Innovative business model of energy Internet and construction of power grid enterprises

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Abstract: In this paper, the Internet and the power industry are deeply integrated to create a new development model, so as to realize the economic transformation from non-clean energy driven to clean energy driven. Based on the theoretical framework of innovative business model, this paper adjusts the organizational structure, pays more attention to the cooperation with external institutions, so as to seek the market entrance of energy Internet, and studies the behavior of energy suppliers under the traditional business model and innovative business model from different angles.

1. Traditional business model of traditional power grid enterprises

1.1. Traditional business model

1.1.1 Value proposition
The value of power grid enterprises is mainly reflected in social value and economic value. From the perspective of economic value, business models of power grid enterprises are value propositions based on energy sales service. The value of power grid enterprises is mainly reflected in social value and economic value. From the perspective of economic value, power grid enterprises are based on energy sales service business model value proposition. From the perspective of social value, the purpose of power grid enterprises is to "serve the overall interests of the party and the state, serve power customers, serve power generation enterprises and serve economic and social development".

1.1.2 Framework management
Framework management takes the enterprise value structure as the core, and identifies the core business capabilities of the enterprise through enterprise value analysis and business modeling.

Value structure: power grid enterprises purchase electricity from power generation enterprises, and then sell electricity to power users to obtain profits.

Core competencies: (1) data information resources: power grid enterprises hold a large number of power data information. (2) Financial resources: power grid enterprises have huge assets and strong capital strength. (3) Professionals: power grid enterprises have professional team. (4) Professional technology, power grid enterprises have rich experience and profound accumulation of technical personnel.
1.1.3 Profit model
The traditional profit model of power grid enterprises is to purchase electricity from power generation enterprises, and then retail to end users to earn price difference. The income of power grid enterprises mainly comes from the sales of electricity and electricity price, which belongs to a single power sales service mode.

1.2 Evolution of traditional business model

1.2.1 Economic development transformation
New energy enterprises are emerging constantly. Compared with traditional energy enterprises, new types of business of energy enterprises often contain many kinds of energy. With the increase of competition of new enterprises and the diversity of users, grid enterprises are also forced to innovate actively.

1.2.2 Social needs transformation
With the development of economic globalization and socialist market-oriented reform, social need is also evolving. Due to the unreasonable planning, energy waste, low utilization rate of equipment and frequent safety accidents, the traditional power system has been unable to meet the demand of energy saving and consumption reduction.

1.2.3 Scientific technology transformation
The energy market will usher in great technological innovations: the terminal control of intelligent appliances will be more efficient and energy-saving; the storage battery will use direct current to store energy, and the energy storage efficiency and charging and discharging speed will be accelerated; advanced bidirectional automatic metering facilities; renewable energy such as wind energy and solar energy will be connected to the transmission network technology; electric vehicle charging equipment and fuel cell technology, which made the electric power industry’s leap and improvement happening.

2. Business model innovation of power grid enterprises based on energy Internet

2.1 Business model review

2.1.1 Business model concept
The concept of business model can be divided into three categories: profit, value and operation. Profit business model is the definition of enterprise profit model, and revenue is the logic of enterprise profit. Stewart and others think that business model is the logic of enterprises to obtain and create profits. Afuah defines business model as a way for enterprises to obtain and use resources and create more value for customers than competitors to make profits. According to Rappa, the basic connotation of business model is to gain more value, and the definition of enterprise survival and maintenance is business model.

From the experience of business model, we can see that the concept of profit as a business model first appeared, then structured research, and finally value centered. This paper holds that the core of business model is value, and the value of business model is around the transfer process between customer values.

2.1.2 Business model expression model
So far, there is no unified model to express business model. From the domestic and foreign scholars' research on business model, it can be divided into three models: simple list model, detailed structured model and logical model.
In the field of strategic management, Hamel's business model sets it as a bridge model. Hamel believes that customer interface, core strategy, strategic resources and value network together constitute the business model. The model relies on efficiency, uniqueness, matching degree and profitability, and plays its function through the connection of customer value, structure configuration and enterprise boundary.

Fig.1 Bridging model

Weng Junyi put forward the structural model of business model in his book business model innovation. He thinks that "the function of business model is to discover new market opportunities, segment markets and target low efficiency parts in organizational structure and production service process under the original or new environment.

2.1.3 research on business model innovation

To explain the concept of business model innovation by the above scholars from the perspective of business model, there are characteristics as follows: First, the understanding of the concept of business model innovation, focus on external customers and markets, and focus on the design business activities of enterprises from the perspective and thinking of customers. Its essence is to find the potential needs of customers and provide more value for enterprises. The innovation of business model is more systematic and holistic, which can be explained from the elements of business model. The combination innovation of various elements of business model innovation is not only from one aspect of innovation, but also from the logical relationship between the existing elements. Besides, it subvert collaborative innovation business model, through the various aspects of business model innovation, often accompanied by product innovation, according to the above discussion of technological innovation and organizational innovation. This paper holds that business model innovation is a kind of enterprise that innovates in multi value chain system, and its ultimate goal is to realize industrial restructuring, subvert traditional business model, and make enterprises obtain competitive advantages of rapid growth and sustainable development.
2.2 Evolution of innovative business model

2.2.1 Value proposition innovation
The core of value proposition innovation is how to create value growth point for customers. So as to provide customers with more abundant value-added services, understand the needs of users for products or services, improve customer evaluation, and follow user orientation.

2.2.2 Customer interface innovation
Energy Internet realizes the two-way exchange of information from power generation to power consumption through two-way energy metering and distributed renewable energy production and utilization. The energy Internet will form an interconnected network between users and power grid enterprises to achieve the effect of real-time, high-speed and two-way data reading, improving the comprehensive efficiency, enabling customers to better control power consumption and meet customers' gradually increasing power demand.

