

# Research on Energy-Saving Service Modes of Chinese Power Grid Enterprises under the Background of “Internet +”

Chengjie Wang and Yunpeng Zhang

**Abstract**—The concept of “Internet +” constitutes new opportunities and challenges for traditional energy-saving services industry in the new situations, which not only brings new thinking on the integration of Internet thinking with energy-saving services industry, but also brings the transition to the traditional energy-saving services mode. And it is particularly important for Chinese power grid energy-saving service enterprises to make good use of “Internet +” and realize the transformation of energy-saving service mode. This paper has developed a systematic and scientific development strategy of “Internet + energy-saving service mode”, and analyzed the transition direction of energy-saving services mode of the power grid enterprises and put forward concrete operating path and suggestions from the perspective of promoting the innovation-driven energy-saving services, process reengineering of the energy-saving service business, cross-border integration of energy-saving service industry, the reconstruction of the relationship among the parties involved in energy-saving service, and the ecological opening of the energy-saving services market.

**Index Terms**—Internet +, energy-saving service model, innovation driven, business process reengineering, cross-border integration.

## I. INTRODUCTION

“Internet +” refers to the diffusion of a complete set of information technology based on Internet (including mobile Internet, cloud computing, big data technology) in various sectors of the economy and society, and its essence lies in the realization of networking and digitization of the traditional industries [1]. In the third session of the twelfth National People's Congress in 2015, Premier Li Keqiang put forward the “Internet +” action plan in the government work report to promote the combination of mobile Internet, cloud computing, big data, Internet of Things and modern manufacturing industry, promote the healthy development of e-commerce, Industry Internet and online financing, include “Internet +” into the national top-level design and lift it into the national strategy level [2].

The concept of “Internet +” constitutes new opportunities and challenges for traditional energy-saving services industry in the new situations, which not only brings new thinking on the integration of Internet thinking with energy-saving services industry, but also brings the transition to the traditional energy-saving services mode. For a long period

of time to the future, the development and application of Internet technology is an important tool for the energy-saving services industry development of power grid enterprises [3]. As how to make good use of such a tool, realize the transformation of energy-saving services mode of the enterprise, improve the construction of enterprise energy-saving service system, optimize the energy-saving service of the enterprise, it needs to combine the current energy-saving service development situation with the development needs, to develop a systematic and scientific “Internet + energy-service mode” development strategy to make clear the future development objectives, ideas and approaches [4].

## II. GOAL ORIENTATION OF ENERGY-SAVING SERVICE INDUSTRY OF POWER GRID ENTERPRISES IN THE BACKGROUND OF “INTERNET +”

With the rapid development of the Internet, the energy-saving service industries of power grid enterprises shall make clear their own development goals and objectives. Committed to “applying Internet technology and platform, collaborate the resources within the grid enterprises, the upstream and downstream of the industries and other stakeholders, relying on the power transmission network and marketing service network with the most extensive coverage, fully playing the role of power grid enterprises, building the “open, sharing and collaborative” energy-service system based on the “Internet + energy-saving service” [1]-[4].

### A. Recent Goals

For the recent goals, the energy-saving service industries of power grid enterprises need to make full use of the existing Internet platform to optimize the internal resources and business, fully integrate and restructure the originally scattered energy-saving elements relying on the Internet, build a networking and open energy-saving service organizational structure, explore the new type of service models which are convenient for users and can improve the user experience, achieve the optimal allocation of resources, and promote the improvement of energy efficiency of the whole society [5].

### B. Medium Term Goals

For the medium term goals, the energy-saving service industries of power grid enterprises need to further strengthen the development and application of interconnection system of the data platform, to initially realize the data interoperability of the related downstream and upstream enterprises, realize the organic integration of

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online and offline business by collaborating the downstream and upstream resources and business. Interact with the user through the platform, analyze users' needs, develop online energy audit and evaluation, energy hosting, demand response and other value-added services, and ultimately build a personalized and interactive customer-centered value-added service system; further enhance user experience by meeting the "personalized" and "interactive" needs of the customer.

