Research on design method of Energy Internet business model

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Abstract. Under the background of high-quality development of China's energy industry, the high proportion of renewable energy access, the promotion and application of electric vehicles and charging infrastructure, the commercialization of energy storage, and the development of distributed generation are actively changing the development pattern of power grid and promoting the reform of energy production and consumption. As an Internet technology of "comprehensive perception, reliable transmission and intelligent processing", the Internet of things is gradually becoming a new technology and new field in the field of electric power in the development process of energy Internet. It is very important for energy enterprises to study the business model under the energy internet. Therefore, starting from the business model design method, this paper puts forward the design framework of business model of energy enterprises under the background of Internet of things, and finally studies the existing energy application scenarios, hoping to help energy enterprises adapt to the market.

1. Introduction
With the advent of the era of network economy, the business environment of enterprises is constantly changing, which also causes the changes of the form and focus of enterprise competition. In the practice of competition, more and more senior managers realize that business model is becoming the key factor to gain competitive advantage[1-2].

Under the background of the construction and rapid development of the power Internet of things[1], the impact of technological change and innovation will exceed expectations. The characteristics of open sharing and the goal of business innovation will also bring fundamental changes to the development of related industries, making the products and services of related businesses face new business model innovation and design in the market promotion. Research and practice show that business model innovation can promote technological innovation and progress through a variety of ways. At the same time, the power Internet of things is facing the open market and fierce competition[3], and its business model design is a systematic work, which also needs more targeted tools and more systematic guidance. Therefore, it is urgent to establish a systematic methodology to provide reference for the development of energy enterprises under the power Internet of things[4-6].

2. Research on Business Model Design Method[3-5]

2.1. Diamond Model
"Diamond Model" was first put forward by Porter. It takes elements as nodes and links between elements as chain. It constructs a simple strategic analysis system, which is mainly used to analyze the international competitive advantage and internationalization strategy of the industry, and can be expanded into a dynamic form. Borrowing the concept of Porter's diamond model, this paper puts
forward the diamond model of business model with similar structural characteristics, and defines the business model as a business activity system for an enterprise to create and acquire value.

Business model runs through all aspects of business activities of enterprises, and constantly carries out value-added activities in three aspects of business object, business process and business performance. At the same time, the basic framework of business model can be further divided into five modules: product service, stakeholder, resource integration capability, revenue and risk, and further subdivided into 11 elements: product / service, customer, partner, competitor, product structure, relationship structure, capital structure, income and risk. In addition, the exchange content of business model includes logistics, capital flow and risk flow. Each business model plate is interrelated and interacted with each other, forming a dynamic operation system. In order to deeply analyze the business model of various industries, scholars put forward business model analysis tools such as business model diamond model structure chart and business model diamond model analysis table. The diamond model structure diagram of business model constructs the connection structure between the modules and elements of the business model, which can help users understand the relationship between the components of the business model; the diamond model analysis table of business model can be used to deconstruct the components of the business model, and compare and evaluate the business model.

2.2 Wei-Zhu model

At present, the most recognized business model in China is the "Wei Zhu six factor business model" proposed by Wei Wei and Zhu Wuxiang. The two professors from Peking University and Tsinghua University jointly published "discovering business model", "reconstructing business model" and "economic interpretation of business model", which are the authoritative works on business model in China. The book analyzes a large number of enterprise cases, and gives the definition of "business model": business model is the transaction structure of stakeholders. According to the book "discovering business models" written by two scholars, the specific definitions of the six elements are as follows:

Positioning: business, target customers and product / service characteristics of the enterprise.

Business system: refers to the relationship between the enterprise and different stakeholders, including contract relationship, equity relationship, etc.

Key resource capability: refers to the key resources and capabilities that enable the enterprise business system to operate well and obtain returns

Profit model: refers to the source and mode of enterprise profit.

Free cash flow structure: including the term structure, duration and risk difference of future expected free cash flow.

Enterprise value: equal to the discounted value of the expected free cash flow that the enterprise can create in the future.

The two scholars put forward the "Wei Zhu business model". The main structure of the model is shown in Figure 1.

![Fig.1 Wei-Zhu model](image-url)
"Wei-Zhu model" takes positioning as the starting point of the business model, takes the business system, key resource capacity, profit model and cash flow structure in the operation mechanism as the operation guarantee of the business model, and takes the enterprise value as the standard to judge the investment value of the enterprise and the advantages and disadvantages of the business model. These six elements interact and determine each other. If any requirement changes, the business model of the enterprise will be different. The enterprise needs to analyze and upgrade the existing business model for the change of a certain element.

