

# A Study on Key Issues of Promoting Sustainable Development of Regulatory Business in Power Grid Enterprises

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**Abstract.** At present, China's economic development keeps a steady recovery trend, with its endogenous power constantly increasing. However, due to the global pandemic situation as well as international political, economic, and other factors, the foundation of sustained economic recovery is still not solid, and the contradiction between the high-intensity development investment, the rigid cost growth, and the slowing electricity growth, difficulty of the benefit growth is increasingly prominent. Particularly, with the deepening of the power reform, the profit model of power grid enterprises has undergone significant changes. Various price cuts and fee reductions have caused the company's profit margin to be squeezed continuously, which puts forward urgent requirements for the sustainable development of the regulatory business in power grid enterprises. This paper first analyzes the main internal and external situations faced by the company's regulatory business. Then it puts forward the key measures for optimization and promotion of regulatory business in power grid enterprises from three aspects: enhancing the security capability of power grid, enhancing the service capability of power grid, and improving the operation efficiency of power grid. Finally, it gives conclusions and suggestions.

**Keywords:** sustainable development; regulatory business; security of power grid; service capability of power grid, operation efficiency of power grid

## 1 Introduction

In recent years, with the deepening of the reform of the electric power system, it is required to speed up the marketization of competing business activities, effectively break the administrative monopoly and prevent market monopoly [1]. For power grid enterprises, the regulation of cost investment, fair and open power grid, open and transparent information, and customer service level will be strengthened.

In terms of cost regulation, price and cost regulation will be further standardized and refined. The profit margin of power grid business will be reduced continuously, which will put forward requirements for cost control and efficiency improvement.

In terms of investment regulation, investment regulation is oriented by market demand, and great importance should be attached to the effectiveness and accuracy of investment.

In terms of improving customer service level, with the liberalization of competing business activities, market competition will become more intense, which requires the enterprises to provide rapid and timely responses to customer needs and continually improve service level and market competitiveness[2].

In terms of fair and open power grids, we should support the non-public economy to enter the power field and relax restrictions on market access. Resources should be utilized equally by different ownership entities according to law. Entities compete openly, fairly, and impartially.

In terms of information disclosure and transparency, stakeholders focus on information disclosure. The requirements for information disclosure such as cost, investment, operation, and power grid utilization of enterprises have been further enhanced[3].

## 2 Key strategies for regulatory business sustainability

Overall, to achieve the sustainable development of regulatory business, power grid enterprises need to improve the security capability, service capability and operation efficiency. Improving security capability is the objective requirement of building a new power system, improving service capability is an important feature of the new power system, and improving reform effectiveness and operational efficiency is the indispensable way to deepen the industry reform, as shown in Fig.1.

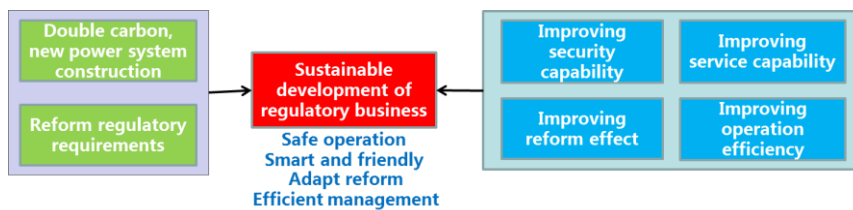


Figure 1 Logic Diagram of Enhancing National Security Guarantee Capability

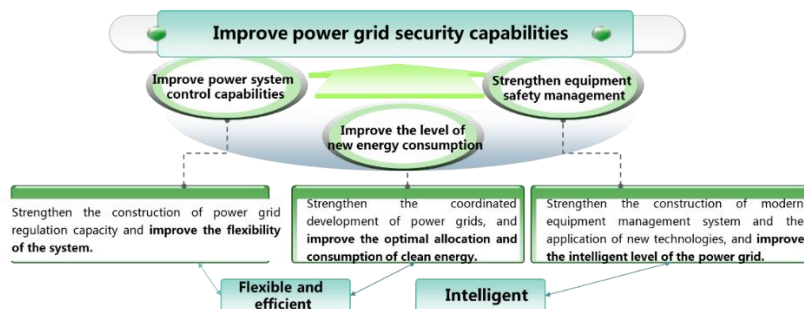


Figure 2 Logic Diagram of Enhancing National Security Guarantee Capability

## 2.1 Enhance the security capability of the power grid

The power grid enterprises should establish the overall national security concept, coordinate development and security. The power grid enterprises should realize the transformation to a more intelligent, flexible, and efficient management by improving the control ability, improving the level of new energy consumption, and strengthening equipment safety management, as shown in Fig.2.

