CHAPTER ELEVEN

China's Energy Strategy: From "Self-Reliance" to "Energy Revolution"

Energy is the epitome of the politics and economy of a country. With the development of economy and society, China's energy strategy has also undergone corresponding changes and adjustments. China's energy strategy grows out of nothing and has registered gradual improvement. It was initially attached to energy development or dispersed in other policies, then, it was included in the energy policies in the "Five-year Plan" and finally evolved to relatively independent energy strategy, *Energy Production and Consumption Revolution Strategy (2016—2030)*. Gradually, the energy policy was shifted from plan-dominated to market-dominated, from self-reliance to interdependence, from single energy development to diversified energy security guarantee. China's domestic energy system was optimized, and its external energy cooperation mechanism was moved from bilateral to multilateral, paying more attention to the balance between production and consumption, the domestic and foreign, traditional energy and new energy, energy security, and environmental protection.

Despite all kinds of problems and challenges, China is actively promoting energy production and consumption revolution, speeding up the construction of a modern energy industry system with diversified structure and stable supply, and constantly improving the comprehensive coordination ability to ensure energy security. China is stepping up efforts to actively respond to short-term supply disruptions in the market and prevent unexpected events and short-term serious price fluctuations. China is paying more attention to the long-term sustainable safety of energy, coordinating the safety of energy security with ecological environment, and taking new energy, new technologies, and climate change as the important content of new energy security concept. We will deepen multilateral energy cooperation and actively promote global energy governance.

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SELF-SUFFICIENT ENERGY DEVELOPMENT STRATEGY (1949–80)

Before the reform and opening-up, China implemented a highly ordered planned economy. Independent and complete energy strategy was absent. Energy policy was mainly embodied in the coal-based and oil-complemented local energy development to meet the core purpose of industrial development. The concept of energy security was also absent. Under the guidance of the "self-reliance and self-sufficiency" policy, energy supply and consumption were allocated by national planning. Energy policy stipulated that the sales volume was determined by the output, so no matter how poor the production of energy producing enterprises was, the survival of these enterprises could be guaranteed. The energy industry was completely enclosed and their pace of development was slow, which resulted in some degree of excessive exploitation and inefficient utilization of energy, and thus energy waste and environmental destruction.

In the early period after the founding of the PRC, the Communist Party of China adopted a "one-sided" diplomatic strategy, which won the support of the socialist countries such as the Soviet Union for our construction. The main purpose of the energy policy at that stage was to revive the original production capacity of the energy industry, especially that in the northeast, eastern coastal energy industry bases. Reviving the capability of the previous mines laid a solid foundation for the construction of socialist industrial economy. In the first "Five-year Plan" of the national economy (1953–57), China began to carry out centralized management on coal and decided to give priority to developing the energy industry. Centering on the 156 projects assisted by the Soviet Union, China managed to finish its key projects of building the Northeast, North China, and other energy bases [1]. However, due to the blind development of heavy industry and the failure of economy to achieve coordinated development, the overall energy supply fell short of demand.

In 1958, China began "the Great Leap Forward" movement, featuring taking steel production as the key task. In order to meet the production targets of iron and steel, the energy industry also formulated unrealistic energy production targets. In order to realize the breakthroughs on energy production, the central and local governments blindly expanded the infrastructure construction of the energy industry, resulting in energy

waste and environmental destruction. The core of the energy policy during this period was to prosperously make iron and steel. In 1963, in order to eliminate negative impacts of "Great Leap Forward Movement," the Central Committee put forward the four-word policy of "Adjustment, Consolidation, Enrichment, and Improvement." This policy was well implemented and the energy industry registered gradual recovery. However, before the energy industry had fully returned to the right track, the "Cultural Revolution" movement began. During "Cultural Revolution," the energy policy was mainly to adjust the strategic layout to serve the national defense industry.

Overall, during the 30 years before the reform and opening-up policy, the self-sufficient energy development policy remained unchanged, and energy production could basically meet domestic energy demand. In 1959, the discovery of the Daqing oil field marked the rise of the oil industry in China, ending the oil-poor history. Later, China successively discovered, developed, and constructed a number of oil and gas fields, such as Shengli, Dagang, Liaohe, North China, and Central Plains. From then on, China's energy output increased substantially and China's energy industry entered the fast-developing period. In 1950, China's total energy production was only 30 million tons of standard coal, among which coal accounted for about 96.7% and the crude oil was about 0.9%. In 1980, the total energy production reached 640 million tons of standard coal, with an increase by nearly 20 times. Among the total energy production, coal accounted for about 69.4% and crude oil for about 23.8% [2]. In 1978, China's crude oil production exceeded 100 million tons. China entered the rank of world's main oil producers. The world oil crisis in 1973 made almost no impact on China's energy supply.

At the same time, in order to make up for the shortage of energy supply, China also actively developed small hydropower, biogas pool, solar cookers, small wind turbines, medium and low temperature geothermal energy, and other renewable energy. Solar energy utilization registered a certain development in the space industry and the civil field. However, in general, before the adoption of the reform and opening-up policy, due to restrictions of technology, funds, and so on, the main development of renewable energy in China is concentrated on the utilization of small hydropower and rural biomass energy, featuring low technical content and limited effects on improving environment. There were few elaborations about renewable energy among energy policies, letting alone systematic renewable energy policies.

DIVERSIFIED AND COMPLEMENTARY ENERGY DEVELOPMENT STRATEGY (1981–2005)

After the Third Plenary Session of the Eleventh Central Committee of the Communist Party of China, Chinese society entered a new historical period. The work focus of the CPC was shifted to the economic construction. Under the ideological guidance that peace and development have become the main theme of the era, the aim of energy policy was not to prepare for war like in the period of the cultural revolution but to serve the goal of socialist modernization by focusing on economic development. Therefore, the goals and means of energy policy changed. Since the adoption of reform and opening-up, the "electricity-centered" energy policy has been established. The energy industry management system, the energy price adjustment, and the energy market construction have all undergone profound reform. Energy production layout has changed from "equilibrium" to "inclination," and some large energy production bases have been built in Shanxi, Inner Mongolia, Xinjiang, and other places. The energy development policy of "attaching equal importance to energy development and conservation and putting energy conservation in the first place" has been determined as the guidelines. It has been put forward that we should regard energy conservation as a kind of resource and bring energy conservation into the "Sixth Five-year Plan" of national economy.

