

## Industrial Green Development Plan (2016-2020)

This plan is formulated to implement the 13th Five-Year Plan for National Economic and Social Development and the strategic deployment of Made in China 2025 to accelerate the construction of ecological civilization and promote green industrial development.

### I. THE SITUATION Facing

During the "Twelfth Five-Year Plan" period, the industrial sector adhered to the development of resource-saving and environmental-friendly industries as an important focus of transformation and upgrading. Industrial energy efficiency and water efficiency have been greatly improved, and energy saving of 690 million tons of standard coal has been achieved, and water consumption per unit industrial added value has been reduced by 35%. Industrial cleaner production advanced applicable process technology demonstration and promotion, toxic and harmful raw material substitution, industrial products green design promotion mechanism was initially established. The scale of the comprehensive utilization of industrial resources has steadily grown, and the level of technology and equipment has continuously improved. The energy-saving and environmental protection industry has grown rapidly, and the output value of energy-saving and environmental protection equipment, comprehensive utilization of resources and energy-saving services in 2015 is about 4 trillion yuan.

The next five years is a critical period for the implementation of the strategy of a manufacturing powerhouse and a critical stage for achieving industrial green development. Promoting green growth and implementing the Green New Deal are common choices for major economies worldwide. Resource and energy efficiency is also an important factor in measuring national manufacturing competitiveness. China's industry in general has yet to get rid of high-input, high-consumption and high-emission development methods, large consumption of resources and energy, ecological environment problems are prominent. Accelerating industrial green development is also an important measure to promote supply-side structural reform and promote stable growth and adjustment of industrial structure.

### II. OVERALL REQUIREMENTS

#### (a) The guiding ideology

Implement the spirit of the 18th CPC National Congress and the 3rd, 4th, and 5th Plenary Session of the 18th CPC Central Committee, firmly establish innovation, coordination, green, open and shared development concept.

#### (b) Basic principles

Innovation driven, standards driven. Promote industrial green development science and technology innovation, management innovation and business model innovation, R&D and promotion of core key green process technology and equipment. Accelerate the improvement of industrial energy efficiency, water efficiency, emissions and comprehensive utilization standards, implement green supervision according to law, and guide green consumption.

Policy-driven, market driven. Give full play to the guiding role of the government in promoting the green development of industry, optimize the industrial structure and regional layout, strengthen the innovation of mechanisms, and form an effective incentive and constraint mechanism. Strengthen the main position of enterprises in promoting industrial green development, stimulate corporate vitality and creativity, and actively fulfill social responsibilities.

Refurbish stocks and optimize increments. Accelerate the green transformation and upgrading of traditional manufacturing industries, encourage the use of green and low-carbon energy, improve resource utilization efficiency, eliminate backward equipment processes, and reduce pollutant production from sources. Actively lead the green development of emerging industries, strengthen green design, accelerate the development of green products, and vigorously develop energy-saving and environmental protection industries.

Comprehensive progress, focus on breakthrough. Focus on solving resource environmental problems in key industries, enterprises and regional development, and give full play to the driving role of pilot demonstration. Actively promote the green development of emerging industries and small and medium-sized enterprises, and accelerate the overall level of industrial green development.

### (iii) Development objectives

By 2020, the concept of green development has become a universal requirement for the whole process of industrial development, and the green manufacturing industry has become a new engine of economic growth and new advantages of international competition.

- Significant improvement in energy efficiency. The growth rate of industrial energy consumption has slowed down, and the proportion of energy consumption in the six high-energy consumption industries has continued to decline.

The level of resource utilization has increased significantly. Water consumption per unit industrial added value has further decreased, the comprehensive utilization rate of large-scale industrial solid waste has further improved, and the recycling rate of major renewable resources has steadily increased.

The level of clean production has increased significantly. Industrial sulfur dioxide,

nitrogen oxides, chemical oxygen demand and ammonia nitrogen emissions have decreased significantly, and emissions of high-risk pollutants have been greatly reduced.

The green manufacturing industry is developing rapidly. Green products have grown significantly, electric vehicles, solar energy, wind power and other new energy technology equipment manufacturing level has increased significantly, energy-saving and environmental protection equipment, products and services have formed a new economic growth point.

The green manufacturing system was initially established. Green manufacturing standard system is basically established, green design and evaluation has been widely used, and hundreds of green demonstration parks and thousands of green demonstration factories have been established.

