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Investing in Green and Low-Carbon China

Introduction

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China's transition to a green, low-carbon, and circular economy will have far-reaching socioeconomic, industrial, and business impact as economic and consumption behavior will be directly related to the country's progress on tackling climate change and environmental degradation.

Companies operating in China, including foreign entities, will be under greater pressure to reduce their carbon footprints across their value chains. Green compliance will also be increasingly important once regulators start to issue stricter standards and implement monitoring mechanisms.

However, China's green transition does open doors to new opportunities for foreign businesses. A push for seeking advanced technologies and tech know-how, more financing options, and regulatory policies leveling the playing field for local and international players is making the growth potential of green industries more attractive than ever.

In this issue of *China Briefing magazine*, we demonstrate the opportunities and risks involved in China's green and low-carbon transition. We also investigate some of the industries where the government has sought to attract foreign capital and know-how. Finally, we summarize major green compliance requirements and provide tips on meeting these targets and relevant environmental standards.

We hope this magazine helps your business build up a clearer understanding of China's green transition and better strategize for operations in this dynamic market.

With kind regards,

Alberto Vettoretti

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The Relevance of China's Green and Low-Carbon Plan to Foreign Investors

China has set major carbon emissions targets, the first of which is due to be reached in 2030. To achieve these goals, policymakers are writing the frameworks to guide China's green transition and achieve a low-carbon economy. The country is also seeking tech know-how and innovation-based expertise and has been leveling the production playing field. It is projected that as a result of this pivot, China's market for green goods and services will be among the largest in the world.

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After decades of breakneck economic growth, China is making it a priority to develop a green, low-carbon, and circular economy in coming decades. Continuing along the same growth track would have been unsustainable and inefficient – an assessment that is backed by top policymakers. In February 2021, the State Council released a guiding opinion outlining the transition plan for how China will initially form the production system, circulation system, and consumption system featuring green, low-carbon, and recycling development by 2025 and fundamentally improve the ecological environment to achieve the goal of "beautiful China" by 2035.

Accomplishing these goals require serious social and economic transformation. China emits over 25 percent of the world's greenhouse gases and has more installed coal capacity than the rest of the world combined. It is inevitable that a green and low-carbon transition in the country will impact all types of market players. In this article, we provide an overview of China's plans and the paths it has identified to secure a green economy and explain their relevance to foreign investors.

What is China's green and low-carbon plan?

China's decarbonization commitments and climate policy framework

In his video address to the UN General Assembly on September 21, 2020, President Xi Jinping announced China's intentions to expedite its voluntary carbon emissions reduction targets ahead of its pre-existing commitments and strive to reach peak carbon emissions by 2030 and carbon neutrality by 2060.

In the run-up to the COP26 summit in early November 2021, China released two key policy documents, further cementing its decarbonization commitments. The two documents, titled the *Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation*

of the New Development Philosophy ("Working Guidance") and the *Action Plan for Reaching Carbon Dioxide Peak Before 2030* ("Action Plan") also form the basis of China's climate policy framework for reaching its carbon reduction targets, known as the "1+N" policy framework.

The "1" part of the policy framework refers to the Working Guidance, which acts as the country's overarching guiding principles for reaching its climate goals, while the "N" stands for an unspecified number of auxiliary policy documents targeting specific industries, regions, fields, and goals. The Action Plan is the first and most important "N" document that has been released.

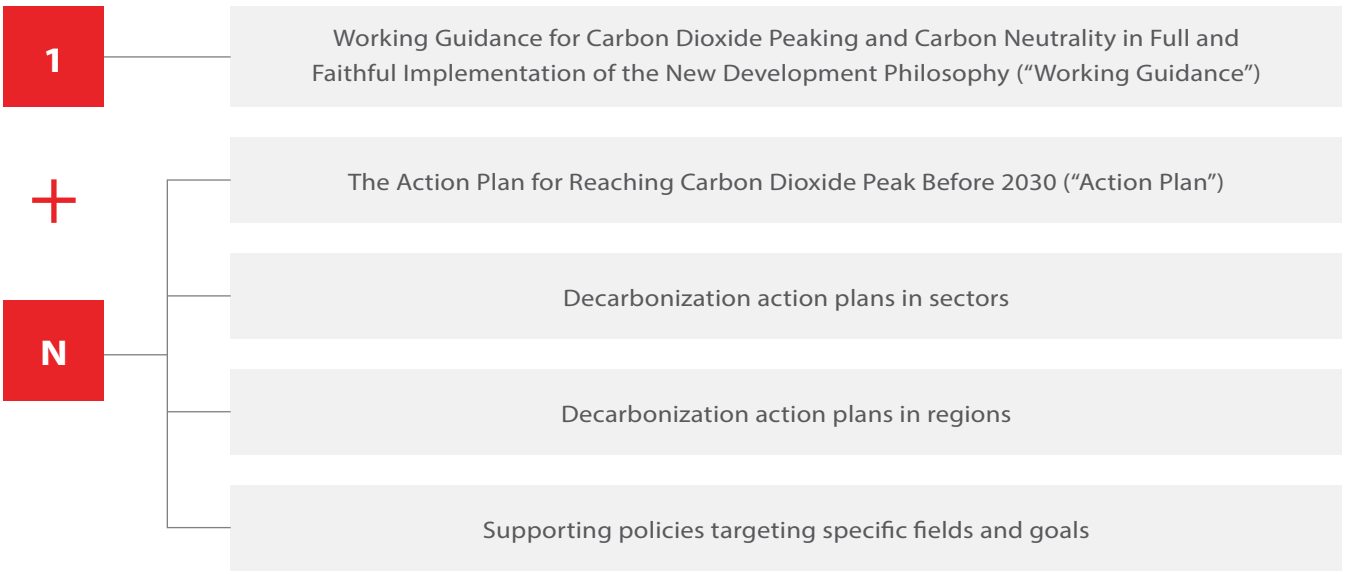
Both the Working Guidance and the Action Plan are "top-level design documents" that will collectively guide China's decarbonization efforts. But the Action Plan goes far beyond topline goals – it provides an extensive overview of the areas of China's economy that will gradually be reduced or shifted to sustainable energy and methods, including heavy industry, agriculture, transportation, and the circular economy.

