ENERGY FOUNDATION
能源基金会

COAL TRANSITION QUARTERLY

NEWSLETTER OF ENERGY FOUNDATION CHINA'S COAL TRANSITION INITIATIVE

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Foreword by Dr. ZOU Ji

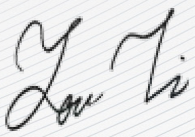
CEO and President of EFC

As the most carbon-intensive fossil fuel, coal accounts for more than four tenth of global carbon emissions. By comparison, similar ratio in China is near 80%. As the world's largest coal consumer and producer, though China has drastically lowered coal's share in national energy consumption mix from 63.8% in 2015 to 56.8% in 2020, China's share of global carbon emissions still reached a record high at 31% last year, with sizable contribution from continuous rebounding of national coal consumption starting from 2016. Not surprisingly, the future of coal is key for both China's clean energy transition and global climate agenda.

Given a coal-reliant energy structure's contribution to China's high carbon footprint, how to promote orderly phase-out of coal is crucial for China to peak national carbon emissions before 2030 and achieve carbon neutrality before 2060, an ambitious climate pledge announced by Chinese President Xi Jinping in September 2021.

Fortunately, at the Leaders Summit on Climate in April 2021, President Xi, for the first time, explicitly mentioned "phase-down" of coal, stating that China will "strictly limit" coal power projects and coal consumption during the 14th Five-Year Plan (FYP) period from 2021 to 2025, and "phase it down" gradually in the 15th FYP period. His speech clearly signaled to both international and domestic audience alike that the golden era of coal in China is expected not to return again.

In the near term, apart from strictly controlling capacity of coal-fired power plants, China's coal phase-out strategy should focus on lowering industrial process coal demand and scattered coal combustion. Above all, with concerted efforts made by like-minded stakeholders, clean energy transition agenda in China could be progressed along with an increasingly ambitious coal phase-out action plan.



Note from Dr. LI Jie

Vice President, Programs and Acting Director of Coal Transition Initiative

We are happy to present the first issue of EFC Coal Transition Quarterly. Here it provides an overview of major developments on climate change and coal phase-out in China and beyond. The past year or so is by no means normal. A lot has happened and the impacts are continuing, from the ongoing COVID-19 pandemic, to China's landmark carbon neutrality pledge, to transfer of presidential power in the US. Each has brought tsunami effects to the global climate change agenda.

In the first issue of the serials of newsletter, we begin with an introduction of EFC's Coal Transition Initiative.

In the remaining sessions and future issues, the Quarterly routinely covers coal data updates, key developments in China and abroad; features progress of the Coal Transition Initiative; and highlights knowledge from the field.

The EFC Coal Transition Quarterly is co-published with EFC's Coal Data Updates. We hope you find the report useful and welcome your feedback.

ABOUT

EFC's Coal Transition Initiative

Vision

To keep global temperatures from increasing more than 1.5°C, our vision aims to lower the share of coal in China's primary energy consumption to below 50% by 2025 and phase out unabated coal use without CCS/CCUS in the period of 2040-2045.

Goal

The Coal Transition Initiative at Energy Foundation China (EFC) aims to help China achieve the following goals during 2040-2045: to achieve "near-zero" coal consumption by facilitating the energy transition, such as developing renewable energy, improving energy efficiency, and promoting electrification; and to achieve "net zero" emissions through carbon capture and storage (CCS) technologies, for unavoidable coal consumption.

Initiatives

Focusing on the integrated "4-E" nexus of Economy-Energy-Environment-Equity, we will systematically tackle the political, technological, and financial challenges of phasing out coal in the power, industry, and small-scale, "scattered" use sectors. Meanwhile, we will strategically support energy and economic transition pilots in different regions.

- Support the development of a national coal phase-out master plan under the goals of carbon peaking and neutrality
- Support research on sectorial coal transition initiative plans for power, industry, and small-scale, scattered coal use sectors
- Promote development of renewable energy in Northwest and Southwest China, with an aim to replace coal power in current consumption centers in the East and South
- Support development of a comprehensive policy package to reverse the coal power rebound
- Facilitate stranded asset management for coal power phase-out
- Reduce residential use of scattered coal to zero nationwide by 2025
- Promote co-management of coal control and air quality improvement
- Support the development of just transition roadmaps for key regions, with focuses on economic diversity, social security, and employment
- Promote pilots of zero-coal industrial parks
- Forge ahead strategic communications, raise awareness, and form partnership with social organizations
- Facilitate the development of an online data hub and platform to trace the financial performance of plant-level coal power plants and the on-the-ground progress of phase-out

Participating programs

The Initiative is a major cross-program effort of EFC that is based on the participation and ownership of six of the Foundation's seven programs, including Clean Power, Clean Industry, Clean Environmental Management, Low-Carbon Cities, Low-Carbon Economic Growth, and Strategic Communications. Each plays a critical role for the success of the Initiative.

