

Research on major theoretical issues of power regulation under the goal of "carbon peaking and carbon neutrality"

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Abstract: Under the goal of "carbon peaking and carbon neutrality", my country will accelerate the construction of a new power system with new energy as the main body. The power regulatory system is facing some major problems, including the strengthening of the public attributes of the power grid and the "death spiral" caused by distributed power sources. The discussion and cracking of these major issues will promote the continuous improvement of power supervision in innovative development.

1. Introduction

In 2020, China put forward the development goal of "strive to reach the peak of carbon dioxide emissions by 2030 and strive to achieve carbon neutrality by 2060" (that is, the goal of "carbon peaking and carbon neutrality"). Build a new power system with new energy as the main body". Under the goal of "carbon peaking and carbon neutrality", along with the switching of the main power source, the adjustment of the operating mechanism, the change of the energy consumption mode, and the reshaping of the market system, the existing power structure, development mode, industrial form, institutional mechanism, Science and technology will undergo profound changes. Among them, power supervision is a major institutional arrangement in the power management system, which will face some major theoretical innovation problems, which will force the continuous innovation and development of the power supervision system.

At present, scholars have begun to discuss related issues. For example, Ruibo Energy Think Tank (2015) systematically introduced the international experience in the regulation of the low-carbon power industry in the United States [1]; Lu Yanguo (2021) discussed accelerating the construction of a new power system from the perspective of building a new credit-based power supervision mechanism [2]. But overall, the current research is still in the exploratory stage.

2. Issues related to electricity regulation caused by low carbon

Taking into account factors such as the development of the electricity market and technological progress, the following important issues that need to be focused on in future electricity regulation may exist.

2.1 The public attributes of the power grid are continuously strengthened

Under the "dual carbon" goal, the power grid infrastructure will carry more social functions, and the "externality" will continue to increase, which will inevitably lead to strengthened supervision and more likely to tend to "downward" strict supervision.

First, the "externality" of electricity to the economy and society has been continuously strengthened. Under the "dual carbon" goal, the replacement of fossil energy in power generation and terminal sectors will be accelerated, the proportion of electricity in energy consumption will continue to rise, and the penetration into transportation, environmental protection, international trade, and living

consumption will be accelerated. For example, from 2000 to 2020, the proportion of electric energy in final energy consumption in my country increased from 14.5% to 27%, an increase of 12.5 percentage points. In this context, the "externality" of electricity to the national economy is significantly enhanced. For example, when transportation is more electrified, electricity supply will deeply affect transportation operations.

Second, the society's "sensitivity" to changes in electricity prices has increased. Due to the improvement of electrification level, the future electricity price changes will attract more attention from all walks of life, the trend of "difficult to rise and easy to fall" will become more obvious, and the permitted income of the power grid will face the possibility of "downward" strict supervision. For power grid companies, it becomes more difficult to coordinate economic, political and social responsibilities.

2.2 The "death spiral" poses a challenge to the supervision method of transmission and distribution prices

The rapid development of distributed power sources will, on the one hand, lead to a decline in power sales and revenue, but on the other hand, the investment in access to distributed power grids will increase, which will intensify the upward pressure on transmission and distribution prices. Further stimulate users to develop distributed power sources instead of buying electricity from the big grid. This means that the traditional power transmission and distribution price supervision model may face "failure" and cannot ensure that power grid companies obtain reasonable income.

In essence, the reason for this problem is that there has been a major change in the way the power grid creates value. The traditional "transmission function" has evolved into "transmission and capacity backup functions." As a result, the reserve value of grid capacity cannot be compensated under the traditional electricity price monitoring mode.