Column 1 Main indicators of industrial green development during the 13th Five-Year Plan period			
Indicators	2015	2020	cumulative deceleration
(1) Decrease in energy consumption per unit of industrial added value of enterprises above scale (%)	—	—	18
Total energy consumption of steel (kg of standard coal)	572	560	
Comprehensive energy consumption of cement clinker (kg standard coal / ton)	112	105	
Alternating current consumption of electrolytic aluminum solution (kWh/ton)	13350	13200	
Refining energy consumption (kg of standard oil/tonnes)	65	63	
Ethylene energy consumption (kg of standard coal/tonnes)	816	790	
Synthetic ammonia integrated energy consumption (kg standard coal / ton)	1331	1300	
Total energy consumption of paper and cardboard (kg of standard coal/tonne)	530	480	

(2) Decrease in CO2 emissions per unit of industrial added value (%)	—	—	22
(3) Decrease in water consumption per unit of industrial added value (%)	—	—	23
(4) Decrease in emission intensity of major pollutants in key industries (%)	—	—	20
(5) Integrated utilization rate of industrial solid waste (%)	65	73	
Of which: tailings (%)	22	25	
Coal gangue (%)	68	71	
Industrial by-product gypsum (%)	47	60	
Steel smelting slag (%)	79	95	
Red mud (%)	4	10	
(6) Major recycled resources (billion tons)	2.2	3.5	
Of which: recycled non-ferrous metals (thousands of tons)	1235	1800	
Waste steel (thousands of tons)	8330	15000	
Waste electrical and electronic products (billion)	4	6.9	
Waste plastic (domestic) (thousand tons)	1800	2300	
Used tires (thousands of tons)	550	850	
(7) Green and low-carbon energy accounted for the proportion of industrial energy consumption (%)	12	15	
(8) Six high energy consumption industries account for the proportion of industrial added value (%)	27.8	25	
(9) Output value of green manufacturing industry (trillion yuan)	5.3	10	
Note: This column is a guiding index, mostly national average, and each region can set goals in conjunction with the actual situation.			

### III. MAIN MANDATE

(1) Vigorously promote energy efficiency improvement and accelerate the realization of economical development

Adhere to the priority of conservation, vigorously promote the energy consumption revolution, improve the efficiency of industrial energy use, promote enterprises to reduce costs and increase efficiency, accelerate the formation of green intensive production.

Take the supply-side structural reform as the guide to promote structural energy conservation. To optimize industrial structure and energy consumption structure as an important way to promote industrial energy conservation in the new era, strengthen energy conservation assessment review and post-evaluation. Focus on steel, petrochemical, building materials, non-ferrous metals and other industries, and actively use environmental protection, energy consumption, technology, technology, quality and safety standards. Accelerate the development of advanced manufacturing and strategic emerging industries with low energy consumption and less pollution, and promote the transition from production-oriented manufacturing to service-oriented manufacturing. Vigorously adjust the product structure and actively develop high-value-added, low-consumption and low-emission products. Promote the green and low-carbon transformation of industrial energy consumption structure, encourage enterprises to develop and utilize renewable energy, accelerate the construction of distributed energy centers for industrial enterprises. Implementation of coal clean and efficient use of action plan, in coking, coal chemical industry, industrial boilers, kilns and other key coal use areas, promote coal clean, efficient, quality utilization.

Strengthen technological energy conservation with advanced application of technology and equipment as a means. Promote the transformation of energy-saving technology in traditional industries, in-depth promotion of energy efficiency of key industries and key enterprises, accelerate the promotion of advanced technologies such as high temperature and high pressure dry coke Continue to promote the energy efficiency improvement project of general equipment such as boilers, motors, transformers, etc., and organize and implement the energy efficiency improvement plan of air compressor system. High energy consumption industry enterprises, accelerate process innovation, implement system energy saving transformation, encourage the integration and optimization of advanced energy saving technology, promote the short process of electric furnace steel. High-strength steel hot stamping technology, vacuum high-pressure casting, ultra-high vacuum thin-wall casting and other lightweight forming technology. Promote the utilization of low-grade waste heat and waste pressure power generation, heating and recycling, and actively promote the use of low-grade waste heat from steel, chemical and other industries to heat urban residents. Implement energy-saving renovation projects in industrial parks, strengthen the utilization of energy ladders in parks, and promote central heating and cooling.

Take the construction of energy management system as the core to improve

management and energy saving. Implement mandatory performance consumption standards and implement price policies such as stepped electricity prices and differential electricity prices in electrolytic aluminum and cement industries. Promote the construction of energy management system of key enterprises, and carry out energy measurement review, energy audit, energy efficiency diagnosis and benchmarking on a regular basis. Implementation of key industry energy efficiency leaders to lead the action, driving the overall energy efficiency of the industry. Energy-saving management for SMEs, building public service platforms, organizing energy-saving service companies to enter the enterprise activities, and comprehensively improving the energy management awareness and capabilities of SMEs. We will strengthen the supervision of industrial energy conservation, organize the monitoring of compulsory performance consumption, energy efficiency standards and the elimination of backward energy equipment. Further improve the energy-saving supervision system at the provincial, municipal and county levels covering the whole country, support the improvement of hardware facilities, carry out business training, and effectively carry out supervision functions.

