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Research on the Development Status and Problems of Third-Party Platform and Operator of Charging Pile

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Abstract

The development of new energy vehicles is an important link in achieving the goal of "dual carbon", and the operation of charging piles plays a key role in the development of new energy vehicles. In order to promote the interconnection process of the charging pile industry and better improve the status quo of charging pile operators operating separately through third-party platforms, this paper analyzes the overall market development of the charging market, the actual situation of charging pile operators and third-party platforms, and puts forward the main problems existing in the current operation process of charging piles. Scientific and reasonable suggestions for the operation and management of charging piles are given, so as to promote the interconnection process, promote the overall efficiency of the charging network, and alleviate the mileage anxiety of the majority of the owners of new enegergy vehicles.

Keywords

Charging Pile; Third Party Platform; Range Anxiety; Connectivity.

1. Introduction

In September 2020, at the 75th session of the United Nations General Assembly, China put forward the goal of achieving carbon peak by 2030 and carbon neutrality by 2060. The development of new energy vehicles is an important part of achieving the goal of "dual carbon", and it is also an important starting point for the country to promote the transformation and upgrading of the automobile industry. Unlike traditional fuel vehicles, the development of new energy vehicles is restricted by the charging infrastructure, and the user's "range anxiety" has become a pain point in its development. Vigorously developing the charging infrastructure is the key to alleviate the range anxiety problem. The direction of policy support is transferred from "replenishing vehicles" to "replenishing piles", which, as an important part of new infrastructure, has entered a new round of development. With the continuous rise in the number of new energy vehicles, charging infrastructure will play a pivotal role in replenishing energy. The rapid growth of new energy vehicles will drive the expansion of their charging infrastructure, and the market size for charging infrastructure has significant potential for further development.

The number of electric vehicle charging stations in China is steadily increasing, although the growth rate is gradually slowing down. Despite this, there still exists a significant potential for further expansion in the scale of charging infrastructure. Over the long term, we anticipate a continued trend of year-on-year improvement as "new infrastructure" may catalyze a new phase of accelerated development for charging station construction. However, each charging pile operator operates separately and lacks the interconnection of information. If the operator does not actively divert and increase the utilization rate of single piles, it will face operational difficulties when the operation subsidy is stopped.

Based on the full integration of resources, the third-party platform manages the electricity data and consumption data generated during the operation of the charging pile to empower the

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operating enterprise. With the wide application of digital technologies such as 5G, big data, cloud computing, blockchain, and artificial intelligence in the field of charging, a virtuous circle of economic and social benefits can be achieved through the deep integration of digital technologies. Big data is used to integrate the charging pile information of the access platform, optimize the site selection, layout, construction and operation planning of charging pile, and improve the resource utilization rate of a single charging pile while providing a better charging experience for users of new energy vehicles.

2. Literature References

2.1. The Research on Charging Pile

In a certain area of the city, in order to ensure the normal replenishment of new energy vehicles, a corresponding number of charging infrastructure must be equipped, and the planning of charging piles plays an important role in the development of new energy vehicles[1].According to Noel et al. [2], the main obstacle for consumers to buy new energy vehicles stems from range anxiety. The development of the charging pile industry is confronted with numerous challenges, including inadequate infrastructure construction, suboptimal operational performance, and limited profitability. Particularly for small and medium-sized charging pile operators, the high costs associated with platform construction, operation, and maintenance pose significant affordability barriers. As a result, these enterprises struggle to provide an optimal user experience while maintaining cost-effectiveness. The main problem in the downstream of the new energy automobile industry is the construction of charging piles, and the current charging facility installation speed seriously lags behind the vehicle development speed[3]. After the new energy vehicles open the market, we must adhere to the principle of tripartite coordination between the government, enterprises and the market to promote the development of the industrial chain, and cooperate with each other to complete the construction of charging piles.

