



SESEC V Translation

Implementation Plan of Standardization for Emerging Industries (2023-2035)

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Introduction

On 22 August 2023, China's Ministry of Industry and Information Technology, together with the Ministry of Science and Technology, the National Energy Administration, and the Standardization Administration of China, recently issued the **Implementation Plan of Standardization for New Emerging Industries (2023-2035)** (hereinafter referred to as the "Implementation Plan"). The purpose is to thoroughly implement the deployment requirements of the National Standardization Development Outline, continuously improve the standard system of emerging industries, and proactively plan for future industry standard research. The translation offered by SESEC is as follows.

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Implementation Plan of Standardization for Emerging Industries (2023-2035)

The emerging industries refer to the emerging and future industries that develop and expand with the application of new technologies. They are characterized by active innovation, intensive technology, and broad prospects for development. These industries relate with the overall situation of national economic and social development, together with the optimization and upgrading of industrial structure. Standardization plays a fundamental and leading role in promoting the development of emerging industries. The implementation of this Implementation Plan has far-reaching significance for promoting the high-quality development of emerging industries, as well as for accelerating the construction of a modern industrial system. The objectives for formulating this Implementation Plan are: thoroughly implement the requirements of the National Standardization Development Outline; continue to improve the standard system for emerging industries, forward-looking layout of future industrial standards research; give full play to the guiding role of the standard industry; systematically improve the economic benefits, social benefits and ecological benefits of the standard; and lead the high-quality development of emerging industries.

I. Guiding ideology

Guided by the Socialism with Chinese Characteristics for a New Era, the Implementation Plan will fully implement the guiding principles of the Party's 20th National Congress; based on the new development stage, fully, accurately and comprehensively implement the new development concept, serve the new development pattern, and stick to the new industrialization path. Make promotion of innovation and development of emerging industries and the seize of opportunities for future industrial development as the goals, while taking improvement of an efficient and collaborative new industry standardization work system as the starting point, in order to: finally coordinate and promote the research, formulation, implementation and internationalization of new industry standards; give full play to the new industry standards in promoting technological progress, service enterprise development, strengthen industry guidance, strengthen the leading role of industrial upgrading. Constantly improve the technical level and internationalization of new industry standards, which will eventually provide solid technical support for the acceleration of a high-quality development of emerging industries and the construction of a modern industrial system.

II. Basic Principles

Led by innovation. Optimize the linking system of industrial technological innovation and standardization; jointly promote technological R&D, standard research, and industrial development. Strengthen research on standards in key technological areas; promote standards for advanced and applicable scientific and technological innovations; and optimize the efficient transformation of scientific and technological innovations.

Driven by application. Face the development needs of emerging industries, stick to the principles including enterprises as a core of the development, market orientation, and application traction; strengthen the iteration of innovation results and the construction of application scenarios; strive to create a new industrial standardization work model that is led by large enterprises, deeply participated by SMEs and closely coordinated by the whole industrial chain.

Systematic layout. Strengthen the coordination of new industry development strategies, plans, policies, and standards; achieve a coordinated research and formulation of different types of standards including international, national, sector and association ones; comprehensively enhance the whole life cycle management of standard such as research, formulation, implementation, and review; continue the improvement of standardization work system for emerging industries.

Systematic implementation. Closely focus on the needs that initiate from high-quality development for standardization works; scientifically establish a medium and long-term goal that is forward-looking, systematic and phased; divide tasks in detail with clear schedule; strengthen systematic implementation; attach importance to phased evaluation results to ensure effectiveness.

Openness and cooperation. Deepen international standardization communication and cooperation and steadily expand the institutional openness of standards. Continue to improve the consistency of key technical parameters in Chinese standards with those of international ones. Combine China's practical experience in the development of emerging industries, extract technical specifications and management requirements to actively make contribution with Chinese solutions, and jointly formulate international standards.

