The "14th Five-Year Plan" for the development of the raw materials industry

Ministry of
Industry and
Information
Technology

Ministry of Science and Technology
Ministry of Natural Resources

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The raw materials industry is the foundation of the real economy and supports the development of the national economy.

It is a fundamental industry and a key field for winning international competitive advantages, and is the main force for industrial infrastructure reconstruction and the main battlefield for green industrial development. This plan is formulated to implement the Outline of the Fourteenth Five-Year Plan for the National Economic and Social Development of the People's Republic of China and the Visionary Goals for 2035, and to improve the quality and efficiency of the development of the raw materials industry.

I. Development situation

(i) Basis for development

The raw materials industry includes petrochemical and chemical industries, iron and steel, non-ferrous metals, building materials and other industries. Since the "Thirteenth Five-Year Plan", the transformation and upgrading of the raw materials industry has been effective, the comprehensive strength has been growing steadily, and the international competitiveness has been continuously enhanced. **The scale advantage has been newly enhanced.** In 2020, the added value of China's raw materials industry accounted for 27.4% of the industry

above designated size, and the output of crude steel, refined copper, electrolytic aluminum, methanol, urea, cement, flat glass and other production has remained the world's first for many years. The variety of materials has become richer, with the self-sufficiency rate of steel, aluminum and photovoltaic glass exceeding 98%, which basically meets the needs of the national economy and the national defense and military industry. **New progress has been made in structural adjustment. The** supply and demand of industries with serious overcapacity has basically returned to balance, the target of removing 150 million tons of iron and steel production capacity has been accomplished ahead of schedule, and the strict control of electrolytic aluminum and cement production capacity has achieved obvious results. The industrial concentration of the top 10 cement enterprise groups has reached 58%. The strength of enterprises will be upgraded at a faster pace. In 2020, China (excluding Hong Kong, Macao and Taiwan) will be listed among the world's top 500 raw material industry enterprises, accounting for 34, which is equivalent to the total number of enterprises listed in the list.

The number of the total number of the **Innovation capacity has reached a new level. The** intensity of R&D

investment increased from 2015

By 2020, it will have increased from 0.76% in 2008 to about 0.9% in 2020. The main equipment of key enterprises has generally reached the international advanced level, and more than 170 national key laboratories and engineering (technology) research centers and 26 national key platforms for new materials have been built. **Green Transformation**

The new face of the model has been presented. Comprehensive energy consumption of tons of steel in key large and medium-sized enterprises decreased by It has decreased by 4.7%, the comprehensive AC power consumption of primary aluminum is 6.9% lower than the world average, the emission of sulfur dioxide per ton of steel and carbon dioxide emission of ten thousand yuan of industrial added value in the building materials industry have decreased by 46% and 16.5% respectively compared with that of 2015, and reached the world's advanced level in general. The level of comprehensive utilization of resources has been steadily improved, and 168 sets of cement kiln co-disposal systems have been put into operation. All calcium carbide slag has been utilized, and the comprehensive utilization rate of phosphogypsum has reached 40%. **Intelligent manufacturing has reached a new level.** More than 2,200 raw material enterprises have passed the evaluation of the dualization integration management system, and the level of dualization integration of large raw material enterprises is 61.1, which is 9.1% higher than the national average. The numerical control rate of key processes in the raw materials industry was 65.7%, including 73.8% in petrochemical enterprises, 21.7 percentage points higher than the

national average. Sixty intelligent manufacturing factories and digital workshops have been built.

(ii) Development environment

During the "14th Five-Year Plan" period, the raw materials industry has entered a new stage of high-quality development, with unprecedented opportunities and more severe challenges, and many new changes in opportunities and challenges. **From the point of view of opportunities,** the new development pattern to speed up the construction of the advantage of the domestic super-large-scale market to further play, especially in emerging areas and consumption upgrading on the demand for high-end materials, for the sustained and healthy development of the raw materials industry provides a broad space. China's fair competition in the market system is becoming more and more perfect, especially a variety of resource elements to the advantage of the field, enterprise agglomeration, for the raw materials industry to strengthen the industry chain resilience to provide the basic support. The new round of scientific and technological revolution and industrial change reshape the global economic structure, especially the new generation of information technology and manufacturing industry in-depth fusion for the transformation and upgrading of the raw materials

industry to forge a new advantage to provide a source of power. **From the challenge point of view,** in the face of the economic globalization countercurrent and the extensive impact of the new coronary pneumonia epidemic, the industrial chain supply chain security risk highlights the expansion of the national

The difficulty of the international market has increased significantly. Facing the new situation of the new stage of high-quality development, steel
Demand for iron, electrolytic aluminum, cement and other major bulk raw material products will successively reach or approach the peak of the platform period, the scale of quantitative demand expansion momentum tends to weaken. In the face of strong constraints on resources, energy and ecological environment, carbon peak carbon neutral hard task, the people's new expectations for safe production, the raw materials industry green and safe development of the task is more urgent.

At present, the short boards and bottlenecks in the raw materials industry are still prominent, the serious surplus of low-end products and the lack of supply of high-end products co-exist, the core technology of key materials and equipment independent and controllable level is not high, the green and low-carbon development of the long way to go, the level of digitalization is difficult to effectively support the high-quality development of the key strategic resources to ensure that the ability to be weak, and so on, urgently need to speed up to solve the problem. In the face of the new situation, new requirements, to maintain strategic

stability, enhance bottom-line thinking, adhere to the system concept, accelerate the promotion of raw materials industrial system optimization and opening and high-quality development.

II. General requirements

(i) Guiding philosophy

Adhere to Xi Jinping's thought of socialism with Chinese characteristics in the new era as the guidance, fully implement the spirit of the 19th CPC National Congress and the 19th Plenum, based on the new stage of development, completely, accurately, and comprehensively implement the new development concept, accelerate the construction of a new development pattern, promote high-quality development as the theme, deepen the structural reform of the supply side as the main line, reform and innovation as the basic driving force, and satisfy the growing needs of the people for a better life as the fundamental purpose, integrate development and security, focus on optimizing the traditional industry and product structure, cultivate and grow the new material industry, accelerate the information technology empowerment, and make up the industrial chain needs of the people, integrating development and security, focusing on improving the level of advanced

industrial base and modernization of industrial chain, focusing on optimizing the structure of traditional industries and products, fostering and expanding the new material industry, accelerating the empowerment of information technology, and completing the industrial chain.

short boards, realize low-carbon recyclability, and promote the high-end and structural rationalization of industrial supply,
The development of greening, transformation of digitalization, system security, to promote the construction of a manufacturing power to a new level, and to provide strong support for the comprehensive construction of a socialist modernized country to start a good start, a good step.

(ii) Basic principles

--Innovation leadership. Take technological innovation as the first driving force, promote all kinds of innovative elements to enterprises, strengthen horizontal cooperation among industries, universities, research institutes and applications, strengthen vertical synergy of process technology, processing equipment and information technology, improve industrial innovation ecology, strengthen the supply of common basic technology, breakthroughs in strategic key technologies, promote the fusion of technological innovation and industrial development, and accelerate the application of results in industrialization and scale.

--Market-led. Respect for the laws of the market as a basic guideline, give full play to the decisive role of the market in the allocation of resources, and strengthen the main position of enterprises in investment decisions,

technology choices and other aspects. Follow the laws of development of raw materials industry, better play the role of the government, focusing on strategic planning and guidance, standards and regulations, market order maintenance, industrial safety and security, to create a favorable development environment.

--Coordination of supply and demand. We have made meeting domestic demand a priority task, based on the new requirements of the new development pattern, stabilized the reasonable proportion of the raw materials industry, strengthened resource security, improved the quality of supply, promoted the coupled development of the raw materials industry, strengthened upstream and downstream convergence, and formed a high level of dynamic equilibrium in which demand pulls supply and supply creates demand.

--Green safety. Take green safety as the bottom line of development, focus on the goal of carbon peaking and carbon neutrality, improve the level of energy and resource conservation and environmental protection, strengthen the whole industrial chain and the whole life cycle of green low-carbon safety development, strive to enhance the essential safety level of key industries, and realize the organic integration of

economic benefits with ecological and social benefits.

One.

(iii) Development goals

By 2025, the raw materials industry will safeguard and lead the high-quality development of the manufacturing industry.

The ability to significantly strengthen; value-added growth rate to maintain a reasonable level in the manufacturing industry than the

The weight is basically stable; the scale of the new materials industry continues to improve, accounting for a significant increase in the proportion of the raw materials industry; the initial formation of a higher quality, better efficiency, better layout, greener, more secure pattern of industrial development.

--The level of high-end supply is constantly improving. The stability, reliability and applicability of the quality and reliability of advanced basic materials have been significantly improved. Some cutting-edge new material varieties have realized mass production and typical applications. A number of key basic materials in key strategic areas will be broken through. The collaborative innovation system will be more efficient and complete, and the national new materials platform system will be built initially. The

innovation ability of new materials industry will be significantly improved, the R&D investment intensity of key industries will reach more than 1.5%, and a number of key common core technologies with independent intellectual property rights will be mastered.

--The level of structural rationalization has continued to improve. Crude steel, cement and other key raw materials The production capacity of bulk products will only be reduced but not increased, and the capacity utilization rate will be maintained at a reasonable level. The degree of industrial concentration in key areas will be further improved, and 5 to 10 industry chain leading enterprises with ecological dominance and core competitiveness will be formed. The industrial layout and production factors will be more synergized, and more than five world-class advanced manufacturing clusters will be formed in the field of raw materials. The intensive level of chemical parks will be significantly improved, and a number of petrochemical industry bases will be formed.

--The level of greening of development has risen significantly. Key industries such as iron and steel, non-ferrous metals and building materials have achieved milestones in controlling total energy consumption and carbon emissions. The comprehensive energy consumption per ton of steel

in the iron and steel industry has been reduced by 2%, and the energy consumption per unit of clinker in cement products has been reduced by 2%.

The level of consumption was reduced by 3.7%, and carbon emissions from electrolytic aluminum decreased by 5%. Unit output of key industries

The intensity and total amount of pollutant emissions of value have achieved a double-decrease, and various industries have realized stable and standardized emissions, with new projects meeting ultra-low emission standards. The comprehensive utilization rate of industrial waste and other solid wastes has been further improved.

--The effect of industrial digital transformation has been highlighted. More than 20% of enterprises with maturity level 3 or above of intelligent manufacturing capability, more than 70% of key processes are numerically controlled, and the level of numerical control of key processes in key fields such as iron and steel is further improved. The level of digitization, networking and intelligence in key industries will be significantly improved, the network security protection capacity of enterprises will be accelerated, more than 100 intelligent manufacturing demonstration factories will be constructed, and more than 10 industrial Internet platforms will be built.

--The foundation for system securitization has become more solid. Strategic resource security capacity has

been significantly

Upgrading and forming a basically stable resource security system. The level of autonomy and control of key production process technologies and equipment in key industries has been substantially increased, and the number of industry chain breakpoints and blockages has been significantly reduced. The level of intrinsic safety of key industries has been substantially improved. The task of relocating and transforming hazardous chemical production enterprises in densely populated areas of cities and towns has been fully accomplished.

By 2035, it will become a highland of R&D, production and application of important raw material products in the world, the competitiveness of the new material industry will be comprehensively improved, the level of green and low-carbon development will be advanced in the world, and the industrial system will be safe, autonomous and controllable.