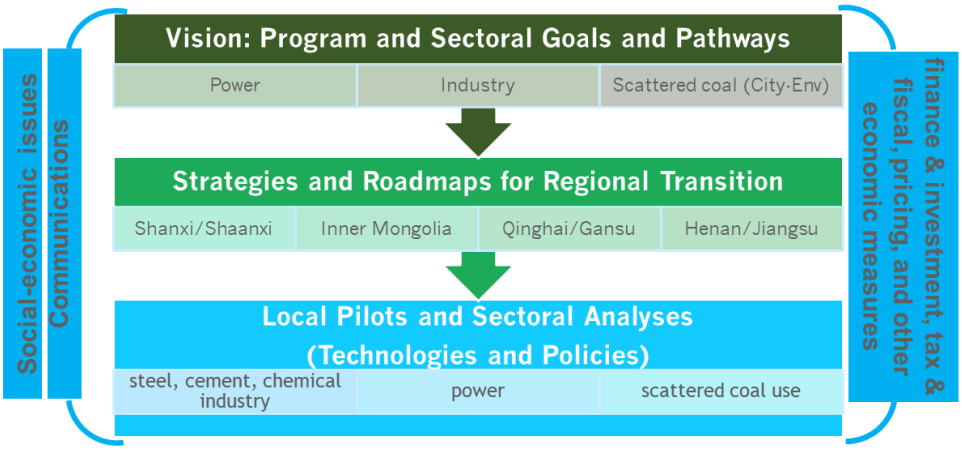


Figure 1. Framework of the Coal Transition Initiative

The Initiative's framework is structured in three layers. On the top is the Initiative Master Plan, underpinned by three sectoral Action Plans for coal power, industrial coal use, and scattered coal combustion. The master plan and sectoral strategies together lay out the vision, goals, and pathways for coal phase-out in each of the key sectors. In the middle, the framework is firmed up by the roadmaps for regional transitions. Representative provinces/autonomous regions are selected for deep dive. A number of case study regions are identified and engaged at each phase of the Initiative. At the bottom, pilots and technological and policy analyses are to be conducted at city, district, industrial park, and project levels in support of the landing of activities on the ground.

In addition, just transition, strategic communication, and financial, tax, pricing, and fiscal policies are cross-cutting thematic topics, for which the Initiative will consistently support and equally emphasize across all the three layers.

A Recap of 2020 and Coal Data Updates

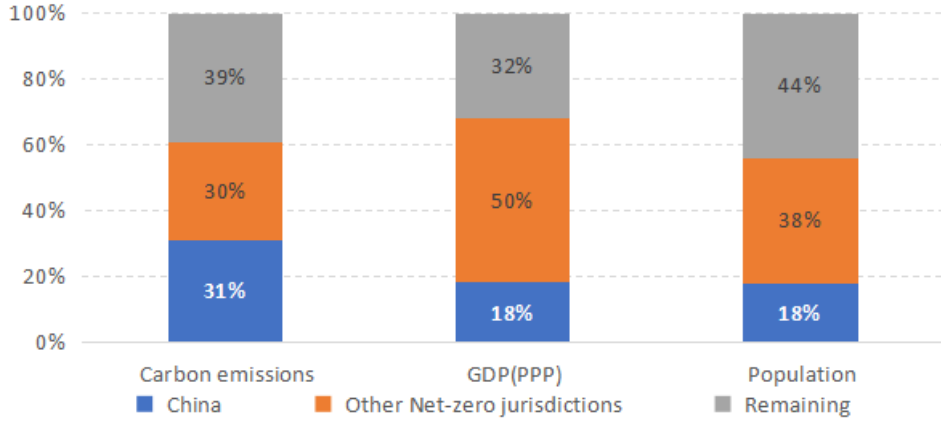


Figure 2. Share of Net Zero Pledges by Jurisdiction

Source: Agora Energiewende.

Against the backdrop of the COVID-19 pandemic, China was the only major economy that grew in 2020. While the global economy shrank by 3.3% year-on-year (YOY), the Chinese economy grew by 2.3%. After the first quarter (Q1) of 2020, during which the Chinese economy contracted for the first time in more than four decades, China mounted a speedy recovery. Unfortunately, this recovery brought about rather high levels of emissions. In 2020 as a whole, China accounted for 31 percent of global carbon emissions and 18 percent of global gross economic product (GDP).