III. Main Goals

By 2025, the standard system supporting the development of emerging industries will be gradually improved, and the formulation of standards leading the future industrial innovation and development will be accelerated. The proportion for common key technologies and applied science and technology planning projects to form standard will reach more than 60%, and the interaction between standards and industrial scientific and technological innovation will become more efficient. More than 2,000 new national and sector standards will be formulated, and more than 300 advanced association standards will be cultivated. Standards will play a stronger role in guiding high-quality industrial development. More than 10,000 enterprises will carry out standard promotion and implementation. More results will be demonstrated in regards of using standard service to help corporate transition and upgrade. Participate in the formulation of more than 300 international standards. The international standards conversion rate in key areas will exceed 90% and will support and lead the internationalized development of emerging industries.

By 2030, the standard system that fits the high-quality development needs of emerging industries will continue to be improved, and the standardization work system will be more optimized. The technical level and internationalization of new industrial standards continue to improve, and the leading role of standards on guiding high-quality development of emerging industries will be more significant.

By 2035, a more sufficient standard supply will support the high-quality development of emerging industries, and a new industrial standard working system will be formed featuring enterprise ownership, government guidance, openness and integration. The foundation for the standardized development of emerging industries will be more consolidated, and the results to have standards leading the high-quality development of emerging industries will be fully displayed, providing a strong support for achieving a basic level of new industrialization.

IV. Key Missions

(I) Optimize a highly coordinated standard working system for emerging industries

1. Coordinate the developing strategies for emerging industries including developing strategy, planning, policy, standard implementation etc. Focusing on the goals of new industrialization, manufacturing power, and cyber power etc., carry analysis and research for standard needs of emerging industries and reinforce the technical supporting role of standard to the implementation of industrial developing strategies. In the purpose of implementation of national, sectoral, and key sector plannings, accelerate the research, formulation and implementation of key and urgently needed standards in order to strongly support the phased implementation of the mentioned plannings. Insist on the joint research, deployment and implementation of standards and sector policies. Encourage the adoption advanced and applicable standards to support the deployment of sector plannings.

2. Promote and coordinate standard research and formulation of different types for new technologies. Closely follow the sector developing trend, and intensify the systematisms and compatibility of all kinds of standards (international standards, compulsory and voluntary national standards, sector standards and association standards). China's enterprises and public institutions are encouraged to formulate international standards jointly with upstream and downstream companies in the industrial chain all around the world. The research and formulation of compulsory national standards should focus on critical fields such as ensuring personal health, life, and property safety, those relate with ecological environment safety, and those that can meet the basic needs of economic and social management. The research and formulation of voluntary national standards should focus on technical requirements that meet basic and general requirements, supplement compulsory standards, and can take lead for sector developments. The research and formulation of sector standards should focus on enhancing key technologies, advanced techniques, testing methods, significant products and typical applications. Encourage social associations fast response on technical innovation and market needs, and independently formulate and

issue association standards, together with implementation of cutting-edge standard practice demonstration.

3. Coordinate on the promotion of full lifecycle management for new technology standards. Optimize a tracing, monitoring and correcting system that covers the full process from research, formulation, propagation, implementation to review, revision and repealing. Achieve a close-loop management between standard formulation and implementation feedback. Encourage sector association, standard technical organizations and standardization professional institutions to carry out propagation and training on the new technology standards. Guide enterprises on different links (R&D, production, and managements) to facilitate the application and promotion of new technology standards. Evaluate the implementation results of new technology standards through dynamic tracing and make timely standard review to ensure the standards meet the development requirements of new technologies.

4. Coordinate and promote the standardization construction on technical foundation of the new technologies. Reinforce the testing and verification of the key technical parameters in the new technology standards in order to improve the advancement and usability. Research and formulate a new batch of metering technical specifications in critical fields of new technologies, and to enhance the accuracy and scientificness of metrology. Speed up the reliability and quality of key areas; improve the standard development, and the level of product quality and brand influence. Strengthen the construction of a public service system on basic technologies in key areas of emerging industries; improve integrated service capabilities for new industry standards, metrology, certification and accreditation, inspection and testing, test and verification, industrial information, intellectual property rights, and results transformation.