III. Promoting high-end industrial supply

(i) Sound innovation system

Strengthen the support of innovation platform carriers. Encourage advantageous enterprises to actively participate in the construction of national key laboratories and system reorganization, build national manufacturing innovation centers in key fields, and

support the establishment of provincial innovation centers. Supporting the integration of industrial chain and innovation center by converted institutes

The new chain, the formation of industrial common technology research platform, the enhancement of green metallurgical processing, high-end processing Engineering capabilities such as engineering and stable preparation. Supporting localities to take various forms to build national key new materials pilot platforms in the light of local realities. Increase the construction of measurement and testing centers, platforms and alliances for the new materials industry. It will continue to organize the construction of national platforms for production and application demonstration, testing and evaluation of new materials, and synergistically promote product design, development and production, system verification and batch application. Improve the innovation service support system and establish a national public platform for new materials research facilities. It will establish a data center for new materials and improve the ability of data to serve industrial development.

Optimize and improve the innovation mechanism ecology. Support raw material enterprises to increase investment, joint Combine downstream enterprises, universities and research institutes to carry out basic research and applied innovation around processes, equipment and

products. Formulate policies on remuneration incentives for scientific and technological talents in state-owned enterprises, and provide incentive policy support in performance assessment, R&D investment, total salary, and treatment of talents. Select a number of enterprises with good innovation foundation, implement policies on the transformation of scientific and technological achievements on an experimental basis to enjoy the same benefits as those of universities and scientific research institutes, liberalize the restrictions on employee shareholding, increase the weighting of relevant indexes such as the transformation of innovative achievements in performance appraisals, and give preferential treatment to the core and backbone personnel who have made outstanding contributions. Strengthen international exchanges and cooperation, attract foreign key enterprises and research institutions to invest in China and set up factories and R&D centers, and encourage Chinese and foreign institutions to cooperate in materials technology innovation research. Support enterprises to set up overseas research and development organizations for materials technology and equipment, and carry out international cooperation in technological innovation.

(ii) Tackling key technologies

Strengthen the deep integration of industry, academia, research and application, promote the optimal allocation of scientific research power and resource sharing among research institutes, universities and enterprises, and overcome the complexity of mineral deposits and ultra-deep shaft mine safety.

Full and efficient mining and other mining process technology; overcome the composition and organization uniformity control, the original

The company will improve product performance and its stability by homogenizing and purifying materials and other process equipment technologies; tackle mercury-free calcium carbide PVC production, low-temperature and low-concentration flue gas desulphurization and denitrification, enhanced dust removal by chemical agglomeration of fine particles, coordinated disposal of solid wastes (hazardous wastes) and resource utilization of pollutant prevention and comprehensive utilization of resources and other technologies, so as to improve the utilization rate of resources and energy and the level of ultra-low emissions; and tackle on-line inspection and control, rapid identification and evaluation of raw material properties, fault diagnosis and predictive maintenance and other intelligent manufacturing technologies to enhance the total factor productivity. It has also tackled intelligent manufacturing technologies such as online inspection and control, rapid identification and evaluation of physical properties of raw materials, full-life-cycle management of equipment, fault diagnosis and predictive maintenance, and improved total factor productivity. It will organize the promotion of advanced and

applicable technologies, and formulate and release a catalog of advanced and applicable technologies for key industries on a rolling basis.

Column 1 Key Direction of Technological Innovation

Petrochemical and chemical industry. Promote the research and development of new products such as highly selective catalysis, high-efficiency membrane separation, intrinsic safety of hazardous processes, special metallocene polyolefins, high-end lubricants, high-purity/ultra-high-purity chemicals and industrial specialty gases, and methane coupled olefins. Promote the clean and efficient use of coal, coal to chemicals short process, bio-based materials, the preparation of the whole industry chain, as well as low-cost and harmless treatment of phosphogypsum and resource utilization, carbon dioxide capture and storage and comprehensive utilization of technology engineering. Promote the industrialization and application of technologies such as new microchannel reactor equipment and continuous flow processes, hazardous chemical storage and transportation safety, industrial Internet and intelligent manufacturing, and low-global-warming-potential refrigerant substitutes.

Iron and steel industry. Promote high-efficiency and low-cost clean steel smelting, energy conservation and environmental protection and other key common technologies, advanced electric arc furnace and its manufacturing process, near-final manufacturing, special smelting, high-end testing and other general special equipment and parts production technology engineering. Promote the industrialization and application of technologies such as charge mining, low-grade difficult ore dressing, sintering flue gas circulation, mechanized raw material yard, blast furnace gas fine desulfurization, high-efficiency desulfurization and denitrification, waste heat recovery, medium and low-temperature waste heat utilization, and high value-added resource utilization of steel slag.

Non-ferrous metal industry. Promote the research and development of new technologies such as mechanical digging and continuous mining, green and efficient mining of ion adsorption rare earth ores, efficient utilization of associated resources of rare earth

polymetallic ores and lithium in salt lakes, material recycling of extraction and separation processes, and preparation of ultra-high purity metals and targets. Promote high cleanliness and high homogenization metallurgy, high-performance alloy short flow preparation, high-performance rare earth permanent magnet materials, such as precise penetration of the constituency technology, intelligent unmanned mining, mine safety management Internet of Things and cloud services, artificial intelligence dosage and scheduling, the key process virtual simulation, smelting and separation of on-line monitoring and process control intelligence, machine vision quality on-line inspection and other intelligent manufacturing technology engineering. Promote the industrialization of such technologies as high-efficiency sorting and pre-selection of low-grade complex ores, high-efficiency comprehensive utilization of tailings and red mud, harmless disposal of hazardous wastes containing fluorine, arsenic and other hazardous components, and balanced utilization of high-abundance rare earth elements.

Applications.

Building materials industry. Promote the research and development of new technologies such as deep desulfurization and denitrification of cement, enhanced dust removal by chemical agglomeration, and high-efficiency low-carbon energy saving. Promote non-metallic ore grading and purification, crystal shape protection, particle shape and granularity control technology, special glass melting and molding technology, advanced ceramic powder preparation technology, high-temperature solid oxide fuel cell powder and its components co-firing technology, molding and sintering technology, large-size artificial crystal preparation technology, structural and functional integration of integrated refractory integrated manufacturing and diagnostic maintenance of in-service technology such as engineering. Promote the unmanned operation of underground mines, three-dimensional simulation of open-pit mines, unmanned blasting, online monitoring of ore, efficient dissociation of graphite, large scale protection, fluoride-free purification, special glass fibers, basalt fibers and other high-performance fibers such as intelligent continuous drawing in the pool kiln, and other mine mining and materials deep processing technology industrialization and application.

(iii) Breakthroughs in key materials

Adhere to the materials first and demand-driven, focusing on national defense construction, people's livelihood and the construction of a strong manufacturing country major demand, rolling development of key materials product catalogs, the development and release of technology roadmap. The implementation of key short-board materials research action, the use of the "list of commanders", "horse racing" and other ways to support materials production, application enterprises and scientific research units to carry out wide-band semiconductor and display materials, integrated

circuits, key materials, bio-based materials, carbon-based materials, Bio-medical materials and other collaborative research. The implementation of bulk basic materials consolidation and promotion of action to guide enterprises in the optimization of production processes on the basis of the use of industrial Internet and other new-generation information technology to enhance the comprehensive competitiveness of advanced manufacturing of basic parts and components of steel, high-strength aluminum alloys, rare and precious metal materials, special engineering plastics, high-performance membrane materials, new fiber materials, composite materials and so on. Implement the forward-looking layout action of cutting-edge materials, support scientific research units to join hands with enterprises, grasp the development trend of the integration of new materials technology with information technology, nanotechnology, intelligent technology, etc., develop superconducting materials, intelligent bionic, additive manufacturing materials, etc., promote the systematic development of new backbone materials, and strengthen the support and guidance of the application field. Implement the materials genetic engineering program, and explore the pilot application of new modes of materials research

and development. Implement key materials application promotion actions, optimize insurance compensation for the first batch of application of key new materials

Mechanism, through the first (set), green building materials promotion and other measures to promote new materials should be

Use.

Column 2 New Material Innovation and Development Project

Breakthrough key varieties. Focusing on large aircraft, aircraft engines, integrated circuits, information and communications, bio-industry and energy industry and other key applications, to overcome the high-temperature alloys, aviation light alloy materials, ultra-high purity rare earth metals and compounds, high-performance special steel, biodegradable biomaterials, special coatings, photoresists, target materials, polishing fluids, industrial gases, biomimetic synthetic rubber, artificial crystals, high-performance functional glass, advanced ceramic materials, Special separation membrane and high-performance rare earth magnetic, catalytic, optical function, hydrogen storage materials and a number of key materials.

Enhancement of public platforms. Construction of high-end polyolefin, rare metals, powder metallurgy, advanced glass, advanced ceramics and other manufacturing innovation centers. Construct production and application demonstration platforms for information and consumer equipment, energy conservation and environmental protection, and robotics equipment and materials. Construction of new materials testing and evaluation platform regional center, new materials data center.

By 2025, the ability to safeguard key materials will have been upgraded, and the capacity of public services will have been significantly improved.

More than 10 new materials platforms will be built.

(iv) Improving product quality.

Strengthen quality management and process control. Continuously carry out quality improvement actions in the raw materials industry, and improve the stability, reliability and applicability of product quality. Promote the popularization of performance excellence, quality diagnosis, continuous quality improvement and other advanced production management models. Guide enterprises to strengthen total quality management, increase product testing and evaluation, equipment maintenance and security, personnel training, supplier quality control, user complaints and feedback, manufacturing risk analysis and other aspects of work.

Strengthen the digital innovation and application of quality management, guide enterprises to make full use of cloud computing, big data, blockchain, artificial intelligence, industrial Internet and other new generation of information technology means, promote advanced molding and processing methods, online testing, intelligent manufacturing, etc., to establish the production process control and quality control system to meet the needs of the application, and to improve the whole life cycle of fertilizers, cement, waterproofing materials, heat insulation and thermal insulation materials and other products Quality control and traceability mechanism.

Promote product standards and brand building.

Take the international advanced quality standard as the standard Rod, strengthen the construction of materials standards system, improve and revise the "14th Five-Year Plan" raw materials industry standards system, establish a standards system covering the entire life cycle of products, upstream and downstream synergies, and promote resource conservation and rational application of materials. Focusing on the needs of major technology and equipment, major projects, etc., cultivate a number of weathering steel, bearing steel, aviation aluminum, high-performance concrete, artificial crystals, composite materials and other high-end materials group standards. Focusing on the direction of consumption upgrading and green development, revise and upgrade the standards for steel for construction, copper water and other materials. (gas) pipes, waterproof and heat preservation materials, decorative materials, bio-based materials, and other big Zong material and product standards. Participate deeply in international standardization work and take the lead in formulating international standards for advantageous industries. Guide enterprises to strengthen the brand development strategy, encourage enterprises to develop higher than the recommended

standards related to technical requirements of enterprise standards. Encourage petrochemical and chemical, iron and steel, non-ferrous metals, building materials and other industry associations and professional organizations to carry out brand cultivation management system industry standards, quality benchmarking and brand evaluation activities, strengthen industry self-discipline, and increase the quality of industrial clusters brand, corporate brand and other cultivation and publicity efforts to improve brand influence.

Improve the quality evaluation and certification system. Formation of a quality improvement technology base public

The company will provide service platforms to enhance the quality evaluation capabilities of mineral products, smelting products, sintered products, processed materials and other products, such as stability test verification, environmental adaptability evaluation, failure and defect analysis, measurement certification, etc., to improve the quality evaluation system and promote the evaluation of process capabilities. Carry out the raw materials industry enterprise measurement ability to enhance action, encourage enterprises to improve the measurement management system,

strengthen the measurement equipment confirmation and measurement process control, the establishment of enterprise measurement security system. Promote iron and steel, non-ferrous metals, building materials and other industries to carry out quality grading evaluation, and strengthen the effective convergence with product standards, metrology and testing technology.