C. Long Term Goals

For the long term goals, on the basis of the interconnection of data platform, energy-saving service industry of power grid enterprises need to further develop data platform interconnected ecosystem, coordinate the resources and business of energy-saving service companies, equipment suppliers, energy using units, third party certification institutions for energy-saving service, government regulation departments and other stakeholders, create the energy-saving services overall solution with the network, platform, applications and services in one set, form the "Internet + energy-saving" ecosystem with the whole industry chain of energy-saving services, and eventually completely build the "open, sharing, interacting and coordinating" energy-saving service system [6] as shown in Fig. 1.

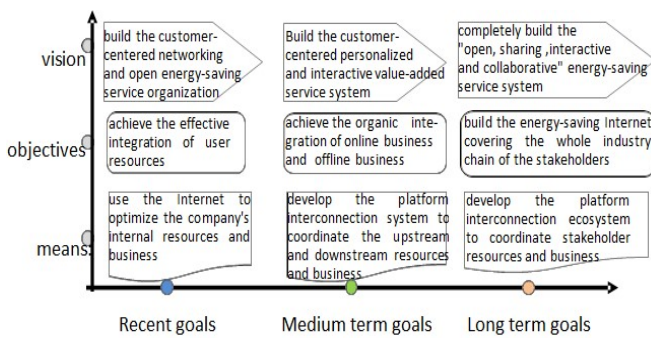


Fig. 1. General objectives.

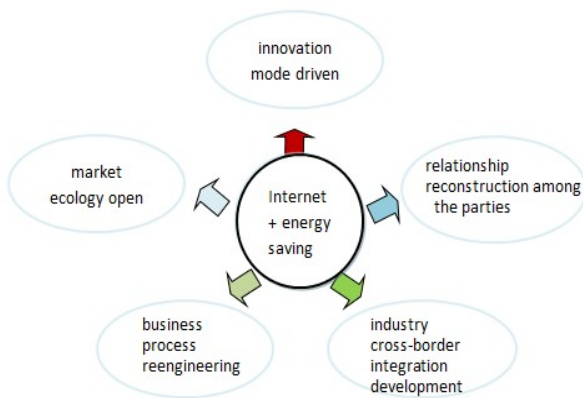


Fig. 2. The direction change in energy-saving service mode of power grid enterprise under the background of "Internet +".

III. ENERGY-SAVING SERVICE MODE

TRANSFORMATION OF POWER GRID ENTERPRISE UNDER THE BACKGROUND OF "INTERNET +"

With the full penetration of Internet thinking into all of the economic and social fields, which promotes the change of production and consumption patterns, "Internet + energy-

saving services" will also bring a new revolution in energy-saving industry, promote the transformation of energy-saving service business model, including the promotion of innovation-driven energy-saving services, process reengineering of the energy-saving service business, cross-border integration of energy-saving service industry, the reconstruction of the relationship among the parties involved in energy-saving service, and the ecological opening of the energy-saving services market, which is of great significance for the realization of effective allocation of social resources and the promotion of social efficiency and energy saving [5] as shown in Fig. 2.

A. Innovation Driven

"Internet + energy" will bring a new revolution in energy-saving industry, promote the innovation driven of the energy-saving service. It is mainly reflected in: first, the development of Internet technology makes the personalized, decentralized demand of a large number of customers closely dock with the energy-saving service companies, which changes the mode of "find customers – determine demand – seek equipment - carry out energy-saving service" of the traditional energy-saving service, showing a "de-channel" trend and creating new business models; second, realize the energy optimization and energy hosting, change the traditionally single energy-saving products sales model through the technical means of online monitoring. On the basis of contracted energy management benefit sharing, the energy-saving service companies will be transformed into energy cost hosting, energy efficiency plant and other more diversified business models; third, provide the fine management for the project operation, enterprise information resource integration, accurate docking of quality projects, the three is through the Internet platform to free brand image advertisement, and gradually realize the win-win development of the relevant parties [7].

