Energy Revolution and the Energy Demand Side Management in China

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Abstract. China's energy revolution has put forward new requirements for energy demand side management. For a long time, China's energy demand side management lacks legalized and institutionalized policy and legal guarantee, which inhibits the role of energy demand side management in promoting sustainable economic and social development and energy structure transformation and upgrading. Based on the analysis of the status of China's energy demand side management policies and laws and the existing problems such as low level of legislation, poor operability and focusing on power demand side management, suggestions on the legislation of China's energy demand side management are put forward.

1. Introduction

As the largest energy consumer in the world, how to effectively guarantee the national energy security and effectively guarantee the national economic and social development is a major problem facing China's energy development [1]. In China's current energy structure, the dominant position of coal has not changed substantially, and the proportion of clean energy is still small. In order to cope with the increasingly prominent resource and environmental constraints, China has put forward the requirements of promoting the revolution of energy production and consumption, restraining unreasonable energy consumption and establishing a diversified supply system [2]. The report of the 19th national congress of the communist party of China clearly stated that it is necessary to adhere to the principle of giving priority to conservation and form a spatial pattern, an industrial structure, a mode of production and a way of life that conserving resources and protecting the environment. In the context of comprehensively advancing the rule of law, the establishment of the national strategy of energy revolution urgently requires the improvement of energy rule of law.

In the field of energy regulation, energy demand side management is an important measure for energy conservation and emission reduction. Since the introduction of the concept of energy demand side in the 1990s, China has made remarkable achievements in energy demand side management through a series of policies and legal measures. With China's economic and social development in recent years emphasizing on the quality of development, energy demand side management has been widely promoted and developed. According to statistics, through the implementation of power demand side management, from 2012 to 2016, a total of 55.3 billion kWh of electricity was saved, and 12.68 million kW of capacity was saved, exceeding the target by 13.1 billion kWh and 3.59 million kW respectively [3]. Nevertheless, in terms of energy demand side, there is still a big gap between China's energy output efficiency and that of developed countries, and there is still a large space for energy efficiency improvement (see figure 1). According to the 2015 level, China's comparable energy consumptions of steel, copper smelting, electrolytic aluminium and cement are 1.03, 1.03, 1.05 and 1.16 times of the international advanced
level, respectively.[4] Generally speaking, China still lags behind the international advanced level in energy efficiency.

![figure 1: Comparison of energy consumption (kg of oil equivalent) per $1000 of GDP](image)

Figure 1. Comparison of energy consumption (kg of oil equivalent) per $1000 of GDP
(The data are collected from the World Bank Open Data)

Therefore, realizing the effective control of energy consumption quantity and intensity through demand side management become the important choice for improving the quality of China's economic development, the energy transformation and upgrading of the energy structure. In the context of promoting the rule of law, turning beneficial practices of the demand side management in China into legal measures also plays a positive role in the energy revolution.

2. Concept of Energy Demand Side Management

The meaning of energy demand side management is using administrative and fiscal incentives to encourage demand side to use a variety of effective energy saving technologies, and to change the mode of energy demand, on the premise of securing energy service level, so as to effectively reduce energy consumption and load levels and to increase social and economic and environmental benefits [5]. Historically, energy supply side management began with a situation of tight energy supply. With the development of economy, energy supply cannot meet the ever-expanding energy demand. Based on the goal of energy security and social and economic stability, countries in energy-stressed regions adopt corresponding policies and regulations to control energy demand and regulate energy demand to ease the energy tension [6]. In the 1970s, the oil crisis caused by the fourth Middle East war resulted in oil shortage and soaring oil price, which posed a serious threat to the energy security and economic development of western countries. Due to the shortage of energy supply, the western countries represented by the United States began to pay attention to the management from the demand side, so as to rationally and effectively use energy resources and reduce energy consumption. In order to realize the adjustment of demand side, a series of related laws, regulations, standards and policies have been issued, thus forming the policy and legal system of demand side management [7].

Due to the important role of electricity in national economy, demand side management mainly focuses on demand side management of electricity. Electricity demand side management is referred to as taking effective measures and appropriate incentives to promote power generation companies, power grid companies, energy service companies, social intermediary organizations and power users to work together so as to improve the efficiency of power consumption and change the mode of electricity, while meeting the function to reduce power consumption and demand for electricity, save resources and protect the environment [8]. Demand side management mainly includes energy efficiency improvement, load management, energy substitution and residual energy recovery, distributed power supply and new power consumption services.
3. Policy and Legal Status of Energy Demand Side Management in China

In the early 1990s, the concept of energy demand side management was introduced into China and attracted the attention of the government. In order to implement energy demand side management, China has promulgated a series of laws, departmental regulations and other policies and legal documents. For example, the Energy Conservation Act in 1997 (revised in 2016), the Power Conservation Regulation in 2000, and the Guiding Opinions on Strengthening Power Demand Side Management in 2004. Among them, the Energy Conservation Act 2016 and the Power Demand Side Management Measures 2017 are the most representative.

