Public Disclosure Authorized

Project Information Document (PID)

Concept Stage | Date Prepared/Updated: 17-Mar-2021 | Report No: PIDC31069

BASIC INFORMATION

A. Basic Project Data

Country	Project ID	Parent Project ID (if any)	Project Name
China	P175708		China Energy Transition Towards Carbon Neutrality Project (P175708)
Region	**Estimated Appraisal Date**	**Estimated Board Date**	**Practice Area (Lead)**
EAST ASIA AND PACIFIC	Jun 28, 2021	May 19, 2022	Energy & Extractives
Financing Instrument	**Borrower(s)**	**Implementing Agency**	**GEF Focal Area**
Investment Project Financing	People's Republic of China	National Energy Administration	Climate change

Proposed Development Objective(s)

The project development objective is to accelerate energy transition towards carbon neutrality in the power sector through supporting development of policies at national level and piloting implementations in selected province(s).

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	19.43
Total Financing	19.43
of which IBRD/IDA	0.00
Financing Gap	0.00

DETAILS

Non-World Bank Group Financing

Counterpart Funding	2.00
Borrower/Recipient	2.00
Trust Funds	17.43
Global Environment Facility (GEF)	17.43

Environmental and Social Risk Classification	Concept Review Decision
Substantial	Track II-The review did authorize the preparation to continue

Other Decision (as needed)

B. Introduction and Context

Country Context

1. China has experienced fast economic growth in the decades to 2020 and this has contributed to a dramatic reduction in extreme poverty. Since China announced its 'reform and opening' policy in 1978, its gross domestic product (GDP) per capita has increased about 27-fold in the intervening 40 years from about Y 2,642 in 1978 to Y 72,447 in 2020 (valued at 2020 price). Economic growth has taken about 770 million people out of extreme poverty, so China announced that all poor counties have escaped from its poverty status in late 2020, and the next focus of poverty reduction will be reduction of regional unbalanced development.

2. The steady growth of China's economy has driven a rapid increase in energy consumption, leading to severe domestic and global environmental impacts. Primary energy consumption grew from 571 million tons of coal equivalent (mtce) in 1978 to 4,980 mtce in 2020, an increase of more than 8-fold. While coal remains as the primary source of energy consumption, its share of primary energy consumption has been kept decreasing, from 69.2 percent in 2010 to 56.8 percent in 2020. Power generation is the largest coal consumer in China, its coal consumption increased from 1,537 million tons (raw coal) in 2010 to about 2,100 million tons in 2020 and its share in the national total coal consumption also increased steadily from 44 percent in 2010 to more than half after 2018. China suffers from severe air pollution due to heavy reliance on coal uses for energy, making some Chinese cities among the world's most polluted. Particulate matter and other local pollutants from coal combustion take a high toll in terms of deaths, morbidity, and associated economic costs (World Bank and PRC State Council Development Research Center 2013). The Government has placed a high priority on air pollution control and declared a 'war on pollution'. A major part of this effort is to promote renewable energy (RE) and other clean energy sources to replace coal consumption.

3. China's pledge of carbon neutrality by 2060 makes it possible to achieve the global target of limiting warming to 1.5°C above pre-industrial levels. IPCC study indicates that achieving the 1.5°C target would require global efforts to reach carbon neutrality between 2045 and 2060 while postponing the period to about 2060 to 2080 could increase the global temperature by 2°C above pre-industrial levels. Current Nationally Determined Contributions (NDCs) of all major countries are not adequate to achieve these targets, so additional ambitious commitments to limit their carbon emission are critical. After the EU commission issued its European Green Deal in December 2019 and announced that the whole Europe Continent would achieve carbon neutrality by 2050, China also pledged in September 2020 to peak its carbon emission by 2030 and achieve carbon neutrality by 2060. Carbon emission from energy production and use amounts to about 85 percent of total carbon emission in China, so achieving the pledge will rely mainly on actions to be taken in the energy sector, including both continuous energy conservation to slow down the growth of energy consumption and reduction of carbon emission from energy production and use. Considering that China is the largest carbon emitter and

it has harvested substantial low-hanging fruits in improving energy efficiency and developing RE, the challenges to materialize the pledge will be huge for China.