### **Improvement on power system regulation capacity and energy and power reserve capacity:**

The power grid enterprises should strengthen the capacity construction of power grid regulation, expand the proportion of flexible power access, promote the development of energy storage technology, so as to form a flexible resource system with timely response and coordinated linkage between source, network, load and storage, and constantly improve the level of system flexibility.

First, power grid enterprises should strengthen the regulation ability of the power system. The power grid enterprises should improve and perfect the policy mechanism of power demand response, accelerate the marketization of ancillary services such as power peak shaving. The power grid enterprises should also improve the profit and rate of return of the energy storage industry at the power plant side, guide the power plant side to play a more active role in the energy storage market, and promote the technological development and industrial growth of the energy storage industry at the plant side. What's more, the power grid enterprises should also enhance the management of power demand side, guide and encourage power customers to explore peak shaving resources, participate in system peak shaving, and improve the ability of the demand side to participate in system peak shaving.

Second, power grid enterprises should improve the simulation analysis ability of the power grid. Relying on digital technology to implement upgrading and transformation, we will build an advanced power system simulation technology platform, conduct in-depth research on relevant operation mechanisms and key response technologies, and enhance the capabilities of power system informatization and security protection.

Third, power grid enterprises should coordinate with the flexible transformation of thermal power. Power grid enterprises should promote provinces to start the construction of peak shaving auxiliary market, promote the establishment and improvement of peak shaving and frequency modulation auxiliary service mechanism, and mobilize the enthusiasm of thermal power to participate in flexible transformation and peak shaving.

Fourth, power grid enterprises should strengthen the construction of multiple energy storage facilities. In accordance with the requirements of "integration of source, network, load and storage", energy storage facilities should be matched at the load side to enhance the flexible interaction ability of the load side. To ensure the comprehensive performance of the power system, the construction of pumped storage should be accelerated, and the layout of pumped storage should be optimized. Private enterprises and social capital should be encouraged to participate in the construction of pumped storage and electrochemical energy storage facilities and explore the business model of shared energy storage.

**Improvement on new energy consumption capacity:** To improve the optimal allocation and absorption capacity of clean energy in the grid, power grid enterprises should build a super-

large, interconnected power grid, promote the construction of UHV major grid, and enhance the transmission capacity of inter-provincial channels and the proportion of new energy power.

First, power grid enterprises should strengthen the implementation of unified dispatch of the whole network and enhance the ability of large power grid balance regulation. The requirements of adapting to the high proportion of new energy dispatching operation and consumption work should be implemented. To ensure the maximization of new energy consumption, power grid enterprises should uniformly utilize the reserve regulation resources across provinces and regions.

Second, power grid enterprises should enhance the intelligent level of dispatching systems. 5G communication, big data, artificial intelligence, and other new technologies will help power grid enterprises to improve the construction of multi-coordinated dispatching control platform for source-network-load-storage, build a smarter dispatching operation system with intelligence, efficiency, and multi-directional interaction, realize the perception and control of flexible regulation resources, and improve the flexible regulation ability of the power grid.

Third, we should arrange in an orderly way the construction of power transmission channels across provinces and regions. Clean energy should be transported preferentially. Enterprises should enhance the capacity of the mutual aid and supply of power grids. For the stock of transmission channels, based on the strength of the transmission and reception grid and safe operation, we should enhance the scale of supporting new energy. For the planning of new transmission channels, the target of renewable energy share can be achieved through the mode of “integration of wind, solar, water, fire and storage”. The feasibility of flexible transmission technologies such as “integration of wind, solar and storage” or even pure new energy transmission mode and flexible electric power transmission technique can be explored.

## **2.2 Improvement on the service capacity of the power grid**

The customer service orientation should be adopted in power grid enterprises. To support the national strategy and meet the needs of customers, power state enterprises should provide equal, interactive, and convenient service. The power state enterprises should provide more equalized service, actively serving the development of clean energy, and optimizing the business environment of electric power.

For the purpose of this paper, service equalization refers to enterprises providing customers with universal power services, accelerating the transformation of rural power grids in poor areas, and achieving common prosperity.

Service mutualization refers to enterprises serving the development of clean energy, carrying out collaborative and interactive research on source-network-load-storage, and promoting the optimal operation of elements of source-network-load-storage.