Column 2 Energy efficiency improvement project
<p>Reform of key industry systems. Steel industry implemented high temperature and high pressure dry coke, sintering flue gas circulation, non-ferrous industry implemented new structural aluminum electrolytic cell, aluminum liquid direct supply, oxygen rich melting and other technologies.</p> <p>High energy consumption general equipment modification. In the motor system, permanent magnet synchronous servo motor, high voltage variable frequency speed regulation and other technical transformation. Amorphous alloy transformer, load capacity regulation and voltage regulation are carried out in the distribution transformer system. Promote the application of new information technology such as power electronic devices. Implementation of engineering machinery, agricultural machinery, inland marine diesel engine efficiency improvement. By 2020, the average operating efficiency of motor and internal combustion engine systems will increase by 5 percentage points, and the proportion of efficient distribution transformers operating on the network will increase by 20%.</p> <p>Waste heat and pressure efficient recycling. In the self-contained power plant, the technological transformation such as waste heat recovery and utilization of flue gas system, supercritical hybrid high-parameter integrated cycle power generation is carried out. Promote the technology of high temperature flue gas purification and recycling of mineral heat furnace, the application of metallurgical residual heat and pressure energy recovery coaxial unit, screw expansion power drive. By 2020, the utilization rate of low-grade waste heat and waste pressure will reach 80%.</p> <p>Clean and efficient use of coal. The coking and coal chemical industries focus on optimizing product structure, increasing the depth of resource processing</p>

and conversion, and popularizing the technology of integrated gas combined cycle power generation (IGCC). Industrial boilers prioritize the implementation of high-efficiency energy-saving technology transformation or clean energy substitution. Industrial kilns focus on the technological transformation of full (rich) oxygen combustion, heat storage combustion, fuel substitution and waste heat utilization.

Energy-saving renovation of the park system. Develop distributed energy such as wind and solar energy and smart microgrid construction in the park to improve the proportion of renewable energy use in the park. Implement green lighting renovation of the park, build an energy management center in the park, strengthen the utilization of waste heat and pressure ladders in the park, and promote central heating and cooling.

Energy efficiency leaders lead the way. Implement energy efficiency leader actions in key energy use industries, carry out enterprise energy efficiency standards, regularly publish the list of leading enterprises and their indicators, and guide enterprises to implement energy-saving technology transformation. Released "Energy-saving Electromechanical Equipment (Product) Recommended Catalogue" and "Energy Efficiency Star Product Catalogue".

## 2) Solidly promote clean production and significantly reduce pollution emissions

Clean production technology transformation around key pollutants, promote green basic manufacturing processes, reduce pollutant emission intensity, and promote the implementation of action plans to prevent air, water and soil pollution.

Reduce the use of toxic and harmful raw materials. Revision of the list of substitute toxic and harmful raw materials encouraged by the State to guide enterprises to use non-toxic or low-toxic and low-toxic raw materials in the production process. Promote the use of toxic and harmful substances in key products such as electrical appliances and electronics and automobiles. Continue to implement high-risk pollutant reduction action plans, strengthen mercury, lead, highly toxic pesticides and other reduction substitution, gradually expand the scope of implementation, reduce environmental risks. Implement VOC reduction programmes to promote substitution or reduction technologies in key industries such as coatings, furniture, printing, automobile manufacturing and painting, rubber products, shoe making and so on. Promote chromium-free refractories.

Promote clean production technology transformation. We will actively guide key industry enterprises to implement cleaner production technology transformation, and gradually establish a cleaner production efficient implementation model based on technological progress. In key regional organizations such as Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta, Northeast China, etc., clean production level improvement projects in key industries such as steel, building materials, etc. In the Yangtze River, the Yellow River and other seven major river basins organized to

improve the level of clean production of key industries, reduce the total discharge of wastewater, chemical oxygen demand, ammonia nitrogen and other pollutants. Promote the prevention and control of soil pollution sources in the industrial field, and promote advanced and applicable soil repair technology and equipment and products.

Strengthen water conservation and pollution reduction. Water efficiency leader of water enterprises, water balance test and water efficiency matching standard, vigorously promote water conservation technology transformation, promote industrial water conservation technology, technology and equipment. Strengthen production process and process water management of high water consumption enterprises, strictly implement national standards for water intake quotas, and carry out special industrial water conservation actions around high water consumption industries and water shortage areas. Promote water recycling and industrial wastewater treatment reuse, promote franchising, commissioning and other specialized water conservation models, promote the intensive use of water resources in industrial parks. Promote the development and utilization of non-conventional water resources such as medium water, reclaimed water and seawater, support the demonstration project of non-conventional water utilization industrialization.

Promote green basic manufacturing processes. Promote clean and efficient manufacturing process, focusing on casting, heat treatment, welding, coating and other fields, promote the application of alloy steel non-oxidizing clean heat treatment, heat treatment atmosphere reduction, vacuum low pressure carburizing heat treatment. Promote short process, waste-free manufacturing, focusing on near-net forming, digital mold-free casting, additive manufacturing, new anti-corrosion and other short process green material technologies.