4. China launched an energy revolution program in 2014 which put a solid ground towards China's pledge to achieve the said carbon neutrality. The energy revolution program calls for radical changes in energy consumption, energy supply, institutional reform, energy technology innovation, and strengthening of international cooperation. By the end of 2019, China has largely achieved the majority of its 13th Five-Year-Plan (FYP, 2016-2020) targets, including limiting the growth of its total energy consumption, improving energy efficiency, accelerating renewable energy development and promoting energy sector reform[1]. China's GDP growth of annual 6.6 percent from 2015 to 2019 has been supported by 2.9 percent of annual energy consumption growth. The energy consumption elasticity is lower than that during 2011-2015. Gains in energy efficiency improvement have also been substantial as the energy consumption per unit of GDP was reduced by 13.2 percent from 2015 to 2019, as claimed by the National Development and Reform Commission (NDRC) in October 2020. China has established the required legal and policy framework to continuously improve its energy efficiency after decades of noticeable efforts. In the aspect of RE development, China's installed capacity of both wind power and solar PV has increased steadily from 173 GW in 2015 to 413 GW in 2019, the largest installed capacity in the world. The share of non-fossil fuel increased in parallel, from 8.6 percent in 2010 to 12 percent in 2015, then 15.3 percent in 2019 exceeding the planned 2020 target of 15 percent. In the power sector, the share of wind and solar PV generation increased steadily from 1.2 percent in 2010 to 3.9 percent in 2015, then 8.6 percent in 2019.

5. Power sector plays a decisive role to decarbonize the whole energy sector, and it is the front runner to achieve carbon neutrality much earlier than the national carbon neutrality goal. In China, the share of carbon emission in the power sector amounted to about 42 percent in the whole energy sector in 2019, due to mainly the coal combustion in those coal-fired power plants. In line with the global trend of increasing electrification in all industries, more and more sub-sectors (e.g. transport, manufacturing, buildings) have switched steadily from burning fossil fuels directly to using electricity. While this is good news to contribute to the reduction of overall carbon emission in all economic sectors, the share of carbon emission in power sector is likely to increase substantially if the energy transition within the power sector cannot be advanced quickly. China still needs to make efforts in its continuous development of RE and reducing the share of coal power in its power sector. The power sector would need to achieve carbon neutrality much earlier than the national carbon neutrality goal. The studies by the Global Energy Transition Commission, Tsinghua University and others showed that for China to achieve carbon neutrality in 2060, the power sector would need to have net zero emission by around 2040. So power sector is the front runner to achieve the national carbon neutrality goal.

6. China urgently needs assistance in developing national and provincial energy policies/strategies and roadmaps and take actions in the power sector to accelerate its energy transition, in line with the national roadmaps for carbon emission peaking and neutrality. At the national level, the Ministry of Ecology and Environment is leading the preparation of national roadmaps to achieve carbon emission peaking by 2030 and carbon neutrality by 2060, and coordinate with concerned government agencies including National Energy Administration (NEA). In addition, several provinces are already working on their roadmaps on how to achieve carbon emission peaking and neutrality (Beijing, Shanghai, Jiangsu etc.), and quite some companies have already announced their own actions related to carbon emission peaking. In the power sector, there are still a lot of debates on the role of coal power capacity, especially after the power shortages in December 2020. In addition, the fast growth of RE has encountered major challenges of RE integration while more ambitious RE targets are aimed in China. So the proposed GEF support, which could be available in about mid-2022, can help build the vision, policy, targets, mid-to-long-term planning in the power sector at national level, create the enabling

[1] China Energy Revolution Progress Report 2020, October 2020, State Council Development and Research Center.

environment to achieve carbon emission peaking and neutrality in the energy sector, and provide tailor-made support to implementation at the provincial level. All the efforts will accelerate the energy transition in the power sector in China.