Receiving. Continuously carry out green building materials certification. Establish a certification system for new materials and support municipal

The construction of field-oriented and specialized third-party high-end quality certification bodies, the promotion of quality compliance, process stability, service applicability of the whole industry chain, the whole life cycle, the whole region evaluation demonstration, to create an international certification brand, and actively promote the mutual recognition of certification results and evaluation standards among international certification bodies.

IV. Promoting the rationalization of the industrial structure

(i) Consolidation of the results of the removal of production capacity

Strictly control new production capacity.

Improvement and strict implementation of iron and steel, cement, flat glass, electrolytic aluminum industry capacity replacement related policies, to prevent copper smelting, alumina and other blind and disorderly development, new construction, renovation and expansion projects must meet the energy consumption limit standard advanced value, pollutant ultra-low emission value. Strictly control urea, ammonium phosphate, calcium carbide, caustic soda,

yellow phosphorus and other industries to add new capacity, new projects should be implemented in the capacity of equal or reduced replacement. Encourage regions to expand the implementation of capacity replacement in the raw materials industry, improve the elimination of backward standards, the use of comprehensive standards in accordance with the law to promote the withdrawal of backward production capacity. It is strictly prohibited to build new projects in the restricted and eliminated categories of the Guidance Catalog for Industrial Structure Adjustment.

Sound long-term mechanisms. Research on the establishment of a mechanism for applying carbon emissions, pollutant emissions, and energy efficiency.

(c) A constraint mechanism to curb the expansion of excess capacity by means of total consumption and other means. Urban steel mills that fail to meet ultra-low-emission requirements and are weakly competitive, as well as steel mills in cities in key regions for the prevention and control of air pollution, have been taken to adopt such means as complete closure, transformational development, localization, relocation and upgrading in order to promote transformation and upgrading. Implement regularized peak production of cement, and explore the establishment of peak

production mechanisms for steel and other industries. Strengthen the petrochemical and modern coal chemical industry planning and planning environmental impact assessment, combined with the "13th Five-Year Plan" implementation effect and carbon peak carbon neutral requirements, scientifically determine the reasonable scale of industry development. Implement energy-saving review, strict

Controlling the amount of fuel coal consumed by major coal-consuming industries such as petrochemicals and chemicals, iron and steel, and building materials.

Improve the long-term working mechanism to prevent overcapacity, open up reporting channels, strengthen joint law enforcement, enhance industry early warning, make full use of satellite monitoring, big data and other technical means to increase the investigation and handling of illegal and irregular new production capacity, and continue to maintain a high-pressure crackdown.

(ii) Guiding rationalization

Optimize the layout of new production capacity. Implementing the major national regional strategies, regional coordinated development strategies and main functional area strategies, and promoting the adjustment and optimization of the spatial layout of the raw materials industry based on the spatial planning of the national territory. Implement the planning and layout of the petrochemical industry, and strictly prohibit the construction of new paraxylene and ethylene projects outside the planning. Optimize the layout of hazardous chemical production, prohibit new construction and expansion of hazardous chemical production projects outside chemical parks, and ensure

that the external safety protection distance of hazardous chemical production projects meets the relevant requirements. Promote the relocation and transformation of chemical enterprises in key watersheds into compliant chemical parks. Encourage iron and steel smelting projects to rely on existing iron and steel smelting production plants with conditions for clustering and construction. Alumina and other projects utilizing overseas resources will be placed in coastal areas in an orderly manner. Scientific placement of sand and gravel resources mining rights, reasonable layout of a number of large-scale mechanism of sand and gravel production base. Supporting localities to combine their own advantages and industrial foundation, and reasonably layout new material projects in line with the classification catalog of strategic emerging industries.

Promote standardized cluster development.

Formulate the conditions for recognizing chemical parks and guide

Localities have identified a number of chemical parks to guide the clustering and standardized development of chemical enterprises. Promote the petrochemical industry to explore the complementary development of modern coal chemical industry and traditional refining industry,

renewable energy power generation and hydrogen production industry, guide the iron and steel industry to rely on urban mines to build distributed short-flow steel mills, and promote the layout of electrolytic aluminum industry by "coal - electricity - aluminum".

Shift to "hydropower, wind power and other clean energy-aluminum" to promote the building materials industry to the synergistic

Transform the development mode of circular economy by disposing of wastes. Promote the construction of national industrial demonstration bases for new industrialization in the field of raw materials, and promote the transformation and upgrading of industrial agglomeration into clusters. Focusing on industry segments or key products with a good industrial foundation, outstanding comparative advantages and leading technologies, giving play to the leading role of leading industrial chain enterprises, promoting the aggregation of elements and value enhancement, strengthening specialized collaboration and supporting capacity, and creating a number of petrochemical and chemical, iron and steel, non-ferrous metals, rare earths, green building materials, and new materials industry clusters. Timely release of production capacity early warning to prevent blind duplication of construction in localities.

(iii) Optimization of the organizational structure

Strengthening leading enterprises. Adhere to the combination of market-led and government-promoted measures, remove obstacles to cross-regional mergers and reorganizations, clean up restrictions such as market

segmentation and regional blockades, coordinate the resolution of major issues in cross-regional mergers and reorganizations, and support enterprises in accelerating cross-regional and cross-ownership mergers and reorganizations, increasing industrial concentration, and carrying out international operations. In the petrochemical and chemical, iron and steel, non-ferrous metals, building materials and other industries, cultivate a number of ecologically dominant and core competitiveness of the industry chain leading enterprises, stronger and larger rare earth enterprise groups, and encourage rare metal enterprises to speed up the integration. Give play to the leading enterprises in the chemical and building materials industries to promote the reorganization and restructuring of enterprises. For the completion of substantive mergers and reorganization of iron and steel and other industry enterprises to give capacity replacement support policy. Improve the standardized management of the industry and promote the concentration of market elements in the advantageous enterprises. Encourage financial institutions to provide comprehensive financial services to raw materials enterprises implementing mergers and reorganization, transformation and upgrading, in accordance with the principles of controllable risk and

commercial sustainability.

Cultivate and grow small and medium-sized enterprises (SMEs). Improving the innovation capacity of small and medium-sized enterprises in the raw materials industry and specialization levels, and encourage leading enterprises to incorporate supporting SMEs into common production

We have established a stable business chain management, quality management, standard management, cooperative R&D management, and so on.

The company has set up collaborative and supporting relationships in supply, production and sales to realize the integrated development of large, medium and small enterprises. Focusing on the raw materials industry chain, advanced basic technology, core basic parts and components, to cultivate a number of specialized, special new "small giants" enterprises, manufacturing single champion enterprises.

(iv) Promoting industrial synergy

Expanding domestic demand for medium- and high-end materials. Facing the requirements of new infrastructure construction, high-end equipment, new urbanization construction, transportation and water conservancy construction and other major projects and the people's better life, we will accelerate the upgrading of traditional materials and break down the invisible barriers and unreasonable regulations that restrict the application of materials. Revise and improve the design and application specifications, expand the domestic market for mature products such as green building materials, promote the application of green building materials and the construction of pilot cities, promote

assembly-type buildings and steel-structured residential buildings, and tap the consumption potential of high-end materials such as high-performance aluminum. Vigorously develop new markets and uses for traditional products, and continuously improve the competitive advantages and competitive efficiency of traditional industries. Strengthen the matching of supply and demand structures in the raw materials industry, reduce ineffective supply, expand effective supply, improve the adaptability of the supply structure to the demand structure, and promote the formation of a high-level dynamic balance of demand-driven supply and supply-created demand.

Strengthening upstream and downstream linkage. Raw material enterprises to strengthen cooperation with upstream and downstream enterprises Symbiosis, coupled development, to the production of parts and components, parts and components of the extension, to provide integrated material systematic solutions change. Adopt the cooperation mode of early intervention in R&D and continuous improvement in the later stage, promote business model innovation and industry innovation, and promote the transformation of production-oriented manufacturing to service-oriented manufacturing. Support industry associations to build a

platform to connect supply and demand. Establish and improve aviation materials, heavy-duty gas turbine materials, integrated circuit materials, and other materials.

materials, rare earth permanent magnet materials for new energy vehicle drive motors, and biomedical materials, Upstream and downstream cooperation mechanisms such as hot rolled steel for construction. Give full play to the role of leading enterprises in driving the innovation and application of new materials. Support third-party organizations to organize and carry out "one-stop" application demonstration and promotion of key materials.

V. Accelerating the greening of industrial development

(i) Actively implementing energy-saving and low-carbon actions

Focusing on the target nodes of carbon peaking and carbon neutrality, we will strengthen the concept of carbon-efficient development, fully implement carbon emission reduction actions, incorporate carbon emissions into environmental impact assessment, and bring into play the synergistic effect of pollution reduction and carbon reduction. It has formulated implementation plans for carbon peaking in key industries such as petrochemicals and chemicals, iron and steel, non-ferrous metals, and building materials, ensured peaking before 2030, and encouraged industries and enterprises with the conditions to take the lead in peaking. Support enterprises to implement

raw material and fuel substitution, accelerate industrial coal-to-electricity and coal-to-gas conversion, and increase the proportion of renewable resources and clean energy use. Support enterprises to utilize waste heat and pressure to generate electricity and connect to the grid. Support key industries such as iron and steel, cement and other key industries to build a system of statistical accounting, monitoring and evaluation of carbon emissions in the whole production process. Accelerate the promotion of energy-saving and low-carbon transformation and upgrading of raw material enterprises, encourage enterprises to build energy management centers, and implement in-depth energy ladder utilization. Optimize the trade structure of products, encourage the increase of imports of primary processed products, and strictly control the export of high-energy-consuming and low value-added products. Strengthen energy-saving supervision of key industries and implement mandatory energy consumption limit standards per unit of product. Carry out industrial energy-saving diagnostic services. Strictly implement the policy of stepped electricity prices for key industries such as iron and steel, cement, electrolytic aluminum, etc., and improve the differentiated electricity price policy that is conducive to green and low-carbon

development.

Into coal gasification, carbon dioxide as a feedstock for the production of chemical products, hydrogen-rich carbon cycle blast furnace, hydrogen kiln, hydrogen-based direct reduction and other technologies.

Promoting advanced technologies. The petrochemical industry promotes low-carbon technologies such as the direct production of chemicals from crude oil, the intelligent micro-reaction and continuous production of fine chemicals, and the bio-fermentation of carbon monoxide-containing industrial tail gas to make ethanol. The iron and steel industry promotes low-carbon technologies such as the use of recycled materials in iron and steel, short-flow casting and rolling near the end, and biometallurgy of low-grade resources. The non-ferrous metal industry promotes low carbon technologies such as high current density and low energy consumption aluminum electrolysis, hot copper matte continuous blowing, and low carbon raw material substitution. The building materials industry promotes low-carbon technologies such as co-disposal, low-carbon and high-performance cement, carbon capture and purification, oxy-rich combustion, all-electric fusion and electric fusion, raw fuel substitution, and molding and sintering.

Building pilot projects. It has organized and implemented pilot projects on low-carbon smelting, such as hydrogen metallurgy and non-blast-furnace ironmaking; carried out pilot projects on the promotion and application of carbon dioxide capture and storage technology in the cement and coal chemical industries; promoted the application of carbon dioxide in the driving of oil and the synthesis of organic chemicals; and carried out pilot projects on low-carbon cement, hydrogen kilns and carbon-fixed building materials.

By 2025, key industries such as iron and steel, nonferrous metals and building materials will have achieved milestones in controlling total carbon emissions.

