and Mandalay came first, the local villagers and farmers came second.

Occasionally, the release of dam water also causes crops to be flooded. Unnatural and unseasonal flooding occurs when the dam water is released in the rainy season, destroying crops already planted. Flooding of rice farms is an expected annual event -- the flooding helps irrigate the newly planted rice crops. But recent floods are anything but natural. They correspond to the decision of the authorities' to open the gates of Mobye Dam further upstream on the Balu *chaung*. Combined with natural flooding during the rainy season, the excess of water flow in the river overflows the banks of the river and floods nearby farms downstream. The authorities do not consult with the farmers about this, or give any notice when they intend to open the gates.

To conserve water in the dry season and regulate water flow, construction of a second dam, the Dawtacha, began in 1988. Water was diverted to the Dawtacha reservoir for use at the power plants. The farms below the reservoir were deprived of water and those above it were flooded. Six hundred acres of farmland around

Dawtacha village were flooded, and 2,000 acres of farmland in small villages above the reservoir became fallow due to the lack of water. This has now been turned into a vast landmine field. The Dawtacha dam, smaller than the Mobye, was built in order to store water closer to the power plants for better flow control. Plant No 1 is located close to Plant No 2, but receives water from Dawtacha dam and has an installed capacity of 28 MW.

The residents below Mobye dam used to catch fish by blocking the waterway and swilling out the water, using meshed bamboo traps and bamboo nets. The Inthas, Shans, Kayahs, and Kayans who lived above the Mobye dam were well equipped with motorized fishing boats and fishing nets. They made a reasonably good living from fishing before the dam was built. Plenty of fish such as banded and short-headed snakehead, eels, carp, featherback and different kinds of catfish were commonly found in the river. But about five years after the construction of the dam, the fish catch fell off and the numbers engaged in the fishery started to decline. A villager from Kwa Long (upstream of the dam and five kilometers from Pekhon) explained that before the dam all fifty households in his whole village had fishermen. One person could get up to 40 viss (64 kilograms) of fish per day, but presently there were only two fishermen in the whole village and they could only manage to catch 4 or 5 viss (6.5-8 kg) of fish in a day. Villagers also complain that there is a bad smell in the reservoir and that some fish are diseased.

Before the power station was built residents could freely forage in the surrounding forests. But after work began Burma Army soldiers ordered the locals to make their homes in prescribed areas and their movements were restricted. Most submitted to the regulated lifestyle without complain, but after a time military units made them move to new locations alleging security concerns. Some grappled for their livelihood by cultivating small plantations, peanuts, and dry farm plots along the Lawpita-Lawdalay road. Others, deprived of farm plots, had to turn to relatives in distant villages for support as their own farm plots were covered with landmines. Many had to pay for permits from the authorities to cultivate farm plots at some distance. Eventually, for many, it became too difficult to survive and they fled to Thailand

Contrary to promises made when the power stations were built, most of Karenni state inhabitants still receives no electricity. A 402-km-long high voltage transmission line carries the power produced to Rangoon, while another 400-km-long high voltage line runs to Mandalay. There are seven villages in Mahtawkhu tract and thirteen in Lawpita tract, both close to the hydropower plants. These villages lie within the security zone of the plants, but no one has bothered to provide them with el ectricity. Only three towns --- Loikaw, Demawso, and Pruso -- are scantily supplied with power and rural areas have no access. The power supplied to the towns exists in name only; the military bases, government offices, officers' flats, and businessmen's houses receive full supply, ordinary people have to be content with a low voltage line.

When the Mobye dam was built, many households in the area were evicted to make way for workers' barracks, staff quarters and equipment storage areas. Two thousand workers – primarily laborers from central Burma but also including Burmese, Japanese, Swedish, and UN engineers – were brought into the area and provided with housing. After the dam was finished the authorities distributed the land belonging to the Karenni farmers to the migrant workers who had been engaged on the construction proect. The former owners received no compensation, It was later learned that the authorities had promised the laborers from central Burma ownership of farmlands in Karenni state. Some locals only learned what was going on when water from the the reservoir started to approach their villages. According to local sources, the infill of the dam reservoir in 1972 caused the displacement of over 8,000 families in Pekhon township. No compensation was offered for the loss of lands or livelihood. For homes, the fixed sum of 327 kyat was offered. Most people reportedly refused the payment in anger; the phrase "only enough to pay for the stairs" was commonly heard. An anti-dam construction committee made up of local leaders formed in 1963. They wrote several complaint letters and met with officials, but the only thing they received were threats of arrest. Finally, the group formed the Kayan New Land Party which became an armed resistance in 1964.

In 1961, after the first stage of Plant No. 2 was completed, the Burma government stationed IB No 54 in Loikaw and built up its numbers to between 700 and 1,000 soldierds. Military camps were stationed in the towns of Loikaw, Demawso, Pruso, Pasaung and financially viable areas such as the Mawchi tin and tungsten mine and the Lawpita power plants. At the time, the Karenni resistance forces virtually dominated the rural regions, causing the Burmese government much apprehension for the security of the towns and the power plant. This in turn led to increased human rights abuses by Burma Army troops.

Eventually, five hundered Burma Army troops were stationed at Lawpita in 1974 to guard Plant No 2 and the pylons for the power line. About 400 residents from the Lawpita village tract were evicted to make way for the battalion base. The evicted villagers were not told where to move to; they had to resettle in nearby villages on their own. In time, as the number of staff employed at the plant grew and other labourers came to work there, the land they needed for cultivation was expanded and the land available for long-time residents was cut back, forcing many to move to other locations.

Karenni farms were also confiscated without compensation during the 1980s to make way for the construction of Plant No 1. Local farmers sent petitions to the authorities but to no avail. These arbitrary measures caused deep resentment and led to sporadic attacks on the high voltage cable pylons. Skirmishes broke out between Karenni and Burma army troops around the power plants. KNPP forces regularly attacked security forces at the power plants during the 1980s until the Burma army evacuated villages around the stations and planted landmines in the area.

Landmines were also planted at the base of every high voltage transmission pylon so that armed groups could not destroy them. Villagers near the pylons had to provide fencing for areas around the base of the pylons. They were and still are forced to cut brush in the area around the transmission line. Many civilians have lost their limbs and lives due to the explosion of landmines planted around the power plants and lines. As of 2001, 30 civilians had been killed and another 50 injured by landmine explosions in the Lawpita region.

**Compiler's note**: The pdf version of this report has many excellent pictures, maps and charts.

# C) Information from the websites of <u>Japanese corporations</u> involved in the planning and construction of the Lawpita power plants

NEWJEC Inc <a href="http://www.ecfa.or.jp/english/pdf/newjec.pdf">www.ecfa.or.jp/english/pdf/newjec.pdf</a>

- Baluchaung No 1 Hydropower Project (28.8 MW) Design, Supervision and other services, contracted by OECF, 1984-1992
- Baluchaung No 2 Hydropower Project (168MW) Other services, contracted by OECF, 1990-1994
- Baluchaung No 3 Hydropower Project (48MW)

Feasibility study contracted by MEPE, 1994-1995

N.B. Other could include sector study, basic design, project Formation, evaluation OECF = Overseas Economic Co-operation Fund (Japan)

Nippon Koei Co Ltd <u>http://www.n-koei.com/english/profile/index.html</u>

- Balu Chaung No 2 Hydroelectric Power Development: 1st Stage Power: Run-of-river type, net head 425.2 m, 84,000 kW, 235 GWh/year T/L: 230/132 kV, 770 km Responsible for study, detailed design, construction supervision, operation, maintenance 1954-1964
- Balu Chaung No. 1 Hydroelectric Project: Installation of 28 MW at No 1 power station to increase tsystem capacity, supply of 200 GWh per annum hydropower to existing system, improvement of the existing output of No 2 power station to 168 MW, 146 GWh. Responsible for detailed design, construction superivsion

Responsible for detailed design, construction superivsion 1984-1992

Rehabilitation of Baluchaung No. 2 Hydropower Plant
 The project aims to improve power generation efficiency of Baluchaung No 2 Hydropower Plant,
 which supplies 20% of the nation's electricity. The rehabilitation work consists of replacing and
 repairing severely deteriorating facilities and machinery such as transformers, supplementary
 machinery of turbines and control panels. Responsible for Basic Design. 2001-2002.

Marubeni <u>http://www.marubeni-powersystems.com/business/epc\_plant/en\_baluchang.html</u>

Baluchaung No 2 Hydropower

This is Maruben's first project in the overseas market. Baluchaung No 2 hydropower plant accounts for about 24pc of the annual electricity production in Myanmar. The power plant and three of six generators were installed in 1960 with postwar reparations from Japan; the other three were installed by Myanmar in 1974. If the plant were left in its present condition it would have to cease operations due to damaged water turbines or fires caused by insulation failure. The plant was partly renovated with a loan extended by Japan in 1986; rehabilitation work was completed in 1992 on first three generator, on the second three in 1994 2001-2002.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> In September 2001, Tokyo Electric Power Co and Nippon Koei, a Japanese engineering company, were awarded a modernization contract for the Hitachi Pelton turbine/generator (T/G) sets at Baluchuang-2 (6 X 28 MW).

**Compiler's Note**: See entries below from the Working People's Daily (10/08/92) for other Japanese companies involved in work on the Lawpita plants.

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### D) References to the Lawpita hydropower plants and dams in on-line journals

Working People's Daily, 05/07/92. <u>http://www.ibiblio.org/obl/docs3/BPS92-07.pdf</u> The Dawtacha diversion dam of the No 1 Baluchaung hydel power station in Lawpita, Loikaw township. was inaugurated July 1st. Begun in 1987, the project includes a 36-foot-high, 1,736-foot-long earth dam, a fourmile-long, 22-foot-high, 15-foot-wide concrete canal, 6,647 feet of 13-foot steel pipes and 527 feet of 6 to12 foot steel pipes, and two 14-megawatt power engines. The new station will produce 28 MW.

### WPD, 10/08/92. http://www.ibiblio.org/obl/docs3/BPS92-08.pdf

Biluchaung No 1 hdroelectric power plant was inaugurated in Kayah State on 09/08/92 in the presence of Energy Minister Khin Maung Thein, SLORC Secretary-2 Tin Oo, Japanese ambassador Tomoya Kawamura, Pres T. Nishigori of Newjec Engineering, GM O Inaba of Mitsubishi Corp., Pres T Yamato of Sakai, Sr GM Y Uebori of Kajima, Project ManagerHla Maung and others. The plant, begun in 1987, has two 14-MW turbines.

Article authored by DTS entitled 'Burma's electricity problems' published in April 1999 http://www.burmalibrary.org/reg.burma/archives/199904/msg00395.html Lawpita machine needs water flow of 1,600 cu ft/sec to produce 196 megawatts

NLM, 27/10/99. www.myanmargeneva.org/99nlm/n991027.htm

Gen Maung Aye inspected the power plant at Baluchaung No 2 hydel power project at Lawpita. Officials reported on rainfall of Loikaw and its surrounding areas, inflow of water to Moebye reservoir and Innlay lake and storage capacity of the two water bodies, power generation of Baluchaung No I and No 2 hydel power plants, the condition and maintenance of the plants, and efforts being made to improve the inflow of water to the reservoir. EPM Tin Htut explained systematic arrangements being made for durability of the power plants and staff welfare programmes. Commander Maj-Gen Maung Bo and Minister Maj-Gen Nyunt Tin explained tree plantation and related tasks in beautifying Innlay lake.

MEPE information on ASEAN Energy website, [circa 2000].

<u>www.aseanenergy.org/energy\_sector/electricity/myanmar/future\_electricity\_projects.htm</u> Feasibility study for Baluchaung No 3 in Kayah state, 48 MW, expected to generate 327 GWh annually, completed by NEWJEC

Mizzima, 06/02/03. www.mizzima.com/archives/news-in-2003/news-in-feb/06-feb03-06.htm

Due to the shortage of rainfall in Kayah state in the last rainy season, run-off has fallen causing the generators at Lawpita power station to slow down. It is expected that the wattage will continue to decline this year. Because of drought conditions over the past 3 years, only one of the three generators at Lawpita hydro-power plant could operate and wattage has declined up to 50% of total output.

#### NLM, 11/05/03. www.myanmar.gov.mm/NLM-2003/enlm/may11\_h2html

Forestry Minister Aung Phone reports on the forest and wildlife conservation project within the 20-milestretching area of Inlay Lake and on measures being taken to prevent forest extraction and extension of farmland in the 20-mile area surrounding Inlay Lake. Deputy Ag & Irrig Minister Ohn Myint reports on the prevention of silt in the creeks which flow into the lake [and] conservation of the water resource ir order to supply water to Lawpita hydel power plant. Inlay Lake supplies water to Moebye Dam which controls the flow of water to the Lawpita power plant.

NLM, 28/04/04. <u>http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040428.htm</u> At Moebye dam, Brig-Gen Taung Aye oversees power supply facilities at the dam. He is briefed on the storage of water and water supply tasks. The dam facilitates water supply to 19.942 acres of farmland.

Democratic Voice of Burma, 23/04/05. <u>http://six.pairlist.net/pipermail/burmanet/20050425/000683.html</u> The SPDC claims that the KNPP [Karenni National Progressive Party] insurgents mined an electric power pylon on the grid linking Lawpita hydropower station and Toungoo. The report publishe in the Myanmar Alin on 23 April failed to give details on why the pylon was mined and where it was located. Foreign Affairs Director Saw Doh Hsay of the KNPP said the explosion had occured near Tower 130 close to the border of Toungoo township. He said the Lawpita hydropower station had been in service for more than half a century without the Karenni people having the right to use the electricity. Those who live in the vicinity of Lawpita still had to rely on lamps and candles, while the Burmese militaryt junta had been supplying electricity to benefit major industries in Rangoon and Mandalay.

#### Aye Aye Win: AP: 04/01/06 www.irrawaddy.org/article.php?art\_id=5335

A shortage of funds, lack of rainfall and rising demand for energy have resulted in frequent power cuts in Rangoon, disrupting livelihoods and affecting the economy. The city of five million needs 450 MW of electricity daily, but generating capacity at present stands at only 385 MW. An official of the Electric Power Dept said electricity rationing could last until June, a month after the monsoon rains set in. He said the generators at the Lawpita hydroelectric plant could not operate at full capacity due to lack of rainwater in the reservoir. Other generators have broken down and cannot be repaired for lack of funds. Shortage of natural gas has shut down some gas-powered generators. Lawpita, located 210 miles (350 km) north of Rangoon is an important source of electricity for city.

Khun Sam, IRROL, 15/03/06. http://www.irrawaddy.org/article.php?art\_id=5559

An environmental impact report has condemned Burma's proposed dam projects on the Salween River, warning that vast tracts of land and thousands of Karenni villagers would be at risk if the projects were to proceed. The report, *Dammed by Burma's Generals*, was prepared by the Karenni Development Research Group (KDRG) -- a Mae Hong Son-based forum comprising nine civil society groups -- and raises serious concerns about the potential impact of the projects, particularly in light of previous experience with the Lawpita hydropower plant in Karenni State. A spokesperson for the group, Aung Ngeh, cited the Lawpita hydroelectric plant -- built in the 1960s – as an illustration of the likely problems to be faced as a result of future projects on the Salween River. He challenged the claims by Burma's military junta that Lawpita had successfully increased energy and irrigation output, claiming to the contrary that Lawpita had been responsible for forced displacement, electricity and water shortages, increased militarization, human rights violations, and an increase in landmine installations to protect the site from attack by ethnic rebels. The KDRG report claimed the Lawpita project caused flooding over 200 square kilometers and the loss of an estimated 12,500 homes and farms, with the majority of people who lost their homes not receiving any compensation from the government.

NLM, 23/06/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060622.htm

Brig-Gen Thaung Aye, Foresty Minister Thein Aung, EPM No 1 Zaw Min and Loikaw Station Commander Hla Myint Shwe and officials inspect storage of water, functions of the water intake building, valves of the sluice gate and supply of water to No 1 Power Plant at Dawtacha dam near Loikaw. Biluchaung No 1 power plant is equipped with two 14-MW generators and generates 200 million kWh annually, supplying Toungoo, Yangon, Kalaw, Thazi and Mandalay through No 2 Power Plant (Lawpita). The also inspect operations at Biluchaung No 2 power plant which has six 28-MW generators and produces 1,200 million kWh annually. The electricity is supplied to Yangon, Kalaw, Thazi, Mandalay, Taunggyi, Loikaw, Moebye, Dimawhso, Pruhso

### NLM, 18/02/07. www.myanmargeneva.org/07nlm/n070218.htm

Lt-Gen Kyaw Win of the Ministry of Defence and party arrive at Baluchaung No 1 hydro-electric power station (Lawpita) on the right bank of Balu Creek, about 10 miles south-east of Loikaw and inspect operations at the station. They also visit Baluchaung No 2 hydro-electric power station (Lawpita) about 14 miles east of Loikaw. The manager of the station reports that the plant is generating at full capacity. Measures are taken to ensure machinery repair within 4 or 5 hours of any breakdown. Baluchaung No 2 station was built in 1960 and is the biggest in the country. It can generate 1,200 million kWh annually. Baluchaung No 1 station was built in 1992 and it can generate 200 million kWh annually.

# Japanese Embassy in Myanmar, 01/06/07.

### www.mm.emb-japan.go.jp/profile/english/press/2007-06-01.htm

The Grassroots Grant Assistance Scheme (GGA) has granted US\$151,646 for two humanitarian assistance programs in Thai-Myanmar border areas. One of the projects is for the construction of a water supply system in the Mobye village tracts in Shan state. It includes the area where the Kayan National Guard (KNG) has partial autonomy. Because of a long-lasting war fought in the area, this is one of the least developed regions in Shan state. At present, the Mobye Village tracts have a population of 10,000. There are only ten wells in the area and the people are forced to draw water from the Balu river. The quality of water is not safe for drinking and it is hard on the women and children who have to carry it from the river every day. Local residents launched a water supply project to improve the situation but lacked the financial resources to bring it to fruition, so the project stalled. The committee applied to for grass roots assistance for their project. Considering the dire water situation and the importance of improving the lives of ethnic minorities who have made peace with the government and returned to legal fold, the Japanese government decided to fund the project.

# Myanmar Times, 04/06/07. www.mmtimes.com/no369/n002.htm

A statement released by EPM No 2 on May 23 said the country's total electric power capacity is 1,542 MW, but the amount being generated was 782 MW. The hydropower stations have a combined output of 738 MW but have been operating at 58.8pc of capacity because of low water levels in the reservoirs. During the summer season, only the Lawpita hydropower station near Moebwe dam in Kayah state was able to operate at full capacity. Nine natural gas turbines, which have a combined capacity of 450 MW, were operating at 42pc of capacity.

### Kyaw Thu, Myanmar Times, 27/08/07. http://www.mmtimes.com/no381/n009.htm

Two towers used to transmit power to the national grid were destroyed and a third damaged in an attack by anti-government insurgents [in Thandaung township?] in Karen state on August 14. Explosives were used to destroy towers 206 and 208, and nearly knocked down tower 205. Yangon lost 90 MW due to the destruction of the lines, according to an official of YESB. Some of the shortfall in power supply had been overcome by increasing the supply of natural gas to turbines in Yangon. "We have been getting an additional 6.1 million cu ft of gas per day from the Energy Ministry, so we have been able to increase the output from the gas turbines to partially compensate for the power lost by the explosions," the official said. It will take "at least one week" to repair the towers because they were located in a remote, mountainous region where heavy rain and mudslides can hinder work. The reduction in power supplies has forced YESB to supply power to township according to a rotating system. The townships have been divided into three groups, with two groups receiving 18 hours of electricity and one group getting 12 hours on a given day.

### Kyaw Thu, Myanmar Times, 26/11/07. http://www.mmtimes.com/no394/b005.htm

Two private Myanmar companies developing hydropower projects are planning to hire foreign consultant companies, said an energy expert close to one of the companies on November 20. Asia World and Olympic Construction are the first two private, local firms to have been entrusted to build hydropower projects in Myanmar. Asia World is slated to build the Thaukyegeat hydropower project in Bago Division, which is expected to produce some 140 MW, while Olympic Construction will build the Baluchaung 3 project in Kayah State. This project is hoped to deliver a further 48 MW. "The two companies have been running feasibility studies and preparing to submit a proposal to the Myanmar Investment Committee," he said. When finished,

the electricity generated by the two projects will be sold to the Ministry of Electric Power 2 for distribution through the national grid.

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# E) Documentation related to the controversy surrounding <u>Japanese aid</u> for repairs to the generating facilities at Lawpita Plant No 2 in 2001/02.

#### Jiji Press (Japan), 05/04/01. [unofficial translation]

http://www.burmalibrary.org/reg.burma/archives/200104/msg00028.html

It is revealed on 4th April that the Japanese government is to provide aid for repairing an old power plant in Myanmar. It will be executed within the year and total 3.0 billion yen to 3.5 billion yen. (\$24 million to \$28 million.) It will be the largest aid since the beginning of Japanese sanction against the country in 1988. Japan wants to use the aid to support a move of national reconciliation, that is, resumption of the "political dialogue" between the junta and opposition groups led by Ms. Aung San Suu Kyi.

#### Tetsu Hakoda, *Translator's Note on Japanese Aid to Burma*, Burma Net News, 08/04/01. http://www.burmalibrary.org/reg.burma/archives/200104/msg00028.html

The Baluchaung hydroelectric power plant in Kayah state was built in 1960 using Japanese war reparations funds for Burma. In 1981, Japan gave loans of 16 billion yen [to fund the construction of Baluchaung No 1 plant] and 3.53 billion yen in 1986 for repairs to Baluchaung No 2 plant.