Since 1994, the focus of China's energy policy has been shifted further from the quantity of development to the efficiency of growth. Increasing energy supply capacity and optimizing energy structure has been given top priority, which further opened up oil import and export trade. Since 1998, China has made more effort to construct infrastructure and energy bases in the central and western regions. With the emphasis on accelerating the development of new energy industries, China has put forward the guideline of "adjusting measures to local conditions, adopting a balanced energy mix, making a comprehensive utilization and achieving maximum efficiency" to develop energy. During this period, China also strengthened the construction of energy legal system. A series of energy-related laws and regulations have been promulgated and implemented successively, such as *Environmental Protection Law of the People's Republic of China (1989)* and *Energy Conservation Law of the People's Republic of China (1998)*. The energy management has been gradually guided onto the legalized and standardized track.

With great effort for more than 20 years, to the end of the Tenth Five-year Plan (2005), China's energy production capacity has been greatly enhanced, reaching 2250 million tons of standard coal. That is 3.7 times more than that at the preliminary stage of the reform and opening-up. China has formed the coal-based energy production structure with oil, natural gas, electricity, and other energy complementing each other. Energy supply has basically met the increasing domestic demand. The proportion of oil and natural gas in energy consumption has been rising continuously. From the reform and opening-up to the end of the "Tenth Five-year Plan," the core of China's energy policy was to adjust structure of energy supply and consumption, and construct a diversified energy supply system which can not only guarantee the rapid development of national economy but also safeguard global energy security. Energy policy not only focused on economic benefits meeting the energy demands of industrial production and social life but also paid more attention to environmental performance, energy security, and so on. The government functions have gradually changed from developing energy resources to establishing market supervision framework.

With the continuous expansion of the opening-up, China has gradually turned its policy thinking from relying entirely on domestic resources to solve the problems about energy supply and consumption to the energy strategy of utilizing both domestic and foreign markets and resources. From the 1980s to the mid 1990s, China mainly adopted the strategy of opening up domestic energy production market, in which China actively utilized foreign capital and imported equipment in energy field, drew on the advanced technology and management experience, and encouraged foreign investment to enter the field of energy production in China.

After the 21st century, China has actively structured the 21st century petroleum development strategy centered on petroleum security. On March 6, 2001, Premier Zhu Rongji for the first time officially proposed the implementation of the national oil strategy at the Fourth Session of the Ninth National People's Congress. After this, China formulated *Guidelines for China's 21st Century Petroleum Strategy*, whose general framework includes the following 10 aspects: implementing "diversified" strategy, implementing "going abroad" strategy and cooperating with foreign countries in running oil and gas fields abroad; establishing national oil reserve and oil security safeguard system; exploring to set up national oil fund; establishing oil finance system and participating in global oil futures market; discussing to restore the National Energy Commission; building up oil

transport fleets, offshore force, and the strong naval and air force to ensure the capability to defend the maritime resources and energy supply in case of energy shortage; constructing four major strategic oil and gas reserve fields, including Xinjiang, Shaanxi, Gansu, and Ningxia fields; accelerating the establishment of a conservation-effective oil consumption model; developing three major Chinese "petroleum carriers," including China National Petroleum Corporation (CNPC), Sinopec, and China National Offshore Oil Corporation (CNOOC); adjusting national energy structure to establish a diversified strategy on the natural gas and coal consumption system [3].

In 2005, *Kyoto Protocol*, aiming at reducing global greenhouse gas emissions, came into force. In the same year, China completed the "Tenth Five-Year Plan" and began formulating *Eleventh Five-Year Plan for National Economic and Social Development*. During the "11th Five-Year Plan," energy policy was properly adjusted and the guideline was established of "giving priority to saving, seeking diversified development based on domestic efforts, strengthening mutually beneficial international cooperation, building stable, economical, and clean energy system, supporting sustainable development of economy and society by seeking for energy sustainable development". In 2005, in his speech at Beijing International Renewable Energy Conference, President Hu Jintao pointed out that the tasks of strengthening global cooperation, properly responding to energy and environmental challenges and achieving sustainable development are the common aspiration and responsibility of all countries in the world. In 2008, Hu pointed out, at the Economic Power Energy Security and Climate Change Summit held in Hokkaido, Japan, that China has identified the construction of ecological civilization as a strategic task, stressing the adherence to the basic national policy of resource conservation and environmental protection, and making efforts to form the industrial structure, growth pattern and consumption mode that can serve to save energy resources and protect ecological environment.

"NEW ENERGY SECURITY" CONCEPT IN NEW ERA

At the Dialogue Conference among leaders of G8 and developing countries held in St. Petersburg in July 2006, President Hu Jintao elaborates mainly on the global energy security issue and proposed the "New Energy Security Concept." He emphasizes that global energy security has a close bearing on the economic lifeline and livelihood of all countries,

and it's vital in safeguarding world peace and stability as well as promoting common development of all countries. Every country has the right to make full use of energy resources to promote its own development. Most countries cannot secure their energy security without international cooperation. In order to ensure global energy security, countries should implement the new energy security concept of seeking for diversified development and collaborative guarantee by making mutually beneficial cooperation.

To be more specific, efforts should be made in three aspects. First, effort should be made to strengthen mutually beneficial cooperation on energy development and utilization. The international community should strengthen policy coordination, improve international energy market monitoring and emergency mechanism, promote oil and gas resources development to increase supply, and achieve globalization and diversification of energy supply. Based on basic energy supply and demand balance, we should ensure stable and sustainable international energy supply and reasonable international energy price to meet energy demands of different countries. Second, strive should be made to develop advanced energy technology research, development, and promotion system. We should strengthen research, development, and promotion of energy saving technologies, support and promote all countries to increase energy efficiency, save energy and explore a clean, safe, economical, and reliable future energy supply system for the world. The cooperation in these fields, with an aim at the sustainable development of overall human society, should focus on capital investment, intellectual property protection, and technical popularization, so that all countries can benefit from it. The last but not the least, people should endeavor to maintain a sound political environment for energy security and stability. Different countries should work together to safeguard the stability of oil-producing areas and ensure the safety of international energy channels. Differences and contradictions should be resolved through dialogues and negotiations and energy issues should not be politicized [4].

In 2007, Premier Wen Jiabao delivered a speech entitled "Working for Win-Win Cooperation" at the Second East Asian Summit Meeting. He expounds his proposal on energy security that China should renew energy concept and ensure energy security. With the deepening of economic globalization, facing the more and more salient energy problems, Wen Jiabao expresses that to solve this problem, China needs to make the joint efforts of the international community to establish and implement the

new energy security concept of seeking for diversified development and collaborative guarantee by making mutually beneficial cooperation. He proposes to make contributions in the following three aspects. In the field of energy security, China should strengthen dialogues and policy coordination between energy consumers and consumers and between energy consumers and producers to safeguard the stability of local energy market. China should increase energy efficiency and conservation, give impetus to the research, development, and promotion of clean energy, alternative energy, and new energy technologies and build a clean, safe, economical, and reliable regional energy supply system in the future. Through bilateral and multilateral international cooperation, different countries should work together to maintain international energy transport security [5]. In 2012, at Fifth World Energy Conference, Premier Wen Jiabao proposed to establish a global stabilization mechanism for energy resources under the G20 framework. With the major G20 energy producing and consuming countries as the members, the mechanism aims at creating fair, reasonable, and binding international rules. Through negotiations and dialogues, attempts should be made to establish an early warning, price coordination, financial regulation, and emergency mechanisms.

