Research on the Path and Technique Route of Power Grid Enterprises' Construction of New Energy-Centred Energy Internet Ecosystem

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Abstract. To build an Energy Internet Ecosystem and promote the extensive aggregation, financing innovation and value creation of industrial resource elements in new power system, Power Grid enterprises are not only the inevitable choice to comprehensively support the implementation of the strategic task, but also the role of Power Grid enterprises as "major powers and heavy weapons" to promote high-quality economic development. In the critical period of planning the 14th Five-Year Plan, existing researches have not provide Power Grid enterprises a clear and unified understanding of the "Energy Internet Ecosystem", and the working technology on how to build and develop the Energy Internet Ecosystem. With logical reasoning and practice induction ,this paper proposes the path and technique route of new energy centred Energy Internet Ecosystem, which has great strategic significance to carry out in-depth research on relevant issues.

Keywords: Energy Internet Ecosystem Construction Path Power Grid Enterprises

1 Introduction

With electricity as the center and a strong smart grid as the basic platform [1], the Energy Internet that deeply integrating advanced information and communication technology, control technology and advanced energy technology, supports the clean and low-carbon transformation of energy and power, the optimization of comprehensive energy utilization efficiency and the flexible and convenient access of multiple subjects, with clean and low-carbon, safe and reliable, ubiquitous interconnection, efficient interaction and open intelligent energy system [2].

This study treats the Energy Internet Ecosystem as a business ecosystem promoted by core enterprises, participated by upstream and downstream enterprises of the energy and power industry chain and relevant partners, users, governments and social institutions, which bases on the Energy Internet, with the carrier of Energy Internet business and operating according to a certain ecological mechanism [3], the goal of promoting openness, cooperation and sharing.

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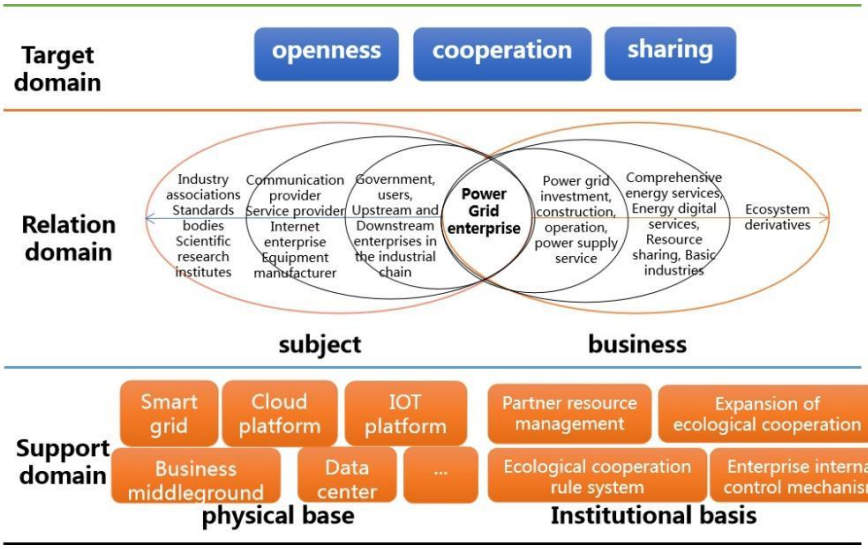

Fig. 1. Conceptual Model of Energy Internet Ecosystem led by Power Grid enterprises

1.1 Ecological subject

Power Grid enterprises as the core, includes main subjects such as upstream and downstream enterprises, users and government in the energy and power industry chain, as well as relevant partners, social institutions and other participants [4]. As Fig.1 presents, ecological cooperation relations are widely establish by various entities in Energy Internet business, including upstream and downstream supply, equity cooperation, technical cooperation, industrial alliance, product services, etc.

1.2 Business system

The Energy Internet business presents the overall characteristics of clear core, cross-border extension and fuzzy boundary. With the energy grid and information system, on the basis of consolidating the traditional energy transmission and power service business, Power Grid enterprises extend vertically along the upstream and downstream of the industrial chain on the energy production side and consumption side. Meanwhile, based on the sharing demand of society for resources, they promote the horizontal expansion of business by excavating the reuse value of basic resources, and evolve into a network that runs through the whole energy and power industry chain Business system with certain border openness.

1.3 Physical base

Which refers to the Energy Internet centered on electricity as the basic support platform. Among them, the grid system and information system are the infrastructure of the ecosystem and play a supporting role in the form of material and technology [5].

1.4 The institutional

Which is the institutional system for ecosystem's orderly operation, including the ecological enterprise management and control mechanism built by Power Grid enterprises as ecological owners (which can be called "internal ecological mechanism"), as well as the relevant mechanisms of ecological resource management and ecological relationship governance (which can be called "external ecological mechanism") formulated to promote the good interaction of all ecological subjects.

2 Developing requirements

In the 14th Five-Year Plan period, China's economic and social development environment has become more complex and changeable. The reform of power system and state-owned assets and state-owned enterprises has entered a critical period of comprehensive deepening and implementation. The clean and digital transformation of energy and power industry has accelerated. Power Grid enterprises are facing new situations and requirements in building and developing Energy Internet Ecosystem.

Firstly, the development environment at domestic and abroad is more complex and severe, and the pressure on stable economic growth continues to increase. Power Grid enterprises are required to give full play to the economic driving role of the Energy Internet Ecosystem and contribute to the modernization of national governance capacity.

Secondly, with the strengthening of industry supervision and the deepening of market-oriented reform, the operation and management transformation of Power Grid enterprises is becoming increasingly urgent. There is an urgent need to improve the ability to optimize the utilization of stock resources and the ability to break through and develop incremental markets in the Energy Internet Ecosystem.