B. Cross-Border Integration

The development of Internet technology will bring the cross-border integration of the energy saving service industry. On one side, with the high frequency interaction between customers and enterprises (especially the platform enterprises) and the use of mobile cloud calculation and big data, the traditional industries enterprises with producers as the center and the goods as boundaries will be transformed into the consumer centric, and demand oriented interconnected enterprises. Through the Internet platform, the energy-saving enterprises will accurately master the customer behavior, real-time sense and respond to the full range customer needs; in addition to the traditional sense of the industry products, they can also supply services of other industries to achieve low-cost and high-income cross-border. Second, the Internet technology will gather the originally segmented and decentralized massive customers into huge customer resources; the original single enterprise cannot meet the personalized and interactive demand of customers in such a scale, and it needs to build the platform and integrate the related products of the upstream and downstream industry chain, in order to provide all-weather and one-stop service for customers. In the platform operation mode, the enterprise and enterprises of other industries will "integrate" on the same platform and develop

together, which will become a new type of commercial activity.

### C. Structure Reconstruction

The combination of Internet and energy saving service mode will bring about the relationship reconstruction among the parties involved in energy saving. And it is especially reflected in the relationship reconstruction between the energy saving service companies and customers, relationship reconstruction between energy saving service companies and equipment providers and the cooperation relationship reconstruction between the energy saving service companies [8].

- 1) The relationship reconstruction between the energy saving service companies and customers. Under the promotion of the development of Internet, find and meet customer needs, restructure and use new type customer relationship has become an important driving force for the development of energy-saving service enterprises. Enterprises do not only need to meet the customer's product demand, but also need to meet the customer's full range services and personalized needs. The traditional model which takes the producer as the center and the commodity as the boundary will transform to the model which takes the customer as the center, and takes the direction of satisfying the customer demand, and the customers become the core resource of the enterprise.
- 2) The relationship reconstruction between energy saving service companies and equipment providers. The information and demand interaction between energy saving service companies and equipment providers can be realized on the basis of Internet platform; through the screening of basic information provided by the Internet platform equipment providers, it can help the energy-saving companies to select the equipment providers that can meet the requirements faster and better, in order to carry out the energy-saving cooperation in a more efficient way.
- 3) The cooperation relationship reconstruction between the energy saving service companies. The global energy Internet breaks the original geographical structure, cross regional cooperation between energy saving service companies in different regions around the world and within China can be realized through the energy Internet; the effectiveness of energy-saving services can be improved through sharing application of good energy-saving technology, energy-saving products, energy-saving service personnel, and share the benefits of energy saving.

### D. Business Process Reconstruction

In the age of Internet, enterprises will focus on customer needs and satisfaction to reconstruct the existing business process, to provide customized products and services, build the enterprise organization structure for networking and flexible development, improve the efficiency of communication and collaboration. It is mainly reflected in: first, organizational design shall take business processes as the foundation. The change of organizational structure should be designed according to the requirements of business process management and coordination, compress

the management level as much as possible through the establishment of process control procedures, establish the flat management structure, improve the operational efficiency and market reaction speed of the organization; second, the reconstruction of business process shall be people oriented [9]. Outside of the organization, the enterprise business process shall be designed based on the customer satisfaction, and give full consideration to the needs of customers, and establish a complete set of operation mode to maximize the satisfaction of the customers to improve user loyalty; inside the organization, the goal is to stimulate the enthusiasm and creativity of the employees, give employees the right to make decisions and give full play to each person's subjective initiative and potential.

