The practice of renewable portfolio standard in China: renewable energy consumption obligation mechanism

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Abstract. As an important mechanism for renewable energy development, renewable portfolio standard has been fully implemented in many countries around the world. Recently, China has put it into practice by introducing the renewable energy consumption obligation mechanism. This paper introduces the recently released policy, and briefly introduces the practice of renewable portfolio standard in other countries. Based on the recently released policy, recommendations for China’s power grid utilities are proposed.

1. Introduction
China recently released the China’s version of renewable portfolio standard policy “renewable energy consumption obligation mechanism”, which is characterized by the determination of the weight of obligation for renewable energy consumption in accordance with provincial administrative regions [1]. The power supply or retail companies and electricity consumers jointly undertake the obligation for consumption according to the “renewable energy consumption obligation mechanism”.

Similar to the “Renewable Portfolio Standard” in the United States [2][3], the “Renewable Obligation” in the United Kingdom [4], the “Mandatory Renewable Energy Target” in Australia [5] and the similar policies in other countries, China's “renewable energy consumption obligation mechanism” also guarantees the consumption of renewable energy through quotas. The purpose of “renewable energy consumption obligation mechanism” is to promote the priority of all provincial-level regions to consume renewable energy, promoting fairness of obligation for all types of market entities, and forming a long-term development mechanism led by renewable energy consumption. It is of great significance to promote China's energy structure adjustment and build a clean, low-carbon, safe and efficient energy system.

2. Core of the “renewable energy consumption obligation weight”
The “renewable energy consumption obligation mechanism” determines the proportion of renewable energy in the provincial administrative regions in the power consumption, i.e., “renewable energy consumption obligation weight”.

2.1. Obligation unit
The provincial administrative area is the renewable energy consumption obligation unit, including 31 provincial administrative regions (excluding Hong Kong, Macau and Taiwan), which is not consistent with provincial power grid companies. The weight of renewable energy consumption obligation of each provincial administrative region is uniformly calculated annually. The energy department of the State Council issues the report before the end of March each year.
2.2. Classification of “renewable energy consumption obligation weight”
“Renewable energy consumption obligation weight” includes the weight of total consumption obligation and the weight of non-hydropower consumption obligation. Renewable energy that meets the weight of total consumption obligation includes all types of renewable energy generation. China’s current non-hydro renewable energy mainly includes wind power, solar photovoltaic, and biomass power generation.

2.3. Way to complete the obligation weight
The amount of renewable energy consumption obligation is the amount of renewable energy that is actually consumed by the market entities. The basic way for market entities who undertake obligation for consumption to complete the consumption is to purchase renewable energy through the wholesale electricity market. Enterprises with self-sufficient power plants can also use renewable energy for their own use. In addition, the “renewable energy consumption obligation mechanism” also gives the following two complementary (alternative) ways:

- Purchasing the excess amount of renewable energy consumption from the market entity that has exceeded the annual consumption with transaction price negotiated by both parties. It is worth noting that the purchase of hydropower consumption cannot be used to complete the assessment of non-hydropower renewable energy consumption obligation.
- Purchasing the renewable energy green certificate voluntary. The amount corresponding to the renewable energy green certificate can be used for the amount of “renewable energy consumption obligation weight”. The renewable energy green certificate can be used for the assessment of the weight of the total energy consumption of renewable energy or non-hydrogen renewable energy consumption.

The above two complementary (alternative) methods are parallel relationships and market entities can make their own choices.

3. Obligations of all parties
The “renewable energy consumption obligation mechanism” clearly stipulates the obligations of government departments, power grid enterprises, and other various market entities. Each provincial energy authority takes the lead in implementing the obligation and organizes the implementation of the renewable energy consumption implementation plan at the provincial level. Power retail companies and electricity consumers work together to meet the obligation for consumption. The power grid enterprise is responsible for organizing and implementing the implementation of the burden of obligation for the consumption. There are two types of market players that bear obligation for consumption:

- The first type of market entity is the main body of electricity sales. That is, all kinds of power grid companies that supply/sell electricity directly to power users, independent power sales companies, and power sales companies that have the right to operate distribution networks need to take the amount of consumption obligation corresponding to the annual sales of electricity;
- The second type of market entity is the main body of electricity consumers. That is, electricity consumers who purchase electricity through the wholesale electricity market and the enterprises that have their own power plants need to bear the amount of consumption corresponding to their annual electricity consumption. Agricultural electricity and special metered heating power are exempt from the burden of obligation assessment.