In addition to the Action Plan, the National Development and Reform Commission (NDRC) has explained that the "N" part of the framework will also include decarbonization action plans for specific industries and regions, as well as supporting policies that regulate scientific and technological support towards decarbonization, carbon sink capacity, carbon accounting, decarbonization inspection and assessment, and fiscal and financial support towards decarbonization, etc.

At the Two Sessions in 2022, the NDRC provided more details about the "1+N" plans to be drafted in 2022.

According to reports, detailed decarbonization action plans can be expected for multiple sectors, including energy, industry, transportation, iron and steel, nonferrous metals, petroleum, petrochemicals, natural gas, urban and rural development, agriculture and rural areas, and building materials. Through the "1+N" climate policy framework, China wants to coordinate and consolidate the economy-wide carbon reforms.

China's "1+N" Decarbonization Policy Framework



China's broader plan for a green, low-carbon, and circular economy

In February 2022, the State Council released the *Guiding Opinions of the State Council on Accelerating the Establishment and Improvement of a Green, Low-carbon and Recycling Economic System* ("Guiding Opinion"), which sets broader goals for China to transfer to a green economy.

Other than working points related to carbon reduction, the Guiding Opinion pays attention to the efficient use of resources other than energy and their discharge of pollutants as well as the general development of the environmental protection industry. Some examples are stated below.

For water resources, the Guiding Opinion proposes to:

- promote efficient water-saving technology in agriculture;
- improve the charging policy for sewage treatment in manufacturing;
- develop contract water conservation management services;
- lay out sewage recycling facilities in urban areas;
- improve the trading mechanism for water use rights; and
- carry out the pilot program of resource tax collection and transformation of water resource fees into taxes.

For pollutant discharge, the Guiding Opinion proposes to:

- accelerate the implementation of pollutant discharge licensing system;
- strengthen the management of hazardous waste in industrial production; and
- develop third-party environmental pollution treatment and environmental custody services for better environment treatment results.

To achieve these goals, the Guiding Opinion suggests that China must first make breakthroughs in key areas, such as conservation and environmental protection, clean production, and clean energy, before comprehensively driving the green upgradation of its primary, secondary, and tertiary industries and infrastructure. Also, emphasis is laden on the importance of innovation and the market's guiding role, indicating that green tech and private entities will be expected to play an important part in China's green transition.

To achieve China's green and low-carbon transition goals, policymakers have identified specific tasks (see table on page 7).

How to understand China's current progress on green transition

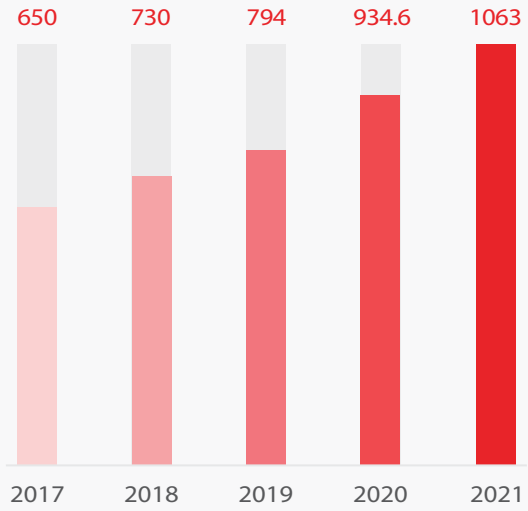
China has been investing heavily in renewable energy over the past decade. According to the National Energy Administration (NEA), China's installed renewable energy capacity reached 1063 gigawatts (GW) in 2021, accounting for 44.8 percent of China's total power generation capacity. However, it is important to note that "capacity" refers to the maximum level of electrical power that can be produced in the country, not the total amount of electrical power that has been generated. This figure is useful to gauge the energy generation potential of the country but does not show the actual amount of energy that has been generated from renewables. In terms of electricity generation, renewables account for a smaller proportion, reaching 2.48 trillion kWh in 2021, equivalent to 29.9 percent of total electricity use that year.

The majority of China's power supply thus still comes from fossil fuel sources. According to data from the National Bureau of Statistics (NBS), in 2021, China's consumption of coal increased 4.6 percent year-over-

China's Transition to Green, Low-Carbon, and Circular Economy: Key Tasks	
Improving the production system	Promoting green upgrading of industries
	Accelerating green development of agriculture
	Improving the level of green development of the service industry
	Expanding green and environmental protection industries
	Improving the recycling level of industrial parks and industrial clusters
	Building a green supply chain
Improving the circulation system	Creating green logistics
	Strengthening the recycling of renewable resources
	Establishing a green trade system
	Promoting the consumption of green products
	Advocating a green and low-carbon lifestyle
Improving the consumption system	Promoting the consumption of green products
	Advocating a green and low-carbon lifestyle
Accelerating the green upgrading of infrastructure	Promoting the green and low-carbon transformation of the energy system
	Promoting the construction and upgrading of urban environmental infrastructure
	Improving the green development of transportation infrastructure
	Improving urban and rural living environment
Building a market-oriented green technology innovation system	Encouraging research and development of green and low-carbon technologies
	Accelerating the transformation of scientific and technological achievements
Improving the system of laws, regulations, and policies	Strengthening the support of laws and regulations.
	Improving the price mechanism for green charges
	Increasing fiscal and tax support
	Vigorously developing green finance
	Improving green standards, green certification system, and statistical monitoring system
	Cultivating green trading market mechanism