### E. Open Ecology

"Internet +" encourages enterprises to open the ability and explore the integrated innovative mode from the basic resources, channel resources, data resources, product capabilities, marketing system and other aspects, so as to actively promote their own transformation with a more open attitude, and promote the Internet integration of the related industries to create a win-win ecological environment [10]. First, it is the product openness. For the products with great market demand, select these with better quality, take the way of ODM (original design manufacturer) for production, share the market; second, it is the platform openness. By building an open platform, gather the users need online, which in turn will affect the offline service and sales, achieve the online and offline organic synergy. At the same time, expand the marketing contacts, lift the loyalty of platform users and achieve a win-win situation while promoting the product sales of the partners; third, it is the marketing system openness. Energy-saving service companies need to reconstruct their marketing system, to achieve the Internet-based business. The forward and backward marketing capabilities can be enhanced through big data analysis, O2O and other ways, and at the same time, open the network marketing resources, and carry out integration and innovation with the cooperation partners to maximize the bilateral interests [11].

## IV. ENERGY-SAVING SERVICES OF POWER GRID ENTERPRISES UNDER THE BACKGROUND OF "INTERNET +"

The business areas of energy-saving service mode can be divided into two parts, the existing business and new business, among them, the existing business is mainly reflected in the integration of existing resources, while new business is mainly reflected in the enterprise energy audit, macro energy data management, online energy efficiency diagnosis, demand response, unified remote energy hosting etc. [12]-[16].

### A. Integration of Existing Resources

Integration of human resources: make full use of the advantages of the existing platform, create the exchange window, establish the energy-saving brand of power grid enterprises, strengthen internal exchanges and promote the development of talents. On one hand, improve the visibility

of energy-saving companies within the system so as to better promote the project through the online answering and typical case provision by energy-saving experts. On the other hand, establish the internal experts database, sort out the knowledge structure and technical expertise of the energy-saving experts, promote internal technology exchange and achieve internal technical resources sharing.

Integration of technology resource: energy-saving services involves many technologies, and different areas have different focus of energy-saving services, so inter-regional technology sharing, cooperation and win-win have been achieved by the advantages of marketing network of the power grid enterprises. On one hand, promote the inter-regional cooperation, realize the advantages of technology complementation, thereby increasing the competitiveness of the technology. On the other hand, create a knowledge base, as a new industry, energy saving services have the characteristics of a number of technical points, thereby, each unit shall form the typical case library to achieve the sharing of technology in accordance with their own business characteristics.

Integration of financial resources. Play the brand, capital and market advantages of the power grid enterprise, relying on customers, partners and other supply chain resources, build the Internet financial investment and financing platform to achieve the fund raising for the project.

#### B. Energy Audit of the Key Enterprises

The acquisition of on-site energy data by the traditional energy audit generally adopts the on-site measurement method, which has long duration, great labor intensity of the measurement personnel and high audit cost. Based on the configuration normalization and detection standardization of the energy meter, through the real-time acquisition of enterprise data by "Internet +", more extensive and more realistic data can be acquired at low cost, Use data mining and other analysis tools to find the weak links existing in the process of energy consumption and put forward the improvement proposal.

#### C. Macro Energy Data Management

For power grid enterprises, because the energy consumption data involves cost accounting business leaders often want to acquire the detailed and accurate energy consumption data of the sub-system; the traditional manual meter reading method is time-consuming and strenuous, and prone to error due to subjective reasons [12]. Use "Internet +" to achieve energy data management, and rapidly generate the energy report, which can effectively reduce the number of energy management personnel for the enterprises and improve the standardization and accuracy of energy data.

#### D. Online Energy Efficiency Diagnostics

Make full use of the advantages of existing power service management platform of the power grid enterprises, promote the enterprise energy consumption data to access the platform, carry out the summary, statistics and analysis of the energy consumption data for the key parts of enterprises in combination with the energy consumption model of the equipment and process, realize real-time monitoring, so as to put forward reasonable and personalized transformation program. At the same time,

assess the effectiveness after the energy-saving transformation of enterprises.