In September 2020, China announced that it aims "to peak national carbon emissions before 2030 and achieve carbon neutrality before 2060." While the overall carbon neutrality and emissions peaking goals are clear, the means to achieve them are still not well understood, and China has not yet submitted its Mid-Century GHG Low-Emission Development Strategy. Moreover, while this transition will generate significant and broadly shared benefits to China and the world, navigating these changing dynamics while also structuring a rapid and orderly transition toward this new economy presents challenges.

Nevertheless, as the net-zero/carbon neutrality pledge has come to take center stage in efforts to halt climate change, by the end of 2020, jurisdictions with net-zero targets represent at least 61, 68, and 56 percent of global emissions, GDP (PPP), and population, respectively. In particular, China's carbon neutrality pledge has significantly boosted the global climate agenda ahead of the COP 26 summit in Glasgow in 2021.

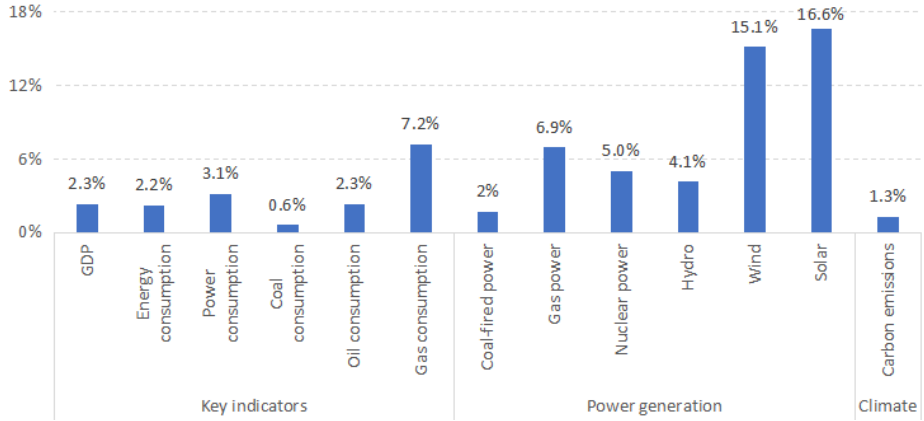


Figure 3. YOY Change of Key Economic & Energy Indicators in 2020

Source: Agora Energiewende.

In 2020, Chinese GDP grew almost on par with national energy consumption at 2.2-2.3% YOY, indicating a rather strong coupling of economic activity and energy consumption. By comparison, national power consumption increased even stronger at 3.1% YOY.

Despite an ongoing COVID-19 pandemic, demand of all fossil fuels in China—from coal to oil as well as gas—witnessed positive growth. As a result, China's national carbon emissions grew by at least 1.3% YOY, a sharp contrast with a worldwide contraction at 5.8% YOY.

In the Chinese power sector, all generation technologies including coal-fired power plants increased their output levels, with wind and solar performing the best at double-digit growth and coal-fired power plants growing the least at 2% YOY. By the end of 2020, coal-fired power capacity in China stands at 1,095 GW, the equivalent of 52% of global total.

Coal production

In 2020, national coal production by enterprises above the designated size reached 3.84 billion tons, the equivalent of a 0.9% YOY growth, 3.3 percentage points lower than similar ratio (4.2%) in 2019. Following Inner Mongolia, Shanxi has become the second provincial level coal producer with annual production ever exceeding 1,000 Mt of coal, and surpassed Inner Mongolia to become China's top producer again. Monthly coal production in Shanxi stands at 92 Mt in 2020, which represents a 11.8% YOY growth. By comparison, monthly coal production in Inner Mongolia contracted by 2.2% YOY.

In retrospect, key features in the coal production segment are as below: 1) major coal producing regions become more dominant, with Shanxi and Inner Mongolia alone accounting for 53.7% of national coal supply; 2) small coal producing regions witnessed additional contraction of their market share. For the 15 coal producing regions with monthly output level below 5 Mt, only five of them witnessed positive growth of coal production in 2020.