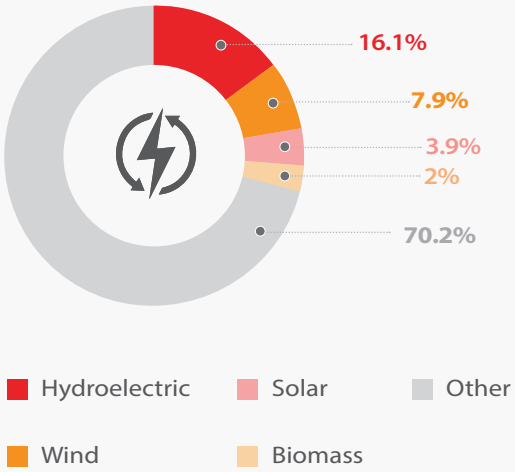
Source: State Council

Growth in Total Installed Renewable Energy Capacity (GW)



Source: National Energy Administration

Proportion of Renewable Energy in Total Electricity Consumption, 2021



Source: National Energy Administration

year and accounted for 56 percent of total energy consumption. Also, new domestic coal-fired power plants were green lit as recently as February 2022. In April, the State Council confirmed China would increase its coal output in 2022 to 300 million tons, up from 220 million tons in 2021.

If coal consumption is back, how can we trust China's climate action pledges?

While the renewed dependence on coal is contradictory to China's pledges to decarbonize its economy, the country realizes that a peak consumption point will be reached before it stabilizes enough to implement radical targets. Energy security is, after all, the basis for China's economic and social development.

This fact was made evident by some of the worst power shortages experienced in the country in the fall of 2021, leading to rolling blackouts in urban areas and forcing the closure of factories in parts of the country. The power crunch was blamed on a combination of factors, including an increase in demand and a cut to coal production in response to policies to reduce energy intensity. The shortage came as a considerable shock to the country. Cut to 2022, when multiple COVID-19 outbreaks across China have triggered strict lockdowns in some of the country's largest economic centers. External factors, such as continued supply chain bottlenecks, high commodity prices, and geopolitical instability following the breakout of the Russia-Ukraine war in late February, are also weighing heavily on the minds of Chinese policymakers. Another power crunch of the kind seen in 2021 would therefore be disastrous for China's economy.

2022 is also a pivotal year for the government as it prepares for the upcoming 20th National Congress of the CCP in the latter half of the year. In the run-up to this event, economic and social stability will be paramount. As a result, government officials repeatedly stress the importance of ensuring a stable energy supply and place energy security as a top priority for the year.

Does this mean that China could go back on its green and low-carbon commitments?

The short answer is no. During the Two Sessions in 2022, President Xi stated, "Green transformation is a process, and not something that can be accomplished overnight" and decarbonization should be "not too fast, not too slow, steady and sure". The current increase in coal production and consumption is a response to short-term issues of energy supply, and as other energy sources catch up, China's coal consumption will reduce.

Till then, policymakers will release more policies and regulations aimed at reducing carbon emissions in specific areas of the economy and roll out more incentives to encourage the participation of private capital in the country's green transition.

Bearing that in mind and given the difficulty of immediately reducing the reliance on fossil fuels, China is expected to enhance green and low-carbon transition in other fields to compensate. This includes improving the carbon emission measurement method, developing the carbon trading market, more emphasis on green compliance, and encouraging the development of green technologies, such as energy conservation and emission reduction technologies.

What are the implications for foreign investors?

China's transition to a green, low-carbon, and circular economy is an immense task that will have far-reaching influence on the whole society, especially on all kinds of market players whose economic behaviors are directly related to China's plans for tackling climate change and environmental degradation.

For the purpose of this article, we summarize the implications of China's green and low-carbon transition for foreign investment into three aspects.

New opportunities emerging

While the transition towards green development may add burden to some businesses regarding green compliance and the green transformation of their operations and supply chains, it also opens the door for new opportunities.

Driven by policies and supported by research and innovation, emerging green industries, including renewables, clean productions, waste management, sustainable infrastructure, and services that support green development, have great potential for growth in China. In addition, increased public awareness will help shift consumer trends towards green consumption.

As estimated by Goldman Sachs, there will be a US$16 trillion investment opportunity on China's path to carbon neutrality by 2060. And China's market for green goods and services will be the largest in the world, presenting a US$1 trillion opportunity.

Although Chinese companies dominate the global market share in many of these areas, they are not always strong in innovation and advanced technologies. This leaves a big space for foreign companies to enter, as innovation and technology are essential to China's green transition, especially given China's difficulties to change its energy structure in the short term.

On the other hand, the Chinese government has been gradually removing subsidies on renewable energy sources, new energy vehicles, and other green industry areas to even the playing field between

domestic and foreign companies – thereby making quality the bigger factor in competitiveness. In the absence of subsidies, China is developing a green bond market to finance the industry, which will further facilitate the access of foreign capital into China's sizeable – and politically imperative – green market.

Foreign investors, especially long-term value investors, should pay attention to China's zero-carbon development and invest in green assets, projects, and technologies to seize the opportunities emerging in China's green and low-carbon transition.

Upgrading existing investments

As China steps up its efforts to decrease emissions and transfer to a greener economy, companies operating in the country will be under greater pressure to reduce their carbon footprints across their value chains and be more efficient in environment protection.

Foreign businesses operating in traditional sectors may also need to thoroughly and systematically upgrade their existing operations and supply chains to perform better on energy saving, pollution control, and resources recycling, among others. Advanced technologies and management will play a key role in this process.

Whereas the greening of traditional sectors does seem costly, a lot of new green technologies and management techniques are set to improve operational competitiveness and profitability. Many energy-efficient investments are also cost-effective and yield high economic returns. Additionally, these transitions could have a brand impact with green consumption influencing new consumer trends. Products and services from businesses with greener supply chains and operations will be viewed more positively in the market.