A Japan Times story covered the matter of a new loan for repairs to Baluchaung plant no 2 on 14th February 2001 under the headline 'Japan readies fresh ODA for Myanmar.' It reported that Japanese government sources had said that Japan would consider carefully the timing of any overseas development assistance for the Baluchaung power project at the same time as it kept a close watch on political developments in Burma and on international circumstances surrounding the south-east Asian country. The Jiji report shows that Japanese government has stepped up its procedures with regard to the aid. The Ministry of Foreign Affairs is also deeply involved in the decision making process.

The issue was raised four months ago in Sankei Shimbun, a Japanese rightwing newspaper. It reported on 18 December that in January 2000 JICA had sent a mission of inquiry to Burma that carried out research on the Baluchaung power plants for three months. The mission report urged the necessity of emergency repair work. If not carried out, it said "the power plants will not work properly in the near future." Japan had been trying to present the assistance to the SPDC as humanitarian aid. However, the project had been stopped in the face of the political deadlock in Burma, the article said. Sankei reported that the Yugoslav government had estimated the costs of the repair project at US\$33 million last year. A source reported that Yugoslavia and the SPDC had reached basic agreement on the aid at the beginning of December. Sankei, well known for its extremely hostile attitude to China, worried that the Chinese government would give financial support to Yugoslavia using Japanese ODA funds provided to China, since Yugoslavia didn't seem to be able to finance the project completely by itself.

It's not certain that China will provide funds to Burma through Yugoslavia. However, the airing of the issue does seem to reflect concern on the part of some anti-Chinese policy makers in Japan. These government officials and MPs have been very sensitive to China's growing influence in Burma. Some Japanese assistance in Burma, such as the meeting held last December to support structural reforms for the Burmese economy, has been provided for the purpose of lessening China's influence in Burma. The Sankei article ended with an expression of nationalist antagonism to China: "If Japan ignores this matter, it is possible that hydroelectric plants build by Japanese aid will carry another nation's flag and China will snatch away the benefits resulting from Japanese aid."

Anyway, it is clear that the Japanese government is heading for the first fresh aid to the junta since 1998. At that time, they justified assistance for upgrading the runway at Mingaladon airport in Rangoon as a form of 'humanitarian' aid, needed to secure passenger safety. Ironically, All Nippon Airways (ANA) pulled out of Burma in March 2000 and now there are no direct flights between Rangoon and Kansai or Narita. The Japanese government is trying the same maneuver that it used in 1998. It is using the term 'humanitarian'

assistance' for the Baluchaung repair project and saying that the aid will stimulate a move towards 'political dialogue' between the NLD and SPDC, the exact content of which is still not known.

Nobody knows where the 'dialogue' will lead to. The international community is watching the current situation with cautious optimism. For example, the EU is sticking to its sanctions policy. ILO sanctions are still on because of the SPDC's complete failure to tackle forced labor problems. In addition, there are still a lot of problems in the border area. The number of refugees and IDPs fleeing from the SPDC offensive against ethnic forces, the killings, rapes, forced labor, forced relocation and other serious human rights abuses are on the increase. It is hardly possible to say that SPDC is really heading for true national reconciliation. It is really the policies and concrete activities of the junta that make 'humanitarian' assistance necessary for people both inside and outside Burma. The Japanese government must review its project-oriented involvement in Burma based on the plentiful evidence of the SPDC's failure to tackle almost all kinds of problems in Burma. It must first urge the junta to stop human rights abuses against its people and to release all political prisoners, including Daw Suu Kyi.

Central Committee, Karenni National Progressive Party, Statement regarding the plan of the Japanese Government plan to provide US\$24 million to the SPDC to repair Lawpita hydro-power plant and to build

another power plant at Lawpita, Karenni State, 24/04/01. http://www.burmalibrary.org/reg.burma/archives/200104/msg00004.html

1. The present Lawpita hydropower plant was built in 1952 by Japanese engineers. It was paid for using Japanese war indemnity funds. Despite being located inside Karenni State, successive military regimes in Burma have never allowed Karenni civilians to use the electricity. The power plant distributes its electricity to the rest of Burma, in particular to the country's two largest cities, Rangoon and Mandalay.

2. Since the SPDC took over, seven villages have been forcibly moved out of the Lawpita area and 10,000 anti-personnel landmines have been laid there. The mines in this massive field have caused death and injury to numerous Karenni villagers and tens of hundreds of cattle belonging to the villagers.

3. Should the proposed extension to the Lawpita power plant go ahead, more dams will be built which will destroy tens of thousands of acres of farmland and even more people living on the Karenni-Shan border will become homeless.

4. Due to the abnormal weather patterns in 1998, lakes and rivers, including the Mang Pai Dam, dried up. Since the Bilu river, the main source of water for the Lawpita power plant, went dry there was not enough water to power the generators. In order to obtain more water for the power plant, the SPDC blocked all the streams and irrigation on which Karenni farmers depend for their farms. As a result Karenni farmers faced a shortage of water on their farms and crops failed and even essential consumption needs were not met.

5. The SPDC is now facing a shortage of electricity, since the Lawpita power plant does not produce as much electricity as it did in the past, due to the shortage of water from the Bilu river.

The SPDC has met with NLD leaders to gain help from international community. The SPDC will be able to solve many political and economic difficulties it is facing, if the Japanese government helps to repair the Lawpita power plant and build another power plant. The SPDC will continue to violate basic human rights, once all the difficulties it is facing are met. In reality the sanctions imposed by the international community against the SPDC and the shortage of electricity in Burma serve to put pressure on it.

The Japanese Government will automatically break these sanctions, if it funds the building of a new power plant or repairs the original plant.

The KNPP requests that plans to rebuild or repair the Lawpita Dam be stopped. Due to the past history of SPDC action in this area we believe there will be no benefit to local people and numerous disadvantages. Should the plans to build it go ahead, we believe that it will only serve to further entrench and empower a government that holds no regard for the people of Burma.

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Thomas Crampton, International Herald Tribune, 26/04/01. www.iht.com/articles/2001/04/26/burma\_ed3\_.php

To support secret talks between opposition leaders and Rangoon's military government, Japan has quietly approved the largest grant aid package since Burma's ruling generals cracked down on pro-democracy demonstrations in 1988. The move, which breaks a long-standing de facto ban on bilateral international assistance to Burma, took place in consultation with the United Nations and the United States.

Sources familiar with the progress of the United Nations-brokered talks in Rangoon said the grant, which sets aside ¥3.5 billion (US\$28.6 million) for reconstruction of turbines in a hydropower dam, was intended to serve as a tangible reward to the military government for having kept open a dialogue with the opposition leader Daw Aung San Suu Kyi.

Rehabilitation of the Baluchaung dam was agreed to earlier this month and quietly announced during a littlepublicized visit to Tokyo by Burma's deputy foreign minister, Khin Maung Win. The dam, in eastern Kayah province, was built by Japan in the 1960s as part of war reparations. Japanese consultants will leave for Burma in the next few weeks to draw up a feasibility study. The agreement was not announced in Burma's official press and went unnoticed by many observers, including Rangoon-based diplomats.

The reconciliation talks started last October at the prompting of a new UN special envoy, Razali Ismail. "This is a very significant move by Japan," a Rangoon-based source said. "Japan has been trying to keep it quiet yet cooperate with Razali to reward progress for the talks." Mr. Razali overcame years of stalemate to start talks between Daw Aung San Suu Kyi and leaders of the military junta. The talks remain secret, but some of the government's more virulent propaganda against Daw Aung San Suu Kyi has eased. In another hint of progress, the Burmese government earlier this month let in an envoy from the UN human rights office for the first time in five years.

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Dr Thaung Htun, Representative for UN Affairs, NCGUB, [at the Tokyo PressClub], 21/05/01. http://old.ncgub.net/Views/Statement%20made%20by%20Dr.%20Thaung%20Htun,%20Representative%20f or%20UN%20Affairs,%20NCGUB%20may%2021,%202001.htm

We are quite concerned about the recent approval of the grant of ¥3.2 billion to fix the turbines at the Lawpita power station and the Baluchaung dam. We were told that the assistance is "humanitarian" because it will help lower the price of electricity and make it more accessible to the poor and will help prevent accidents and the blackouts which are having a serious impact on hospitals.

Let me explain about Japan's grant for the hydroelectric power plant in Lawpita. The refurbishment of the Lawpita hydroelectric power generation plant alone is not enough to resolve the power problem in Burma. Even with full power generation of 180 MW from Lawpita, an increase in output of 27pc, Burma's power generation would only be about 620 MW -- way below the current national demand of more than 1,200 MW.

What is more disturbing is the current electricity distribution system in Burma and figuring out ways to increase the power supply to to the people it is intended to reach. The current electricity distribution incorporates a system of special privileges and priorities that is discriminatory to ordinary citizens. Selective groups of people or certain categories enjoy reduced tariffs or simply pay no tariff at all at the expense of ordinary consumers. The electricity shortage is but one symptom of the socioeconomic crisis that can be attributed to a government that lacks transparency and accountability and is unresponsive to the needs of the people.

**Compiler's Note**: The entry: '<u>Special privileges</u> alleged in electricity distribution system', provides details about the system referred to by Dr Thaung Htun in his presentation. It was handed out at the media conference.

Mekong Watch, Japan, Development, Environment and Human Rights in Burma/Myanmar: Examining the Impacts of ODA and Investment: Public Symposium Report, Tokyo, December 15, 2001. http://www.mekongwatch.org/english/documents/burmareport-screen.pdf

A major portion of the Japanese war reparations to Burma was used for construction of the Baluchaung hydroelectric power plant in Karenni (Kayah) state. Another portion was used for the so-called 'four major industrialization projects', including production of light and heavy vehicles, farm machinery and electrical machinery. These projects began in 1962 and lasted until 1988 and changed in character from projects associated with war reparations to 'quasi-reparations'. Official Development Assistance (ODA) in the form of yen loans replaced war reparations in 1968. Grant aid was started in 1975.

Excerpt from remarks by Teddy Buri, exiled MP-elect for Karenni State at the Tokyo Press Club.

Baluchaung was the first power plant built by the Japanese with war reparation money, but the electricity produced there goes to power industries in central Burma. Not only are local Karenni people unable to enjoy the electricity, but they also have to provide unpaid labor. They have to carry water, look for firewood, and guard the power pylons and power lines. Why do they have to guard them? Because Karenni State, my state, is a militarily contested area. We have the Burmese troops there, as well as the Karenni resistance troops. They are often fighting. It is because of that that the villagers have to guard the pylons and power lines.

This hydropower plant is so old that it needs renovation, so the Japanese government is bent on giving this 3 billion yen to renovate it. If this plant is renovated, more security will be needed. There will be a bigger presence of the military then. With a bigger military presence, more forced labor will be demanded of the people. They certainly won't be able to return to the villages they were relocated from.

Before giving aid, the Japanese government should place some conditions that there will be no forced labor, conditions that the money is used in a way that is transparent and accountable. The grant should be used as a lever to ensure that the talks between Aung San Suu Kyi and the regime make some progress. Unless there is progress in the talks, this ODA should not be extended to the Burmese generals. Otherwise the money will go to expand the army that is used to suppress the people.

Kyodo: 25/02/02 http://findarticles.com/p/articles/mi\_m0WDQ/is\_2002\_Feb\_25/ai\_84260071

Myanmar Foreign Minister Win Aung said Friday that Japan's stalled grant aid of \$26 million to repair an ageing hydroelectric power station in his country was "nothing" in comparison with national pride. Win Aung said Japan is reluctant to help Yangon repair the Baluchaung power station in Lawpita in Kayah state. Instead he praised China, saying, "A friend in need is a friend indeed," though he stressed that China has provided "no big loan" to Myanmar and has invested little in the military-ruled country. Japan has urged Myanmar's SPDC to engage in dialogue with the opposition NLD and the party's pro-democracy leader Aung San Suu Kyi. Japanese officials have suggested that the anticipated grant is one of the elements that keeps the way open for Japan to communicate with Myanmar's leaders. Win Aung said the dialogue between Myanmar's junta leaders and the NLD "will move forward." He declined to give any clue about the dialogue contents but said he is satisfied with the momentum of the talks. He neither confirmed nor denied a report that the SPDC's Gen Than Shwe held discussions with Suu Kyi on 22/01/02.

Ministry of Foreign Affairs, Japan, *Grant Assistance to Myanmar for Rehabilitation of Baluchaung No 2 Hydropower Plant*, May 10, 2002. <u>www.mofa.go.jp/announce/announce/2002/5/0510.html</u>

1. The Government of Japan decided to extend emergency assistance of up to 628 million yen to the Union of Myanmar for the project: 'Rehabilitation of Baluchaung No 2 Hydro Power Plant'. Notes to this effect were exchanged on May 10 in Yangon between Mr. Shigeru Tsumori, Japanese Ambassador to Myanmar, and U Soe Tha, Minister for National Planning and Economic Development of Myanmar.

The Baluchaung No. 2 Hydro Power Plant is the largest power plant in Myanmar with an installed capacity of 168 MW. It accounts for about 24pc of the total annual electricity production in the country. The power plant and three of six generators were installed in 1960 using postwar reparations from Japan. The remaining three were installed by Myanmar in 1974. The plant was partly renovated with a loan extended by Japan in 1986 that kept it in operation. If the plant were left in its present condition it would be necessary to close it down completely owing to damage caused to the water turbines or fires caused by insulation failure. This would have an enormous impact on the daily life of people in Myanmar.

In this situation, the Government of Myanmar formulated a rehabilitation project and requested grant assistance from the Government of Japan to procure materials and equipment to repair heavily damaged parts such as water turbines, generators and electrical transformers, replacing part of the equipment and adding electric lines.

3. The project will prevent serious accidents in the plant and will enable the distribution of a stable power supply needed by the people of Myanmar.

4. The Government of Japan welcomes the lifting of the restrictions on the movements of Daw Aung San Suu Kyi on May 6. Japan supports Myanmar's efforts for democratization and nation building, and from this point of view has decided to extend this grant assistance.

#### Aye Aye Win, AP, 10/05/02. http://www.highbeam.com/doc/1P1-52906942.html

Japan said Friday it would give Myanmar's military government 628 million yen to renovate the Baluchaung No. 2 Hydro Power Plant in Kayah state, in what appears to be a reward for freeing democracy leader Aung San Suu Kyi from house arrest. The grant will pay for the restoration of six generators and related substation equipment. Last month, when it became clear that Suu Kyi was going to be released soon, Japan pledged 792 million yen for the purchase of medical equipment for Yangon hospitals. Japan eased its attitude in late 2000 when the junta began closed-door reconciliation talks with Suu Kyi. She was released Monday after 19 months of confinement at her lakeside villa. Myanmar rations electricity, and blackouts lasting up to three days are common in Yangon and across the country. Last year, Japan had said that rehabilitating the Baluchaung plant would cost 3 billion yen. It is not clear if Japan is planning to give more money to foot the bill.

# **E**) Selected passages from 'Baluchaung No 2 Power Station Renovation Project'.

Japan Bank for International Co-operation, *Baluchaung No 2 Power Station Renovation Project: Myanmar*, pp 1-7, May 2002. <u>http://www.jbic.go.jp/english/oec/post/2002/pdf/070\_full.pdf</u>

This is a post evaluation report of the long-term results of the renovation of the generators at Lawpita No 2 carried out by Japan in 1989-90. The field survey for the post evaluation was carried out in Sept 2001. The results of the evaluation anticipate the second renovation project that was officially approved in May 2002.

By 1987 the total net generation capacity at Baluchaung No. 2 Station was 142 MW, while total rated capacity was 168 MW. The renovation project in 1989-90 restored all six units to 28 MW, and total capacity to 168 MW. By the time of the post-evaluation in Sept 2001 the net generation capacity had been reduced to 157 MW.

Through the 1980s, growth in electricity use in Myanmar remained low. In an effort to improve public welfare and to promote industrial development, the government placed a high priority on the development of power resources. In the fifth 4-year Economic Development Plan (1986-1989), it decided to increase power supply through the construction of a hydroelectric power plant. During the 1990s the total demand for power nearly

doubled; from 1,500 GWh in 1987, it shot up to 3,000 GWh in the year 1999. This trend in power demand is evidence of the relevance of this project.

Fiscal	1985	1990	1992	1993	1994	1995	1996	1997	1998	1999
Year										
Hydel	226	258	289	291	299	317	327	328	340	360
Total	684	804	807	809	837	982	1033	1042	1055	1196
Hvdel %	33	32	36	36	36	32	32	31	32	30

#### Table 1: Electric Power Installation Capacity (Unit:MW)

The volume of actual net production in Baluchaung No 2 from fiscal year 1987 to FY 2000 is shown in Table 3. The average volumes from 1987 to 1992, and from 1993 to 1997, were 920 and 1,197 GWh, respectively. Thus the renovation project is considered effective.

Table 3:Net Production in Baluchaung No. 2

Fiscal Year	Net Production (GWh)	Output Capacity (MW)	Utilization Factor %
1987	908	142	73.0
1988	828	142	66.6
1989	864	142	69.5
1990	943	142	75.8
1991	1013	142	81.4
1992	963	145	75.8
1993	1172	156	85.8
1994	1190	164	82.8
1995	1224	168	83.2
1996	1192	168	81.0
1997	1205	165	83.4
1998	631	162	44.5
1999	672	161	47.6
2000	1219	158	88.1

The utilization factor, which includes such elements as demand, on-stream and rain, is calculated using the following formula: Utilization Factor = (Net Production) / (Output Capacity x 365 x 24). In 1998 and 1999, the utilization factor was very low due to severe drought.

Table 4:

### National Firm Power and Peak Load

											Unit:	MW	
Financial	87	88	89	90	91	92	93	94	95	96	97	98	99
	407	407	202	250	050	204	200	444	000	000	040	000	700
Firm	407	407	383	350	350	384	399	411	609	623	613	622	706
Power													
Peak	359	332	373	407	430	460	483	485	581	680	750	845	897
Demand													
Balance	48	75	10	-51	-74	-76	-84	-74	28	-57	-137	-223	-191

The Baluchaung No. 1 and No. 2 power stations have a generation capacity of 28 (14 X 2) MW and 168 (28 X 6) MW, respectively. Of this, 120 MW of electric power is transmitted to Yangon and 60 MW to Mandalay.

Impact

Improvement in public welfare and well-being is closely linked to industrial development, in Myanmar as in any other country. This is commensurate with per capita consumption of power, which as can be seen in Fig. 4, rose nearly 50% from 1985 to 1997. The increases in demand for industrial, commercial and household sectors shown in Fig. 1 also reflect trend. The renovation project contributed to this trend.

No adverse impacts on the environment or on local residents have been reported by either the Myanmar Electric Power Enterprise or Baluchaung No. 2 Hydro-Electric Power Station.

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#### Addditional references

See above: <u>'Tribe's home</u> to be a valley of the dammed' (London Times: 22/03/06)

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### Appendix 2

### BILIN HYDROPOWER PROJECT: NOTES

Topographic map reference: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-09: Pegu Bilin dam and power station, 16 mi north of Bilin [17° 14' N, 97° 15' E], grid sq ref: 8\1, 26\8 [?] <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-9.jpg</u>

NLM, 30/07/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm</u> Plans are under way to implement 15 hydel power projects such as the Bilin hydel power plant in Bilin township that can generate 140 MW for the first phase and 140 MW for the second phase.

NLM, 12/11/99. <u>http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n991112.htm</u> At a meeting of SPIC, EPM Tin Htut presented feasibility studies on the implementation of the 600-MW Yeywa hydel power project in Patheingyi township, the 150-megawatt Thaukyekhat hydel power project in Thandaung township and Bilin hydel power project with two stages, each of 140 MW, in Bilin township.

#### NLM, 24-03-97. [on-line reference not available]

Chairman Woo Choong Kim of Daewoo Corp of the Republic of Korea signed an MoU with MEPE to undertake a feasibility study of the Bilin hydel power project on Bilin *chaung*, 16 miles north of Bilin town.

Nippon Koei Co Ltd website info, [n.d.]. <u>http://www.n-koei.com/english/profile/index.html</u>

From 1994 to 1996, Nippon Koei Co Ltd, a Japanese technical assistance consulting firm, carried out a review of the existing study and a survey from technical and economic viewpoints of the feasibility of a hydropoower dam and generating plant on the Bilin river. The plan was for a 700-MW facility that would produce between 800 and 1,000 GWh annually with 2005 as the target year of completion.

WPD, 15/09/90. http://www.ibiblio.org/obl/docs3/BPS90-09.pdf

SPIC, chaired by SLORC V-C Gen Than Shwe, met to review hydel power and energy projects. Projects in the immediate future include the Biluchaung hydro-electric power project No. 1 in 1992 (28 MW) and the Mann thermal generation project in 1993 (72 MW). Later projects planned include: Saing Din hydroelectric project in Buthidaung township, Paunglaung hydelpower project in Pyinmana township (280 MW) at a cost of K 4,250 million (US\$ 410 million) for power, and K 135 million (US\$ 14 million) for irrigation of 40,000 acres; Bilin hydel power project in Mon State (240 MW) at a cost of K 2,590 million (US\$ 245 million); Kun hydelpower project in Pyu township (84 MW), Yenwe multipurpose dam project in Kyauktada township (16.2 MW) and irrigation of 40,000 acres.