Sectoral and Institutional Context

7. China has relied mainly on coal power generation to meet its electricity demand for decades, though the fast-growing RE since early 2010s is slowing down the pace of coal power development; China is making efforts to promote the energy transition in its power sector with challenges. Coal power generation has dominated its generation mix in China for decades. Total installed capacity of coal power increased steadily from 647 GW in 2010 to 1,080 GW in 2020, with an annual growth of about 5 percent, though its share of capacity decreased from 67 to 49 percent in the period. Annual generation of coal power also increased steadily from 3,216 TWh in 2010 to about 4,633 TWh in 2020, with an annual growth of about 3.7 percent, though its share of generation decreased from 76 to 61 percent in the period. Energy transition is happening in China's power sector, with the continuous growth of RE. The new emerging REs (mainly wind power and solar PV) have experienced a fast growth since early 2010s. Total installed capacity of both wind power and solar PV increased also steadily from 30 GW in 2010 to 535 GW in 2020, with an annual average growth rate of about 33 percent. The generation of both wind power and solar PV also rises from 49.6 TWh to 728 TWh in the period, with its share increasing from only 1 percent in 2010 to 10 percent in 2020. The new installed capacity of both wind power and solar PV exceeded that of new coal power in 2016 and has been kept climbing high so the new capacity of both wind power and solar PV is about three times of new coal power in 2020. The fast-growing REs is slowing down the pace of coal power development in China. China is making efforts to continuously promote energy transition in the power sector, with challenges.

Addressing RE Integration Issue to Increasing RE Penetration

8. Achieving higher RE penetration is required to meet the demand of energy revolution, and the coming 14th FYP (2021-2025) could be a critical instrument to determine the roadmap of achieving carbon neutrality. Though China has made substantial progress in fast scaling up its RE capacity, increasing the share of RE in its total energy mix, and driving down its cost dramatically, multiple studies (e.g. IEA study on China Power System Transformation, Tsinghua Study on China Low Carbon Development Strategy and Transition Path) have indicated that more ambitious RE targets are needed in order to reduce the share of coal power in the total energy mix and increase the share of RE in power systems. China already announced its new RE related targets in the Climate Ambition Summit 2020 to reduce its carbon intensity by more than 65 percent from 2005 to 2030, and the new targets of share of non-fossil fuel will be about 25 percent and installed capacity of both wind power and solar PV will be more than 1,200 GW by 2030 [2]. China is preparing its 14th FYP (2021-2025), which is expected to be published in mid-2021, and more ambitious RE development targets are anticipated in order to fulfill the announced targets. The 14th FYP will be a new start to target higher and faster RE development, and it could be the turning point to lock the long term energy development path in China with some important decision and actions supported by the step-by-step implementation details and clear targets. Thus continuous Bank support to the implementation of the 14th FYP will be important.

9. China has expanded supports to promote RE development, including continuous increase of RE penetration in power systems, distributed RE development, and promotion of innovative RE applications for non-power uses, while addressing the major challenges of RE integration will be the key solution for higher RE penetration in power systems. China experienced serious RE curtailment in 2015-2017 when national average of about 15 percent of wind power and about 9 percent of solar PV generation were curtailed – this was caused mainly by inflexible power systems which were

[2] The previous NDC related targets in China: carbon intensity will be reduced by 60-65 percent from 2005 to 2030; share of non-fossil fuel will be about 20 percent by 2030.

not capable of integrating the increasing share of RE in power systems, together with institutional barriers and vested interests. This issue was addressed to some extent in later years, contributed by strong political intervention, system rehabilitation and enhancement, enhanced inter-provincial power exchange, dispatch of hydropower for system flexibility and RE integration, and mandatory policies and mechanisms to improve power dispatch, so the RE curtailment reached a low level at about 3.4 percent for wind power and 1.7 percent for solar PV in the first three quarters in 2020. Considering the requirement to increase the share of RE in power systems more ambitiously in the coming 14th FYP and later years, addressing the major challenges of RE integration will be the key solution, including (a) pilots and application of emerging technologies (e.g. energy storage, green hydrogen) to adapt to the variability of RE outputs, (b) scaling up of distributed RE (DRE) development, and (c) establishment of enabling legal and policy environments to remove market barriers, which have hindered the application of the emerging technologies and RE delivery across provinces and regions, and to enable scaling up DRE development.

