Analysis on the planning of township electric vehicle charging facilities under the background of new rural construction

Xiaoping Zhang

The Center of Collaboration and Innovation, Jiangxi University of Technology, Nanchang, Jiangxi, China 15718462@qq.com

Keywords: electric vehicle; Charging facilities; plan

Abstract: At present, the promotion of new energy vehicles in China is at the key point of popularization from cities to villages and towns. It is an important measure to arrange charging supporting facilities in advance. This paper analyzes the problems existing in the construction of township electric vehicle charging facilities in China, and puts forward relevant solutions from three aspects of policy formulation, complementing weak points and strengthening security, in order to effectively help the further development of the industry.

1. Introduction

According to the data of China Automobile Industry Association, from January to August 2022, the production and sales of new energy vehicles in China will reach 3.97 million and 3.86 million respectively, with a year-on-year growth of 1.2 times and 1.1 times. It can be seen that China's new energy vehicle industry has entered the stage of rapid large-scale development. At present, in the context of the country's vigorous promotion of new rural construction and the introduction of new energy vehicles to the countryside, it is one of the important ways to stabilize and expand the consumption of new energy vehicles and ensure the healthy development of the automobile industry to eliminate the problem of difficult charging of township electric vehicles. In August 2022, the Ministry of Transport, the National Energy Administration, the State Grid Corporation of China and the China Southern Power Grid Corporation jointly issued the Action Plan for Accelerating the Construction of Charging Infrastructure along Roads, which pointed out that on the basis of improving the township supporting management mechanism of the new energy automobile industry, we should improve the construction of township charging station facilities, The shown in Figure 1. and effectively solve the problems of The allocation of public parking lots and other places and the construction of public charging infrastructure.



Figure 1. Charging station facility structure drawing

2. Main problems in the construction of township electric vehicle charging facilities

At present, the promotion of electric vehicles is at the key point of popularizing from cities to villages and towns. By effectively identifying the pain points of industrial popularization and planning in advance, people's concerns can be alleviated to a large extent, market buying enthusiasm can be accelerated, and projects can benefit people.

Copyright © (2022) Francis Academic Press, UK 109

2.1 The management mechanism of township charging facilities is not perfect

Under the national policy of vigorously promoting the electric vehicle industry to the countryside, major car enterprises have also continuously improved their models in response to the specific needs of township consumers, and proposed a series of measures to benefit the people, such as life-long warranty, free installation of private charging piles, and purchase replacement subsidies, which has stimulated consumption and boosted the revitalization of villages. However, it is not difficult to find that, from the management level, the construction and management of township electric vehicle charging facilities are almost in a blank state, and there are mainly several deficiencies: one is the lack of position of township management in the process of promoting new energy vehicles to the countryside; The second is the lack of communication between township management and industry, car enterprises and consumers; The third is the government's lack of detailed policy formulation for grass-roots management units or departments in the process of promoting industrial development. The lack of management will not only lead to disorderly development in the early stage of the market, but also lead to industrial waste and increased governance costs in the later stage.

2.2 The construction conditions of charging facilities in villages and towns vary greatly

There are many problems involved in the construction conditions of township charging infrastructure. As far as macro issues are concerned, they mainly include: First, regional differences in natural conditions, including regional temperature, altitude and other natural conditions. Second, the regional economic development level is different, including the level of financial support and consumer purchasing power. The third is the difference in population density. Fourth, the existing road infrastructure conditions are different. As far as the micro problems are concerned, they mainly include the difference in the management and governance level of each township, the difference in the penetration rate of electric vehicles and the difference in the cost of land use. The difference of charging infrastructure construction conditions will lead to obstacles in construction standards, site selection, management and maintenance of charging stations.

2.3 Prominent problems in operation and maintenance of township charging facilities

In addition to the problems in management and construction, the problems in operation and maintenance of township charging facilities are also prominent. First, there are many charging points and a wide range, which makes centralized management of operation and maintenance inconvenient ^[1]. Second, the stability of township supporting power grid and operation network needs to be strengthened. Third, the input is not proportional to the output. The main reason is the high investment in the early construction of charging facilities, coupled with the implementation of the national urbanization strategy in villages and towns, which led to the reduction of the tax on the number of long-term residents in villages and towns, thus making the use of charging piles less frequent. Fourth, the maintenance of township charging facilities is difficult. The main reason is that the safe use environment of township charging stations is not high, and the safety awareness of the users needs to be strengthened.