#### E. Demand Response

Based on the demand side response of "Internet +" technology, the release and feedback results of the demand response information can be quickly realized, and the response user groups at the demand side can be expanded, take the method of load integrators for enterprises with small demand load response space. With the help of online monitoring system of power consumption information and power service management platform of the power grid enterprises, guide the user to carry out in-depth understanding of the load characteristics, to further enhance the demand response space, thereby increasing the benefit of users and improving the user loyalty.

#### F. Unified Remote Energy Hosting

Based on the management mode of "Internet +", gradually develop the energy hosting business from the management of energy using equipment. Within a region (such as a Industrial Park), generally undertake electricity facilities hosting services for small and medium-sized enterprises, to provide professional services of internal power supply facilities operation and maintenance for the enterprises; include the electricity facilities control of all the enterprises into a unified management platform through the Internet, which can achieve the effective integration of the power equipment management human resources and save management cost for the enterprise.

On this basis, with a complete understanding of the enterprise's energy demand for production, the energy hosting services can be carried out, which is to contract the annual energy costs of the enterprise, and reduce energy costs and achieve profitability through energy-saving technological transformation and energy management optimization and other methods [13].

### V. THE CONSTRUCTION PATH OF THE ENERGY-SAVING SERVICE MODE OF POWER GRID ENTERPRISES UNDER THE BACKGROUND OF "INTERNET +"

- 1) Pilot test first, implement it step by step. Power grid enterprises should fully consider the regional differences and characteristics of the energy-saving work, and carry out the "Internet + energy-saving service" in the pilot areas and units, and when the conditions are mature, promote it orderly after summing up the experience.
- 2) Integrate the resources, play their advantages. Power grid enterprises should pay attention to integrate the resources of the energy-saving service companies, power supply units, research institutions, and the resources directly under the industry company, play their respective advantages, converge the efforts to nurture and develop "Internet + energy-saving service" industry, and enhance the comprehensive competitiveness.
- 3) Based on the market, long-term operation. Power grid enterprises should follow the market rules and the demand of the service object, fully combined with the

Internet thinking, gradually change the traditional energy-saving service mode, set up the new type energy-saving service operation mode to adapt to the market development needs; make full use of the existing Internet platform, and constantly tap the potential of the platform, and gradually form a long-term operation mechanism of energy efficiency management.

## VI. MEASURES AND SUGGESTIONS

Power grid enterprises should make full use of the tool of "Internet +", and actively take measures to transform the energy-saving service mode under the new situation.

- 1) Overall guidance, actively strive for the support of multi social resources. The departments in charge of power grid enterprises shall be responsible for coordinating the social resources and company resources, strengthen the communication with government departments, closely master the dynamic development of the Internet and energy-saving service industry, strengthen the guidance and support for the energy-saving service companies, and provide a strong backing support for the development of energy-saving service companies.
- 2) Give full play to the role of the platform. On the basis of the existing platform business, power grid enterprises should add the energy-saving services and electric energy alternative business sector, energy saving products and electrical equipment sales, energy saving and energy alternative case analysis, energy saving and energy alternative related technology and knowledge promotion, financing, customer service, tracking and other business contents of the energy-saving companies, realize the online and offline docking of the energy-saving services and energy alternative business.
- 3) Play the supporting role of the research institutes. Arrange the enterprise research institution to organize special personnel to research online expert diagnosis, technical support, online answering and other modules, and establish the energy-saving expert database, rely on the existing business platform, organize experts to carry out online diagnosis, online answering services, promote the cross-region cooperation of energy conservation through the online platform [14].
- 4) Give full play to the guiding role of pilot units. Select the pilot units, and combine with their own characteristics and advantages, play an exemplary role, rely on its own platform, integrate the enterprise information resources, mine big data in-depth, carry out the data analysis, effectively position the user needs through data analysis, carry out targeted and personalized services; further strengthen the platform development, and gradually realize the interoperability with government and social data platforms, promote the development of "fine management of project operation, accurate docking of quality project, free brand image publicity" and other value-added services.

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