After Premier Wen Jiabao proposes a global energy governance mechanism under the G20 framework in 2012, the government's internal research agency began the research and published more detailed research plans to discuss how China could participate in global energy governance, particularly under the G20 [6]. A research team at the Development Research Center of the State Council published a report of "Building a Global Governance Mechanism for Commodity Energy Resources under the G20," arguing that the G20's core power structure and mechanism have considerable cost advantages and it is advisable to govern the global energy resource markets with G20 as the center [7]. In February 2014, Energy Research Institute of the National Development and Reform Commission and the Grantham Research Institute on Climate Change of the British Imperial Institute of Technology jointly released an exposure draft for a research report on global energy governance and China's participation. It argues that G20 energy could provide leadership for global energy governance reform by establishing a new energy working group and could provide an important representative platform for leaders to discuss energy issues. The report also provided policy recommendations on how China could better participate in global governance, how to formulate more international energy policies, and how to better explain China's

energy policies to the international community in order to facilitate the objective understanding of these policies, and so on [8].

In addition, in the domestic academia, since 2007, the voices questioning traditional Chinese energy concept have also gradually become louder. More and more scholars suggest that China should set up an energy security concept of a new era and actively participate in global energy governance (Generally speaking, the traditional concept of energy security has a high degree of strategic and geopolitical color. It says energy is closely related to national security and advocates to maximize the level of energy self-sufficiency. In the aspect of overseas strategy, it believes that both developed and developing countries have competition and antagonism in acquiring resources, and the aim of "going out" is to grab more overseas oil and gas resources.). In the book *New Pattern of World Energy: Impacts of American "Energy Independence" and China's Response*, the author put forward that with the new changes in the world energy pattern, the limitations of traditional energy security concept has become increasingly obvious. China urgently needs to set up a new concept of energy security, whose basic connotation is that China will experience changes from the coal era to the oil and gas era, from single theme to multiple competition and from individual security to collective security. China should follow the "going global" pattern, strengthen cooperation with oil producers, transporters and other consumers, and achieve collective energy security through integrated, multilateral, regional cooperation and other forms of cooperation [9].

"ENERGY PRODUCTION AND CONSUMPTION REVOLUTION" SINCE THE 18TH CPC NATIONAL CONGRESS

The "energy production and consumption revolution" is a major topic proposed in the 18th CPC National Congress Report. In 2012, the report stated that "promoting energy production and consumption revolution, controlling total energy consumption." The previous expression in the 5th Plenary Session of the 17th CPC Central Committee Report and "12th Five-Year Plan" was "promoting the transformation of energy production and utilization, rationally controlling the amount of energy consumption." From "transformation" to "revolution" and from "rationally control" to "control," the great changes of national energy development

can be discerned. On June 13, 2014, President Xi Jinping presided over the Sixth Meeting of the Central Leading Group on Financial and Economic Affairs to deliberate China's energy security strategy. Xi Jinping put forward that in face of the new changes in the pattern of energy supply and demand and new trends in international energy development, the energy production and consumption revolution must be promoted to guarantee national energy security. The Party Central Committee put forward the concept of energy revolution, which indicated the determination to ensure energy security, adjust energy structure, and control air pollution from the strategic height of national development and security. Energy revolution is an important way and the important content to build beautiful China and realize the Chinese dream.

President Xi put forward five guidelines for the revolution in energy production and consumption. First, China should promote energy consumption revolution and curb irrational energy consumption. We should resolutely control the total energy consumption and effectively implement the policy of giving priority to energy conservation to ensure the overall energy conservation and in all fields of economic and social development. Industrial structure should also be adjusted, with the energy conservation of urbanization as the focus and the view of frugality and energy saving should permeate into people's thinking so as to accelerate the formation of energy saving society. Second, China should promote the energy supply revolution and establish a pluralistic supply system. Based on the domestic diversified supply to ensure energy security, we should vigorously promote the clean and efficient utilization of coal, with the development of non-coal energy as main task, to form the multi-wheel-driven energy supply system supported by coal, oil, gas, nuclear, new energy, and renewable energy and strengthen energy transmission and distribution network and storage facilities in synchronization. Third, China should promote energy technology revolution to drive industrial upgrading. Based on our national conditions, we should follow the new trend of the international energy technology revolution. Guided by the green and low carbon principles, technology innovation, industry innovation, and business model innovation should be pushed forward systematically, combined closely with high and new technologies to cultivate energy technology and correlative industries into new growth points of driving industrial upgrading in our country. Fourth, China should promote energy system revolution and open up the fast lane for energy development. We should unswervingly push forward reform, restore the attributes of energy commodities, construct an

effective competition market structure and market system, form a mechanism in which energy price is determined by market, change the government's supervision over energy, and establish and optimize the law system of energy. Fifth, China should strengthen international cooperation in an all-round manner to realize energy security under open conditions. With the precondition of relying on the domestic, we should strengthen the overall international cooperation concerning energy production and consumption revolution and make effective use of international resources.

For energy revolution there are four goals. The first one is to realize the integration and intensification of energy market, that is, to integrate the energy market, promote the complementation of various energy sources and resource allocation of energy market, and reduce the operation cost of energy enterprises. The second one is to reduce the cost of ecological environment by reducing the external impact of energy production and consumption, to ensure the national welfare of positive energy production. The third is to make use of domestic and international markets to ensure that the engine of China's rise can be provided with sustainable and abundant energy supply. The last one is to expand information exchange of energy, and serve China's social progress and overall energy security. The orientation for China's energy production and consumption revolution is to construct a modern energy system in which several kinds of energy complement each other and the relationship between supply and demand is in balance under market dominance and macro-control.

The task of energy revolution should following paths. First, coal-based traditional energy needs to be transformed to vigorously develop clean energy, especially the part of history that every household were engaged in coal mining can no longer return. Second, energy consumption system should be transformed to strictly control energy consumption indulgence. As the world's largest population country, China has become the world's largest energy producer and consumer. With the rapid economic development since the reform and opening-up, the consumption level of Chinese people has been elevated, and both the energy consumption per capita and total consumption have increased rapidly. Energy consumption should be controlled according to the average consumption level of the population at different levels of the country, and the total consumption per capita should be combined with the ladder price system. Third, the unreasonable energy structure, the high cost of energy and environment, and the relatively backward energy system and mechanism should be transformed. At present, China's extensive development model greatly relies on the energy

consumption, the domestic and foreign energy acquisition difficulty has increased, and the pressure of climate change and international resource competition has become heavier. So China should formulate mechanisms and channels for the co-allocation and co-enjoyment of multiple energy sources.