Column 3 Green Cleaner Production Promotion Project
<p>Clean production in key areas. Implementation of cleaner production in key air pollution industries in key areas such as Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta. By 2020, the national industry will reduce smoke and dust by 1 million tons per year, sulfur dioxide by 500,000 tons per year, and nitrogen oxides by 1.8 million tons per year.</p> <p>Clean production in key watersheds. Clean production level improvement in key water pollution industries in key watersheds such as Yangtze, Yellow River, Pearl River, Songhua River, Huaihe River, Haihe River and Liaohe River. By 2020, the national industry will reduce wastewater by 400 million tons/year, chemical oxygen demand by 500,000 tons/year, ammonia and nitrogen by 50,000 tons/year.</p> <p>Characteristic Pollutant Reduction Program. With the goal of reducing pollutants such as volatile organic compounds, persistent organic pollutants and heavy metals, the industrial characteristic pollutant reduction plan is implemented.</p>



ted around key industries and key areas. Reduce mercury use by 280 tonnes/year by 2020, reducing total chromium by 15 tonnes/year, total lead by 15 tonnes/year and arsenic by 10 tonnes/year.

Promotion of green-based manufacturing processes. Focus on promoting green casting, forging, welding, cutting, heat treatment, surface treatment and other basic manufacturing technologies and equipment. By 2020, the casting waste rate will be reduced by 10%, the utilization rate of forged materials will be increased by 10%, the utilization rate of cutting materials will be increased by 10%, and the plating and coating industry will reduce pollutant emissions by more than 30%.

Cleaner Production Implementation Programme for SMEs. Improve the level of R&D and application of cleaner production technology to SMEs, carry out pilot projects for the purchase of cleaner production services by the government, and implement cleaner production training programs for SMEs. To continue to implement the Guangdong-Hong Kong Cleaner Production Partnership Scheme and promote demonstration in other regions.

Special industrial water conservation initiatives. Water conservation and pollution control projects are carried out around key industries such as steel, textile printing and dyeing, paper, petrochemical chemical, food fermentation and other key industries.

## (2) Strengthen the comprehensive utilization of resources and continuously promote circular development

In accordance with the principles of reduction, reuse and resourceization, accelerate the establishment of circular industrial system, promote the symbiosis and cooperative utilization of enterprises, parks, industries and regions.

Vigorously promote the comprehensive utilization of industrial solid waste. With the focus on high-value, large-scale and intensive utilization, we promote a batch of advanced applicable technologies and equipment to promote deep resource utilization of industrial solid wastes such as tailings, waste rock, gangue, fly ash, smelting slag. In order to promote the construction of comprehensive utilization bases in Chengde, Shuozhou, Guiyang and other resources, choose areas with foundation, potential, industrial agglomeration and demonstration effect. Exploring a new model of regional cooperative development of resource utilization industry, giving full play to local advantages, promoting regional cooperative development of resource utilization industry.

Accelerate the efficient use of renewable resources and the development of industrial norms. The company is committed to the development and application of advanced recycling technology and equipment, including waste steel, waste non-ferrous metals, waste paper, waste rubber, waste plastic,

waste oil, waste electrical and electronic products. Build a batch of renewable resource industrial agglomeration areas, promote the cross-regional cooperative use of renewable resources, and build a regional renewable resource recycling system. Implement the extended producer responsibility system, and carry out pilot demonstration of extended producer responsibility in electrical and electronic products, automobile and other industries. Promote the gradual standardization of industry order, regularly publish a list of enterprises that meet the requirements of industry norms, and cultivate key enterprises in the renewable resource industry.

Active development of remanufacturing. Implement high-end, intelligent and in-service remanufacturing demonstration projects around traditional mechanical and electrical products, high-end equipment, and other key areas, and create a number of remanufacturing industry demonstration zones. R&D and promotion of remanufacturing technology, R&D and application of remanufacturing surface engineering, fatigue detection and residual life assessment, additive manufacturing and other key common technologies. Guide remanufacturing enterprises to establish a product information management platform covering the entire process of remanufacturing, and promote the healthy development of remanufacturing norms. Promote product identification and encourage the promotion and application of remanufactured products.

Full implementation of circular production methods. Promote industries such as steel, non-ferrous, petrochemical, chemical, building materials and other industries to expand product manufacturing, energy conversion, waste disposal-consumption and recycling functions. Cement kilns should be jointly disposed of solid waste according to local conditions, and pulp production using forestry waste and crop straw should be encouraged in the papermaking industry. Promote the circular transformation of all kinds of parks, realize the coupling of production processes and multi-production, and improve the resource productivity and comprehensive competitiveness of the parks.

Column 4 Resource efficient recycling engineering
<p>Comprehensive utilization of large-scale industrial solid waste. Focus on the comprehensive utilization of smelting slag and dust, chemical slag, tailings, coal and electricity slag. By 2020, the comprehensive utilization of large-scale industrial solid waste will reach 2.1 billion tons, the utilization rate of phosphorus gypsum is 40%, and the utilization rate of fly ash is 75%.</p> <p>Integrated use of renewable resources. In the fields of scrap metal, waste electrical and electronic products, scrap automobiles, construction waste, etc., the key technology equipment such as efficient crushing, rapid detection of rare p</p>

recious metal components, and comprehensive recycling of polymetals. By 2020, the utilization rate of major renewable resources will reach 75%.

Regional integrated resource utilization initiatives. In Beijing-Tianjin-Hebei, Yangtze River Economic Belt, Pearl River Delta, Northeast and other old industrial bases, 10 smelting slag and mining waste, coal power waste, end-of-life electromechanical equipment, etc.

