An Analysis of the Impact on the Electricity Market of Fully Liberalizing the Power Generation and Utilization Plans for Operating Power Users

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Abstract. In June 2019, the National Development and Reform Commission announced the “Notice on the Relevant Requirements for fully liberalizing the power generation and utilization plans for operating power users”, which means that the electricity generation plan for operational electricity users will be fully liberalized, except for residents and public utilities, other power users can participate in market-oriented power transactions. Therefore, it is urgent to study the impact of the introduction of policies on electricity market operations and electricity market transactions. First of all, this paper studies the process of opening up the electricity generation and utilization plans of foreign power users. Then, the impact of the policy on the electricity market is analyzed from the dimensions of market transaction size, market transaction entities, and market operation supervision. Finally, we analyzed the impact of the policy on the electricity market trading system from trading and management perspective.

1. Introduction
In recent years, in order to promote the implementation of reforms, the state has issued a series of policies aimed at advancing the reform of electricity marketization, further liberalizing development and use of electricity plans, and forming a more complete electricity market-based trading mechanism.

Since 2015, as the most important part of the new round of electricity reform "opening both ends", the reform of the electricity generation and utilization plans was launched in a small step and fast way. In March 2017, it was made clear that "the planned electricity consumption of existing coal-fired power generation enterprises will be reduced year by year"; in July 2018, it proposed the "electricity generation and utilization plans for four industries: coal, steel, nonferrous metals, and building materials." In June 2019, the National Development and Reform Commission announced the "Notice on the Relevant Requirements for fully liberalizing the power generation and utilization plans for operating power users" on its website, which fully liberalized the electricity generation and utilization plans for operational electricity users. The reform has taken a crucial step, and further expanded the scope of electricity marketization on the basis of four industries.

Among the existing literature, literature [1] [2] analyzes the policy connotation, literature [3] [4] analyzes the impact of policy from the perspective of evolution and law, and literature [5] proposes a policy implementation model with the province as the main body and suggestions. However, in the existing literature, there is a lack of analysis of the impact of policies on electricity market operations and electricity market transactions. Therefore, this paper focuses on this aspect.
2. The history of the power generation and utilization plans of foreign power users

The wave of market-oriented reform of the power industry in the world started in the 1990s. Developed countries represented by the United Kingdom, the United States, and Australia have taken the lead in deregulating and market-oriented reforms of the power industry. In the reform process, most countries first introduced competition on the power generation side, and then gradually liberalized the electricity sales market. The opening of the electricity sales market usually starts with large power users, and then gradually transitions to ordinary users. The establishment of the Japanese power retail market is a typical example.

After more than 20 years of power market reform, most developed countries have established an open and competitive electricity retail market. The following table shows the opening years of electricity retail markets in some countries.

| countries         | years | countries       | years |
|-------------------|-------|-----------------|-------|
| Australia         | 2002  | Italy           | 2002  |
| Austria           | 2001  | Korea           | 2001  |
| Belgium           | 2007  | Netherlands     | 2001  |
| Czech Republic    | 2006  | New Zealand     | 1994  |
| Denmark           | 2003  | Norway          | 1997  |
| Finland           | 1998  | Poland          | 2007  |
| France            | 2007  | Portugal        | 2006  |
| Germany           | 1998  | Spain           | 2003  |
| Greece            | 2007  | Sweden          | 1996  |
| Hungary           | 2000  | Turkey          | 2003  |
| Ireland           | 2000  | the United Kingdom | 1999 |
| the United States | 1996  | Japan           | 2016  |
| Canada            | 2001  |                 |       |

Although the establishment of competitive electricity retail markets in various countries is very different, the goals of the reforms in various countries are basically same: breaking the monopoly, introducing competition, building a regulated and fair competition electricity market, striving to improve efficiency, reducing costs and electricity prices, improving service quality, and protecting the legality of the majority of power users rights and interests. Moreover, the reforms of various countries have touched on two aspects: breaking the vertical integration monopoly of the power industry and introducing competition on the basis of the separation of vertical integration, and establishing a competitive power market.

3. Analysis of the impact of the electricity generation and utilization plans for operating power users on the electricity market

In recent years, in order to promote the implementation of reforms, the state has issued a series of policies aimed at forming a more complete electricity market-based trading mechanism. The process of electricity market reform is shown in the figure.
3.1. Impact on the scale of electricity market transactions

The full liberalization of the power generation and utilization plans for operating power users means that more market players can enter the power market without restrictions on voltage levels and power consumption. It is worth noting that the coal, steel, and other industries which had released previously development plans for electricity use have a higher degree of marketization and a stronger market awareness, and have the experience in participating in the marketization of electricity in the early stage. In contrast, the annual electricity consumption of general industrial and commercial users are smaller, but the base is huge, and the resulting surge in transaction electricity will inevitably have an impact on the existing market mechanism. According to the research report of Guojin Securities, the full liberalization of the power generation and utilization plans for operating power users is expected to bring an increase of 200 billion to 300 billion kWh market-oriented transactions this year.

3.2. Impact on power market trading entities

(1) Impact on power users

Safely and reliably meeting electricity demand. A reasonable cross-regional and cross-provincial electricity purchase and sale price mechanism is conducive to promoting cross-regional and cross-province electricity purchase and sale transactions, and helping to solve the electricity demand of electricity purchase provinces.