Thirdly, the integration of the energy revolution and the digital revolution has deepened, and the transformation of the energy industry to clean and digital has accelerated. It is urgent to strengthen the construction of digital transformation technologies and facilities of the energy industry, innovate Energy Internet business formats, support the development of clean energy, meet diversified energy consumption needs, and lead industrial transformation and upgrading.

Fourthly, The Power Grid enterprise's strategy points out the direction for the development of the Energy Internet Ecosystem, and requires strengthening the development concept of openness, cooperation and win-win, so as to comprehensively improve the value creation ability of the ecosystem.

3 Developing position

Function of resource aggregation (energy accumulation). Building Energy Internet Ecosystem, provides rich and diverse resource sharing platforms and fair and reasonable cooperation mechanisms for Power Grid enterprises and partners, realizes the effective aggregation of industrial resource elements such as capital, data, technology and talents, supports Power Grid enterprises and ecological partners to break through their own resource and capability boundaries, and

forms a resource potential of "not owned by me and used by me", which meets the linkage needs of business development and enterprise growth [6].

Function of innovation incubation (enabling). Building Energy Internet Ecosystem, Power Grid enterprises will play the leading role of core enterprises, increase the construction of infrastructure such as data center and IOT platform, strengthen the research and development of common technologies, model tools and general standards, continuously consolidate the basic ability of ecosystem evolution, and form a basic support for ecological partners to cooperate in Energy Internet business innovation. Establish and improve the ecosystem cooperation mechanism, standardize the ecosystem operation rules, will stimulate the development vitality of the ecosystem, enhance the cross domain and cross industry network cooperation effect, explore customer needs and guide customer behavior in a wider range, and realize the derivation and incubation of emerging businesses at lower cost and higher efficiency.

Function of support driving (energy release). Building Energy Internet Ecosystem, will deepen the research and application of common technologies, establish and improve the cooperation and sharing mechanism, drive the linkage development of upstream and downstream enterprises in the industrial chain, promote the prosperity of the Energy Internet industry, and help the clean and digital transformation of the energy and power industry by building a technology platform and business platform. Relying on the advantages of Energy Internet ecological aggregation of cross industry data, it can provide the government with data products and services in many fields such as society, people's livelihood and industry, and effectively serve the improvement of government governance ability.

4 Developing path and relevant technology

4.1 Developing path

Focusing on the Functional positioning, to promote the construction and development of the Energy Internet Ecosystem of Power Grid enterprises during the 14th Five-Year Plan period, we should follow the basic idea of "two insistences, three efforts and one transformation", that is, adhere to the ecological development concept of openness, sharing and win-win cooperation, adhere to the guidance of user (customer) needs, and focus on "strengthening the foundation", "excellent business" and "building a mechanism", Consolidate the basic support capacity for the evolution and development of the Energy Internet Ecosystem, build a business development system carrying the creation of ecological value, build a governance system for the operation and development of the ecosystem, give full play to the role of the ecosystem in "gathering, enabling and releasing energy", realize the transformation from enterprise value standard to social value standard, and fully support the implementation of Power Grid enterprises' strategic tasks in the 14th Five-Year Plan, effectively serve the improvement of government governance capacity, and help the upgrading of energy and power industry and the transformation of energy industry.

4.2 Technique route

As the core enterprise, Power Grid enterprises mainly promote the construction and evolution of Energy Internet Ecosystem during the 14th Five-Year Plan period by the technique route of

"one main line, two drivers and three promotion", that is, taking the construction of "ecological power" as the main line, giving play to the driving role of digital technology and market mechanism, and actively promoting deep opening, precision empowerment and collaborative innovation.

"One main-line", that is, the main line of ecological power construction. This is not only the fundamental responsibility of Power Grid enterprises as the core role, but also the core advantage of Energy Internet Ecosystem of Power Grid enterprises. The construction of ecological power is mainly reflected in "one deepening and three constructions", that is, deepening the practice of the concept of ecological development and promoting the construction of basic support capacity, business development capacity and ecological governance capacity.

"Two drives", namely digital technology drive and market mechanism drive. Digitization is the technical trend of industrial development and industrial development and the most essential technical feature of Energy Internet. From the perspective of development, we must rely on digital technology to promote the evolution of Energy Internet Ecosystem of Power Grid enterprises. Marketization is the core feature of the change of industry structure and operation mode. It is the basic direction for Power Grid enterprises to promote internal change. From the perspective of governance, we must rely on the marketization mechanism to activate the evolution power of the Energy Internet Ecosystem.

"Three advances", i.e. promoting deep opening, precision empowerment and collaborative innovation. Promoting deep opening is a prerequisite for Power Grid enterprises to truly realize ecological development and build an ecosystem. They must "open the door" in capital and market, "share external data and technology", and "be fair" in rules and business formats. Promoting precise empowerment is the core function of Power Grid enterprises as "eco-master" enterprises. It needs to promote the ability of ecological partners through technology empowerment, data empowerment and platform empowerment, and jointly promote the evolution of the ecosystem to a higher level in cooperation. Promoting collaborative innovation is the fundamental way to realize the value of the ecosystem. Through business development, standard construction and mechanism construction, we should improve the cooperation efficiency of ecological partners, stimulate the willingness to cooperate, and realize product innovation, model innovation and format innovation through more cross-border cooperation around meeting the needs of users (customers).

5 Conclusion

During the 14th Five-Year Plan period, to build an Energy Internet Ecosystem, Power Grid enterprises should focus on the missions and tasks of serving company's strategy, helping partners' value creation, serving economic and social development, promoting energy and power transformation and industrial upgrading, strengthen the resource aggregation function, innovation incubation function and support and driving function of the ecosystem, and build a close cooperation an ecological network of mutual benefit, symbiosis and win-win cooperation.

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