



Analysis of China's Pathway to Carbon Neutralization

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Abstract: China is in the context of a new development pattern. The proposal of "carbon neutrality" goals and visions will help China's sustainable economic development, energy green and low-carbon transformation, speed up the process of ecological civilization construction, and deepen international exchanges on emission reduction. and cooperation, etc. At present, to achieve the goal of "carbon neutrality" in China, China is faced with a large base of carbon emissions, a coal-dominated energy structure, still relying on a high-carbon industrial structure, difficult to tackle key problems in emission reduction technologies, and imperfect low-carbon incentive policies and institutional mechanisms, etc. In short, there is an urgent need to improve the ecological carbon sink capacity, accelerate the adjustment and reform of the energy structure, promote the low-carbon transformation and upgrading of the industrial structure, promote the innovation and application of green and low-carbon technologies, and improve low-carbon incentive policies and institutional mechanisms.

Keywords: Carbon neutrality, China, path.

1. Introduction

Achieve carbon peak by 2030 and carbon neutrality by 2060, which is a major strategic decision made by the Party Central Committee with Comrade Xi Jinping at the core after careful consideration. Achieving peak carbon neutrality has far-reaching world and historical significance, and is an important opportunity to achieve high-quality development.

2. China's contribution to carbon neutrality

Since the reform and opening up, especially since the 18th National Congress of the Communist Party of China, China has attached great importance to the issue of climate change, taking active response to climate change as a major strategy for national economic and social development, and taking green and low-carbon development as an important part of ecological civilization construction, and has taken a series of

actions , has made important contributions to addressing global climate change . In 2009, China announced the goal of my country's nationally determined contribution to the international community. The actual implementation progress is better than expected, and the autonomous action targets promised to be completed in 2020 have been completed ahead of schedule in 2019. Judging from the evaluation of the implementation of the "13th Five-Year Plan", in 2020, the total national energy consumption will be 4.98 billion tons of standard coal, and the energy consumption per unit of GDP will be 0.49 tons of standard coal per 10,000 yuan. Energy consumption decreased by 13.2% cumulatively; carbon dioxide emissions per unit of GDP decreased by 18.8% during the "13th Five-Year Plan" period, exceeding the planned target; the proportion of non-fossil energy in primary energy consumption increased from 12% in 2015 to 15.9%; forest coverage rate From 21.7% to more than 23%, the forest stock volume exceeded 17.5 billion cubic meters[1].

2.1 Positive progress has been made in the adjustment of industrial structure and the development of low-carbon and green industries

Adjusting and optimizing the industrial structure and improving the level of the industrial chain are important ways of low-carbon transformation. According to estimates, the contribution of industrial structure adjustment to carbon emission reduction exceeds 50%. Since the reform and opening up, China has vigorously promoted structural adjustment while accelerating industrialization[2]. In 2012, the proportion of the service industry exceeded that of the secondary industry for the first time, becoming the largest industry in the national economy and the biggest engine of economic growth. The three industrial structures were adjusted from 27.7:47.7:24.6 in 1978 to 7.7:37.8:54.5 in 2020. Compared with the initial period of reform and opening up, the proportion of the secondary industry dropped by 10 percentage points, and the proportion of the service industry increased by 29.9 percentage points. Within the industrial sector, we will eliminate outdated and excess production capacity in industries such as coal, steel, cement, flat glass, and electrolytic aluminum, accelerate the green transformation and upgrading of traditional industries, update process technology and equipment, and reduce energy consumption and emissions[3]. Vigorously cultivate strategic emerging industries such as new energy, energy conservation and environmental protection, new generation information technology, biology, new materials, and new energy vehicles, develop green services, implement contract energy management, contract water conservation management, and build an industrial system featuring green. The energy conservation and environmental protection industry is developing rapidly, with an annual production capacity of about 7.5 trillion yuan in 2020. The production and sales volume of new energy vehicles exceeded 1.3 million, ranking first in the world for five years[4].