Energy revolution should be advances in the following three aspects. First, to make several types of energy complement each other is an important way to realize the revolution of energy supply methods in China. In this way, energy will continue to be diversified, so clean energy will be greatly developed, and the complementation, substitution, and coordination of various types of energy will be gradually deepened. Second, to ensure supply and demand interact with each other is the survival mode of energy consumption. The energy revolution should make a good link between supply and future energy demand so as to make them highly integrated and coordinated. Considering our country's total energy demand and increment in all periods are all very large, we must try our best to ensure the balance between the supply and demand of energy, promote the demand-side energy revolution, and create a new-type consumption mode. Third, market dominance and macro-control is the important guarantee of energy revolution. Energy marketization and the government's management on energy is the key to energy revolution, giving full play to the respective advantages of government and market, making the market play a decisive role in resource allocation in a wider scale and to a maximum degree and constantly pushing forward the reform and adaption to the productive relations to facilitate the development of the productive force to jointly promote the revolution of energy production and consumption [10].

STRATEGY FOR ENERGY PRODUCTION AND CONSUMPTION REVOLUTION (2016–30)

On December 29, 2016, the National Development and Reform Commission and the National Energy Bureau issued the *Energy Production and Consumption Revolution Strategy (2016–2030)* to implement the guiding principles made at Sixth Meeting of the Central Financial Leading Group and Second Meeting of the National Energy Commission. It has been pointed out that promoting energy production and consumption revolution is of great practical and far-reaching strategic significance to enhance the

capacity to guarantee energy security, improve economic development quality and efficiency, increase the basic supply for public services, actively respond to global climate change, and comprehensively promote the construction of ecological civilization and a well-off society. We should conceive and implement new development concepts, adapt to and lead the new normal of economic development, take promoting energy revolution as the national policy of energy development, build a solid foundation for energy security, and promote civil energy consumption, diversified sources of energy supply, scientific and technological innovation, deepened reform, and strengthened cooperation, so that energy production and consumption patterns can be fundamentally transformed and improved. The content of the *Energy Production and Consumption Revolution Strategy (2016—2030)* mainly includes the following aspects:

1. Target planning

By 2020, revolution in the layout of energy system will be launched in an all-round way to promote clean utilization of fossil energy, fundamentally reversing the extensive growth mode of energy consumption and attaching importance to both policy orientation and constraints. The total energy consumption will be controlled within 5 billion tons of standard coal. The proportion of coal consumption will be further reduced, with clean energy as the subject of energy increment. Energy structural adjustment will register remarkable progress, with non-fossil energy accounting for 15% of the energy mix, carbon dioxide emission of GDP per unit reduced by 18% compared with that in 2015. In addition, the utilization efficiency of energy development will be significantly improved and the energy utilization of major industrial products will reach or approach the international advanced level, with energy consumption ratio of GDP per unit reduced by 15% compared with that in 2015. The electricity, oil and gas system, energy price formation system, green policy of finance and taxation, and other basic institutional systems will basically take shape. The energy self-sufficiency will maintain above 80%, and a relatively optimized energy security guarantee system will basically be formed, so that it will provide energy guarantee for the complete construction of a well-off society as scheduled.

From 2021 to 2030, the utilization of renewable energy, natural gas, and nuclear energy will continue to grow, and the utilization of high-carbon fossil energy will greatly decline. Total energy consumption will be controlled within 6 billion tons of standard coal, with

non-fossil energy accounting for about 20% and natural gas about 15%. The newly increased energy demand will mainly depend on clean energy to meet. The carbon dioxide emission of GDP per unit will reduce by 60%–65% compared with that in 2005. It will reach peak around 2030 and the peak should be reached as early as possible. Energy consumption GDP per unit (calculated by current price) will reach current international average level. Energy efficiency of major industrial products will reach international advanced level. Capacity of independent innovation will be improved in an all-round manner. The level of energy science and technology will rank the world. The modern energy market system will be more and more mature and strengthened. The energy self-sufficiency will remain at a relatively high level, and at the same time international energy resources will be put into better use, so that the modern energy system will be basically shaped. Looking into the year of 2050, it can be predicted that the total energy consumption will be basically stable. Non-fossil energy will account for over half of the total energy consumption. The civilized energy consumption society will be successfully built, and energy efficiency, energy science and technology, and energy equipment reach the international advanced level. China will become an important participator in global energy governance. The modern energy system will be built to guarantee the realization of modernization.

2. Promoting energy consumption revolution and creation of a new situation featuring energy conservation and high energy efficiency

We should strengthen the management of binding targets, promote adjustment of industrial structure and energy consumption structure in synchronization, effectively implement the policy of giving priority to energy conservation, improve the quality of energy use in urban and rural areas, fundamentally curb irrational consumption, substantially raise the efficiency of energy utilization, and accelerate the formation of energy saving society.

2.1 Resolutely controlling the total amount of energy consumption

We should implement "dual control" of energy total consumption and intensity. Taking the targets in energy total consumption and intensity as important binding targets of economic and social development, we should promote the formation of anti-driving economic transformation and upgrading mechanism. We should focus on controlling the total amount of coal consumption and the increment in oil consumption, by encouraging renewable

energy consumption and adopting differentiated management approaches on total energy consumption. In the major areas of air pollution prevention, the total amount of coal consumption should be strictly controlled, encouraging the use of other kinds of energy to reduce the demand on coal. So the utilization scale of natural gas will be expanded. Fossil energy consumption rate in the eastern developed regions will be the first to reach peak. We should strengthen management on total energy consumption in key industries and fields. We should establish and improve the initial distribution system of energy-using rights, cultivate the market for trading energy-using rights, carry out the paid use and pilot trading of energy-using rights, and formulate relevant systems on energy-using right management.

2.2 Creating an upper intermediate energy consumption structure

China should promote the mutual drive of industrial structure adjustment and energy structure optimization to make energy consumption structure greener and highly efficient in an upper Intermediate form. We should promote the transformation and upgrading of traditional industries by adjusting energy consumption structure. We should raise market access standards, limit the development of industries with high energy consumption and pollution, and curb the consumption of coal and other fossil energy. We should promote the green transformation and upgrading of manufacturing industry. We should eliminate backward production capacity in coal, steel, building materials, petrochemical, nonferrous, and chemical engineering and other industries according to laws and regulations. We should regulate import and export tariffs, promote import and export of products with high quality and at reasonable price, and reduce the export of energy-exhausting products. We should vigorously develop strategic newly emerging industries, implement the projects of intelligence manufacturing, and accelerate energy conservation by stepping up efforts to develop a new generation of information technology, new energy vehicles, new materials, biological medicine, advanced rail transit equipment, power equipment, aviation, electronics, information industry, and other advanced manufacturing industries. We should increase the proportion of service industry, promote the transition of producing services to specialization and extending to the high end of value chain, and

advance the shift of living services to high quality and push the service industry to use more clean energy.