Service convenience refers to enterprises’ advanced knowledge of the customer needs, improvement of service response speed, and enhancement of customer service experience.

**Improvement on the service equalization:** Based on the company’s public utility attributes, we will play a supporting and guaranteeing role in promoting common prosperity, coordinated regional development, rural revitalization, environmental protection, emergency rescue and other major national policies and improving people’s livelihood, and improve service

equalization.

To improve the service equalization, the company should make joint efforts in infrastructure construction, universal power service and corporate social responsibility, make up for the gap in infrastructure, promote the construction of power market, and contribute to the realization of regional coordinated development, rural revitalization, and common prosperity in China.

In terms of infrastructure construction, we will promote the construction of power infrastructure in western and rural areas to make up for the gap in infrastructure. We will further promote East-West assistance, speed up the transformation and construction of rural power grids, optimize the compensation mechanism for power grid construction and cross-regional power transmission from the eastern region to the western region. We will try to realize the policy that “the east drives the west; the city drives the countryside”.

In the aspect of universal service of electricity, we should promote the construction of the electricity market and enhance the efficiency and fairness of service. The electricity is characteristic of “quasi-public goods”, which helps to improve the openness of the power grid and ensure the “equal opportunity” for different individuals to obtain electricity services.

In terms of corporate social responsibility, we should share corporate value with society and promote “three distributions”. The company should play the leading role and promote industrial upgrading, promote the high-quality funds flow to private enterprises, especially small and medium-sized enterprises, and improve the standard of living and increase employment opportunities.

**Proactive serving on clean energy development:** The power grid enterprise should play the role of a platform, coordinate the interaction between source, network, load, and storage. What’s more, the major customers and load aggregators should be actively involved in the development. The power grid enterprise should innovate service modes, which will meet the diversified and personalized energy needs of customers, enhance customer satisfaction and sense of acquisition, and promote the improvement of the comprehensive energy efficiency of the society.

The power grid enterprise should promote the construction of virtual power plants. The power grid enterprise should improve the efficiency of demand response. To form the integration and coordination of cross-space source-network-load-storage, realizing the utilization efficiency of energy and the maximization of power supply efficiency, the power grid enterprise should aggregate adjustable load, distributed generation, energy storage, charging and switching power stations, micro-grid and other resources through various forms such as virtual power plants.

Continue to improve the smart energy service platform. Using the provincial smart energy service platform, we can aggregate various resources such as adjustable load and energy storage on the customer side, realize the application of resource classification, guide customer side resources to participate in the demand response market, auxiliary service market, medium and long-term market and spot market transactions, enhance customer sense of gain and participation.

Construction of collaborative and interactive industrial ecosystem of source, network, load and storage. Encourage market players to actively participate in and expand the source network load storage collaborative interaction business in a flexible manner, improve the business model of sustainable development, promote the implementation of national support policies, guide the

wide participation of social resources, build a hierarchical source network load storage collaborative interaction industrial system and innovate the service model.

### **2.3 Improve the operation efficiency of the power grid**

**Improve the input-output efficiency of the power grid:** Operate and manage the company's assets from the perspective of overall assets, take into account the immediate needs and future development needs as a whole, strengthen cost control, reinforce precision investment, improve asset management, achieve the lowest life cycle cost and the highest cost performance, and continuously improve the input-output efficiency.

(1) Strengthen cost control, scientifically adjust the total cost, and gradually converge with supervision

Continuously optimize the cost structure. In accordance with the principle of ensuring safety and improving quality, taking the upper limit of national nuclear price rate as the boundary condition, and according to the actual needs of each unit, referring to the standard cost and affordability, taking into account the development stage of the power grid, continuously improve the classified cost structure.

Optimize the cost transmission mechanism of the grid supporting company. The regulatory business should pay the grid supporting company according to market prices and products. Therefore, it can realize the reasonable transmission of grid supporting company's cost to the power grid and the complete reflection of the power transmission and distribution cost.

Reduce the consumption of human and material resources reasonably and increase the development expenditure. Apply modern information and digital technology, take the difficulties and pain points of the company's production and operation management as the entry point, encourage management innovation and technological innovation, research and develop intelligent and automatic application platforms, and reduce dependence on human and material resources.

(2) Promote precise investment and realize the unification of "speed, quality and benefit" of power grid development

Coordinate the relationship between clean development and system cost to ensure the cost recovery of the new energy consumption system. Closely follow the National Energy Transformation Strategy, scientifically evaluate the impact of the "double carbon" goal on the rigid investment scale of the power grid, optimize the power grid investment layout, strive to dredge the contradiction between the rising cost on the energy supply side and the low cost on the demand side, and enhance the strategic value of the company's power grid investment[4].