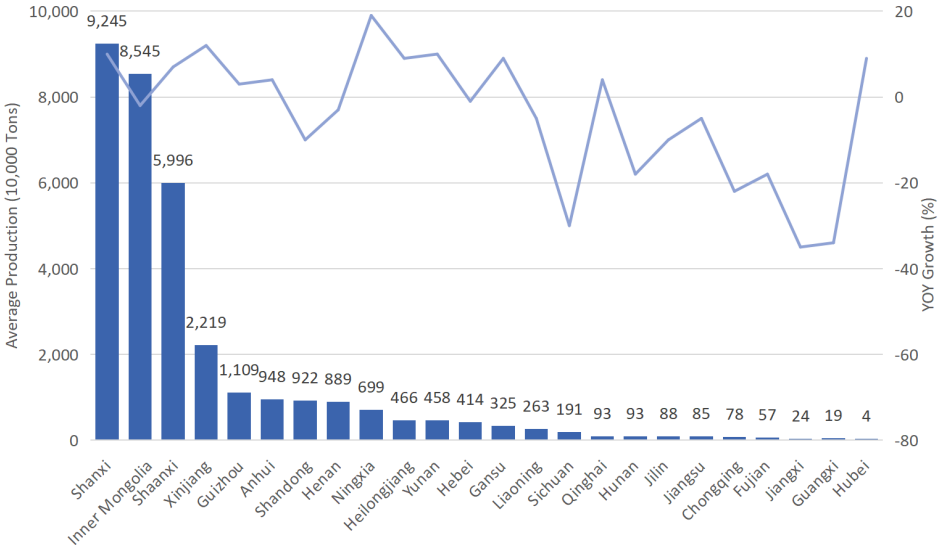


Figure 4. Monthly Average Production of Raw Coal in 2020

Source: National Bureau of Statistics

Coal consumption

In 2020, national energy consumption stands at 4.98 billion tce, the equivalent of a 2.2% YOY growth. By comparison, national coal consumption grew modestly at 0.6% YOY. In recent years, coal's share in national energy mix keeps declining, lowering from 59% in 2018 to 56.8% in 2020.

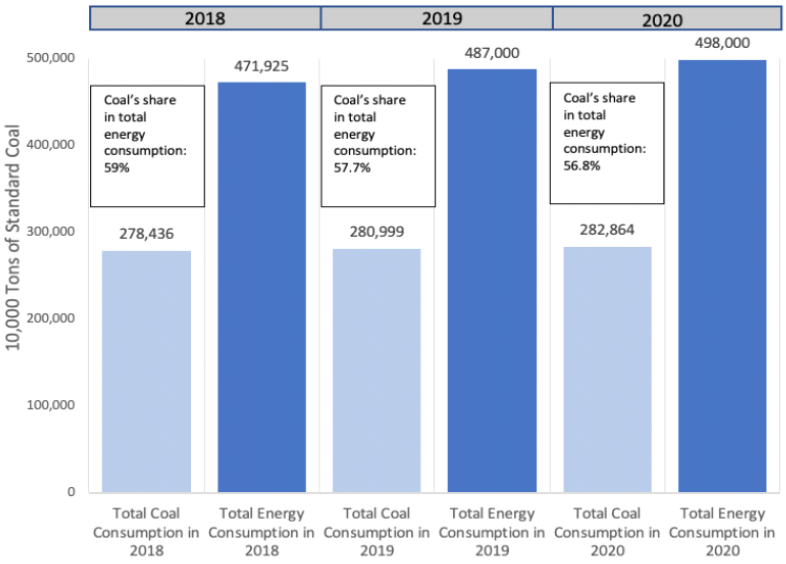


Figure 5. Share of Coal Consumption

Source: National Bureau of Statistics.

In 2020, national coal consumption is dominated by four major coal-consuming sectors including power, iron and steel, building materials and chemicals, with their share of national consumption increasing by 0.8, 3.3, 0.2 and 1.3 percentage points YOY, respectively. By comparison, share of the remaining sectors in national coal consumption has contracted by 4.6 percentage points YOY. It is worthwhile to mention that the Chinese power sector alone accounts for about 55% of national coal consumption last year.

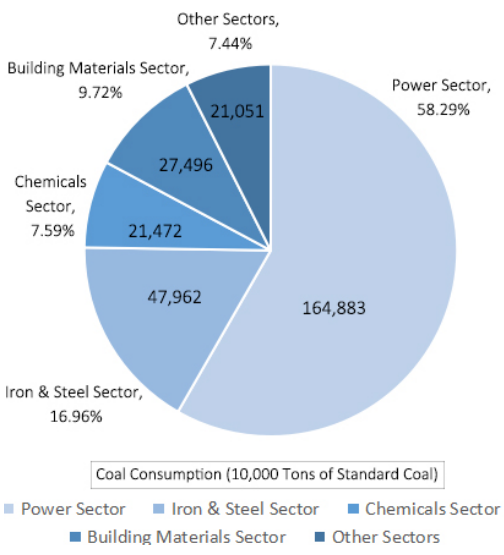


Figure 6. Coal Consumption by Sectors

Source: Coal Development Report 2020, China Energy Big Data Report 2020 – Coal.

