



Research on the New Active Distribution Network Organization Model and Mechanism of Provincial Power Grid Enterprises Adapting to the Large Scale Development of Distributed Power Sources

Weixuan Meng^{1*}, Xiangyu Chen², Tian Guang², Yang Yang³, Ma Hao⁴, Dongfang Zhang¹, Xuesong Wang¹

¹ Dept. of Corporate Management Consulting State Grid Energy Research Institute CO., LTD. Beijing China

² State Grid Hebei Electric Power CO., LTD. Shijiazhuang Hebei China

³ Economic Research Institute of State Grid Hebei Electric Power CO., LTD. Shijiazhuang Hebei China

⁴ Marketing Service Center of State Grid Hebei Electric Power CO., LTD. Shijiazhuang Hebei China

*Corresponding author's e-mail: mengweixuan87@126.com

Abstract. The large-scale and systematic development of distributed power generation in China is becoming the main trend in the high-quality development of energy and electricity. With the rapid development of distributed power generation, provincial power grid enterprises urgently need to adjust and optimize policy system, organizational system, and business system to adapt to the power grid business of distributed power generation, and make precise efforts to better adapt to the development of distributed power generation. Provincial power grid enterprises such as Hebei Company should follow the "large department system" approach, and accelerate the implementation of business organization models and management mechanism optimization ideas and measures covering distribution network business, online business, and professional management.

Keywords: Distributed Power Sources Organization models Provincial power grid enterprise

1 Introduction

Under the new situation, provincial-level power grid enterprises are facing multiple constraints such as regulation, market, cost, and policy. Exploring and promoting the transformation of distribution network organizational models and management mechanisms is to seize the "master switch" of building organizations that meet strategic requirements. Empowering business transformation and upgrading, cultivating innovative development vitality, and strengthening the key foundation of power supply guarantee and power services in organizational and management upgrading will pro-

vide strategic support for provincial-level power grid enterprises to promote high-quality development of "one body, four wings".

The ecological organization that follows the development principle of "large department system" is an important direction for the evolution of large enterprise groups^[1], which is not only the key for enterprises to continuously acquire core competitiveness in uncertain environments^[2], but also an important mechanism for driving enterprises to continuously accumulate and obtain development momentum through organizational evolution, resource integration, and control upgrading^{[3][4]}. The large-scale development of distributed power generation is promoting the deep adjustment of organizational models and management mechanisms of provincial-level power grid enterprises, especially the business transformation based on digital management, which will accelerate the continuous improvement of organizational efficiency of provincial-level power grid enterprises^[5].

2 The Current Situation of Hebei Company

2.1 Continuously improving the support capacity of the distribution network

Firstly, Hebei Company scientifically strengthens supporting power grids, actively raise funds, and focus on increasing the reinforcement of power grids in photovoltaic rich areas such as western mountainous areas, in order to improve the carrying capacity of the power grid;

Secondly, Hebei Company continues to deepen the construction of new power systems, innovate the application of "distributed photovoltaic+energy storage" integration and grid control technology, and plan to implement demonstration projects for new power systems at the village, township, and county levels;

Thirdly, Hebei Company carries out the construction of distributed photovoltaic regulation mechanisms. Exploring a low-voltage distributed photovoltaic centralized control mode that integrates technology, platform, and regulations in pilot projects in Dingzhou and Xushui, Baoding. The technical route is included in the typical scheme of the State Grid.

2.2 Actively supporting the development of distributed photovoltaic science

Firstly, Hebei Company strengthens digital applications and build a rooftop distributed photovoltaic data sharing and control center. Research and application of a distributed photovoltaic development planning and analysis platform, integrating power consumption information collection, PMS, scheduling control and other systems, real-time monitoring of 9 types of data such as distributed photovoltaic access scale and equipment operation, intelligent calculation of the open capacity of 98 counties across the region, automatic positioning of distribution transformers and overvoltage users with penetration rates exceeding 80%, achieving comprehensive management of development monitoring, planning analysis, operation and maintenance.

Secondly, Hebei Company strengthens communication and establish regular consultation mechanism with manufacturers and users. Establish regular consultation

mechanisms with 25 photovoltaic manufacturers and industry associations, with company leaders leading in-depth visits to relevant power generation groups, photovoltaic development enterprises, and users. Actively promote government policy requirements, promote a basic understanding of the current power grid consumption situation and difficulties faced by the photovoltaic industry, basically eliminate complaints about 12398 photovoltaic, gradually address reverse overload and voltage exceeding limits, and enter a healthy, scientific, and orderly development track for distributed photovoltaic.

Thirdly, Hebei Company organizes grassroots research and optimize work priorities for key issues. Organize special research in Julu County, Xingtai, and other areas to form research results such as the "Research Report on Low Voltage Distributed Photovoltaic Access". Sort out and analyze outstanding issues in policy standards, management mechanisms, technical means, distribution network upgrades, and clean services, and propose targeted optimization measures.