2.2 Significant achievements have been made in improving energy efficiency and adjusting energy structure

China's coal-dominated resource endowment determines the importance of energy structure adjustment and the construction of a modern energy system in the green transition. Since the "Eleventh Five-Year Plan", China has taken the energy consumption per unit of GDP as a binding indicator, and has included it in four consecutive five-year plans to promote energy conservation and consumption reduction in key areas such as industry, construction, and transportation. consumption shows a downward trend. In 2020, the energy consumption per unit of GDP will be reduced by 13.2% compared with 2015. In 2020, the total national energy consumption will be 4.98 billion tons of standard coal, and the energy consumption per unit of GDP will be 0.49 tons of standard coal per 10,000 yuan[5]. Progress has been made in the adjustment of the energy structure. The proportion of coal in primary energy consumption has dropped from 67.4% in 2012 to 56.8% in 2020, and the proportion of non-fossil energy consumption in primary energy consumption has increased from 12% in 2015 to 15.9%. The process of clean and low-carbon energy use has been accelerated, especially the clean and efficient utilization of coal has taken substantial steps, and the cumulative completion of the ultra-low emission transformation of coal power has exceeded 700 million kilowatts, and the 2020 target has been completed ahead of schedule. China has become a global leader in the use of non-fossil energy[6].

2.3 Effective development of green technology innovation

Scientific and technological innovation can effectively improve the efficiency and intensification level of energy resource utilization, which is a key measure to promote green transformation. Technological investment has increased substantially. In 2020, my country's R&D investment reached 2,442.6 billion yuan, an increase of 10.3% over the previous year, and the ratio to GDP was 2.40%, of which basic research funding was 150.4 billion yuan, exceeding the 2.1% average of the 15 EU countries. R&D investment in green technologies has also increased significantly[7]. Reduce the transfer cost of green technology, promote the demonstration and promotion of green technology, and promote the utilization of new technologies such as energy conservation, emission reduction, and comprehensive utilization of resources. Green technology innovation has increasingly become the source of green development. Promote the integration of green technology research and development and standards, strengthen the supporting role of science and technology in the formulation of standards, and dynamically improve industry green standards. A major breakthrough has been made in the controllable utilization of thermonuclear fusion technology, which provides technical possibilities for solving the energy crisis and high carbon crisis

from the root[8].

2.4 The first in the world to establish a carbon emissions trading market
After the preliminary pilot, a unified national carbon emission trading market will be established, and corresponding regulatory rules will be researched and formulated to establish a carbon emission trading market supervision system. As of the close of July 23, the national carbon emission trading market has been running for 6 trading days . The opening price on the 23rd was 56.52 yuan / ton, and the closing price was 56.97 yuan / ton. The cumulative transaction volume of the national carbon market reached 4.833 million tons, with a transaction value of nearly 250 million yuan, of which the transaction value on the first day of the market was nearly 210 million yuan. Since the six trading days, both listed agreement transactions and block transactions have been completed.

2.5 Continued strengthening of pollution prevention and control
Pollution prevention and control has been intensified, the quality of the ecological environment has been improved, and favorable conditions and environment have been created for green transformation. Some pollutant emissions have entered a peak plateau period. In 2020, the average number of good days in 338 cities across the country reached 87%, an increase of 10.3 percentage points over 2015. Greenhouse gas emissions have been drastically reduced. In 2020, among the 1,937 water quality sections (points) of surface water across the country, the proportion of Class I-III water quality was 83.40%, an increase of 8.5 percentage points from 2019; the proportion of inferior to Class V was 0.6%, a decrease of 2.8 percentage points from 2019.