Remanufacturing demonstration. High-end intelligent remanufacturing demonstration around large complete sets of equipment such as aero-engine, gas turbine, shield machine, medical equipment, computer server, copier, printer, mold, etc. Implementation of in-service remanufacturing demonstration around CNC machine tools, turbine compressors and other equipment. By 2020, the remanufacturing industry will reach 200 billion yuan.

#### (4) Reduce greenhouse gas emissions and actively promote the low-carbon transition

Industry is a key area to deal with climate change, to achieve the 2030 carbon emission peak target, we must increase the capacity of industrial savings at the same time, take measures to promote some industries, some parks to take the lead in reaching the peak.

Promote the low-carbon transformation of key industries. Combining the characteristics of key carbon emission industries, formulate major low-carbon technology promotion and implementation plans to promote the promotion and application of new low-carbon technologies, new processes, new equipment and new materials. Research and formulate carbon emission control goals and action plans for key industries such as steel, building materials, non-ferrous and chemical industries, and improve the carbon productivity level of key industries. In key industries, a number of large-scale low-carbon technologies with high emission reduction potential, high maturity and advanced application will be selected to promote the reduction of carbon intensity in the industrial sector.

Control of greenhouse gas emissions from industrial processes. The goal is to reduce greenhouse gas emissions in industrial processes such as carbon dioxide, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, etc. Develop cement production raw material substitution, use industrial solid waste and other non-carbonate raw materials to produce cement, reduce carbon dioxide emissions in the production process. High-carbon product substitution, guide the use of new low-carbon cement instead of traditional cement, new steel or renewable materials instead of traditional steel, organic fertilizer or slow-release fertilizer instead of traditional fertilizer.

Pilot demonstration of industrial low-carbon development. Continue the pilot demonstration of the park, combined with the construction of new industrial demonstration bases, increase the construction of low-carbon industrial parks, formulate national low-carbon industrial parks guidelines, and promote park

enterprises. We will conduct a pilot demonstration of low-carbon enterprises, guide enterprises to implement low-carbon development strategies, gradually establish low-carbon enterprise evaluation standards, index systems and incentive and constraint mechanisms. Encourage building materials, chemical industry and other industries to implement carbon capture, utilization and storage pilot demonstration, promote the utilization of carbon dioxide resources.

Column 5 Industrial Low Carbon Development Project
<p>Green Energy Promotion Initiative. Control and reduce the total amount of coal consumption, and increase the proportion of renewable energy such as solar, wind, biomass and hydropower. Pilot demonstration of industrial parks and enterprise smart microgrids will be carried out to encourage smart microgrids to access power demand-side management platforms in the region.</p> <p>Control of greenhouse gas emissions from industrial processes. Promote the short process technology of electric furnace steelmaking and hot rolling, the short process technology of non-ferrous metal smelting, improve the production technology of tourmaline and lime, and reduce CO<sub>2</sub> emissions in the production process. Improve the production process of fertilizer, adipic acid, nitric acid, caprolactam, etc. to reduce the emission of nitrous oxide in industrial production process. Implementation of high greenhouse gas replacement, through the use of reasonable protective gas, innovative operating technology, alternative research and development, improvement of equipment use, etc.</p> <p>Pilot demonstration of industrial low-carbon development. In key industries such as steel, non-ferrous, building materials, petrochemical and chemical industries, and equipment manufacturing, low-carbon enterprises have been established as pilot projects. Implement carbon capture, utilization and storage demonstration in chemical, cement, steel and other industries, and strengthen the application of carbon dioxide in oil extraction, plastic products, food processing and other fields.</p>

(5) Improve scientific and technological support capabilities to promote green innovation and development

Follow the direction of scientific and technological revolution and industrial change, accelerate green technological innovation, increase the research and development of key common technologies, increase the effective supply of green technological achievements.

Accelerate the development of key technologies for green transformation of traditional industries. The company focuses on a new generation of clean and efficient recycled production technology equipment, and breaks through a number of key technologies for industrial green transformation, and develops a number of major

equipment to support the upgrading of traditional industrial technology. The company mainly supports the development of new technologies and equipment for heat exchange type two-stage coke oven and high efficiency, clean all scrap steel electric furnace smelting, ultra-large capacity electrolytic cell, continuous blowing and so on.

Support core technology research and development of green manufacturing industry. Facing the technical needs of green manufacturing industries such as energy saving and environmental protection, new energy equipment and new energy vehicles, we will strengthen R&D of core key technologies and build a technology system to support the development of green manufacturing industry. Energy-saving and environmental protection industry focus on research and development of energy-saving technologies such as coal clean and efficient utilization, Rankine cycle and new energy-saving technology. New energy equipment focuses on the development of key technologies such as core equipment parts manufacturing, grid connection, grid scheduling and operation and maintenance management. Electric vehicles focus on power battery, motor, electronic control and other technologies research and development.