3 The Main Problems of Hebei Company

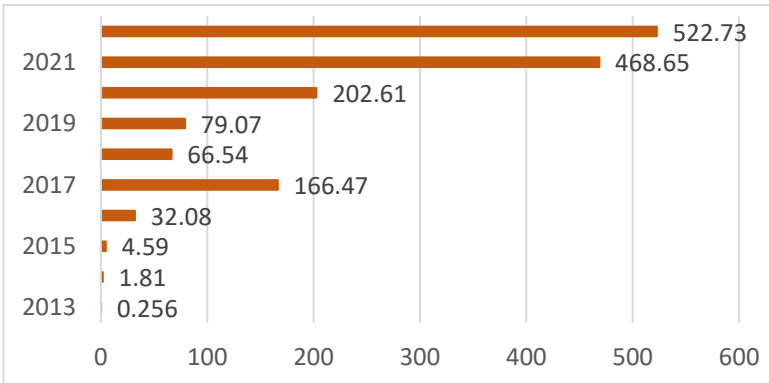
The challenges faced by the development of the active distribution network of Hebei Company mainly come from the spatiotemporal mismatch between the power supply side and the consumption side driven by policies, the asynchronous connection between distributed power generation and distribution network updates and upgrades, and the mismatch between professional management models and grassroots business operation requirements. The innovation of organizational models and management mechanisms urgently need to play a leading role in creating space for deep response to external demands and promotions of distribution network business upgrading (shown as Table 1).

Firstly, dividing responsibilities according to voltage levels has not yet optimized the organizational model according to the distributed power supply business chain, and grassroots human resources urgently need to be integrated.

Secondly, the focus of professional management is not sinking enough, and the assessment and accountability directions are inconsistent, resulting in risk issues of not being able to reach the profession and being uncontrollable at the grassroots level.

Thirdly, professional processes urgently need to be standardized, and efficient management mechanisms such as active distribution network scheduling, equipment, marketing, and security have not yet been established.

Table 1. Distributed photovoltaic grid connection of Hebei Company



3.1 Optimal Path of Hebei Company

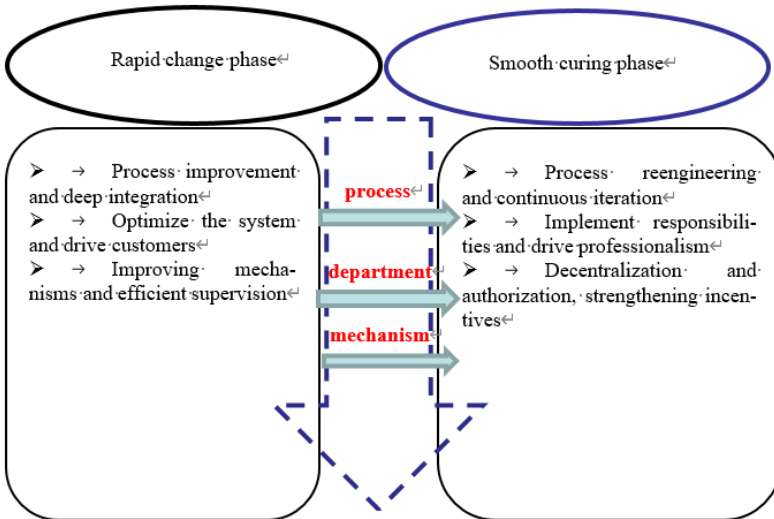


Fig. 1. Optimal Path of Hebei Company’s organization model

Optimal Path 1: Deeply leverage the strategic leadership and professional control role of Hebei Company's headquarters, and sink the focus of professional management. Explore the establishment of a distributed power supply business management organization or coordination mechanism, and strengthen grassroots business command, service, and shared support. (shown as Figure 1)

Optimal Path 2: Facing the direction of full business and full process online processing, we will focus on strengthening the connection between multiple professional chains such as power grid dispatch, equipment regulation, and business processing. Establish an information platform system that covers all levels of dispatch systems,

power supply service command platforms, equipment centralized control platforms, "Online State Grid" platforms, and new power load management systems.

Optimal Path 3: According to the requirements of full business chain management, focus on building a "full business, full process" leading management and professional coordination mechanism for power grid dispatch, equipment, marketing, security, and other aspects. In accordance with the requirements of "strong professional support and fast demand response", strengthen and revitalize grassroots professional support at different levels, and strengthen the planning and operation inspection teams of city and county companies.

4 The measures of Hebei Company

4.1 Two organizational optimization plans

Option 1: Building distribution network management center.

Starting from the full life-cycle management of equipment, we will coordinate and carry out management services related to the full business planning and construction, operation monitoring, system operation and maintenance of distributed power distribution networks.