World Bank, *Burma: Issues and Option in the Energy Sector: Report No 5416-BA*, June 1985, p.18. <u>www.wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1999/09/17/000009265\_3970723102606/Ren</u> <u>dered/INDEX/multi\_page.txt</u>

A 240-MW scheme on the Bilin River appears to be one of the best hydroelectric prospects for relatively early development. The estimated construction cost for Bilin is US\$227 million (1981 prices) which is lower than for Paunglaung, primarily due to the smaller dam size. Firm power would be greater owing to the much larger water storage at Bilin. Mean annual energy production is estimated at 880 GWh. However, the multi-purpose nature of the project, which is only at the preliminary study stage, raises substantial uncertainties as

to the relative economics of Paunglaung and Bilin. The project status of Bilin should be upgraded to the same level as that of Paunglaung to allow comparison of the economics of the two projects.

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### Appendix 3

### DAGYAING CREEK HYDROPOWER PROJECT IN HLAINGBWE TOWNSHIP: NOTES

**Topographic map reference**: Thailand: 1:250,000: Series L509, U.S. Army Map: NE 47-10: Li The Dagyaing hydropower project, 5 mi north-east of Paingkyon [17° 02' N, 97° 59' E], grid sq ref: 18\9, 3\9 <u>http://www.lib.utexas.edu/maps/ams/indochina\_and\_thailand/txu-oclc-6535632-ne47-10.jpg</u>

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

The Dagyaing hydropower project with a planned capacity of 25 MW is expected to generate 88 million kWh annually. It is currently in the planning stage and will be carried out by the HPID.

NLM, 30/07/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm</u> EPM No 1 Zaw Min informs the Electric Power Development Project Work Cte that plans are underway to implement the 25-MW Dayaingchaung hydel power plant in Hlaingbwe township along with 14 others.

Karen Human Rights Group, 11/02/06. http://www.khrg.org/khrg2006/khrg06f1.pdf

During 2005, Pa Kah village about 5 km east of Dta Greh (Burmese: Pyaingkon) received a visit from the officers of LID No 22 headquartered in Pa'an. They informed the villagers that a hydroelectric power dam would built across Dta Greh river at Oo Wih Hta just outside the village. Both the villagers and a local contingent of the DKBA cease-fire group in the area are opposed to the dam, but feel they can do nothing to stop it. To clear the site, the authorities enlisted local people who were paid them K1,000 per day. However, the villagers feel this was done to win their co-operation and that when more labour is required later they will probably have to work without payment. **Compiler's Note**: Pa Kah (Hpagat) appears to be 8 km north of Paingkyon on topographic maps of the area. Name of the river is shown as Dagyaing *chaung*.

NLM, 21/01/06. <u>http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060121.htm</u> The 15-MW Dayaingchaung (Paingkyon) hydel project will be implemented in Hlaingbwe township.

NLM, 08/02/05. <u>http://www.myanmar.gov.mm/NLM-2005/Feb05/enlm/Feb08\_h2.html</u> Kayin state PDC Chairman Col Khin Kyu reports on geographical surveys conducted for power supply through Dakyaing creek in Hlaingbwe township.

NLM, 28/12/04. <u>http://www.myanmar.gov.mm/NLM-2004/Dec04/enlm/Dec28\_h6.html</u> Announcement at a SPIC meeting chaired by Gen Than Shwe that Dayaing creek (Paingkyon) hydel power project will be built 12 miles east of Hlaingbwe in Kayin state. A 25-MW generator that is expected to generate at least 10 MW [?] will be installed.

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### Appendix 4

### GAS-FIRED POWER PLANTS OF THE AYEYAWADDY VALLEY NOTES

Tin Maung Maung Than, *"Burma's Energy Use: Perils and Promises"* in *Southeast Asian Affairs 1986*, (Institute of Southeast Asian Studies, 1986), p. 73. [not available on-line] Appendix 4

Industrial use of natural gas started in Burma with its utilization as feedstock for the nation's first fertilizer plant at Sale in 1971. Rapid development of the gas fields resulted in a quadrupling of production between 1973/74 and 1983/84, corresponding to a yearly average growth rate of nearly 15pc. The rapid growth of

natural gas in the decade could be attributed to the increasing demand for its use, not only in fertilizer production, but also in the production of electricity by gas-turbine generators. Demand for these uses as well as for other downstream petrochemical projects undertaken at the start of the 1980s may have been the reasons for the optimistic annual plan targets set in recent years -- targets which were not realized in actual production. Plan fulfilment ratios were equally disappointring for natural gas as for petroleum. However, it is likely that production from the newly developed fields in the Irrawaddy delta and the Prome/Htantabin area would significantly increase the natural gas supply well above Burma's present needs. Further development of natural gas may be constrained mainly by infrastructure problems and financial limitations on potential downstream projects rather than by resource inadequacy as such.

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#### References to the Kyunchaung gas power plant

**Compiler's note**: The Kyunchaung gas-power station and a nearby urea fertilizer plant are located close to the Ayadaw natural gas field, south-west of Pakokku, opposite Nyaung-U on the Irrawaddy. Gas pipelines connect it to the Chauk and Lanywa oil and gas fields about 20 km farther south and to the Kyaukkhwet/Letpando oil and gas field some 80 km to the northeast in Myaing township. The Ayadaw field has been exploited for over a hundred years. There are no recent production reports. The Kyaukkhwet/Letpando field was first drilled in 1974 and after fits and starts began producing on a large scale in 1999. In 2005, along with the nearby Thakyitaung/Sabei oil and natural gas field, it was reported to be producing 1,400 barrels of crude oil and 20 million cubic feet of natural gas per day.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> The 54-MW power plant at Kyunchaung uses simple-cycle gas turbines.

### NLM, 17/11/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n061118.htm

EM Lun Thi inspected No 2 Fertilizer Plant (Kyunchaung) at Kyunchaung. At the briefing hall of the factory, Factory Manager U Htay Aung reported on production of the fertilizer factory and Liquefied Petrolem Gas Plant (Kyunchaung), and the factory manager of Gas Turbine (Kyunchaung) of Ministry of Electric Power No 2 on collection of natural gas and supply of electricity.

#### NLM, 25/04/05. www.myanmar.gov.mm/NLM-2005/April05/enm/April25 h3.html

At the natural gas power plant (Kyunchaung), Lt-Gen Ye Myint heard a report on matters related to the power plant. The power plant was installed with three dual fuel gas turbines that can generate 18.1 MW. The plant produces 475,668 million kWh a year to supply electricity to factories in Sale, Wazi, Kyunchaung and Nyaungbingyi as well as Pakokku, Yezagyo, Monywa, Salingyi, Yinmabin and Pale townships.

ECFA, late 2004. http://www.ecfa.or.jp/japanese/act-pf/H16/minkatsu\_Myanmar\_Eng.pdf

Current electric power requirements by the Monywa copper mine of 20 MW are being supplied by Kyunchaung gas power plant.

Soe Myint, "Oil and Gas Supply, Processing and Refining in Myanmar", in Asean Energy Bulletin, First Quarter, 2002, p. 10. http://www.aseanenergy.org/download/aeb/aeb 1st 2002.pdf

Following the introduction and widespread use of gas turbines for power generation in the world power industry, the commercial utilisation of natural gas began with the establishment of the first gas turbine unit at Kyunchaung in the central Myanmar area in the early 1970's. More effective utilisation, through production of value added products, was launched in 1970 with the start up of the Sale urea fertilizer factory in the same region.

NLM, 17/10/01. www.myanmargeneva.org/01nlm/n011017.htm

At the Kyunchaung gas power plant, EPM Tin Htut is briefed on generation of electricity at Nos 1 and 2 power plants and the repair of No 3 power plant.

Ministry of Energy website information, [undated, circa 2000]. <u>http://www.energy.gov.mm/MOGE\_1htm</u> Letpando, Kyaukkwet and Ayadaw natural gas fields are connected by 10"-pipe for 44.5 miles and a 14"-pipe for 9 miles. Ayadaw and Lanywa natural gas fields are connected by a 10"-pipe stretching 23 mi, the Lanywa and Chauk fields by a 6"-pipe that stretches 1 mi, and the Chauk field to Sale by an 8"-pipe that stretches for 13 miles.

Ministry of Energy website information, [undated, circa 2000]. <u>www.energy.gov.mm/MEP\_1.htm</u> The Kyunchaung gas-turbine power station has an installed capacity of 54.30 MW.

Nation (Bangkok), 13/02/96. <u>www.burmalibrary.org/reg.burma/archives/199602/msg00138.html</u> The first gas turbine power station at Kyunchaung was completed and commissioned in 1974.

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### References to the Myanaung gas power plant

**Compiler's note**: The Myanaung gas power plant is located close to the town of the same name on the lower Irrawaddy river about half way between the large regional cities of Pyay and Hinthada. Its gas supply is sourced from the nearby Myanaung oil and gas field and the Shwepyitha field, 14 miles away. Reports in recent years from these older fields indicate that natural gas production on both has fallen to combined total of 2 to 3 million cf/d. The gas is also needed for a cement mill in Kyangin eight miles north-east of Myanaung. Additional gas for the two plants and a methanol plant at Seiktha is now provided by the Pyitaungtan field on the east bank of the Irrawaddy. In 2000, two of the turbine-generator sets at Myanaung were removed and installed at the Thaton plant leaving the Myanaung plant with a reduced capacity of 34 MW.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> The 68-MW power plant at Kyunchaung uses simple-cycle gas turbines.

NLM, 30/05/05. <u>http://www.myanmar.gov.mm/NLM-2005/may/enlm/May30\_h2.html</u> Energy Minister Lun Thi checks repairs on the gas pipeline that connects the Pyay oil and gas field with the Siektha methanol plant on the opposite bank of the Ayeyawady river. The 10-inch-diameter pipeline was laid in November 2004. It pipes 1.5 million cubic feet of gas daily for Kyangin Cement Plant and Myanaung Natural Gas Power Plant.

NLM, 20/05/04. <u>http://mission.itu.ch/MISSIONS/Myanmar/04nlm/n040520.htm</u> The Myanaung and Shwepyitha oil and gas fields are now producing 502 barrels of crude oil and 2.361 million cu-ft of gas a day.

NLM, 06/08/02. <u>http://mission.itu.ch/MISSIONS/Myanmar/02nlm/n020806.htm</u> Minister for Electric Power checks on the repair of generators at the Myanaung power plant

JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan, *"Memo on Interviews/Field Surveys in Villages for Rural Electrification: February 2001 - November 2002"*, of the *Study on Introduction of Renewable Energies in Rural Areas in Myanmar*, September 2003.

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159779&volno=000000000&filename=11734175\_03.pdf&seqno=3

One of the interviews conducted by a JICA field team describes a visit to the MEPE office in the city of Hinthada on the lower Ayeyawaddy river. The MEPE township office has a staff of 50. MEPE is reported to be supplying 1.7 MW to the city of 50,000 of whom 8,000 are consumers of electric power provided by MEPE. There are an additional 300 industrial customers. According to the memo, load shedding occurs between 05:00 and 23:00 for 3 hours a day. **Compiler's note**: It is doubtful that Hinthada is receiving its electric power supply from Yangon as reported by the Japanese visitors. It is more likely that the city receives its supply from the Myanaung station about 80 km north of Hinthada to which is connected by a 66-kV transmission line, as shown in the MEPE power grid map on p 9 of the final report of the Study.

Win Kyaw Oo, Myanmar Times, 01/10/01. http://www.myanmar.gov.mm/myanmartimes/no83/

Dept of Electric Power D-G Thein Tun said an upgrading project at the Thaton station would increase its output from 18 MW to 51 MW. The upgrade has involved the transfer of equipment from a station at Myanaung.

NLM, 17/08/00. <u>http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n000817.htm#(2)</u> Myanaung gas power plant supplies power to Kyangin cement plant

Minister of Energy website information, [undated, circa 2000]. <u>http://www.energy.gov.mm/MOGE\_1htm</u> The Myanaung and Shwepyitha oil and gas fields are connected by a 10-inch-diameter, 14-mile-long pipeline; Kyangin is connected to the Myanaung field with an 8-inch-diameter, 13.5-mile-long pipeline, Seiktha and Kyangin by a 10-inch-diamenter, 9-mile-long pipeline, and Seiktha and the Pyitaungtan oil and gas field by a 10-inch-daimeter, 9-mile-long pipeline across the Irrawaddy.

Ministry of Energy website information, [undated, circa 2000]. <u>www.energy.gov.mm/MEP\_1.htm</u> The gas turbine power station at Myanaung has an installed capacity of 67.65 MW.

Salween Watch, November 1999. <u>http://www.ibiblio.org/obl/docs/SW03.htm</u> The Myanaung gas power plant was finished in 1975 and upgraded in 1984.

John C. Wu, *The Mineral Industry of Burma*, [1995]. <u>http://www.ibiblio.org/obl/docs2/MIB1995.pdf</u> Production of natural gas from the Aphyauk gasfield, near Taikkyi in the lower delta of the Ayeyarwady rose to 2.12 million cu m/d in 1995 from 1.1 million cu m/d in 1994. Natural gas production from the Aphyauk gas field will be raised further to 2.8 million cu m/d when a 224-km pipeline network is completed in 1996. The new pipeline will supply natural gas to power plants at Ywama and Myanaung, a cement plant at Kyangin, and a methanol plant at Seiktha.

Hitchachi Gas Turbine Supply List, [n.d]. <u>http://www.power-hitachi.com/member/pdf/GTSupply0202.pdf</u> The company supplied the Burma Electricity Supply Board with a 16,250 kW MS5001 EUPG 197 gas turbine for its power plant in Myanaung in 1975

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#### References to the Mann gas power plant

**Comiler's note**: Very little public information is available about the Mann gas-fired electric power station. Together with an LPG extraction facility it is located at Minbu across the Irrawaddy river from the regional city of Magway. A 14-inch-diameter gas pipeline connects the two plants to the Htaukshabin and Kanni oil and gas fields a few miles to the south and to the Mann field a few miles to the north of Minbu, respectively. Recent reports indicate that the Mann field is producing about 4 - 5 million cf/d and the Kanni/Htaukshabin field about 9 -10 million cf/d. As shown in Table 2 of the JIBC evaluation report below, this would appear to be fairly consistent with the levels maintained over the past twenty years.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> The 37-MW power plant at Mann uses simple-cycle gas turbines.

Japanese Bank for International Co-operation, *Myanmar Integrated Liquefied Petroleum Gas Project (Phase I-Part 2) (Phase II)*, p 4, October 2002. www.jbic.go.jp/english/oec/post/2002/pdf/074\_full.pdf According to the Myanmar Petrochemical Enterprise, no improvement in the supply or content of natural gas supply can be expected, because the Mann gas field which provides natural gas to the liquid petroleum gas (LPG) extraction plant at Minbu is being depleted. Under these conditions, it is unforeseeable that the target volume of producing LPG 30,000T/Y will be accomplished in the future. Table 2: Gas Supply Volume and Gas Composition

	Appraisa	Actua												
FiscalYear	Plan	1987-	1988-	1989	1990	·1991	·1992	-1993	-1994	1995	1996	·1997·	1998	1999
	-1982	88	89	90	91	92	93	94	95	96	97	98	99	2000
Volume	24	14	14	14.1	14	14	13.2	13.1	14.6	15.3	14.8	15.6	15.4	13.7
mmcfd														

Table 2: Gas Supply Volume and Gas Composition

The Kanni and Htaukshabin oil and gas fields are connected by a 14-inch-diameter gas pipeline that runs 17 miles north to the Mann field. From the Mann field a 10-inch-diameter pipeline goes farther north for 59 miles to the Lanywa field where it connects to a pipeline across the Irrawaddy to the Chauk field.

Ministry of Energy, [undated, circa 2000] <u>www.energy.gov.mm/MEP\_1.htm</u> The Mann gas turbine power station has an installed capacity of 36.90 MW.

Salween Watch, November 1999. <u>http://www.ibiblio.org/obl/docs/SW03.htm</u> The Mann gas power plant was finished in 1980.

NLM, 26/03/98. <u>http://mission.itu.ch/MISSIONS/Myanmar/98nlm/n980326.htm#07</u> EPM Tin Htut visits the Mann LPG plant, oil-field and natural gas-fired electric power station.

WPD, 15/09/90. http://www.ibiblio.org/obl/docs3/BPS90-09.pdf

SPIC, chaired by SLORC V-C Gen Than Shwe, met to review hydel power and energy projects. MEPE will increase power supply to 721.46 MW in 1992-94, when the Biluchaung hydro-electric power project No 1(28 MW) comes on-line in 1992 and the addition to the Mann thermal generating station (72 MW) comes on-line in 1993, Firm capacity will then be about 562.91 MW.

Tin Maung Maung Than, "Burma's Energy Use: Perils and Promises" in Southeast Asian Affairs 1986, Institute of Southeast Asian Studies, 1986, p 84. [not available on-line] Among the gas turbine power stations commissioned in recent years, those at Mann, Ywama and Prome, which had been started in fiscal 1978/79, were financed partly by loans and grants (mainly for turbogenerators and control/switching elements) from the United Kingdom.

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# References to the Shwedaung gas power plant

**Compiler's note**: The Shwedaung gas-fired electric power station is located in the town of the same name about eight miles south of the regional city of Pyay (Prome). It is the largest of the four gas power plants in the Irrawaddy valley and supplies electricity to state-owned and defence factories across the river at Sinde, Htonbo and Nyaungchaydauk in Paduang township, as well as to the industrial area in Pyay. Originally, it drew much of its gas supply from the Pyitaungtan field, 22 miles to the south, and from the Tantabin field across the Irrawaddy in Kyangin township. In the nineties it benefited from the discover of gas on the Apyauk field in Taikkyi township farther south. Like the gas-turbine plants in Yangon, it is now increasingly dependent on gas from the Yadana field in the Andaman sea.

Platts Myanmar Country Energy Profile, [mid-2007]. For access information, see <u>Power Profile</u> The 80 MW power plant at Shwedaung uses simple-cycle gas turbines.

NLM, 10/01/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n070110.htm

EPM No 2 Khin Maung Myint visits the Pyay gas-fired power station in Shwedaung township where the manager briefs him on input and distribution of electricity, the importance of maintaining the generators, and input and output lines in the switching yard. Arrangement are being made to link the 230-kV Toungoo-Oakshitpin and the 230-kV Shwedaung-Oakshitpin cable lines. This should make it possible provide extended distribution of electricity to No 1 Steel Mill of MEC near Kyaukswegyo Village in Aunglan township.

NLM, 25/08/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060825.htm

EPM No.2 Khin Maung Myint looks into the gas turbine plant at Shwedaung. He checks the control room and switching yard and urges officials to keep up full supply power to No 3 fertilizer plant in Kyaw Swa.

Ministry of Energy website information, [undated, circa 2000]. <u>http://www.energy.gov.mm/MOGE\_1htm</u>

The Shwetaung plant is connected to the Pyitaungtan field by a 10-inch-diameter pipeline. A parallel 14-inch line extends 37 miles from the Pyitaungtan field to Titut a few miles north-east of Pyay.

Ministry of Energy website information. [undated, circa 2000]. <u>www.energy.gov.mm/MEP\_1.htm</u> The gas turbine power station at Shwedaung has an installed capacity of 54.30 MW.

Salween Watch, November 1999. <u>http://www.ibiblio.org/obl/docs/SW03.htm</u> The Shwedaung gas power plant was finished in 1982.

John C. Wu, *The Mineral Industry of Burma*, [1995]. <u>http://www.ibiblio.org/obl/docs2/MIB1995.pdf</u> Production of natural gas from the Aphyauk gas field, near Taikkyi in the lower delta of the Ayeyarwady rose to 2.12 million cu m/day in 1995 from 1.1 million cu m/d in 1994. Natural gas produced from the 10 wells on the Aphyauk gas field was piped to Yangon and Pyay for power generation at Thaketa and at Shwedaung, near Prome.

Tin Maung Maung Than, "Burma's Energy Use: Perils and Promises" in Southeast Asian Affairs 1986, Institute of Southeast Asian Studies, 1986, p 84. [not available on-line] Among the gas turbine power stations commissioned in recent years, those at Mann, Ywama and Prome, which had been started in fiscal 1978/79, were financed partly by loans and grants (mainly for turbogenerators and control/switching elements) from the United Kingdom.

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# Appendix 5

# DIESEL-OPERATED GENERATING PLANTS IN MYANMAR: NOTES

**Compiler's note**: Diesel-operated generating plants are an important source of power in many of the towns and larger villages across the country. As indicated below, there were over 900 of these state-owned diesel-fueled plants operating throughout Myanmar in 2006. The total amount of electric power they generated by diesel plants has not varied greatly over a 35-year period. However, the number of privately operated diesel-fueled generating plants at factories, workshops, commercial establishments, hotels and in the suburban areas of large cities has ballooned over the last decade to compensate for the frequent brown-outs and failures in the national system. Rising prices for diesel combined with the recent cutbacks in fuel subsidies in Myanmar are bound to have a heavy impact on the use of electricity throughout the country.

### References

Tin Maung Maung Than, "Burma's Energy Use: Perils and Promises" in Southeast Asian Affairs 1986, Institute of Southeast Asian Studies, 1986, p 83. [not available on-line]

Although the strategy [outlined in the government's economic plan] for satisfying long-term power requirements envisaged large-scale hydro-electric schemes integrated to irrigation projects, because of the long lead times and high capital costs of such projects, mini-hydroelectric power plants and thermal generation plants (employing gas turbines and multi-fuel steam generators) have been set up as short-term measures to satisfy the rising demand for electricity. Small diesel generating plants have also been employed in off-grid locations to cater for local requirements (see Table 6).

