Abstract

Study on the Low-Carbon Development Indicator System for China's Power Sector ---- China's Power Industry Emissions Reduction Report 2019 (referred to as "the Report" hereinafter) gave an overview of developments in China's power sector and clean coal-fired power, outlined key energy conservation and environmental protection policies and regulations for China's power sector issued since 2018, and offered an explanation of the constraints facing the power sector's low-carbon development. Furthermore, based on an analysis of the power sector's low-carbon development indicators and their implementation during the 13th Five-Year Plan (FYP), the report provided suggestions for adjusting the indicator system in China's 14th FYP. In addition, it also offered separate policy suggestions that also aim to promote the low-carbon development of China's power sector. The Report is divided into three sections:

The first section reviewed both overall and environmentally specific developments seen in China's power sector in 2018. By the end of 2018, China's total installed power generation capacity reached 1,900.12 GW, increasing 6.5% compared to 2017. More specifically, China's hydropower capacity reached 352.59 GW (including 29.99 GW of pumped storage power generation), increasing 2.5% compared to 2017; thermal power capacity reached 1144.08 GW (including 1008.35 GW of coal-fired power and 83.75 GW of gas power), increasing 3.1%; nuclear power capacity reached 44.66 GW, increasing 24.7%; on-grid wind power reached 184.27 GW, increasing 12.4%; and on-grid solar power reached 174.33 GW, increasing 33.7%. The generation capacity from non-fossil fuel sources, which includes hydropower, nuclear power, and on-grid wind and solar, accounted for 40.8% of China's total power generating capacity in 2018, an increase of 2.1% compared to 2017. For thermal power plants with capacities over 6000kW, the standard coal consumption rate for power supply was 307.6g/kWh. Nationwide dust emission from the power sector was 0.21 million tons in 2018, while the sector's dust emission intensity was 0.04g/kWh. Additionally, nationwide SO2 emissions were about 0.99 million tons, with an emission intensity of 0.20 g/kWh, and nationwide NOx

emissions were about 0.96 million tons, with an emission intensity of 0.19 g/kWh.

The second section introduced and highlighted constraints on low-carbon development in China's power sector. Based on an analysis of the power sector's low-carbon development indicators and their implementation during the 13th Five-Year Plan (FYP), the report provided suggestions for the indicator system in China's 14th FYP. The power sector's low-carbon development goals are comprised of three characteristics – safe, green, and economically feasible. According to the theory of constraints, low-carbon development constraints can be analyzed from a framework of resource and technology constraints, rigid and flexible constraints, and short and long-term constraints. Resource and technology constraints are directly affected by the relevant technical standards and regulations. "Rigid constraints" are mainly defined as constraints that are difficult to resolve at a reasonable cost, such as resource scarcity, a lack of technology, or a legal ban; "flexible constraints" refer to those that can be solved at a reasonable additional cost, such as through market-based methods like carbon trading. "Short-term constraints" refer to those faced within a five-year period, while "long-term constraints" refer to the medium-long term, such as by a milestone year of 2030 or 2050. The process of addressing constraints on the power sector's low-carbon development is itself a process of realizing specific low-carbon development goals. Specifically, these goals are to define "safe, green, and economically feasible" with standardized indicators, and then quantify these indicators in terms of time and development phase. The 13th FYP's low-carbon development goals for the power sector includes 15 indicators in areas like carbon emissions intensity, total carbon emissions amount, energy efficiency, and replacing energy capacity with non-fossil fuels. Synthesizing analyses of these indicators' past implementation, the CPC's goals and policies for high-quality economic transformation, and new global momentum on addressing climate change, the study helped establish the power sector's low-carbon development indicator system in the 14th FYP. Furthermore, the study suggested that six guiding low-carbon development indicators, namely total energy consumption, CO2 emissions from large groups' power supply-related activity, CO2 emissions from large power groups' coal use, total coal consumption from coal-fired generating units,

and proportions of coal consumption and natural gas consumption should only be set as long-term, predictive indicators, and not be subject to review or an itemized breakdown. Additionally, the study suggests several changes to the indicators, such as respectively adjusting CO2 emissions intensity standards for power supplying groups and CO2 intensity standards for major power groups' coal-fired units to nationwide thermal power plants' CO2 emissions intensity standards (g/kWh) and nationwide CO2 emissions intensity standards for power generation (g/kWh).

The third section proposed policy suggestions for promoting low-carbon development in China's power sector. The first suggestion is to improve the top-level design of the indicator system. Specific measures may include researching and implementing comprehensive energy, climate change, and low-carbon development regulations. Another potential measure to this end is coordinating low-carbon power development indicators and goals for energy development, pollution control, energy transition, and emerging industries. The second suggestion is using a carbon-led strategy to solve development constraints on low-carbon energy. This can be realized using scientific decision-making mechanisms to address China's current low-carbon development problems. Given that carbon emissions control will become the most significant development constraint in the medium and long-term, all goals and strategic measures should focus on carbon emissions. Third, the carbon market was suggested as an effective way to promote policy coordination, and should be prioritized in addressing low-carbon issues. The fourth suggestion was to simplify the carbon emissions reduction system and to align the system with China's international commitment target. Given recent developments in addressing climate change, China's economic situation, and China's progress in carbon emissions reduction, the committed emissions reduction target should be scientifically investigated. The carbon emissions reduction indicators and goals should also then be adjusted accordingly. Government agencies responsible for climate change should simplify and streamline policy construction that shapes carbon indicators and reduction targets.