Option 2: Building a power management center.

Connecting marketing, development, and equipment functions, coordinating various types of power supply access and management tasks, and focus on carrying out management services such as user interface, planning coordination, and operation monitoring.

4.2 Business processes optimization

As shown in Figure 2, overall, the distribution network business of Hebei Company will be upgraded based on the grassroots power supply service system and organizational mechanism. Through vertical connectivity and horizontal correlation, strong connections will be established between external service systems such as load management and online business, as well as internal systems such as dispatch systems, power supply services and command systems, and equipment centralized control systems, to promote the transmission of distribution network operation and maintenance pressure to planning, construction, and grid connection services, further enhance the organizational support potential under the development of active distribution network forms.

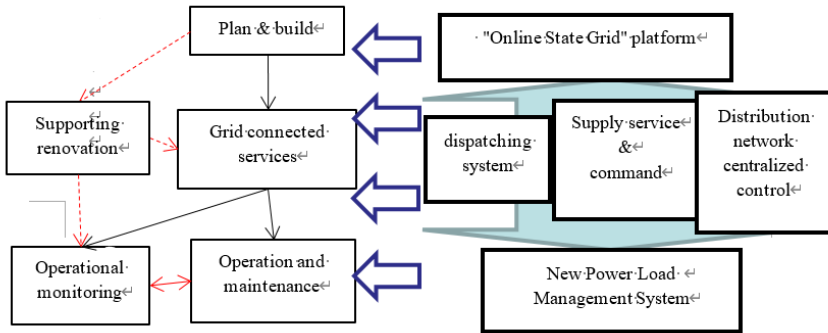


Fig. 2. Optimal Path of Hebei Province’s organization model

4.3 management mechanism optimization

4.3.1 Strengthen the planning and management of active distribution networks

Firstly, improving the coordination and management system for distribution network planning. Establish a highly flexible power grid planning and management system at the city and county levels, and adopt methods such as integrating different specialties or working together to solve the problem of insufficient planning professionals.

Secondly, strengthening the role of economic research institutes at all levels. Enhance the status of grassroots power supply stations in planning, enhance the allocation of planning talents in power supply stations, strengthen the training of planning and construction knowledge for power supply station personnel, and enhance the coordination of management terminal operation and distribution regulation.

Thirdly, establishing a sound distributed photovoltaic responsibility assessment system. Based on the development of distributed power sources in various cities and counties, research and improve the corresponding assessment system, and actively carry out pilot demonstrations.

4.3.2 Strengthen the operation and inspection management of active distribution networks

Firstly, conducting professional skills training for grassroots operations and maintenance. Developing safety-operating procedures for active distributed power grids. standardizing live-working process of multi-feed distributed power lines. strengthening technical training, and improve the skill level of operation and maintenance personnel;

Secondly, strengthening the construction of a comprehensive talent team at the grassroots level. At the city and county levels, exploring the construction of versatile management and skilled talents with diverse majors and comprehensive abilities.

achieving mutual assistance and substitution of personnel within the city and county levels, and granting more flexible resource allocation permissions.

5 Conclusion and Enlightenment

Based on the research on the distributed power supply business chain and drawing on the "large department system" approach, this study proposes a path for optimizing the organizational model and management mechanism of Hebei Company's new active distribution network, and focuses on three key measures: optimizing the business organizational system, reengineering online business processes, and optimizing professional management mechanisms.

Firstly, Hebei Company should carry out professional organizational efficiency evaluation and systematically deploy organizational optimization for city and county-level power supply companies in order to adapt to the basic requirements of the active distribution network organization mode. Secondly, Hebei Company should address the prominent shortcomings in the operation, maintenance, and external services of active power distribution in grassroots power supply locations, accelerate the improvement of flexibility in human resource allocation, and enhance the level of grassroots skilled talents.

Acknowledgments

Authors wishing to acknowledge support from State Grid Hebei electric power. co., LTD.'s management consulting project "Active distribution network organization and management mechanism adapted to the large-scale development of distributed power generation".

References

1. Ansoff, H. I. Corporate Management [M], McGraw-Hill, New York, 1965.
2. Morck R., Yeung B. Y. Never waste a good crisis: An historical perspective on comparative corporate governance[J]. Annual Review of Financial Economics, 2009, 1(1):145-79.
3. Mengweixuan, Chengjiaxu, Liu jin. Research on Operation Mechanism optimization framework of Power Grid Business Organization under the new circumstances[J].Journal of Physics: Conference Series (JPCS),2021.
4. Scott. Institutions and Organizations [M], Thousand Oaks, Calif.: Sage, 1995.
5. Wood E. Determinants of innovation in SME's [J]. See Michie and Smith. 1998: 119-145.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