The assessment of the completion of the obligation weight in the “renewable energy consumption obligation mechanism” is divided into two levels. First, the provincial energy authority is responsible for the assessment of the market entities responsible for the burden of consumption. Second, the state conducts monitoring and evaluation according to the provincial administrative region. The provincial-level energy administrative department supervises the rectification of market entities that have not fulfilled their obligation for consumption. Market entities that evade social obligation and do not
rectify according to the requirements within the prescribed time limit are included in the bad credit record according to the regulations.

4. Practices of renewable portfolio standard in other countries
Renewable portfolio standard originated from California. Since the 1980s, it has been implemented in many countries and regions around the world as an important policy tool to support the development of renewable energy. It is reported that there are more than one hundred countries or states (provinces). In order to increase the flexibility of the completion of quota indicators, it is usually accompanied by the Renewable Energy Certificate system.

4.1. Renewable portfolio standard in Texas in the United States
The United States has not yet introduced a federal-level renewable portfolio standard policy. State's renewable portfolio standard policies vary in specific details. In the case of Texas, for example, 1MWh wind power generator can get a Renewable Energy Credit. To encourage the development of renewable energy other than wind power, every 1MWh of non-wind power renewable energy can get 2 renewable energy certificates.

4.2. Renewable obligation in the United Kingdom
The United Kingdom introduced the renewable obligation in 2002, which requires onshore wind power companies to receive a renewable energy certificate for every 1MWh of electricity supplied. Under the same conditions, offshore wind power companies and crop power generation enterprises can obtain two renewable energy certificates. The number of renewable energy certificates available for energy and electricity varies from biogas power generation, landfill gas power generation, and other micro power producers.

4.3. Mandatory renewable energy target in Australia
Australia proposed the mandatory renewable energy target in 2001. Its renewable energy certificate is divided into a large-scale generation certificate and a small-scale technology certificate. The large-scale power generation certificate is mainly for renewable energy power stations. A large-scale power generation certificate can be obtained for every 1MWh of electricity produced by a qualified renewable energy power station. The small-scale technical certificate is mainly for small-scale photovoltaic power generation systems, i.e., solar water heaters, air heat pumps, small-scale wind power, small-scale hydropower and other small-scale systems that meet the requirements. Small-scale renewable energy systems can obtain one small-scale technical certificate for every 1MWh of electricity produced. According to the solar multiplier mechanism, the system part of the solar power system can obtain 1 to 5 times the certificate.

5. What does the grid utility need to do?
First, grid utility needs to fully consider the “renewable energy consumption obligation mechanism” in the promotion of power marketization, completing the obligation of renewable energy consumption by market means.

Second, grid utility needs to establish an obligation system for the completion of obligation, coordinating the local consumption of renewable energy and optimize the allocation across provinces.

Third, grid utility needs to organize and guide the market entities to consume renewable energy, ensuring the market entities fulfill their obligation for consumption on time. Provincial power exchanges need to organize the transfer of consumption within the provincial administrative regions. The Beijing Power Exchange Centre and the Guangzhou Power Exchange Centre need to organize the transfer of consumption across provincial administrative regions.
6. Conclusion
This paper introduces the practice of renewable portfolio standard in China, i.e., the “renewable energy consumption obligation mechanism”. The main mechanisms and assessment methods of the “renewable energy consumption obligation mechanism” and other countries’ practices are introduced. Finally, suggestions are made for the grid utility to complete the renewable energy consumption obligation weight.

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