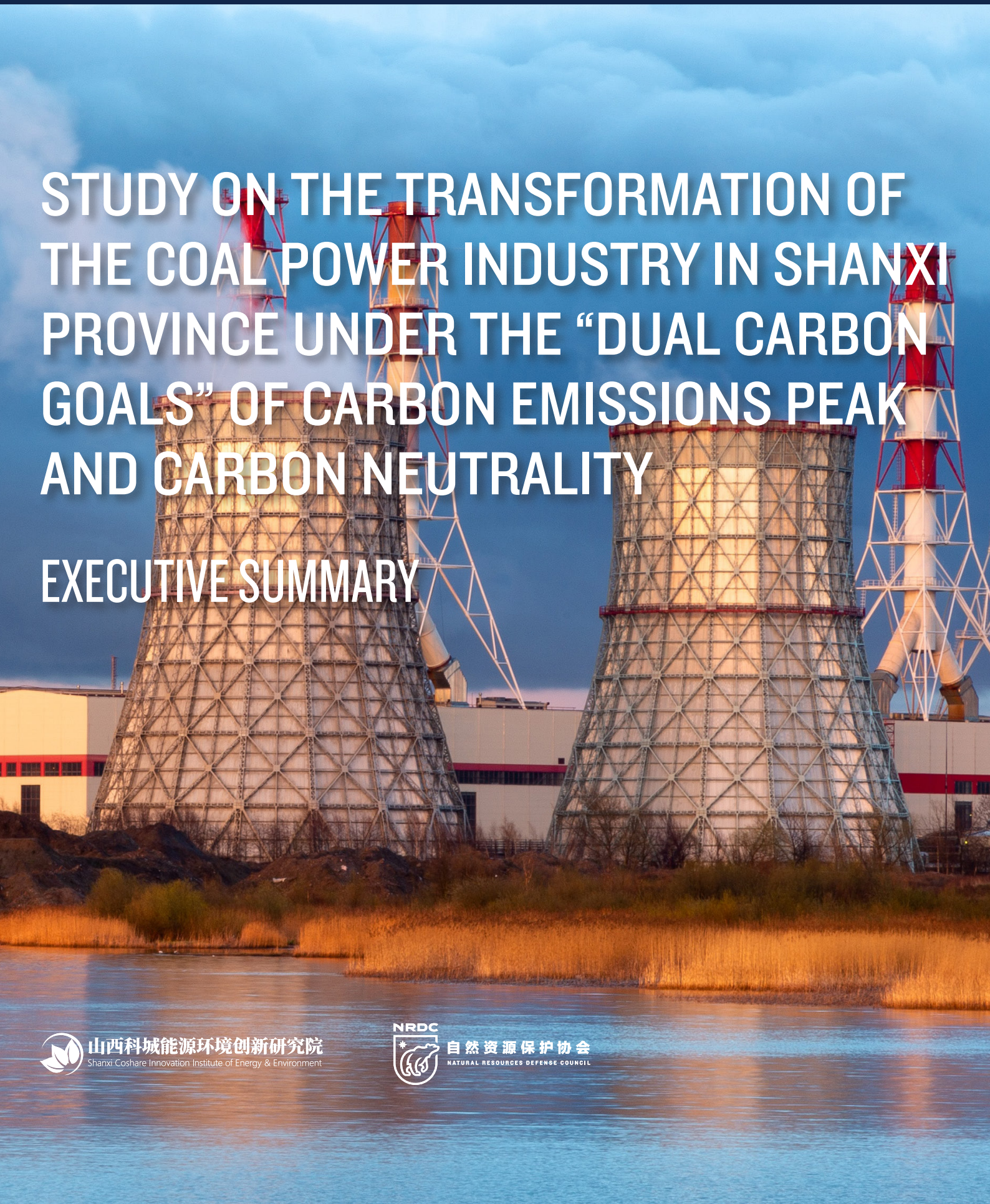
煤控研究
China Coal Cap

2022.07

STUDY ON THE TRANSFORMATION OF THE COAL POWER INDUSTRY IN SHANXI PROVINCE UNDER THE "DUAL CARBON GOALS" OF CARBON EMISSIONS PEAK AND CARBON NEUTRALITY

EXECUTIVE SUMMARY



山西科城能源环境创新研究院
Shanxi Coshare Innovation Institute of Energy & Environment

NRDC
自然资源保护协会
NATURAL RESOURCES DEFENSE COUNCIL

Executive Summary

Shanxi Province is one of China's largest coal power bases, with its coal power industry being a key sector for the province's coal consumption and carbon emissions. Promoting low-carbon and green transformation of Shanxi Province's coal power industry in a timely way is of great significance for the province to establish a clean, low-carbon, efficient and safe energy system and achieve the dual carbon goals of carbon emissions peak and carbon neutrality.