Budget Year	1971/72	1975/76	1979/80	1983/84	1985/86**
Total electricity*	619	760	1080	1674	2321
Hydroelectricity	475 (77%)	532 (70%)	725 (67%)	993 (59%)	1024 (44%)
Thermal	71 (11%)	36 (5%)	37 (4%)	72 (4%)	77 (3%)

#### Table 6 Generation of Electricity by Units under the EPC (In millions of kWh)

Gas turbine	1	(-)	127	(16%)	263	(24%)	549	(33%)	1150	) (50%)
Diesel	73	(12%)	66	(9%)	56	(5%)	60	(4%)	79	(3%)

\*\*Rounding errors may result in differences between the total figures and the sums of its components. \*\*Provisional figures; subject to revision in later years (usually downwards).

### ASEAN Centre for Energy, [undated, circa 2000].

www.aseanenergy.org/energy\_sector/electricity/myanmar/future\_electricity\_projects.htm

According to statistics submitted to the ASEAN Centre for Energy by MEPE, diesel power plants had an installed capacity of 24.97 MW in stations connected to the national grid in fiscal 1999-2000 and 40.42 MW in isolated stations. The combined total capacity of 65.39 MW amounted to 5.57% of national generating capacity and they produced 56.30 million kWh, roughly 1.25% of all the electricity generated by MEPE power plants.

JICA, MEPE, Nippon Koei, Institute of Energy Economics Japan, *Study on the Introduction of Renewable Energies in Rural Areas of Myanmar: Final Report: Volume I: Summary*, September, 2003, pp 8, 10, 11. http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshi sbt=1&shoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&seqno=1

In the remote areas not covered by the national grid, the township centres are supplied by MEPE through local systems connected to diesel generators and/or small hydro-electric generators. It is often inefficient to extend the distribution network from the grid to these rural areas because of low population density and the dispersal of the centres far from the grid. MEPE currently operates 456 diesel generators and 30 small hydro-electric systems in rural areas not covered by the grid. Diesel generators are operated for only 3 hours a day due to budget limitations. Where revenues are insufficient, these are supplemented by by remittances from MEPE. Battery lighting was introduced when kerosene disappeared from the market during the oil crisis of 1973. Before that kerosene lamps were the main source of lighting for farm households. Now many battery charging stations powered either by the grid or by small diesel generators operate on a commercial basis countrywide. Small diesel generators are also used for a single household or fed to several neighbouring households.

### NLM, 22/01/06. http://www.ibiblio.org/obl/docs2/NLM2006-01-22.pdf

Small, medium and heavy diesel-used power plants are being built in the regions which are far from the national grid and border areas. In addition to these facilities wind-powered power plants, waste heat recovery power plants, bio-fuel used power plants and bio-diesel used power plants are being built to fulfil the electricity needs. In 1988, the state-owned electric power company had 621 diesel power plants. By 2006 there were 944 diesel operated generating plants.

Alfred Oehlers, Behind Burma's Fuel Price Rise, IRROL, 22/08/07.

#### http://www.irrawaddy.org/article.php?art\_id=8318

To fully understand the pressures behind the [recent] increase in fuel prices [in Burma], it is important to consider some deeper structural characteristics of the Burmese economy and oil and gas sector. To begin, one bold fact: Burma is essentially a diesel-powered economy. We see this in the buses, trains and trucks that rumble around the country. We also see this in the dilapidated power plants that sometimes generate electricity. Most of all, we see this in the ubiquitous portable generators that exist in nearly every home, factory and shop that can afford one. For a long time now, diesel prices have been kept artificially low through subsidies. And as demand for diesel has continued to grow in tandem with an expanding economy, the amount spent on these subsidies has similarly expanded, posing an ever increasing strain on the In an attempt to increase the supply of diesel, the regime attempted to encourage regime's finances. greater crude oil output from the domestic oil industry in recent years. This has not met with great success. as onshore wells are declining in productivity (the "peak oil" phenomenon) and there are few, if any, offshore In any case, sources suggest, even if higher volumes of crude could be obtained domestically, wells. another bottleneck would have developed around the available refining capacity in Burma. Burma's ageing refineries simply cannot refine crude volumes sufficient to meet demand. These refineries, in addition, are incapable of refining crude from other sources with different sulfur content, thus ruling out imports of crude to augment domestic supplies. The only solution then, is to import diesel. And as this is usually done at spot market prices, it is an extremely costly solution. ... [Moreover,] rising imports of diesel, gasoline and gas

products at escalating prices cannot be paid for from existing gas revenues. Nor can an already weak state budget—depleted by projects such as a new capital—absorb such rising costs. The only solution is to slash the subsidies and raise fuel prices.

# NLM, 28/12/07.

On 22 December, EPM No 2 Khin Maung Myint visited the An Township electrical engineer's office to check up on power sufficiency and the distribution of electricity in the township. The minister and party inspected the maintenance of two 150 KVA diesel-powered generators and the installation of power lines. Afterwards, accompanied by Western Commander Maung Shein he went on to the Ma-i electrical engineer's office on the An-Taungup road where they inspected generators and met with service personnel.

See above: 'Fuel <u>price increase</u> impacts industrial use of electricity' (IRROL: 15/08/07) '<u>Premium rates</u> for electricity in Mon villages' (IMNA: 03/08/07) 'Impact of <u>unreliable power supply</u> on industrialization in Myanmar (IDE: 10/05) 'Proposal for <u>barge-operated power plant</u> at Monywa copper mine' (ECFA: Dec 2004) 'Coping with power <u>black-outs in Rangoon</u>' (Mizzima News: 27-04-04) '<u>Private operators</u> meet consumer need for alternative power service' (MT: 03/02/02)

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# Appendix 6

# USE OF <u>YADANA GAS FOR POWER GENERATION</u> AND INDUSTRY: CHRONOLOGY

Unocal Corporation, 22/04/96. www.secinfo.com/drdbh.91Bu.htm

The Yadana project is expected to supply -- through a domestic pipeline -- a proposed 200-MW power plant and a 1,750-metric-ton/day fertilizer manufacturing facility near Yangon.

Myanmar U.N. Mission, Geneva, official website, [undated, circa mid-1998]. http://mission.itu.ch/MISSIONS/Myanmar/t&b/gas-oil.html

The Yadana natural gas field will produce 650 million cu ft/day of natural gas of which 525 million cu ft will be sold to Thailand with effect from July 1998. Of the remaining 125 million cu ft of natural gas that will be utilized within Myanmar, 105 million cu ft will be sent to the Kyaikto area in Mon State through a 20-inchdiameter pipeline to be used [as feedstock] for a 340-MW electric power plant [and a urea fertilizer factory] that will produce 57,000 tons annually. This 3-in-1 natural gas utilization project will be jointly implemented by Total, UNOCAL and Mitsui companies.

Pennwell Petroleum Group, January 2001.

http://www.pennwellpetroleumgroup.com/Articles/Article\_Display.cfm?Section=ARTCL&ARTICLE\_ID=18709

According to Unocal Corp, Myanmar told a three-company international consortium known as the Myanmar Fertilizer Power Development Co (MFPD) to proceed with a long-delayed project to build a \$200 million gas pipeline from the Yadana gas field in the Gulf of Martaban, to an onshore location near the capital city of Rangoon. The MFPD partners are Unocal, TotalFinaElf SA, and Mitsui & Co of Japan. The 20-inch, 241-km gas pipeline was part of the \$750 million 'Three-in-One' project proposed in the mid-1990s under the overall development of Yadana gas. Aside from the gas line, the project included a 300-MW gas-fired power station and a 1,750-tonne/day fertilizer production facility near Kyaikto, south-east of Rangoon. The Yadana-Kyaikto gas pipeline was planned to come on-stream in early 1998, delivering up to 105 million cf/d of gas from the Yadana offshore production complex to the proposed power and fertilizer plants. The gas required for the project was part of the 125 million cf/d allotted under the 30-year domestic sale agreement that the Yadana consortium signed with Myanmar in 1995.

World Bank, *Myanmar: An Economic and Social Assessment (Draft version)*, p 100, 18/08/99. [not available on-line]

One project that could be urgently undertaken is the construction of a pipeline from the offshore Yadana gas field to [a point] near Yangon. This pipeline could deliver the 125-million cf/d of gas obligated for the domestic market from Yadana, and would make up for the decline in onshore gas production. But a dispute over the size of the pipeline has unnecessarily delayed its construction. France's Total, US Unocal, and

Japan's Mitsui are partners in the joint venture that has proposed a 20-inch, \$200-million-line that would have a capacity of 220 million cf/d (290 million cf/d with compression). The government would like to build a 35-inch line with a capacity of 985 million cf/d that would have a price tag of \$400 million. There does not seem to be a sound technical or economic basis to build such a large pipeline. The government should move quickly to clear aside the obstacles to building the 20-inch line, which has already been cleared for 60pc debt financing from the Japan Export-Import Bank. Myanmar should rely on market forces to determine the size and timing of future domestic pipeline projects.

NLM, 05/06/99. http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n990605.htm

Chairman of Myanmar Investment Commission Maung Maung Khin received GM Kim Ho Sang of Hyundai Engineering & Construction Co Ltd of Singapore hey discussed development of infrastructure and opportunities in Myanmar.

NLM, 12/06/99. <u>http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n990612.htm</u> In Beijing, Deputy PM Tin Hla received V-P Bai Jiliang of Sainty International Group, Jiansu Machinery (I&E) Corp. They discussed matters relating to a 4,000-ton cement factory to be built at Mainggalay.

Korea Economic Weekly, 17/07/00. <u>www.burmalibrary.org/reg.burma/archives/200007/msg00038.html</u> Hyundai Corp announced that the firm has contracted with MOGE to export 45,000 tons of steel pipe worth US\$30 million. The export amount of 20-inch pipe will be loaded from September 2000 through March in 2001. The pipe will be used to construct a gas pipeline promoted by Myanmar government. Hyundai said that it had created a consortium with Hyundai Pipe, SeAH Steel and Shinho Steel to win the supply contract through a public tender.

Hyundai Heavy Industries website, [n.d.] <u>www.hhi.co.kr/english/IndustrialPlant/product/cementplants</u> **Compiler's note**: this reference is no longer available on http://english.hhi.co.kr/] In 2000, Hyundai Heavy Industries installed a KHI roller mill (330 T/H) for limestone grinding and a KHI roller mill (250 T/H) for pre-grinding of clinker at the Hpa-an [Myaingalay] cement plant.

Ministry of Energy website information, [undated, circa mid-2000]. <u>www.energy.gov.mm/MOGE\_3\_2htm</u> MOGE will lay a natural gas pipeline from Kanbauk in Taninthayi division to Myainggalay in Kayin state. The pipeline will transport 170 million cf/d of natural gas from the gas fields in the Moattama and Taninthayi offshore areas for use in Myainggalay. The pipeline has a total length of 183 miles and will be 20 inches in diameter. The project is targeted foe testing and commissioning by August 2001.

Mon Forum Monthly, February 2006. <u>www.rehmonnya.org/monforum2-06.php</u>

In 2000, the Construction Ministry, the Ministry of Energy, and the South-east Military Command implemented a project to lay a gas pipeline from Kanbauk gas terminal to Myaingkalay cement factory. The construction of the pipeline started in November 2000 and took about ten months to complete. The pipeline passes through Yebyu township, the whole (south-north) length of Ye township, Thanbyuzayat township and Mudon township and part of Kyaikmayaw and Moulmein townships. From there it crosses into Pa'an township in Karen state where the cement factory is situated. In Mon state the route passes through many paddy growing farms, rubber and fruit plantations and even entire villages. Wherever the pipeline passed, the authorities and the army confiscated civilians lands, orchards, plantations and houses without payment and ordered the people to move out as quickly as possible. For example, in the Mon village of Wae-winkara in Thanbyuzayat township where the route passed by seven house the authorities ordered the families to move out and destroy their houses within three days. Soldiers from LIB No. 31 came and threatened the owners with arrest should they disobeying the order. In Kyaikmayaw township 200 acres where rubber trees were growing were confiscated without payment.

NLM, 02/04/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010402.htm

Lt-Gen Tin Oo and party went to the 4,000-ton cement plant project in Myainggalay where they were briefed on constructions of the plant. The 4,000-ton cement plant will produce cement using the dry process. The project started in February 1999. The plant will undergo a test-run in about December and will produce cement on a commercial scale.

Oral Intervention at the 57th Session of U.N. Commission on Human Rights, July 2001. www.ibiblio.org/obl/docs/chr2001ngo-ciir.item10.htm

Khin Ohmar of the Catholic Institute of International Relations: According to our sources, the Burmese military confiscated lands without any compensation along a new gas pipeline construction from Thanbuzayat in Mon state to Myainggalae in Karen state. Many villages on the pipeline route have been forcibly relocated. This pipeline will bring gas from Yetagon gas field for consumption in a cement factory in Myaingalae. We were informed that forced labor is being used for the construction of the pipeline.

NLM, 03/05/02. www.myanmar.gov.mm/NLM-2002/enm/May3.htm

Three KNU terrorist insurgents blew up a gas pipeline near Thabyechaung Creek bridge on the railroad line between Hnit Kayin and Ahnin villages in Ye township on 30 April 2002. The pipeline transports gas from Kanbauk to Myainggale. Watchman U Soe Naing and wife Daw Nyo of Kyeikkhe village sustained burns on their back from the explosion. The three KNU terrorist insurgents holding small arms arrived at the civilian guard house near the bridge at night on 30 April. They tied up U Soe Naing and wife in the guard house, and blew up the pipeline.

# DVB, 04/05/02. [not available on-line]

A gas pipeline explosion near Thabyechaung village in Ye tsp on 30 April has caused the Myainggale cement factory to close. Parts of the Moulmein-Ye-Tavoy railway were damaged beyond repair and the Thanbyuzayat-Ye-Tavoy secton has been temporarily closed.

# Thet Khaing, Myanmar Times, 16/09/02. [not available on-line]

Work has begun on a natural gas pipeline that is expected to ease an electricity supply shortage in Yangon within about two months. Maj-Gen Kyaw Win told a news conference the pipeline would overcome supply shortages at two gas-powered electricity generating stations on the outskirts of the capital. U Aung Koe Shwe of the EPM said the project involved extending a pipeline to Yangon from Thaton, where gas from the Yadana offshore field is used as an energy source at a cement factory. He said the extension would be linked to gas-fired generators at Hlawga and Ahlone. The two power stations need another 60 million cf/d of gas to operate at capacity. The gas will be bought from TotalFinaElf, which operates the Yadana field jointly with MOGE. According to U Aung Koe Shwe, the generators supplying electricity for Yangon are producing about 285 MW an hour, about 100 MW short of the city's needs.

### Win Kyaw Oo, Myanmar Times, 23/12/02.

http://www.myanmar.gov.mm/myanmartimes/no147/myanmartimes8-147/Rev2002/Rv2002-03.htm

A 20-inch diameter, 183-mile pipeline recently laid to Myainggale in Kayin state from the Total pipeline centre in Kanbauk is supplying 20 million cf/d of gas from the Yadana gas field.

### Human Rights Foundation of Monland, 31/07/04

http://www.rehmonnya.org/previousnews-detail.php?ID=22

Local authorities in Mon State have forced hundreds of civilians who live along Kanbauk-Myaingkalay Gas Pipeline to fence the pipeline and cover it with earth to prevent attacks from rebel armed groups and protect it from flooding during the rainy season. Villagers were also required to clear grass and bushes along the pipeline. In Thanbyuzayat township, parts of pipeline were exposed by flood waters during the early monsoon in June and local authorities were so concerned about possible sabotage by the rebels that they ordered the villagers to cover these areas in order to camouflage them. At places where the pipeline crosses rivers or streams, it is totally exposed, so the local military ordered the villagers to fence the pipeline in these areas. The villagers had to find and bring the building materials themselves.

### IMNA, 16/06/06. <u>http://www.bnionline.net/index.php?option=com\_content&task=view&id=411&Itemid=8</u>

"The fireball shot up 100 feet with a frightening 'whoosh-whoosh' sound as the Kanbauk-Myaing-Kalay gas pipeline exploded on February 1. "We watched in shocked silence" said villager Myit Twe, still traumatised months later. People living within three kilometers of the explosion site smelt the gas and saw the blaze. "The boom-boom, was laced with the whoosh-whoosh. The villagers near the explosion site spent a sleepless night," added Myit Twe. Despite the flames and the smell of the gas frightening them, the families settled down because they had seen such a sight before. This was the third time such an explosion has taken place near the village, according to Myit Twe. The most recent explosion has added to the villager's woes for the local military commander has ordered them to patrol the pipeline and fence part of it that is above ground so that rebels can't cause explosions. The military has also told the people that they would have to take responsibility if the gas pipeline blew up near their village or farm again. At a meeting a few days after the pipeline exploded, the local commander threatened to kill villagers and shift the villages should there be another explosion. **Compiler's note**: A series of news items from the same agency tells of half a dozen other occasions in which explosions and major leaks have occurred along the pipeline in the si x years since it was finished.

Myanmar Times, 02/10/06. <u>http://www.myanmar.com/myanmartimes/MyanmarTimes17-336/h003.htm</u> Repairs have been completed on a pipeline that supplies natural gas to four power plants in Yangon. Problems along the pipeline were blamed for blackouts in Yangon. The 320-km (199-mile) pipeline carries 3.1 million cu m (110 million cu ft) of gas a day to the Ywama gas control station from Yadana gas project in Tanintharyi division.

Total Yadana website information, [undated: around the beginning of 2007].

# http://burma.total.com/en/contexte/p 1 3.htm

Contractually, Myanmar is entitled to take up to 20% of Yadana's production for domestic consumption. Until recently, it was taking about 40 to 50 million cu ft per day (1.1 to 1.4 million cu m), approximately half of its entitlement. Since December 2006, it is taking 100 to 110 million cubic feet per day (2.8 to 3.1 million cu m). The gas is piped from the Yadana pipeline at Kanbauk further north to a cement factory in Myaingkalay and then to Yangon via a pipeline built and operated by MOGE.

NLM, 28/12/07. http://mission.itu.ch/MISSIONS/Myanmar/07nlm/n071228.htm

Natural gas production at the Yadana offshore gas field will be suspended while repairs are carried out to the production process of the field from 28 December, 2007 to 7 January, 2008. Gas-powered plants and factories are to reduce their production during the period. However, the authorities have already taken necessary measures not to affect the supply of electricity to Yangon during the period.

# Additional references

See above: <u>'Yadana gas</u> will fire electric power plants in Myanmar' (MP: Sept 1995)

### Appendix 7

# PLATTS ELECTRIC **POWER PROFILE** FOR MYANMAR

Platts Myanmar Country Energy Profile: Appendix 7

**Compiler's notes**: 1) Access the complete Platts energy profile for Myanmar through a Google search using the words 'Myanmar's peak demand in 2006 was 1,140 MW'. 2) References in the article indicate it was researched in 2006/07 and published in mid-2007. The factual inaccuracies in the profile have been left uncorrected in the version that appears below.

Myanmar's power system was nationalized in 1951 when the government formed the Electricity Supply Board (ESB) from scattered private utilities, the largest being in Yangon. The state-owned utility Myanma Electric Power Enterprise (MEPE) was created from the ESB in 1972 and now operates as the Ministry of Electric Power (EPM). The government holds an effective monopoly on the electricity business in Myanmar.

In 2006, EPM's capacity was 1,750 MW and power production was 6,064 GWh. This may be compared to 2,226 GWh in 1989 and 4,508 GWh in 2000. As of mid-2007, the country's 10 largest power plants were Hlawga/Ahlone in Yangon (298 MW, combined-cycle), Paunglaung in Mandalay division (280 MW, hydro), Baluchaung in Kayah state (196 MW, hydro), Tikyit in Shan state (120 MW, coal-fired), Tharkayta in Yangon (92 MW, combined-cycle), Ywama in Yangon (90 MW, oil- and gas-fired steam and gas turbine), Shwedaung in Bago division (80 MW, gas turbine), Mone in Magway division (75 MW hydro) and Myanaung in Ayeyarwady division (68 MW, gas turbine). Other simple-cycle gas turbine plants are Kyunchaung (54 MW) and Mann (37 MW), both in Magway division. Additional hydroelectric plants include Kinda in Mandalay
Division (56 MW), Thaphanseik in Sagaing division (30 MW), Zawgyi-1 and Zawgyi-2 in Shan state (30 MW), Sedawgi in Mandalay division (25 MW), and Zaungtu in Bago division (20 MW).

Myanmar's peak demand in 2006 was 1,140 MW, almost four times the 332-MW peak in 1989, but not too different from the 1,005 MW value reported for 2000. There is no particular rural electrification strategy in place and per capita consumption remains very low. There are few known autoproducers.

In addition to new construction, EPM has a variety of rehabilitation and modernization programs underway. One important project is at the Baluchuang-2 plant where the first three units were built in the 1950s using war reparation funds from Japan. In September 2001, Tokyo Electric Power Co and Nippon Koei Co, a Japanese engineering company, were awarded a modernization contract for the Hitachi Pelton turbine/generator (T/G) sets at Baluchuang-2 (6 X 28 MW).