3. China's path to carbon neutralization

carbon peaking and carbon neutralization is mainly to achieve "one increase and one decrease", that is, the gradual reduction of carbon emissions and the gradual increase of carbon sinks after the peak of carbon emissions, so as to achieve the balance and neutralization of carbon emissions and carbon sinks . According to the Paris Agreement, the Nationally Determined Contribution (NDCS) is the implementation of an irreversible renewal mechanism, and from a country-by-country perspective, the goal of peaking carbon neutrality is dynamic. In 2015, States parties submitted their initial nationally determined contribution targets. New or updated INDCs are submitted in 2020 and every five years thereafter. In 2015, my country submitted a national voluntary emission reduction target without any conditions, including: carbon dioxide emissions will peak by 2030 and strive to reach the peak as soon as possible. At the Climate Ambition Summit held in December 2020 , Chinese President Xi Jinping announced a series of new measures for China's Nationally Determined Contribution, and submitted

a new round of NDCS targets on behalf of the Chinese government, including: by 2030, carbon dioxide emissions per unit of GDP Compared with 2005, it will drop by more than 65%, the proportion of non-fossil energy in primary energy will reach about 25%, the forest stock volume will increase by 6 billion cubic meters compared with 2005, and the total installed capacity of wind power and solar power generation will reach more than 1.2 billion kilowatts. It was actually a tighter commitment to the first round of 2015 targets. Comprehensive analysis of feasibility and necessity, considering that my country's economic development is still in a period of incremental growth. Combined with the goal of carbon emission reduction when carbon peaks in 2030 , carbon dioxide emissions per unit of GDP are reduced by more than 65% compared with 2005. It is estimated that by 2030, my country's total carbon emissions (including land use change) will peak at about 28 billion tons, of which carbon dioxide emissions from fossil fuel combustion will peak (this is also my country's carbon emissions reached under the Paris Agreement). Peak target) is about 16 billion tons of carbon dioxide equivalent, of which carbon dioxide emissions are about 13 billion tons. From the perspective of carbon sink targets , the forest stock volume in 2030 is about 18.5 billion cubic meters. There are many favorable conditions for China to achieve the goal of carbon peaking , but it also faces the urgent need to optimize the production structure, the challenge of energy structure adjustment, the overall low level of green technology, the pressure of ecological environment governance, the overexploitation of resources, the need to speed up the transformation of living and consumption patterns, and the low level of energy consumption. The carbon development policy system needs to be improved and other challenges and problems. We must strengthen our confidence and, under the strong leadership of the CPC Central Committee, give full play to the advantages of the socialist system with Chinese characteristics, the advantages of a super-large economy, and the huge advantages of technological transformation of traditional sectors, and strive to advance relevant work to ensure that carbon peaks and carbon neutrality are achieved as scheduled. Target.

3.1 Optimizing the pattern of development and protection of national land and space, and improving differentiated applications

The regional strategy for climate change is based on the carrying capacity of resources and environment, gives play to the comparative advantages of each region, promotes the rational flow and efficient aggregation of various elements, and promotes the formation of a new pattern of land and space development and protection with obvious main functions, complementary advantages, and high-quality development. Implement classified-guided carbon peaking and carbon neutrality regional policies, and determine differentiated climate change mitigation and adaptation goals, tasks and implementation approaches for different main functional areas. The optimized

development of urbanized areas should strictly control greenhouse gas emissions; the key development of urbanized areas should strengthen the control of carbon emission intensity, the old industrial bases and resource-based cities should speed up the green and low-carbon transformation; the main agricultural production areas should strengthen the control of development intensity; Key ecological function areas should delineate ecological red lines, and formulate and implement strict industrial development catalogs.

3.2 Focus on the development of clean energy and build a low-carbon energy system

Control the total coal consumption, strengthen the clean utilization of coal, increase the proportion of coal centralized and efficient power generation to promote the energy revolution, build a clean, low-carbon, safe and efficient energy system, and improve the ability to guarantee energy supply. Large-scale development of renewable energy. By the end of the "14th Five-Year Plan" , the installed capacity of renewable energy will account for more than 50% of China's total installed capacity. A high proportion of renewable energy development. By the end of the "14th Five-Year Plan" , the proportion of renewable energy in the increase in electricity consumption in the whole society will reach about two-thirds, and the proportion in the increase in primary energy consumption will exceed 50%. The incremental supplement of power consumption has become the main body of the incremental energy and power consumption. Improve the new energy consumption and storage capacity, build a new power system, and improve the flexible adjustment capacity of the power system. Speed up the construction of charging and replacing infrastructure . Efforts will be made to develop nuclear power generation, the research and development and application of new nuclear energy modularization, miniaturization, and differentiation, and rational distribution of coastal nuclear power bases. Develop the industrialization of unconventional oil and gas resources, such as shale oil, coalbed methane and natural gas hydrate (submarine combustible ice). Accelerate the breakthrough of the bottleneck restriction of thermonuclear fusion technology, and realize commercialization and application as soon as possible.

