Advanced Materials Research *Online: 2014-12-11*
ISSN: 1662-8985, Vols. 1070-1072, pp 1637-1641
doi:10.4028/www.scientific.net/AMR.1070-1072.1637

Study on charging business operation model of electric vehicle

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Keywords: electric vehicle; charging facilities; power management model

Abstract: For the bottleneck of electric vehicle short range and energy supply inconvenience to restrain the fast development of electric vehicle, from the perspective of the electric vehicle power charging model, through analyzing the current situation and developing trend of electric vehicle charging facilities, consulting the existing electric vehicle charging model of advice, and borrowing from the mature business operation model of other domestic industry, one kind of proposal of suitable for the domestic electric vehicle current situation of power supply mode is analyzed. The proposal can provide reference for domestic electric vehicle scale and rapid development.

Introduction

The problem of environment pollution and energy shortages is dash forward shown following the gasoline cars total amount increases. In order to protect the environment and ensuring the energy supply, every government actively searches the approach to solve the problem [1]. Electric vehicles will become the important green transportation because of having the advantages of high efficiency, energy saving, low noise, and zero emissions. But, the large-scale development and popularization of the electric vehicles need perfect supporting charging facilities to supply power for their batteries. In this paper, by analysing the present situation and development trend of domestic and overseas, and other domestic related industry mature business operation model, one kind of adapted to the Chinese context charging model of electric vehicles is recommended. The recommendation will provide reference for the large-scale development of electric vehicles.

Domestic charging facilities Present situation and trend

The electric vehicle supply facilities mainly include charging facilities and battery replacement facilities [2].

There are mainly two types of charging facilities including AC charging points and DC chargers, and the electric vehicles are charged by charging facilities connecting to the distribution network. Ac charging points can provide charging service for small electric vehicles having on-board charger. The Ac charging points are installed in the low voltage distribution network, and connected with the power grid by charging management system. At present, the charging power is generally not more than 5 kW, and the charging time is generally in more than 3h [3-4]. The Ac charging points can be configured in the high-speed service area or downtown parking, and provide plug and play convenient charging service for electric vehicle users.

At present, the charging and battery replace facilities have been developed in our country Shanghai, Tianjin, Hangzhou, Nanjing, Shenzhen and other cities, and a lot of charging or switching stations are constructed[5]. But most of these stations are demonstration projects, and still not realize large-scale commercial operations.

As electric vehicle charging technology rapid development and relevant policies, standards, norms system gradually perfect, the scale construction process of our country electric vehicle

charger facilities will speeding up unceasingly. The development of charging facilities will present "generalization, intelligence, integration, efficiently" trend based on commercial service oriented.

Abroad charging model analysis

From the commercialization process of the countries electric vehicle charging facilities, the supporting facilities construction and operation are impacted and constrained by economic development, electric vehicles industrialization, and the participation way of government, enterprises, public institutions, etc. Among them, the participation way of government and enterprises is the decisive factor to decide the construction model of electric vehicle charging facilities [6].

Government dominant model

The government as the investment subject guides and promotes the power suppliers, the charging technology equipment providers and other related service providers to participate in the construction and operation of charging infrastructure. According to different organization and management of charging infrastructure operation, this model is divided into government directly leading and government indirectly leading. The charging infrastructure in the model of government direct leading as the public infrastructure provides services to the public, which has the nature of non-profit. The representative country Switzerland, the charging infrastructure construction operation is implemented by the Federal Energy Department. The charging infrastructure in the model of government indirect leading has half public welfare nature, and provides low-cost services for electric vehicle users. Part of the electric vehicle charging stations of United States will be adopted this model. The model is suitable for the development early of electric vehicle and commercial run smaller phase, need the government to encourage and support enterprises engaged in the electric vehicle charging infrastructure [7].

Power enterprise leading model

Power supply enterprise is the investment construction and operation management subject of the charging infrastructure, the charging facilities are commercialized fully, and the cost and profit are recycled through providing charging service to electric vehicle users. On the specific operation and management of charging infrastructure, various flexible ways of power enterprise direct management, entrusting a third party operation or combining with the third party enterprise management, etc., are used according to actual circumstances. This model is applicable to the situation of larger scale commercial operation, the charge scale and service demand are relatively stable, and has good market foundation. The power enterprise has strong strength and intention to expand electricity market, and investment financing channel is unobstructed.

Social enterprise leading model

Social enterprise as the construction investment and operation management main body of electric vehicle charging infrastructure, implements commercial operation in accordance with the principle of marketization, every partner will follow the principle of profit sharing, risk-sharing. In this model, the power supply enterprise is only the electrical energy provider role. This pattern is mainly suitable for the development stage of electric vehicles commercially run large, user scale and charge service needs foundation are good, commercial conditions are ripe, market environment is good, and investment financing channel is unobstructed.

Electric vehicle user leading model

The charging infrastructure is invested and installed by the electric vehicle user to meet the demand of themselves vehicles running. The charging infrastructure usually doesn’t provide service

for other vehicles, have not the nature of the commercial operation, and the internal operation management pattern is relatively simple.

Domestic other industry model analysis

Gas station operation mode

Traditional gas station can provide reference for the construction and operation of electric vehicle charging facilities in the two aspects of management system and charge settlement system.

The operation and management of gas stations of Petro China, Sinopec and other traditional energy supply enterprises are designed mainly according to the gas stations asset nature and construction model.

(1) Wholly owned gas station operation and management

Wholly owned gas stations management mainly has three ways. The first is the self-management model, in which the management center in the secondary company, the work in the gas station operation, product distribution, price, safety, personnel, asset, etc., are implemented by the secondary company accordance with the regulations of the parent company. The second is the internal contraction model, in which the gas station is contracted by the company worker and the contractor's income is linked to sales. The third is assets entrusted management model, the gas station is trusted by outside staff management.