EPM sold 4,353 GWh in 2006 and has 1.3 million customers. At last report, industrial customers accounted for 38% of sales, residential customers for 41%, bulk sales (direct connection) for 18%, and other customers for the balance. Electricity pricing policies are poorly-developed in Myanmar and reflect the lack of modern meters and billing infrastructure. According to the ASEAN Centre for Energy, Myanmar's flat- rate electricity tariff as of 2005 was 7.3 U.S. cents/kWh.

EPM operates three grids interconnected by 230- and 132kV lines with a total system length of 5,131km. The main grid moves power from Baluchaung south to Yangon at 230kV, and north to Thazi and Mandalay in central Myanmar at 132kV. An extension runs west from Thazi to Chauk and the gas-turbine plant at Kyunchaung. A southwestern grid connects Prome [Pyay] to the gas turbine plant at Myanaung and operates at 66kV. A third system supplies the Manna [Manmaw = Bhamo] area at 33- and 11kV. System losses are very high at about 35%.

Germany's Kreditanstalt fur Wiederaufbrau (KFW) helped fund a 230kV line from Thazi to Toungoo, which is used to evacuate power from the new hydro plant at Paunglaung. In January 2007, China Power Grid International Economic and Trade Co signed a contract with EPM for equipment supply for a 230kV line on the route Belin-Monywa-Meiktila-Taungdwingyi plus substations at Mongsan, Shweli, and Shwesaryan.

EPM has 76 transmission substations with installed capacity of 2,569 MVA. Myanmar's distribution lines are at 11-, 6.6-, and 3.3kV and measure 30,858km. There are 12,493 distribution substations and transformers with installed capacity of 4,996 MVA.

Myanmar's hydroelectric potential is immense, perhaps as much as 100 GW. In large measure, major power plant development in Myanmar in the near- and medium-term will depend on the development of power exports, and particularly on the outcome of a July 1997 Memorandum of Understanding (MOU) between the Myanmar and Thailand for power sales of about 1,500 MW. Working groups from both countries were formed to finalize and implement the agreement, but intermittent economic problems in the region plus the high cost of large-scale hydroelectric plants have delayed implementation of the export-oriented power projects. Several are now underway, but, in any event, Myanmar's national requirements are continuing to increase so MEP has an active construction program to supply domestic needs. . . .

[**Compiler's note**: Details about individual power plants and projects covered in the Platts Profile are omitted at this point in the profile but are included with appropriate key articles in the Compendium.]

Myanmar has a large number of hydroelectric plants of all sizes and these will be the main focus of renewable power plant development for some time. Since 1990, YMEC has supplied equipment for about a dozen minihydro plants in Myanmar.

The deployment of wind and direct solar energy plants will cost far more than Myanmar can afford at this point, particularly given the abundance of other energy resources. Nonetheless, the Department of Meteorology and Hydrology and the Ministry of Science and Technology have made some preliminary investigations into the wind resource in the hilly parts of Chin and Shan states, in coastal regions, and in the central part of the country where Japan's New Energy and Industrial Technology Development Organization

(NEDO) has constructed two meteorological observation stations. EPM, NEDO, and NEWJEC have also installed wind and solar measuring devices at four other locations.

Another potential non-fossil resource is geothermal energy. Myanmar has identified nearly 100 hot springs and during 1987, MOGE, EPM and Japan's Electric Power Development Co (EPDC) completed sampling and measurements at five locations in Mon and Shan States. More studies were done in 1990 and again in 1995, however, no firm plans have been established to attempt to exploit these resources for electricity production.

There has been increasing commercial pressure on Myanmar's timber resources which, with agricultural biomass, are important energy resources in rural areas. The government estimates that 65% of Myanmar's primary energy usage is from biomass, although this is well down from the 80% share estimated a decade ago. Around half of Myanmar remains forest-covered and the Ministry of Forestry has embarked on an ambitious public education and afforestation program, particularly in the dryer areas in the center of the country. To reduce the pressure on wood fuel stocks, the government is also encouraging the deployment of biogas digesters to supply fuel and lighting.

Myanmar's electricity sector has barely entered the "take-off" stage and operation of virtually any part of the transmission and distribution system could be modernized and improved to great benefit. The transmission system is considered to be in reasonably good condition, but there are bottlenecks at key voltage transformation points. Development of Myanmar's big electricity export projects has been delayed, but the generating projects already under construction or in advanced planning will suffice to meet domestic demand growth for some time.

The country has attracted perhaps disproportionate interest from both large commercial enterprises and activist non-governmental organizations for two reasons: an abundance of natural resources and large areas of almost undisturbed wilderness occupied by tribal communities. When long-running ethnic and separatist conflicts are added to the mix, it can be seen that sustainable economic development in Myanmar will be more than usually complex.

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# Appendix 8

#### **HYDRO-POWERING THE REGIME**

Yuki Akimoto, Irrawaddy Magazine, June 2004. <u>www.irrawaddy.org/article.php?art\_id=3757</u>]

The military junta that rules Burma has a strong predilection for hydro-power plants. SPDC chairman Than Shwe, who hails from Kyaukse, through which the Zawgyi river flows, is widely rumored to believe himself a reincarnation of King Anawrahta (r. 1044-1077). The long-dead Pagan-era monarch was a prolific dam- and canal-builder, particularly along the Zawgyi, where he supervised the building of a series of weirs and canals to atone for killing his foster-brother Sokka-te.

Burma's potential capacity for hydropower is great, and the ruling generals know it. The major rivers run roughly north-south: the Irrawaddy, the Chindwin (chief tributary of the Irrawaddy), the Sittang and the Salween, the longest undammed river in south-east Asia. For generations they have served as a lifeline to the country, used for irrigation, rice cultivation, communication and transport. In recent years the extensive river system has been targeted for another use: large-scale hydro-power.

The interest in hydropower is driven both by the desire to export and domestic demand. With even Rangoon subject to daily blackouts, the need for domestic power is clear Although plans for dam construction on the Salween River have attracted the most attention among Burma-watchers, similar planning is underway throughout the country's vast river network.

Hydro-power accounts for about one-third of Burma's electricity production. At least four major hydro-power plants started operating in the last decade: Zawgyi No 1 (commissioned in July 1995) and Zawgyi No 2 (commissioned in March 2000) -- both in Shan state; Zaungtu (commissioned in March 2000) in Pegu

division; and Thaphanseik in Sagaing division (commissioned in June 2002). Collectively, these plants generate 80 MW of electricity, about one-fifth of Burma's hydro-power production. Large dams service all of these plants: Zawgyi dam is 44.2 meters high; Zaungtu dam is 44.8 meters high and Thapanseik dam is 32.9 meters high.

Burma's total installed capacity is about 1,200 MW, only 400 MW of which is from hydro-power. Sources such as the EPM and NLM indicate that the SPDC would like to build several dozen additional hydro-power projects in the future that would add over 25,000 MW of capacity. Many of these projects would involve large dams.

Burma's interest in hydropower is driven both by the desire to export and domestic demand. With even Rangoon subject to daily blackouts, the need for domestic power is clear. Many ongoing or planned hydropower projects whose electricity is slated for domestic use are located in central areas of Burma -- mostly between Rangoon and Mandalay. For example, there are a number of dams being built -- or in planning -- on the Sittang River and its many tributaries. The sites include Khabaung, Pyu, Kun, Bogata, Yenwe, Thaukyegat and Shwe Gin, with the potential capacity of each site ranging from about 20 MW to 160 MW and the dams about 52 meters to 77 meters high.

Further upstream on another tributary of the Sittang is the Paunglaung Dam, which is near completion at 131 meters high with an estimated capacity of 280 MW. The regime plans to implement two more projects nearby —Upper Paunglaung and Nancho. Construction is proceeding at Yeywa Dam just southeast of Mandalay, also planned to be over 130 meters high with an installed capacity of 780 MW. Concerns have been raised about the displacement of local residents, as well as the prospective submersion of an ancient Buddhist temple in the area.

But the scale of the dams in central Burma is fairly modest when compared with planned hydro-electricity developments on the country's borders. The sale of electricity to neighboring countries is as important to the regime as securing domestic power supply. The regime will get hard currency, while bordering countries will get cheap electricity free from the headache of dealing with the public debate and protests that would occur if the power projects were built at home.

Burma and Thailand are making plans to jointly develop hydro-power plants on the Salween River, which runs through eastern Shan state in Burma, and along the Thai-Burmese border. The power is to be exported to Thailand. In the early 1990s, about ten potential sites were identified through preliminary studies that were commissioned by energy authorities in Thailand and Burma and conducted by Japan's Electric Power Development Company (EPDC). A feasibility study is underway for the development of two of these sites, Weigyi and Dagwin. Estimates indicate that these two export-oriented projects will, if completed, have generating capacities of 4,540 MW and 792 MW, with dams 168 meters and 49 meters high, respectively.

In 1997, the two governments signed an MoU under which Thailand agreed to encourage the purchase of up to 1,500 MW of electricity from Burma, including hydro-generated power, by 2010. There are also reports that progress is being made with respect to a hydro-power project for export at Tasang in Shan State, which would involve a 168 to 180-meter high dam and potential generation capacity of 3,300-3,600 MW (recently SPDC capacity estimates for this project jumped to 7,110 MW). Japan's EPDC has already conducted a feasibility study at the Tasang site. In December 2002 an MoU purportedly on the project was exchanged between the military regime and MDX, a Thai company. The content of the MoU has not been made public, however, and the exact status of the Tasang project is unclear.

In western Burma, just inside the Indo-Burmese border, runs the Chindwin River, where several potential dam sites have been identified that are likely to service export-oriented hydro-power plants. The sites include Thamanthi, Mawlaik, Homalin, and Shwezaye.

The World Commission on Dams has found that large dams can cause irreversible harm to the environment -- tens of millions of people have been displaced around the world because of dams. It also found that large dams built to deliver hydro-power tend to perform below expectations. Some developed countries have simply stopped building large dams and have started decommissioning existing ones, while looking into alternative options for generating and saving energy. In developing countries, too, plans to build large dams are often met with strong opposition.

But Burma's regime seems determined to repeat the mistakes of its neighbors, which have prioritized investment in large-scale energy supplies regardless of the consequences. The political and social conditions in Burma compound the negative impact common to large dam projects in developing countries. Burma has all the factors needed to bring about the worst-case scenario. The country lacks a sound socio-economic infrastructure, the rule of law and mechanisms for public participation. Burma's environmental regulations are weak, and those that exist are not enforced effectively. And then there is the military: in Burma, development projects typically involve an increase in the military presence in the targeted area, which leads to greater human rights abuses.

Sites are identified and studied without consultation with surrounding communities; troops are brought in to "secure" the area; people are ordered to move at gunpoint; then villagers are taken as forced unpaid laborers. Burma has a tradition in this regard. The building of Baluchaung No 2 hydro-power plant in Karenni State, which was completed in 1960, led to the forced relocation of local residents. Today the area is surrounded by landmines. Dam projects since have entailed the displacement of local residents.

The International Labour Organization reported that villagers were required to contribute labor to the Zawgyi Dam. Human rights abuses and environmental damage have been linked to projects along the Sittang, and forced labor has been reported in connection with dam construction at Shwe Gin. Forced labor also has been documented at the dam project at Thaukyegat, which is likely to result in the forced relocation of residents in the area of its reservoir. More recently, independent Burmese media reported that four villages were ordered to be relocated and villagers' land confiscated to make way for a dam on Paday Creek, a tributary of the Irrawaddy. Given the difficulties in obtaining detailed, reliable information about such abuses in a secretive, authoritarian state like Burma, these few documented cases may be only the tip of the iceberg.

Serious concerns have been raised about the well-being of the environment and local residents near the projects on the Salween. The prospective dam at Tasang, for example, would mean the flooding of the gorge for 230 km upstream. There are reports that soldiers guarding the Tasang site forced local residents to porter and build military facilities. The Chiang Mai-based Kachin Post reported in June 2004 that if the planned Myitsone, Kachin State hydro-project is built, "5,000 houses from 30 villages will be sunk and 8,000 people will become homeless." Additionally, 18,000 arable acres, forests and natural resources will be submerged. The dam will destroy the Mali-N'mai confluence, which is regarded as the Kachin cultural heartland.

Although the Burmese government currently does not receive any public multilateral development financing for hydro-power development, it has found other sources of funding, especially from Asian countries. In the absence of multilateral financing, bilateral assistance from Japan and China and investment by private companies from Japan, China, and Thailand have supported the regime's efforts to build large dams.

In 2002, the Japanese government promised to rehabilitate Baluchaung No 2 hydro-power plant through its Official Development Assistance. This plant accounts for a large part of Burma's installed hydro-power capacity. Japan has shown a particular commitment to developing hydro-power in Burma, and a number of prospective dam sites have been identified and studied by Japanese government agencies and companies. Apart from the EPDC, mentioned above, other Japanese firms have been involved with studies relating to potential dam sites on the Salween and elsewhere.

In August 2001, the Kansai Electric Power Company, or KEPCO, contracted with Burma to provide technical assistance for developing 12 hydro-power plants, including at least five sites on the Sittang -- Yenwe, Khabaung, Pyu, Bogata and Shwe Gin. In its FY 2003 business plan, KEPCO stated that it was negotiating with Burma about conducting feasibility studies for additional projects. The firm's involvement in the Shwesaryay and Myitsone projects has been reported within the last year.

Moreover, between 1980 and 2000, Nippon Koei Co conducted pre-feasibility or feasibility studies for sites at Yeywa, Tasang, and Yenwe. In 2000-2001, Tokyo Electric Power Services Company, or TEPSCO, a subsidiary of Japan's largest private electricity firm, the Tokyo Electric Power Company, conducted a

feasibility study of the Shweli hydro-power project in Shan State. If and when Japanese ODA to Burma is fully resumed, Japanese companies will be well positioned to begin helping the regime with large-scale dam construction.

China is also a major player in promoting Rangoon's hydro-power development. China's Export-Import Bank has provided financing for at least three hydro-power projects -- Thapanseik, Mon Creek, and Paunglaung -- and has expressed an interest in the Salween hydro-power project. It also has been reported that loans from China will be used to buy equipment for the Yeywa project. Chinese companies such as CITIC and YMEC, have been involved in the development of many hydro-power projects, including Mone Creek in Magwe Division, Shweli, Zawgyi No 1, Zaungthu, Thapanseik, and Paunglaung. It also has been reported that China National Machinery and Equipment Import and Export Corporation, the same company that has been involved in building China's Three Gorges Dam, has expressed an interest in working on the Weigyi and Dagwin projects.

Thailand has been working on the Weigyi and Dagwin projects on the Thai-Burmese border. The Myanmar Times recently reported that the Burmese government intends to establish two hydro-power plants to supply electricity to the industrial zones near Hpa-an and Myeik that are planned to be developed under Thailand's Economic Cooperation Strategy, or ECS. For dam sites on the Chindwin River along the Indo-Burmese border, the regime is reportedly looking for assistance from Indian companies.

It bears mentioning that the Asian Development Bank, to which Japan is one of the largest financial contributors, includes the controversial Tasang site in its "Master Plan" for regional power interconnectivity, under which electricity generated by hydro-power plants in Burma, China and Laos will be consumed by Thailand and Vietnam. While not providing direct financial assistance to Burma because of the current political situation, the ADB, like the Japanese government, may be waiting for what it believes will be a more propitious time to begin assisting the regime to develop large-scale hydro-power projects.

Rangoon has been able to secure funding for the development of large-scale hydro-power in Burma, so the construction of major dams has been proceeding at an accelerated pace. If the regime's ambitions are even partly achieved, many large dams will be built in coming years—and not just on the Salween, but on the Irrawaddy, Sittang and Chindwin rivers. The lack of meaningful public participation in development decisions and widespread human rights abuses inflicted by Burma's military are likely to increase the ecological and social problems commonly associated with large dams built in developing countries, while revenues from electricity exports will bolster the incumbent regime.

**Compiler's note**: The print edition of Irrawaddy for June 2004 carries a map that pinpoints the location of most of the hydropower projects mentioned in the article.

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Appendix 9 RENEWABLE ELECTRICITY SUPPLY IN RURAL MYANMAR: INTRO (In preparation)

Appendix 10 ELECTRICITY GENERATION IN MYANMAR BY<u>STATE AND DIVISION</u> (In preparation)

Appendix 11

#### KINDA DAM FIFTEEN YEARS ON: AN EVALUATION OF HYDROPOWER IMPACTS

Asian Development Bank, "Case Study 6: Kinda Dam Multi-Purpose Project" in Strategic Environmental Framework (SEF) for the Greater Mekong Subregion: Integrating Development and Environment in the Transport and Water Resource Sectors: Volume IV: SEF Case Study Reports, pp 119-39, March 2002. [document, pp 130-50]

http://www.rrcap.unep.org/sef-gms/Volume%20IV%20-%20SEF%20Case%20Study%20Reports%20FINAL.pdf

The Kinda Dam Multi-Purpose Project (Kinda Dam) consists of a dam (for hydropower, irrigation and flood control), a hydroelectricity generating power station, and an irrigation command area. It was commissioned at the end of 1985 after a construction period of approximately five years, and was financed by the World Bank through the International Development Association and the Kreditanstalt für Wiederaufbau, a Germany promotional bank that specializes in development assistance for developing countries. The total cost of the project was US\$270 million, including US\$156 million in foreign exchange. World Bank financing was provided through a loan for US\$90 million. A project completion report (PCR) was issued in June 1992, covering both the power and irrigation components. An operations evaluation impact (OED) study was prepared in 1996.

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The project area is located about 65km south of the city of Mandalay in the central dry zone of Myanmar. The dam is on the Panlaung river, a tributary of the Ayeyarwady, about 15 km upstream of a pre-existing weir. According to Myanmar's National Commission for Environmental Affairs (1999) the total "project area" is about 80km from north to south and 30km east to west. This apparently refers to the dam site, including the power house, the area of the reservoir, and the irrigated command area.

The project area is part of the dry central zone of Myanmar, and has a tropical monsoon climate with three distinct seasons. The annual rainfall is approximately 1060 mm in an around the dam site but is only about 810 mm in the irrigated command area. There is practically no rainfall from December through March. Temperature variation at Mandalay ranges from an average in January of 21.1°C to an average in May of 30.6°C. However, minimum temperature can fall below 10°C, and the maximum temperature can rise above 40°C. Humidity varies with temperature and rainfall, and leads to considerable evaporation in the hot dry months from March to May. The catchment area of the Panlaung river at the dam site measures about 2,240 km2. Annual stream flow (1950-77) averaged about 1,400 mm3 at the dam site, which fluctuates depending on rainfall in the upper basin area. Minimum stream flow usually occurs in March-April.

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#### Table 7.1 Kinda Dam Mulit-purpose Fact Sheet

#### **Project Objectives**

Primary Objective: Economic Growth Secondary Objectives: Hydro-electric generation Irrigation Flood control

#### Site Location

Mandalay Division, Myinttha township 65 Km South of Mandalay

#### Hydrology

Catchment area rainfall: 1060 mm Irrigable area rainfall: 810 mm Catchment area (dams site): 2240 km<sup>2</sup> Catchment area (weir site): 2445 km<sup>2</sup> Mean annual inflow: 1.399mm<sup>3</sup> (1950-77)

#### Dam

Type of dam: Rockfill dam Dam height: 72 m Crest elevation: RL 213.36 m Crest length: 625 m Crest width: 10 m

#### Turbine

Type: Francis Capacity Speed: 250 rpm No. of units: 2

Generator

Capacity: 2 x 28 MW Annual energy: 165 Gwh

#### Spillway

Size: 29<sup>°</sup>-6" x 34'x4" with shutter **Conduit** Length: 465 m Maximum discharge: 114 m<sup>3-/</sup>sec Size: diameter 7.4 m

#### Service Area

Irrigable area: 175000 acres Crop area: 201,381 acres (1994-95)

# Implementation Period

Project start: 1981-82

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Storage volume (MOL): 970 mm<sup>3</sup> Active storage volume: 764 mm<sup>3</sup> Maximum operating level: RL 207.25 m Minimum operating level: RL 175.5 m Diversion tunnels: 1 Length: 465 m Diameter: 7.8 m

#### Penstock

Length: 2 x 30 m Diameter: 3.2 m

#### **Power House**

Type: Shaft powerhouse

Project completion: 1989-90

Project Financing World Bank Ioan: US \$90 million Total Project Cost: US \$ 270 million including in foreign exchange of US\$156M

#### Project Reports<sup>39</sup>

Staff Appraisal Report (SAR) 1980 Project Completion Report (PCR) 1992 Operations Evaluation Impact study 1996

The first investigation of the dam site was undertaken during 1967-71 by the Irrigation Dept of Myanmar. In 1975, Engineering Consultants Inc.(USA) was commissioned to prepare a feasibility report, which was subsequently appraised by the IDA in May-June 1976. Additional IDA-financed engineering studies were carried out by Lahmeyer International (Federal Republic of Germany). A Staff Appraisal Report (SAR) was submitted to the IDA in May 1980.

Kinda Dam was constructed with the objective of exploiting irrigation releases by producing hydro-electric energy prior to conveying and supplying an irrigated command area. Reservoir operation studies were undertaken assuming a maximum operating level of 207.26m asl and minimum operating level of 178.61m asl. Reservoir releases were designed primarily to correspond to irrigation demand. The project was designed to generate a maximum capacity of 56 MW (two units of 28 MW each), and an average annual energy production of approximately 165 GWh. The Kinda reservoir was formed by a 71.93-metre-high rockfill dam on the Panlaung River. Water is released from the reservoir through the hydro-electric plant. Storage at the maximum operating level is 969.5 MM3 and the active storage is 763.2 MM3. The existing Kinda weir was rebuilt as a regulating dam with 2.2 MM3 of storage.