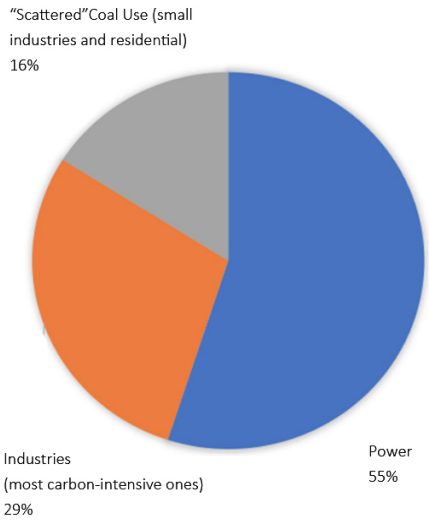


Figure 7. China's Key Coal-Consuming Sectors

Source: EFC's analysis

Coal-fired power plants

During the 13th FYP period, China's national power capacity increased from 1,526 GW in 2015 to 2,201 GW in 2020, the equivalent of an annual average growth rate at 7.6%. While the 13th FYP target for power capacity at 2,000 GW has been greatly exceeded, national coal-fired power capacity at 1,080 GW by the end of 2020 is slightly lower than the 13th FYP target at 1,100 GW. In retrospect, though coal-fired power capacity in China increased from 755 GW in 2012 to 1,080 GW in 2020, its annual average growth rate at 3.7% is significantly lower than that of national power capacity. As a result, coal-fired power plants' share in national power capacity mix declined below 50% for the first time.

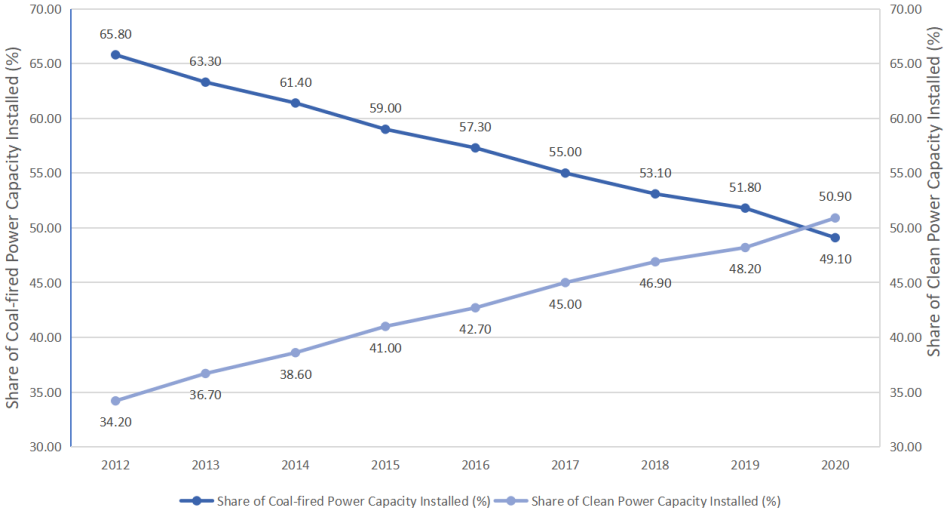


Figure 8. Comparison of Coal-fired Power Capacity Installed and Clean Power Capacity Installed

Source: BJX Power Info Net.

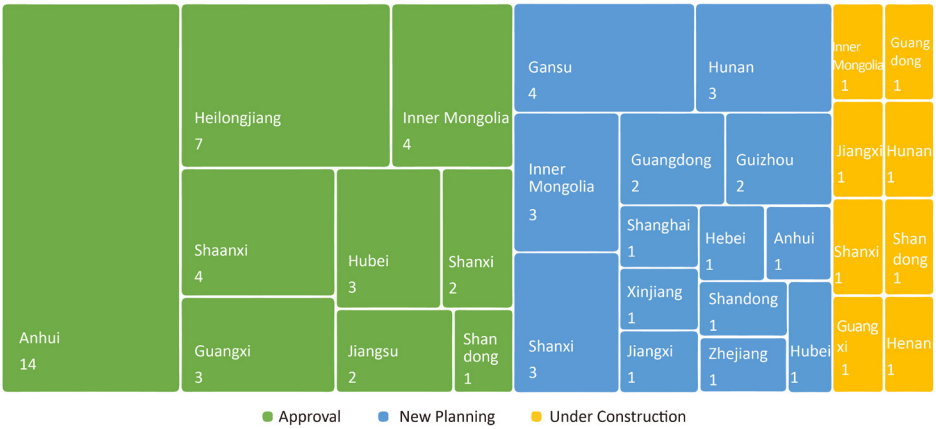


Figure 9. Location of New Power Plants in 2020

Source: Energy Foundation China.

According to EFC's latest data collected, current coal power pipelines include about 72 projects with more than 86 GW, of which, 46.1 GW were newly permitted in 2020, and the rest 40 GW were planned, announced, or pre-permitted. The 46.1 GW of greenfield coal-fired power plants permitted in 2020 is 3 times of that in 2019, and is the equivalent of about 30% of all the coal power capacity permitted during the 13th FYP period. The drivers behind are mainly local considerations of fiscal income, economic growth and employment, energy security, decentralization of approval authority, and the technical, regulatory, and safety challenges in the deployment of storage. Categorized by investor, greenfield coal-fired power plants were primarily owned by local power enterprises. More specifically, the rebounding of coal-fired power permitting in 2020 was largely driven by a relaxing of the color-coded alert system for coal-fired power plants coupled with economic recovery policies during the COVID-19 pandemic.