Bigger push for green compliance

With China adding more environmental laws, regulations, standards, and other requirements to its green and low-carbon framework, green compliance will become more important for businesses operating here. For example, on December 18, 2021, China's Ministry of Ecology and Environment (MEE) issued the *Measures for the Administration of Legal Disclosure of Enterprise Environmental Information* (the Measures), which came into effect February 8, 2022.

The Measures strengthen China's reporting requirements on environmental, social, and governance (ESG) by mandating major polluters and the companies that finance them to submit annual reports providing a range of environmental information. Moreover, the Measures enhance their implementation scope by making ESG compliance relevant to a company's corporate credit score, the fluctuation of which is more damaging to large companies than monetary fines.

This demonstrates the trends for green compliance in China – standards will be stricter and their monitoring will be more consistent. Businesses operating in China are advised to keep a close eye on the roll out of China's green compliance requirements and make necessary preparations in advance.

New Opportunities in China's Green and Low-Carbon Transition

Foreign investors may have been hesitant to enter China's renewable energy market in the past due to sops enjoyed by domestic companies, preferential government procurement practices, and inconsistent levels of transparency. Yet, this is changing as top policymakers are opening associated sectors to foreign participants while also rolling back advantages enjoyed by local firms and improving access to financing.

Qian Zhou
Author

China's plans to transform its economy to meet high environmental standards and serve climate conscious goals may be considered ambitious, but it creates new opportunities. With advances in technology, financing, and regulatory policies, the growth potential of green industries is more attractive than ever – much of this momentum is concentrated in the renewables, clean production, waste management, sustainable infrastructure, and services that support green development.

This is in line with the areas encouraged in the *Catalogue of Encouraged Industries for Foreign Investment* (hereinafter, the encouraged catalogue). In the presently effective 2020 version of the encouraged catalogue, around 100 items fall into the scope of green industries, accounting for nearly one fifth of the total sectors where foreign investment is encouraged. This trend persists in the exposure draft of the 2022 version of the encouraged catalogue.

In this article, we investigate some of the highlighted industries that offer new opportunities to foreign investors by reviewing market trends, China's green and low-carbon plans, and the country's foreign investment policies.

Renewable energy

Along China's path to reach its ambitious carbon reduction targets, a rapid and effective shift of power generation from fossil fuels to renewable energy sources will be unavoidable, as this sector is responsible for 52 percent of carbon emissions in the country, higher than the global average of 41 percent.

Despite China's dominance in renewables and the country's proliferation of renewable energy sources, it is still far from replacing fossil fuel sources. In 2021, electricity generated from renewables reached 2.48 trillion kWh, equivalent to 29.9 percent of total electricity use that year. To double electricity production from renewables, Zhang Xiliang, a climate modeler at Tsinghua University, projected that China will need to increase solar

power generation 16-fold, wind power ninefold, nuclear power sixfold, and hydroelectricity twofold. Even though China is already a global leader in the area, it will need to spend trillions of dollars on renewable energy sources in the coming decades, presenting huge opportunities for foreign investment.

To be more concrete, China has launched a plan to build 455 GW of solar and wind energy capacity in the country's vast desert regions. The plan targets to install 200 GW of capacity by 2025 and an additional 255 GW by 2030, of which about 60 percent will be solar, and 40 percent will be wind. Further, including the desert project, China will install 500 GW of wind and solar by 2025 and 700 GW by 2030, which would put its total installed capacity of wind and solar at 1,700 GW.

For foreign investors, China's renewable energy market has felt intimidating to enter in the past, due to the market share of domestic companies, government procurement practices, and inconsistent levels of transparency. Yet, the below facts and trends offer fresh scope to enter this sizable market:

- The energy sector prioritizes low costs, and innovation in technologies like solar panels have been relatively slow. While Chinese companies dominate the market share in many of these areas, they do not always possess the advanced technology required for cost efficiency.
- China is gradually removing subsidies for the renewables sector to even the playing field between domestic and foreign companies as markets and technology mature.
- Innovation with green and sustainable applications is expected to accelerate as countries around the world adopt renewables. The importance of producing industry-leading technology with scalable applications will only grow bigger – and China presents a great opportunity for market exploration in this regard.

As for encouraging foreign investment access, China is making efforts to attract foreign investors to participate in the renewables and upstream and downstream sectors. Overall, there are no special limitations for foreign investors to invest in new energy projects. And many sectors are specially encouraged for foreign investment, according to the 2020 version of the encouraged catalogue.

Foreign enterprises with technological and quality advantages shall gain new development opportunities, especially in the commercial and industrial application of renewables.

Renewables sectors that are encouraged for foreign investment:

- Construction and operation of new energy power stations (including solar energy, wind energy, geothermal energy, tidal energy, current energy, wave energy and biomass energy, etc.)
- Construction and operation of regional energy supply (cold and heat) projects driven by renewable energy resources
- Construction and operation of biogas projects
- Manufacturing of new energy power generation equipment in set or key equipment
- Development and application of complementary system for power generation with gas and renewable resources
- R & D as well as application in production of large energy-storage technologies (thermal battery, pumped storage technology, air energy storage technology, wind power and heating after midnight, etc.)

Hydrogen industry

The Chinese government has identified the hydrogen industry as one of six industries of the future, and recently released plans that underscore its importance for both energy and industrial development.

In March 2022, the National Development and Reform Commission (NDRC) and National Energy Administration (NEA) issued the *Medium and Long-term Development Plan for Hydrogen Energy Industry (2021-2035)*, making it clear that China wants to take a leading role in developing the nascent green hydrogen (hydrogen made using renewables) market:

- By 2025: The plan calls for producing 100,000-200,000 tons of green hydrogen annually, up from 6.6 tons currently, and getting 50,000 hydrogen fuel cell vehicles on the road – up from 7,700 as of 2021.
- By 2035: China should form an industrial system for hydrogen energy and a system for applying hydrogen energy, including for transportation and energy storage.

