Research on the New Marketing System for Large-Scale Power Generating Enterprises Participating in the Unified Electricity Market

Xiaodong Zhao[1, a], Xuda Hou[1, b], Guangze Shan[1, c], Bo Peng[2, *], Jiguang Zhang[2, d]

[1]Huadian Guangxi Energy Co. Ltd., Nanning, 530000, China
[2]Huadian Electric Power Science Research Institute Co., Ltd., Hangzhou, 310030, China

[a]391116761@qq.com, [b]7030532@qq.com, [c]444568814@qq.com,
*bo-peng@chder.com, [d]jiguang-zhang1@chder.com

Abstract. In view of the urgent situation of the construction of the national unified electricity market system, in accordance with the principle of "unified control, hierarchical authorization, high efficiency and flexibility", the new marketing management system mechanism of "vertical integration and horizontal synergy" of large-scale power generation enterprises has been innovatively put forward to help strengthen its ability to enhance the ability of power generation enterprises to integrate and optimize resources in large regions and to compete in the market.

Keywords: power generation companies; electricity market; marketing system

1 Introduction

Since the new round of electric power system reform, China's electricity market construction has been steady and orderly, and the competitive situation has become increasingly complex.2022 In January, China formally issued thedocument to clearly accelerate the construction of the national unified electricity market and put forward a number of reform tasks, such as sounding the multi-level unified electricity marketsystem and promoting the construction of regional markets. By the end of 2023, 28 regions in the country had carried out the practice of electricity spot market operation, in which the southern regional market realized the first trial run of the whole region spot settlement, and the construction of the national unified electricity market system had taken a key step[1].To actively integrate into the construction of the national unified electricity marketsystem, large-scale power generation enterprises urgently need to build a marketing management system adapted to the national unified electricity marketsystem[2-3], in order to fully connect the relationship between enterprises and the market in the allocation of resources, to coordinate and optimize the market competition, to enhance the optimization of the allocation of resources and the ability to compete in the market[4], to stimulate competition in marketing and the ability to create

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value, and to assist power generation enterprises in high-quality development of the marketing business.

This study focuses on the construction of a new marketing system for large power-generation enterprises to participate in the national unified electricity market. Based on the new characteristics of the construction of the national unified electricity market system, it analyses the impact of the construction of the national unified electricity market system on large power generation enterprises, and proposes operational management mechanisms from both horizontal and vertical dimensions.

2 New Features of the Construction of a Unified National Electricity Market System

Under the national unified electricity market system, the national market will operate in synergy with the provincial (autonomous regions and municipalities)/regional markets, and the medium and long-term, spot, and auxiliary service markets for electricity will be integrated in design and jointly operated to give full play to the fundamental role of the provincial (autonomous regions and municipalities) markets in the national unified electricity market system, improve the efficiency of electricity resource allocation within the provincial area, and safeguard the basic balance of the local electric power(As shown in Fig. 1) [5]. We will continue to promote mutual coupling and orderly convergence of different levels of markets, and when the time is ripe, the provincial (autonomous regions and municipalities) markets will be integrated with the national market, or multiple provinces (autonomous regions and municipalities) will jointly form a regional market and then be integrated with the national market[6-7].