2.3 Business model canvas

Business model canvas is different from the existing methods of describing business model. It uses a visual layout that is easy to understand, which can guide users how to locate business model and business model innovation and re-engineering in the fierce competition environment. This paper describes the business model and its four main business models. The nine tectonic plates are customer segmentation, value proposition, channel access, customer relationship, revenue source, core resources, key business, important cooperation and cost structure; the four main aspects are customer, provider, infrastructure and financial viability.

3. Research on Business Model Design of Energy Enterprises Under the Background of Power Internet of Things

Business model is the core logic for enterprises to create unique value. It explains the process from strategic decision-making to tactical implementation: on the basis of responding to their own strategies and matching resources, enterprises promote business development and project implementation in order to solve market demand, obtain profit value and realize sustainable development. Nowadays, the fierce competition among many enterprises in China has developed from product competition, resource competition, service competition and brand competition to business model competition. Business model is one of the advanced forms of modern enterprise competition evolution.

This section proposes the general implementation process of power Internet of things business model. From design to successful implementation, all business models need to go through resource and environment analysis, business model scenario screening, market model analysis, business model design, input-output analysis, project implementation and project post evaluation. After each step of the implementation of the business model, it is necessary to find out the root cause of the problem and to find out whether the business model is successful after each step. The business model implementation process is shown in Figure 2.

4. Business Model Analysis of Energy Enterprises[6]

4.1 Investment in micro grid construction in the park

Microgrid is a kind of micro integrated energy system close to the user side, covering natural gas, solar energy, wind energy and other primary energy and power secondary energy, involving power, heat, gas and other energy transmission and distribution network and load demand, energy storage, control and protection equipment and information platform. It takes electric power as the core, realizes multi energy collaborative interaction through multi energy interconnection, information energy
coupling, market economy guidance, supply and demand coordination optimization and self balance. The source side includes distributed photovoltaic, small fan and other power sources, gas triple supply system, heat source such as heat pump, biogas digester and other gas sources; the storage side includes storage battery, heat storage tank, cold storage air conditioning and other power storage, heat storage (cold) and gas storage equipment; the grid side includes power, heat (cold), oil and gas transmission network; The information layer includes big data cloud computing platform, micro balance market trading system and energy management system.

4.2. Energy storage investment on demand-side
Energy storage is widely used in many fields of production and life. It has the functions of peak shaving and valley filling, peak regulation and frequency modulation, power-off backup, power quality improvement, new energy stability, new energy energy time shift and so on. Energy storage is mainly used in smart cities, smart villages, industrial parks, hospitals, stations, scenic spots and other large-scale industrial and commercial units with high power consumption, as well as areas with power shortage and poor power quality. It plays the role of peak shaving and valley filling, clean energy consumption, peak load reduction, etc., to realize smart energy management. The main function of demand side energy storage is to complete the user side demand response and smooth the energy consumption curve of the park together with the user load.

4.3. Virtual power plant
Driven by the aggregation of economies of scale, the virtual power plant integrates independent der into the power market by using communication, control, computer and other technologies. It uses the power market to strengthen the coordination and interaction between the supply side and the demand side of the power system, and strengthen the mutual accommodation capacity between new energy and system. Driven by the allocation of power resources in the power market, the virtual power plant coordinates, optimizes and controls the distributed energy cluster composed of distributed generation, energy storage, intelligent community, controllable industrial and commercial loads. As a whole, the virtual power plant participates in the power market transaction and the operation safety of auxiliary power system, and provides auxiliary services such as peak shaving, frequency modulation and emergency control According to the contribution of all kinds of Der in the virtual power plant, the benefits are distributed.

4.4. Vehicles to Grid (V2G)
The Internet of vehicles relying on charging pile is also a kind of business model of electric power Internet of things, which has the characteristics of energy Internet and the nature of automobile mobile Internet of things. Under the condition of interconnection of energy system, information system and transportation IOT system, real-time energy balance and information collection and feedback are required, as well as technological progress and economic rationality. Under this condition, the business model of Internet of vehicles can be divided into three types according to different business dominance: power supply company led mode, private company led mode and government led mode; in the case of different commercial entities leading, it can also be divided into direct charging mode of battery vehicles, battery leasing or automobile according to different modes of service provided Leasing business model and other business models.

5. Conclusion
Business model is the core logic for enterprises to create unique value. The implementation of business model is a systematic project, which explains the process from strategic decision to tactical implementation: on the basis of responding to its own strategy and matching resources, enterprises promote business development and project implementation in order to solve market demand, obtain profit value and realize sustainable development. Therefore, it is very important for enterprises to find the right business model in the competitive environment. This paper puts forward the business model
design framework of energy enterprises under the background of the power Internet of things by studying the basic methods of business model design, and analyzes the existing energy business scenarios, hoping to help energy enterprises quickly adapt to the market and constantly improve their competitiveness.

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