

Measures Taken by Power Companies to Promote the Development of Energy Internet

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Abstract. Energy Internet is the product of deep integration of energy field with automatic control, information processing, network communication and other fields. It is a fundamental revolution to the way of life of human society. It is necessary to evaluate the development of the energy Internet from five aspects: investment environment, economic benefits, energy conservation and emission reduction, energy services, and technical level. As one of the main forces in the construction of energy Internet, power enterprises need to promote the development of their own energy Internet business from four aspects: policy orientation, business structure, innovation mechanism, and financing channels.

Keywords: Energy Internet; Benefit Evaluation; Power Companies.

1. Introduction

Energy Internet is a heterogeneous energy interconnection and sharing network formed by using electricity as the core, using renewable energy power generation technology and information technology, integrating multiple energy networks such as power network, natural gas network, heating and cooling network, and electric transportation network. At present, the energy industry is undergoing a series of major changes and innovations. Only by understanding the true connotation and boundaries of many concepts, can we improve our understanding of the energy Internet and promote the development of the energy Internet.

2. Characteristics of Energy Internet

The development of energy Internet is a typical representative of the energy industry's implementation of the "Internet +" plan. It can be understood as "Internet + smart energy". But it is not a simple superposition of the Internet and the energy network. It is quite different from a single Internet or a single energy network. As the deepening and development of smart grid, the energy Internet has a flat network structure. It supports multiple energy access, and energy and information are highly integrated. Energy Internet mainly has four characteristics: open, interconnected, equal, and shared.

2.1 Open

Energy Internet has a high degree of openness at both the industrial and technical levels. It provides a communication medium for the integration of the energy industry with other industries. The Energy Internet has universal access ports, which can realize the adaptive docking of various equipment such as distributed power supply and energy storage, and ensure the two-way flow of energy and information.

2.2 Interconnected

On the one hand, the Energy Internet can ensure the interconnection between local energy devices and the self-balance of internal supply and demand of distributed energy modules. On the other hand, the Energy Internet can ensure the interconnection and coordination between the decentralized energy

modules and the centralized energy modules, play a complementary and synergistic role between the two, and effectively improve the security and economy of system operation.

2.3 Equal

Energy Internet will change the "top-down" organization of traditional energy networks. Each participant is both a "producer" and a "consumer". Each energy device has the ability to send and receive energy and energy information. In the process of intelligent information processing and energy flow, all energy nodes are equal.

2.4 Shared

Energy Internet terminals include a large number of energy information interaction devices. This makes the Energy Internet a platform for the bidirectional flow of energy and information flow between energy nodes and information nodes. Each energy node has the authority and ability to obtain data information. This will further promote the optimal allocation of energy resources in a wide area.

3. Evaluation of the Development of Energy Internet

The development of the Energy Internet requires both support and guarantee. Its development requires not only the policy support of the government, but also the construction and participation of enterprises, as well as the support of academic research and innovation. In order to better guide the planning of the Energy Internet and promote long-term sustainable development, it is necessary to give timely scientific evaluations to its development. At present, the evaluation research on the energy Internet mainly evaluates the energy Internet from five dimensions: investment environment, economic benefits, energy conservation and emission reduction, energy services, and technical level.

3.1 Investment Environment Evaluation

With the further advancement of the construction of the energy Internet, it is necessary to evaluate the investment environment of the energy Internet. Analyzing the support and guarantee of the development potential of the Energy Internet can provide theoretical guidance and reference for the construction and development of the Energy Internet. The energy Internet investment environment assessment mainly focuses on the policy environment, economic environment and infrastructure environment. The policy environment evaluation can reflect the implementation of relevant policies and the promotion and support for the construction of the energy Internet. The purpose of economic environmental assessment is to evaluate the level of social research investment and economic support for the energy Internet, which can reflect the development potential of the regional energy Internet. Environmental assessment of infrastructure is mainly to measure the utilization of energy equipment and the level of infrastructure construction.

3.2 Economic Benefit Evaluation

The economic benefits generated by the energy Internet are an important dimension of the energy Internet evaluation. The economic benefits come from the technological innovation of the energy Internet, the investment costs of engineering construction and the economic benefits of the project. The evaluation of the economic benefit dimension of the Energy Internet mainly focuses on two aspects: cost control and profitability. The cost control evaluation aims to assess the expenditures in energy Internet construction, operation and maintenance, and services, which can indirectly reflect the efficiency of energy Internet production, consumption, and services. It mainly includes investment and operation and maintenance costs, management service costs, cooling, heating and power coordination costs, and backup costs. Profitability evaluation mainly includes project operating income, investment recovery period, subsidy income, input-output ratio, etc.

3.3 Environmental Benefit Evaluation

The construction of the Energy Internet has always revolved around the overall goal of social clean, efficient, safe and sustainable energy development, proceeding from the overall concept and conforming to the environment-friendly development pattern. The evaluation of the environmental benefits of the Energy Internet mainly considers the optimization of energy structure, the level of energy conservation and emission reduction, and the ability to control pollutants.

Energy structure optimization is a comprehensive indicator to measure the structure of traditional energy and renewable energy. The energy saving and emission reduction level aims to assess the emission reduction level of carbon dioxide and conventional pollutants in the energy Internet system. Pollutant control capacity aims to examine the state's treatment policy for pollutant discharge and the treatment capacity of existing pollutants.

3.4 Social Benefit Evaluation

The social benefit of the Energy Internet is the ability to use various methods and approaches to meet the energy service consumption of various subjects such as residents, businesses and industries. The evaluation of the social benefits of the Energy Internet mainly considers three aspects: the ability to drive social development, the quality of energy services, and the ability to improve system interaction.

