Research on the Business Model of Hazardous Waste Disposal of Power Grid Enterprises Based on the Commercial Canvas Model

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Abstract. The issue of hazardous waste disposal has become a key difficulty and obstacle for power grid companies to achieve green development. This article systematically analyses the business model of hazardous waste disposal of power grid companies based on the business model canvas model, which consists of value proposition, core resources, key business, important partners, customer segmentation, channel access, customer relationship, cost structure and revenue sources, and then lays a theoretical foundation for hazardous waste disposal of grid companies.

1. Introduction

In 2021, the two sessions emphasized the promotion of green energy development, the improvement of consumer-side electrification, and the construction of a new generation of electricity-centric power system put forward higher requirements for the development of the power grid. As the economy enters a stage of high-quality development, environmental protection has risen to a strategic height and been deeply coupled with other fields, with the demand for electricity increasing year by year, the power grid is gradually transforming and upgrading from rapid development to high-quality development. Improving the coordinated development of the power grid with the economy and the environment has become the top priority for the development of power grid enterprises.

Large-scale construction and operation of power grids also produce a series of hazardous wastes, which are not only diverse in types, but also unevenly distributed and have different disposal requirements. Hazardous wastes of power grid companies mainly come from substations of various voltage levels, including used lead-acid batteries, waste transformer oil. Due to the wide range of substation sites and other constraints, collection and treatment processes of hazardous wastes face high costs, and it is difficult to collect in a unified and centralized manner. At the same time, in the process of harmless disposal of hazardous wastes, power grid companies of China have not yet formed a relatively complete system. They are currently in the stage of separate exploration by provincial power grid companies, and the problems of irregularities and high costs are prominent, which cannot form a reproducible business model.

With the tightening of environmental protection regulatory policies, the issue of hazardous waste disposal has become a key difficulty and obstacle for power grid companies to achieve green development. Therefore, in order to achieve the high-quality development of the power grid and the scientific and standardized construction and operation of the power grid, this article introduces a
business canvas model to systematically and comprehensively analyze the business model of power grid companies’ hazardous waste disposal, in order to provide a method and idea reference for the analysis of business models of power grid companies and other hazardous waste disposal companies.

2. Literature review

2.1. Hazardous waste disposal

Developed countries such as the United States, Japan, and Germany started relatively early in hazardous waste disposal and have accumulated certain technological capital and institutional capital. Take lead-acid batteries as an example, the United States has established and gradually improved a waste battery recycling system, and carried out policy publicity and implementation work while building disposal plants, so that the public consciously supports and cooperates with waste battery recycling; Japan has always built environmentally friendly recycling society, and began to implement supporting policies and measures related to battery recycling as early as 1993, among which. all lead-acid batteries in the automotive industry have been recycled; Germany makes it clear that the non-profit organization GRS is responsible for the recycling of waste batteries in the form of legislation, and strictly classifies and disposes them through collection, transportation[1].

China is still in its infancy in the harmless disposal and utilization of hazardous waste, and has not yet formed a comprehensive policy and institutional system, nor has it formed a corresponding business model. Taking waste lead storage batteries as an example, China has successively issued a series of policies, regulations, technical standards, such as "Access Conditions for Waste Lead Storage Battery Recycling Industry", "Management Measures for Hazardous Waste Operation Permits", "Administrative Regulations on Recycling and Disposal of Waste Electrical and Electronic Products” ”, “Pollution Control Standards for Hazardous Waste Storage”, etc., which put forward clear requirements for the recycling, transportation, and disposal of waste lead-acid batteries. However, the relevant systems are still in the process of preliminary and dynamic improvement. And the effectiveness of policy implementation still needs to be further demonstrated.