Encourage research and development of common technologies that support industrial green development. In accordance with the product life cycle concept, to improve the level of industrial green development technology as the goal, to increase the green design technology, environmental protection materials, green technology and equipment. Focus on breaking through the common technology of product lightweight, modular, integrated and intelligent green design, R&D and promotion of high-performance, lightweight and green new materials.

(6) Accelerate the construction of a green manufacturing system and develop and strengthen the green manufacturing industry

Strengthen green management throughout the life cycle of products, support enterprises to implement green design, develop green products, build green factories, develop green industrial parks, build green supply chains, and comprehensively promote green manufacturing systems.

Development of green products. In accordance with the product life cycle green management concept, in accordance with the principles of minimizing energy consumption, minimizing ecological environmental impact and maximizing renewable energy. Actively promote third-party evaluation and certification of green products, publish industrial green product catalogues, guide green production and promote green consumption. Establish a cooperative mechanism for all parties, carry out typical product evaluation pilot, and establish an effective regulatory mechanism.

Creating a Green Factory. Create green factories in accordance with the principles of plant intensification, harmless raw materials, clean production, waste resourceization and low carbonization of energy. Guide enterprises to build, renovate and manage factories in accordance with green factory construction standards, and

intensively utilize factories. Encourage enterprises to use clean raw materials, strictly sorting and stacking various materials to avoid pollution. Advanced cleaner production technology and efficient end-of-life treatment equipment are preferred to promote the resourceization and harmless utilization of water, gas and solid pollutants. Electric heating and cooling combined power supply and other technologies to improve the primary energy utilization rate of the plant, set up a waste heat recovery system, and effectively use the waste heat generated by the process and equipment. Increase the proportion of clean and renewable energy use in factories, and build photovoltaic power plants, energy storage systems, smart microgrids and energy management centers in factories.

Development of green industrial parks. Focus on enterprise agglomeration development, industrial ecological link, and service platform construction to promote the construction of green industrial parks. Optimize the layout and structure of industrial land and improve the level of intensive land use. Actively utilize waste heat and waste heat resources, implement integrated applications of cogeneration, distributed energy and photovoltaic energy storage systems, build smart microgrids in the park, increase the proportion of renewable energy use. Strengthen the recycling of water resources, promote the green transformation of infrastructure such as water supply and sewage, and strengthen sewage treatment and recycling. Promote the exchange and utilization of waste resources between enterprises in the park, and improve the efficiency of resource utilization through symbiosis between enterprises and parks, mutual supply of raw materials and resource sharing. Promote the basic capacity-building of resource and environmental statistics monitoring, and develop public service platforms such as information, technology, and commerce in the park.

Building a Green Supply Chain. With the leading enterprises in automobile, electronic and electrical communication, machinery, large-scale complete equipment and other industries as the basis of green supply chain standards and producer responsibility extension system. Establish a traceability information system for green raw materials and products.

Support enterprises to implement green strategies, green standards, green management and green production, carry out green corporate culture construction, and enhance brand green competitiveness. Guiding enterprises to establish a green management system integrating resources, energy, environment, safety and occupational health, green management throughout the entire process of enterprise R&D, design, procurement, production, marketing and service. To foster a group of leading green enterprises with independent brands and strong core technology capabilities, and to play a leading role in green development, to guide enterprises to establish an information disclosure system.

Green product design demonstration. Promote green design pilot demonstration, carry out green design level evaluation pilot of typical products, cultivate a group of green design demonstration enterprises, and formulate green product standards. By 2020, create 100 green design demonstration enterprises and 100 green design centers, and strive to develop and promote 10,000 kinds of green products.

Green demonstration plant created. Formulate green factory construction standards and guidelines, and conduct pilot demonstrations in key industries such as steel, non-ferrous, chemical, building materials, machinery, automotive, light industry, textile. By 2020, thousands of green demonstration plants will be created.

A green demonstration park was created. Select a number of industrial parks with good basic conditions and strong representation, and carry out demonstration projects for the creation of green parks. By 2020, create 100 green parks with strong demonstration significance and high comprehensive level.

Green supply chain demonstration. Take the core enterprises of the supply chain as a grasp, carry out pilot demonstration, implement green procurement, implement producer responsibility extension system, cultivate 100 green supply chain demonstration enterprises in ICT, automobile, home appliances, textile and other industries.

(7) Give full play to regional comparative advantages and promote the coordinated development of industrial green

Implement the green concept in regional industrial development, give play to regional comparative advantages, strengthen regional cooperation, and promote regional industrial green development.

Fasten the functional positioning of the main body to further adjust and optimize the industrial layout. It plays a guiding role in the planning of the main functional area, and determines the direction and intensity of regional industrial development according to the regional resource bearing capacity and environmental capacity. We will actively develop advanced manufacturing industries with energy saving, land saving and environmental protection, and promote the transformation of industrial structure to high-end, efficient and high value-added. The key development areas will develop and effectively protect energy and mineral resources, transform resource advantages into economic advantages, transform traditional industries, and vigorously develop new industries. Restrict development areas to strengthen development intensity control, restrict large-scale high-intensity industrial development. Prohibited areas shall not be industrialized.