2.2.3 Framework management innovation
With the development of new energy technology, the traditional power grid has changed to the Internet plus based energy Internet system. Energy Internet is an intelligent energy network with power as the center and power grid as the main line, covering all terminals and transmission systems, realizing the flow and intercommunication of energy and information, and form a non fossil power interconnection network with diversified power and energy complementary. Use Internet thinking to seek change and give full play to the power of innovation.

In the energy Internet, the innovation of communication technology framework is mainly reflected in 5G. Communication technology acts as the "central nervous system" of energy Internet. 5G's technical advantages of large speed, high reliability, low delay and wide connection bring new opportunities and challenges to the construction of energy Internet. (1) New energy. In order to maintain ecological balance, it is urgent to develop renewable energy power generation. (2) New users. With the rapid development of new energy electric vehicles, the charging demand is very objective, and new mode can be adopted in power management. (3) New requirements. With the development of new energy and new technology, higher requirements for power quality are put forward. (4) New business. Energy Internet has opened a new platform for power services and trading.

2.2.4 Profit model innovation
In terms of profit model innovation, in addition to the construction of industry and business chain, according to specific projects, the profit model can be divided into four aspects: first, potential revenue sources; second, core services; third, basic services; fourth, value-added services.

For power grid enterprises, it is necessary to try innovative business model, which is user-centered, market demand-oriented, energy-saving and consumption reducing as the goal, so as to give full play to the technical advantages of energy Internet and serve the social and economic development.

3. Conclusions
The development of energy Internet will subvert the existing energy system, promoting the emergence of innovative business models and opportunities, integrating market demand, as well as making full use of innovative technologies of renewable energy.

The energy Internet has a strong ability to optimize the allocation of resources, high security and stability of operation, and improve the reliability of users' electricity consumption. The development and utilization of renewable energy can promote energy conservation and environmental protection; and advanced information, communication and computer control technology can realize the intelligent power system. As important backbone enterprises and pillar industry related to the national energy security and the lifeline of the national economy, power grid enterprises should seize the new opportunities of the development of the energy industry, expand and enhance the service capacity and
technical level of the power system, drive the social and economic development, and realize the innovation of business model.

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References
[1] JIA MY, WANG Z. (2018) The Path to Realize the Financial Integration of Enterprises in the Era of Great Transformation[J]. Accounting and Finance, (2):58-61
[2] Cao DB, Wang JR.(2018)The Internet Technology Revolution: A Reflection Based on the Perspective of the Economic Philosophy[J]. Journal of Shanghai University of Finance and Economics, 20(4):15-28
[3] XIE GG, ZHANG YJ, LI ZY, et al. (2012) A Survey on Future Internet Architecture[J]. Chinese Journal of Computers, 35(6):1109-1119
[4] LIN C, LEI L. (2007) Research on Next Generation Internet Architecture[J]. CHINESE JOURNAL OF COMPUTERS, 30(5):693-711
[5] ZHANG J, YE YY, LI B, et al. (2020) Research on the Internationalization Strategy of Smart Grid Standards[J]. Distribution & Utilization, 37(3):1-9
[6] DU YR, WANG XD. (2020) Local strategy for energy transformation under the background of climate change: from the perspective of Germany, the US and Japan[J]. Environment and Sustainable Development, 45(4):156-160
[7] Liu ZY. (2013) Smart grid and the third industrial revolution[J]. Guangxi Electric Power, (12):84-87
[8] BAI JH, XIN SX, LIU J, et al. (2015) Roadmap of Realizing the High Penetration Renewable Energy in China[J]. Proceedings of the CSEE, 35(14):3699-3705
[9] Zhao DW. (2014) Internet thinking: Dugu 9sword[J]. China’s Foreign Trade, (8):32-32
[10] CAO JW, MENG K, WANG JY. (2014) An energy internet and energy routers[J]. Science in China (Information Sciences), 44(6):714-727
[11] Wang FF, Gao CW. (2009) Technical content and comparison of smart grid[J]. HIGH-TECHNOLOGY & INDUSTRIALIZATION, 5(5):99-102
[12] ZHU ZX, CHEN W, FANG J, et al. (2019) A summary review of the development of key technologies of active distribution network in the perspective of smart grid[J]. Journal of Yunnan University of Nationalities (Natural Sciences Edition), 28(4):389-397
[13] SONG J, TANG J, XIAO F. (2010) Development and Analysis of Smart Grid at Home and Abroad[J]. ELECTROTECHNICS ELECTRIC, (3):1-4
[14] WU JD. (2009) Innovative Development of Smart Power Grid and Interactive Smart Grid in China[J]. ADVANCES OF POWER SYSTEM & HYDROELECTRIC ENGINEERING, (6):5-8
[15] Zhang ZR. (2009) Primary Presentation of Smart Grid[J]. YUNNAN ELECTRIC POWER, 37(3):28-28
[16] HAN Z, FANG J, QU JS. (2019) Review of key technologies in the smart grid CPS[J]. Journal of Yunnan University of Nationalities (Natural Sciences Edition), 28(5):517-522
[17] XIE K, LIU YQ, ZHU ZZ. (2008) The vision of future smart grid[J]. ELECTRIC POWER, 41(6):19-22
[18] Feng QD. (2013) Analysis and Prospect of smart grid development domestic and abroad[J]. Smart Grid, (1):17-23
[19] HE FL, CHEN JQ, LI QH. (2020) Application and development of internet of things in smart grid[J]. Power System Protection and Control, 58-69, 48(3)
[20] Chaouachi A, Kamel R M, (2013) Andoulsi R, et al. Multiobjective Intelligent Energy Management for a Microgrid [J]. IEEE Transactions on Industrial Electronics, 60(4): 1688-1699