Key Development in China

January 29: The sixth ecological and environmental protection inspectorate of the central committee of CPC gives feedback to National Energy Administration

On December 15, 2020, the second meeting of the Ecological Environmental Protection Inspection Leading Group reviewed and passed the inspection report, and gave feedback to the National Energy Administration (NEA) on January 29, 2021. The feedback mainly includes three aspects: First, ecological environmental protection is not paid enough attention that it deserves. Second, the policy system does not sufficiently reflect the requirements of ecological and environmental protection. Third, the requirement of "management of specific industry must also supervise environmental protection" is not properly implemented.

According to the inspector, the NEA should establish and improve the energy policy system of green development, implement the responsibility of "management of specific industry must also supervise environmental protection." The NEA should also continue to promote clean heating in northern areas, accelerate the adjustment of energy structure, promote the development of high-quality renewable energy, optimize the industrial layout and structure of coal power development, and guide and supervise the solution of universal ecological and environmental problems in the industry. The inspector stressed that the NEA should, according to the inspection report, urgently develop a rectification plan and report to the central government and release it to the public in a timely manner. (MEE)

March 12: The Outline for 14th FYP and the Long-term Goals for 2035 was officially released

China's new FYP for 2021 to 2025 and long-range objective through 2035 sets no absolute greenhouse gas emission targets. In a break from tradition, it also did not set a specific target economic growth rate, which indicates that the State Council of China aims to focus on quality of economic growth instead of speed of the growth.

More specifically, during the 14th FYP period, China sets an energy intensity reduction target at 13.5%, and carbon emissions intensity reduction target at 18%. In addition, the outline calls for an improvement of the forest coverage rate from 23.4% in 2020 to 24.1%. Moreover, it expects the country's total energy production to reach more than 4.6 billion tonnes of coal equivalent. Please note that the 13th FYP had set a cap on energy production rather than a minimum level. (Xinhua News Agency, Carbon Brief)

March 15: President Xi Jinping stressed the importance of integrating carbon peaking and carbon neutrality into the overall development of ecological civilization

In the 9th Meeting of the Central Finance and Economic Commission, President Xi stressed that striving to achieve carbon peaking by 2030 and carbon neutrality by 2060, is a major strategic decision made by the central committee of the Party, after careful consideration; and this is important to sustainable development of the Chinese nation and building of a community with a shared future for mankind.

The meeting pointed out that the 14th FYP period is the key to peak national carbon emissions. It is needed to build a clean, low-carbon, safe and efficient energy system, control the total amount of fossil energy, focus on improving efficiency, implement renewable energy alternative action, deepen the reform of the power system, and develop the new power system based on new energy. Meanwhile, key issues on low-carbon development were discussed during the meeting, including air pollution control, green transformation of key industries, low-carbon technology development, green finance, international cooperation, and etc. (People.cn)

April 17: China-U.S. Joint Statement Addressing the Climate Crisis

Chinese Special Envoy for Climate Change Xie Zhenhua and U.S. Special Presidential Envoy for Climate John Kerry met in Shanghai on April 15 and 16, 2021, to discuss aspects of the climate crisis. At the conclusion of the discussion, a joint climate statement was released to pave way for the Chinese president's attendance of Biden Administration's Leaders Climate Summit on April 22, with two noticeable clauses as below:

China and the United States are committed to cooperating with each other and with other countries to tackle the climate crisis, which must be addressed with the seriousness and urgency that it demands.

They will each implement the phasedown of hydrofluorocarbon production and consumption reflected in the Kigali Amendment to the Montreal Protocol. (MEE)

April 22: Chinese president's attendance of the Leaders Climate Summit

Chinese President Xi Jinping, speaking via video link to the Leaders Climate Summit on April 22, said China was committed to green development and upgrading its coal-dependent energy system. More specifically, President Xi announced that China will strictly control coal-fired power generation projects, and strictly limit the increase in coal consumption over the 14th FYP period and phase it down in the 15th FYP period.