The first release of water from the reservoir took place in August 1985, and power reached the national grid on schedule in January 1986. The irrigation component of the project was delayed and completed in 1991, over four years behind schedule. Before the construction of the Kinda Dam the existing Panlaung irrigation system, which included three diversion weirs on the Panlaung river, irrigated about 35,600 ha. The Kinda Dam improved agricultural production on the existing 35,600 ha and was planned to bring an additional 43,300 ha of rainfed area, predominantly bushland, under irrigation (this is less than was initially estimated to be irrigated in the original Staff Approaisal Report carried out in 1980. The combined planned irrigated area was 78,900 ha.

Runoff from the catchment area upstream from the dam site is quite variable and predominantly occurs during the monsoon season. Over the 1950-77 period annual runoff varied from a minimum of about 965 MM3 (1972) to maximum of 2,400 MM3 (1956), with an annual average of about 1,400 MM3. [But} from 1986 through to 1998 the average inflow was [only] about 1,110 MM3, or approximately 76 percent of the 1950-77 average. Due to the below average rainfall in the catchment during this period (1986-98), the average release was about 1,056 MM3, again roughly 76 percent of the planned average irrigation; thus the actual irrigated area is closer to 70,800 ha. During these years hydropower production was given priority in the winter months, when the demand for irrigation was less than the water released. This contributed to water shortage during periods of higher irrigation demand.

Due to head variations the Kinda Dam energy generation has varied significantly over its life. Since commissioning in 1986 the power station has generated on average 106.1 Gwh annually, which is far below the annual targeted production of 165 GWh. There has been only two years, 1992 and 1993, when annual energy production has exceeded the target of 165 GWh (Table 7.3).

Year	Annual inflow (Ac ft)	Annual release (Ac ft)	Water (ft)	Vater level Peak (MW) A ft) G		Annual Generation	Rainfall (inch)
			Min	Max		(Gwh)	
1985	700038	231942	-	-	-	-	-
1986	749280	714648	-	-	-	83.1	-
1987	775506	711813	646.1	619.4	-	104.5	-
1988	768765	850139	639.9	612.3	-	117.9	38.78
1989	964934	764111	647.6	5929	-	99.5	34.57
1990	723885	1048544	646.0	591.5	41.2	135.5	35.00
1991	1004937	647629	649.5	489.0	40.9	82.2	44.21
1992	1359135	1130655	676.8	616.0	56.0	183.9	43.05
1993	897386	1251621	663.4	600.1	52.9	167.6	44.07
1994	748612	765046	614.4	569.8	32.6	74.8	30.51
1995	724218	549902	629.2	562.0	37.4	42.7	37.17
1996	1010177	836322	649.4	601.1	45.5	116.8	42.13
1997	840561	1113946	646.2	587.1	46.5	126.9	29.72
1998	629670	729801	602.4	559.4	31.2	43.1	28.85
Mean	861313	855244				106.1	37.09

# Table 7.3 Annual Inflow, Release, Maximum and Minimum Water Level and Energy Generation, Kinda Dam. p 125 = document p 136

Due to study constraints, little can be said in detail about key environmental issues often associated with dams, such as impacts on fisheries and biodiversity, habitat loss, area flooded by the reservoir, downstream hydrological and geomorphological changes, and reductions in water quality; or the impacts associated with dam construction and the construction and operation of associated roads and transmission lines. It seems unlikely that a fish species inventory was carried out in the project impact area during the dam planning and design phases, or that the possible impacts of the project were identified. According to a report issued by National Commission for Environmental Affairs (NCEA) of the Myanmar Government in 1999, the growth, spread and persistence of aquatic weeds in the newly irrigated project area is the most serious environmental problem in the scheme. The report also states that poor drainage in the canal system, combined with a pattern of cropping requiring large amounts of water, has resulted in extensive water logging and salinization. The drainage problems are a result of "inappropriate design and planning of project".

A water quality monitoring program has been carried out continuously since the formation of the reservoir (NCEA, 1999). The purpose of this programme is most likely to assess the quality of the irrigation water supply and also to monitor water quality with regard to the hydroelectric powerhouse, but is also useful for fish culture management. Oxygen content and other parameters are monitored. Water quality is reported as being good, and no conditions have been observed so far which would inhibit fish development. However, it is not clear if the water quality monitoring programme is confined to reservoir water or if it also includes sampling of dam discharge water. The dam wall is 72 m high and the turbines installed are of the high head Francis type. Drawdown is substantial at 28.65 m. It is therefore possible that deoxygenation of the hypolimnion occurs annual during the dry season. This suggests that water low in oxygen (and possibly containing toxic hydrogensulphide) is discharged downstream for part of the year. A negative impact on downstream fisheries and fish biodiversity could be expected under such conditions.

According to NCEA (1999) deforestation has become an issue in the project area, arising from shifting cultivation in the upper parts of the area and heavy fuelwood consumption in the lower parts. In response UNDP and the Government of Myanmar established in 1997 the project "Pilot Watershed Management for Kinda Dam". The NCEA (1999) reports that these programmes successfully introduced watershed management technologies "appropriate" for Myanmar. Since the idea of watershed management was new to the staff of the Forest Department and to the rural people living in the catchments, it was decided first to start with a pilot project. A 24,300 ha demonstration area was selected for the pilot project in the 222,600 ha watershed area near Ywangan township in Shan State. The Food and Agriculture Organisation of the United

Nations (FAO) was designated as the executing agency and Myanmar Forest Dept as the counterpart agency responsible for project implementation. The UNDP contribution was US\$3.3 million and the Government contribution was K20.2 million. A pilot demonstration area was established, including multipurpose nurseries, species trials, and small scale planting. A total of about 90 miles of roadside plantations were established. Woodlots belonging to the Forest Department were established on approximately 320 ha in six village tracts in the project demonstration area. To protect the plantations, a fire protection plan was developed and 50 village guards appointed following a brief training season.

According to NCEA (1999), the project resulted in almost "negligible" resettlement of persons displaced from the reservoir area. However, the construction of the dam entailed the flooding of 4 villages with a total of 96 households (426 person), as well as 29 ha of irrigated paddy and about 113 ha of rainfed cropland. The ratio of displaced persons to the power generation (which according to Goodland, 1997, is a reliable "first" approximation to distinguish between "better" and "worse dams") is approximately 7.6 displaced persons/MW, which, while much lower than the ongoing Three Gorges Dam (71 displaced persons/MW) or the Akosombo/Volta Dam in Ghana (96 displaced persons/MW), is on the same order as the controversial Nam Theun 2 Dam in Lao PDR (8 displaced persons/MW) and the Ertan Dam in China (9 displaced persons/MW). The project is said to have provided for the resettlement of these peoples, including compensation of loss for immovable private and communal property and a subsistence allowance for about 6 months. Each family was provided an approximately 15m x 30m residential plot and a new house. The agricultural land given per family was 0.8 to 2 ha depending on the number of family members.

No information is available indicating if, during the planning and development, a public consultation and stakeholder dialogue process was undertaken. NCEA (1999) notes that in the past a "top-down" planning approach had been widely used in Myanmar development programmes that concerned local peoples, with minimal success, if any, and without active participation of the stakeholders. It is further noted that under the previously mentioned "Pilot Watershed Management for the Kinda Dam" project, a "bottom-up" approach was introduced, including direct people's participation in initial planning, implementation, and maintenance, and this has proven to be a successful mechanism for motivating communities and farmers to improve land-use practices. According to NCEA (1999), initiatives such as the species trials and the small scale planting demonstrated in the pilot watershed areas have heightened awareness on the part of the government and local communities on the need for immediate action to reverse the trends in environmental degradation in the area. Expansion to a full-scale integrated watershed management program is envisaged in this area during subsequent phases of the watershed management technical assistance programme.

Of particular note in evaluating the environmental sustainability of the project is the fact that production of paddy is [only] 40pc of the projection made in the initial staff appraisal report. One of the reasons offered for this in the NCEA report (1999) is that most farmers had pursued different cropping patterns after initially agreeing to plant paddy "in support of government's rice export campaign". A World Bank OED study on agro-economic impacts of investments in gravity-fed irrigation schemes in the paddy lands of south-east Asia (1997), which included the Kinda Dam, found that that the area supplied by the irrigation system is usually considerably less than planned, and in general noted that amongst the six sites studied reasons included over-optimism, engineering errors, lower than normal rainfall, and failures to extend the tertiary canals. More significantly, the report concludes that smallholder irrigated paddy can no longer provide the basis for a growing, or even stable, household economy.

As far as energy generation is concerned, the Kinda Dam output has varied significantly. Since commissioning in 1986 the power station has generated on average 106.1 Gwh annually, which is far below the annual targeted production of 165 Gwh. In only two years, 1992, 1993, did the annual energy production exceed the target of 165 Gwh.

Overall, the Economic Rate of Return (ERR) is considerably lower than originally estimated, primarily due to the decline in the international price of rice (NCEA, 1999). The original projection for 1990 rice prices, made in 1980, was US\$ 700/ton. The actual midyear 1995 price was US\$ 237/ton. According to the original staff appraisal report in 1981, it was projected at 21.3 pc. At the time the project was completed in 1992, it was calculated at 14.0 pc. An operations evaluation study prepared in 1996 reported the actual figure at the time was 7.4 pc. For the Government of Myanmar (the borrower), an ERR of between four and seven percent is

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acceptable given the visible sign of improvements over large areas previously rainfed. The Government of Myanmar is satisfied that the project has been successful.

Given the lack of documentation on the project (and in particular the lack of access to official World Bank project Staff Appraisal Reports (SARs), Project Completion Reports (PCRs), and Operations Evaluation Impact Studies (OEDs), the inability of the authors to visit the site; and the inability of the authors to conduct Qualified Observer interviews in-country, it is impossible to draw any comprehensive conclusion about lessons learned. The project [appears to be] economically sustainable. However, some doubts have arisen regarding the full achievement of anticipated benefits, as the inflow into the reservoir has so far not exceeded 76 percent of the expected inflow. Though the last few years have been dry years all over central Myanmar, the possibility of errors in the initial analysis cannot be ruled out. Even with reduced inflows, the project benefits could be maximised with maximum use of rainfall, prudent water management on the farm and keeping the power station closed when there is no irrigation demand. Extension service for irrigated agriculture, especially for promotion of non-paddy crops requiring less irrigation water, has to be actively pursued and strengthened. The fact that the lender (World Bank) has no long term involvement with the Kinda Dam project, or even the borrower country, highlights the need to maintain longer term monitoring programs in order to more accurately assess positive and negative social and environmental impacts, and to learn from these experiences.

#### Internal references

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World Bank, 1992. Project Completion report (PCR) World Bank, 1996. Operations Evaluation Impact Studies (OEDs)

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NF 47-09: Mandalay Kinda dam and power station, north of Nyaunggyat [21° 06 N, 96° 19' E], grid sq ref: 12\9, 26\4 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-nf47-9.jpg</u>

The sluice gates and spillway are easily located on Google Earth at 21° 09' 45" N, 96° 19' 16 along with penstocks, power house and the large reservoir behind the dam.

# Additional references

Department of Irrigation, Myanmar Ministry of Agriculture and Irrigation, [undated, circa 2004] <u>http://www.irrigation.gov.mm/works/majorirrigationworksconstructed.html</u>

Kinda multipurpose dam in Myittha township, a rock-filled dam, 2,034 feet in length, 236 feet in height, with a storage capacity of 873,580 acre-feet. The irrigation potential works out to a command area of 201,500 acres and a cropping area of 328,390 acres. It also generates hydro-power from two turbines, each having an output of 28 megawatts, together capable of producing 165 million kilowatt-hours annually. It is the largest reservoir in Myanmar according to storage capacity and dam height. The Irrigation Dept renovated the existing 215.7-mile canal system and constructed new canals, totaling 498 miles. Construction of the dam was initiated in 1980-81 and completed in 1990-91.

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Myanmar Nyauggyat (Kinda) Dam Multipurpose Project [Evaluation] Report, September 2002 <u>http://www.jbic.go.jp/english/oec/post/2002/pdf/069\_full.pdf</u>

A Japanese loan in the amount of 3,081million yen (US\$12.8 million), repayable over 30 years, was made to assist with irrigation and agricultural parts of the project. An evaluation carried out in Sept 2001 also included references to hydropower side of the project.

	Table 1	Comparison o	Original and Ac	tual Project Cost L	<b>Jnit: Million US Dollars</b>
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Unit: Million US Dollars						
Items	P	rojected Cos	st	Actual Cost		
	Foreign	Local	Total	Foreign	Local	Total
	Currency	Currency		Currency	Currency	
Multipurpose Dam	77.0	24.5	101.5	69.69	39.71	109.40
Hydropower Station	45.0	18.0	63.0	48.58	17.30	65.88
Irrigation and Drainage Facilities	24.6	30.4	55.0	19.18	52.34	71.52
Agriculture Support	2.0	2.2	4.2	0.26	1.45	1.71
Agriculture Mechanization	1.5	0.9	2.4	0.69	0.63	1.32
Valley Survey & Detail	6.4	0.8	7.2	7.00	0.80	7.80
Engineering						
Utilization of Underground Water	1.5	0.2	1.7	1.20	0.20	1.40
Total	158.0	77.0	235.0	146.60	112.43	259.03

The design capacity of the hydropower station (28 MW x 2 Units) was confirmed in performance tests conducted in December 1985. The station commenced supplying energy to the National Power Grid in 1986. Yearly unit generation fluctuates between 31 to 222 GWh (target value = 165 GWh). This fluctuation of generation was caused by demand side requirements and was not due to the matters in the hydropower station. The present function of the hydropower station has been peak shaving, and it is now operated under the standard operation pattern (utilization factor = 37.2%, equivalent to 173 GWh generation).

WPD, 23/03/90. http://www.ibiblio.org/obl/docs3/BPS90-03.pdf

Kinda Multi-Purpose Dam Project formally inaugurated, built at a cost of K1,759,400,000, including US\$184,200,000. Through its canal system it will irrigate 201,500 acres of arable land.

Michael Aung Thwin, *Irrigation in the Heartland of Burma: Foundations of the Pre-Colonial Burmese State,* (Centre for Southeast Asian Studies, Northern Illinois University, Occasional Paper No. 15, 1990), pp 14 – 18. [not available on-line]

The Kyaukse irrigation system has long been considered as the most effective and efficient in Burma, relative to its size, with its origins in the Pagan period. Kyaukse's irrigation techniques, particularly weircanal technology was, perhaps, developed in the 10th or 11th centuries A.D. When the Irrigation Dept under the British reconstructed the Kyaukse weirs, in no case was it found advantageous to alter the site. The Zawgyi and Panlaung rivers were the foundations of the Kyaukse's irrigation system. The Panlaung had five weirs: the Kinda, Htongyi, the Kinda II (or Pinda), the Nathlwe and the Kyime.

Sekhar Bandyopadhyay, *Burma To-day: Development and Political Control since 1962: June 1987* (Papyrus, 1987), pp 58-60. [not available on line]

The idea of the Kinda project was born in 1967, when the government set up a joint survey and study team composed of Soviet and Burmese experts to devise means for a systematic utilization of the water of the Panlaung river. The team produced a preliminary feasibility report and during 1973-74, a request for financial assistance was made to the World Bank for the implementation of the project. The Bank agreed to finance the project, whereupon in 1975 an American firm made a fresh feasibility study, after which international tenders were invited. A West German firm, Lehmeyer International won the tender bid and in 1978 it submitted the final feasibility report, which was approved by the World Bank and the required financial loan was given. In 1981-82, the Kinda Multipurpose Dam project was initially implemented, the total capital investment for the project being K1,586 million kyat, out of which K1,070 million [was] in foreign exchange. The project had two aspects: the construction of a dam and the building of the hydroelectric power house. Later on, Hyundai Construction of the South Korea was given the contract to construct the

dam, while the West German firm is responsible for the hydroelectric power project. The whole project was expected to be completed within 1986.

In order to develop the infrastructure for the project, the Irrigation Dept has undertaken the construction of new irrigation canals and the renovation of existing canals. The renovation work involves the removal of silts, repairing of pipes, sluices and sluicegates in the existing divserion canals. In addition, a main canal, about 78 miles long, 32 feeder canals having a total mileage of 32 miles, and 304 smaller canals with a total length of 280 miles are among the proposed construction plans. To protect against floods, an embankment, 26 miles long, is being built along the Panlaung river, together with another 6-mile-long embankment along the Paukchaung stream. For the transportation of farm products of the area, a 38-mile-long road is also under construction, together with a proposed all-weather road, 110 miles long, along the main canal. As a result of the project, the annual value of the agricultural produce of the area is expected to increase from over 106 million kyat to over 501 million kyat. It is calculated that in about eight years to total cost of the project will be recovered.

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WPD, 17/04/87. http://www.ibiblio.org/obl/docs3/BPS87-04.pdf

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Kinda dam multipurpose project was implemented in 1979-80 and by 1986-87 the main dam and minor dams were completed, as were 50pc of the irrigation works; when completed it will irrigate 201,500 acres of land and 322,400 acres of cropland, and generate I65 million kWh of electricity annually.

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Appendix 12

# POLITICAL ECONOMY OF INDUSTRIALIZATION IN MYANMAR: INTRO

Tin Maung Maung Than, *State Dominance in Myanmar: The Political Economy of Industrtialization* (ISEAS: 2007)

In preparation

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#### Appendix 13 <u>REGULATION</u> OF THE ELECTRIC POWER INDUSTRY IN MYANMAR: NOTES

In preparation

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#### Appendix 14 <u>HISTORY</u> OF THE ELECTRICAL INDUSTRY IN BURMA/MYANMAR: NOTES

In preparation

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#### Appendix 15

# KEY <u>WEBSITES</u> FOR ACCESSING INFORMATION ON MYANMAR'S ELECTRICAL INDUSTRY

#### **ASEAN Energy Centre**

#### http://www.aseanenergy.org/

The Myanmar electricity section provides barebones information on MEPE, installed capacity, production and sales, completed, ongoing and future generation projects and information about possible grid connections between Myanmar and Thailand. The Myanmar information has not been updated since the beginning of 2001.

#### **BurmaNet News**

#### http://www.burmanet.org/news/

This widely used resource provides news articles from a wide spectrum of agencies five times a week. Both 'keyword' and 'calendar' search facilities are available through this page for editions of the BNN from July 2004 up to the present. For 'calendar' searches of editions of the BurmaNet News from 1994 to 2001 use the reg.burma archive. <a href="http://www.ibiblio.org/obl/reg.burma/">http://www.ibiblio.org/obl/reg.burma/</a> For 'keyword' searches of the reg.burma archive use <a href="http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi">http://www.ibiblio.org/obl/reg.burma/</a> For 'keyword' searches of the reg.burma archive use <a href="http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi">http://www.ibiblio.org/obl/reg.burma/</a> For 'keyword' searches of the reg.burma archive use <a href="http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi">http://www.ibiblio.org/obl/reg.burma/</a> For 'keyword' searches of the reg.burma archive use <a href="http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi">http://www.ibiblio.org/obl/reg.burma/</a> For 'keyword' searches of the reg.burma archive use <a href="http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi">http://www.ibiblio.org/obl/cgi-bin/reg.burma/</a> For 'keyword' searches of the reg.burma archive use <a href="http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi">http://www.ibiblio.org/obl/cgi-bin/reg.burma/namazu.cgi</a>

## **Burma News International**

# http://www.bnionline.net/

The 'keyword' search facility on this page gives access to articles from the ten news organizations that form the BNI network. 'Calendar' searches can be made by consulting the archives, also available on this page.

**Central Statistical Organization** of the Myanmar Ministry of National Planning and Economic Development <a href="http://www.csostat.gov.mm/csomonthly.asp">http://www.csostat.gov.mm/csomonthly.asp</a>

Monthly Indicators 9 and 10 show electric power generated and sold and production by generation types. Current monthly stats are updated quarterly. Past monthly stats are retained for two years, then rolled into financial year totals.

#### Country Presentation Myanmar: Franco-ASEAN Seminar, 6-7 September, 2007.

http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

An up-to-date presentation on the two Ministries of Electric Power and current, planned and completed generation and transmission projects. Useful maps on the locations of the projects are provided.

#### Irrigation Department of the Ministry of Agriculture and Irrigation

http://www.irrigation.gov.mm/works/default.html

This site has valuable information on many of the multipurpose dams constructed in Burma/Myanmar over the the last 50 years. The following sections are of particular interest for the data related to the hydroelectric installations at these dams

http://www.irrigation.gov.mm/works/between1962and1988.html

http://www.irrigation.gov.mm/works/1988.html

http://www.irrigation.gov.mm/works/majorirrigationworksconstructed.html

http://www.irrigation.gov.mm/works/datarelativetomajorirrigationwork.html

Water in the multipurpose dams appears to be reserved primarily for agricultural purposes. Operation of the dams at these locations is the responsibility of the Department of Irrigation, while intake and discharge of water used for hydro-electric generation is the responsibility of Hydropower Generation Enterprise. Technical data on river flows and dam capacities on this site can be usefully cross-checked with information available in the key articles and supplements in the compendium.