Highlight the core concept of precision investment through quantitative analysis. Coordinate the relationship among ensuring safety, fulfilling responsibilities and investment benefits, reasonably balance the development needs and investment scale of power grids at all levels, and conduct star-rating on demand projects to prevent inefficient and ineffective investment.

Strengthen the regulatory integration. Promote the effective connection between development investment planning and government regulatory requirements, further strengthen communication with government departments, strive for favorable policy support, and improve the accuracy of development investment.

(3) Practice the concept of asset life-cycle and improve the value of assets and operation quality of power grid

Deepen asset life-cycle management. Focusing on the improvement of the quality and efficiency of asset operation, scientifically formulate the company's asset management strategy, strengthen the effective coordination among departments, strengthen the goal decomposition, measure implementation and performance evaluation, and realize the closed-loop management of asset life-cycle[5].

Strengthen lean management of production cost. Focusing on the core elements such as equipment, projects and business activities, steadily promote the projectization of power grid equipment operation and maintenance cost, take PMS and ERP financial data link as the main line, cooperate with financial multidimensional lean management, realize the cost collection and allocation of organization layer, station line layer and equipment layer, and promote the quantitative management of equipment life-cycle cost.

**Improve the efficiency of power grid business management:** Establish the concept of overall efficiency, strive to eliminate vertical execution resistance and horizontal coordination obstacles by strengthening the organic connection of all levels and disciplines, and continuously improve the company's efficient coordination and rapid response ability by reinforcing the application of emerging technologies.

(1) Carry out cross-professional and cross-level process re-engineering

At the headquarters level: optimize and improve the management and control mode, change the headquarters from the control center to the support, service and monitoring center, and provide necessary support for the resource allocation of "market front-end post" of grass-roots units.

At the provincial corporate level: further improve the awareness of internal support and external service of non-marketing departments and directly affiliated units.

At the level of local and municipal companies: improve the power supply service command system, strengthen the coordination and linkage of various departments and links of customer service, promote the establishment of a customer service chain with smooth operation and consistent value, form a working mechanism with the background for the front desk, the upstream for the downstream and all staff serving customers, to realize the transformation from "business orientation" to "customer orientation".

(2) Establish an efficient cooperative operation mechanism to promote the overall efficiency

Firmly establish an integrated enterprise perspective, coordinate all kinds of resources, exchange all kinds of information quickly, strengthen the collaborative linkage of various departments and processes, promote cross-level, cross-departmental and cross-professional efficient collaboration, greatly improve efficiency and reduce costs.

Establish an efficient collaborative operation mechanism with vertical connection, horizontal coordination and high terminal integration to promote the overall efficiency of the company.

(3) Use modern information and communication technology to improve operation management efficiency

Focus on the development of digitization, networking and intelligence, make in-depth use of

modern information technologies such as "big data, cloud computing, IoT, mobile internet and smart city chain", fully stimulate the value of data elements, bring into play the data multiplication effect, and promote the overall improvement of the company's power grid, management and service quality and efficiency.

### 3 Conclusion

For the power grid enterprises, they should fully grasp the regulatory requirements, fully respond to the concerns of the government and public opinion, and serve the national strategy and the improvement of people's livelihood, and further play a strong supporting role in promoting common prosperity, coordinated regional development, rural revitalization, environmental protection, social employment, emergency rescue and other national strategic deployments.

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### References

- [1] Jamal I. H. (2012) The impact of business regulatory reforms on economic growth[J]. *Journal of the Japanese and International Economies*, 26(3): 285-307.
- [2] Sakib Amin, Tooraj Jamasb, Rabindra Nepal. (2021) Regulatory reform and the relative efficacy of government versus private investment on energy consumption in South Asia[J]. *Economic Analysis and Policy*, 69: 421-433.
- [3] Alexander Kaller, Samantha Bielen, Wim Marneffe. (2018) The impact of regulatory quality and corruption on residential electricity prices in the context of electricity market reforms[J]. *Energy Policy*, 123: 514-524.
- [4] Jamal Ibrahim Haidar. (2012) The impact of business regulatory reforms on economic growth[J]. *Journal of the Japanese and International Economies*, 26(3): 285-307.
- [5] Hiroaki Nagayama. (2007) Effects of regulatory reforms in the electricity supply industry on electricity prices in developing countries[J]. *Energy Policy*, 35(6): 3440-3462.