3. Thoughts on the construction of township electric vehicle charging facilities



Figure 2. The idea of township electric vehicle charging facility construction

To be sure, under the background of "dual carbon", effectively solving the problem of short board in the construction of charging facilities in villages and towns will play a better role in promoting the realization of the national energy strategy. The structure is shown in Figure 2.

3.1 Plan and determine the foundation in advance

In terms of the current development speed of the new energy vehicle industry, by 2035, pure electric vehicles will become the mainstream of new sales, so we should advance the layout from three aspects of policy formulation, implementation and guarantee. Local development and reform departments and energy departments should strengthen coordination with housing, urban and rural construction and other departments, strengthen contact with local management departments of project construction, actively improve the overall layout of charging facilities and promote policy formulation. First, on the basis of improving the existing charging facility construction planning and policy formulation, the township charging facility construction should be included in the management scope in advance. Second, according to the changes and development trends of the existing new energy vehicle market, we should scientifically predict the market size, and formulate long-term implementation rules for the construction of supporting facilities for township charging stations in advance. Third, it is necessary to formulate safeguard measures for the implementation of policies, define the scope of rights and responsibilities of the policy implementers and participants, and the process and order of project implementation, especially emphasize the scope of rights and responsibilities of the policy implementers.

3.2 Concentrate on making up for weaknesses

According to the Action Plan for Accelerating the Construction of Charging Infrastructure along the Highway, it is pointed out that we should speed up the improvement of charging infrastructure construction in counties and towns, and accelerate the realization of "full coverage in counties" and "full coverage in villages and towns" of electric vehicle charging stations. It is necessary to concentrate human, material and financial resources to ensure that the public can "get home, get out of the city, and get into the countryside", and implement the construction of charging facilities in each phase to meet the public's needs for ease of travel.

3.2.1 Optimize the layout of township charging infrastructure

For the construction and layout of charging infrastructure, we should adhere to the principle of building the charging infrastructure first if conditions permit, improving the charging infrastructure if conditions permit. First, we should build and optimize the quantity and quality of large charging stations according to the current development trend of charging demand, urban and rural planning, and the overall layout of villages and towns. Second, according to the market demand, a large number of small charging facility units, and conditional charging facilities within units and enterprises should be opened in an orderly manner to realize the sharing system within a specific period of time. Third, build effective coverage of charging facilities along township roads, and optimize the overall energy consumption layout of charging stations based on the principle of minimizing the construction cost, use cost and maintenance cost of charging stations. The fourth is to arrange charging facilities on important road traffic nodes in all villages and towns.

3.2.2 Innovate the power supply mode of township electric vehicles

First, build a "fixed+mobile" power supply mode. On the basis of ensuring the stability of the power supply of the existing fixed charging stations, it is particularly important to pay close attention to the charging needs of township users at specific time nodes, such as holidays, major activity days, etc. Relevant management departments should actively and actively establish a professional supporting mobile power supply system, including management documents, mobile power supply devices, personnel matching, safety implementation, professional protection and education. Second, build a "fast+slow" power supply mode. In response to sudden demand, we will build a power supply

mode with fast charging as the main and slow charging as the auxiliary. We will focus on building a fast charging service system within 30 minutes to reduce or ease the travel pressure of township users. Third, build electric vehicle power exchange mode ^[2]. In contrast, the energy supplement process in the power change mode is faster than refueling, and it does not require parking space support, which is more intensive and efficient.

3.2.3 Innovate the capital operation mode of township charging facilities

From the current source of funds for the construction of charging facilities, there are mainly three situations: first, the operation mode of State Grid+charging station under the leadership of the government. That is to build large and medium-sized charging facilities based on the existing national grid resources and under the guidance of the government. The advantages are that the funds are sufficient, while the disadvantages are that the construction speed is slow and the construction points cannot be too dense. The second is the co construction model of government and social capital. This model emphasizes the risk sharing mechanism and the principle of value for money in the process of cooperation between government and social capital. The third is the independent operation mode of social capital introduction, and carry out project construction and operation management in the form of market competition. That is, the government is responsible for planning and monitoring who will build, who will benefit and who will be responsible. This mode is the main direction of innovation, including expanding the channels of capital sources, adopting project territorial investment and management, building a sharing mechanism, promoting the public use of unit piles and private piles, and intelligent charging facilities.