(ii) Promotion of ultra-low emissions and cleaner production

It has pushed forward the implementation of ultra-low emission reforms in the iron and steel industry, and studied and promoted the implementation of ultra-low emissions in key industries such as chemicals, coking, electrolytic

aluminium, copper smelting, lead and zinc smelting, cement, glass, refractory materials, graphite deep-processing, ceramics and so on. Encourage petrochemical and chemical enterprises to carry out initial rainwater collection and treatment, petrochemical and chemical, iron and steel and other industries to organize enterprises to carry out internal water-saving renovation. For enterprises producing, using and discharging priority control chemicals, implement mandatory cleaner production audits, promote key industries such as petrochemical and chemical industries, non-ferrous metals, building materials and other key industries to formulate cleaner production transformation and upgrading plans, and innovate cleaner production implementation modes for key raw material industries. Strengthen the centralized planning and management of tail gas resources in industrial parks and water laddering, centralized treatment, and promote the recycling of industrial tail gas, cleanliness, and high-value utilization. Strengthen the heavy metal pollution control in the non-ferrous metal industry, and harmlessly treat arsenic-containing smelting slag, aluminum ash and other hazardous wastes. Restrict and phase out highly toxic, highly polluting and environmentally risky chemical products and process technologies, prohibit the illegal production

and use of persistent organic pollutants, and prohibit the illegal production of mercury-added products. Supporting enterprises

Research, development, popularization and application of the reduction of industrial solid waste generation and the reduction of industrial solid waste hazard.

Harmful production processes and equipment. Strengthen the concept of green development throughout the life cycle of products, and vigorously promote green processes and products. Guiding enterprises and parks to carry out excellent environmental performance management, strengthening the integration of intelligent management and control, and comprehensively building green factories and green parks. Strengthen the ecological restoration of mines and build green mines. A number of key standards on environmental emissions and water conservation have been revised.

(iii) Upgrading the comprehensive utilization of resources

Supporting the efficient utilization of resources, continuously upgrading key processes and process management levels, improving the efficiency of primary resource utilization, and reducing resource and energy consumption at the source. Comprehensively promote the comprehensive utilization of raw material industrial solid waste, focusing on tailings, waste rock, fly ash, red mud, smelting slag, electrolytic manganese

slag, industrial by-product gypsum, chemical waste residue, waste fibers and composite materials, etc., to build a number of comprehensive utilization bases of industrial resources, and build comprehensive utilization of tailings waste, phosphogypsum, electrolytic manganese slag, etc., and iron and steel non-ferrous synergistically dispose of zinc-containing secondary resources projects in key regions, as well as coal gasification furnace, cement kiln, large-scale sintered brick tunnel kiln co-disposal of waste and other demonstration lines, to accelerate the realization of harmlessness, reduction and resource disposal. Encourage the nationwide implementation of phosphogypsum "slag to production". Accelerate the treatment of plastic pollution and plastic recycling, and promote the industrialization and application of biodegradable plastics. Develop building materials cogeneration systems that enhance the efficiency of comprehensive resource utilization. Promote the priority use of recycled water, seawater and other non-conventional water in the production process of raw material industries, and reduce the amount of new water intake. Promote the deep treatment and recycling of wastewater in petrochemical and chemical industries, iron and steel industries, and create a number of

industrial wastewater recycling demonstration enterprises and parks. Encourage conditional areas to promote the coupled development of petrochemical and chemical, iron and steel, non-ferrous metals, building materials, electric power and other industries, and establish a raw materials

Industrial coupling development parks to realize the gradual utilization of energy resources and industrial circularity

Connections. Improve the resource price formation mechanism.

VI. Accelerating the digitalization of industrial transformation

(i) Accelerating manufacturing process intelligence

Promote the construction of digital infrastructure. Encourage enterprises to combine the transformation of production process conditions, accelerate the deployment of intelligent sensors, processors, gateways, instrumentation and other digitalization tools and equipment, and improve the real-time perception and data collection capabilities of production sites such as ore extraction, smelting and processing, and chemical reaction. Establish a unified data integration and management platform to realize centralized management of data for the whole process of R&D, production, operation, operation and maintenance. Encourage enterprises in a position to do so to apply new-generation information technologies such as 5G to upgrade their networks and build a ubiquitous sensing and interconnected factory operating environment.

Improve the level of production intelligence. Encourage enterprises to develop and apply data-driven

Advanced process control system with dynamic, mechanistic, empirical and simulation models to optimize the operating parameters of production equipment. Establish real-time monitoring, early warning of abnormal working conditions, dynamic scheduling of the whole process, and intelligent disposal of key links such as raw material feeding, reaction process, smelting process, quality control, pollutant emission, and energy consumption. Construct digital twin models for major production scenarios, processes, and key core equipment. Encourage the application of robots in positions with high labor intensity, harsh operating environment, high safety risks and high precision requirements. Establish an enterprise management and operation decision-making system that integrates information on customer service, operation management, production execution and process control.

Accelerating changes in enterprise management systems. Support enterprises to carry out the integration of dualization management system

(c) Pilot demonstration of standardization and graded standardization assessment. Organize and carry out the assessment of the degree of integration

of dualization, clarify the development focus and promotion path of enterprises with different degrees of integration, and guide them to

Upgrade the level of information technology integration and application on a level-by-level or cross-level basis.

Supporting advantageous enterprises in dualization

Integrate the promotion and replication of advanced practical experience, incorporate supporting enterprises into common supply chain synergy, quality control, cooperative R&D and other management systems, drive the upstream and downstream enterprises of the industrial chain to improve their level of intelligence, and enhance the security of the industrial chain supply chain. Support small and medium-sized enterprises to accelerate transformation and upgrading, and promote the popularization and application of new-generation information technology and collaborative innovation in R&D and design, production and manufacturing, operation and management, and product services.

(ii) Promoting the empowerment of the industrial Internet

Accelerate the construction of the second-level node of identification resolution for raw materials industrial Internet, and promote the exploration and application of identification resolution in supply chain collaboration, product tracking and tracing, and inventory management. Encourage leading enterprises to build a networked collaboration

platform between them to realize resource sharing and collaborative manufacturing in multiple production bases. Encourage leading industrial chain enterprises to build enterprise-level industrial Internet platforms, realize the integration of industrial chain supply chain, and build featured industrial Internet platforms for specific industries and regions, as well as specialized technology-based industrial Internet platforms. Enterprises are encouraged to connect enterprise-side and user-side data based on the platform, and reconfigure the product structure and manufacturing process oriented to downstream customers' demands, so as to realize the transformation from large-scale mass production to large-scale customized production. Create a cross-industry and cross-field industrial Internet platform, and explore the cross-field integration of the raw materials industry with logistics, urban construction, energy and other industries. Encourage leading enterprises of raw material subsectors and third-party institutions to take the lead in building specialized and characteristic raw material industrial Internet platforms, and promote the digital transformation of key equipment and cloud platforms. Focusing on key links to cultivate and promote a number of process management industrial APP and solutions,

providing services for small and medium-sized enterprises in R&D and design, software use, manufacturing, equipment operation and maintenance, business management, warehousing and logistics. Accelerating the exploration of raw material industry

The industry and "5G + Industrial Internet" integration and development, to create more typical application scenarios.

Empowering enterprises to improve quality, reduce costs and increase efficiency.

(iii) Strengthening the digital support base

Promote the construction of intelligent manufacturing standard system by industry. Build a test and verification platform for intelligent manufacturing standards, and accelerate the piloting and promotion of standards in key industries and fields. Support the formation of industrial intelligent manufacturing alliances and the establishment of expert committees. Cultivate a batch of raw material intelligent manufacturing system solution suppliers and industrial Internet service providers by industry and scene, and select and release the supplier list. For the characteristics of the raw materials industry, form a number of digital intelligent system solutions. Increase the combination of information technology and specialization of composite talents, team training efforts, the formation of a number of raw materials industry digital intelligent development of the leading team. Deepen the implementation of industrial Internet network security classification and grading management for raw material production enterprises, promote the

Column 4 Digital Empowerment Project

Carry out pilot demonstrations. Formulate guidelines and action plans for the digital transformation of intelligent manufacturing in key industries, and promote pilot demonstrations of intelligent mines and intelligent factories (workshops) integrating intelligent production, intelligent operation and maintenance, and intelligent management. Promote the research, development and application of industrial internet and intelligent equipment in mines, encourage the popularization and application of 5G and big data in mines and factories, and provide safe and convenient network connection for the digital construction of enterprises.

Building service platforms. It has formulated the action plan of "Industrial Internet + Key Industries", and supported leading industrial enterprises and digital service providers to build industrial Internet platforms that connect consumption and production, supply and manufacturing, products and services, and have the

application of commercial password technology, and enhance the industrial Internet security protection capability of key industrial enterprises.

VII. Securing the industrial system

(i) Improving resource security

Rationalize the development of domestic mineral resources. It has increased its efforts in prospecting for iron ore, copper, potassium and other scarce mineral resources, and is actively carrying out deep and peripheral searches for minerals in existing mines. Implement preferential tax policies, encourage the adoption of advanced processes and equipment that reduce the generation of mining solid waste, efficiently and intensively utilize low-grade ores, and encourage the comprehensive utilization of complex co-associated ores and mine solid waste. When drawing control lines such as the red line for ecological protection, it is fully connected with strategic mineral resource areas. Appropriate new high-standard mines will be built to strengthen the role of "ballast" and the basic guarantee capacity of domestic mineral resources. Optimize the management mechanism of the annual mining total control index, and scientifically regulate the mining scale of rare earths, tungsten and other mineral resources. Improve the policy on mineral resources royalties.

Expanding diversified resource supply channels.

Developing "urban mine" resources, supporting Advantageous enterprises have established large-scale

recycling bases and industrial agglomerations for scrap steel and recycled aluminum, copper, lithium, nickel, cobalt, tungsten and molybdenum, etc., and promoted the integrated development of recycling, dismantling, processing, classification and distribution of recycled metals. Construct a mineral resources reserve system with the joint participation of the state and enterprises, and the combination of product reserve and resource land reserve. Improve the ore trading market system and form an open, transparent, fair and reasonable pricing mechanism. Promote international cooperation in the field of mineral resources, optimize the structure and layout of overseas investment in accordance with the principles of equality and mutual benefit and win-win cooperation, participate in overseas resource development in a standardized and orderly manner, and enhance the ability of global strategy for mineral resources. Encourage the import of low-carbon petrochemical raw materials such as light hydrocarbons. Strictly enforce import standards for renewable resources and promote the import of high-quality renewable resources.

Increasing mining reserves. Support the construction of key domestic mines for iron ore, copper, rare earths, etc., and select and build a number of important bases for the efficient development and utilization of inorganic and non-metallic mineral resources. Construction of renewable resources recycling projects in line with industrial policy. Encourage enterprises to standardize the exploration and development of overseas resources, and build comprehensive resource bases for the integration of mining, processing and metallurgy.

By 2025, the ability to guarantee resources will be significantly improved, a stable and open resource guarantee system will be constructed, and a

A number of first-class large-scale key mineral development enterprises in China will be established, and more than 15 key non-metallic mines will be efficiently developed and utilized as bases. The domestic self-sufficiency rate of ferrous metals will be greatly increased, the ratio of scrap steel will reach more than 30%, and the ratio of recycled copper and aluminum production will reach 35% and 20% respectively.

(ii) Enhancement of supporting capacities

Expanding supporting supply channels. Sort out the shortcomings of the industrial chain supply chain in key industries of raw materials, carry out security assessment of the supply of key equipment, parts and components, instruments and meters, raw and auxiliary materials, etc., and formulate a working plan for supporting supply security. Promote the establishment of industry chain supply chain information sharing platforms in key industries and fields, and strengthen the supply and demand docking of key supporting products. Support enterprises to establish a working mechanism to deal with industrial chain supply chain

security, set up a sound reserve system, and improve the ability to guarantee supply in case of emergency. Encourage enterprises to formulate and implement "spare tire" plans and promote the diversified layout of supply channels. Support industrial clusters to carry out third-party spare parts supply services.