5. Jointly promote the construction and management of standardization technical organizations in emerging industries. Closely follow the development needs of emerging industries, optimize and improve the existing standardization technical organizing systems, with full consideration of reality, timely form standardization technical organizations in emerging fields. Establish and improve the cooperation mechanism of standardization technical organizations in the upstream and downstream sectors of the industrial chain and the industrial ecosystem; jointly promote the development and implementation of key standards. Regularly organize and carry out assessment on standardization technical organizations, and continuously improve their working ability and effectiveness.

6. Work together to promote an integrated standardization development for large, small and medium-sized enterprises. Relying on sector associations, standardization technical organizations and standardization professional institutions etc., carry out standard training and diagnostic services for enterprises. Guide companies to improve standardization capabilities and encourage them to develop enterprise standards whose technical indicators are better than national and sector standards. Strengthen the concept of "top-level enterprises focus on standards" and give full play to the dominant role of leading enterprises in the construction of industrial ecosystems and supply chains; strengthen technical cooperation with SMEs in key supporting links; jointly carry out standard development; form a work pattern in which the whole industrial chain is in coordinated promotion, and upstream and downstream is consistently matching. Encourage high-quality SMEs to actively participate in the development of national and sector standards. Support qualified SME clusters in the same sector to develop association standards and have them participate in the application demonstration of advanced association standards.

(II) Intensify the standard capability on supporting industrial scientific and technological innovation system

1. Improve the linkage between standards and industrial technological innovation. Strive to make the foundation, capability and skill level of standardization as key setting basis for projects of critical common technologies and application technical programs. Increase the support for standardization work and carry out research and verification of key standards in critical technical areas in advance. Work to make standardization achievements be treated as the main output indicators of major projects and incorporate them into the performance evaluation system of science and technology plans, so as to improve the industrialization level of science and technology achievements. In light of the actual development of emerging industries, timely establish an assessment standard system on technology maturity, and encourage standardization professional institutions to carry out such assessment on emerging industries in accordance with standards.

2. Raise the transition level from advanced scientific and technological innovations to standards. Closely track and study the technological development trend of global emerging and future industries, accurately determine the core technical indicators and implementation methods in the standard, to effectively support the research and application of prospective basic technologies, leading general technologies, and leading original technologies. Improve the evaluation and service system on the transformation from scientific and technological achievements into standards; strengthen the evaluation on the advanced nature, applicability, and diffusion of the achievements of science and technology programs in key areas; build a database for scientific and technological innovation achievements that can be transformed into standards. Support professional standardization institutions and those of scientific and technological project management on to enhance coordination; speed up the transformation of scientific and technological innovation achievements (such as key common technologies, advanced production processes, and general test methods that are urgently needed and advanced in the industry) into standards.

3. Improve standard formulation quality. Strengthen the test and verification of key technical indicators, advanced manufacturing processes, and general test methods in the standards of emerging industries to ensure their technical contents are scientific and applicable. Strengthen the standard system construction for emerging industries; guide all stakeholders in the whole industry chain to coordinate in the standard research and formulation; ensure an effective connection of upstream and downstream standards. Intensify the tracking and evaluation of the implementation results of standards of emerging industries; establish a standardization benefit evaluation system in key areas and encourage standardization professional organizations to carry out trials for such evaluations. Strengthen the standard review of emerging industries; accelerate revision for out-of-date standards and continue to improve standard quality.

4. Improve the efficiency of standard formulation. Promote an efficient transformation from scientific and technological innovation achievements in emerging industries into standards; shorten the standard development period of new technologies, new processes, new materials, and new methods. Strengthen the standard pre-research emerging industries to improve the feasibility of standard development. Improve the overall standard planning and coordination of emerging industries; improve the collaboration of cross-industry and cross-domain standardization technical organizations and accelerate standard formulation. Guide sector associations and standardization institutions to strengthen the basic theories, working methodology and supportive capacity of standardization, and improve the review efficiency for key links and main standard contents. Develop machine-readable standards and promote digital transition for standards.

(III) Fully propel the standard system construction for emerging technologies

1. New generation of information technology. Optimize 5G standards on key scenarios and sector application. Develop digital information standards on integrated circuits, basic devices, energy electronics, ultra HD video, virtual reality etc.; develop software standards for basic software, industrial software, application software etc.; formulate standards in emerging digital sectors such as big data, Internet of Things (IoT), computing power, cloud computing, artificial intelligence (AI), blockchain, industrial internet, satellite Internet.