Reducing the user's electricity price level. The floor electricity price of the receiving province is lower than the local coal-fired benchmark electricity price, which lowers the average electricity purchase price of the electricity purchase provincial power grid company, and provides space for the adjustment of sales electricity price through the electricity price transmission chain.

Reducing local environmental pressure. Purchasing electricity from wealthy areas not only meets the local electricity demand, but also reduces the long-distance transportation of coal. This has a very positive effect on reducing the emission of local carbon dioxide, sulfur dioxide, nitrogen oxides and other pollutants, and on promoting local energy saving and emission reduction.

(2) Impact on power generation companies

Under the existing price mechanism, some power generation companies' earnings will be affected. For coal-fired power will form a further "strike", in many places, the base power used by the unit for "survival" will continue to decrease until it is canceled. Due to the need to repay loans and assessment requirements for the number of hours used, the number of power plants that generate electricity at a loss may increase further. For new energy power generation enterprises, although there are mechanisms such as priority power generation plans, "guaranteed quantity and guaranteed price", and "guaranteed quantity and competitive price", they still increase market competition and investment recovery risks.

(3) Impact on power grid companies

The market share of power grid companies has decreased. The decline in the market share of power grid companies is mainly affected by the lower barriers to market access for users. Electricity sales
companies can represent large users and small and medium users in cross-region and cross-province transactions, so that the market share of power grid companies is divided.

Both the pressure of electricity purchase competition and the risks of the electricity purchase market have increased. After the electricity sales company intervenes, a multi-buyer structure will be formed, and the power grid enterprises will face the direct pressure of power purchase by agents: On the one hand, power grid companies' market share has declined due to reduced electricity purchases, and market influence will decline. On the other hand, power grid companies have to face the power purchase competition of the power selling companies, and have to bear the risk of corresponding power purchase price increases. With the gradual liberalization of the power generation and utilization plans for operating power users, the power grid will mainly serve power users and non-operating users who choose not to enter the market. Finally, the share of electricity sales will gradually decrease, and the main business will become the provision of transmission and distribution services.

3.3 Impact on electricity market operation and regulation

(1) The flexibility of the grid operation mode is reduced, which affects the reliability of the system

In the current situation where most of the regions have not established a spot market, the power generation plan will continue to be liberalized, which will put greater pressure on dispatch. Dispatching needs to face multiple target constraints, including mid- and long-term contract execution, clean energy guaranteed acquisitions, etc. The available balancing methods are reduced compared to before, so the flexibility of the grid operation mode is reduced, which affects the reliability of the system. In order to ensure the implementation of cross-region and cross-province direct transactions, it is recommended to pay attention to the transmission paths that are more severely blocked, and select areas and transmission paths that are less prone to blockages for transactions. After the construction of the electricity market is gradually improved, it will be fully promoted.

(2) A test of regulation

The regulatory issues brought about by the full liberalization of the power generation and utilization plans for operating power users require special attention. In addition to the challenges to the existing market mechanism, the rapid expansion of the number of market players and the scale of transactions. These have brought market regulators the ability to supervise and how to ensure that supervision is in place. Therefore, electric power trading institutions should strengthen their own capacity building, and build an open and transparent electric power trading platform with perfect functions.

4. The impact of fully liberalizing the power generation and utilization plan for operating power users on the existing trading system

(1) Transaction

The current direct transactions of large users are all carried out through planned scheduling, and the actual power consumption curve and power generation curve are not very related to the transaction. Restricted by factors such as real-time power balance, safety constraints and transmission constraints, there will be a certain deviation between the contractual power execution of the power generation entity and the actual power consumption.

Therefore, it is necessary to maintain the electricity load characteristics during the transaction. In order to maintain the user's electricity characteristics and avoid increasing the peak shaving pressure of the system, in the early stage, direct trading power should distinguish peak-to-valley power and implement peak-to-valley electricity prices. The peak-to-valley electricity price ratio should not be lower than that of the province where it is located. In areas where conditions permit, both the generator and the consumer are encouraged to provide load curves. In the mid-term, efforts are made to achieve basic matching of electricity in direct transactions. Both the power generation and consumption parties need to provide load curves, but they are not strictly required to fulfill them. In the later period, all power sellers need to provide the estimated output curve; and all power buyers need to provide the estimated power consumption curve.
(2) Management

Power trading institutions should strengthen their own capabilities, and improve the registration, publicity, commitment, and filing systems for power users in key industries. In addition, they should establish a credit evaluation index system for different market players, introduce national industry associations, credit service agencies and power trading institutions, and establish a credit evaluation system. Besides, institutions should also strengthen their credit awareness, and restrict market entities with bad credit records from participating in market-oriented power transactions. And the market subject credit indicator framework is shown below.

![Figure 2. The market subject credit indicator framework](image)

5. Conclusion

The fully liberalizing the power generation and utilization plans for operating power users means that more market entities can enter the power market without being restricted by voltage levels and power consumption. It also means that there are more power market transaction entities and an increase in the power market transaction scale. This article firstly analyzes the process of power generation and electricity release in foreign countries, and then analyzes the impact of this policy from the dimensions of electricity market operations and electricity market transactions. The research in this paper shows that the policy has different impacts on the main players of the power market, and brings changes to the power trading system at the transaction and management levels.

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