The social development driving ability aims to assess the social and economic benefits and market size of the energy Internet. Energy service quality aims to measure the system's ability to continuously supply energy and the user's satisfaction with the convenience and economy of the provided energy value-added services. The system interaction improvement capability is used to reflect the interaction level between the demand side and the energy system in the Energy Internet, reflecting the degree of interaction between the "source-load" and "load-load" of the Energy Internet and its contribution to the improvement of energy efficiency and the increase of the proportion of clean energy etc. contribution.

3.5 Technical Level Evaluation

Energy Internet needs the support of many key technologies. Technology is in the process of continuous evolution. Evaluating the level of technology, understanding the actual level of technology development, and grasping the future needs of technology can scientifically guide the development route of the Energy Internet and the formulation of strategic decisions. The evaluation of the technical level of the energy Internet mainly focuses on the technical maturity of the innovative application of cloud computing, big data, artificial intelligence, and the Internet of Things, the ability to identify data security risks, and the technological innovation of the energy Internet.

The technical maturity assessment of key technologies such as cloud computing, big data, artificial intelligence, and the Internet of Things can reflect the various attributes of key technologies of the Energy Internet and the weak links of individual technologies. The assessment results can be used to grasp the overall maturity level of the Energy Internet and clarify the energy The key direction of Internet construction is to ensure the realization of the expected functions of the Energy Internet. The assessment results can be used to grasp the overall maturity level of the Energy Internet and clarify the construction direction of the Energy Internet. Ensure the realization of the expected functions of the Energy Internet. The evaluation of data security risk identification capability aims to evaluate the data intrusion tolerance capability of the Energy Internet, comprehensively reflect the security status of the entire data life cycle under network attacks, and lay the foundation for the safe operation of the Energy Internet. The evaluation of energy Internet technology innovation can reflect the innovative application level of several key technologies that play an important supporting role in the construction of the energy Internet in various fields, and promote the transformation of the global energy Internet from strategic ideas into practical actions.

4. Suggestions on the Development of Energy Internet Business for Power Enterprises

Energy Internet is the specific realization form of the future energy system with the power system as the core. Promoting the interconnection of energy networks, comprehensively using new Internet technologies, and accelerating the construction of the energy Internet are an important fulcrum of energy transformation and the development direction of the power industry. Power companies are important participants in the current business model. Such enterprises carry out energy Internet business based on market demand and industry development, which can help enterprises improve the quality of investment, increase profits, and establish new ideas and paths for my country's clean and low-carbon energy transformation and development. Therefore, when power companies develop energy Internet business, they need to conduct in-depth research on the policy orientation, business structure, innovation mechanism, and financing channels of energy Internet. Through these methods, a practical foundation is laid for the development of the energy Internet business, and the improvement path is clarified.

4.1 Strengthen Policy Communication and Cooperation, and Strive for Favorable Policy Support

Effective communication and cooperation with the government, actively responding to relevant policy guidance, striving for favorable policy support, and actively cooperating with a sound and perfect market-oriented mechanism are the institutional guarantees for power companies to carry out energy Internet business. Improve power trading rules, optimize supervision methods, and improve the power trading market system. After completing the approval of the regional power grid transmission and distribution price and the electricity price standard for incremental power distribution business, power companies should actively respond to relevant government policies and guidance, put the new price formation mechanism into practice, and further promote the liberalization of incremental power distribution business.

4.2 Pay Attention to Market Development Trends and Continuously Improve Business Structure

With the proposal of "dual carbon goals" and the deepening of energy supply market reform, the electricity market will form a reform trend dominated by low-carbon development. As the operation of the carbon market becomes more and more mature, the interaction between the electricity market and the carbon market will profoundly affect the development of the energy Internet business of power companies. Therefore, in order to keep up with the trend of market development, power companies should establish a scientific and reasonable market evaluation mechanism, continuously optimize the existing business, and promote the rapid development of incremental business.

4.3 Stimulate the Vitality of Scientific and Technological Innovation and Improve the Level of Core Technology

The development of the Energy Internet is inseparable from the development of science and technology. Technological innovation is the key to enhancing the core competitiveness of the energy industry, as well as the key to the core competitiveness of future power companies. Electric power enterprises need to establish and improve the energy technology innovation mechanism to stimulate the innovation vitality of enterprises. Electric power enterprises need to promote the establishment of an innovation platform with enterprises as the main body that closely integrates energy technology and energy industry, and accelerate technology research and development in energy storage information communication, energy management and other aspects. State-owned power enterprises should accelerate the development of technical equipment. Private power enterprises should carry out energy technology innovation. Small and micro power companies should increase investment in research and development. Electric power enterprises should take the initiative to improve the

innovation mechanism and form an innovative situation of mass innovation and mass entrepreneurship.

4.4 Accelerate the Reform of the Financial System and Expand the Financing Channels for Enterprises

The construction and development of the energy Internet requires the upgrading and transformation of the existing energy network and energy equipment. At the same time, it is also necessary to increase research and development efforts in distributed renewable energy development technology, Internet technology, electronic power technology, and energy storage technology to accelerate technological innovation. It is also necessary to cultivate a large number of new energy talents, which are inseparable from sufficient financial support. Optimizing the financing environment, accelerating financial reforms, increasing social financing channels, and communicating corporate financing channels and social investment channels are crucial to the construction and development of energy Internet business for power companies.

5. Conclusion

Energy Internet is a product of deep integration of the energy field with automatic control, information processing, network communication and other fields. It is a fundamental revolution to the way of life of human society. For enterprises, the development of energy Internet business requires not only the innovation of energy technology itself, but also the reform of energy system, energy production and consumption model and business model. As one of the main forces to promote the construction of the energy Internet, power companies need to accelerate the development of energy Internet business.

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