Implement major development strategies and promote green manufacturing demonstration and industrial upgrading. Promote green cooperative development in Beijing, Tianjin and Hebei regions, around Beijing's non-capital functions, optimize and adjust the regional industrial structure with industrial transfer, and build a coordinated development system. Promote ecological protection of the Yangtze River Economic Belt, promote water saving and pollution control, clean production transformation along the Yangtze River, accelerate the development of green industries such as energy conservation and new energy equipment.

Promote regional industrial green transformation and implement regional green manufacturing pilot demonstration. Further improve the efficiency of energy use of regional industrial resources, reduce pollution emissions, strengthen the constraints and guidance of resource and environmental standards, and explore new models, new mechanisms and new ideas for industrial green low carbon transformation. Guide pilot cities to tighten energy consumption, water consumption and emission standards, strengthen scientific and technological innovation and management innovation, and take the lead in realizing industrial green and low carbon transformation. Summarize the successful experiences and practices of the pilot cities, form a unique industrial green transformation and development model, and promote the industrial green transformation and development.

(8) Implement green manufacturing + Internet to improve the level of industrial green intelligence

Promote the integration of the Internet and green manufacturing, improve the intelligent management of energy, resources and environment, promote the sharing of production factors resources, tap the potential of resources and data.

Promote intelligent energy management. Implementation of digital energy efficiency promotion plan, encourage enterprises to implement dynamic monitoring, control and optimization of energy consumption, especially large-scale energy consumption equipment, improve enterprise energy analysis, prediction and scheduling. Strengthen the construction of energy control centers, and continue to popularize and improve the construction of energy control centers in the steel, chemical, textile, paper and other industries. Actively cultivate the industrial energy-saving cloud service market and encourage small and medium-sized enterprises to use cloud computing technology to share energy management. Innovate energy consumption supervision models, promote the construction of energy consumption monitoring systems in parks and regions, and establish analysis and prediction early warning mechanisms.



Promote green lean production methods. We use mobile Internet, cloud computing, big data, Internet of Things and sharing economy to promote green transformation of production methods, promote R&D design, raw material supply, processing manufacturing and product sales. Accelerate the formation of enterprise intelligent environmental data perception system, implement ecological environmental protection information project. Accelerate the construction of green data centers. Develop large-scale personalized customization, network cooperative manufacturing, remote operation and maintenance services, reduce the waste of resources in production and circulation links. Promote e-commerce enterprises to directly sell or cooperate with physical enterprises to operate green products and services, encourage the use of the network to sell green products, and meet the diversified green consumption needs of different entities. Use online and offline integration models to promote the formation of green consumption habits and improve the sense of green consumption.

Innovative ways of recycling resources. Developing a new model of "Internet +" recycling, supporting the use of Internet of Things, big data for information collection, data analysis and flow monitoring, encouraging renewable resource utilization enterprises and Internet recycling enterprises. Support the use of electronic tags, two-dimensional codes and other Internet of Things technology to track the flow of waste electrical and electronic products. Encourage Internet companies to actively participate in the construction of waste information platforms in industrial parks, and promote the transformation and upgrading of the existing backbone renewable resources market.

(9) Focus on strengthening standards to lead constraints and improve green development foundation capabilities

Establish and improve the system of industrial green development standards, evaluation and innovation services, create a green manufacturing service platform, speed up the cultivation and expansion of energy-saving and environmental protection services.

A sound standard system. Focus on industrial green development needs, build a green manufacturing standard system around green products, green factories, green parks and green supply chains, improve energy saving, water saving, land saving, material saving and measurement requirements. Give full play to the role of enterpri

ses in standard formulation, encourage the formulation of enterprise standards stricter than national standards and industry standards, and promote the upgrading of industrial green development. Promote mutual recognition of standards, encourage enterprises, research institutes, industry organizations to actively participate in international standardization work, and lead or participate in the development of international standards. Strengthen the supervision and evaluation of the implementation of mandatory standards, carry out implementation effect evaluation, and establish a statistical analysis and reporting system for the implementation of mandatory standards.

Establishment of evaluation mechanisms. Accelerate the establishment of a green manufacturing evaluation mechanism that combines self-evaluation, social evaluation and government guidance. Accelerate the formulation of green manufacturing evaluation system, research and propose green manufacturing evaluation methods and guidelines, formulate green evaluation indicators and evaluation methods by industry and field, and develop and apply evaluation tools. Carry out green products, green factories, green parks and green supply chain evaluation pilots to guide green production and promote green consumption. Encourage third-

party service organizations to innovate green manufacturing evaluation and service models, and provide comprehensive green manufacturing solutions for consulting, testing, evaluation, identification, audit and training in key areas. Strengthen the application of green evaluation results, establish and implement the energy efficiency, water efficiency and environmental protection leader system, and gradually establish a link mechanism between the evaluation results and green consumption.