Considering Shanxi Province's actual situation, the power supply-demand balance, and the key impacts on both the demand and supply sides, this study discusses the goal of peaking carbon emissions, the low-carbon transformation pathway and policy recommendations for the coal power industry in Shanxi Province. The main conclusions are as follows:

1. The coal power industry in Shanxi Province can strive to achieve peak carbon emissions around 2028-2030.

Under the baseline scenario, Shanxi Province's coal power industry will reach its carbon emissions peak of around 300 million tonnes in 2031-2032; under the low-carbon scenario, the industry will reach carbon emissions peak of about 280 million tonnes in 2030; and under the enhanced low-carbon scenario, the industry will reach carbon emissions peak of about 270 million tonnes around 2028. In each of the scenarios, the province will retain some coal powe r units until 2060, and it is necessary for Shanxi Province to achieve carbon neutrality through carbon capture and storage (CCS) and other decarbonization technologies.

Considering the needs of Shanxi Province's economic and social development, the report selects the low-carbon scenario as the recommended scenario. Under the low-carbon scenario, according to the power balance, there is a shortage of installed power capacity from 2025 to 2035, which requires the accelerated development of energy storage, namely, 6 GW, 10 GW, and 20 GW respectively in 2025, 2030 and 2035, to ensure the power supply for peak loads. In 2060, the CO_2 emissions of Shanxi Province's coal power industry will be reduced to 64 million tonnes, a cumulative reduction of 77 percent compared with the peak. For the remaining emissions, to realize carbon neutrality, technologies such as CCS and bioenergy with carbon capture and storage (BECCS) will be required.

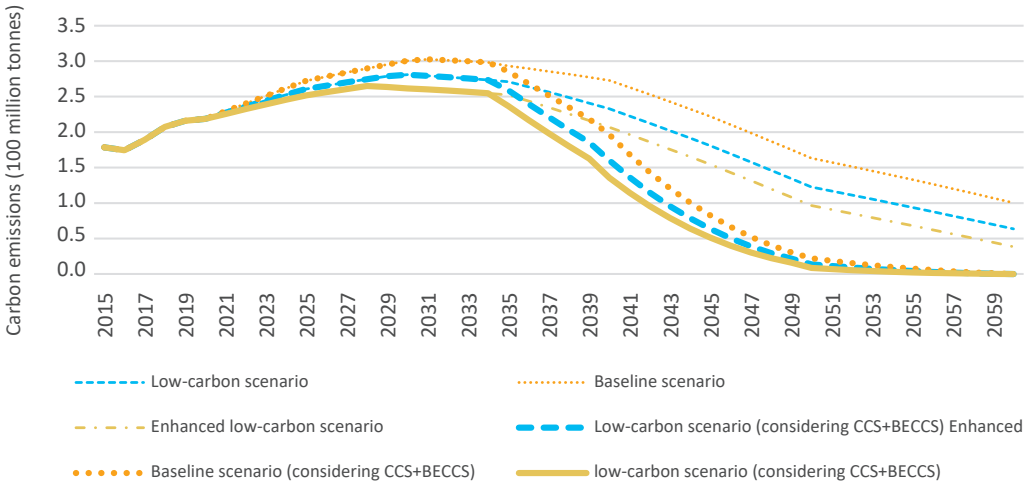


Figure 1. Scenarios for achieving the carbon emissions peak and carbon neutrality goals of Shanxi Province

2. The core is to determine the development orientation and scale of the coal power industry in Shanxi Province in an appropriate way.

As a power transmission base, Shanxi Province should, on the premise of ensuring the security of the national energy supply and following the principle of coordinating economic development with power supplies and peak shaving capacities, reasonably determine the scale of coal power transmission, strictly control the construction of coal power for self-use within the province, accelerate the elimination of outdated units, and extend the life of existing ones. Considering Shanxi Province’s coal power units under construction, planned and outdated ones, it is recommended that the total installed capacity of coal power units in Shanxi Province peaks before 2030 within 83 GW, and no new coal power installed capacity is added after 2030. By doing so, Shanxi Province’s coal power will continue to play the role of security guarantee, while transforming from the traditional power supply that provides electricity to power supply that combines both basic guarantee and system regulation.