As the first ever official announcement of coal phase-out by China, the above pledge provides more clarity to China's carbon neutrality pledge made by President Xi in September 2020, boosting momentum of clean energy transition in China in the years to come. (Xinhua News Agency)

Key Development:
International Perspective

January 20: U.S. officially rejoins the Paris Agreement

Hours after he was sworn-in on January 20, U.S. President Joe Biden signed an executive order beginning the 30-day process for the US to re-enter the global pact. The U.S. had officially exited the agreement on former President Donald Trump's orders, becoming the first and only country to formally pull out of the deal since it was adopted in 2015. Rejoining the Paris Agreement is a significant step by the Biden administration to reverse the climate policies of the last four years, during which Trump rolled back or loosened many of the country's bedrock environmental policies and regulations. U.S. rejoining the Paris Agreement not only significantly boosted global climate momentum, but also re-opened the door for U.S.-China cooperation on climate change. (The White House, CNN)

April 15-16: U.S. climate envoy John Kerry visited Shanghai

U.S. Special Presidential Envoy for Climate John Kerry visited Shanghai for extensive meetings with China's Special Envoy for Climate Change Xie Zhenhua. Following the meeting, they released a U.S.-China Joint Statement Addressing the Climate Crisis, demonstrating the willingness of both sides to engage constructively to advance climate ambition, even as other issues in the bilateral relationship remain tense. Highlights of the statement include: explicit mention of the need to reduce emissions from coal, oil, and gas; a commitment by both countries to expand international financing to support developing countries' transition from fossil fuels to renewable energy; references to controlling non-CO2 gases, including cooperating on methane and phasing down hydrofluorocarbons (HFCs) according to the requirements of the Kigali Amendment; and a list of sectors and issues both countries will tackle, paving the way for further joint action and engagement moving forward. (MEE, Washington Post)

April 22: Biden Administration's Leaders Climate Summit

At the Leaders Summit on Climate, President Xi re-affirmed China's commitments to climate action, highlighting that China's comprehensive decarbonization efforts will engage all sectors and stakeholders. Three especially noteworthy parts of his speech: 1) President Xi, for the first time, explicitly referenced a coal "phase down," stating that China will "strictly limit" coal power projects and coal consumption during the 14th FYP period (2021–2025), and "phase it down" gradually in the 15th FYP period (2026–2030); 2) President Xi mentioned support for "peaking pioneers from localities, sectors, and companies," emphasizing the importance of all sectors and stakeholders contributing to China's early peaking and early neutrality, with more advanced regions and actors paving the way with ambitious climate action now; 3) President Xi stressed the importance of "ecological cooperation" along the Belt and Road, highlighting BRI "action TFs" on green infrastructure, green energy, green transport, and green finance. (MEE, The White House)

July 5: China-Germany-France leaders' meeting on climate and recovery

In preparation for the upcoming multilateral meetings, particularly the World Conservation Congress, the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity in Kunming, the 26th session of the Conference of the Parties to the UNFCCC in Glasgow, and the G20 Summit in Rome, the French President, the German Chancellor, and the Chinese President held a video conference on July 5, 2021. After welcoming China's ratification of the Kigali Amendment, President Macron, Chancellor Merkel, and President Xi discussed the concrete steps necessary to achieve the set targets for the reduction in greenhouse gas emission and carbon neutrality. Particularly, three parties discussed the importance of cessation of funding for coal-fired power plants in China. (The French Embassy)

Progresses of EFC's Coal Transition Initiative

Top design of the framework

As EFC started practicing recently, we have applied a renewed approach for program strategy for Coal Transition Initiative: 1) Improving the Initiative's strategic structure with a focus on the Initiative Master Plan development; 2) Focusing on three key sectors (power, heavy industries, and scattered coal use) and developing sectoral Action Plans; and 3) Drilling down to local level conducting case studies of good practices in typical provinces.

The preparation of the Master Plan and three sectoral Action Plans were launched in the 2nd quarter of 2021 and are expected to be finalized in September.

Deep dive in Inner Mongolia

We have applied this strategy into Inner Mongolia work actively. In March, EFC team conducted a scoping trip led by CEO, identifying key areas to work with among major cities including Hohhot, Ordos, Baotou, and Ulanqab, where old coal power plant role transition and phasing-out, coal chemical, clean heating, RE generation, and others are considered great potential. In April, EFC also organized a successful training in Inner Mongolia for high-level officials and authorities on carbon peaking and energy transformation. With endorsement from Inner Mongolia Government and NDRC as well as Work Plan developed for different terms, we aim to make further progress with concrete next steps, including: 1) Launching immediate capacity building: design a tailored package of trainings to decision- and policymakers, industries, and other key stakeholders; 2) Developing Energy and Carbon Control Action Plan; 3) Organizing a forum: "Initiating a New Era of High-Quality Development—Opportunities and Challenges of Inner Mongolia under the Carbon Peaking/Neutrality Background;" and 4) Supporting a cluster of projects: focusing on key sectors and main energy-consuming cities.