2.3 Promoting energy conservation and emission reduction

China should adhere to the overall strategy of giving priority to energy conservation, improve the standards and measuring systems for energy conservation, optimize the system of energy conservation assessment, increase the efficiency of energy utilization in an all-round manner, and improve management systems for the pollutants and carbon emission. We should regard industry as a key area for promoting energy consumption revolution, by adjusting industrial energy structure and modes to promote energy resources to be used in the fields of high technology, high efficiency, and with added value. We should vigorously promote certification for low-carbon product and the low-carbon production. We should encourage the green industrial manufacturing and the all-round development of green products, green factories, green parks, and green supply chains. We should establish and improve standard systems of energy conservation and vigorously develop green buildings. We should build a green low-carbon transportation system, optimize transportation structure and vigorously develop railway transportation, urban rail transit, and water transportation. We should resolutely control pollutant emissions, actively control carbon emissions, establish and improve the initial distribution system of the emission permit and carbon emission permit, and cultivate and develop the national market for trading carbon emission permit.

2.4 Promoting and developing urban and rural electrification

Combined with the construction of the new-type urbanization and agricultural modernization, we should broaden the field of electric power use, give priority to using renewable energy, and simultaneously promote the construction of electrification and informatization. We should greatly enhance the electrification level of the urban terminal and replace coal and oil used in urban terminal with the clean energy of electricity. We should speed up the electrification of manufacturing equipment to raise the industrial electrification level in cities and towns. We should improve the power distribution network construction, power access facilities, and the supporting facilities of electricity supply for agricultural production to promote the electrification of agricultural

production. We should vigorously develop solar energy, shallow geothermal energy, biomass energy, and so on. We should improve the intelligence level of terminal energy consumption in an all-round way, developing smart energy cities, popularizing intelligent building, smart home and smart home appliances, and developing intelligent transportation and intelligent logistics. We should foster the Internet-based energy consumption market, promote the networked transactions of energy rights, carbon emissions permit, renewable energy quotas, and other types of transactions, and develop energy-sharing economy.

2.5 Cultivating the consumption concept of frugality

China should vigorously advocate the life style and consumption pattern of using energy with rationality to promote the formation of diligent and thrifty social fashion. We should spread the economic, environmental, and ecological consciousness nationwide, actively cultivate the saving culture, make saving the mainstream value of society and see saving and high efficiency as the important content of quality-oriented education. We should give full play to the typical demonstration and driving role of public institutions and energetically call for the construction of green offices, enterprises, communities, and families. We should strengthen the publicity of green consumption. We should live a green life and make greater efforts to encourage all people to act in a civilized and green manner in such areas as clothing, food, housing, transporting, and means of travel. We should continue to improve the supportive policy systems for popularizing low-emission automobiles and new energy automobiles. We should guide consumers to buy all kinds of energy saving, environment-friendly, and low-carbon products, reduce the use of disposable products, and popularize green lighting and energy-efficient products.

3. Promoting energy supply revolution and building a clean and low-carbon new system

Based on the national energy resources condition, we should implement the supply-side energy structural reform, promote the development of coal transition, increase the large-scale development of unconventional oil and gas, vigorously develop non-fossil energy, improve the transmission and distribution network and the reserve system, and optimize the energy supply structure to form a multi-wheel-driven, safe, and sustainable energy supply system.

3.1 Promoting clean and efficient development and utilization of coal

We should realize coal transformation is the foothold and primary task of our country's energy transformation. We should work hard to realize the centralized use of coal and take diversified ways to promote the replacement of civil bulk coal by high-quality energy, vigorously launch coal-to-gas and coal-to-electricity switch projects. We should vigorously push the clean utilization of coal. We should establish the management system for coal quality and optimize the coal cleaning, storage, and transportation system. We should continuously improve the efficiency of the coal-fired power units and reduce the coal consumption in energy supply. We should accelerate the upgrading and rebuilding of active-duty coal-fired power units. The large-scale power units to be built next should adopt the most advanced power generation technologies such as the ultra-supercritical technology, and coal-fired power units with high efficiency and ultra-low emission. Combined with the transformation of shanty towns and other urbanization constructions, we should develop cogeneration (combined heat and power generation). We should moderately advance coal in the direction of deep processing and explore new ways of developing clean and efficient modern coal chemical industry. We should develop the green production of coal, strictly control the increment in coal production capacity, well integrate the new capacity control with dissolving the excessive capacity, and optimize the normal exit mechanism for coal mines. We should coordinate coal and coal-bed methane development and raise the comprehensive utilization capability of coal gangue, mine water, coal mine gas, and so on. We should strengthen coal washing and dressing to increase the proportion of coal washing.

3.2 Promoting the great-leap-forward development of non-fossil energy

China should seek for both distributed and centralized development, with distributed utilization as the focus, to promote the renewable energy development to a high proportion. We should vigorously develop wind energy and solar energy, continuously improve the efficiency of power generation and reduce the cost of power generation. We also should extensively develop biomass energy, accelerate the development of biomass heating, biogas, and rural methane, and expand the scale of urban power

generation with garbage. We should coordinate the economic benefits, social benefits, and environmental benefits of hydropower development and popularize the development and utilization of geothermal energy. We should carry out demonstration of promotion activities about utilizing ocean energy and other renewable energy and pursue safe and efficient development of nuclear power. We should actively promote the doubled development of domestic supply capacity of natural gas. We should strengthen the exploration and development of natural gas, building Sichuan, Xinjiang, and other natural gas production and supply areas, to accelerate the exploration and development of coal-bed methane in different coal ranks of the Ordos Basin, Qinshui Basin, Xinjiang, and other areas, as well as that of shale gas of the Sichuan Basin and its surroundings, the middle and lower reaches of the Yangtze Areas and the northern area. We should promote the large-scale development of coal-bed methane, shale gas, tight gas, and other unconventional gas with a low cost and safely and steadily promote the pilot production of natural gas hydrates. We should well deal with environmental problems in the process of oil and gas exploration and development, strictly implement environmental protection standards, spare no efforts to prevent and control water, soil, and air pollution, and promote distributed utilization as an important way of energy utilization.