Hydrogen energy also factors into China's plans for a number of other industries, such as new energy vehicles (NEVs). For example, the *New Energy Vehicle Industry Development Plan* projects hydrogen refueling station (HRS) capacity to grow from 72 units in mid-2020 to 2,000 units by 2035, demonstrating the close relationship between hydrogen energy development and NEV development.

China is already the world's largest hydrogen supplier, producing about a quarter of global output. The China Hydrogen Alliance projects the output value of China's hydrogen industry to reach RMB 1 trillion (US$157.44 billion) in value as early as 2025.

Nevertheless, China's hydrogen energy industry is still in the early stage of development, which is lagged in industrial innovation and technologies. Meanwhile, less than 20 percent of China's hydrogen production is green for the moment – China produces about 60 percent of its hydrogen from coal (brown hydrogen) and about 25 percent from natural gas (gray hydrogen). The growth potential for green hydrogen is huge.

The 2020 version of the encouraged catalogue also includes hydrogen energy and its upstream and downstream industries as "encouraged sectors", which further motivates foreign capital to participate in the development of China's hydrogen energy sector.

Among others, in November 2020, the British traded multinational energy company Shell announced the establishment of a joint venture (JV) company in Zhangjiakou, Hebei Province to invest in a green hydrogen production project with a capacity of 20,000 kW. In December 2020, Shell signed a strategic cooperation agreement with Jiaxing city in Zhejiang province, under which the two sides will cooperate in hydrogen energy and other new energy fields.

Besides hydrogen energy production, storage, and transport, many opportunities for foreign investors stand to come in the form of application, such as in hydrogen fuel cells. In 2020, for example, the Japanese auto company Toyota set up a JV with the Chinese hydrogen fuel cell maker Beijing SinoHytec to manufacture fuel cells for the Chinese market.

Foreign investors with specialty and experience in hydrogen industrial chains are recommended to pay attention to the developments in this sector.

Hydrogen sectors that are encouraged for foreign investment:

- Production, storage, transportation, and liquefaction of hydrogen fuels
- Manufacturing of equipment for preparation, storage and transportation, and inspection system for hydrogen energy
- Construction and operation of hydrogenation stations
- R&D and manufacturing of hydrogen cycle pumps, hydrogen ejectors, 70MPa hydrogen cylinders, on-board hydrogen concentration sensors, and fully wound carbon fiber cylinders for vehicle compressed hydrogen plastic inner bladder
- Manufacturing of fuel cells

New energy vehicles

Driven by government support and policy incentives, China has already been the world's largest NEV producer and consumer, hosting over 90 percent of global investment for both original equipment and components.

In 2021, China sold 3.52 million units of NEVs, up 181 percent from 2020 and exceeding the total sale of the previous three years. This growth trend of NEVs is expected to continue, with China striving to reduce carbon emissions in all fields and green consumption getting more recognition in the consumer market.

According to the *NEV Industry Development Plan (2021-2035)* released by the State Council, the sales of NEVs in China will account for 20 percent of the domestic auto market, marking a major turning point for the NEV industry as it becomes more market-driven and the industrial supply chain begins to stabilize.

For foreign investors, the cap on the share ratio of foreign investment in NEV manufacturing was lifted as early as 2018. And as of January 1, 2022, the restriction that one foreign investor cannot establish more than two JVs in China to manufacture the same type of vehicles has been removed. Thus, China's NEV sector is now completely open to foreign investors.

In addition to whole car manufacturing, many of the upstream and downstream industries that are part of NEV supply chains are encouraged for foreign investment.

According to the 2020 version of the encouraged catalogue, foreign investment is especially welcome for research and development (R&D) and manufacturing of key parts and components of NEVs and the manufacturing of charging piles and charging piles for energy storage. For the former, the 2020 encouraged catalogue has provided a very detailed breakdown of the key parts and components of NEVs that are encouraged for foreign investment, with parameter requirement of each industry specified. For example, for cathode materials of batteries, the encouraged catalogue required that the specific capacity should be no less than180mAh/g and the cycle life should be 2,000 times with not less than 80 percent of initial discharge capacity.

Most of the listed industries are those where there are still performance gaps between domestic and foreign products. As the NEV sector becomes more market-driven, helped by government efforts to level the playing field for all participants, foreign investors will have more chances to take a bigger bite of this giant market.

NEV sectors that are encouraged for foreign investment:

- R & D and manufacturing of key parts and components of new energy vehicles: monomers of energy-based power batteries; cathode materials of batteries (specific capacity ≥ 180mAh/g, cycle life of 2,000 times with not less than 80% of initial discharge capacity) and precursor materials of batteries, anode materials of batteries (specific capacity ≥ 500mAh/g, cycle life of 2,000 times with not less than 80% of initial discharge capacity), separators of batteries (thickness ≤ 12μm, porosity 35%? 60%); battery management systems, motor controllers, and electronic control integration of electric vehicles; motor system for driving of electric vehicles (high-efficiency area: 85%, efficiency in working area ≥ 80%), vehicle DC/DC (input voltage 100V? 400 V), high power electronic devices (IGBT, voltage class ≥ 750V, current ≥ 300A); plug-in hybrid electromechanical coupling drive systems; fuel cell engines (mass specific power ≥ 350W/kg), fuel cell stacks (volume specific power ≥ 3kW/L), membrane electrodes (platinum consumption ≤ 0.3g/kW), proton exchange membranes (proton conductivity ≥ 0.08S/cm), bipolar plates (metal bipolar plate thickness ≤ 1.2mm, and other bipolar plate thickness ≤ 1.6mm), low platinum catalyst, carbon paper (resistivity ≤ 3mω · cm), air compressors, hydrogen cycle pumps, hydrogen ejectors, humidifiers, fuel cell control systems, booster DC/DC, 70MPa hydrogen cylinders, on-board hydrogen concentration sensors; heat pump air conditioners for electric vehicle; special 32-bit or more chips for motor drive control (at least 2 hardware cores with main frequency of no less than 180MHz, with hardware encryption functions, etc.); integrated electric drive assemblies (power density ≥ 2.5kW/kg); high speed reducers (maximum input speed ≥ 12,000 rpm and noise below 75dB)
- Manufacturing of charging piles and charging piles for energy storage
- Design and manufacturing of special production equipment for power batteries for automobiles

Carbon capture, utilization, and sequestration (CCUS)

Carbon capture, utilization, and storage (or sequestration) (CCUS), also termed as carbon capture, utilization, and sequestration, is an important emissions reduction technology that can be applied across the energy system.