Column 1 New generation of information technology

The 5th Generation Mobile Communication Technology (5G). Revise and formulate 5G core network, base station and terminal equipment standards that covers 5G enhanced mobile broadband (eMBB), ultra-reliable and low-latency communication (uRLLC), high-speed and large connection Internet of Things. Develop 5G advanced (5G-A) technology standards that related with vertical sectors like non-ground networks, new passive IoT, and Integrated Sensing and Communication (ISAC). Develop 5G application and security standards for key sectors such as industry, medical care, power, and mining etc.

Electronics information manufacturing. Formulate standards for integrated circuit materials, special equipment and parts; develop or revise standards on design tools, interface specifications and packaging and testing. Develop high-end chip standards such as new memory and processors; carry out application standard research for artificial intelligence chips, automotive chips, and consumer electronics chips etc. Develop basic device standards such as intelligent sensors, power semiconductor devices, and new display devices. Formulate and revise standards in the fields of electrical connectors, fiber optics,

microwave devices and printed circuits. Develop standards on test methods, advanced products, system application standards for key technologies such as photovoltaic, power electronic devices. Develop standards for intelligent photovoltaic, testing and evaluation for energy storage product safety, intelligent system scheduling, intelligent operation and maintenance. Formulate basic and general standards such as UHD system, parameters and specifications; and standards for key technologies such as high dynamic range, three-dimensional sound, high-speed digital interface etc.; standards for key products like ultra high definition display equipment etc., as well as application standards on vehicle, culture, education, entertainment etc. Develop critical standards for virtual reality, health comfort, information security, content production, coding transmission, terminal equipment etc., and application standards like model architecture and solution in application scenarios.

Software. Focus on basic software, develop standards for industrial, desktop, server, intelligent terminal, embedded operating system standards, as well as middleware standards; develop standards on database such as centralized transaction, distributed transaction, analytical, mixed transaction analysis and processing, along with graph database etc., and standards on office software like stream, format, browser and others. Focusing on industrial software, develop basic standards such as classification, terminology, naming norms, etc.; formulate and revise standards for industrial software data model, industrial application and quality testing and assessment etc. Focusing on application software, develop standards for data models and interfaces, system interoperability, software architecture openness, application programming interfaces, typical scenarios, value and quality evaluation etc. Develop standards for open source, including terminology, licenses, connectivity, project maturity, community operation and governance, and open source software supply chain management etc.

Emerging digital fields. Develop basic and general standards for data quality, data management, data sharing, data security, etc., and data elements circulation standards such as data registration, evaluation, trading etc. Focusing on IoT, formulate and revise basic and general standards such as classification, description, security and reliability etc.; develop key technical standards such as high-precision indoor positioning, ISAC, new short-range wireless communication, edge computing, and digital twins etc.; standards on construction, operation and maintenance including planning, design, deployment, implementation, operation and maintenance etc.; and application standards for smart home, smart health and others. Focus on computing power, develop technical standards such as the linkage of facilities layer, network layer, IT layer and computing application layer; platform construction standards covering computing power scheduling, network monitoring, and the coordination of computing power and network etc., as well as standards for high energy efficiency and high security development of computing power. Develop cloud computing standards such as cloud operating system, intelligent cloud service, computing power service, cloud native, cloud migration, distributed cloud, edge cloud, industry cloud, cloud application, and cloud security etc. Focus on AI, develop basic hardware standards such as accelerators and servers; key software standards such as compilers, operator libraries and development frameworks; key technical standards such as natural language processing, computer vision and basic models; application evaluation standards such as intelligence level, service capability, and application scenarios in key sectors; and secure and reliable standards for risk management, ethical governance and privacy protection etc. Focus on blockchain, develop basic standards such as coded identification; technical and platform standards on consensus algorithms, smart contracts, cross-chain etc.; application and service standards such as service capability evaluation, testing and assessment, and documentation traceability etc., as well as developing operational and safety standards. Develop standards for collaboration of full industrial chain, digital supply chain system, new models and new formats, and digital transformation diagnosis etc. Focusing on the industrial internet, formulate: basic and general standards such as term definition, testing and evaluation, and management; network standards such as new industrial networks, identification resolution, and interoperability; platform standards such as data dictionary and cloud management, industrial mechanism model, low code development, and industrial intelligence technology; security standards such as network and data security protection management, and sector application standards.