3.3 Promoting the energy supply-side management

China should strictly control the energy increment, optimize the energy stock, strive to improve the quality and efficiency of energy supply, expand the effective supply, rationally control the cost of energy elements, and enhance the adaptability and flexibility of energy supply. We should establish and improve a market-oriented system for the management of energy production, distribution and trading, promote the timely supply of high-quality energy, and guide the upgrading of energy consumption. We should optimize the withdrawal mechanism of production capacity and accelerate the elimination of backward production capacity in the energy sector. Through technological progress, we should reduce the cost of clean energy, improve the market mechanism which supports clean energy development, establish and perfect the compensation mechanism of ecological protection, and internalize the external environmental cost of fossil

energy so as to reasonably determine the coal tax level. We should establish the supply system of diversified oil product market, optimize the operation of energy system, and create an infrastructure platform in which energy is used efficiently and flows fairly. We should establish the effective supervision mechanism of ensuring the equitable access to energy infrastructure, reduce the cost of transmission and distribution, and improve the efficiency of energy supply.

3.4 Optimizing the layout of energy production

The Eastern Region should make full use of domestic and foreign natural gas, develop nuclear power, distributed renewable energy, and offshore wind power, actively absorb surplus clean energy from other areas, and take the lead in reducing coal consumption. The Middle Region should vigorously develop distributed renewable energy, do well in coal protective development, reduce the overall coal production scale, accelerate the development of coal-bed methane, and build energy input channels from out-of-zone and energy transfer hubs. The Southwest Region should construct such hydropower bases as Yunnan, Guizhou, Sichuan, and Jinsha River hydropower bases, greatly develop natural gas in Sichuan and Chongqing, and actively develop biomass energy. The Northwest Region should build a large comprehensive energy base of fossil energy and renewable energy. The Northeast region should accelerate the elimination of backward coal production capacity, vigorously develop new and renewable energy, and steadily promote the development and utilization of maritime energy. It should optimize the layout of the petroleum refining industry, effectively link energy development areas with transmission network, giving priority to achieving local balanced energy supply and demand, and try best to minimize long-distance transmission on a large scale. It should accelerate the transformation of energy transmission network, improve the operating efficiency of the system, and expand the effective utilization of renewable energy.

3.5 Constructing the "Internet Plus" smart energy in an overall scale

China should promote the deep integration of energy with modern information technology and drive the reform of energy production management and marketing modes. We should promote intelligentized energy production, intelligentized production of wind power, solar power, and other renewable energy and intelligent transformation of the whole process of fossil

energy exploitation, processing, and utilization, and accelerate the development of advanced energy storage systems. We should strengthen the intelligence construction of power systems and effectively connect oil and gas pipeline networks, heat pipe networks, and other energy networks to build the energy Internet featuring the coordinated development and integrated complementation of power, grid, load, and energy storage. We should build a distributed energy network, encouraging the coordinated development of distributed renewable energy and natural gas to make distributed energy highly efficient, flexibly accessible and integrated in production and consumption. We should develop new business forms based on energy internet, promoting the intelligent customization of various energy sources, reasonably guiding the power demand, encouraging users to participate in peak shaving, and cultivate the new mode of intelligent use of energy. We should, relying on electronic commerce trading platform, realize free trade and flexible subsidy settlement on energy and advance virtual energy currency and other new business modes. We will build an information platform, service system, and industrial system for energy monitoring, management and dispatching, based on big data, cloud computing, Internet of things, and other technologies.

4. Promoting energy technology revolution

China should accurately grasp the evolution trend of world energy technology, taking the green and low-carbon development as the main direction, selecting the major scientific and technological fields to promote technological innovation, business model innovation, and industrial innovation, so that we can transform technological advantages into economic advantages and foster new growth points for upgrading energy technologies and related industries.

4.1 Popularizing advanced and efficient energy saving technology

China should develop the technology for industrial high-efficiency energy use and strengthen the technology research and development in manufacturing techniques and mechanical equipment for energy saving. We should push forward the energy saving reconstruction of the process industry system, and improve and popularize technologies on industrial recycle, systematic and cascading utilization. We should encourage green and energy saving designs as well as light weight, low power consumption,

easiness for recycle, and other technical crafts. We should popularize building technologies featuring ultra-low energy consumption as well as green household products, green appliances, and other energy saving technologies in life, developing new thermal insulation materials, reflective coatings, energy-efficient doors, windows and glasses, green lighting, intelligent home appliances, and other technologies and actively popularize the technologies of large-scale application of solar power, geothermal energy, air thermal energy, and other renewable energy to buildings. We should work hard to make breakthroughs in core technologies of new energy automobiles, developing energy saving automobile technologies, core energy saving technologies on high-speed railway and new rail transport and large aircraft, ship materials, and fuel processing technologies. We should research, develop, and popularize the technology of integrating transport and Internet. We should use big data of transport to develop urban intelligent traffic management technologies, vehicular networking technologies, and other traffic control network technologies.

4.2 Popularizing the technologies for developing and utilizing clean and low-carbon energy

China should develop renewable energy technology. We should accelerate the research and development of technology and complete equipment about large-scale land, offshore wind power systems, striving to make technological breakthroughs on the grid connection of low-speed wind and power generation at wind power plant. We should accelerate the development of high-efficient solar power generation technology and equipment, mainly researching and developing such technologies as solar cell materials, photoelectric conversion, intelligent photovoltaic power stations and power generation technology with wind power, photovoltaic power, and hydropower complementing each other. We should research the large-scale absorptive technology of renewable energy. To develop advanced nuclear energy technology, we should promote the construction of large and advanced PWR (pressurized water reactor) nuclear power plant on a gigantic scale, the demonstration project of sodium-cooled fast reactor nuclear power plant, the demonstration project of PWR spent nuclear fuel reprocessing, the nuclear power demonstration project of high-temperature gas-cooled reactor, and other

new nuclear power demonstration projects. We should develop fault-tolerant nuclear fuel technologies, advanced nuclear fuel cycle postprocessing technologies, and high-level radioactive waste treatment and disposal technologies. To develop technology for the clean development and utilization of coal, we should innovate key technologies such as high-efficient well construction, nonhuman and nonharm intelligent coal mining, filling mining, water-preserved mining, non-pillar mining (lane by using mine pressure), and so on. We should innovate ultra-high efficiency thermal power technology, ultra-clean pollution control technology, carbon emission reduction technology with low energy consumption, sulfur capture, storage and utilization technology, integrated coal-gas combined cycle power generation technology, etc. To develop oil and gas development technology, we should actively research and apply oil and gas high recovery technology and land deep oil and gas exploration and development technology. We should explore new fracturing technology of tight gas and shale gas, and oil shale in situ mining technology. We should develop and popularize coal-bed methane extraction technology suitable for different coal seams, promote the technology and equipment research in deep-sea oil and gas exploration and development, and emergency response and rapid treatment for offshore oil spill and other accidents.