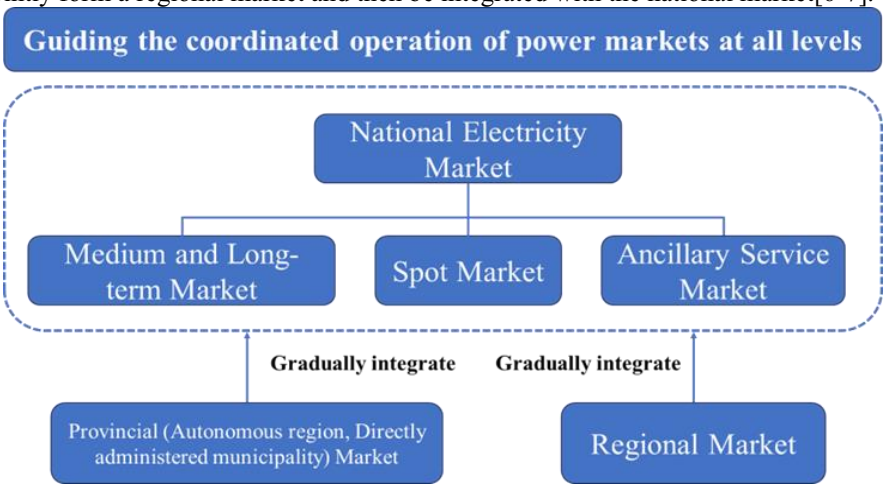

Fig. 1. Gradual integration of the various levels of electricity market synergistic operation under the national unified electricity market system

The construction of a unified national electricity market exhibits the following features:

1) Focusing on synergy and embodying a systematic problem-solving mindset.. The unified national electricity marketis reflected in the design of the market structure with multiple time dimensions of power trading products and multiple space spans between power purchasing and selling entities and their organic coordination, that is, the synergistic relationship between the power trading mechanisms of various trading cycles and the trading products of power trading platforms of different geographical scopes, and the integration of market construction and power planning, market construction and power grid operation and management, market construction and power costs, as well as the integration of electricity marketsystem construction of various types of markets. and the integration of market construction and power planning, market construction and grid operation and management, market construction and power cost, and the integration of the construction of the electricity marketsystem for each type of market[8].

2) Following the law and improving the efficiency of market resource allocation. Reconstructing the relationship between the market and the government, the role of the government focuses on the formulation of policies and regulations, market supervision and monitoring, and the provision of policy support for the supply of basic public services. As for the market mechanism, the core is the price market formation mechanism and transmission mechanism. The construction of the national electricity market is to improve the economy of power grid operation and the level of optimal allocation of power resources under the premise of guaranteeing the safe and stable operation of the power grid, organically combining the objective laws of power operation and the laws of the market economy, and ensuring that the results of the transactions satisfy the requirements of the continuity and orderly operation of the power grid while restoring the attributes of electric power commodities, so that the role of the market mechanism is brought into full play[9].

3) Strengthening supervision and giving full play to the key functions of the government. Government regulation is based on respecting the logic of the market, that is, better playing the role of the government on the basis of playing the decisive role of the market in resource allocation[8-9]. Further improve the modern electricity market regulatory system; enhance market regulatory capacity; strengthen monitoring and early warning, information sharing, and disclosure; strengthen the regulation of natural monopoly businesses of grid enterprises; improve the regulatory system for fair and open access to the grid; strengthen the regulation of permitted revenues from transmission and distribution of electricity; and promote the separation of accounting for transmission and distribution of electricity and the purchase and sale of electricity by grid enterprises[9-10].

4) Overcoming difficulties and breaking down barriers to cross-provincial and cross-regional transactions. Promote open cooperation among inter-provincial and inter-regional markets, classify and liberalize inter-provincial and inter-regional priority power generation plans, promote the conversion of national power delivery plans and local government power delivery agreements into government-authorized medium- and long-term contracts, achieve convergence with market mechanisms, and establish a mechanism for the participation of diversified market players in inter-provincial and

inter-regional transactions. Encourage and support power generation enterprises to conduct direct transactions with power selling companies and users. Strengthen the dynamic convergence between the cross-provincial and cross-regional and provincial markets in terms of economic responsibility and price formation mechanisms and maximize the use of cross-provincial and cross-regional affluent channels to optimize the allocation of power resources[11-12].

5) Optimizing mechanisms to promote the construction of new systems and energy transition. Adjustments have been made to market transactions and supporting mechanisms, mainly in the following areas. The first is to improve the adaptability of the electricity marketto a high proportion of new energy, further enrich market players, innovate new business models for power sales, guide regions to establish market-based cost recovery mechanisms for power generation capacity according to the actual situation, and improve the level of economic compensation for auxiliary services, power generation capacity, etc.[13]. The second is to explore the market-based mechanism for green power, discover the environmental value of green power in a market-based manner, reflect the priority status of green power in the organization of transactions, grid scheduling, etc., guide users in need to directly purchase green power, and effectively connect the green electricity marketto the new system. The second is to explore the green electricity marketization mechanism, discover the environmental value of green power in the market, reflect the priority status of green power in the organization of trading and dispatching of power grids, guide users with demand to buy green power directly, and effectively connect green power trading, green certificate trading, and carbon emission right trading[14].