3. The key is to advance the improvement in the quality and efficiency of the coal power industry and strengthen its adaptability.

Shanxi Province should implement management of under-construction, planned and existing units by category, and further promote the clean and efficient development of coal power. In this regard, Shanxi Province should require that projects under construction prove their necessity, and ensure that necessary units be constructed to achieve advanced national or international levels. It should also examine the technologies and equipment of coal power units under construction to pursue energy conservation and carbon reduction potentials, to improve the capability of energy and resource utilization. Besides, the province should focus on 300MW and 600MW subcritical units, implement comprehensive and systematic energy-saving and efficiency-improving retrofits of existing units, and simultaneously

optimize the use of fuel and raw and auxiliary materials to tap the potential of heating and steam supply.

Shanxi Province needs to accelerate the flexibility retrofitting of 300MW to 600MW coal power units to improve the flexibility capacity of coal power units. To be specific, the Province should promote the application of biomass co-firing in coal power generation to improve fuel flexibility. It should also improve the low-load stability of the straight condensing unit from the fuel supply and boiler side, and ensure the normal operation of the desulfurization, denitrification and dust removal systems during low-load operation. Moreover, the province should implement retrofits of the steam turbine body and increase thermo-electric decoupling equipment such as electric boilers and heat storage tanks to improve the thermo-electric decoupling capacity of heating units.

According to the low-carbon transformation pathway of the coal power industry in the future, the following policy recommendations are put forward:

1. Strictly control the scale of coal power and develop a roadmap for the orderly exit of coal power

Shanxi Province should bring the coal power plants under construction into operation in an orderly manner, and strive to control the installed capacity of coal power within 83 GW by 2030. After 2030, no new coal power capacity should be added, and coal power projects that are necessary to be constructed should be reduced or replaced by the same amount of other power resources. Shanxi Province should assess the conditions of in-service units, reasonably determine the exit time, roadmap and requirements of coal power units, and develop relevant supporting policies.

2. Encourage pilot projects for comprehensive energy supply and explore high-quality development paths

It is encouraged to carry out pilot projects for comprehensive energy services for coal power units, and promote the transformation of coal power enterprises to shift from their main business of “power generation” to “heating, cooling, steam supply, power generation, peak regulation, frequency modulation” and other comprehensive energy supplies, so as to strengthen enterprises’ energy cascade utilization. Shanxi Province should encourage coal power companies to use existing resources to build photovoltaic and other clean energy power generation projects, explore the use of existing sites and power transmission and transformation facilities for decommissioned thermal power units to build storage or wind-solar-storage facilities, and promote the integrated development of coal power and renewable energy.

3. Develop relevant standards and specifications to guide retrofits for flexibility and lifetime extension

It is recommended that relevant government departments take the lead in developing standards and specifications for flexibility retrofits to ensure that enterprises choose suitable technological routes and working methods. They should also work out evaluation methods for units seeking extension of their operating lifetime, as well as the technical specifications and standards systems for the retrofitting, evaluation and supervision of operating lifetime extensions.

4. Improve the top-level design of the power market, and promote deeper power market reform

Shanxi Province should combine the medium and long-term market and the spot market, deepen the market construction of auxiliary services such as peak regulation, frequency modulation, and backup service, and speed up the construction of supporting markets such as capacity and contract markets. The province should improve the cost return mechanism for energy storage facilities and straighten out the operation and management system of energy storage facilities, as well as promote the price-setting mechanism for electricity. Shanxi Province should establish market system standards and policy mechanisms that support the construction of a new type of power system, and accelerate the establishment and improvement of the electricity spot market operating system and mechanisms, so as to improve the electricity market in a steady manner.

5. Set up an industry transformation fund to increase support for enterprise transformation

Shanxi Province should focus on supporting the R&D, demonstration and application of low-carbon, zero-carbon and negative-carbon technologies in the coal power industry. It should promote the comprehensive transformation of coal units for energy conservation, carbon reduction and pollution reduction, and provide reasonable shutdown compensation for coal units that retire early. The province should guide and assist enterprises to improve their carbon emissions management capabilities throughout the whole process, and support the retraining and re-employment of laid-off workers, so as to ensure a smooth transition.

CONTACT US

TAIKANG FINANCIAL TOWER, SUITE 1706,
NO.38 DONGSANHUAN BEI ROAD, CHAOYANG,
BEIJING, CHINA

T +86 (10) 5927-0688

printed on recycled paper