4.3 Developing smart energy technology

We should promote the deep integration of Internet with distributed energy technology, advanced power grid technology, and energy storage technology. To develop advanced power grid technology, we should strengthen the research, development, and applications of new energy grid connection, micro-grid, and other smart grid technologies, promote the research, development, and demonstration of advanced infrastructure and key equipment technologies, information communication technology, and interactive regulation and control technology, and optimize and popularize the demand-side interactive technology, power virtualization, and power trading platform technology to improve the regulation capacity of power grid system. To develop energy storage technology, we should develop variable speed pumped energy storage technology, push forward the research, development, and application of flywheel, high-parameter and high-temperature heat

storage, phase change energy storage, new compressed air, and other physical energy storage technologies, and develop high-performance fuel cells, super capacitors, and other chemical energy storage technologies. We should research and develop distributed energy storage devices that support plug-and-play and flexible transactions. To develop energy Internet technology, we should join our efforts to tackle problems of key equipment technologies and system-supporting technologies on energy internet, with focus on multi-energy flow-oriented energy switch router technology, energy exchange technology, energy informatization and information physics fusion technology, energy big data technology, energy trading platform and financial services technology, etc.

4.4 Strengthening the fundamental research on energy science and technology

China should implement the strategy of giving priority to talent development, with focus on improving the research capabilities and levels in fundamental science fields such as fossil energy geology, energy environment, energy dynamics, materials science, information, and control. To carry out pioneering innovation research, we should accelerate the research and development of hydrogen energy, graphene, super-conducting materials, and other technologies, make technological breakthroughs on the wireless power transmission technology, solid-state intelligent transformer, and other core technologies, and develop fast reactor nuclear power technology. We should strengthen research on such basic theories as the mechanism of coal disasters and investigate more deeply the technology of utilizing hot-dry rocks. We should strive to make breakthroughs on technology of using microalgae to produce oil and using algae to produce hydrogen. We should take initiative to research individual, generalized, and independent technologies related with self-energy system. To attach importance to major technological innovations, by tackling key problems centering on controlled thermonuclear fusion test devices, we strive to achieve major breakthroughs in the controlled thermonuclear fusion laboratory technology, and we should develop the technology in economical and safe natural gas hydrate production and carry out deep study into the technology of economical full-collection and full-processing carbon capture, utilization, and sequestration.

5. Promoting energy system revolution to facilitate the modernization of the governance system

We should revive the energy's property as commodities, accelerate the formation of a unified, open, competitive, and ordered market system, giving full play to the decisive role of market in resources allocation, and better play to the role of government. With saving, diversification, and high efficiency as objectives, we should reform energy macro-control mechanism, improve scientific supervision system, and perfect energy laws and regulations so as to construct system and mechanism of stimulating innovation and open up the fast lane of energy development.

5.1 Constructing energy market system featuring effective competition

China should adhere to the direction of socialist market economy reform and accelerate the formation of an energy market system for independent operation of enterprises, free choice of consumers, and free movement of commodities and elements. We should also accelerate the formation of modern market system. The government should reduce the interference to energy market, direct distribution of energy resources, and public administration of microeconomic activities. It should speed up to build basic systems to ensure the orderly and free flow of resources. We should promote the reform of energy administration in examination and approval system in an overall scale, improve the negative list, encourage and guide all kinds of market entities to legally and fairly participate in investment and operations in the energy sector outside the negative list. We should actively and steadily develop mixed ownership, support nonpublic ownership development and diversify market entities. We should establish a sound energy trading market for oil, natural gas, coal, electricity, energy rights, and so on, and establish fair, open, transparent, and unified market rules. We should break the regional blockade and industry monopoly, strengthen market price supervision and anti-monopoly law enforcement, and severely punish the entities who commit monopolistic conducts, such as the implementation of monopoly agreements, abuse of market dominance and administrative power.

5.2 Promoting the market-oriented reform of energy enterprises in an all-round manner

With focus on promoting the overall optimization of energy structure, layout, and technology, we should implement the classification-based reform of state-owned energy enterprises by following the principle of some advancing while retreating and getting some things done while leaving some things undone, especially the reform of key industries such as electric power, oil, and gas. According to the principle of regulating the middle and deregulating the two ends, we should orderly deregulate the businesses of power generation, distribution, and sales. Government should optimize the layout of state-owned capital, improve the modern enterprise system, increase the investment efficiency, and give full play to the leading and guiding role in protecting the resource environment, speeding up transformation, and upgrading and fulfilling social responsibility, so as to better adapt to the upgrading of energy consumption demands. We should strengthen state-owned economy's vitality, control, influence, and anti-risk ability to make it strong and outstanding and better serve the national strategic objectives.

5.3 Establishing a pricing mechanism mainly determined by market

The prices in competitive links should be fully liberalized. All prices, as long as they can be determined by market, should be determined by the market. We should strengthen the interim and postmortem supervision of market price and regulate price behaviors to promote the formation of energy pricing mechanism in which energy price is determined by such factors as energy resource scarcity, market supply and demand relation, environmental compensation cost, and intergenerational equity sustainability. We should properly handle and gradually reduce cross-subsidization. Government should strengthen the supervision on pricing cost and promote pricing openness and transparency. Government should perfect the systems in supervising areas which are important to people's livelihood and natural monopoly price of some network industries. We should implement and improve the linkage mechanism of social assistance, guarantee standards and price increases, and ensure the basic demand on energy for the masses.

5.4 Reforming the scientific energy management mode

China should accelerate the transformation of government functions, further streamline administration and delegate power to a

lower level, combine delegating power and strengthening regulation, and optimize service to establish and improve the scientific energy management mode in which strategies planning, plan implementation, and supporting policies and supervision are well in place. We should strengthen the leading role of strategic planning, such as the planning of major energy issues, reinforcing the top-level design, and constantly improving the full-scale, forward-looking, and oriented energy management. We should accomplish the organic linking of energy planning, annual planning and all kinds of specialized planning, and establish the mechanism for plan implementation, supervision and inspection, and appraisal and assessment, to ensure effective implementation of plans and further improve their scientific, authoritative, and binding features. We should innovate and improve energy macrocontrol. In accordance with requirements of combining total energy adjustment and oriented policy implementation, integrating short-term, medium-term, and long-term tasks, harmonizing domestic and international situations, coordinating reform and development, we promote the coordination of total energy amount and intensity control, optimization of energy structure, risk prevention and control, and environmental protection.

