Research on the development of domestic and foreign electricity sales markets serving the construction of electricity retail markets

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Abstract. The retail competition model is the most thorough form of electricity competition. This article elaborates on the concept and evolution of the electricity retail market. In the analysis part of the typical foreign electricity sales market, it focuses on the electricity markets in California, the United Kingdom and Australia; in the part of the analysis of typical domestic electricity sales markets, it focuses on some typical practices in provinces such as Guangdong, Shandong, and Zhejiang. Finally, it summarizes the experience in market access rules, transaction methods, credit management and control.

Keywords: Electricity retail; Power market construction; Admission to market; Trading Rules.

1. Concept of Electricity Retail Market
In the process of power reform, opening the transmission link can form a wholesale market, and opening the distribution link can form a retail market. Electricity retail does not involve any physical changes, it is just a commercial link. Retail is oriented to end users directly. It includes ordering, pricing, and electricity sales; it also includes metering, billing and charging. In fact, the electricity produced by a power generator cannot flow exactly to its designated users (Zhenxiang Han, 1997). It is only a financial contract if a power sales contract is established between the user and the retailer. In the future, retail competition will unfold. If users unfortunately choose a "bad" power supplier, it will not lead to unreliable power supply, nor will they encounter power outages. Different choices will only cause price differences. Retail costs account for about 3.3% to 4.7% of total power supply costs. Regardless of the introduction of initial competition in the retail sector or the establishment of a mature retail market in the future, it is a point that should be realized: the cost of retail business does not account for a large proportion of the total cost. The retail competition model is the most thorough form of electricity competition. Power generation and sale of electricity are all open to competition, except for the power transmission and distribution links that must maintain a monopoly. Compared with wholesale competition, the retail competition model not only allows large users to purchase electricity directly, but
also breaks the monopoly on power distribution companies to supply power to a wide range of users, allowing small users to freely choose power suppliers.

Looking at the literature on electricity market reforms, there is no uniform and precise definition of the theoretical meaning of electricity retail competition, although some national electricity departments have implemented some retail competition practices. Generally speaking, there are two statements: one believes that retail competition is Direct Access, which is to give all power users, including large industrial users, commercial users and residential users the right to enter the (wholesale) market and purchase electricity freely; the other thinks that retail competition is Consumer Choice, which gives power users the right to choose their own power service providers among power service companies such as LSE, including independent retailers, utility distributors and other power market participants. In the first argument, the essence is to bring end users to the wholesale market, which has already achieved full competition, thereby realizing competition in the retail sector; in the second argument, the essence is to introduce new suppliers in the retail link to realize the supply of multiple manufacturers, thereby realizing competition in the retail link. In fact, the two statements represent different proposals for introducing competition into the retail sector.

Many countries have completed these two types of markets step by step or simultaneously, as shown in Figure 1.

2. Typical Foreign Electricity Sales Market
The access rules for electricity sales companies mainly include assets, technology, management, and risk management.

2.1. California Electricity Market
Asset requirements:
(1) Electricity sales companies that participate in power market transactions for less than 6 months need to have assets of 00,000;
(2) Electricity sales companies that participate in power market transactions for 6 months or more need to have assets at least $100,000;
(3) The assets of the electricity sales company shall not be less than the estimated total amount of the agreement in the electricity retail market.

Companies applying for retail electricity sales are required to submit market transaction risk management and control policies, which specifically include the risk management framework, the scope of market transactions, the provision and training of professionals, the implementation of market transactions, and risk control limits.
2.2. UK Electricity Market
Since the full liberalization of the electricity retail market was introduced to the United Kingdom in 1999, both residential and non-residential customers can choose electricity suppliers freely. Different from power generation, transmission and distribution companies, an electricity supplier is defined as a commercial entity that pays for the distribution network and purchases electricity from the wholesale electricity market, and then sells it to its customers at a certain price. The functions include: signing contracts with power generation companies to purchase electricity, signing contracts with distribution companies to deliver the purchased electricity, and signing contracts with users to stipulate terms such as charging mechanisms and service content. Although the power supplier is not required to provide a certain amount of power or serve users in a specific area, its responsibilities stipulate that the power supplier must have the ability to predict the load demand of users and sufficient resources to ensure that the load demand of users is met.

2.3. Australian Electricity Market
In Australia, the only participants in the national electricity retail market are electricity retailers and users, and transmission and distribution service providers only undertake the transportation of electricity and charge corresponding "tolls" and equipment maintenance fees.

Technical and management requirements:
Entities applying to enter the retail market must have the corresponding technical and organizational capabilities to serve the energy industry, including:
(1) Professional technical ability. In order to ensure the quality of service, electricity sales companies must hire enough professionals and receive regular training to ensure that employees gain sufficient work experience.
(2) Organizational ability. Electricity sales companies applying for retail business must provide relevant information including organizational structure, business units, management personnel, and previous market transactions to prove their organizational capabilities.

Risk management policy:
The risk management policy of the retail electricity company that the regulatory authority stipulates should include operational and financial risks.

3. Typical Domestic Electricity Sales Market
3.1. Guangdong Electric Power Retail Market
Guangzhou power retail market grid companies, power sales companies and users that including large power users and general users, sign a tripartite contract. The electricity sales company signs the electricity purchase and sales contract with the user, and agrees on the electricity sales price package and other content, which are separately sent to the electricity trading agency for registration. The settlement basis of power trading institutions for electricity sales companies and users is tripartite contract and power purchase and sale contract.