In the current research on new energy vehicles and charging pile industry, many scholars pay attention to the relationship between stakeholders. For their own interests, each participant has a game relationship of cooperation and conflict. Cao et al. [4] concluded through the evolutionary game method that increasing infrastructure construction such as charging stations for new energy vehicles is conducive to expanding the market scale of new energy vehicles. Yue et al. [5], based on the industrial policy of China's new energy charging infrastructure, conducted a correlation analysis with the market performance of charging infrastructure from the perspectives of technology, operation and business model, and believed that the mode of "Internet + charging infrastructure" through mobile Internet can provide convenience for users to charge. The status quo of the overall charging pile industry is large but not strong, small and scattered, and operators are idle to carry out information interconnection, and the problems of heavy construction, light operation and high failure rate and low utilization rate of charging piles lead to a vicious circle that is difficult to continue, and many chronic diseases make the third-party platform of charging piles emerge.

2.2. The Research on Third Party Platform

Due to the large number and complexity of charging pile brands, rational optimization of charging pile resource allocation plays a crucial role in promoting the development of charging pile industry. In the era of digital economy, the principle of "traffic is king" prevails. In this case, on the one hand, it is necessary to expand the traffic in the public domain through the diversion and promotion of the platform to achieve the purpose of "open source"; On the other hand, it is also necessary to conduct in-depth analysis based on the precipitation consumption data, so as to achieve the purpose of "tapping potential" to develop the consumption potential of customers. The deep integration of the third-party platform of charging pile with the energy

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Internet, vehicle networking and transportation network will become a new development trend [6,7]. Since Jiangsu Cloud Fast Charging Technology created the first third-party charging pile platform in 2017, the current third-party platform in the new energy charging pile market has continuously emerged. The third-party platform uses big data to integrate the charging pile information of the access platform, break through the barriers between different operators, optimize the site selection, layout, construction and operation planning of the charging pile, improve the resource utilization rate of a single charging pile, and guide the users of new energy vehicles to scientifically plan the charging route and provide a more convenient one-stop charging experience. The iterative analysis is carried out for the unreasonable location of the charging pile, on the one hand to avoid the "long line" of users, on the other hand to reduce the "zombie pile".

As a new framework for enterprise value creation [8], the platform breaks through the traditional linear transaction logic and realizes the purpose of value co-creation through the platform [9]. Chen et al. [10] built a platform-type corporate social responsibility multiple governance model and its effective operating mechanism, and believed that the leading platform enterprises should lead the whole industry in fulfilling their responsibilities and realize the efficient governance of platform-type corporate social responsibility. Zhao et al. [11] said that by promoting the "Internet + charging infrastructure" information service platform, the operational efficiency of charging infrastructure can be improved. It can be seen that charging piles need to be operated in fine detail. By connecting charging piles of various operators, the third-party platform can make real-time big data analysis and prediction according to the characteristics of the charging network, which is convenient for the operation and management of charging piles.

3. Examination of the Current State of Third-Party Charging Pile Platforms and Operators

3.1. The Analysis of the Current Development Status in the Charging Pile Market

While new energy vehicles receive strong support from the government and social capital and usher in rapid development, they also provide good soil for the construction and development of charging piles. As an important part of new infrastructure, charging piles are closely related to the strategy of automobile power and the strategy of expanding domestic demand. In February 2020, the Chinese government listed the construction of new energy vehicle charging piles as one of the seven major industries of "new infrastructure", and the important position of charging piles is self-evident, and charging infrastructure is an important force to help the steady growth of the country. As shown in Figure 1, the number of public charging piles in China in 2023 is 2.726 million units, an increase of 51.70%. It can be seen that in the context of carbon peak and carbon neutrality, the number of charging infrastructure shows a rapid growth trend.

The Chinese government attaches great importance to the development of charging infrastructure industry, and under the continuous promotion of "new infrastructure", China has introduced a series of policies to encourage the construction and development of charging piles. Policy support plays a role in the promotion of charging facilities and the market diffusion of electric vehicles [12]. The joint efforts of policy guidance and market demand aim to alleviate the difficulties of high initial investment cost and long capital recovery cycle in the construction and operation of charging piles, so as to improve the income level of charging pile operators, attract more enterprises to actively participate in the construction and operation of charging piles, and expand the scale of charging infrastructure industry. With the dual driving effect of market and policy, China is gradually promoting the large-scale layout of charging pile.