CCUS technology involves **capturing** carbon dioxide (CO2) from fuel combustion or industrial processes, **transporting** this CO2 via ship or pipeline, **using** it as a resource to create valuable products or services, or **storing** it in the form of mineral carbonates in geological formations or in deep ocean masses for an indefinite period of time. Thus, this technology is of high relevance for countries committed to reducing carbon emissions but anticipated to remain dependent on fossil fuels in the short term.

In China, CCUS technology will play an important role in helping the country meet its carbon commitments, serving as one of the few solutions to tackle emissions from heavy industry and to remove carbon from the atmosphere.

According to the *Global Carbon Capture and Storage Industry* report released by Global Industry Analysts in February 2022, by 2026, China's CCUS market size is forecast to reach US$482 million, trailing an annual growth rate of 11.4 percent, and the industrial separation segment is forecast to reach US$293.9 million.

CCUS is still at an early phase of development in China but is bound to gain prominence. Progressive policy frameworks and sustained government support will pivot China to become among the fastest growing regional CCUS markets.

Amid the intensified government push for net zero emissions and recent corporate trends of voluntary commitments to achieve this, businesses have been encouraged to develop carbon-offsetting projects and services for their own use or sale to third parties.

CCUS sectors that are encouraged for foreign investment:

- Development of CCUS technology and services
- Construction and operation of CCUS projects
- Manufacturing of equipment for capture, use, storage, and monitoring of carbon dioxide

Other green services

China's green transition has created new green services industries that benefit the environment or conserve natural resources, such as ecosystem services, contract energy management, contract water conservation management, third-party environmental pollution treatment, and environmental custody services.

As per market consultancy Askci Corporation, the size of China's energy conservation service industry was RMB 582. 6 billion (US$90.3 billion) in 2020, with 6,859 companies (showing a growth of 4.8% year-on-year) and 760,000 employees (an increase of 25.4% year-on-year) engaged in the industry.

As most green services industries require high innovation capabilities and technology advancement, a lot of the green services are encouraged for foreign investment.

Foreign firms with experience and expertise in this area have already been actively participating in the Chinese market. One example is the Veolia Group of France, which has established an office in China to offer environmental services. German and UK companies engaging in green services, such as ALBA Group and ERM, are also trying to promote the export of their technologies to China considering the tremendous growth potential of this sector.

Green services that are encouraged for foreign investment:

- R&D of offshore oil pollution cleaning and ecological restoration technology and the relevant product development; prevention and treatment of sea water eutrophication, marine life explosive growth disaster; coastal zone ecological environment restoration technology
- R&D and application of technologies for energy conservation, environmental protection, and recycling economy
- R&D and application of technologies for recycling and comprehensive utilization of resources and for recycling of emissions and discharges from enterprise production

- R&D of environmental pollution treatment and monitoring technology
- Development of clean production technology and services
- R&D and utilization of integrated technologies for land conservation and outdoor environment, energy conservation and utilization of water resources, material conservation and utilization of material resources, and indoor environment and operational management of green buildings
- R&D and application of disposal technology for radioactive waste
- Construction and operation of hazardous waste utilization and disposal facilities and technical consultancy services
- R&D of technologies for prevention and control of desertification and desert restoration

Recycling

Recycling forms an important component of China's plan to transfer to a green, low-carbon, and circular economy.

On July 7, 2021, the NDRC released the *Development Plan for the Circular Economy in the 14th Five Year Plan Period*, which put extra emphasis on recycling as a means of maximizing resources use and the life cycle of products. The plan sets several hard numerical targets for the government to reach by 2025, including:

- Reaching a utilization rate of 86 percent for crop stalks, 60 percent for bulk solid waste, and 60 percent for construction waste
- Utilizing 60 million tons of wastepaper and 320 million tons of scrap steel.
- Producing 20 million tons of recycled non-ferrous metals
- Increasing the output value of the resource recycling industry to RMB 5 trillion (US$773 billion)

Moreover, the plan also commits to act on:

- Recycling park development
- Improving recycling and utilization of electrical waste and electronic products
- Recycling used batteries

For foreign investors, standalone recycling is not economically attractive as yet. However, the sector potential may increase exponentially as local governments raise standards for waste management. Businesses engaging in the upstream and downstream industrial chain of the recycling sector, such as R&D and application of technologies for recycling and manufacturing of equipment for recycling or remanufacturing, should expect greater market scope in the medium to long term.

Recycling sectors that are encouraged for foreign investment:

- Recycling and treatment of waste and used electrical and electronic products, automobiles, mechanical and electrical equipment, rubbers, metals, and batteries
- Recycling and reutilization of waste plastics
- Recycling of building wastes
- Manufacturing of equipment for recycling, treatment and reutilization of waste and used plastics, electrical appliances, rubbers, and batteries

- Manufacturing of equipment for recycling of used and waste textiles
- Manufacturing of equipment for remanufacturing of waste electromechanical products
- Manufacturing of devices for comprehensive utilization of used and waste tires
- Manufacturing of equipment for utilization of waste heat, pressure, and gas
- R&D and application of technologies for energy conservation, environmental protection, and recycling economy
- R&D and application of technologies for recycling and comprehensive utilization of resources and for recycling of emissions and discharges from enterprise production

Energy storage

Energy storage will be crucial in China's green transition, as the country needs an advanced energy-storage system to respond to the challenge of power-generation fluctuations via renewables and to facilitate the development of the local EV market.