The hazardous waste management of power grid enterprises in China mainly has the following characteristics: 1) The management process is long and involves many departments. The various links in the hazardous waste treatment chain are scattered in the materials, science and technology departments, and the work process does not clearly define the responsibilities of each department, which affects the overall efficiency of the management process. 2) The updating frequency is high. Lead-acid batteries in substations are used in the form of battery packs, of which there are about 108 units of 2 volts in a group and 18 units of 12 volts in a group. Although the design life is 5-8 years, it needs to be replaced as a whole for safety considerations once the performance of the battery pack appears 6%-10% unqualified. The actual life is only 3-5 years, and the update frequency is relatively high. 3) Disposal methods vary significantly in different provinces. In consideration of the distribution characteristics of hazardous waste and the cost of disposal, various provincial companies usually choose disposal methods suitable for their territorial characteristics. However, due to differences of local policies and geographic differences, disposal methods are not able to copy. 4) Information on hazardous waste disposal needs further sharing. There is a lack of further sharing of information on hazardous waste disposal methods in various provinces. Although there are certain differences between provinces, they can still learn from each other in the process of selecting hazardous waste disposal methods[2].

2.2. Business canvas model

The business model canvas is a business model analysis tool proposed by Ostwald and Pini in the book "New Generation of Business Models"[3]. The business model canvas, also known as the nine-element model, includes value propositions, core resources, key businesses, important cooperation, customer segmentation, channel channels, customer relationships, cost structure, and revenue sources, as shown in Table 1.
Table 1. Nine elements in business canvas model

| Element                  | Meaning                                                                 |
|--------------------------|--------------------------------------------------------------------------|
| Value propositions       | Provide products and services to customers                               |
| Core resources           | Important assets needed to ensure the smooth operation of the enterprise |
| Key businesses           | Key business activities that ensure in the normal operation of the enterprise |
| Important cooperation    | Important network of partners needed to ensure the normal operation of the enterprise |
| Customer segmentation    | Different target customer groups that companies want to serve            |
| Channel channels         | Ways to deliver products and services to customer groups when communicating and establishing contacts |
| Customer relationships   | Type of relationship established for a certain type of customer group    |
| Cost structure           | All costs incurred during operation                                       |
| Revenue sources          | The cash benefits from each customer group                                |

The business model canvas model has been used by large foreign companies and units such as IBM, Ericsson, and government departments because of its strong operability and the intuitive display of corporate business models. With the gradual deepening of business model research, more and more scholars and experts apply it to corporate strategy formulation and business model analysis, among which Maxin et al. analyze the business model of Xiaohongshu[4], Xing Yangbo et al. perate Systematic analysis of Pinduoduo's business model[5], Shi Qingyue analyze the business model of Yonghui Supermarket[6].

3. Business Model of Hazardous Waste Disposal of Power Grid Enterprises

3.1. Value propositions
Power grid companies advocate to give full play to the resources and technological advantages of state-owned enterprises, and provide the society with a replicable model of hazardous waste business models. On the one hand, it is necessary to reflect the responsibility of state-owned enterprises. On the basis of complying with national laws, technical regulations, environmental protection requirements, and corporate supervision, actively explore sustainable hazardous waste disposal methods, and form a paradigm to radiate energy to other enterprises, thereby reducing the overall trial-and-error cost of the society and contributing to the green transformation of energy. On the other hand, it is necessary to achieve the goal of increasing state-owned assets as much as possible. Starting from the value chain of hazardous waste disposal, explore a business model that maximizes overall value and reduce the loss of state-owned assets.

3.2. Core resources
There are advantages of material, financial, knowledge, talent, data, and platform resources in power grid companies. As a state-owned power grid enterprise related to the national economy and the people’s livelihood, it has significant platform resource advantages in the process of hazardous waste disposal, which is specifically reflected as follows: 1) It can obtain various policy subsidies such as national finance, taxes and fees through pilots and other forms, so as to be able to undertake the high cost risks brought by different hazardous waste disposal modes; 2) It link governments, power generation companies, equipment manufacturers, consumers and other subjects, with the characteristics of platform enterprises, which facilitate the creation of a hazardous waste disposal
paradigm and share it with other companies and industries. And then it gradually establish a hazardous waste disposal network, and form a scale effect.

