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Risk Management for Matching the Autonomy of Charging Pile Infrastructure Construction with the Participating Parties

Na Zhao*

School of management, Harbin University of Commerce, Harbin 150001, China
**Corresponding author e-mail: zhaona@hit.edu.cn*

Abstract: *With the construction of smart cities in full swing, the demand for infrastructure such as charging piles, transportation, water conservancy and environment is increasing, and the new infrastructure is gaining momentum. However, most of the existing researches stay in the exploration of traditional basic theories, with little theoretical support to match them. Based on the charging pile infrastructure project, this paper explores the reasonable sharing and management of risks among the various project participants and meets the actual interests of each participant. The study finds that the proportional allocation of shared risks helps to further clarify the cooperation rights and responsibilities of both parties, whether in the short or long term, and a clearer and more reasonable allocation of rights and responsibilities also helps the cooperativeness of multiple parties with important theoretical and practical significance.*

Keywords: *Risk management; charging pile; infrastructure construction*

1. Introduction

Characteristics of the charging pile infrastructure project and its participants. Charging pile infrastructure is a type of facility that provides charging pile supply or service for social production and residential life, and is the basis of modern economy and modern logistics system, industrial system and social service system [1]. And the charging post infrastructure construction project is the approach taken for the design, construction and operation of such facilities. As a major branch of infrastructure engineering, the charging pile infrastructure project not only has the role of infrastructure engineering, but also has its own unique characteristics. Charging pile infrastructure engineering is an important material basis for improving and enriching the life of society and residents, and the vigorous development of charging pile infrastructure engineering has a boosting and driving effect on the development of social enterprises, which can greatly improve the living conditions and living standards of residents and reduce the cost of living [2]. for example, the popularization and promotion of natural gas has greatly improved people's livelihood, and the rapid development of new energy vehicles is due to the construction of charging piles. For example, the popularization and promotion of natural gas has greatly improved people's livelihood, and the rapid development of new energy vehicles has been made possible by the construction of charging piles [3]. The total number of charging piles is very considerable, but the shortcomings still exist: on the one hand, the installation rate of private charging piles is low due to the lack of parking spaces and the difficulty of increasing the capacity of electricity; on the other hand, there are problems such as the imperfect layout of public charging piles, and the experience of using them is poor. Accelerating the construction of charging piles will not only help improve the charging experience, boost consumer confidence and stimulate the consumer demand for new energy vehicles, but will also stimulate direct investment and drive the steady release of investment potential in other industries, becoming an important grip for the transformation and upgrading of the automobile industry, the development of green transportation and the promotion of energy transformation. In recent years, as the construction of charging piles continues to accelerate, the problem of difficult charging of new energy vehicles has been partially alleviated, but the development of charging piles still faces problems such as low installation rate of private piles and poor experience of using public piles [4]. Therefore, accelerating the construction of charging piles will indirectly boost the investment demand of the new energy vehicle industry chain, forming a leveraging effect, and accelerating the construction of charging piles is conducive to promoting the transformation and upgrading of the automobile industry and realizing green transportation and energy transformation [5].

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Therefore, it is of positive significance for each country to manage the construction risk of charging pile infrastructure projects [6-7].

2. Characteristics of the Charging Pile Infrastructure Project

The definition of charging post infrastructure can be summarized as having the following characteristics.

The life cycle process of the project is long and dedicated. Charging pile infrastructure and infrastructure projects have certain commonalities, for example, the time from design, construction to operation of such projects is generally long, and the amount of investment involved is huge, so this characteristic of the project makes the uncontrollable factors in the middle process of the project will also change with the accumulation of time, the more risks they will bear, so this type of project is difficult to recover the cost and revenue in a timely manner within a controlled range. In addition, the investment in energy infrastructure is often huge and dedicated, and the resulting investment is not convertible and cannot be disinvested, making it difficult to generate other additional functions and value after completion[8-9].

A quasi-public good in its own right. Charging pile infrastructure is not entirely a social public good, as it is not inherently discretionary, but is not an absolutely marketable product and is therefore defined here as a quasi-public good. There are differences between the fully neutralized nature of social goods and certain properties of public goods. In particular, for projects in the area of charging piles, the product or service can only be enjoyed by the consumer if the public good is paid for in a normal way, and although the coverage is greater, there are restrictions on its use and it has limited resources compared to social goods, so projects in the area of charging piles fall somewhere in between.

Less innovative. In order to prevent monopolies and protect national security, the government has intervened and introduced multiple social participants to compete with each other, and has restricted innovation by limiting the business model and engineering approach of the project, limiting the development of the field. On the other hand, research on existing projects has revealed that the signing of charging pile projects is not only time-consuming and costly, but also leads to uncontrollable factors in the development of the projects due to political risks, large investment amounts and legal risks, which ultimately leads to far lower returns than expected, hindering the entry of capital and inhibiting the development of innovation in technology and business models.