China has set goals to boost its non-pumped hydro energy storage capacity to around 30GW by 2025 and 100GW by 2030.

Achieving this goal would require enhanced government supports and vigorous investment to the sector, which is expected to drive the boom of the strategic energy storage industry.

Foreign investors are generally not restricted to access this sector while R&D and application of large energy-storage technologies are especially encouraged for foreign investment.

Challenges and solutions

Investing in green industries in China offers significant, but often difficult to capture, opportunities.

On the one hand, China has ambitious plans to decarbonize and become a world leader in green technology, leading to numerous investment opportunities and incentives to grow related sectors. On the other hand, many green industries, such as renewables, have traditionally been dominated by state-owned enterprises or domestic companies that receive subsidies, which undercut foreign competition.

Foreign investors must therefore be strategic when entering China in this market space, such as by partnering with local companies to be more competitive.

Moreover, as with other areas where China seeks to adopt advanced technology, businesses need to tread the line between offering high demand technology and know-how while simultaneously protecting intellectual property and market status, making partner identification and pre-investment strategy all the more important.

Preparing for Green Compliance in China

Despite increasingly robust environmental laws in China, proper implementation and compliance have often stood in the way of progress. That is expected to change as ambitious targets demand stricter regulatory standards, monitoring, and better policy implementation. These in turn mean that businesses can no longer stick with the status quo, and depending on their industry and scope - must prepare to make necessary changes to avoid risks from a sudden transition.

Qian Zhou
Author

Green compliance, or environmental compliance, refers to conforming to environmental laws, regulations, standards, and other requirements by businesses to legally operate in a specific jurisdiction.

Given the state's determination to transform China into a green, low-carbon, and circular economy, green compliance will grow more important for companies doing businesses in the country.

While many green compliance requirements are currently limited in scope and implementation, recent regulatory trends demonstrate that the standards and implementation will soon become more detailed and stricter. Those who are better prepared will enjoy a comparative advantage.

In this article, we introduce China's major green compliance obligations and provide tips for businesses to make necessary changes.

Green compliance obligations in China

Carbon trading

On July 16, 2021, China launched the world's largest carbon trading market after several delays. At launch, the carbon market covered over 2,225 companies in the power generation sector, most of which are state-owned enterprises (SOEs). Together, these companies are responsible for about half of China's energy-related emissions, and 10-14 percent of the world's total.

Under the carbon trading scheme, each company is allowed by the government to emit a certain amount of CO2 emissions each year. If the company ends the year beneath its allotted limit, they can sell the difference on the market as a credit. Conversely, if the company exceeds its limit, it is required to buy additional credits to compensate.

Failure to pay quotas on time and in full amount is regarded as incompliance and will lead to

penalties, such as fines and "name and shame". As of May 2022, the Ministry of Ecology and Environment (MEE) has punished over 100 firms in the national carbon market for incompliance.

While the fine for noncompliant firms is currently limited to RMB 20,000-30,000 (US$2,960-4,450) each and the "name and shame" penalty will likely not hurt enough, it still provides reason for businesses in China to integrate carbon pricing into their business and risk strategies. That is because the system can be expanded in future to become more comprehensive, and the penalties made higher to speed up China's decarbonization process.

Eventually, China's carbon market may cover a much broader set of companies, while the emergence of a global trading system also remains a possibility. Further, the price on carbon will likely be closer to RMB 180-200 (US$27.77-30.86) per ton by the end of the decade.

One way that companies can prepare for carbon trading requirements is to put an internal price on carbon. This can either be an internal tax to encourage emissions reductions within the company to fund green initiatives, or a shadow price that allows the company to track its emissions.

ESG reporting

ESG stands for environmental, social, and governance – which represents the three main criteria for investors to quantify and evaluate a company's level of sustainability.

While there is currently no legislation covering the ESG responsibilities of all companies in China, it has been trying to enhance ESG requirements by mandating major polluters and companies that finance them to submit annual reports detailing a range of environmental information.

For example, on February 8, 2022, the *Measures for the Administration of Legal Disclosure of Enterprise Environmental Information* (the Measures) released by the MEE came into effect, according to which:

- Companies identified as being required to disclose environmental information must compile a yearly "Legal Disclosure Report of Environmental Information" and upload the report onto the "Enterprise Environmental Information Legal Disclosure System", which set up by the MEE and its local counterparts on the official government websites.
- Companies may sometimes be required to file ad hoc reports throughout the year to disclose information, such as changes to company details, administrative licenses, updates on administrative penalties, changes to legal representatives, and other ad hoc information that arises throughout the year.
- The annual report detailing the information of any given year (from January 1 to December 31) must be submitted by March 15 of the following year.

Companies required to disclose environmental information include:

- Major dischargers of pollutants
- Companies that are required to undergo mandatory clean production audits under the Clean Production Audit Measures
- Publicly listed companies and bond-issuing companies (and their subsidiaries) – if they have been penalized for ecological or environmental violations in the previous year

Failing to comply with the ESG reporting requirements listed in the Measures could make

companies liable to penalties of RMB 10,000 (US$1,580) to RMB 100,000 (US$15,805). This will also be included in the company's credit record. While the fines proposed in the Measures are relatively small for large corporations, the potential negative impact on their corporate credit record could be much more damaging and could cause reputational damage, mandated suspension of production, or missing out on bids for government contracts.

In addition to the mandatory ESG reporting requirements, it is noticed that voluntary ESG reporting has increased significantly in China over the past decade. According to JPMorgan, 86 percent of companies listed on the CSI 300 Index – the top 300 stocks traded on the Shanghai and Shenzhen stock exchanges, produced ESG reports in 2020, up from just 49 percent in 2010, despite not being required to do so. A proactive stance on sustainability reporting can help future-proof businesses, not only against further regulation but also against changing attitudes of investors and stakeholders, and facilitate funding easier in a climate-conscious world.