3.3. Key businesses
Affected by the wide coverage of the power grid, the hazardous waste of power grid companies usually has a characteristics of wide range, and various factors such as the economic and geographical conditions of each province have derived a variety of hazardous waste disposal methods and businesses, including online bidding, competitiveness negotiations, public bidding, framework agreements, etc. Grid companies select appropriate disposal methods, and carry out corresponding businesses, such as direct trading transactions, building platforms to match transactions, and so on.

3.4. Important cooperation
The hazardous waste value chain of power grid companies mainly includes power grids and power grid subsidiaries, other waste-producing units, equipment suppliers, recycling service providers, transportation service providers, research institutions, governments, etc. The interaction between the entities is shown in Figure 1.

![Figure 1 Important cooperation in hazardous waste disposal](image)

3.5. Customer segmentation
According to the development stage of the hazardous waste disposal business of power grid companies, in the short term, the service targets are mainly provincial, city and county companies with disposal capabilities. At the same time, they can also rely on the established temporary storage, transportation, and disposal ability to serve other waste producers and create commercial value. In the long run, grid companies can build platforms to provide trading platforms for lead battery manufacturers, waste producers, transportation companies, disposal companies and other consumers, and provide other entities with services such as disposal, transportation, and matching buyers and sellers.

3.6. Channel channels
The research on the business model of hazardous waste disposal of power grid enterprises should first focus on the disposal methods of communications providers such as China Mobile and China Unicom, which also have the characteristics of multi-faceted and wide-ranging, whose disposal methods have worthy of reference. And these can explore and carry out pilots and study joint disposal methods. At the same time, on the basis of traditional offline transactions, explore the use of new media and new platforms, explore new business formats and new models, and improve the efficiency and effectiveness of hazardous waste disposal.
3.7. Customer relationships
According to the location of each participant in the hazardous waste value chain, grid companies are both sellers and service providers. In the short term, power grid companies’ hazardous waste disposal focuses on realizing the retained value of hazardous waste. At this stage, power grid companies are mainly hazardous waste sellers. They can choose to treat and reuse hazardous waste or entrust a third party to dispose hazardous waste, while grid companies provide all kinds of information such as the location and status of hazardous waste. With the gradual improvement of the hazardous waste disposal chain of power grid companies, they can emerge as platform service providers, hazardous waste recyclers, hazardous waste transporters, etc., to provide customers with offline or online services.

3.8. Cost structure
The cost of the entire process of hazardous waste disposal by power grid companies mainly includes recycling cost, transportation cost, disposal cost, and platform operation and maintenance cost. Among them, the recycling cost, transportation cost and disposal cost come from self-organized team management fees or expenses incurred by a third party; the platform fee comes from the built hazardous waste disposal platform or from commission paid for the third-party platform. At the same time, with the continuous improvement of hazardous waste disposal platform services, there are still costs for data sorting and data mining to provide support for matching transactions and precise services.

3.9. Revenue sources
According to the maturity of hazardous waste disposal of power grid enterprises, income can be divided into direct service fees, platform commissions, and data information fees. Among them, the direct service fee is the income generated by the direct realization of hazardous waste disposal at the current stage; after the platform functions are gradually improved, platform commissions and advertising fees will become the main income source; data information fees will be the main income source after the platform has matured, and then it can provide different services for each subject through data sorting and data analysis, which is not only a high-level function, but also a fundamental quality.

4. Conclusion
This article systematically analyzes the business model of hazardous waste disposal of power grid companies based on the business model canvas model, and analyzes nine aspects including value proposition, core resources, key business, important partners, customer segmentation, channel access, customer relationship, cost structure and revenue sources, which lay a theoretical foundation for grid companies to establish a sustainable and replicable business model for hazardous waste disposal. At the same time, it also provides key support for grid companies to adapt to environmental protection supervision, state-owned enterprise supervision, and energy green transformation.

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