Strengthen the development and application of short-board equipment. Around the ground pressure monitoring equipment, synergistic melting Technical equipment, large-scale melting and casting equipment, new quick-setting smelting equipment and other specialized production equipment, high-precision bearings, special valves, high-pressure pumps and other key components, non-destructive testing equipment and other precision instrumentation, to support the upstream and downstream enterprises, research institutes and ancillary enterprises to carry out joint research and accelerate the breakthrough of bottlenecks and constraints, and to enhance the ability of the industry chain supply chain independent and controllable. Utilizing the first (sets) of major technical equipment insurance compensation mechanism to encourage enterprises to actively develop and use innovative equipment. Timely adjustment of major technical equipment and products imported key components, raw materials commodity

catalog, to create a fair competition in the market environment.

Column 6 Chain-reinforcement projects

Organize collaborative research. Encourage the upstream and downstream of the industrial chain, small and medium-sized enterprises to integrate and innovate, and organize the collaborative research of high-end special production equipment, core parts and components, precision instruments for testing, core raw materials and auxiliary materials, and industrial basic software, so as to open up the supply chain blockage and breakpoints.

Expanding supporting channels. Promote the establishment of an information-sharing platform for industrial chain supply chains in key industries and fields, strengthen the supply and demand matching of key supporting products, establish industrial chain supply chain alliances in key fields, support the formation of consortiums among enterprises, and build an autonomous and controllable ecosystem through industrial synergy. It has studied the establishment of a reserve system that takes into account both strategic and commercial reserves, supported enterprises in formulating an emergency reserve system and work plan for responding to major emergencies in terms of important materials, key equipment, spare parts, etc., and rationally planned for the variety of reserves and the reserve cycle, so as to enhance the risk-resistant capability of enterprises.

By 2025, the breakpoints and blockages in the supply chain of the main industrial chain will be effectively resolved, and the level of security will be significantly improved.

(iii) Enhancing safety and productivity

Strengthening the intrinsic safety of enterprises. Adhering to the principle of putting people first and life first, we will intensify efforts to reform safety technologies and eliminate technologies and equipment that fail to meet the requirements for safe production. Promote enterprise source management, reduce safety risks, and improve the level of intrinsic safety of enterprises. Implement the action plan for industrial

Internet+safety in production, utilize information technology to build a system for sensing, monitoring, early warning, disposal and assessment of safety in production based on the industrial Internet, study and formulate guidelines for the implementation of industrial Internet+safety in production in key industries, and carry out pilot demonstrations. It will promote the intelligent construction of chemical parks and the relocation and transformation of hazardous chemical production enterprises in densely populated urban areas.

Promoting the implementation of the main responsibility of enterprises. Guidance to enterprises on the implementation of work safety laws and regulations

regulation and standardization system, strengthen the awareness of safety risk prevention, fulfill the main responsibility of production safety, and improve the level of production safety management. Support and encourage enterprises to promote the standardization of work safety, strengthen the role of safety technology and management team, and do a good job in work safety training. Guiding enterprises to improve the monitoring and early warning mechanism of key parts, key links and major sources of danger, and establish and

improve the risk classification and control of production safety and hidden danger investigation and treatment.

The system of management.

VIII. Safeguards

(i) Enhanced planning and implementation

(c) Strengthening sectoral coordination and upward and downward linkages. Relevant State departments are working to implement the relevant work in accordance with their division of responsibilities. Each region will strengthen the connection with this plan, and incorporate the main contents of the plan and major projects into the key work arrangements of the region. Petrochemical and chemical industries, iron and steel and other key industries around the planning objectives and tasks, combined with the actual industry to develop specific implementation views. Establish a mid-term evaluation mechanism to strengthen the dynamic tracking of the completion of the plan and new issues and situations arising in the implementation process, and adjust the content of the plan in accordance with the procedures when necessary. Industry organizations give full play to their role as a bridge connecting enterprises and the government, and provide timely feedback on planning and implementation issues and suggestions.

(ii) Enhancing policy synergies

Give full play to the leading role of planning, and

strengthen the synergy between policies on fiscal, taxation, finance, investment, import and export, energy, ecology and environment, natural resources and price, and industrial policies. Investment authorities at all levels and authorities in charge of natural resources take planning as an important basis for the approval and filing of investment projects as well as the approval of land and sea use. The layout and construction of chemical parks, bases, demonstration projects and major projects involved in the planning should implement the regional "three lines and one single" ecological and environmental zoning control requirements, and the relevant development and construction planning and construction projects should carry out environmental impact assessment in accordance with the law. Make full use of the existing funding channels to support the major projects involved in the plan. Deepen the cooperation between industries, give full play to the role of the national platform for cooperation between industries, and actively support projects in line with the plan through financial services and equity investment. Actively apply internationally recognized rules to create a fair and competitive market environment. Strengthen intellectual property protection and services.

(iii) Strengthening talent security

Guiding colleges and universities to optimize the layout of disciplines and specialties according to the development needs of the raw materials industry, and expanding the scale of personnel training in mining, metallurgy, materials, chemistry and other disciplines. Deepen the construction of new engineering disciplines and optimize the professional structure of related fields. Carry out the mapping of talent needs in key areas of the raw materials industry, and build a big data platform for industrial talents and an expert information database. Strengthen the training of engineers and technical and skilled personnel in urgent need, and implement the program of improving the quality of vocational education and cultivating excellence. Increase the introduction of overseas high-level teams, talents and service guarantee. Implement the new material talent training program, and continue to organize new material field talents to go abroad (realm) and domestic training.

(iv) Increasing publicity and guidance

Make full use of all kinds of media and adopt various forms to strengthen publicity and reporting on the content of the plan, implementation progress and typical experience. Formulate refined industrial policies to eliminate the misconception that the raw materials

industry is included in the "two highs and one capital" industry across the board, effectively strengthen the industry's self-confidence, guide the development of industry-city integration, and create a favorable public opinion atmosphere for the high-quality development of the raw materials industry. Give full play to the role of industry associations and professional organizations to strengthen the implementation of the plan.

“十四五”原材料工业发展规划

工业和信息化部
科学技术部
自然资源部

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原材料工业是实体经济的根基，是支撑国民经济发展的基础性产业和赢得国际竞争优势的关键领域，是产业基础再造的主力军和工业绿色发展的主战场。为贯彻《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》，提高原材料工业发展质量和效益，制定本规划。

一、发展形势

（一）发展基础

原材料工业包括石化化工、钢铁、有色金属、建材等行业。“十三五”以来，原材料工业转型升级成效显著，综合实力稳步增长，国际竞争力持续增强。**规模优势得到新提升。**2020年我国原材料工业增加值占规模以上工业的27.4%，粗钢、精炼铜、电解铝、甲醇、尿素、水泥、平板玻璃等产量连续多年保持世界第一。材料种类更加丰富，钢材、铝材、光伏玻璃等自给率超过98%，基本满足了国民经济和国防军工需求。**结构调整取得新进展。**产能严重过剩行业总量供需基本恢复平衡，1.5亿吨钢铁去产能目标提前完成，严控电解铝、水泥产能取得明显成效。前10家水泥企业集团产业集中度达到58%。企业实力加快提升，2020年我国（不含港澳台）入围世界500强原材料工业企业34家，占入围企业数量的29.1%。**创新能力迈上新台阶。**研发投入强度由2015年的0.76%提高到2020年的0.9%左右。重点企业主体装备总体达到国际先进水平，建成了170余家国家重点实验室和工程（技术）研究中心、26家国家新材料重点平台。**绿色转**

型呈现新面貌。重点大中型企业吨钢综合能耗较2015年下降4.7%，原铝综合交流电耗比世界平均水平低6.9%，吨钢二氧化硫排放量、建材工业万元工业增加值二氧化碳排放量较2015年分别下降46%、16.5%，总体达到世界先进水平。资源综合利用水平稳步提高，水泥窑协同处置系统已投入运行168套。电石渣实现全部利用，磷石膏综合利用率达到40%。**智能制造达到新水平。**通过两化融合管理体系评定的原材料企业2200余家，大型原材料企业两化融合水平61.1，高于全国平均水平9.1%。原材料工业关键工序数控化率65.7%，其中石化企业73.8%，高出全国平均水平21.7个百分点。建成了60个智能制造工厂、数字化车间。

（二）发展环境

“十四五”时期，原材料工业进入高质量发展新阶段，机遇前所未有，挑战更加严峻，机遇和挑战呈现许多新变化。**从机遇看，**新发展格局加快构建，国内超大规模市场优势进一步发挥，特别是新兴领域和消费升级对高端材料的需求，为原材料工业持续健康发展提供了广阔空间。我国公平竞争的市场体系日趋完善，特别是各种资源要素向优势领域、企业集聚，为原材料工业强化产业链韧性提供了基础支撑。新一轮科技革命和产业变革重塑全球经济结构，特别是新一代信息技术和制造业深度融合，为原材料工业转型升级锻造新优势提供了动力源泉。**从挑战看，**面对经济全球化逆流和新冠肺炎疫情广泛影响，产业链供应链安全风险凸显，拓展国

际市场难度明显增加。面对高质量发展新阶段的新形势，钢铁、电解铝、水泥等主要大宗原材料产品需求将陆续达到或接近峰值平台期，规模数量型需求扩张动力趋于减弱。面对资源能源和生态环境的强约束，碳达峰碳中和的硬任务，人民群众对安全生产的新期盼，原材料工业绿色和安全发展的任务更加紧迫。

当前，原材料工业存在的短板和瓶颈依然突出，中低端产品严重过剩与高端产品供给不足并存，关键材料核心工艺技术与装备自主可控水平不高，绿色低碳发展任重道远，数字化水平难以有效支撑高质量发展，关键战略资源保障能力不强等问题亟待加快解决。面对新形势、新要求，要保持战略定力，增强底线思维，坚持系统观念，加速推动原材料工业体系优化开放与高质量发展。

二、总体要求

（一）指导思想

坚持以习近平新时代中国特色社会主义思想为指导，全面贯彻党的十九大和十九届历次全会精神，立足新发展阶段，完整、准确、全面贯彻新发展理念，加快构建新发展格局，以推动高质量发展为主题，以深化供给侧结构性改革为主线，以改革创新为根本动力，以满足人民日益增长的美好生活需要为根本目的，统筹发展和安全，着眼提升产业基础高级化和产业链现代化水平，着力优化传统产业和产品结构，培育壮大新材料产业，加速信息技术赋能，补齐产业链

短板，实现低碳可循环，促进产业供给高端化、结构合理化、发展绿色化、转型数字化、体系安全化，为推动制造强国建设再上新台阶，为全面建设社会主义现代化国家开好局、起好步提供有力支撑。

（二）基本原则

——**创新引领。**把技术创新作为第一动力，促进各类创新要素向企业集聚，加强产学研用横向合作，强化工艺技术、加工装备和信息化技术的纵向协同，健全产业创新生态，强化共性基础技术供给，突破战略关键技术，推动技术创新和产业发展融合，加快成果产业化规模化应用。

——**市场主导。**把尊重市场规律作为基本遵循，充分发挥市场在资源配置中的决定性作用，强化企业在投资决策、技术选择等方面的主体地位。遵循原材料工业发展规律，更好发挥政府作用，注重战略规划引导、标准法规制定、市场秩序维护、产业安全保障等，营造良好发展环境。

——**供需协调。**把满足内需作为优先任务，立足新发展格局新要求，稳定原材料工业合理比重，强化资源保障，提高供给质量，促进原材料工业耦合发展，强化上下游衔接，形成需求牵引供给、供给创造需求的高水平动态平衡。