3 Impact of the Construction of a Unified National Electricity Market System on Large Power Producers

At present,the national unified electricity marketsystemhas started practical exploration; the southern region has launched the country's first regional electricity market,the provincial market is in transition to the regional market start, and the national unified electricity marketsystem is accelerating. The impact of the national unified electricity marketsystem on large power generation enterprises is mainly reflected in three aspects: organizational system, talent, and technical support.

The first is the impact on the marketing management systems of power generation enterprises. Market competition and openness further highlight the requirements of power generation enterprises in a wider range of optimization of internal marketing resources and build a new marketing management system and mechanism to match the unified electricity market. At present, the provincial marketing centers of large-scale power generation enterprises are basically in their own situation, and in the face of a larger regional market, it is difficult to achieve unified decision-making, unified deployment, and inability to maximize the overall market efficiency of the enterprise, and should be accelerated to promote the construction of the national and regional marketing centers, and to establish a coordinated, effective, smooth operation of the new

mechanism within the scope of a larger market. In addition, large-scale power generation enterprises need to reform their thinking further, clarify the path of market-oriented institutional transformation, and establish assessment and incentive mechanisms to adapt to the new system.

Second, it puts forward higher requirements for the technical level of electricity market personnel. With the gradual expansion of the scope of transactions, the demand for power transactions presents diversified characteristics, power generation enterprises in marketing skills, transaction means, and other aspects of the need for further qualitative enhancement of the technical level of marketing management, and talent teams put forward higher requirements. By the end of 2023, the cumulative number of power generators registered on various power trading platforms exceeded 30,000, and the overall number of market players exceeded 740,000. At present, the number of marketing personnel in large-scale power generation enterprises in various regions varies, and there is a lack of marketing teams that are good at rules, good at systems, and capable of proposing efficient trading strategies and programs. The number and quality of existing marketing personnel are unable to satisfy the competitive environment of the national unified electricity market.

Third, it is a challenge to the management decision-making efficiency and technical level of the electricity market. In 2023, the national electricity market traded 5.7 trillion kWh of electricity, up 7.9 percent year-on-year, accounting for 61.4 percent of the proportion of total social electricity consumption. The national unified electricity marketneeds to deal with a larger amount of market transaction data, and the management decision-making efficiency and technical level of power generation enterprises have put forward higher requirements. At present, the construction of a marketing system for large-scale power generation enterprises cannot adapt to the needs of unified market operations on a large regional scale, and the construction of an auxiliary decision-making system for electricity markettransactions adapted to the national unified electricity marketsystem needs to be improved and optimized urgently.

4 Building a Marketing Management System Adapted to the National Unified Electricity Market System

To grasp the major development opportunity of the construction of the national unified electric electricity marketsystem and adapt to the requirements of the new electric power system, large-scale power generation enterprises should adopt the new marketing system construction principle of “unified control, hierarchical authorization, high efficiency and flexibility”, adhering to the concept of value creation, adhering to the marketing as a leader, and on the basis of the existing marketing management system, optimizing and perfecting, observing, and innovating. Optimize and improve, maintain the rights and innovation, and accelerate the construction of a marketing management system that adapts to the national unified electricity marketsystem.

