

A New Energy Smart Street Light Business Model Based on the Internet of Things

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Abstract: With the development of the Internet of Things economy and continuous innovation in science and technology, new energy smart street light systems have emerged, and large companies such as Huawei, Lenovo, and Haier have successively laid out in the smart light pole market. This article analyzes domestic smart street lamps and proposes the construction of a new energy smart street lamp business model based on Internet of Things technology, providing practical and feasible business model suggestions for the development of the domestic smart street lamp industry.

Keywords: Internet of Things Economy; Smart Street Lights; Business Model

The Smart Light adopts a dual circuit power supply of solar energy and mains electricity, and uses an Arduino microcontroller to intelligently design the smart street light. The street light can calculate road flow and environmental quality on its own, achieve precise intelligent lighting and color temperature adjustment. The smart street light is equipped with LED advertising screens, environmental monitoring, video monitoring, voice and alarm modules, and other diverse functions of the smart street light to provide high-quality lighting services. Priority should be given to using battery power to save energy, improve charging efficiency and energy utilization. Induction adjustment should be made based on the flow of people and vehicles on the road to provide more intelligent lighting services. At the same time, advertising spaces should be provided for various advertisers. The service goal is to make urban road lighting more intelligent and create more smart cities through the Internet of Things.

1. Industry and market analysis

With the continuous development and improvement of infrastructure, the application of the Internet of Things in various industries such as security, logistics, and transportation is expected to continue to penetrate and popularize, and combine with data analysis to continuously improve the level of intelligence. The market space is huge. The Internet of Things, as a key direction for China's independent innovation and breakthrough in the new generation of information technology, contains huge innovation space. In fields such as chips, sensors, close range transmission, massive data processing, and comprehensive integration and application, innovation activities are becoming increasingly active, and innovative elements are constantly accumulating.

With the rapid development of smart cities and the support of 5G technology, the number of smart light poles in China is rapidly increasing. According to data, the number of completed smart light poles in China has doubled from 2016 to 2020, reaching around 50700 in 2020. However, due to the large base of lighting street lights, the penetration rate of smart light poles has only increased from 0.01% in 2016 to 0.17% in 2020, still at a low level, and there is a huge market penetration space. The demand for 5G ultra dense networking, government policy support, and urban municipal construction have brought huge driving forces to the development of smart street lights. It is expected that the industry market size will reach 13.15 billion yuan by 2024.

The reason why the scale of China's smart street light market continues to grow includes the official commercialization stage of the 5G plan in 2020. As an important entry point for 5G infrastructure construction, smart street lights can effectively meet the site needs of 5G ultra dense networking and become beneficiaries of the 5G new infrastructure wave. At the same time, with the accelerated development of urban construction in China, the development of the urban road lighting market has experienced rapid growth, with a huge stock of facilities, providing sufficient infrastructure foundation for the renovation and upgrading of smart street lights. According to data, from 2015 to 2019, the size of China's smart street light market (measured by sales revenue) increased from 140 million yuan to 1.96 billion yuan, with a compound annual growth rate of 93.4%.

It is expected that the market size of smart street lights will continue to grow at a rate of 46.3% from 2019 to 2024. The main reasons include that, firstly, 5G is gradually entering the commercialization stage. As the entrance end of smart cities, smart street lights have the characteristics of “having a network, a point, and a pole”, and are the source of information data collection for cities, which is highly valued by the industry. Since 2018, the market size of smart street lights has significantly increased, benefiting directly from the 5G new infrastructure wave. Secondly, data from the National Bureau of Statistics shows that from 2017 to 2019, the actual length of roads in Chinese cities increased from 401000 kilometers to 443000 kilometers. The construction length of national urban roads is directly related to the quantity of national road lighting. As the main body of urban lighting, urban road lighting has achieved rapid growth and huge stock on the basis of the rapid development of urban construction in China, providing sufficient basic equipment for the renovation and upgrading of smart street lights. Thirdly, the country strongly supports the development of the smart street light industry. The Ministry of Industry and Information Technology and the State owned Assets Supervision and Administration Commission of the State Council have issued the “Implementation Opinions on Promoting Telecommunications Infrastructure Co construction and Sharing in 2018”, which can promote the establishment of a sound smart street light industry system. The combination of multiple factors is driving the growth of China’s smart street light market, and it is expected that the market size will reach 13.15 billion yuan by 2024.

Based on the PEST analysis method, a macro environmental analysis is conducted on the advantages of the IoT smart street lighting industry from four aspects: politics, economy, society, and technology. From a political perspective, China encourages and supports the construction of telecommunications infrastructure and the development of the Internet of Things. Therefore, the political environment vigorously promotes the improvement of the smart street light industry system; From an economic and technological perspective, China’s industrial system has gradually shifted from the secondary industry to the tertiary industry, and from traditional manufacturing to high-tech industries. The Internet of Things has also formed a complete industrial system, which has a good promoting effect on the development of the smart street light industry; From a social perspective, the new smart street lights can automatically adjust their lighting according to weather conditions and traffic flow to increase road visibility, thereby reducing driver visual fatigue and reducing the occurrence of traffic accidents to a certain extent.