#### Ministry of Electric Power

#### http://www.energy.gov.mm/MEP\_1htm

This website has not been updated since the Electric Power Ministry was reconstituted as two separate ministries in May 2006. The data available on the site is the same as that posted when the site was set up in 2001. However, it does provide information useful for historical purposes including two maps, one showing the existing power grid system in 2000, and the other showing the locations of 29 hydro-electric projects then on the drawing boards.

#### Myanmar Times

# http://mmtimes.com/

This is an excellent source of information about both privately- and state-owned companies and projects of Burma/Myanmar's electrical industry. 'Key word' searches are best carried out through Google. MTs own 'archive' seem to be permanently under construction. The most readily accessible public archive is available through the On-line Burma Library, although it is far from complete. http://www.ibiblio.org/obl/show.php?cat=1687&lo=d&sl=0

Many of the back editions for 2000 and 2001 not available through the OBL website can be accessed by substituting volume and edition numbers in the following URLs:

http://www.myanmar.gov.mm/myanmartimes/no49 http://www.myanmar.gov.mm/myanmartimes/no68/myanmartimes4-68/

## New Light of Myanmar

Much information available about state-operated industries and projects is available through this source. For 'keyword' searches of the on-line editions 1998 - 2003, use

http://www.burmalibrary.org/cgi-bin/NLM/namazu.cgi

For 'key word' searches of the on-line editions from July 2003 to the present, use

http://www.foreverspace.com.mm/fulltext/default.aspx

For 'key word' searches of editions of the Working People's Daily (WPD) and the New Light of Myanmar (NLM) 1987 – 1996, as reported in the Burma Press Summary, use Google.

Access to the on-line editions and print editions of the New Light of Myanmar from 1988 to the present is available through <a href="http://mission.itu.ch/MISSIONS/Myanmar/NewsArchives/newsindex.htm">http://mission.itu.ch/MISSIONS/Myanmar/NewsArchives/newsindex.htm</a>

The On-line Burma Library (OBL) also has a readily accessible archive of the print edition of NLM from Oct 2003 to the present. The same page also provides links to the archives of other state-owned media. http://www.ibiblio.org/obl/show.php?cat=1449&lo=d&sl=0

To access the archive of the Burma Press Summary of the editions of WPD and NLM from 1987 – 1996: http://www.ibiblio.org/obl/show.php?cat=1455&lo=d&sl=0

An archive (2001 – 2005) with feature articles from the print edition of NLM (not normally available in the online edition) is available at <u>http://www.myanmar.gov.mm/Article/</u>

# Salween Watch

# http://www.salweenwatch.org/

The Salween Watch bills itself as 'a coalition of organizations and NGOs that deal with Burma-related environmental issues'. 'It was set up with the primary aim of preventing the building of harmful hydro-electric power dams on the Salween (Thanlwin) river.' The site is updated regularly and provides quick access recent publications by coalition members. A newsletter is available. Fourteen issues of the Salween Watch Update from February 1999 to March 2003 are available through a permanent archive maintained by the Online Burma Library <u>http://www.ibiblio.org/obl/</u> The SW archive can be accessed directly through OBL's Main Library section > Economy > Infrastructure > Energy > Hydroelectric > Dams.

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# Appendix 16

# THAUKYEKHAT HYDEL POWER PROJECT: NOTES

Kyaw Thu, Myanmar Times, 26/11/07. http://www.mmtimes.com/no394/b005.htm

Two private Myanmar companies developing hydropower projects are planning to hire foreign consultant companies, said an energy expert close to one of the companies on 20/11/07. Asia World is slated to build the Thaukyegeat hydropower project in Bago division, which is expected to produce some 140 MW of electricity, while Olympic Construction will build the Baluchaung 3 project in Kayah State. "The two companies have been running feasibility studies and preparing to submit a proposal to the Myanmar Investment Committee," the expert said. However, he refused to say which company – or companies – Asia World is planning to hire, or to state the value of any such deal, although he did say what its role would be. "The foreign consultancy company will help us to draw-up a project design and monitor the overall construction," he said.

**Topographic map reference**: Burma 1:250,000: Series U542, U.S. Army Map: NE 47-05: Toungoo Thaukyaykhat creek dam, near Tonbo [18° 55' N, 96° 37' E], grid square reference: 9\9, 26\1 <u>http://www.lib.utexas.edu/maps/ams/burma/txu-oclc-6924198-ne47-5.jpg</u>

Franco – ASEAN Seminar Myanmar Country Presentation, 06-07/09/07. http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf Thaukyegat dam and power station with a planned capacity of 140 MW is under implementation by the HPID. It is expected to generate 670 million kWh annually when it comes on line in 2011.

NLM, 24/09/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060924.htm

At a SPIC meeting, EPM Zaw Min reports that the 140-MW Thaukyaykhat No 2 hydel power project will be built on Thaukyaykhat Creek near Htonbo Village, seven miles east of Toungoo in Bago division. The project will distribute electricity through the national grid. It will also protect the Sittoung basin from flooding and supply water to 50,000 acres of farmland in the Toungoo and Htantabin regions.

KHRG, Toungoo District: Update on the Dam on the Day Loh River, 30/05/06.

http://www.khrg.org/khrg2006/khrg06b5.html

The site of the dam on the lower Day Loh river (known in Burmese as the Thauk Yay Ka river) is at the western edge of the hills in Tantabin township of Toungoo district, just east of the plain surrounding Toungoo town. According to information gathered from local people by the Free Burma Rangers (FBR), four foreign engineers from "Japan and France" visited the site in 2002. In May 2005, six Japanese engineers visited Day Say Hta village in Tantabin township to oversee preparations for the construction of the dam and the 150-MW hydroelectric power plant. The arrival of the Japanese engineers in May 2005 probably accounts for the large force of military deployed in this relatively small area at the time. According to the website of the Ministry of Electric Power all of the preliminary studies performed for the project thus far have been conducted by the Japanese firm, Tokyo Electric Power Services Co. Ltd. (TEPSCO). In January 2006 a number of the villages from the area around Tun Boh (just below the dam site) were reportedly issued orders to relocate to the Law Gha Inn relocation site, an area not too far from the dam site with scarce water resources, few trees, and poor soil which cannot support adequate crops. If not used to work directly on the dam and power plant itself, the villagers will almost certainly be ordered to work on related infrastructure projects, such as building and maintaining access roads to the dam site, building new army camps along those roads, and keeping them stocked with provisions by portering food and munitions for the soldiers based there. Since the beginning of 2006, the SPDC has already been ordering one villager per household from nearby villages to stand sentry at the dam site. Compiler's Note: See the Toungoo (Taw Oo) district map: http://www.khrg.org/maps/2006maps/Toungoo2006b5.jpg Note that the district and township boundaries and names in KHRG maps differ slightly from those on most Myanmar maps.

NLM, 12/05/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060512.htm

Lt-Gen Khin Maung Than of the Ministry of Defence visits Thaukyekhat hydel power project in Htonebo village, 12 miles from Taungoo, where he is briefed by Director Tint Lwin of HPID's Construction Group 3 on work at the project site. He inspects sites chosen for building the dam and hydel power plant. When the Thaukyekhat hydel power station is completed it will produce 670 million kWh per year.

KHRG, Report on Toungoo district, 19/08/05. http://www.khrg.org/khrg2005/khrg05f7.html

The Burmese military junta plans to build a new dam and access road on the Thauk Yay Ka (Day Loh) river just upstream of its emergence from the hills into the plains to flow toward the Sittaung river. This dam will be downstream from Pa Leh Wah and just upstream from Tun Boh village in the Day Say Hta area (see map http://www.khrg.org/maps/2006maps/Toungoo2006b5.pg Local people have been told the dam is part of 'development', but they say it will be bad for them because every time the military junta announces infrastructure projects they confiscate land belonging to the people, demand money and materials, and force civilians to do labour. Local civilians fear that they will be unable to refuse these demands because the SPDC will enforce them with guns. To assert its control in the area and secure it for dam and road construction, an extremely large column of 2,000 SPDC soldiers was sent into the area between Tun Boh and Pa Leh Wah in May 2005. After patrolling for several days they returned to their bases, but from the beginning of June onwards columns from LIB 599 began constant patrols between Tun Boh and Pa Leh Wah. Access to the area is now extremely difficult, so KHRG researchers have been unable to get details on the direct effects of construction activites on local villagers thus far. Other battalions are stopping all vehicles travelling along the roads between this area and Toungoo town. In the areas of Thandaung township west of the Klay Loh river, the military is checking all traffic along the roads. Small outposts, each manned by five soldiers, have also been established at regular intervals along the railway line in the Sittaung River area.

NLM, 15/03/05. http://www.myanmar.gov.mm/NLM-2005/Mar05/enlm/Mar15\_h1.html

On a visit to Pyu creek dam site, General Than Shwe is briefed on the Thaukyaykhat hydel power project and geological data of the Sittoung river basin. He give guidance on implementing the Thaukyaykhat project.

*Monywa Copper Mine Electric Power Plant Project by BOL Scheme*, Engineering Consulting Firms Association -- Japan, [late 2004].

http://www.ecfa.or.jp/japanese/act-pf/H16/minkatsu\_Myanmar\_Eng.pdf [doc, pp 14, 16]

According to a long range plan for development of electric power facilities prepared in 2001 by the Planning Dept of the Ministry of Electric Power, three turbines of 50 MW each were to be installed at the Thaukyegat hydropower project which was expected to produce 780 million kWh annually. A preliminary study had been completed by TEPSCO of Japan. The project was estimated to cost US\$ 180 million and was scheduled for completion in 2006.

NLM, 01/02/00. http://mission.itu.ch/MISSIONS/Myanmar/00nlm/n000301.htm

On a visit to Thandaunggyi, SPDC Secretary No 2 Tin Oo mentions that the Thaukyaykhat hydel power project is now under way

KHRG, Peace Villages and Hiding Villages, 15/10/00. See the section: Forced labour on roads. <u>http://www.khrg.org/khrg2000/khrg0005.html</u>

Adding to the problems created by all the other road projects in Thandaung township, a new dam is to be built on the Day Loh River at Pa Leh Wah. village. Three Japanese engineers carried out surveys in the area earlier this year and villagers have been required to work on the project. The dam at Pa Leh Wah will almost certainly result in forced relocation without compensation of the villagers at the reservoir site.

#### NLM, 12/11/99. http://mission.itu.ch/MISSIONS/Myanmar/99nlm/n991112.htm

At a SPIC meeting EPM Tin Htut presents a feasibility study on implementating the I 50-MW Thaukyekhat hydel power project in Thandaung township.

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Appendix 17

#### SOUTH NAWIN HYDEL POWER PROJECT: NOTES

Monywa Copper Mine Electric Power Plant Project by BOL Scheme, Engineering Consulting Firms Association -- Japan, [late 2004].

http://www.ecfa.or.jp/japanese/act-pf/H16/minkatsu\_Myanmar\_Eng.pdf [doc, p.18]

According to a long range plan for development of hydropower resources developed in 2001 by the Planning Dept of the Ministry of Electric Power, two single megawatt generators were to be installed at the South Nawin dam which was expacted to produce 10 million kWh annually. Procurement of the turbine generator sets was said to be underway. Completion was scheduled for 2003.

NLM, 01/06/03. www.myanmar.gov.mm/NLM-2003/enm/Jun01\_h2.html

Lt-Gen Khin Maung Than of the Defence Dept visited the South Nawin Dam . At the briefing hall, officials reported on facts about the dam, water storage capacity, irrigation of farmlands including some 54,000 acres of monsoon paddy and 16,000 acres of summer paddy, cultivation of paddy and other crops with the use of water from the dam. At the site of South Nawin hydel power project, Deputy EPM Myo Myint and D-G Win Kyaw of Hydel Power Department reported on the project.

NLM, 15/06/01. http://mission.itu.ch/MISSIONS/Myanmar/01nlm/n010625.htm

Secretary No 1 Khin Nyunt and party went to South Nawin Dam in Paukkhaung township where A&IMin Nyunt Tin reported on the condition of generating electricity from the dam. Later, they inspected the dam and the site where a penstock has been installed and the site chosen for construction of a hydro-electric power station.

Irrigation Dept website, [n.d.]. www.irrigation.gov.mm/works/majorirrigationworksconstructed.html

The South Nawin dam is in Paukkhaung township, Bago Division. It is an earthen type, having a length of 16,674 feet and a height of 141 feet. The storage capacity at full level is 287,000 acre-feet. The potential for irrigation is 62,500 acres of command area and 98,100 acres of cropping area. The main canal covers 32

miles and the lateral canals 177 miles. Construction commenced in 1985-86 and came to completion in 1994-95. The opening took place on 28/04/95.

Irrigation Dept website, [n.d.]. <u>www.irrigation.gov.mm/works/datarelativetomajorirrigationwork.html</u> South Nawin in Paukkhaung township, 5082 m long, 32 m high, storage capacity, 354,015,000 cu m completed in 1995-96.

U.S. Dept of Labor website, Report on Labor Projects in Burma, Appendix III, Infrastructure Projects using Unpaid Labour 1988-1996, Sept 1998.

http://www.dol.gov/dol/ilab/public/media/reports/ofr/burma/main.htm#AP3

The U.S. Department of Labor has identified the South Nawin Dam, built by the Burmese regime with planning and engineering paid for by the Government of Japan, as having used some 260,000 forced laborers during the mid 90s.

NLM, 29/04/95 http://www.ibiblio.org/obl/docs3/BPS95-04.pdf [doc, p 95]

SLORC Secretary No 2 Lt-Gen Tin Oo spoke at the inauguration of South Nawin dam in Paukkhaung township. It will irrigate 62,500 acres of catchment area and 98,100 acres of plantations. In his address Gen Tin Oo said the Overseas Economic Co-operation Fund (OECF) of Japan had conducted a survey for drafting the Project for Allround Development of the Upper Sector of Ayeyawady Delta Region from 1977 to 1979. Based on the report, consultants of the Sanyu Group were hired to draw the design for the dam beginning in April 1983. He also referred to the hundreds of thousands who had "contributed voluntary labor" for the dam. The dam cost K 1,473 million, of which K 438 million (Yen 8,150 million) was in foreign exchange loaned by the OECF of Japan. Ambassador of Japan to Myanmar Takashi Tajima expressed pleasure at the completion of the dam.

WPD, 20/08/88. <u>www.ibiblio.org/obl/docs3/BPS88-08A.pdf</u> [doc, p.21] Under the South Nawin Dam Project launched in 1985 1985-86, construction work is under way. When finished, it will supply water to 62,500 acres of land and 94,900 acres of crops.

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#### Appendix 18

ELECTRIC POWER GENERATED AND SOLD BY ELECTRIC POWER ENTERPRISES: 1971 – PRESENT

Electrical Industry Compendium Table 1

ELECTRIC POWER GENERATED AND SOLD BY ELECTRIC POWER ENTERPRISES 1971 – PRESENT

Year	Installed	Generated	U	nits sold in r	nillions of k	ilowatt hou	rs
	Capacity	Millions kWh	General	Industrial	Bulk	Other	Total
71-72		619					
75-76		760					
78-79		976					690
79-80		1081					763
81-82		1228					854
80-81		1345					950
82-83		1562	316	552	145	37	1050
83-84		1652	341	585	158	38	1122
84-85		2321					
85-86	684	2119					1460
90-91	804	2643	629	787	214	78	1708
91-92		2676	672	727	229	70	1698
92-93		3007	771	769	238	104	1882
93-94		3385	883	829	263	113	2088
94-95	837	3632	983	863	302	70	2218

95-96	982	3763	972	876	340	74	2262
96-97	1030	4130	1089	876	393	76	2434
97-98	1248	4834	1206	914	473	83	2676
98-99	1055	4107	1119	949	511	89	2668
99-00	1058	4508	1176	1187	525	91	2899
00-01	1172	5118					3268
01-02	1165	5672	1789	1915	748	109	4262
02-03	1190	5068	1431	1418	552	84	3484
03-04	1312	5426	1612	1577	578	83	3850
04-05	1562	5608	1662	1549	613	85	3909
05-06	1175	6015	1463	1410	683	107	3663
06-07 (9 mos)	1175	4722	1149	1106	535	84	2874

Note 1: Compiled from various sources. MEPE and CSO data for the same year are often different. They are also revised from time to time.

Note 2: EIC Table 1 will be updated and added to as more information becomes available.

# CI CHRONOLOGICAL INDEX

Article Head	Start 07	<u>Start 06</u>	<u>Start 05</u>	<u>Start 04</u>	<u>Start 03</u>
<u>Start 02</u>	<u>Start 01</u>	<u>Start 00</u>	Start90s		

PATHI HYDROPOWER PLANT INAUGURATED IN TOUNGOO TOWNSHIP (NLM: 03/01/08) DAM QUARTET ON MONE CREEK HEADED BY UPPER BUYWA PROJECT (NLM: 18/12/07) PYIN-U-LWIN HYDROPOWER PROJECTS SPEEDED UP (NLM: 30/11/07) FOREIGN CONSULTANTS FOR PRIVATE HYDROPROJECTS (MT: 26/11/07) FULL RESERVOIRS TO BOOST HYDROPOWER (MT: 19/11/07) CHINESE FIRM TAKES 51% INTEREST IN TASANG HYDROPOWER PROJECT (MT: 19/11/07) FISHERIES FACTORIES TO GET 24-HOUR POWER "BY MARCH" (MT: 22/10/07) SMALL ELECTRIC POWER PLANTS OPENED IN 2007 (NLM: 11/10/07) VILLAGE RICE HUSK POWER PLANT WILL SERVE AS RESEARCH CENTRE (MT: 24/09/07) YADANABON CYBER CITY SLATED FOR SOFT OPENING IN SEPTEMBER (MT: 2409/07) GAS IN SHORT SUPPLY TO MEET DEMAND FOR ELECTRICITY (MT: 17/09/07) RISING WORLD LEAD PRICES ZAP LOCAL BATTERY MARKET (MT: 10/09/07) PETROLEUM SUBSIDIES AND THE PRICE OF ELECTRICITY (Burma Digest: 02/09/07) PLANS FOR 7-MILLION-DOLLAR RICE-HUSK POWER PLANT EDGE FORWARD (MT: 27/08/07) FUEL PRICE INCREASE IMPACTS INDUSTRIAL USE OF ELECTRICITY (IRROL: 15/08/07) RELIABLE POWER SUPPLY GIVES ADVANTAGE TO THAI SHRIMP FARMERS (MT: 13/08/07) PREMIUM RATES FOR ELECTRICITY IN MON STATE VILLAGES (IMNA: 03/08/07) BANGLADESH, MYANMAR TO SIGN HYDROPOWER DEAL (XN: 15/07/07) POWER SUPPLY, BANK CREDIT KEY TOSME BREAKOUT (MT: 09/07/07) FISHERIES FACTORIES OFFERED 24-HOUR POWER (MT: 09/07/07) COLENCO ENGINEERING TO ADVISE ON UPPER MYITNGE PROJECT (NLM: 04/07/07) MORE GAS NEEDED FOR 24/7 POWER IN YANGON (MT: 02/07/07) ELECTRICITY MINISTERS BUSY IN BEIJING AND KUNMING (NLM: 13/06/07) RICE-HUSK GENERATORS SLATED FOR VILLAGES IN YANGON DIVISION (MT: 11/06/07) EGAT AGREED ONLY TO STUDY FEASIBILITY OF SALWEEN PROJECT (BKKPost: 10/06/07) MA MYA DAM PUT INTO SERVICE IN MYANAUNG TOWNSHIP (NLM: 08/06/07) FULL POWER SUPPLY PROMISED FOR JULY (MT: 04/06/07) FACTORIES URGED TO SPEED UP PRODUCTION OF LAMPOSTS AND WIRING (NLM: 30/05/07) THAI COMPANY PURSUING BIG HYDROPOWER PROJECT IN TANINTHAYI (MT: 21/05/07) ELECTRICITY METERING PROGRAM TAKING ROOT (IMNA: 11/05/07) MYANMAR CASHES UP ON ENERGY, BUT LOCALSIN THE DARK (AFP: 15/04/07) MYANMAR LEARNS TO LIVE WITH THE LIGHTS OUT (Reuters: 09/04/07)