3.1. Energy Conservation Act 2016

The Energy Conservation Act 2016 clarifies the responsibilities of the government and puts forward clear energy conservation requirements and measures for industry, construction, transportation, public institutions and key energy-using units. Any unit or individual shall have the right to report any act of wasting energy. This act clearly defines the legal status of power demand side management. The state will support the promotion of energy conservation measures such as demand side management, contract energy management and voluntary agreement on energy conservation through fiscal, taxation and pricing policies. According to the law, the state will establish mandatory energy efficiency standards for energy-using products and equipment and energy consumption quota standards for energy-intensive products during production, encourage the development of energy conservation service institutions, and formulate relevant legal responsibilities and incentive measures.

3.2. Power Demand Side Management Measures 2017

In order to further strengthen the power demand side management and thoroughly implement the national energy conservation and emission reduction strategy, in November 2010, the National Development and Reform Commission and other six ministries and commissions jointly issued the Power Demand Side Management Measures. The regulation was revised on September 20, 2017. The main contents of this regulation include: implementing the power demand side management assessment and evaluation system of power grid enterprises. The competent government departments shall formulate and release the annual electric power saving targets for power grid enterprises at the corresponding level, and organize the assessment of the completion of the annual targets. In principle, the power and electric quantity saving index in the current year shall not be lower than 0.3% of the maximum electricity load and 0.3% of the electricity sold in the previous year in the power selling business area of power grid enterprises. Power grid enterprises can organize their own implementation or purchase services to achieve their targets.

4. Deficits in the Demand Side Management in China

It can be found from the status of China's energy demand side management policies and laws that China's demand side management legislation has the following three major problems.

4.1. Relatively Low Level of Legislation

The departmental regulations represented by Power Demand Side Management Measures 2017 are at a low level of legislation, making it difficult to establish the legal status of the measures related to demand side management. According to the provisions of article 80 (2) of the Legislative Act, the matters provided in the departmental regulations shall be those relating to the implementation of laws or administrative regulations, decisions or orders of the state council. Without the basis of laws or administrative regulations, decisions and orders of the state council, the regulations of a department shall not set up norms that impair the rights or increase the obligations of citizens, legal persons and other organizations, or increase the powers or reduce the statutory responsibilities of the department. Because energy demand side management involves the vital interests of public institutions and energy users, legislation on energy demand side using departmental regulations cannot fully guarantee the
compliance of relevant provisions, and this also limits the scope and measures involved in demand side management [9].

4.2. Poor Operability of Related Policies and Legal Measures

On the one hand, there are many advocating expressions in relevant laws and regulations, but there is no corresponding in specific measures. For example, in demand side management, expressions such as "encourage" and "support" account for the vast majority of clauses, and these clauses lack coercive force in terms of safeguard measures. Such expressions are also common in basic laws directly related to energy demand side management, such as the Renewable Energy Act and the Energy Conservation Act, without corresponding legal systems and measures [10]. Even though the relevant provisions set out the legal obligations of demand side management, there is no corresponding legal liability in the chapter of legal liabilities to ensure their implementation. The essence of demand-side management is the internalization of external costs or the requirement to produce positive externalities of production. Therefore, from the perspective of cost-benefit analysis, it is difficult for relevant subjects to take the initiative in the absence of positive incentives or punishment measures. If the obligations are not secured by legal responsibility, then the coercive force, executive force and authority of the law will be reduced, thus forming a "soft law" situation in which the energy demand side management mainly presents advocacy without compulsion or obligation without responsibility. However, there is a lack of necessary legal accountability mechanism for power enterprises to complete the goal of demand side management and take corresponding measures actively. Due to the conflict between the implementation of demand side management and the goal of electric power enterprises to obtain economic benefits by selling electricity, the lack of such supervision, assessment and responsibility mechanism makes electric power enterprises lack the initiative to implement demand side management [11].

4.3. Power Demand Side Management as the Main Focus

At present, power demand side management is the main form of energy demand side management implemented in China [12]. The documents aforesaid mainly focus on power demand side management when referring to demand side management. However, demand side management is not limited to demand side management of power [13]. It is pointed out that the energy industry that could have been integrated, but in the current situation of power shortage, our attention is naturally limited to a narrow range of power demand side management, the space for thinking is limited by ourselves, and our vision and creativity are greatly constrained. In recent years, power supply and demand situation is undergoing profound changes in China, and the power demand growth is gradually slowed, rising by an annual rate of 5.7% during twelfth five-year period, while the average annual growth rate of electricity generation is 9.3% [3]. At the same time, China is faced with renewable energy consumption contradictions. As the growth rate of electricity consumption slows down and the installed capacity of renewable energy increases rapidly, the curtailment of renewable energy has become an intractable issue. Therefore, substantial changes have taken place in the main target of demand side management, while only focusing on the power demand side management cannot adapt to the current economic and social development and the new demand of energy revolution.