10. While DRE development has been supported by the World Bank and GEF to scale-up of DRE and GHG emission reduction in China through policy interventions and pilots, additional support is needed to address the RE integration issue. DREs are emerging as a potential solution for China's clean energy transition with distinct opportunities and challenges. The potential benefits of DRE from the perspective of the power system include, among others, avoiding the need for additional transmission capacity and ancillary services to ensure quality operation of the grid. Developing DRE, particularly in China's eastern and southern provinces which are close to the load centers, will greatly contribute to realizing the Government's targets to improve its energy mix and, at the same time, avoiding the RE integration issues in China's northern and western provinces. The key barriers and challenges of DRE development include: (a) limited enabling policies; (b) lack of planning guidance; (c) lack of technical standards and specifications; (d) limited proven and scalable business models; (e) lack of access to financing. To support the Government in addressing above challenges, the Bank approved a GEF-financed operation (China Distributed Renewable Scale-up Project) in 2019. This operation will be complementary to the proposed project to increase RE penetration in China, while the proposed project will be focused mainly on addressing RE integration challenges, as well as reduction of the share of coal power.

11. Enabling legal and policy environments are required to remove the market barriers and improve continuously the RE integration in power systems. China has initiated a series of new actions to prepare for the new-phase RE development, including introduction of RE quota and green certificates to engage consumers in purchasing RE and pilots of emerging technologies such as battery storage to improve the power system flexibility and increase integration of variable RE. Since the achievement of these actions varies with different enforcement results, it is expected that these actions will be improved in the 14th FYP in order to meet the need of large scale RE integration: (a) China introduced RE quota in 2019 and enforced mandatory allocation of RE quota to each in 2020. Lessons and experience of the enforcement in 2020 is under review and will lead to improvement of the RE quota policy in the 14th FYP; (b) pilots of green certification was launched in 2017 in China and it played only a marginal role in promote RE development since the actual transaction is far less than expected – only 0.15 percent of the issued green certificate was purchased by voluntary consumers. How to integrate the voluntary green certificates mechanism into the overall RE development will be one key issue to be addressed in the 14th FYP; (c) application of battery storage in power systems at different levels has been initiated since mid-2010s but the institutional, technical and financial barriers still hinder its scaling up, which require policy support, and the quality of commissioned battery storage systems is a major concern due to lack of incomplete standards, regulations and supporting service (e.g. testing, recycling); and (d) China's power markets have experienced a mixed development since the power sector reform was revived in 2015, while some progress has been made in phasing out the coal power generation quota policy, the pricing mechanism is intervened heavily by the government short-term targets (e.g. economy recovery so mandatory price control is applied). Incorporating the ambitious RE development into the power market design will be a major consideration in the 14th FYP. Establishing enabling legal and policy environments will improve the RE integration and remove market barriers to scale up the application of those emerging technologies.