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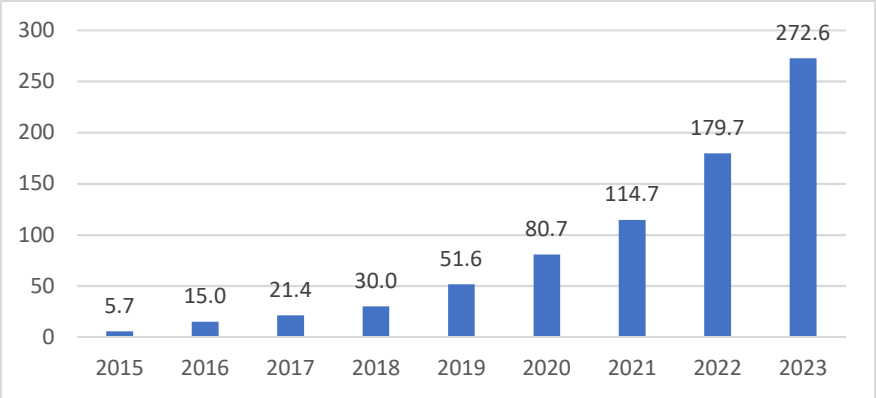

Figure 1. Number of charging piles and public charging piles in China from 2015 to 2023 (10,000 units)

3.2. The Analysis of the Current Development Status in the Charging Pile Market

Charging pile operator refers to the enterprise involved in the construction and operation of charging piles. Operators in the middle reaches of the charging pile industry chain are in an important part of the industry chain. At present, enterprises related to charging services in China actively participate in the construction and operation of charging piles, including energy, electric power, manufacturing, and automobile enterprises. Among them, large state-funded enterprises actively respond to policies promoting the development of the charging pile industry. Sinopec, Petrochina, and other state-owned traditional energy giants are undertaking high-profile mixed reforms, expanding their charging infrastructure business on the basis of their original gas stations. The transformation from traditional energy to new energy is imperative for oil companies; As power operators, State Grid and China Southern Power Grid, relying on their own grid infrastructure construction, have inherent advantages in entering the field of charging piles, and plan the industrial layout of charging piles by aggregating multi-dimensional industry resources; Qingdao Terui De Electric Co., Ltd. has a strong advantage in electrical equipment manufacturing, Qingdao Terui De Electric Company has a strong electrical equipment production strength. Its special call is mainly engaged in value-added services related to the construction, operation and interconnection of charging networks for new energy vehicles, and is committed to promoting the construction of charging ecology. In 2019, it crossed the break-even line for the first time, and its charging pile market share ranks first in China. In order to provide users with better services, new energy vehicle companies have set foot in the charging operation market, taking charging piles as their after-sales service content, attracting car purchases, creating a closed loop of the enterprise ecological chain, aiming to extend the service chain of cars and improve their service quality. The profit level of charging pile operators is mainly determined by the utilization rate of single charging pile and charging service fee. Due to the fierce competition in the charging market and the high sensitivity of consumers to charging cost, charging service fee is difficult to increase in the short term. Therefore, operators who improve the utilization rate of charging pile should focus on improving profitability. Relying on the deep integration of information and platform operation capabilities, the third-party service platform of charging piles can coordinate charging resources more efficiently and provide comprehensive charging information for users of new energy vehicles.

The charging pile policy dividend is sufficient, the siphon effect caused by it and the continuous improvement of the charging ecology have attracted more and more new players to enter the new energy charging pile circuit, the integration and development of the charging pile industry is accelerating, and the various participating parties are helping the healthy development of the

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charging pile industry in different modes. At present, in addition to the above-mentioned participants in the charging pile industry chain, new players such as the Internet and technology enterprises are also joining in succession, successively injecting new vitality into the charging pile industry chain ecology, innovating cooperation models, and jointly promoting the charging pile industry to high-quality development.