4.1 "Vertically Integrated" Operational Management System

In accordance with the management idea of headquarters "general," regional "practical," grassroots "strong foundation," to create marketing "two small, the middle big the management and control structure of marketing is "small at both ends and big in the middle" to promote the flattening of business and management. At the headquarters level, the company will play a supervisory role in management services, highlight the synergy and optimization of market operations, rationalize the functions and responsibilities of business management, study the establishment of regional quotation centers in accordance with the route of the construction of a unified national electric electricity market, explore the establishment of inter-provincial and regional market-oriented trading institutions and mechanisms, coordinate inter-provincial and inter-regional businesses, and realize the optimization of inter-regional and national-level market operations. At the regional unit level, the company optimizes and improves the operation and control of provincial power generation enterprises, power sales companies, and operational quotation centers. At the level of regional direct units, it will optimize and perfect the "trinity" operation system of provincial power generation enterprises, power sales companies, and operation quotation centers, and strengthen the management functions of the Marketing Department. (As shown in Fig. 2)

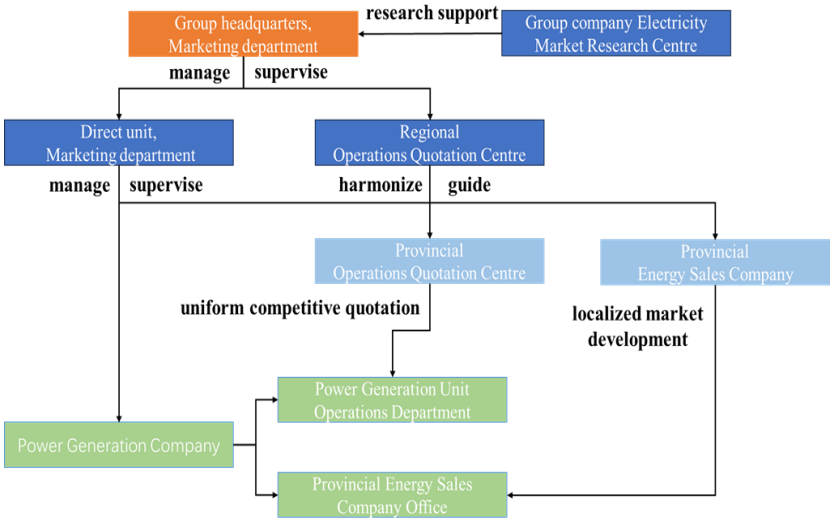

Fig. 2. Marketing Management System of Large Power Generating Enterprises Adapting to the National Unified Electricity Market System

4.1.1 Positioning of the Responsibilities of the Group Headquarters Organization.

Marketing Department of the Group Headquarters: The Group's marketing work is centralized and managed by the department responsible for interfacing with state ministries and commissions and relevant departments of the headquarters of the same type of enterprises, responsible for the top-level design and construction of new marketing

system and mechanism, guiding, serving, supervising and assessing the marketing departments of directly affiliated units, and responsible for the management, guidance, coordination and monitoring and assessment of the completion of the work of the regional offer centers.

Regional Operation and Quotation Center: Responsible for research on power reform policies and market development of the regional electricity market, research on and response to inter-provincial trading rules, analysis of power supply and demand situation, convergence and coordination of inter-provincial and intra-provincial trading[15], formulation, reporting, and implementation analysis of inter-provincial trading programs, etc., responsible for coordinating and guiding provincial quotation centers to carry out market trading, and is the unified outlet of exchanging data between the regional and the regional (national) power trading centers. It is the unified outlet for the exchange of data between the region and the regional (national) power trading centers, and has the right to suggest assessment of the provincial operation offer centers.

Electricity Market Research Center: Responsible for research on policy theory, market technology, and trading strategy, specifically carrying out electricity market policy research, situation analysis, risk prediction, technical research, analysis and evaluation of market trading and economic operation, marketing professional training, information technology research, etc., and providing technical and business support for the headquarters of the power generation enterprises and the regional market policy to strive for the economic operation and market competition strategy.

4.1.2 Positioning of the Institutional Responsibilities of the Regional Units.

The regional unit strengthens the "three-in-one" operation system of grassroots power plants, power sales companies, and quotation centers under the unified management of the Marketing Department. The regional unit is the main body of marketing and market competition for intra-provincial and inter-provincial transmission, and in accordance with the principle of "unified coordination, unified management, unified competition and unified optimization" it implements the unified management of the electricity sales business and realizes the maximization of regional benefits.