5.5 Improving macropolicy supporting mechanism

China should improve the industrial policies and investment and financing mechanisms that encourage the accelerated development of clean energy. We should strengthen the integration of energy-use right with the initial distribution system of water-use rights, emission permits, and carbon emission permits, as well as non-free land-use management systems to promote rational and efficient utilization of energy resources. We should examine and improve the mineral resources royalty and supporting systems, safeguarding the rights and interests of the resources owners and investors, and improving the energy and mineral resources management mechanism in which the government puts energy resources into the market orderly and enterprises compete with each other openly and fairly. We should establish and improve the finance, taxation, and financial service system which support green development of energy. We should strengthen energy statistics system, improving the measurement system and the evaluation systems for the targets in total energy consumption,

environmental quality, and energy conservation and emission reduction, and promoting the certification of energy management system. We should coordinate the energy management system reform, defining the energy supervision responsibilities of the central and local governments. We should promote the construction of credit system in energy field, improving the regulatory coordination mechanism, and establishing a modern energy regulation and supervision framework in which rights and liabilities are clear, rules and regulations are uniform, the ways of supervision are proper, and law enforcement is powerful. We should improve the system of energy market access, unifying the access "threshold" and strengthening technical standards such as resources, environment, and safety. By means of market, credit, and legal system, we should strengthen the continuous dynamic supervision on conducts of energy market entities to guard against safety risks and maintain market order.

5.6 Establishing and perfecting the energy legal system

By means of energy legal system to balance interests of all parties and build consensuses on energy reform, we should promote, reform under the legal system, and perfect the legal system in the process of reform. We should establish scientific, complete, advanced, and applicable energy law and regulation system. According to the development requirements, we should improve energy laws and regulations system, strengthening the construction of laws and regulations on energy supervision, studying and improving the relevant supporting enforcement regulation, integrating local laws and regulations with administrative laws and regulations, and timely revising or abolishing laws and regulations that hinder reform and development. We should enhance the timeliness, pertinence, and effectiveness of energy laws and regulations.

6. Strengthening all-round international cooperation and creating energy community of shared fate

In accordance with the principles of overall planning, multidimensional cooperation, mutual benefit, and win-win objective to yield long-term interests, we should strengthen wide-ranging and multilayered cooperation throughout the whole industrial chain, build the energy cooperation network linking China to the rest of the world, and create the community of shared interests and fate on energy cooperation.

6.1 Realizing diversified and stable sources of overseas oil and gas resources

China should improve the layout of key overseas cooperation areas, enrich the connotation of international energy cooperation, and understand the converging interests of all parties. To construct a diversified supply pattern, we should effectively utilize international resources, speed up the reconstruction of supply territory, and form a long-term, reliable, safe, and stable supply channel. To create a community of shared fate, we should understand and expand the converging interests of all parties on international energy cooperation, fully take care of the real interests of the host country of the cooperation, and combine the strategic interests of China's energy cooperation with the demands on economic development and people's livelihood improvement of the resource countries. The enterprises which orient at energy "going-out" should earnestly fulfill the social responsibilities at the local and promote mutual benefit and win-win result. To innovate ways of cooperation, we should attach equal importance to economic and diplomatic development, invest and trade, making full use of the opportunities of high-level exchanges and visits, bilateral and multilateral negotiations, foreign economic assistance, etc., to innovate the approaches to international energy cooperation. We should give full play to the advantages of capitals and funding to promote the combination of resource development with infrastructure construction.

6.2 Opening "the Belt and Road" energy channel

While consolidating the existing strategic import channels of oil and gas, China should also accelerate the construction of new energy channels so as to effectively improve China's energy supply capacity as well as the countries along the route and comprehensively increase the capability of the mutual complementation and mutual help in energy supply. To ensure the energy channel is unobstructed, we should consolidate the existing main oil and gas strategic import channels, promote the establishment of safety cooperation mechanism on land and sea channels, control the risks at the key nodes of the channel, improve the protection capability for the facilities, capability for strategic early warning and capacity for emergency response, and build a large, safe, and smooth channel for energy transmission. To improve the layout

of energy channel, we should strengthen the linkage between domestic and foreign countries and the two-way opening of the east and the west, accelerate the development of energy connectivity between the countries and regions in the Road and Belt Initiative, accelerate the construction of energy channels, and improve the transportation capacity of onshore channels. To promote connectivity of basic power network of neighboring countries and boost shared growth through discussion and collaboration, we should work with relevant countries and regions to promote integration of the layout planning with the standard specification, operation and management of energy infrastructure, and strengthen cooperation in legal affairs to ensure efficient and smooth transportation of energy. With enterprises as the main body and infrastructures as the bibcock, we should jointly build the industrial parks for overseas energy trade.

6.3 Deepening international cooperation on production capacity and equipment manufacturing

China should introduce technologies and talents simultaneously, broaden scope of cooperation, intensify cooperation on international energy technologies, promote deep integration of China's energy industries with those of foreign countries, and enhance the international competitiveness on energy. We should introduce advanced and applicable technologies. Through mutual investment, market opening, and other means, we introduce, digest, absorb, and make innovations in clean coal, spent fuel treatment, smart power grid, and other key and applicable energy technologies. We should encourage foreign enterprises which have mastered advanced technologies to participate in China's unconventional oil and gas exploration, clean and low-carbon energy development and utilization, and so on. To promote the global collaborative innovation capability on science and technology, we should actively participate in the construction of cooperative platform and mechanism for forward-looking energy technology international research, development, and application, and closely follow up and master the current trends in key areas. We should strengthen cooperation and exchanges of inter-government, inter-enterprise, and inter-research institution, improve the talent cooperation and training mechanism in energy field, actively participate in formulating advanced energy

technology standards, and promote the internationalization of domestic technical standards. We should integrate into the global energy industry chain, give full play to comparative advantages, cultivate a batch of transnational enterprises, enhance international competitiveness, and promote the going-out of energy-producing, highly efficient and energy saving equipment, technologies, and services. We should work with advanced countries to develop the third-party international markets and deeply integrate into the global energy industry chain, value chain, and logistics chain.

6.4 Participating actively in international energy governance

China should promote the transformation of global energy governance mechanisms to jointly deal with global challenges and create a community of shared destiny. We should consolidate and improve our bilateral and multilateral energy cooperation mechanisms and actively participate in the reform of international institutions. We should actively take international responsibilities and obligations. By adhering to the fair principles of taking common but differentiated responsibilities and giving full play to respective abilities, we actively participate in international negotiations on handling climate change and promote the formation of a global climate governance system that is fair, reasonable, and mutually beneficial through cooperation. We should widely carry out practical exchanges and cooperation to push developed countries to earnestly implement obligations set forth in the *United Nations Framework Convention* on *Climate Change*, such as taking the lead in reducing emissions significantly. We should support developing countries to develop clean energy and protect ecological environment to establish the image of a responsible great nation.

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