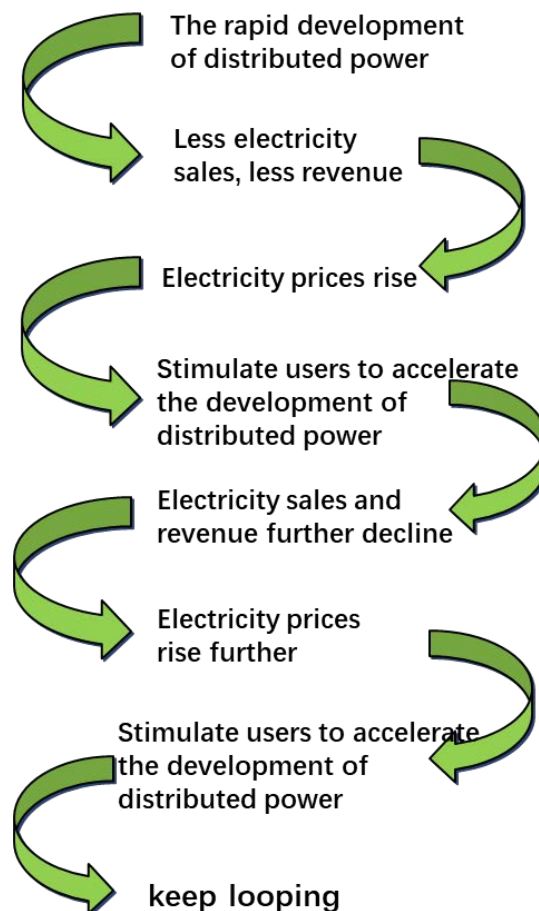


Figure 1. The "death spiral" phenomenon caused by the development of distributed power generation.

2.3 Data may become an important new content of grid supervision in the future

In the digital age, power data resources have gradually highlighted strategic value and become an important factor of production. However, due to the special nature of the natural monopoly of the power grid, data supervision will become an important new content of power grid supervision. The use of power data by grid companies may face three regulatory requirements:

First, the large-scale use of power data needs to meet the regulatory requirements of national network security and privacy protection. Recently, my country is speeding up the establishment and improvement of the regulatory policy system for online information, and strengthening the supervision and governance of the Internet platform economy, aiming at safeguarding national network security, protecting consumer interests, and maintaining market fairness. Regulatory review. Electric power data is generally large in scale, far exceeding the scale of 1 million users. It needs to be used carefully, without any negative impact on national network security, and without infringing on personal or corporate privacy.

Second, some power data are derived from valid assets and may face regulatory discussions on whether to deduct permitted income. When the power data has a large application value, the characteristics of the power grid assets will inevitably lead to the theoretical discussion of whether it is a part of the effective assets or "derivative assets", which will lead to the income generated by the future data being fully or partially offset by the allowable income. Possibility.

The third is the support of power data for competitive businesses, which may be questioned as unfair competition. Co-construction and sharing of power data will become an important way for power grid companies to promote the coordinated development of the industrial chain. In the future, data support may have important commercial value and become an important source for competitive businesses to gain market competitiveness, which may become another aspect of power grid supervision. Important areas.

3. Conclusions and Recommendations

Based on the above analysis, this paper draws the following conclusions: First, under the "dual carbon" goal, due to the transformation of energy consumption to electricity, the public attributes of the power grid are continuously strengthened. Second, the development of distributed new energy and the increase in transmission and distribution prices have entered into an endless cycle of mutual reinforcement, triggering the phenomenon of "death spiral" in the power grid, and challenging the traditional monitoring and auditing methods of recovering transmission and distribution prices through electricity. Third, in the digital age, power data will also become the focus of power supervision.

At the same time, the policy recommendations for power regulation in this paper are as follows:

First, accelerate the expansion of non-grid business profit sources. With the strengthening of the public attributes of the power grid, it is difficult for the power grid business to obtain sufficient profits from the perspective of optimal supervision, and it is impossible to systematically guarantee the basic requirements of power grid enterprises for the continuous growth of operating profits. Source of profit.

The second is to improve the transmission and distribution price supervision mechanism. In the transmission and distribution price pricing mechanism, in accordance with the principle of "who benefits, who bears", the charging mechanism for the value of grid capacity is strengthened; in terms of reliability supervision, a reasonable reduction in the reliability of power supply is allowed.

The third is to improve the management and application of power data. When developing and utilizing power data resources, prudently cooperate with foreign capital, and do not introduce foreigners in the "three meetings and one layer"; advance research on the incentive compatibility mechanism for the utilization of data resources and the corresponding mechanism for returning some profits to users, and put forward policy suggestions in a timely manner; During the transition period, to speed up the sharing and support of data resources and enhance the market competitiveness of competitive businesses, in the long run, it is necessary to promote standardized management and effective isolation of data resources.

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