12. Pilots of innovative applications of emerging technologies could provide additional solutions to address the technical challenges of large scale RE integration, like battery storage and green hydrogen, and these applications could have large potential of replication in China and globally. In addition to policy and market barriers, major technical challenges of large scale RE development still exist, mainly grid integration and grid stability due to high penetration of variable RE in power systems. While China can continuously take its conventional measures like improving the flexibility of existing coal-fired plants, installation of more pumped storage, increasing regional power trade, application of more advanced forecast for both wind power and solar PV, changing dispatch practice, and exert political pressures to provincial government and state-owned enterprises in reducing RE curtailment, innovate zero-carbon energy technologies (e.g. battery storage, green hydrogen, demand side responses) are considered as main solutions to address the RE integration issue in power system in the medium and long run. Application of battery storage can improve the performance of variable REs, so its impact on grid stability and reliable electricity supply can be mitigated. Green hydrogen is also one innovative solution as its production can adapt to the variability of RE output, then it can be stored and shipped for transport or gas use. However, the application of these emerging technologies is still in an early stage, and pilots of these applications can help prepare the power system for its new stage of RE development. The Bank approved an IBRD financed operation (China Renewable Energy and Battery Storage Promotion Project) in 2019, aiming to promote the integration and use of RE through the deployment of battery storage systems and innovative RE applications (including green hydrogen). The importance of enabling policy environment and successful pilots are recognized as a must, as noted in the project appraisal document of the approved operation, in order to scale up the application of these emerging technologies in China. China has the largest RE market, and these pilots, with the support of international organizations, can help accelerate deployment of these emerging technologies and RE development in China. The proposed project will be a parallel operation to contribute to the deployment of these emerging technologies.

Addressing Policy Barriers to Reduce the Share of Coal Power

13. Consensus has been built that coal power development will be slowed down then stopped in China, but the real question is how fast the coal transition can be made. To accelerate the coal power moratorium in China, faster RE development is a must in order to meet both the peak load (measured as GW) and electricity demand (measured as GWh). While addition of the new coal power capacity has been reduced from an annual average of 51 GW in 2010-2015 to 36 GW in 2016-2020, whether the annual new coal capacity can go down quicker till zero, or even negative? It depends on (a) whether adequate new REs can be developed to meet the annual incremental demand (GWh) and (b) whether stable operation can be guaranteed for power systems with high penetration of variable RE. The former requires incentive mechanisms to promote continuously RE development and its cost reduction, while the latter requires adequate power system flexibility to integrate RE, for which development of advanced technologies to increase stability (e.g. energy storage to reshape the outputs of variable RE, and green hydrogen production to adapt to the intermittency of variable REs) together with demand side management could be some of the solutions. In addition to above technical considerations, other key challenges related to coal transition include: (a) reliance on domestic resource for energy security, (b) reliance on low-cost baseload coal power for reliable and affordable power supply and system security , (c) reliance on coal-based co-generation for space heating (few non-fossil alternatives), (d) large size and stranded assets of coal power, (e) social impacts of job losses due to slowing down coal related industries, and (f) vested interests and lobby of coal industries.

14. China has launched the new round of power sector reform since 2015 and phasing out coal power is one of the major directions to go, enabling policy environment is also required to accelerate the process and reposition the role of coal power to facilitate the RE development. To cap the carbon emission, limiting the growth of coal power generation (GWh) matters more than limiting the coal power capacity (GW) as carbon emits when coal is burned, though debates exist as new coal power capacity implies possible higher coal power generation and lock-in effect of long-term impact in carbon emission. Appropriate pricing policies and regulations and rules for power system dispatch should be in place to

delink the coal power capacity and coal power generation, so coal power generation can be discouraged, and REs can play the dominant role. Internalizing the external carbon costs into the fossil fuel generation is one of the solutions, in parallel to eliminating the generation quota for coal power plants, which was introduced in 1980s to attract investment for coal power plants in addressing the power shortage. In addition, approval of new coal power capacity should be handled very cautiously. In this regard, China has introduced a traffic light warning system since 2016. This system is managed by NEA, and all provinces are assessed year by year to evaluate their needs in approving and building new coal-fired power plants – no new coal power plants can be approved and built in the provinces marked as red in NEA's traffic lighting warning system. Combined use of phasing out the traditional generation quota and strict enforcement of the ongoing traffic light warning system to administrate the construction of new coal power plants, together with the right pricing signal to internalize the externality carbon costs in the dispatch rules, will lay the ground to guide the coal power development in China, to change the role of coal power gradually from supplying baseload to providing shoulder and/or peaking capacity, and to make RE the main energy supplier in power system. In addition to the policy interventions for the coal transition, pilots to retire inefficient coal power plants and repurpose the generators to synchronous machine can be considered, as these plants can be switched from providing electricity directly to providing both reactive power and rotational inertia to the power system, which are critical for high RE penetrated power systems. Provided the pilots can be successful, it could be a win-win choice to boost the energy transition. This repurposing will help accelerate retiring of old coal power plants, making room for scaling up RE generation, and enabling the power system to absorb increased share of RE, so the energy transition can be boosted.