——**绿色安全。**把绿色安全作为发展底线，围绕碳达峰碳中和目标，提高能源资源节约和环境保护水平，强化全产业链、全生命周期绿色低碳安全发展，着力提升重点行业本质安全水平，实现经济效益与生态效益、社会效益的有机统

一。

（三）发展目标

到2025年，原材料工业保障和引领制造业高质量发展的能力明显增强；增加值增速保持合理水平，在制造业中比重基本稳定；新材料产业规模持续提升，占原材料工业比重明显提高；初步形成更高质量、更好效益、更优布局、更加绿色、更为安全的产业发展格局。

——**供给高端化水平不断提高。**先进基础材料高端产品质量稳定性可靠性适用性明显提升。部分前沿新材料品种实现量产和典型应用。突破一批重点战略领域关键基础材料。协同创新体系更加高效完善，国家新材料平台体系初步建成。新材料产业创新能力明显提升，重点行业研发投入强度达到1.5%以上，掌握一批具有自主知识产权的关键共性核心技术。

——**结构合理化水平持续改善。**粗钢、水泥等重点原材料大宗产品产能只减不增，产能利用率保持在合理水平。重点领域产业集中度进一步提升，形成5~10家具有生态主导力和核心竞争力的产业链领航企业。产业布局与生产要素更加协同，在原材料领域形成5个以上世界级先进制造业集群。化工园区集约水平显著提升，形成一批石化产业基地。

——**发展绿色化水平大幅提升。**钢铁、有色金属、建材等重点行业能源消耗总量、碳排放总量控制取得阶段性成果。钢铁行业吨钢综合能耗降低2%，水泥产品单位熟料能

耗水平降低 3.7%，电解铝碳排放下降 5%。重点行业单位产值污染物排放强度、总量实现双下降，各行业实现稳定达标排放，新建项目满足超低排放标准。工业废渣等固体废物综合利用率进一步提高。

——**产业数字化转型效应凸显。**智能制造能力成熟度 3 级及以上企业 20%以上，关键工序数控化率 70%以上，钢铁等重点领域关键工序数控化水平进一步提升。重点行业数字化、网络化、智能化水平显著提高，企业网络安全防护能力加快建设，建设 100 个以上智能制造示范工厂，10 家以上工业互联网平台。

——**体系安全化基础更加扎实。**战略资源保障能力大幅提升，形成基本稳定的资源保障体系。重点行业关键生产工艺技术及装备自主可控水平大幅提高，产业链断点堵点显著减少。重点行业本质安全水平大幅提升。城镇人口密集区危险化学品生产企业搬迁改造任务全面完成。

到 2035 年，成为世界重要原材料产品的研发、生产、应用高地，新材料产业竞争力全面提升，绿色低碳发展水平世界先进，产业体系安全自主可控。

三、促进产业供给高端化

（一）健全创新体系

强化创新平台载体支撑。鼓励优势企业积极参与国家重点实验室建设及体系重组，建设重点领域国家制造业创新中心，支持建立省级创新中心。支持转制院所整合产业链和创

新链，组建产业共性技术研究平台，提升绿色选冶、高端加工、稳定制备等工程化能力。支持地方结合本地实际采取多种形式建设国家重点新材料中试平台。加大新材料产业计量测试中心、平台和联盟建设。继续组织国家新材料生产应用示范、测试评价等平台建设，协同推进产品设计、研制生产、系统验证、批量应用。完善创新服务支撑体系，建立国家新材料科研设施公用平台。建立新材料数据中心，提高数据服务产业发展的能力。

优化完善创新机制生态。支持原材料企业加大投入，联合下游企业、高校、科研院所，围绕工艺、装备、产品等方面，开展基础研究和应用创新。制定国有企业科技人才薪酬激励政策，在业绩考核、研发投入、工资总额、人才待遇等方面给予激励政策支持。选择一批创新基础好的企业，试行享受高校及科研院所同等科技成果转化政策，放开员工持股限制，在绩效考核中调高创新成果转化等相关指标权重，对作出突出贡献的核心骨干人员给予倾斜。加强国际交流合作，吸引国外重点企业、研究机构来华投资建厂和设立研发中心，鼓励中外机构合作开展材料技术创新研究。支持企业设立境外材料技术和装备研发机构，开展国际技术创新合作。

（二）攻克关键技术

加强产学研用深度融合，推进科研院所、高校、企业科研力量优化配置和资源共享，攻克复杂矿床及超深井矿山安

全高效开采等矿山工艺技术；攻克成分组织均匀性控制、原料均化提纯等工艺装备技术，提高产品性能及其稳定性；攻克电石法聚氯乙烯生产无汞化、低温低浓度烟气脱硫脱硝、细颗粒物化学团聚强化除尘、固废（危废）协同处置及资源化利用等污染物防治和资源综合利用技术，提高资源能源利用率和超低排放水平；攻克在线检测调控、原料物性快速识别和评价、设备全生命周期管理、故障诊断与预测性维护等智能制造技术，提升全要素生产率。组织先进适用技术推广，滚动制定发布重点行业先进适用技术目录。

专栏 1 技术创新重点方向

石化化工行业。推动高选择性催化、高效膜分离、危险工艺本质安全等技术，特种茂金属聚烯烃、高端润滑油、高纯/超高纯化学品及工业特种气体、甲烷偶联制烯烃等新产品研发。推进煤炭清洁高效利用、煤制化学品短流程、生物基材料全产业链制备以及磷石膏低成本无害化处理及资源化利用、二氧化碳捕集储存及综合利用等技术的工程化。推动新型微通道反应器装备及连续流工艺、危险化学品存储运输安全、工业互联网和智能制造、低全球变暖潜能制冷剂替代品等技术产业化应用。

钢铁行业。推进高效率低成本洁净钢冶炼、节能环保等关键共性技术，先进电弧炉及其制造流程、近终形制造、特种冶炼、高端检测等通用专用装备和零部件生产技术的工程化。推动充填采矿、低品位难选矿、烧结烟气循环、机械化原料场、高炉煤气精脱硫、高效脱硫脱硝、余热回收、中低温余热利用、钢渣高附加值资源化利用等技术产业化应用。

有色金属行业。推动机械掘进及连续开采、离子吸附型稀土矿绿色高效开采、稀土多金属矿伴生资源及盐湖锂等资源高效利用、提取分离过程物料循环、超高纯金属及靶材制备等新技术研发。推进高洁净度高均质化冶金、高性能合金短流程制备、高性能稀土永磁材料选区精准渗透等技术，智能化无人采矿、矿山安全管理物联网及云服务、人工智能配料及排产、关键工序虚拟仿真、冶炼分离在线监测及过程控制智能化、机器视觉质量在线检测等智能制造技术的工程化。推动低品位复杂矿石高效分选及预选、尾矿及赤泥高效综合利用、含氟含砷等有害成分的危废无害化处置、高丰度稀土元素平衡利用等技术产业化

应用。

建材行业。推动水泥深度脱硫脱硝、化学团聚强化除尘、高效低碳节能等新技术研发。推进非金属矿分级提纯、晶形保护、粒形粒貌控制技术，特种玻璃熔化成型技术，先进陶瓷粉体制备技术、高温固体氧化物燃料电池粉体及其组件共烧成技术、成型烧结技术，大尺寸人工晶体制备技术，结构功能一体化耐火材料集成制造及在役诊断维护等技术的工程化。推动地下矿山全工序无人化作业，露天矿山三维仿真、无人爆破、矿石在线监测，石墨高效解离、大鳞片保护、无氟化提纯，特种玻璃纤维、玄武岩纤维等高性能纤维智能化池窑连续拉丝等矿山采选及材料深加工技术产业化应用。

（三）突破关键材料

坚持材料先行和需求牵引并重，聚焦国防建设、民生短板和制造强国建设重大需求，滚动制定关键材料产品目录，制定发布技术路线图。实施关键短板材料攻关行动，采用“揭榜挂帅”“赛马”等方式，支持材料生产、应用企业联合科研单位，开展宽禁带半导体及显示材料、集成电路关键材料、生物基材料、碳基材料、生物医用材料等协同攻关。实施大宗基础材料巩固提升行动，引导企业在优化生产工艺的基础上，利用工业互联网等新一代信息技术，提升先进制造基础零部件用钢、高强铝合金、稀有稀贵金属材料、特种工程塑料、高性能膜材料、纤维新材料、复合材料等综合竞争力。实施前沿材料前瞻布局行动，支持科研单位联合企业，把握新材料技术与信息技术、纳米技术、智能技术等融合发展趋势，发展超导材料、智能仿生、增材制造材料等，推动新的主干材料体系化发展，强化应用领域的支持和引导。实施材料基因工程计划，探索材料研发新模式的试点应用。实施关键材料应用推广行动，优化重点新材料首批次应用保险补偿

机制，通过首台（套）、绿色建材推广等措施促进新材料应用。

专栏 2 新材料创新发展工程

突破重点品种。围绕大飞机、航空发动机、集成电路、信息通信、生物产业和能源产业等重点应用领域，攻克高温合金、航空轻合金材料、超高纯稀土金属及化合物、高性能特种钢、可降解生物材料、特种涂层、光刻胶、靶材、抛光液、工业气体、仿生合成橡胶、人工晶体、高性能功能玻璃、先进陶瓷材料、特种分离膜以及高性能稀土磁性、催化、光功能、储氢材料等一批关键材料。

提升公共平台。建设高端聚烯烃、稀有金属、粉末冶金、先进玻璃、先进陶瓷等制造业创新中心。建设信息通信设备、节能环保、机器人装备材料等生产应用示范平台。建设新材料测试评价平台区域中心、新材料数据中心。

到 2025 年，关键材料保障能力得到提升，公共服务能力得到明显改善，新建 10 个以上新材料平台。

（四）提高产品质量

加强质量管理和过程管控。持续开展原材料工业质量提升行动，提高产品质量的稳定性、可靠性和适用性。推广普及卓越绩效、质量诊断、质量持续改进等先进生产管理模式。引导企业加强全面质量管理，加大产品测试评价、设备维修保障、人员岗位培训、供应商质量管控、用户投诉反馈、制造风险分析等环节工作力度。加强质量管理数字化创新与应用，引导企业充分利用云计算、大数据、区块链、人工智能、工业互联网等新一代信息技术手段，推广先进成型和加工方法、在线检测、智能制造等，建立满足应用需求的生产过程控制及质量管控体系，健全化肥、水泥、防水材料、隔热保温材料等产品全生命周期质量控制和追溯机制。

推进产品标准和品牌建设。以国际先进质量标准为标杆，加强材料标准体系化建设，完善和修订“十四五”原材料工业标准体系，建立覆盖产品全生命周期、上下游协同的标准体系，促进资源节约和材料合理应用。聚焦重大技术装备、重大工程等需要，培育一批耐候钢、轴承钢、航空铝材、高性能混凝土、人工晶体、复合材料等高端材料团体标准。围绕消费升级、绿色发展等方向，修订和提升建筑用钢、铜水（气）管、防水保温材料、装饰装修材料、生物基材料等大宗材料及产品标准。深度参与国际标准化工作，牵头制定优势行业国际标准。引导企业强化品牌发展战略，鼓励企业制定高于推荐性标准相关技术要求的企业标准。鼓励石化化工、钢铁、有色金属、建材等行业协会及专业机构开展品牌培育管理体系行业标准宣贯、质量标杆和品牌评价活动，加强行业自律，加大产业集群质量品牌、企业品牌等培育和宣传力度，提高品牌影响力。