5. Suggestions on Energy Demand Side Management in China

5.1. Improve the Legislation Level and Clarify the Legal Responsibility

The establishment of effective demand side management legal responsibility is based on the provisions of laws and administrative regulations. Without the establishment of legal and regulatory obligations in demand management, it is impossible to establish legal liability. Although the Energy Conservation Act stipulates corresponding legal liabilities for violation of energy conservation obligations, the content of energy demand side management is only energy conservation, and the legal liabilities of other management measures need to be clarified, and the punishment for violation of energy conservation obligations needs to be further intensified. As a result, specific demand-side management measures
lacking the guarantee of coercive force are difficult to be implemented in practice. Taking the renewable energy quota system as an example, countries and regions such as Denmark, Sweden, the United Kingdom and Texas of the United States have stipulated penalties such as fines when the quota subjects (power companies, consumers, etc.) fail to fulfill their quota obligations [14]. Therefore, it is suggested that in the energy law, special chapters should be set for energy demand side management and corresponding powers, rights, obligations and responsibilities, while specific demand side management measures and corresponding assessment, supervision and accountability mechanisms should be set in administrative regulations.

5.2. Implement Comprehensive Energy Demand Side Management Legislation
As China's energy utilization situation has undergone profound changes, the energy revolution has put forward new requirements. In addition to continuing energy conservation and emission reduction, avoiding resource waste and improving energy utilization efficiency, the current demand side management also needs to focus on adjusting the energy utilization structure. Because of the direct and important influence of demand on supply, the improvement of energy demand structure to promote the optimization of energy supply structure is a new goal of demand-side management, which puts forward new requirements for the original demand-side management in China. China's energy demand side management should not only focus on power demand management, but also implement comprehensive energy demand side management from the perspective of energy structure transformation and low-carbon development by coordinating the demand side management of power, coal, oil, natural gas, nuclear energy and other energy sources, and combining them with the goal of energy restructuring.

5.3. Enhance the Operability of Demand Side Management Regulations
In this regard, China can sum up the local practice and absorb the beneficial experience of advanced countries, fix it into legislation mandatory provisions, and set up the corresponding penalty measures. For example, British Columbia province of Canada has designed a relatively completed system for demand side management, especially in terms of its adequacy and rationality. In terms of demand side management plan, the province has passed laws to stipulate the obligations of utilities to conduct demand side management. The Public Utilities Commission Act stipulates in article 44.1 (2) that a public utility must file with the commission, in the form and at the times the commission requires, a long-term resource plan including all of the following: (a) an estimate of the demand for energy the public utility would expect to serve if the public utility does not take new demand-side measures during the period addressed by the plan; (b) a plan of how the public utility intends to reduce the demand referred to in paragraph (a) by taking cost-effective demand-side measures; (c) an estimate of the demand for energy that the public utility expects to serve after it has taken cost-effective demand-side measures; (d) a description of the facilities that the public utility intends to construct or extend in order to serve the estimated demand referred to in paragraph (c); (e) information regarding the energy purchases from other persons that the public utility intends to make in order to serve the estimated demand referred to in paragraph (c); (f) an explanation of why the demand for energy to be served by the facilities referred to in paragraph (d) and the purchases referred to in paragraph (e) are not planned to be replaced by demand-side measures; (g) any other information required by the commission.

The above provisions on demand-side management measures provide clear statutory obligations for the entities, and put forward legal requirements for the adequacy and rationality of the measures taken. Thus, the implementation of demand-side management has been secured by the legal system. These mechanisms are enlightening for effective energy demand side management in China.
6. Conclusion
Although demand side management has a long history, systematic and institutionalized arrangement has not been formed in China, which seriously hinders the role of demand side management in realizing efficient utilization of energy and promoting the transformation and upgrading of energy structure. Current legislation of energy demand side management is at relatively low level, and the legal responsibility has not been clearly stipulated. In addition, the power demand side management is not conducive to all kinds of energy. In the context of the energy revolution, the legalization and synthesis of demand-side management has become an important challenge in the field of energy legislation. In the future, China's energy legislation needs to clearly stipulate the demand side management according to the development and changes of the society, so as to promote the level of rule of law in the energy field and ensure the realization of the goals of the energy revolution.

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