15. The World Bank has started a new operation to promote the energy transition in Shanxi, capping coal consumption and coal power moratorium are two key prior actions to demonstrate the energy revolution in the province. Shanxi is one of the largest coal-producing provinces in China, and its coal production surpasses India, the 2nd largest coal producer in the world. So coal industries are a major pillar of Shanxi's economy and all above challenges of coal transition do exist in Shanxi. The Bank has planned two-phase development policy loans (DPOs, US$ 350 million for DPO 1 and US$ 300 million for DPO 2) to support Shanxi in establishing the required policy framework for energy revolution, to address the key issues related to economy transition (mainly business environment, private sector development, and financing mechanisms), energy transition (RE development, gas development, and reduction of coal consumption and coal power moratorium), and environmental and social issues related to energy transition. The operation in Shanxi can benefit from the enforcement of national policies and initiatives to phase out coal power more rapidly, and other provinces can also benefit from the pilots in Shanxi to implement their energy transition schemes.

World Bank Engagement to Promote Energy Transition with GEF Support

16. China has used substantial GEF (Global Environment Facility) funds to promote its RE development and contribute to the global climate change mitigation since early 2000s, and the World Bank is one of the key partners. WB has worked with Chinese counterparts, mainly NDRC and NEA, to use GEF grants in establishing and accelerating the RE development in China. The early stage RE development in 2000s which were supported by GEF included both Renewable Energy Development Project (US$ 27 m) and China Renewable Energy Scale-up Program (CRESP) Phase I (US$ 40.22 m), focusing on piloting RE investment projects successfully, technology improvement for both wind power and solar PV, and establishing the required legal and policy framework. CRESP Phase II (GEF US$ 27.28 m) remains as the key platform to support China in scaling up its RE capacity since 2013, focusing on technology improvement, cost reduction, and preparing RE to enter the power markets. Above efforts contributed to the growth of China's RE industry from a marginal role to a key market player in China's power system. Looking forward, the GEF support is likely to be used to explore new ways of RE development and establish the required policy environment to have RE as a dominant role in its energy mix. Several parallel operations have been launched or approved by the Bank since 2019: (a) GEF China Distributed RE Scale-up Project (GEF US$ 7.28 m), approved in 2019, targeting the development of distributed RE; (b) China Renewable Energy and Battery Storage Promotion Project (IBRD US$ 300m), approved in 2019, targeting investment in battery storage and

innovative RE applications (including green hydrogen); (c) a parallel GEF financed project to support low carbon mobility (US$ 11 m) under preparation; and (d) this proposed GEF financed project (US$ 17.43 m) to focus on accelerating the energy transition in the power sector towards carbon neutrality. The proposed project will complement the Bank's efforts to promote more ambitious energy revolution in Shanxi through the ongoing Shanxi DPO. So the proposed project is aligned with GEF-7 climate change focal areas, i.e. promote innovation and technology transfer for sustainable energy breakthroughs for decentralized power with energy usage (CCM-1-1), promote innovation and technology transfer for sustainable energy breakthroughs for cleantech innovation (CCM-1-4), and demonstrate mitigation options with systemic impacts for sustainable cities impact program (CCM-2-5). All these operations complement each other to contribute together to achieving higher RE targets in China, and benefit the world from the associated carbon emission reductions.