MOU ON UPPER THANLWIN HYDROPOWER PROJECT INKED (NLM: 06/04/07) MYANMAR, THAILAND BEGIN WORK ON CONTROVERSIAL TASANG DAM (AFP: 05/04/07) LOW WATER LEVELS HINDER POWER DISTRIBUTION (MT: 02/04/07) INDUSTRIAL ZONES TO RUN AT NIGHT (MT: 26/03/07) **INSULATOR FACTORY PROJECT PLANNED FOR CHAUK (NLM: 24/03/07)** YANGON INDUSTRIALISTS URGED TO INCREASE PRODUCTION (NLM: 12/03/07) HOMEGROWN SOFTWARE INDUSTRY STRUGGLES ON (MT: 12/03/07) ASIAN ELECTRICAL APPLIANCES VIE FOR MARKET SHARE IN MYANMAR WIND ENERGY BOOSTS RURAL DEVELOPMENT (MT: 05/03/07) TURBINE FACTORY PLANNED FOR THAGARA INDUSTRIAL REGION (NLM: 25/02/07) ACUTE SHORTAGE OF ELECTRICITY DISAPPOINTS MON RESIDENTS (IMNA: 21/02/07) WORK ON INTAKE TUNNEL GOING AHEAD ATKUNCHAUNG DAM (NLM: 14/02/07) COMPLETION OF HYDROPOWER PLANTS ASSIGNED HIGHEST PRIORITY (MT: 12/02/07) YENWE HYDROPOWER STATION INAUGURATED (NLM: 11/02/07) YWAMA POWER STATION DEPENDENT ON GAS DISTRIBUTION SYSTEM (NLM: 01/02/07) ARAKAN OFFSHORE GAS RESERVED TO MEET DEMAND IN MYANMAR (PTI: 19/01/07) AGREEMENT SIGNED FOR KACHIN HYDROPOWER PROJECTS (NLM: 02/01/07) CHINA'S FIRST BOT HYDRO POWER PROJECT IN MYANMAR REVS UP (News Mekong: 30/12/06) MYOGYI MULTI-PURPOSE DAM TO HARNESS WATERS OF THE ZAWGYI (NLM: 25/1206) THAKETA POWER STATION IMPORTANT DISTRIBUTION HUB (NLM: 13/1206) MINISTERS MEET WITH PRC SUPPLIERS IN NANNING AND WUHAN (NLM: 06/11/06) TAPING RIVER HYDROPOWER PROJECTS UNDER DISCUSSION IN CHINA (Hubei Daily: 04/11/06) PADAUNG FACTORIES BEGIN PRODUCTION OF GENERATORS AND METERS (NLM: 17/1006) USE OF BIO-DIESEL FUEL FOR RURAL ELECTRIFICATION TO GET ATTENTION (NLM: 05/10/06) POWER SUPPLY IMPROVES AFTER YEARS OF ABNORMAL STATUS (Xin: 02/09/06) PLANS FOR HTAMANTHI DAM PROJECT ON CHINDWIN NEAR FINALIZATION (MT: 28/08/06) TROUBLED HISTORY OF POWER SUPPLY AT TACHILEK (Shan Herald: 25/08/06 KIO PROMISES BETTER POWER SUPPLY FOR KACHIN STATE (IRROL: 25/08/06) **INVENTOR CO-OP** SOCIETY EXPORTS FIRST RICE-HUSK GENERATORS (MT: 21/0806) SOUTH KOREA' S KEPCO TO STUDY IMPROVING ELECTRIC POWER NETWORK (MT: 31/07/06) INVENTORY OF GENERATING PLANTS, TRANSMISSION GRIDS, PROJECTS (NLM: 30/07/06) YANGON ELECTRICITY SUPPLIES GET BOOST FROM YESB PLAN (MT: 24/07/06) INDUSTRIAL SECTOR TO BENEFIT FROM ATTENTION TO POWER SUPPLY (NLM: 23/07/06) BUSINESS LEADERS TO PAY FOR NEW POWER SUB-STATIONS (MT: 17/07/06) GOVERNMENT WILL PRIORITIZE HYDROPOWER PROJECTS OVER GAS (MT: 10/07/06) INTEREST GROWING IN RICE-HUSK GENERATION (MT: 10/07/06) TRANSFER OF CAPITAL CREDITED WITH IMPROVING YANGON POWER SUPPLY (Xin: 08-07-06) DIPLOMATS, JOURNALISTS TOUR BAGO HYDROPOWER PROJECTS (NLM: 16/05/06) MINISTRY OF ELECTRIC POWER REORGANIZED (NLM: 16/05/06) ELECTRICITY RATES RAISED, SUBSIDIES FOR CIVIL SERVANTS DROPPED (AP: 15/05/06) THAHTAY CREEK DAM AND OTHER HYDROPOWER PROJECTS IN ARAKAN (NLM: 20/04/06) TRIBE'S HOME TO BE A VALLEY OF THE DAMMED (London Times: 2203/06) THE WEIGYI DAM: 'A GREAT BARRIER AND A WAY TO SAFETY' (KDRG: March 2006) MOTOR AND ELECTRICAL APPLIANCE FACTORIES OPENED IN INDAGAW (NLM: 21/03/06) DELTA HOLDS GREAT POTENTIAL FORTIDAL POWER GENERATION (Voice Weekly: 13/02/06) CALL FOR ENERGY CO-OPERATION (MT: 13/02/06) NATIONAL UPDATE ON ELECTRIC POWER PLANTS (NLM, 18-22/01/06) INDUSTRIALISTS URGED TO DIVERSIFY PRODUCTION (MT: 09/0106) POWER CUTS AFFECT ECONOMY IN RANGOON (AP: 04/01/06) NIBBAN ELECTRONICS EXPECTS 'IP' PROTECTION FOR ITS PRODUCTS (ASEAN: 06) PADDY HUSK POWER PLANT TESTED TO CUT RICE MILLING COSTS (MT: 19/12/05) COLLABORATE ON CONTRACTS, ICT SECTOR URGED (MT: 12/12/05) HYDROPOWER DEPT AND EGAT INK AGREEMENT ON HUTGYI PROJECT (NLM: 10/12/05) WIND POWER SYSTEM IDEAL FOR VILLAGES, SAYS ENGINEER (MT: 05/12/05) YANGON CITY ELECTRIC POWER SUPPLY BOARD LAW ENACTED (NLM: 23/11/05) VILLAGE ELECTRIFICATION TECHNOLOGY ON DISPLAY (MT: 14/11/05) IVANHOE LOOKING TO YEYWA PROJECT FOR POWER SUPPLY (MT: 24/1005)

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#### **AA** ACRONYMS, ABBREVIATIONS, MEASUREMENTS, EQUIVALENTS

AC ACRONYMS OF AGENCIES, COMPANIES, ORGANIZATIONS USED IN THE COMPENDIUM AB OTHER ABBREVIATIONS, SHORT FORMS AND ACRONYMS USED IN THE COMPENDIUM ME MEASUREMENTS AND EQUIVALENTS USED IN THE COMPENDIUM

## **KTR** KYAT TRADING RANGE WITH THE US DOLLAR AT MARKET RATES: 1981 – 2008

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#### ACC ACRONYMS OF AGENCIES, COMPANIES, ORGANIZATIONS USED IN THE COMPENDIUM

ADB	Asian Development Bank
AFP	Agence France-Presse
A&IM	Myanmar Agriculture and Irrigation Ministry (or Minister)
AP	Associated Press
ASEAN	Association of South-east Asian Nations
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Co-operation
BKKP	Bangkok Post
BT	Business Tank
CITIC	China International Trust and Investment Company
CNAMC	China National Agricultural Machinery (I&E) Corporation
CNEEC	China National Electric Equipment Corporation
CPT	Myanmar Communications, Posts and Telegraphs Ministry (or Minister)
CPI	China Power Investment Corporation
DKBA	Democratic Karen Buddhist Army
DPDC	Division Peace and Development Council
EGAT	Electricity Generating Authority of Thailand
EPD	Electric Power Department (of EPM No 2)
EPM	Electric Power Ministry (or Minister) (from Nov 1997 to May 2006)
EPM No 1	Electric Power Ministry (or Minister) Number 1 (after May 2006)
EPM No 2	Electric Power Ministry (or Minister) Number 2 (after May 2006)
EM	Myanmar Energy Ministry (or Minister)
EPSE	Electric Power Supply (aka Distribution) Enterprise of EPM No 2
FER	Foundation for Ecological Recovery
GUM	Government of the Union of Myanmar
HPD	Hydro-electric Power Dept (construction dept of MEPE until 2002 and EPM until 2006) Since May 2006 HPD is the administrative and planning dept of EPM No 1
HPGE	Hydropower Generation (aka Production) Enterprise of EPM No 1
HPID	Hydropower Implementation Dept of EPM No 1
IB	Infantry Battalion (of the Myanmar Army)
ID	Irrigation Department (of the Agriculture and Irrigation Ministry)
IDE	Institute of Developing Economies (Japan)
IMF	International Monetary Fund
IMNA	Independent Mon News Agency
IRROL	Irrawaddy On-line News Service
ISEAS	Institute of South-east Asian Studies
JICA	Japan International Co-operation Agency
KEPCO	Korea Electric Power Corporation
KURG	Karenni Development Research Group
KNG	Kachin News Group
	Karen Nalional Union
	Light Infantry Battalion (of the Myanmar Army)
	Light Infantry Division (of the Myanmar Army) Myanmar Electric Dewar Enterprise
MEPE	iniyanmar Electric Power Enterprise

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MIC	Myanmar Information Committee News Sheet
MMTEI	Myanmar Machine Tool and Electrical Industries
MoD	Myanmar Ministry of Defence
MOGE	Myanmar Oil and Gas Enterprise
MPT	Myanmar Post and Telecommunications Ministry
MTDIU	Mergui-Tavoy District Information Unit (a department of the KNU)
MP	Myanmar Perspectives
MT	Myanmar Times and Business Review
NCGUB	National Coalition Government of the Union of Burma (in exile)
NGO	non-governmental organization
NLD	National League for Democracy
NLM	New Light of Myanmar
PRC	People's Republic of China
PTI	Press Trust India
REAM	Renewable Energy Association Myanmar
SHAN	Shan Herald Agency for News
SPDC	Myanmar State Peace and Development Council
SPIC	Special Projects Implementation Committee (of the SPDC)
TEPSCO	Tokyo Electric Power Services Co Ltd
TNA	Thai News Agency
UMFCCI	Union of Myanmar Federation of Chambers of Commerce and Industry
UNDP	United Nations Development Program
USDA	Union Solidarity and Development Association (a government-led political organization)
WRUD	Water Resources Utilization Department (of the Ag & Irrig Ministry)
XN	Xinhua News Agency
WB	World Bank
WPD	Working People's Daily (the official English language newspaper until mid-1993)
YESB	Yangon (City) Electricity Supply Board
YMEC	Yunnan Machinery and Equipment (Import & Export) Co Ltd
YUPD	Yunnan United [Joint] Power Development Co

#### OTHER ABBREVIATIONS, SHORT FORMS AND ACRONYMS USED IN THE COMPENDIUM <u>AB</u>

Ass'n	association
BCS	battery charging station
Ch	chairman, chairwoman, chairperson
Col	colonel
Co Ltd	limited company
cte	committee
Dep Dir	deputy director
Dept	department
D-G	director-general
Dir	director
DM	deputy minister
ED	executive director
FY	financial year (in Myanmar from April to the end of March in the following calendar year)
Gen	general (no differentiation is made in the rankings of the generals)
GM	general manager
hydel	hydro-electric (abbreviation that enjoys wide usage in South Asian publications)
IDPs	internally displaced persons
I&E	import and export (company)
IPP	independent power producer
IZ	industrial zone
J-V	joint venture (company)
К	kyat (Myanmar currency)
MD	managing director

MoA	memorandum of agreement
MoU	memorandum of understanding
n.d.	date not available
PD	project director
рс	per cent
plc	publicly listed company
PM	prime minister
Pres	president
RCC	roller compacted concrete (dam)
S-G	secretary general
SMI	small and medium industries
T/G	turbine/generator (set)
V-P	vice president

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# ME DEFINITIONS AND EQUIVALENT MEASUREMENTS USED IN THE COMPENDIUM

This section contains some of the more commonly used terms of measurement used in the compendium. They are intended as a rough guide for general verification purposes. Users should take note that there are many variations in energy industry equivalents.

#### Electrical industry definitions and equivalents

1 kWh 1 MWh	kilowatt hour megawatt hour	<ul><li>= 1,000 watt hours = 3,600,000 joules or 3.6 megajoules</li><li>= 1,000 kilowatt hours</li></ul>
1 GJ	1 gigajoule	<ul> <li>0.28 MWh or the amount of electricity generated by 950 cu ft of natural gas @ 1000 BTU per cu ft</li> </ul>
1 GWh	1 gigawatt hour	= 1,000,000 kilowatt hours
1 MW, mw	megawatt	= 1,000 kilowatts (kW)
1 kV	kilovolt	= 1,000 volts
1 MVA	megavolt-ampere	= 1,000 kilovolt-amperes
А	ampere	A measure of the force created by steady electric currents flowing through two wires at a defined distance.
J	joule	An amount of energy. One joule is the equivalent of one watt of power radiated or dissipated for one second.
V	volt	A measure of the potential difference between two points of a constant current of one ampere when the power dissipated between the points is one watt.
V-A	volt-ampere	A unit of electrical power in an alternating current circuit equal to the power dissipated when 1 volt produces a current of 1 ampere; the product of one volt and one ampere is equivalent to one watt. Amperage measures the amount of the flow of electrical current, whereas voltage measures the pressure of that flow.
W	watt	One watt is the power dissipated by a current of 1ampere flowing across a resistance of one ohm.
Ω	ohm	A measure of the electrical resistance offered by a current- carrying element; a device that dissipates one watt of power with one ampere of current flowing through it has a resistance of one ohm

#### Energy industry definitions and equivalents

1 bbl	barrel of oil	= 42 US gals = 35 imp gals = 0.15899 cu m = 159 litres
1 bbl crude	barrel of crude oil	= 5,800,000 BTU = 0.16637 MT (on average)
1 BTU	British thermal unit	= heat required to raise 1 lb of water through 1° Fahrenheit =
		approximately 1055 joules
1 TOE	tonne of oil equivalent	= a unit of energy containing 1,000 million (billion) BTUs; it is

		the amount of energy released by burning one tonne of crude oil,
		it differs with different kinds of crude but is approximately 42 GJ
1 TOE		= 1,125 cu m of natural gas in caloric content
1 cu m of natural gas		= 35.3 cu ft of natural gas @ 14.73 psia
1 BOE (boe)	barrel of oil equivalent	= a unit of energy containing 0.146 TOE; 6.841 BOE = 1 TOE.
1 t (ton)	short ton	= 2,000 lb or 90.72% of a tonne
1 T (tonne)	metric ton	= 1,000 kilograms or 2,204.6 lbs; roughly a long ton
1 T (tonne)		= 48,700 cu ft of natural gas
1 GJ	gigajoule	= 1 million joules = 950 cu ft of natural gas @ 1000 BTU per cu ft;
mcf	thousand cu ft	<ul> <li>unit used to measure the caloric content of natural gas; depending on its content, 5.5 mcf of natural gas is equal to approximately 1 BOE.</li> </ul>
mmcf/d	million cu ft per day	= unit used to measure the amount of gas produced by a well or a field or a company on a daily basis
T/d	tonnes per day	
T/y	tonnes per year	

PSC: Production sharing contract. Countries with oil or natural gas resources contract with one or more oil and gas companies to explore, appraise and develop these resources. The companies that invest in the project are paid in kind with a percentage of the volume produced, while the host country retains ownership of the resources and facilities. A percentage of the oil or gas produced is used to cover the investor's expenses, including depreciation of the facilities ("cost oil" or "cost gas"). The remainder is shared by the project partners and the host country ("profit oil" or "profit gas"). www.burma.total.com/en/ow/glossaire.htm

#### Units used in measuring land and water

1 A	acre	= 0.4047 ha = 4,047 sq m = 2.5 rai (Thailand)
1 ha	hectare	= 10,000 sq m = 2.47 acres = 6.25 rai (Thailand)
1 AF	acre foot	= volume of water sufficient to cover 1 acre of land to a depth of 1 ft
1 AF	acre foot	= 43,560 cu ft = 1,233.48 cu m
1 AF	acre foot	= 325,851 US gals = 271,328 imp gals
1 cu ft		= 7.48 US gallons = 6.23 imp gals
1 km	kilometre	= 0.6214 miles = 1000 m

## Monetary terms used in currency trading

crore South Asian term	= 10,000,000 (often written as 1,00,00000) = 100 lakh
lakh South Asian term	= 100,000 = 0.01 crore

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#### KTR KYAT TRADING RANGE WITH THE US DOLLAR AT MARKET RATES: 1981 – 2008

The quotes are meant to provide a rough guide to the average trading range for the year cited and do not reflect the extremes to which market speculation has occasionally driven the rate. Various sources have been used.

1981	1 US\$ = K 18 - 20	
1987	1 US\$ = K 24 - 27	
1988	1 US\$ = K 32 - 36	Up to the time of the SLORC coup in Sept 1988
1991	1 US\$ = K 55 - 70	
1992 - 93	1 US\$ = K 80 - 140	
1994 - 95	1 US\$ = K 110 - 120	
1996	1 US\$ = K 120 - 160	
1997	1 US\$ = K 160 - 335	Reflects East Asian financial crisis
1998	1 US\$ = K 335 - 350	
1999	1 US\$ = K 350 - 320	
2000	1 US\$ = K 320 - 435	
2001	1 US\$ = K 435 - 740	

the amount of operative released by burning one tappe of grude oil:

2002	1 US\$ = K 740 - 1070
2003	1 US\$ = K 1070 - 890
2004	1 US\$ = K 890 - 880
2005	1 US\$ = K 880 - 1075
2006	1 US\$ = K 1075 - 1280
2007	1 US\$ = K 1280 - 1280

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#### Annex 1

# NATIONAL HIGH-VOLTAGEGRID SYSTEM MAPS

The map below posted on the website of the Ministry of Electric Power No 1 shows the national power grid as it existed in 2001. Source: <u>http://www.energy.gov.mm/MEP\_1.htm</u>

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The map below published in *The Study on Introduction of Renewable Energies in Rural Areas in Myanmar: Final Report: Volume 1: Summary* shows planned extensions to the national power grid as it existed in mid 2003. Stations shown in the boxes were to be part of a project that was not carried out.



# Source

http://lvzopac.jica.go.jp/external/library?func=function.opacsch.mmdsp&view=view.opacsch.mmindex&shoshisbt=1&s hoshino=0000159772&volno=000000000&filename=11734100\_01.pdf&seqno=1

#### NLM, 30/07/06. http://mission.itu.ch/MISSIONS/Myanmar/06nlm/n060730.htm

As of July 2006 the hydel power stations al ready supplying electricity to the national grid are Baluchaung No 1, Baluchaung No 2, Zawgi No 1, Zawgi No 2, Kinda, Hsedawgyi, Zaungtu, Thaphanseik, Paunglaung and Monchaung. These stations are currently generating 712 MW in total. The gas-fired power stations are

Ywama, Kyunchaung, Mann, Thaton, Shwedaung, Myanaung, Thakayta, Ahlon and Hlawga, and these are currently generating 549.9 MW. Steam-powered stations are Ahlon, Hlawga, Ywama, Thakayta, Tikyit and Mawlamyine, and these power stations are currently generating 285 MW. The 25 grid-linked power stations have a capacity of 1546.9 megawatts in total. But the actual producing capacity in 2005 ranged from 601 to 818 MW.

The EPM No 2 has twelve 230-KV power stations, sixteen 132-KV power stations and forty-seven 66-KV power stations for a toal of 75. The national grid lines under the ministry include thirteen 230-KV sections with a total length of 834.16 miles; nineteen 132-KV sections with a total length of 1056.73 miles, and fifty-two 66-KV sections with a total length of 1224.92 miles. Sections to be built to improve the power supply are the 177-mile-long 230 KV grid linking Taungoo-Kyauktaga-Bago-Thanlyin, the 105- mile-long 230 KV line linking Meiktila and Taungdwingyi, the 60-mile-long 230-KV line linking Bago and Myaungtaga [in Hmawbi township], and the 12-mile-long 230 KV line linking Shwesayan [in Singaing township] and Aungpinle [in Patheingyi township]. Sections to be built connecting new hydel power stations to the grid include the 180-mile-long, 230-KV line linking Manipura and Monywa [in Sagaing divison], the 100-mile-long, 230-KV line linking Thantay [in southern Arakan state] and Ushitbin and the 24-mile-long, 230-KV grid linking Ushitbin and Shwedaung [in western Bago division]

The three maps shown below are taken from a presentation made by Myanmar representatives at the Franco – ASEAN Seminar on *Powering ASEAN: Technology and Policy Options* that took place in Bangkok on the 6 – 7 September 2007. Background information and the program of the seminar are available at the following URL:

http://www.jgsee.kmutt.ac.th/seminar\_programme/seminar.html The Myanmar presentation at the seminar is available at the following URL: http://www.jgsee.kmutt.ac.th/seminar\_programme/DAY%202/Country%20Report%202/Tin%20-%20Myanmar%20-%20Presentation.pdf

According to the presentation made by the Myanmar delegation at the Franco Asean seminar, the major power stations feed electricity into the national grid system with 845 miles of 230-kV transmission lines, 1056 miles of 132-kV lines and 1358 miles of 66-kV lines and correspoding substations. In order to reinforce the grid system and facilitate power transmission from new generating stations EPM No 2 is currently carrying out 21 transmission line projects and has planned another 41 transmission line projects to be implemented in the near future. The presentation includes lists of 52 existing substations, thirteen double-circuit 230-kV transmission line projects five single-circuit, 230 kV transmission projects and three single circuit 132 k-V transmission line projects to be implemented in the future are also included in the report.

The first map below shows the existing transmission grid, around 2005. The 230-KV transmission system is shown in red. The 132- KV transmission grid is shown in blue. Green is used for the 66-KV transmission system and orange indicates the 33 KV transmission system. Blue boxes show major hydro-electric stations. Red boxes show major gas-powered generating stations and triangles show the locations of the major sub-stations. Stations shown with a circled cross operate with steam-powered generators.

The second map below, titled Future National Grid System, projects the grid as it is conceived to exist probably by the middle of the next decade. This map provides valuable information not only about the grid and substation systems but also about the locations and capacities of the hydro and thermal stations already exisiting and under construction. It is best viewed using pdf format where it is possible to magnify the projection.

The third map below, titled Long Term Plan for National Grid, without indicated legend, projects the planned grid and power station network as it is conceived to exist probably sometime after 2020. Notably included are grid system links to many of the projects currently intended mainly for export of electric power to Thailand, China and India.