健全质量评价和认证体系。组建质量提升技术基础公共服务平台，提升矿产品、冶炼产品、烧结产品、加工材等产品稳定性试验验证、环境适应性评价、故障与缺陷分析、计量认证等质量评价能力，完善质量评价体系，推动过程能力评价。开展原材料工业企业计量能力提升行动，鼓励企业完善测量管理体系，加强测量设备确认和测量过程控制，建立企业计量保障体系。推动钢铁、有色金属、建材等行业开展质量分级评价，加强与产品标准、计量、检测技术的有效衔

接。持续开展绿色建材认证。建立新材料认证体系，支持市场化、专业化第三方高端质量认证机构建设，推进质量符合性、工艺稳定性、服役适用性的全产业链、全生命周期、全域评价示范，打造国际化认证品牌，积极推进国际认证机构间认证结果与评价标准互认。

四、推动产业结构合理化

（一）巩固去产能成果

严控新增产能。完善并严格落实钢铁、水泥、平板玻璃、电解铝行业产能置换相关政策，防止铜冶炼、氧化铝等盲目无序发展，新建、改扩建项目必须达到能耗限额标准先进值、污染物超低排放值。严控尿素、磷铵、电石、烧碱、黄磷等行业新增产能，新建项目应实施产能等量或减量置换。鼓励各地区扩大原材料行业产能置换实施范围，提高淘汰落后标准，利用综合标准依法依规推动落后产能退出。严禁新建《产业结构调整指导目录》中限制类和淘汰类项目。

健全长效机制。研究建立运用碳排放、污染物排放、能耗总量等手段遏制过剩产能扩张的约束机制。对达不到超低排放要求、竞争力弱的城市钢厂以及大气污染防治重点区域城市钢厂采取彻底关停、转型发展、就地改造、搬迁改造等方式，推动转型升级。实施水泥常态化错峰生产，探索建立钢铁等行业错峰生产机制。强化石化、现代煤化工产业规划和规划环境影响评价，结合“十三五”实施效果和碳达峰碳中和要求，科学确定行业发展合理规模。实施节能审查，严格

控制石化化工、钢铁、建材等主要耗煤行业的燃料煤耗量。健全防范产能过剩长效工作机制，畅通举报渠道，强化联合执法，加强行业预警，充分利用卫星监测、大数据等技术手段，加大违法违规新增产能行为的查处力度，持续保持高压打击态势。

（二）引导合理布局

优化新建产能布局。贯彻国家区域重大战略、区域协调发展战略、主体功能区战略，依据国土空间规划，推动原材料工业空间布局调整优化。落实石化产业规划布局方案，严禁新建规划外对二甲苯和乙烯项目。优化危险化学品生产布局，禁止在化工园区外新建、扩建危险化学品生产项目，危险化学品生产项目外部安全防护距离要符合相关要求。推进重点流域化工企业搬迁改造，进入合规的化工园区。鼓励钢铁冶炼项目依托具备条件的现有钢铁冶炼生产厂区集聚建设。沿海地区有序布局利用境外资源的氧化铝等项目。科学投放砂石资源采矿权，合理布局一批大型机制砂石生产基地。支持地方结合自身优势和产业基础，合理布局符合战略性新兴产业分类目录的新材料项目。

推进规范化集群化发展。制定化工园区认定条件，指导地方认定一批化工园区，引导化工企业集聚规范化发展。推动石化化工行业探索现代煤化工与传统炼化产业、可再生能源发电制氢产业互补发展，引导钢铁行业依托城市矿山建设分布式短流程钢厂，促进电解铝行业布局由“煤—电—铝”

向“水电、风电等清洁能源—铝”转移，推动建材行业向协同处置废弃物的循环经济发展模式转变。推动原材料领域国家新型工业化产业示范基地建设，促进产业集聚向集群转型提升。聚焦产业基础好、比较优势突出、技术领先的行业细分领域或重点产品，发挥产业链龙头企业引领带头作用，推动要素聚集和价值提升，强化专业化协作和配套能力，打造一批石化化工、钢铁、有色金属、稀土、绿色建材、新材料产业集群。及时发布产能预警，防止地方盲目重复建设。

（三）优化组织结构

做大做强龙头企业。坚持市场主导和政府推动相结合，清除跨地区兼并重组障碍，清理市场分割、地区封锁等限制，协调解决企业跨地区兼并重组重大问题，支持企业加快跨区域、跨所有制兼并重组，提高产业集中度，开展国际化经营。在石化化工、钢铁、有色金属、建材等行业，培育一批具有生态主导力和核心竞争力的产业链领航企业，做强做大稀土企业集团，鼓励稀有金属企业加快整合。发挥化工、建材行业龙头企业引领作用，推动企业改组改制。对于完成实质性兼并重组的钢铁等行业企业给予产能置换支持政策。完善行业规范管理，促进市场要素向优势企业集中。鼓励金融机构按照风险可控、商业可持续原则，向实施兼并重组、转型升级的原材料企业提供综合性金融服务。

培育壮大中小企业。提高原材料行业中小企业创新能力和专业化水平，鼓励龙头企业将配套中小企业纳入共同的产

业链管理、质量管理、标准管理、合作研发管理等，建立稳定的供应、生产、销售等协作配套关系，实现大中小企业融通发展。重点围绕原材料产业链先进基础工艺、核心基础零部件等方面，培育一批专精特新“小巨人”企业、制造业单项冠军企业。

（四）推进产业协同

扩大中高端材料内需。面向新型基础设施建设、高端装备、新型城镇化建设、交通水利等重大工程建设和人民美好生活要求，加快传统材料升级换代，破除制约材料应用的隐形壁垒和不合理规定。修订完善设计和应用规范，拓展绿色建材等成熟产品内需市场，推动绿色建材应用及试点城市建设，推广装配式建筑和钢结构住宅，挖掘高性能铝材等高端材料消费潜能。大力开拓传统产品新市场、新用途，不断提升传统产业竞争优势和竞争效率。强化原材料工业供需结构匹配，减少无效供给，扩大有效供给，提高供给结构对需求结构的适应性，推动形成需求牵引供给、供给创造需求的高水平动态平衡。

加强上下游衔接联动。原材料企业加强与上下游企业协同共生、耦合发展，向生产零部件、部品化延伸，向提供一体化的材料系统化解决方案转变。采用研发早期介入、后期持续改进的合作模式，推动商业模式创新和业态创新，促进生产型制造向服务型制造转变。支持行业协会搭建供需衔接平台。建立健全航空材料、重型燃气轮机材料、集成电路材

料、新能源汽车驱动电机用稀土永磁材料、生物医用材料、建筑用热轧型钢等上下游合作机制。发挥龙头企业对新材料创新应用带动作用。支持第三方机构组织开展重点材料“一条龙”应用示范推进工作。

五、加快产业发展绿色化

（一）积极实施节能低碳行动

围绕碳达峰、碳中和目标节点，强化碳效率发展理念，全面实施碳减排行动，将碳排放纳入环境影响评价，发挥减污降碳协同效应。制定石化化工、钢铁、有色金属、建材等重点行业碳达峰实施方案，确保2030年前实现达峰，鼓励有条件的行业、企业率先达峰。支持企业实施原料、燃料替代，加快推进工业煤改电、煤改气，提高可再生资源和清洁能源使用比例。支持企业利用余热余压发电、并网。支持钢铁、水泥等重点行业构建生产全过程碳排放统计核算、监测与评估体系。加快推进原材料企业节能低碳改造升级，鼓励企业建设能源管理中心，深入实施能源梯级利用。优化产品贸易结构，鼓励增加初级加工产品进口，严格控制高耗能、低附加值产品出口。加强重点行业节能监察，贯彻强制性单位产品能耗限额标准。开展工业节能诊断服务。严格落实钢铁、水泥、电解铝等重点行业阶梯电价政策，完善有利于绿色低碳发展的差别化电价政策。

专栏3 低碳制造试点工程
实施技术攻关。组织研发重质劣质油加工及高效转化利用、大型高效节能先

进煤气化、二氧化碳为原料生产化工产品、富氢碳循环高炉、氢能窑炉、氢基直接还原等技术。

推广先进技术。石化化工行业推广原油直接生产化学品、精细化工产品智能化微反应和连续化生产、含一氧化碳工业尾气生物发酵制乙醇等低碳技术。钢铁行业推广钢铁循环材料使用、近终形短流程铸轧、低品位资源生物冶金等低碳技术。有色金属行业推广高电流密度低能耗铝电解、热态铜锍连续吹炼、低碳原料替代等低碳技术。建材行业推广协同处置、低碳及高性能水泥、碳捕捉纯化、全氧富氧燃烧、全电熔及电助熔、原燃料替代、成型烧结等低碳技术。

建设试点项目。组织实施氢冶金、非高炉炼铁等低碳冶炼试点项目，开展水泥、煤化工等行业二氧化碳捕集、封存技术推广应用试点，推进二氧化碳在驱油、合成有机化学品等方面应用，开展低碳水泥、氢能窑炉及固碳建材试点。

到2025年，钢铁、有色金属、建材等重点行业碳排放总量控制取得阶段性成果。

（二）推进超低排放和清洁生产

推进实施钢铁行业超低排放改造，研究推动化工、焦化、电解铝、铜冶炼、铅锌冶炼、水泥、玻璃、耐火材料、石墨深加工、陶瓷等重点行业实施超低排放。鼓励石化化工企业开展初期雨水收集处理，石化化工、钢铁等行业组织企业开展内部节水改造。对生产、使用、排放优先控制化学品的企业，实施强制性清洁生产审核，推动石化化工、有色金属、建材等重点行业制定清洁生产改造提升计划，创新原材料重点行业清洁生产推行模式。加强工业园区尾气资源集中规划管理和水梯次利用、集中处理，推进工业尾气循环化、清洁化、高值化利用。加强有色金属行业重金属污染治理，无害化处理含砷冶炼渣、铝灰等危险废物。限制和逐步淘汰高毒、高污染、高环境风险化工产品和工艺技术，禁止非法生产、使用持久性有机污染物，禁止非法生产添汞产品。支持企业

研究开发、推广应用减少工业固废产生量和降低工业固废危害性的生产工艺和设备。强化产品全生命周期绿色发展理念，大力推广绿色工艺和绿色产品。引导企业和园区开展卓越环保绩效管理，加强智能管控一体化治理，全面建设绿色工厂和绿色园区。加强矿山生态修复，建设绿色矿山。制修订一批环保排放、节水等重点标准。

（三）提升资源综合利用水平

支持资源高效利用，持续提升关键工艺和过程管理水平，提高一次资源利用效率，从源头上减少资源能源消耗。全面推进原材料工业固废综合利用，重点围绕尾矿、废石、粉煤灰、赤泥、冶炼渣、电解锰渣、工业副产石膏、化工废渣、废弃纤维及复合材料等，建设一批工业资源综合利用基地，在重点地区建设尾矿废渣、磷石膏、电解锰渣等综合利用和钢铁有色协同处置含锌二次资源项目，以及煤气化炉、水泥窑、大型烧结砖隧道窑协同处置废弃物等示范线，加快实现无害化、减量化、资源化处置。鼓励在全国范围内实施磷石膏“以渣定产”。加快塑料污染治理和塑料循环利用，推进生物降解塑料的产业化与应用。发展提升资源综合利用效率的建材联产系统。推进原材料工业生产过程中优先使用再生水、海水等非常规水，减少新水取用量。推动石化化工、钢铁等行业废水深度处理与循环利用，创建一批工业废水循环利用示范企业、园区。鼓励有条件的地区推进石化化工、钢铁、有色金属、建材、电力等产业耦合发展，建立原材料