2. Business model construction

The “Smart Light” project has seized the pain point of street lights as infrastructure and entered this blue ocean market with huge market demand. Therefore, the product positioning and audience positioning of “Smart Lights” are particularly clear. Based on the previous market research analysis, we will segment the four major areas of intelligent lighting products that our project currently faces: industrial and commercial, residential and home, outdoor lighting, and public lighting, and lock the target market in the public and commercial and residential and home sectors.

In the public and commercial fields, a combination of industrial and commercial lighting as well as public lighting is used. The combined market share of industrial and commercial lighting and public lighting is relatively large, and these two fields are mainly in cooperation with the government, using EMC and PPP models, which are the main business models of smart light poles in China at present. The contract energy management model (hereinafter referred to as the EMC model) is currently the most common model for the commercialization of smart light poles. EMC is an investment method that uses saved energy costs as payment for the entire cost of street light renovation or new construction. In this model, enterprises and the government agree on the energy-saving goals of smart light pole projects under prescribed lighting management standards. In order to achieve the energy-saving goals, enterprises upgrade and transform urban street lights, and the government repays the saved energy costs to the enterprise in installments. After the energy contract expires, the street lights are returned to the government free of charge. The PPP model is the establishment of cooperation between the government and social capital. The government entrusts the operation and maintenance of public lighting resources to the project company, which invests in construction, upgrades and renovations to ensure the long-term operation of street lights. The operational process, risk sharing mechanism, and profit distribution mechanism of PPP projects will be differentiated based on the specific situation of the project.

At present, due to the high traffic conditions and wide coverage in our country, simple high-pressure sodium lamps or LED lamps are

often used for different road sections and traffic volumes. Most LED street lamps use light sources around 5500K, which have higher luminous efficiency and energy efficiency. However, the color temperature of 5500K lights can make people visually very cold and dazzling, leading to visual fatigue and reducing driver safety. In addition, in rainy and foggy weather, the penetration ability of this type of light is poor, which also affects people's travel safety. However, traditional high-pressure sodium lamps have a color temperature of around 2800K and do not produce dizziness. In rainy and foggy environments, their light penetration ability is stronger, but energy consumption is severe. Therefore, the development of a street light that can combine the advantages of two street lights, achieve energy conservation without dizziness, and have strong penetration ability in rainy and foggy environments, has profound significance for national construction, traffic safety, and improving energy utilization efficiency.

Production is carried out through OEM, and the products are mainly sold in B2B format. The main customer groups are municipal departments and lower level distributors. In terms of municipal affairs, we obtained orders through bidding in the early stage, and assisted our cooperating units in upgrading and renovating the existing street light system. We provided a complete set of intelligent street light system solutions for the new street light system to help the city achieve smart city construction faster. This project develops four different types of new energy intelligent LED street lights with the same function based on different occasions and needs, and sets different prices for each power of new energy intelligent street lights to meet market demand. The product pricing adopts a comprehensive pricing method, which takes into account cost, market acceptance, and the price situation of other similar products. At the same time, we can provide customers with customizable production services.

The competitive advantage is mainly reflected in the adoption of a dual circuit design that complements solar energy and mains power. Under normal weather conditions, solar power is the main source of power supply. When there is insufficient storage capacity in continuous rainy weather, mains power is used for power supply. This not only saves a lot of electricity, but also improves the reliability and stability of the entire system. Secondly, in terms of energy storage, supercapacitors can be matched to replace traditional batteries, which can solve the problem of batteries being greatly affected by temperature and having a short lifespan. Thirdly, in terms of lighting, a scheme can be automatically set according to factors such as traffic flow, time, weather conditions, etc., which automatically adjusts the color temperature of the lights. This not only improves the safety factor of driving in adverse weather conditions such as fog and haze, but also solves the problem of both color temperature and illumination decreasing simultaneously. And it can also adjust the color temperature reasonably according to the traffic flow on the road to reduce driver's visual fatigue and reduce the risk of accidents. Fourthly, this project will reserve API standard interfaces at the control end to facilitate the integration and management of more functions of the smart pole. Fifth, reduce prices by optimizing technology and improving production techniques.

The main customer groups targeted by this project are municipal units, large enterprises, and community developers. Due to the complexity of relationships in the workplace and the need to deal with some government agencies, media, and competitors, the team should pay attention to the handling of public relations in all aspects during the operation process. Good relationships can help achieve the company's marketing goals. Strive to become a supplier of international smart lighting and IoT smart city solutions.

3. Conclusion

In summary, the new energy smart street light system based on the Internet of Things can avoid risks and solve existing problems by making reasonable use of the Internet of Things. The emergence of this system model is of great significance for traffic safety and smart city construction, and is a sustainable development path of green environmental protection and ecological optimization. The emergence of "smart lights" conforms to the trend of the times and will inevitably promote new development and transformation in the smart street light industry.

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