(2) Participation gas station operation and management

The investor contracts operation and management and the oil companies get fixed returns. The oil companies contingent survey the product quality, service, external image sampling of the gas station, if the gas station is in violation of provisions and unflattering will be toke warning, buckled the deposit according to different situations, reduced resources, until terminated the contract.

(3) Franchising management

The franchise contract is signed for the franchise gas station, the pack is uniform required, and the management of people and goods is toke charge by oil companies. The oil security, services quality and gas stations of the franchise gas station will be contingent surveyed.

Telecom business hall model

The construction of electric vehicle charging facilities can reference the brand system and marketing system of the telecom business hall.

Brand construction

In brand construction, the brand recognition should be firstly built, and then vigorously promoted. For customer base, a series of business brands of customer needs are launched on the basis of customer segmentation. They cover high-end users, strong liquidity and earnings potential big potential. At the same time, the new business is constantly rolled out, and the types of tariffs, the business is dealt with, the using method, etc., are continued innovated.

Marketing system

There are mainly three parts including own physical channel, social channel and electronic channel.

(1) Own physical channel is the image window of the telecom operator, it is invested by China Mobile and can embody the functions of the operator products sales and business model, and can reflect strategy pursue of their business and services leading.

(2) The unified image and specification and other brand of the social channel need be permitted by the operators. The management functions of agent charges and business changing are implemented by social forces, such as need to pay a certain amount of margin in China Mobile.

(3) Electronic channel includes mobile company web site, 10086 self-help voice, messaging and other services. The emergence of electronic channel effectively alleviates the pressure of business hall, reduces marketing costs, and complies with the demand of the development of communication electronic.

Domestic charging model study

Charge service network building

The popularization and application of electric vehicle is system engineering. One charging service network having the functions of shortcut, high efficiency and wide coverage is the premise of electric vehicle large-scale development. The advanced of networking and applicability of charging facilities is a top priority of the electric vehicle industry development in the next few years. So the users charging habits and all kinds of charging ways must be considered, the economic development, traffic development and network construction planning of the local social must also be considered, and the reasonable and science plan must be implemented. Therefore, in the follow-up promoting process of charging service network, the following aspects should be considered.

(1) The construction layout of rapid charging stations, battery exchange stations and conventional charging points should be synthesized.

(2) The elements of the user scale, the distribution, the driving radius and circuit should be considered, and the charging network in the city should be improved gradually.

(3) Timely chooses cooperation with traditional energy enterprise, and the fast charging equipment should be built though reforming the gas stations and using the advantage in network coverage.

(4) To cooperate with the group customers of utilities and city bus companies, the quick battery replacement stations should be built in the customer parking spots, and the demand of battery quick replacement should be satisfied.

(5) A large number of charging points should be built in the public areas of urban core, office buildings, business unit, department stores, supermarkets, and hospitals, mainly used for conventional charge.

Charge management system development

The charging management system should be developed and constructed, which can provide integrated solution about billing control, information communication, background management, and service, is the basis conditions to implement the electric vehicle charging service business application. Fig. 1 shows the electric vehicle charging management system architecture diagram.

From Fig.1, it can be seen that the charging management system is constituted by the State Grid, the provincial, prefecture-level and user layer through the Virtual Private Network (VPN). Finally it is unified operated and managed by the State Grid, and the charging management is implemented.

The charging operation site condition is more complex, such as, different province, different areas and different places and even its charge electricity price in the different periods may be different, and the payment methods include card and pay way. Accurate, reasonable, convenient, fast and accurate accounting is the important means to check the financial income and improve the operating efficiency.

Charging facilities operation management

Self-build charging infrastructure operation management

For the independent operation, the pricing strategy and value-added services of the communications industry are imitated, and the users are guided consumption in the state grid charging stations. The policy of the state grid propaganda window is established according to the user registration information, and the value-added services of printing costs list and pay the electricity bills are provided. On the business management model, the use efficiency of the grid is enhanced through testing the service condition of charging station and through pricing strategy to adjust the users charging in the off-peak.

For other operation ways, the operation model of the Sinopec gas station is imitated. The stations are operated and managed by the investors, and the State Grid gets fixed returns. The model

permits individuals or other entities to apply for the franchise license from the State Grid, and the State Grid provides a special charging and charging device and charging system software.

Perfect commercial operating conditions

The basis conditions of the charging infrastructure commercial operation is determined by the charging technology, equipment, and management, and the improvement and perfection relevant policies, laws, standards, and standard system. These basic necessary conditions improvement need to increase the communication and coordination between the power supplier and other participators, and need to strive more policy support in the aspects of land, capital and electrovalence. The related technical standards and specifications should be perfected, and to security the normalization, standardization and modernization of related technologies, products and services facilities development and construction. The study and exploration on large-scale and commercial service operation model should be deepened, and effectively guides the charging service industry rapid development.

Conclusions

For the phenomenon of Chinese electric vehicles development slowed and from electric vehicle charging facilities, the suitable charging model of electric vehicle is discussed through analyzing the current situation of domestic charging facilities and combining the charging model of foreign electric vehicle and domestic other industry mature business model. The study can provide reference for domestic electric vehicles fast development.

Acknowledgement

The authors would like to give their gratitude to the support of project “Research and demonstration of comprehensive integration technology for smart grid based on the feature of low carbon grid”, which is a 2012 technology project from China state grid, and also a major project (2013BAA01B00) from Eleven the Five national science and technology support program.

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