Relationship to CPF

17. **The proposed project is consistent with the strategic engagement areas of the World Bank Group's Country Partnership Framework (CPF) for China (FY2020-2025), discussed by the World Bank Group Board of Executive Directors on December 5, 2019.** The proposed project strengthens the Bank's engagement in Areas Two: Promoting Greener Development and will contribute to achieve both objective 2.1 (Facilitating the transition to a lower carbon energy path) and objective 2.2 (reducing air, soil, water, and marine plastic pollution). The proposed project is also consistent with the interlinked dimensions of clean energy transition in China that could benefit from the World Bank's global expertise, with the potential for replication in other countries. These are: (a) development of an enabling policy environment to support the development of renewable energy and associated emerging innovative technologies; and (b) support for the design and piloting of zero-carbon power systems in selected provinces and cities. In addition, the World Bank will help further disseminate China's successful experiences in scaling up and mainstreaming renewable energy.

18. **The proposed project also contributes to the World Bank Group's global priorities in climate finance and clean energy.** The proposed project can facilitate the implementation of ongoing IBRD financing projects in China, e.g. China Renewable Energy and Battery Storage Promotion Project, thus contribute to the World Bank Group's climate targets, announced in December 2018, to provide around US$200 billion over 2021–2025 in support of countries to take ambitious climate action. Climate action is also a key motivation for the World Bank Group's 'Accelerating Battery Storage for Development' initiative.[3] This includes a commitment of US$1 billion in World Bank Group financing with an extra US$1 billion to be raised in concessional climate funds through channels such as the Climate Investment Funds' Clean Technology Fund and at least another US$3 billion to be mobilized from the public and private sectors.

C. Proposed Development Objective(s)

19. The project development objective (PDO) is to accelerate energy transition towards carbon neutrality in the power sector through supporting development of policies at national level and piloting implementations in selected province(s).

Key Results (From PCN)

20. The project intends to contribute to the government's ambitious renewable targets for the 14th FYP, and global climate change mitigation. The PDO level indicators are proposed as follows:

- Unified pathway for carbon emission peaking and carbon neutrality in the power sector (adopted)
- Breakthrough policies and regulations to be adopted to promote RE integration and coal transition (numbers)

[3] http://www.worldbank.org/en/news/feature/2018/09/26/powering-new-markets-for-battery-storage

- Increase of renewable energy consumption/generation in pilot provinces/cities (TWh)
- Decrease of share of coal power in the power generation mixes in pilot provinces/cities (percentage)
- Avoided GHG emissions (tons of CO2e)

21. The intermediate project indicators will be discussed further during the project preparation, and could be considered as follows:

- Number of innovative energy transition pilots supported
- Installed capacity of battery storage (MW/MWh)
- New production of green hydrogen (ton)
- New jobs and female employment created in wind power and solar PV industries
- Other indicators to satisfy corporate requirements (e.g. citizen engagement)

D. Concept Description

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Screening of Environmental and Social Risks and Impacts

22. The general project scope (objective and project components) has been agreed with the National Energy Administration (NEA) at the project concept stage while the specific project activities including studies, pilot schemes and confirmation of participating provinces/cities will be determined during project preparation and implementation. The overall environmental risk is rated Substantial and the social risk is classified Substantial given the pilot subprojects uncertainty and potential downstream environmental impacts and risks from TA activities. The environmental and social risk classification will be rechecked prior to project appraisal.

23. The project has overall environmental benefits of promoting energy transition in the pilot provinces/cities through increasing RE penetration and reducing the share of coal power in the power sector, and therefore reducing both local air pollutants and greenhouse gas emission, and contributing to climate change mitigation. Based on the current project design, the grant will be largely used for technical studies. Implementation of technical assistance (TA) activities will not cause any direct adverse environmental impacts but will involve significant stakeholder engagement and potentially have downstream impacts due to changes to the government policies and regulations as the results of these TA activities. Potential downstream environmental issues and implications could include impacts, risks and hazards from construction, installation and operation of battery storage, wind farms, solar PV stations, and electric power transmission facilities, such as general construction nuisance, habitat alteration or disruption, electric and magnetic fields exposure, hazardous materials disposal, fire and explosion risks, and occupational health and safety (OHS).