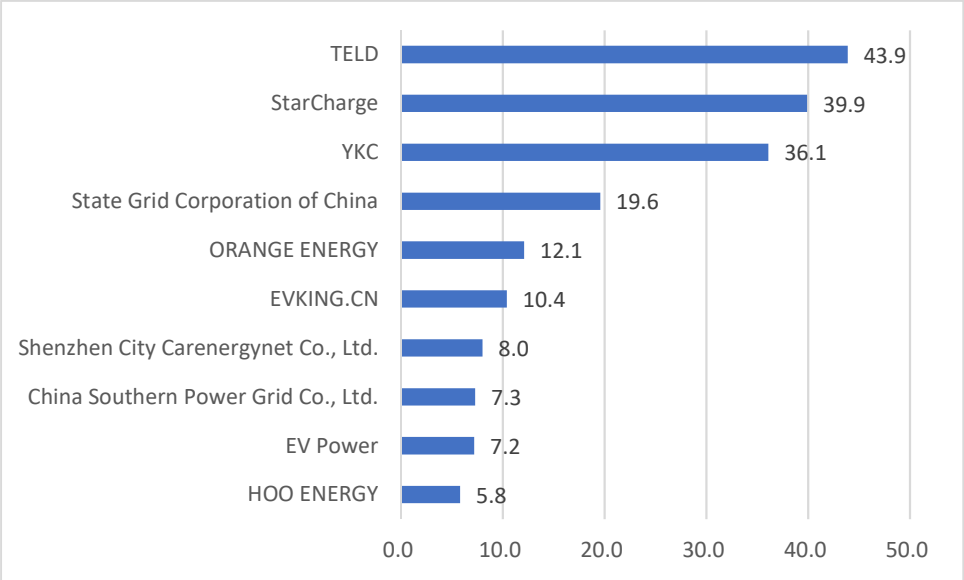

Figure 2. As of July 2023, China's TOP10 enterprises in the possession of public charging piles (10,000 units)

As can be seen from Figure2, the characteristics of high initial investment cost and long return cycle of the charging pile industry have formed a pattern of significant scale effect of the charging pile industry. The top three operators in the public charging pile market share are TELD, StarCharge and YKC. The top 10 operators accounted for 83.6% of the market share, and the remaining small and medium-sized operators accounted for only 16.4% of the total number of public charging piles. Some heading charging pile operators have a certain scale advantage, but most small and medium-sized operators are faced with financing difficulties, sustained losses and other problems in the development process, and are facing the crisis of elimination. At this time, the third-party platform of charging piles is injecting new kinetic energy into the development of charging piles through new thinking and new models.

3.3. Analysis of the Development Status of Third-party Platforms

The third-party platform helps to reverse the situation of operating separately among operators and strengthen the degree of information interconnection of charging piles. Interconnection means that the charging information is connected to the charging network, the Internet, the smart grid, and the transportation network. On the one hand, let the platform become a bridge of deep interaction between the power grid and new energy vehicles, and on the other hand, let the charging information platform become an important part of the smart grid. The interconnection runs through all aspects of charging scheduling, charging and discharging. The third-party platform does not directly participate in the construction of charging piles, and can integrate the highly concentrated source of charging piles of different operators through the third-party charging Internet of Things technology, providing operators with one-stop background, online management, low-cost operation and maintenance and other fine operation services, B/C terminal charging users, weaving a huge smart charging service network.

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Both operators and third-party platforms have the ability to build charging pile operation platforms. However, for independent operators, high costs have been invested in the stage of charging pile construction, and the capital recovery period is long, and the operating costs of charging piles are complicated, including the cost of electricity loss, site rent, and manual maintenance of daily operation, etc., so the operation of charging piles has high requirements. Operators accessing third-party platforms can reduce their own operating costs, and can also use the scale advantage of third-party platforms to bring traffic to their own charging piles. In addition, there are a large number of small and medium-sized operators in the charging pile market. Small and medium-sized operators have local resource advantages, but most of them lack the strength to build information platforms independently. In order to avoid being marginalized by the head operators and prevent the game between the head operators from squeezing the living space of small and medium-sized operators, Choosing access to third-party platforms is an effective way to maintain its market share. The specific role of third-party platforms in promoting connectivity is shown in Figure 3:

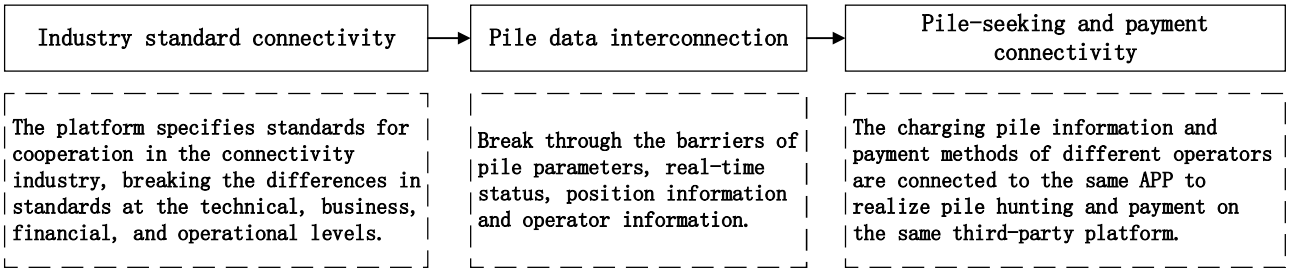

Figure 3. The third-party platform promotes the interconnection of the charging pile industry

The platform establishes connections between charging pile operators and users at both ends, leveraging resource integration to create a vast public traffic pool. This facilitates convenient access to charging piles for users, enhances the quality of charging services, and enables efficient route planning. Moreover, it serves as a means for operators to increase their profitability by improving the utilization rate of charging piles. Ultimately, this optimization of user experience leads to a win-win situation for all parties involved at both ends (B and C). In response to the growing demands of the charging pile industry, third-party platforms continue to emerge, further propelling the development of charging piles. Within the rapidly evolving landscape of platform economy, establishing an intelligent ecosystem for charging stations and creating an innovative management platform are crucial in driving electric vehicle development forward. Currently observed third-party platforms in the charging market can be categorized into three types: government-supported platforms that hold significant industry status and provide big data information management services for government departments (e.g., e-charging network), asset-light operations where multiple brand operators under Unicom do not directly invest or construct charging piles but solely offer platform services (e.g., YKC), and platforms that leverage their own traffic flow advantages to attract participation from charging pile operators (e.g., ORANGE ENERGY).

4. Analysis of Third-Party Platform Development of Charging Pile

The charging pile is listed as one of the "new infrastructure" projects by the state, and is regarded as a "trillion-level" blue ocean market by the industry. However, there are still many problems in the current development of the charging pile market.

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4.1. Low Overall Utilization Rate of Charging Pile

The construction cost of charging stations is high, the return cycle is long, the profit model is limited, and operators heavily rely on capital, which poses the biggest constraint to the development process of charging station operators. There exists a phenomenon of "uneven drought and flood" in the utilization rate of charging stations, with an overall low utilization rate across the industry. In order to reduce investment costs, more affordable slow-charging stations are being utilized, but their 6-8 hour charging time contradicts user preferences. Additionally, high failure rates and fuel trucks occupying space further decrease the utilization rate of charging stations. Most operators are experiencing financial losses. Taking China's leading operator in terms of market share as an example, based on its financial data during the hot years for the charging market in 2020 and 2021, it incurred losses amounting to ¥77,696,200 and ¥51,320,800 respectively. The challenge lies in poor investment efficiency and profitability for operators which has become a major obstacle to achieving healthy and rapid development within China's electric vehicle market. Insufficient management practices for charging stations along with ineffective supply-demand matching significantly impact profitability for operators; therefore there remains ample room within the charging station industry for cost reduction and improved efficiency. At present times like these when developing new revenue streams becomes crucial alongside increasing individual station utilization rates while reducing costs have become key factors enabling operator profitability.

4.2. Unreasonable Charging Pile Layout

At present, the unreasonable layout planning of charging facilities has caused the overall efficiency of the charging network to be low, and it cannot meet the actual charging needs of users of new energy vehicles. In the early stage of development, in order to quickly occupy the market, operators "heavy quantity, light operation", often take the "horse enclosure" way. Due to the lack of reasonable planning of charging service density and charging facility layout in different areas, a large number of charging piles are scattered in places with low traffic flow. The location layout is lack of data support, subjectivity is strong, can not ensure the rationality of the layout. Unreasonable planning and layout has led to the frequent occurrence of the "charging cycle" phenomenon, and some charging piles have become "zombie piles" after being built, and there is often a charging queue for new energy vehicles in areas with a large flow of people. The lack of rationality in the layout of charging piles leads to a large number of idle charging piles [13]. For users of new energy vehicles, there is still a certain gap between the convenience of charging facilities and the real "infrastructure", and the actual charging demand has not been met. This will not only cause a waste of public resources, but also greatly reduce the user's charging service experience, hindering the development of new energy vehicles and charging pile industry.