工业耦合发展园区，实现能源资源梯级利用和产业循环衔接。完善资源价格形成机制。

六、加速产业转型数字化

（一）加快制造过程智能化

推进数字化基础设施建设。鼓励企业结合生产工艺条件改造，加快智能传感器、处理器、网关、仪器仪表等数字化工具和设备部署，提升矿石采选、冶炼加工、化工反应等生产现场的实时感知和数据采集能力。建立统一的数据集成和管理平台，实现对研发、生产、经营、运维等全流程数据集中管理。鼓励有条件的企业应用 5G 等新一代信息技术对网络进行升级，建设泛在感知互联的工厂运行环境。

提高生产智能化水平。鼓励企业开发应用基于数据驱动、机理模型、经验模型、仿真模型的先进工艺控制系统，优化生产作业设备运行参数。建立面向原料进料、反应过程、冶炼过程、质量控制、污染物排放、能源消耗等重点环节的实时监控、异常工况预警、全流程动态调度、智能处置。构建面向主要生产场景、工艺流程、关键核心设备的数字孪生模型。鼓励劳动强度大、作业环境恶劣、安全风险较大、精度要求高的岗位应用机器人。建立集成客户服务、经营管理、生产执行和过程控制等信息的企业管理与经营决策系统。

加快企业管理体系变革。支持企业开展两化融合管理体系贯标试点示范与分级贯标评定。组织开展两化融合度评估，明确不同融合度企业的发展重点和提升路径，引导企业

逐级或跨级提升信息技术融合应用水平。支持优势企业两化融合先进实践经验的推广复制，将配套企业纳入共同的供应链协同、质量管控、合作研发等管理体系中，带动产业链上下游企业智能化水平提升，增强产业链供应链安全。支持中小企业加快转型升级，推动新一代信息技术在研发设计、生产制造、经营管理、产品服务等环节的普及应用和协同创新。

（二）推动工业互联网赋能

加快原材料工业互联网标识解析二级节点建设，推动标识解析在供应链协同、产品追踪溯源、库存管理等方面的探索应用。鼓励龙头企业打造和各企业之间的网络化协作平台，实现多生产基地的资源共享与协同制造。鼓励产业链龙头企业打造企业级工业互联网平台，实现产业链供应链一体化，构建面向特定行业和区域的特色型工业互联网平台以及专业技术型工业互联网平台。鼓励企业基于平台打通企业端与用户端数据，以下游客户需求为导向，对产品结构和制造流程进行重构，实现从大规模批量生产向大规模定制化生产转变。打造跨行业跨领域工业互联网平台，探索原材料行业与物流、城建、能源等行业的跨领域融通。鼓励原材料细分行业龙头企业、第三方机构等牵头打造专业化、特色化的原材料工业互联网平台，推动关键设备的数字化改造和上云上平台。聚焦重点环节培育和推广一批流程管理工业 APP 和解决方案，为中小企业提供研发设计、软件使用、生产制造、设备运维、经营管理、仓储物流等服务。加快探索原材料工

业与“5G+工业互联网”融合发展，打造更多典型应用场景，赋能企业提质降本增效。

（三）夯实数字化支撑基础

分行业推进智能制造标准体系建设。搭建智能制造标准试验验证平台，在重点行业与领域加快开展标准试点与推广。支持组建行业智能制造联盟、设立专家委员会。分行业、分场景培育一批原材料智能制造系统解决方案供应商、工业互联网服务供应商，遴选、发布供应商名录。针对原材料工业特点，形成一批数字化智能化系统解决方案。加大信息化与专业化结合的复合型人才、团队培养力度，形成一批原材料工业数字化智能化发展领军队伍。深化实施原材料生产企业工业互联网网络安全分类分级管理，推动商用密码技术应用，提升重点行业企业工业互联网安全防护能力。

专栏 4 数字化赋能工程

开展试点示范。制定重点行业智能制造数字化转型指南、行动计划，推进集智能生产、智能运维、智能管理于一体的智能矿山和智能工厂（车间）试点示范。推动矿山工业互联网及智能装备研发和应用，鼓励 5G、大数据等在矿山和工厂中的推广应用，为企业数字化建设提供安全便捷的网络连接。

构建服务平台。制定“工业互联网+重点行业”行动方案，支持行业龙头企业、数字化服务商建设贯通消费与生产、供应与制造、产品与服务、具有原材料行业特色的工业互联网平台。支持地方政府、园区管理部门建设本区域工业互联网平台，推动治理体系和行业管理手段的现代化。

完善标准体系。围绕智能工厂参考架构、数据交换技术规范、数据采集规范等，制定一批智能制造相关标准。

到 2025 年，在原材料领域建设 100 个以上智能制造示范工厂，10 家以上重点行业工业互联网平台。

七、保障产业体系安全化

（一）提高资源保障能力

合理开发国内矿产资源。加大铁矿石、铜、钾等紧缺性矿产资源探矿力度，积极开展现有矿山深部及外围找矿。落实税收优惠政策，鼓励采取减少矿业固体废物产生的先进工艺和设备，高效集约利用低品位矿，鼓励综合利用复杂共伴生矿及矿山固废。划定生态保护红线等控制线时，与战略性矿产资源区域充分衔接。适当新建高标准矿山，强化国内矿产资源“压舱石”作用和基础保障能力。优化年度开采总量控制指标管理机制，科学调控稀土、钨等矿产资源的开采规模。完善矿产资源权益金政策。

拓展多元化资源供给渠道。开发“城市矿山”资源，支持优势企业建立大型废钢及再生铝、铜、锂、镍、钴、钨、钼等回收基地和产业集聚区，推进再生金属回收、拆解、加工、分类、配送一体化发展。构建国家和企业共同参与，产品储备和资源地储备相结合的矿产资源储备体系。完善矿石交易市场体系，形成公开透明、公正合理的定价机制。推进矿产资源领域国际合作，按照平等互利、合作共赢原则，优化境外投资结构和布局，规范有序参与境外资源开发，增强矿产资源全球经略能力。鼓励轻烃等低碳石化原料进口。严格执行再生资源进口标准，推进优质再生资源进口。

专栏 5 战略资源安全保障工程
落实战略性矿产资源有关规划要求，实施战略性矿产国内找矿行动，实现找

矿增储。支持铁矿石、铜矿、稀土等国内重点矿山建设，遴选建设一批重要无机非金属矿产资源高效开发利用基地。建设符合产业政策的再生资源回收利用项目。鼓励企业规范开展境外资源勘探开发，建设采选冶一体化等综合性资源基地。

到2025年，资源保障能力明显提升，构建稳定开放的资源保障体系，形成一批国内一流的大型重点矿产开发企业，建设15个以上重点非金属矿高效开发利用基地。大幅提高铁金属国内自给率，废钢比达到30%以上，再生铜、铝产量比例分别达到35%、20%。

（二）增强配套支撑能力

拓展配套供应渠道。梳理原材料重点行业产业链供应链短板，开展关键设备、零部件、仪器仪表、原辅料等供应安全评估，制定配套供应保障工作预案。推动建立重点行业领域产业链供应链信息共享平台，加强关键配套产品的供需对接。支持企业建立应对产业链供应链安全的工作机制，建立健全储备体系，提高应急保供能力。鼓励企业制定实施“备胎”计划，推动供应渠道多元化布局。支持产业集聚区开展第三方备品备件原辅料供应服务。

强化短板装备开发应用。围绕地压监测装备、协同熔炼技术装备、大型熔铸设备、新型速凝冶炼设备等专用生产装备，高精密轴承、特种阀门、高压泵等关键零部件，无损检测设备等精密仪器仪表，支持上下游企业、科研院所与配套企业开展联合攻关，加快突破瓶颈制约，增强产业链供应链自主可控能力。利用首台（套）重大技术装备保险补偿机制，鼓励企业积极开发使用创新装备。适时调整重大技术装备和产品进口关键零部件、原材料商品目录，营造公平竞争的市场环境。

专栏 6 补链强链工程

组织协同攻关。鼓励产业链上中下游、大中小企业融通创新，组织高端专用生产装备、核心零部件、测试用精密仪器、核心原辅料、工业基础软件等协同攻关，打通供应链堵点断点。

拓展配套渠道。推动建立重点行业领域产业链供应链信息共享平台，加强关键配套产品的供需对接，建立关键领域产业链供应链联盟，支持企业间组建联合体，通过产业协同构建自主可控的生态体系。研究建立统筹兼顾战略储备和商业储备的储备体系，支持企业制定应对重大突发事件的重要物资、关键装备、备品备件等应急储备制度与工作预案，合理规划储备品种与储备周期，提升企业抗风险能力。

到 2025 年，主要产业链供应链断点堵点得到有效疏解，安全水平明显提升。

（三）提升安全生产水平

强化企业本质安全。坚持人民至上、生命至上，加大安全技术改造力度，淘汰达不到安全生产要求的技术装备。推动企业源头治理，降低安全风险，提高企业本质安全水平。落实好工业互联网+安全生产行动计划，利用信息化手段，构建基于工业互联网的安全生产感知、监测、预警、处置和评估体系，研究制定重点行业工业互联网+安全生产实施指南，开展试点示范。推进化工园区智慧化建设，推动城镇人口密集区危险化学品生产企业搬迁改造。

推动企业落实主体责任。指导企业落实安全生产法律法规标准体系，强化安全风险防范意识，履行安全生产主体责任，提升安全生产管理水平。支持、鼓励企业推进安全生产标准化建设，强化安全技术和管理团队作用，做好安全生产培训。指导企业完善重点部位、关键环节和重大危险源的监测预警机制，建立健全安全生产风险分级管控和隐患排查治

理体系。

八、保障措施

（一）强化规划实施

加强部门协同和上下联动。国家有关部门按照职责分工，抓好相关工作落实。各地加强与本规划的衔接，将规划主要内容和重大工程纳入本地区重点工作安排。石化化工、钢铁等重点行业围绕规划目标任务，结合行业实际制定具体实施意见。建立中期评估机制，对规划的完成情况及落实过程中出现的新问题、新情况加强动态跟踪，必要时按程序对规划内容进行调整。行业组织充分发挥连接企业与政府的桥梁作用，及时反馈规划实施问题和建议。

（二）加强政策协同

充分发挥规划引领作用，加强财税、金融、投资、进出口、能源、生态环境、自然资源、价格等政策与产业政策的协同配合。各级投资主管部门、自然资源主管部门把规划作为投资项目核准、备案以及用地用海审批的重要依据。对规划涉及的化工园区、基地、示范项目、重大工程等布局建设应落实区域“三线一单”生态环境分区管控要求，相关开发建设规划和建设项目应依法开展环境影响评价。充分利用现有资金渠道，支持规划涉及的重大工程。深化产融合作，发挥国家产融合作平台作用，通过金融服务、股权投资等方式，积极支持符合规划的项目。积极运用国际通行规则，营造公平竞争市场环境。加强知识产权保护和服务。

（三）强化人才保障

引导高校根据原材料工业发展需要优化学科专业布局，扩大矿山开采、冶金、材料、化学等学科专业人才培养规模。深化新工科建设，优化相关领域专业结构。开展原材料工业重点领域人才需求摸底，建设产业人才大数据平台和专家信息库。加强急需紧缺工程师和技术技能人才培养，实施职业教育提质培优计划。加大海外高层次团队、人才引进和服务保障力度。实施新材料人才培养计划，持续组织新材料领域人才出国（境）、国内培训。

（四）加大宣传引导

充分利用各种媒介，采取多种形式，加强对规划内容、实施进展和典型经验的宣传报道。制定精细化产业政策，消除社会将原材料工业“一刀切”列入“两高一资”行业的误区，切实增强行业自信，引导产城共融发展，为原材料工业高质量发展营造良好舆论氛围。充分发挥行业协会、专业机构作用，加强规划的宣贯、落实。