24. Based on current project design, the pilot subprojects at provincial/city levels will be composed of both studies and physical works associated with coal power plants conversion, green hydrogen production, and battery energy storage systems (BESS) installation at wind farms or solar PV stations. The specific information on pilot works such as location, scope and scale is pending for confirmation during project preparation. Given the nature of potential investments, the anticipated physical works would be small to medium scale, and the adverse environmental impacts during construction

phase would mainly include general construction nuisance of dust, noise, soil disturbance, traffic safety, waste disposal, and disturbance to modified habitats, which are generally temporary, short-term, localized, of small to medium scale, and could be effectively avoided, reduced or mitigated through adopting mature civil work techniques and good management practice. Any new construction or rehabilitation that may cause negative impacts on critical habitats or natural habitats will be excluded. Fire and explosion risks during hydrogen facilities and BESS construction and operation can be well controlled by following national design standards with safety considerations, including placement criteria, fire and explosion prevention measures and emergency response requirements. Planning for battery waste management will require the review of current recycling technologies and practices in China. The environmental impacts assessment will compare domestic standards with good international industry practice (GIIP) and determine more stringent performance criteria for the battery operation and disposal.

25. The project will bring significant social benefits to broader society by increasing job opportunities in renewable energy industry and contributing to carbon neutrality in the long term. The project social risks are mainly related to ESS1, ESS2, ESS5, ESS7, and ESS10. Implementing the GEF project itself would have labor related risks and the risk of inadequate stakeholder engagement to inform the technical studies. However, adopting and applying the advice and measures proposed in study outputs would potentially have multifaced downstream social implications. For example, measures to piloting high RE penetration at provincial/city levels would have a potential impact on worker's livelihoods because of labor retrenchment in the coal mine sector. Increasing RE investment would require land acquisition and potential impacts on ethnic minorities considering their geographical distribution. Applying energy storage technologies would have site-specific occupational health and safety and community health and safety risk. The proposed roadmap to energy revolution would also bring social changes by a novel system and create potential exclusion risk to vulnerable persons and groups (such as ethnic minorities, coal mine workers, among others). There would be more favorable circumstances to enable the business to reduce pollution, promote low-carbon lifestyles, and provide more green goods and services. Vulnerable groups would be disadvantaged in sharing green energy-related benefits and opportunities, which requires special inclusive consideration.

26. The downstream environmental and social (E&S) risks and impacts would need to be considered and assessed during the policy and strategy planning process and technical standards setting, including conducting environmental and social analysis and comprehensive alternatives analysis. This is supported by building the counterpart capacity for integrating environmental and social objectives into their work, and have the terms of references (ToRs) and study outputs reviewed by the Bank team to ensure that the relevant ESSs of the ESF are complied with. At the national level, the counterpart is NEA, and a national Project Management Office (PMO) has been established by NEA to be responsible for the daily project management, including overall project planning, contracting, coordination and monitoring responsibilities. The PMO has managed three parallel GEF projects since late 2000s, and has acquired extensive experience with the Bank's safeguards policies, has strong technical capacity regarding policy development and project management, along with a satisfactory track record of safeguard management in previous Bank projects. Some potential participating pilot provinces/cities may also have experience through the implementation of Bank projects. As this project will be the first for NEA and some participating provinces/cities to prepare and implement under the new Environmental and Social Framework (ESF), a time-bound capacity development plan will be prepared in the Environmental and Social Management Framework (ESMF), through which the capacity of both PMO and particularly Project Implementing Units (PIUs) at the local level will be strengthened with regards to ESF implementation.

27. As some of the pilot participating provinces/cities and the specific project activities would be confirmed during the preparation and implementation stage, the PMO will prepare an ESMF, a Stakeholder Engagement Framework (SEF) and an Environmental and Social Commitment Plan (ESCP) consistent with relevant ESSs prior to project Appraisal. Once the pilots and specific project activities are known, the PMO will carry out screening to determine its eligibility for financing. The grant applicants will develop appropriate E&S documents consistent with the ESMF and apply relevant

ESSs. The E&S documents, to the satisfaction of World Bank, should be disclosed locally and at the World Bank and the PMO's websites as early as possible before appraisal to seek views of stakeholders.

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