4.3. Low Level of Connectivity

At present, there are a large number of charging pile operators in the market, but the operators are independent from each other and idle in the interconnection of charging pile information, which hinders the development of charging infrastructure. The low degree of interconnection is the key crux of the charging industry, charging pile operators independently establish their own operating platforms, and the operating platforms are independent from each other, resulting in more and more charging app versions on the market. Charging acts as a rigid demand. When users intend to supply energy for new energy vehicles, they need to download multiple charging applications or small programs when using charging piles of different operators. It is often difficult for users to search for piles. The process can also become tedious. The degree of interconnection between charging piles is low, and the charging information is not smooth, resulting in poor charging experience for users. The low degree of interconnection between various operators, like a "information island", charging pile operators are difficult to

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make profits, new energy owners are difficult to charge, resulting in a vicious circle, making the development of the charging pile industry into a dilemma, and improving the degree of interconnection in the operation stage of the charging pile is imminent.

5. Conclusion

Based on the development status of third-party platforms and operators, the key problems of low utilization rate, unreasonable layout and low degree of interconnection in the operation and development of charging piles are analyzed. In order to solve the difficulties in the development of charging piles, third-party platforms play a crucial role. Third-party platforms can better combine the Internet thinking to innovate business models and explore new profit points, carry out multi-network integration to improve the utilization rate of charging piles, and reduce the cost of a single subject through cooperation. Improve the utilization rate of charging stations, avoid waste of resources, and achieve a win-win situation for platforms, operators, users and even society. This paper puts forward the following suggestions for the operation of charging piles:

Firstly, build an interconnected third-party platform for charging piles. Scientific and reasonable planning of charging infrastructure network is crucial. Through the platform integration of charging pile resources, the use of big data for more reasonable charging pile location layout construction and operation planning, the analysis of charging operation indicators, intelligent scheduling and orderly charging to achieve peak cutting and valley filling, disorder into order, can effectively alleviate the "charging cycle" phenomenon. In response to the problems of low operator traffic, low utilization rate of charging piles, and low degree of interconnection, the third-party platform focuses on opening up the barriers between various operators, deepening the degree of interconnection, and making many charging piles "centralized" to form the scale effect of charging pile operation, which can effectively solve a series of problems such as difficult for users to find piles and cumbersome payment methods.

The secondly, achieve fine operation through in-depth development of data resources. When the third-party platform is involved in the operation of charging piles, it makes clear the interest relationship with the operator at the beginning of the cooperation, stabilizes the flow advantage, deeply develops data resources, improves the operation mode, feedbacks the pile enterprise, improves the operator's operating performance, promotes the interconnection process, promotes the overall efficiency of the charging network, and alleviates the mileage anxiety of the majority of new energy owners. Third-party platforms take advantage of massive data to enable high-quality development of the entire industrial chain. The platform has deposited massive data in user data, charging data, equipment data, and vehicle data, and is committed to establishing data centers to promote the transformation of the industry from a traffic economy to a digital economy.

Finally, optimize the value chain of charging piles by means of platform data empowerment. The data enabling behavior of the platform can promote the interconnection degree of upstream and downstream enterprises in the value chain of the charging pile industry and realize the optimization of the value chain. Long-term cooperation will also enhance the trust between third-party platforms and charging pile operators. Through the in-depth management of charging pile information and resources on the platform, charging pile operators will be empowered, and the in-depth sharing of information and resources can reduce the degree of information asymmetry between the two parties and weaken the uncertainty of external disturbance factors. Thus, the transaction cost between the platform and the operator is greatly reduced. Charging pile industry digitization is in a stage of vigorous development, at this time, seize the new window of digital economy development, to lead the construction of charging piles by digitization, through the third-party platform data to empower charging pile operation,

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and further promote the interaction of vehicle networks, you can explore new profit points, and promote the deep integration and coordinated development of the transportation and energy fields.

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