3.3 Strengthen service and ensure quality

The success or failure of the operation of the charging pile and other supporting facilities is divided into three parts under construction and seven parts under management. In order to avoid the embarrassment of "no one is responsible for the construction", relevant policies and measures should be introduced to encourage enterprises to further sink the service network to the grass-roots level of villages and towns, so as to dispel the concerns of township residents about buying new energy vehicles by continuously optimizing and improving their experience in car use, charging and other aspects.

3.3.1 Improve the power network guarantee capability of charging facilities

The power grid guarantee capability of electric facilities involves power grid construction and power supply service ^[3]. First, speed up the power grid construction in line with the township charging facility planning. Especially for the UHV and high-power charging access terminals in the target area, they should be added, modified, reserved and coordinated in advance. The second is to ensure the ability of users to obtain power. The power security department should vigorously implement and implement the policies formulated by the government, strengthen the responsiveness of users' power demand, and ensure that 100% of the electric vehicle consumers' power demand is realized.

3.3.2 Improve the operation and maintenance guarantee capacity of township charging facilities

On the basis of promoting the construction of charging facilities, we should build the "four best" operation and maintenance support capabilities. First, we should establish the best service concept. That is, on the basis of full research and prediction, change the service concept and establish a response mechanism to meet customer needs. The second is to build the best operation and maintenance facilities. The charging facilities should be able to charge, sufficient to charge and easy to charge, so as to completely solve the worries of township users. The third is to design and implement the most valuable service system. On the basis of realizing the charging demand, it is necessary to innovate service indicators and create differentiated demand and value-added services. Fourth, build the best people friendly operation and maintenance service team.

3.3.3 Improve the service ability of local managers

To improve the service ability of local managers, we can start from four aspects. First, we should establish a long-term communication channel between enterprises and territorial managers, and deepen the participation of territorial management on the basis of information sharing. The second is to strengthen the sense of responsibility of territorial managers.^[4] The third is to improve the governance ability of territorial managers. Fourth, improve the service level of local managers.

4. Conclusion

Accelerating the construction of township electric vehicle charging infrastructure is an important measure to stimulate the consumption of new energy vehicles and stimulate effective investment. It is also a need to meet public travel needs, build people's satisfaction with transportation, and promote green and low-carbon development of the transportation industry. Only through the concerted efforts of all parties can we truly help new energy vehicles run smoothly in the vast new countryside.

Acknowledgement

This research was financially supported by Humanities and Social Sciences Research Project of Universities in Jiangxi Province(Grant No. GL21106);the Jiangxi Provincial Higher Education Teaching Reform Projet(Grant NO. JXJG-21-24-11);Open Fund Project of Jiangxi University of Technology(Grant No. XTCX2106).

References

[1] JIA Long, HU Zechun, SONG Yonghua. An Integrated Planning of Electric Vehicle Charging Facilities for Urban Area Considering Different Types of Charging Demands[J]. Power System Technology,2016,40(09):2579-2587.

[2] YANG Lei, HAO Caixia, TANG Ruihong. Location models of charging and battery swapping facilities based on electric vehicles[J]. Systems Engineering-Theory & Practice, 2019, 39(7): 1781-1795.

[3] ZHANG Xiaoping, CAO Qingsong, LI Nannan, GAO Xiaolin, Research on programme of the electric vehicle charging station considering the traffic flow and the total cost[J]. Mathematics in Practice and Theory,2021,51(04):245-252.

[4] Zhang Ying, Wang Yanhao, Li Fanyu, et al.Efficient deployment of electric vehicle charging infrastructure: Simultaneous optimization of charging station placement and charging pile assignment[J]. IEEE Transactions on Intelligent Transportation Systems, 2020,22(10): 6654-6659.