High level of public participation. Charging pile projects are infrastructure projects with a wide coverage and a high level of public participation. Public participation, including project participants and consumers, has led to a high level of interest in the project, which in turn has been translated into political pressure to influence the financing, progress, quality and procurement of the project.

3. Analysis of the Interests of the Parties Involved in the Project

Then, the collected information is uploaded to the PC; at the same time, processing software running on PC processes the acquired information and calls the target tracking algorithm to obtain the coordinate position of moving target. Moreover, the trajectory of moving target is real-time rendered to the display interface for monitoring the working state of each sensor node. The overall structure of the system is designed as shown in Figure 4.The analysis of the interests of the parties involved in the charging pile project will affect the risk sharing of the project. Therefore, the study of risk sharing in charging pile infrastructure projects should not only focus on the risk itself, but also on the interests of the stakeholders, so that they know themselves and their opponents, and the negotiations between the two sides will be more conducive to the development of cooperation. The analysis of risk preferences, risk aversion and the ability to manage risk events is one of the main components of this analysis.

Analysis of the relevant interests of the government party. As the initiator of the project, the government party does not only provide certain financial support for the project, but also provides some special guarantees or powers to ensure the successful implementation of the project. For the representatives of the government, the main needs of infrastructure projects are to meet the needs of current social development, such as increasing investment in fixed assets for society, creating employment and providing low-cost and high-quality social services or products for the population. Therefore, the Ministry's decisions depend on a balance between the socioeconomic benefits, i.e. the level of support and the economic and social benefits. In order to achieve the socioeconomic benefits,

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the prerequisite is to support the project to be able to operate as expected, so the government side is often in the position of a supporter and the private sector completes the whole process of managing the project through its cash technical and managerial means, while the government side is required to provide guarantees, concessions and other means conducive to risk reduction to guarantee the successful operation of the project.

Analysis of the interests of the investors. The investor is an important participant in the project. The private investor and the government party, etc. jointly set up an engineering company to jointly manage the charging pile infrastructure project. The capital, technology, management model and personnel invested by both parties constitute the equity structure of the engineering company. The quasi-public goods nature of the charging pile infrastructure project makes the objective of the project more focused on the functionality and social benefits of the project itself, but from the perspective of the private sector, more focused on the return on investment and the efficiency of the investment. On the other hand, the operation of the project also requires a significant investment in maintenance, so it is important for the private sector to realise the expected return on investment during the operational phase of the project. However, as investors, they are more risk averse, and the longer the project, the greater the risk and therefore the higher the demand for return.

Analysis of the interests of creditors. The investment in charging pile infrastructure projects is huge and the payback period is long, so the capital for the project investment does not come entirely from the government or private investors, which involves another important task in the project - financing. At present, financing for projects can be obtained from a variety of sources, including bank loans, bond issues or other financial institutions. Such financial institutions, as creditors of the project, will assess the project before financing occurs, but infrastructure projects in the general sense have long payback periods and financial institutions generally prefer other projects that are safer and offer a higher return on investment. In such cases, members of the engineering company must have a high degree of credit protection or a high degree of security of return if they are to obtain lower interest and more stable financing for the project. As a creditor, the lender will pay more attention to the basic income security of the engineering company, pay close attention to the operating status and cash flow position of the engineering company, all of which are closely related to the solvency of the engineering company. With the passage of time, a more comprehensive understanding of the operating ability of the engineering company, unless most of the risks of the project are clear, the willingness of financial institutions to invest in such projects is low, even if the high interest rate of financing does not necessarily offset the high risks in the process of operating the project, which is not worth the loss for financial institutions.

Analysis of the interests of the end-user party. Charging pile projects are quasi-public goods, and investment recovery is achieved through the operation of the project. In traditional public works, the project is financed entirely by public revenue, and the end-user is less willing to pay for public goods and has a long capital recovery period. With the further development of new infrastructure projects, the nature of these projects will change from public goods to quasi-public goods, and pricing will be liberalized to a certain extent, reducing government revenue while bearing a certain amount of project revenue risk.

4. Conclusion

Multi subject participation and cooperation model should actively expand effective investment, effectively control project risks and implement investment and financing policies to ensure that social capital can enter the infrastructure sector without fear. However the participation of each participating body is generally not very enthusiastic. In this paper, we analyse the current situation of the development of charging piles, analyse the risks of each main body, and study the matching problem of risk sharing based on risk sharing. In the construction of charging pile infrastructure projects, the proportional allocation of shared risks will help to further clarify the rights and responsibilities of both parties in the short and long term, and a clearer and more reasonable allocation of rights and responsibilities will also help the cooperativeness of multiple parties.

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