The marketing Department is the functional management department of marketing, responsible for establishing and improving the marketing "trinity" operation system and marketing management system of directly under the unit, responsible for the preparation of annual marketing target task plan, supervising the implementation of marketing indexes, responsible for the evaluation and assessment of the completion of the work tasks of power generation enterprises, power sales companies, and quotation centers, such as the plan of power consumption, market development, and so on. It is responsible for evaluating and assessing the completion of power generation enterprises, power sales companies, and quotation centers in terms of power plan, market development, etc. It is also responsible for striving for provincial policies, formulating competitive strategies, coordinating and managing the wholesale and retail electricity markets, and comprehensive energy service business within and between provinces.

An electricity sales company is the main implementation body for developing electricity users and carrying out comprehensive energy service businesses. Adopting the mode of "headquarters + offices": the headquarters is responsible for preparing and

adjusting the power sales plan, collecting information on power users, formulating market development plans, negotiating and signing retail transactions with customers, drawing up retail packages and wholesale procurement strategies after collecting and analyzing the load curves of power users (in regions where there is an operational quotation center, the quotation center will be responsible for the drawing up of the strategy) The office is responsible for contract signing, power sales settlement, deviation assessment management, exploring demand-side management business, and carrying out integrated energy services of "energy sales + services"; the office is responsible for localized market development and daily services for local users.

The Quotation Center is the main body of competitive quotations for electricity marketransactions. It is responsible for the unified competitive quotation on the wholesale side of the provincial electricity market, providing unit information and various types of statistical report information to the regional quotation center, accepting information related to the electricity marketin the five provinces and regions provided by the regional operation quotation center, carrying out policy interpretation, rule research, market research and judgment, monitoring the operation status of the power generating and consuming equipment, putting forward proposals on the optimization of electric coal transportation, economic operation of power generating equipment and demand-side management, and strengthening risk management and control. It is a unified outlet for the exchange of data between directly affiliated companies and provincial power-trading centers.

Grassroots power plants are the main body of production and operation target implementation. It organizes the economic operation and maintenance of power generation equipment in the plant to guarantee the reliability and safety of the equipment; cooperates with the preparation and support of spot data such as cost in the plant; assists the quotation center to carry out transaction decision-making; executes the transaction decision-making plan issued by the quotation center; assists the power sales company to carry out territorialized market development; provides resources and technical support for the sales network and customer service; and ensures market share within the area of responsibility.

4.2 "Horizontal Synergization" of Operational Management Mechanisms

In line with the innovation of the management system and to meet the needs of the construction of a unified national electricity market system, the following innovative mechanisms need to be established:

4.2.1 Synergistic Mechanisms for the Management of Production Transactions.

Production and trading business synergy is implemented with the goal of maximizing benefits and being oriented to marketing needs. Power generation enterprises specify parameters such as unit performance and operation, and data such as fuel costs, start-up and shutdown costs, and standby costs, and provide them to quotation centers. The quotation center carries out unified market transactions based on internal information such as power plant performance and operation and costs, and external information

such as market supply and demand; coordinates and coordinates the starting and stopping of units, operation adjustment, equipment maintenance, coal transfer, and transportation; scientifically allocates power generation resources; optimizes the structure of power consumption and the economic operation mode; and coordinates and formulates transaction strategies and unit operation plans to ensure market competitiveness and maximize the benefits of power consumption.

4.2.2 Mechanisms for Synergizing Decision-Making on Cross-Provincial and Intra-Provincial Transactions.

The regional operation quotation center is responsible for formulating inter-provincial trading strategies based on the power output of hydropower, thermal power, and new energy units and the available transmission capacity of inter-provincial corridors in each province, taking into account the actual supply and demand situation, and in accordance with the objective of maximizing the group's benefits, analyzing the power supply and demand situation in the region as well as the market information and forming analytical materials, which will be sent to the provincial quotation centers for guidance in formulating the trading strategies and providing the basis for decision-making for the procurement of fuels. Provincial offer centers are responsible for analyzing the supply and demand situation, power supply, line maintenance, etc. in the province, combining with the market information of the region, and according to the actual situation of the offering enterprises, and in accordance with the principle of "Trinity," formulating the trading strategy for the wholesale side of the offering enterprises in the province, completing the approval of the plan in accordance with decision-making procedures, and carrying out the trading operation, process supervision, settlement, statistical analysis, and information dissemination, etc. Provincial offer centers are also responsible for the development of inter-provincial trading strategies, statistical analysis, and information dissemination.