In terms of credit management, if a power sales company exits the market due to special reasons such as poor operation, asset reorganization, or bankruptcy, it should notify the Southern Supervision Bureau of the National Energy Administration, the Guangdong Provincial Economic and Information Commission, the power trading agency, and the state grid enterprises and power users at least 45 days in advance. The electricity sales company shall fulfill all signed electricity purchase and sale contracts or transfer them before withdrawing, and handle related matters, otherwise they are not allowed to participate in the market anymore.

Information such as market contract prices and prices declared by market entities in the Guangzhou power retail market is private, and power trading institutions shall keep it confidential for a certain period of time. Companies that cause market fluctuations and losses to market entities due to information leakage will be investigated and held accountable by the Southern Supervision Bureau of the National Energy Administration and the Guangdong Economic and Information Commission.
3.2. **Shandong Electric Power Retail Market**

Electricity retail transactions in the Shandong Electric Power Retail Market include over-the-counter bilateral transactions and on-exchange retail transactions. Over-the-counter bilateral transactions refer to the way in which electricity sales companies and circuit users sign bilateral retail contracts for transactions. On-exchange retail transaction refers to the transaction method in which the retail company formulates and releases retail packages on the retail market trading platform and power users choose to confirm.

In terms of credit management, during the validity period of Shandong Electric Power Retail Market's retail package or bilateral retail contract, when the contract cannot be performed due to one of the power users or the power sales company, the power trading agency can deal with it in accordance with the package or contract termination agreement, and the arbitration agency has ruled by the judicial authority. At the same time, it is reported to Shandong Energy Regulatory Office and Provincial Energy Bureau for record.

3.3. **Zhejiang Electric Power Retail Market**

Electricity sales enterprises can avoid the risk of electricity deviation adjustment through annual bilateral negotiation transactions, monthly plan adjustments of contracts, and participation in monthly transactions; on this basis, the deviation between the actual power consumption and the current month's contract power is included in the transaction contract deviation fee.

The electricity sales enterprise submit the electricity purchase and sale contract in the prescribed template format through the electricity trading platform after the opening of the annual bilateral negotiated transaction. A user can only sign a power purchase contract with one power sales company, and the contract is valid until December 31 of each year. Grid companies regularly push information to power trading institutions on a monthly about the total monthly electricity consumption of all users participating in medium and long-term retail transactions, including those contracted by power sales companies. Electricity trading institutions provide the basis for monthly settlement in the wholesale market by this information to push grid companies for settlement.

In terms of credit management, if a power sales company exits the market due to special reasons such as poor operation, asset reorganization, or bankruptcy, it should notify the Provincial Development and Reform Commission (Energy Bureau), Zhejiang Energy Regulatory Office, power trading agencies, grid companies and power users and other related parties at least 30 working days in advance, and submit an application for deregistration to the power trading agency. In principle, the electricity sales companies should fulfill all signed electricity purchase and sales contracts and handle related matters before the company withdraws, otherwise they will not be allowed to participate in the market. If power users are unable to perform the contract, they should inform the electricity grid companies, related electricity sales companies, electricity trading institutions and other related parties in writing at least 30 working days in advance, and submit an application for deregistration to the power trading agency. In principle, power users should complete all signed power purchase and sales contracts and handle related matters.

4. **Suggestions**

4.1. **Market Access Rules**

Because the domestic power market has been developed for a short period of time, it often damages the power sales companies and power users while developing the retail industry. Therefore, there is an urgent need to improve the regulation of power sales services. When the regulatory authority authorizes a power sales company, it needs to formulate clear and enforceable regulations to evaluate the financial level, asset status, professional staffing and training level of the power sales company, the company’s organizational settings, and the ability to deal with energy market risks, etc, to ensure that the power sales company has the ability to provide users with high-quality and reliable electricity sales service.

The supervisory department should clarify the social situation and provide necessary guidance for the electricity sales company. For electricity sales companies whose qualifications have been revoked,
the regulatory authority should promptly publicize their information and the reasons for the cancellation to protect the interests of users.

Regarding the electricity sales companies that have entered the market, the regulator should pay attention to their transactions and analyze the risk factors of the electricity sales companies based on their financial status, transaction scale and execution. For power selling companies that are at risk, the regulatory authorities should review their operating qualifications in a timely manner to ensure the stable operation of the power retail market.

4.2. Transaction Methods
The gradual opening and perfection of the British electricity retail market has reference significance for China's electricity sales model reform (From heavy-load industrial and commercial users to civilian users, gradually expanding from England and Wales to Scotland, and finally establishing a unified market system across the UK), the model is suitable for China's large-scale power system with multiple levels and multiple tree-like structures. Based on the UK’s experience in the third power market reform from the power bank model to the NETA model, the refinement of China's electricity retail market and the establishment of a new market system need to keep up with the liberalization of operating electricity prices.

In the competitive electricity retail market, electricity futures trading should be the main trading method. Therefore, the system dispatch center can accurately predict the future load distribution and electricity price based on the futures trading volume and futures prices in the market, and on this basis, carry out effective power system forward planning to ensure the stable operation of the power system. This way can avoid the system supply and demand unsuitable due to the defects of the power system planning scheme.

4.3. Credit Control
With the partial liberalization of the electricity retail market, the marketing business is gradually decomposed from an integrated company to the joint responsibility of market members such as distribution operators and electricity retailers. Under the partial liberalization of electricity retail services, electricity retailers and power distribution companies can both charge end customers, but the charge content will be different, it depends on the electricity retailer's choice of charging method. No matter who charges the end customer, it will follow a basic principle, that is, "whoever charges, bears the risk of arrears by customers". Of course, we can also refer to the trading rules of the Singapore electricity retail market, it avoid risks by charging customers with margins and other forms.

In addition, in order to manage the credit risk of the electricity sales company, it is necessary to formulate a relevant credit management system based on the credit risk and transaction quota of the electricity sales company.

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