Greater emphasis on ESG reporting will require significant changes by companies, including hiring key staff and investing in systems to collect and manage the required information. On their part, smaller companies would likely need support from third party professional services.

Clean production audit

A clean production audit is conducted on the production processes and services according to certain procedures, to find out the cause of high energy consumption, high material consumption, and heavy pollution. This intelligence is then used to recommend and implement feasible technical and economic schemes to achieve cleaner production.

According to the *Clean Production Audit Measures,* the following companies have to undergo mandatory clean production audits:

- Companies that discharge pollutants in excess of national or local standards
- Companies that exceed prescribed energy consumption limit for unit product and hence constitute "high energy consumption"
- Companies that use toxic and harmful raw materials for production or discharge toxic and harmful substances during production

The county-level environmental authority in charge will publish the list of companies that are subject to mandatory clean production audits upon the approval of provincial level environmental departments. Within one month after the list is published, the identified companies must release relevant information on local media or their respective company website. Further, such companies must launch a clean production audit within two months after the list is published and complete the audit within one year after the list is published.

The competent environmental authority in charge at or above the county level shall, within the scope of their respective functions and duties, organize clean production experts or entrust relevant agencies to evaluate and accept the results of these clean production audits.

Companies that fail to implement a mandatory clean production audit, falsify their clean production checks, or fail to properly report the result of the audit – shall be ordered by the competent environmental authority in charge at or above the county level to make the rectification within a

prescribed time period. If the violating company refuses to make such rectification, it shall be fined between RMB 50,000 (US$7,400) to RMB 500,000 (US$74,000).

Pollutant discharge permit

A pollutant discharge permit is an integrated permit that enables relevant entities to discharge pollutants into environment. China has been gradually promoting the implementation of the pollutant discharge permit system for industries since mid-2010s. Previously, entities had to obtain separate environmental permits for each aspect of the operation of a polluting entity or activity.

The *Regulation on the Administration of Pollutant Discharge Permits* (the Regulation) came into effect on March 1, 2021 and marked the establishment of a national pollutant discharge permit system in China. The regulation was designed to standardize the permit application procedures, improve discharge management, tighten supervision, and clarify the responsibilities of relevant discharging entities.

Now discharging entities are required to obtain a pollutant discharging permit prior to the launch of their production facilities or the actual discharge of pollutants, save for discharging entities that generate/discharge only a limited amount of pollutants and have only a minor environmental impact. The latter type of discharging entity is only required to complete a pollutant discharge registration, a much simpler process.

Whether an enterprise is subject to permit management or registration management is stipulated in the *Inventory of Classified Management of Discharge Permits for Stationary Pollution Sources*. For discharging entities subject to the permitting system, a tiered management system – key management and simplified management – is adopted based on factors including quantity of pollutant emissions and environmental impacts.

The main obligations for discharging entities include:

- Carrying out self-monitoring and keeping the original monitoring records for at least five years.
- Establishing a ledger record system for environmental governance.
- Periodically reporting on pollutant discharge permit implementation.
- Disclosing pollutant discharge information on the national pollutant discharge permit management platform as required.

For discharging units that are subject to key management, automatic pollutant discharge monitoring equipment is required to be installed, maintained, and connected to the monitoring equipment of the local ecological and environmental authority in charge.

Violations of the pollutant discharge permit system, such as discharges without a pollutant discharge permit, discharges that exceed applicable standards, or discharges made without a required permit re-application, will lead to fines that are up to RMB 1 million (US$148,000) and administrative sanctions, such as production or business restrictions or suspension, or even business shutdown. The main responsible person may also be held accountable for severe, continuous, and intentional violations.

Environmental damage repairment and compensation

China has been piloting to improve its ecological and environmental damage compensation system

since 2015. Some top-level guidance were released in 2017 and 2020.

And on April 26, 2022, 14 authorities, including the MEE and the Supreme People's Court, jointly released the *Rules on Compensation for Ecological and Environmental Damage*, which clarified the responsibilities of the polluter for repairable and unrepairable damages.

Damages that can be repaired should be so done by the polluter or an entrusted third party. Polluters that cause irreparable damage should compensate for the related losses according to law and bear the related expenses within the scope of compensation for ecological and environment damage or conduct alternative repair to realize the equal restoration of the ecology and its service functions.

Tips to prepare for China's tightening green compliance environment

In addition to knowing and understanding the major green compliance requirements in China as mentioned above, the below tips could be useful:

- **Audit your facility and supply chain:** To be compliant and retain a competitive advantage on green consumption practices, knowing where your business stands is the first step. Companies can begin by conducting regular green audits on their facilities and supply chains to gauge their distance towards achieving green compliance and thus make targeted improvements.

- **Invest in management tools, technology, and services:** To fulfill green compliance responsibilities, polluters should first be able to monitor and measure the pollutants they discharge accurately and efficiently. Investing in management tools and technologies or hiring third party professional services will be necessary to secure this goal. While larger companies may implement multi-dimensional solutions that combine two or more methods, the best choice for smaller companies might be seeking external professional assistance due to its cost efficiency.

- **Pay close attention to future developments:** With China serious about greening its economy, several regulatory updates and environment protection rules are expected to be issued within this decade. Companies are suggested to create a detailed plan for investments, changes to operational workflows, and exposure to incompliant links in the supply chain to effectively adapt to strengthening green compliance requirements. The sooner the process and planning is initiated, the better the organization will be prepared.

- **Fit sustainability into your risk management strategy:** Along with factors like operational and labor costs, sustainability is becoming a mainstream consideration for risk management and business planning. In some industries and jurisdictions, investors and other stakeholders already expect sustainability practices from companies.

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