Europe-China dialogues on coal just transition

As global policy collaboration is being weakened by the accelerating trend of de-globalization, the joint efforts of China and the EU, who are still very active in leading global climate discussions, are becoming more crucial in the fight against rising global temperature. China's pledge to carbon neutrality in September 2020 is highly welcomed by European politicians, widening the collaboration channels of China and the EU on climate mitigation solutions. China and the EU have been discussing about climate change via diplomatic dialogues for years, but more concrete actions are needed to tackle many specific and unsolved challenges. The timely announcement of China achieving carbon neutrality by 2060 points at a clear direction for China's post-pandemic development pathway, offering an opportunity for China and the EU to explore how to recover better on both national and regional levels. Against the aforementioned backdrop, and funded by Energy Foundation China, Berlin-headquartered Agora Energiewende plans to organize a serials of Europe-China Dialogues on Coal Just Transition, aiming to transfer European experience and lessons gained from their ongoing coal just transition processes to China. Through the above dialogues, international stakeholders are expected to better understand prospects of coal just transition in China.

Cost analysis and risk evaluation of coal-fired power plants in China

Funded by Energy Foundation China, this study conducted by a Renmin University of China research team led by Professor Wang Ke aims to analyze operations and long-term profitability of the Chinese coal power sector in increasingly carbon-constrained world, to provide evidence to explain rationale behind investment of greenfield coal-fired power plants, and to explore plausible roadmap to retrofit existing plants.

Preliminary findings of the ongoing study include but not necessarily limited to: 1) average age of coal-fired power plants in China is only 12 years, making it difficult for early closure; 2) there exists great regional discrepancy in terms of capacity distribution of coal-fired power plants across China; 3) profitability of coal-fired plants increase along with size of their generation units; 4) coal-fired power plants running financial deficit largely are in northern China. For those most indebted plants, they are concentrated in northwestern China; 5) profitability of coal-fired power plants in China are extremely sensitive to annual operation hours; 6) carbon pricing is expected to negatively affect bottom line of coal-fired power plants; 7) fuel costs account for more than 50% of operational expenditure of greenfield coal-fired power plants; 8) profitability of coal-fired power plants are primarily driven by on-grid power tariff, fuel cost, annual operational hours, and life span of the plant.

Highlights of Knowledge from the Field

March 16:
A plant-by-plant strategy for high-ambition coal power phase-out in China

More than half of global installed coal-fired power capacity is in China. A key strategy for meeting China's 2060 carbon neutrality goal and the global 1.5°C climate goal is to rapidly shift away from unabated coal use. Here we detail how to structure a high-ambition coal phase-out in China while balancing multiple national needs. The authors evaluate the 1,037 currently operating coal plants based on comprehensive technical, economic, and environmental criteria, and develop a metric for prioritizing plants for early retirement. They find that 18% of plants consistently score poorly across all three criteria and are thus low-hanging fruits for rapid retirement. They develop plant-by-plant phase-out strategies for each province by combining our retirement algorithm with an integrated assessment model. With rapid retirement of the low-hanging fruits, other existing plants can operate with a 20- or 30-year minimum lifetime and gradually reduced utilization to achieve the 1.5°C or well-below 2°C climate goals, respectively, with complete phase-out by 2045 and 2055. (Nature Communications)

April:
COVID-19 China Energy Impact Tracker: A recap of 2020

Agora Energiewende's COVID-19 China Energy Impact Tracker provides regular updates on how the COVID-19 pandemic has affected China's energy sector, from energy supply and consumption to carbon emissions and other key indicators. It aims to better inform the international community and Chinese audiences alike about the impact of COVID-19 on the Chinese energy economy.

In April 2020, Agora published the third issue of the tracker, which is an assessment of COVID-19 pandemic's impacts in year 2020, with focus on energy and climate implications. In sharp contrast with the rest of the world, demand of all fossil fuels in China increases by 0.6% for coal to 7.2% for gas, consequently, the country's national carbon emissions last year increased by 1.3% YOY. (Agora Energiewende)

March 18:
GEIDCO study suggests that Chinese coal power emissions may peak by 2025

Based on research by Global Energy Interconnection Development and Cooperation Organization (GEIDCO), a viable path for China to go carbon neutral is that the country peaks carbon dioxide emissions in the power generation sector in 2025 and brings down the installed capacity of coal-fired plants to 300 million kilowatts by middle of the century before phasing out them all by 2060.

According to GEIDCO, before 2030, China should focus mitigation efforts on suppressing fossil fuel consumption, aiming to peaking national carbon emissions around 10.9 billion tons of CO2 by 2028. By 2050, the Chinese power sector should achieve net-zero emissions. In the following decade before 2060, China's carbon neutrality should be delivered with deep decarbonization, CCUS and reforestation among other measures. (Jiemian, China Daily)