4.2.3 Synergistic Mechanisms for Economic Performance and Asset Optimization.

The regions and provinces combine asset distribution, power supply structure, and power generation characteristics, and in accordance with the production and operation management mechanism of determining power by efficiency, determining repair by sales, and determining coal by power, take into account the whole industry chain management and full-cycle value of fuel, carry out optimal scheduling and trading of fuel, reasonably arrange power generation operation modes, scientifically formulate power generation strategies for economic operation, and coordinate and optimize the power generation sequence, timing of generation, and substitution of power for thermal power, hydropower, wind power, and solar power, to effectively reduce power generation costs and enhance enterprise economic benefits. It also coordinates and optimizes the order, timing, and substitution of power generation for thermal power, hydropower, wind power, and solar power, effectively reducing power generation costs and improving the economic efficiency of the enterprise. Carry out market forecasting and assessment work to determine the market positioning and competitive strategies of each power plant and make asset optimization judgments and choices, including shutdowns and

technological reforms, to adapt to changes in the market. Focused on key indicators such as capacity, availability, reliability, flexibility, efficiency, and cost for optimization, strengthened industry benchmarking, tapped the potential of competitive elements, and improved the overall competitiveness of power generation assets.

4.2.4 Risk Prevention and Control and Assessment and Incentive Synergistic Mechanism.

It is essential to integrate risk monitoring and risk management into the entirety of the market supply and demand analysis process, competitive strategy formulation, operational scheme decision-making, operational result assessment, strategy and scheme adjustment and optimisation. Furthermore, risk identification and assessment must be carried out, including the risk of electricity price uncertainty in the electricity market. This is particularly relevant given the conditions of the electricity spot market, where power generating enterprises have 24 clearing prices per day and 8,760 prices per year, with inherent uncertainty. It is necessary to refine and clarify the business risk of the trading department, as well as to define the responsibilities and risks of the power plant in terms of production safety. Furthermore, a qualitative and quantitative assessment and incentive mechanism must be established that is appropriate to the risk. In order to adapt to market-based competition, it is necessary to establish assessment indicators and incentives that encourage power generation to operate at the lowest cost, with the best price and the greatest benefit. This should be done in a way that stimulates marketing vitality and revenue generation and efficiency, and flexibly supports the development of incentives linked to revenue.

4.2.5 Collaborative Support Mechanism for Market Research and Information Technology-Assisted Decision-Making.

It is recommended that the construction of the electricity market research team be accelerated; that the analysis and research capabilities of the national macro-economy, grid structure, key industries, important enterprises, and core users be strengthened; that in-depth research be conducted on theoretical and technological studies on market policies and responses, market forecasting and optimisation, market operations, and strategies; and that the ability to anticipate market trends and the competitiveness of market operations be enhanced. It is imperative to expedite the construction of information systems and related supporting facilities. This will facilitate the development and implementation of the electric energy trading system, the auxiliary service trading system, and the electric power simulation business platform. The latter will be equipped with fundamental business functions, including assisted decision-making in regional and provincial markets, marketing management, transaction management, contract management, statistical settlement, and analysis. The import of relevant internal and external information and data enables the realisation of comprehensive analysis functions, thereby providing support for the formulation of trading strategies and assisted decision-making.

5 Conclusion

The construction of a new marketing management system for large power generation enterprises to adapt to the national unified electricity marketsystem is an inevitable requirement to comply with the reform of the power system, and they should continue to optimize and improve the marketing management system and mechanism, strengthen the research of policies and rules and optimization of production and operation, and do a good job in the control of costs and risks to effectively stimulate the vitality of marketing and enhance the competitiveness of marketing.

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