Strengthen the data base. Accelerate the construction of an ecological impact database covering the entire life cycle of industrial products such as resource consumption, energy consumption, pollutants and greenhouse gas emissions, and human health effects. Promote the construction of green production base database and output value database, including green material database, equipment resource database, green process database, parts information database, etc. Support key industries such as steel, non-ferrous, papermaking, printing and dyeing, electronic information construction industry green manufacturing production process material flow and energy flow database. Establishment of green product traceability information system, improve the level of green product logistics information and supply chain cooperation. Research and develop data standards and collection methods, improve data measurement, information collection, monitoring and analysis support system, develop enterprise production data and database public service platform interface software system.

Strengthen innovative services. Encourage enterprises and universities, scientific re

search institutions, service institutions and other scientific and technological innovation carriers, such as R&D centers, laboratories, pilot bases, etc. Establish innovation platforms such as industry green innovation alliance and carry out industry-academic research and use collaborative innovation. Strengthen the intellectual property reserve of key core technologies of green manufacturing, build an industrialization-

oriented patent portfolio and strategic layout, build a patent pool for green manufacturing technology, and promote intellectual property resource sharing. We provide integrated services such as knowledge training, problem diagnosis, technical solutions, financing support, and effect evaluation through market mechanisms and information technology. Implement green manufacturing training action plan, improve green manufacturing talent training, consulting, information and other green promotion service system, for small and medium-sized enterprises to conduct online training, free medical consultation.

(10) Actively carry out international exchanges and cooperation to promote green and open industrial development

Grasp the opportunities of "Belt and Road" construction, comprehensively improve the level of international exchanges and open cooperation in the field of industrial green development, seek green development, and make new contributions to global ecological security.

Promote green international economic cooperation. Implement the concept of green development in international cooperation such as "Belt and Road", focus on global resource allocation, and promote green manufacturing and green services through overseas investment, engineering contracting, technical cooperation and equipment export. Steel, building materials, paper and other industries focus on cooperation in the circular economy model, petrochemical industry strengthens the construction of overseas green production bases, and actively participates in the investment, construction and operation of new energy projects.

Strengthen international cooperation in green science and technology. Follow the global trend of green technology and industry development, strengthen international exchanges and cooperation in industrial green development, and make full use of the advantages of market size, equipment production capacity, innovation environment and talent team. We will accelerate the establishment of an international green technology innovation platform, strengthen international scientific and technological cooperation research in green industry and combat climate change.

Improve the long-term mechanism of cooperation on foreign exchange. Make full use of multilateral and bilateral cooperation mechanisms to strengthen exchanges and dialogue on energy conservation, climate change, clean technology and clean energy development.

Strengthen cooperation with the United Nations Development Programme, the Global Environment Facility, etc., and continue to promote cooperation with the United Nations Industrial Development Organization. Under the framework of cooperation between China and Europe, China and relevant international organizations, bilateral and multilateral government departments, research institutions, industry associations and related enterprises. Support Hong Kong and Macao and other regions to cooperate with the Mainland in energy conservation and environmental protection exhibition exchange activities.

#### IV. Safeguards

##### (1) Strengthening organizational leadership

Industry and information technology departments at all levels should fully understand the significance of industrial green development, promote industrial green development as an important task to promote the construction of ecological civilization. Establish a clear, coordinated and orderly industrial green development work system, carry out its duties effectively, further strengthen the evaluation and assessment of target responsibilities, strengthen supervision and inspection, and ensure the completion of planning goals and tasks. Give full play to the role of bridge ties between industry associations and industry alliances to promote green development of key industries.

##### (2) Innovative institutional mechanisms

Give full play to the role of market regulation and build a long-term mechanism for industrial green development. Deepen the reform of the resource system, establish a market-oriented resource price formation mechanism that can reflect market supply and demand, resource scarcity, environmental damage cost, establish and improve the initial allocation system. Establish a green management system covering the entire life cycle of industrial products and the full value chain. Leading the way in energy efficiency, water efficiency and environmental protection. Issue and implement the "Industrial Energy Conservation Management Measures", strengthen regulations and standards for industrial green development, strictly supervise and create a good market environment.

##### (3) Implementation of fiscal and tax policies

We will make full use of the central budget investment, technological transformation, energy conservation and emission reduction, cleaner production, special construction funds and the PPP model. Implement fiscal and tax support policies in the areas of comprehensive utilization of resources, energy conservation and water conservation and environmental protection (special) equipment, and incorporate green energy-saving products into government procurement.

#### (4) Development of Green Finance

Support the green development of industry with green finance, continuously expand the scale of industrial green credit and green bonds, innovate financial products and services, and actively carry out green consumer credit business. Actively study the establishment of an industrial green development fund to encourage social capital to invest in green manufacturing. Establish a linkage mechanism between enterprise green development level and enterprise credit rating assessment and loan. Encourage financial institutions to provide convenient and preferential guarantee services and credit support for the green transformation of SMEs, and actively develop finance leasing, intellectual property pledge loans, and credit insurance policy pledge loans.

#### (5) Strengthening publicity and guidance

Strengthen public opinion publicity and guidance, carry out multi-level and multi-form publicity and education, actively carry out public welfare publicity activities, and vigorously spread the concept of green development. Give full play to the active role of various media, public welfare organizations, industry associations, industry alliances, public participation, public opinion supervision, etc.