3.3 Focus on the development of circular economy and form an energy-saving and low-carbon industrial system

Optimize the industrial structure, revise the industrial structure adjustment guidance catalogue, strictly control the expansion of industries with high energy consumption and high emission, speed up the elimination of outdated production capacity, and vigorously develop the service industry and strategic emerging industries. Vigorously develop circular economy, implement the "14th Five-Year Plan for Circular Economy Development", and by 2025, fully implement circular production methods, popularize

green design and clean production, significantly improve the comprehensive utilization of resources, and develop a resource recycling-based industrial system Basic build. Standardize the development of the second-hand commodity market. Combined with the impulsive consumption and invalid consumption caused by the facilitation of e-commerce, encourage the development of the "Internet + second-hand" model, strengthen the management responsibility of Internet trading platforms, and strengthen the supervision of trading behavior. Encourage platform enterprises to introduce third-party second-hand commodity professional merchants. Promote the standardized construction and operation of the offline physical second-hand market. Strengthen the mandatory promotion of garbage classification, promote the reduction, harmlessness and recycling of garbage, promote the construction of recycling manufacturing bases, and increase the scale of the recycling industry.

3.4 Strengthen ecosystem protection and strive to increase carbon sink resources Vigorously carry out afforestation and greening, carry out in-depth voluntary tree planting, increase wetland protection and restoration, and improve the carbon storage function of wetlands . Focus on national key ecological function areas, ecological protection red lines, and national nature reserves, and implement major projects for the protection and restoration of important ecosystems. Comprehensively strengthen the protection of natural forests and wetlands, increase the forest coverage rate to 24.1%, and increase the wetland protection rate to 55%. Strengthen the restoration of marine environmental protection. Explore the establishment of a comprehensive management system that integrates coastal areas, river basins and sea areas.

3.5 Advocating low-carbon lifestyles and strengthening green consumption patterns Strengthen the low-carbon life and low-carbon consumption education for all, advocate green, low-carbon, healthy and civilized lifestyles and consumption patterns, and promote the formation of a low-carbon consumption concept in the whole society. Give play to the leading role of public institutions, and carry out activities to create energy-saving and low-carbon institutions, campuses, hospitals, venues, and military camps. Guide moderate consumption, encourage the use of energy-saving and low-carbon products, and curb all kinds of extravagance and waste. Improve the waste commodity recycling system and garbage classification and treatment system.

3.6 Strengthen scientific and technological support and break through the bottleneck of key core technologies

Establish a national laboratory in the field of modern energy systems, aim at the frontiers of international science and technology, and carry out strategic, forward-looking and fundamental technological innovations. Improve the level of basic scientific research on climate change, carry out research on climate change monitoring and prediction, and strengthen research on climate change impacts, risk mechanisms

and assessment methods. Strengthen the research and development and industrialization demonstration of low-carbon technologies such as energy conservation and consumption reduction, renewable energy and advanced nuclear energy, carbon capture, utilization and storage, and popularize the use of carbon dioxide to drive oil and coalbed methane.

3.7 Develop green finance and promote the construction of carbon emissions trading market

To support the operation of the national carbon market has been established, an implementation plan for quota allocation has been prudently formulated, and data quality management has been solidly carried out. On the basis of actively and prudently doing a good job in the construction and trading of the national carbon market in the power generation industry, in the new cycle, actively and prudently promote the registration of key energy-consuming industries such as metallurgy, new energy vehicles, and energy storage. Develop green finance, and actively explore the application of various green financial instruments such as green loans, green bonds, green insurance, green funds, and green certificate transactions. Promote the construction of a number of national-level green finance pilot demonstration areas, and strengthen the design, research and development and promotion of green financial products.

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