2. New energy. Develop new energy generation standards such as photovoltaic (PV) power generation, solar

thermal power generation, and wind power generation; improve the grid-integration standards for new energy; formulate key equipment standards such as photovoltaic power generation and storage system, light thermal power generation system and wind power equipment.

Column 2 New energy

New energy power generation. Follow the developing trend of PV application, innovation and integration, develop standards for Building Integrated Photovoltaic (BIPV), PV energy storage system, PV agriculture, and PV transportation etc. Develop PV and thermal standards for supporting technology of trough, tower and Fresnel power generation, large capacity heat storage technology, and high parameter power generation technology. Formulate development and operation standards for deep-sea floating wind power generation, sand desert wind power generation, distributed wind power generation, and grid wind power generation, together with standards on wind power hydrogen production, and wind-solar hybrid power supply system. Conduct preliminary standard research on power generation using biomass energy and geothermal energy.

New energy grid-integration. Accelerate the research on standards on safe and stable operation and control for new energy grid-integration under the condition of high proportion on renewable energy and electronic equipment together with the summer and winter peaking period, formulate and revise new energy grid-integration standards for large-scale wind farm clusters, PV power stations, distributed PV, household PV etc. Develop grid standards covering UHV AC-DC, and intelligent control of distribution network. Formulate standards for power demand side resource development, application and other power demand side management, energy substitution, and distributed microgrid. Develop and promote standards related to the construction of charging and replacing facilities and service networks for electric vehicles.

Key equipment of new energy. Develop standard for new high-efficiency batteries and components, and optical storage components such as TOPCon, heterojunction, perovskite etc. Develop intelligent PV standards; optimize standards on PV module recycling and PV storage system testing, safety management and status assessment. Formulate offshore wind power engineering integration design and simulation, large capacity offshore wind turbine testing, large capacity and high voltage energy storage converter technology, and test and detection etc. Formulate technical standards of key equipment such as heat absorber, large capacity heat storage and trough collector in solar thermal power generation system. Develop standards for the condition monitor and maintenance of key components, intelligent operation and maintenance, fault warning, and renewal and life extension of wind turbine, etc.

3. New materials. Develop standards for advanced petrochemical and chemical materials, advanced iron and steel materials, advanced non-ferrous metals and rare earth materials, advanced inorganic non-metallic materials, high-performance fibers and products, and high-performance fiber composites. Under the needs of industrial integration and development together with the exploration of application scenarios, standard pre-research should be carried out on cutting-edge new materials.

Column 3 New materials

Advanced petrochemical and chemical materials. Develop advanced polymer material standards such as high-end polyolefin, engineering plastics, FVMQ materials, polyurethane materials, high-performance synthetic rubber, synthetic resin, thermoplastic elastomer, and high-performance fiber special materials, etc. Make standard research on performance characterization and test methods. Develop standards on high-end separation film, optical film, new energy film, conductive film and other special film materials. Develop standards applied to high purity and ultra-pure chemical used integrated circuit and chip sectors, such as covering industrial chemicals, high-end reagents and biological reagents etc. Formulate standards for special functional chemicals such as special coatings, special oils, photoresist, new energy

chemicals, bio-based materials, medical materials, and high-efficiency catalytic materials.

Advanced iron and steel materials. Develop standards on engineering structural materials, including high strength and toughness construction structural steel, high performance concrete structural steel, high strength bridge and cable steel, high performance marine steel, steel for steel structures etc. Formulate standards for mechanical structural materials such as high-strength and tough automotive steel, high-quality steel for parts and components, long-life wear-resistant steel, high-quality tool and mold steel, ultra-high strength steel, new generation superalloys, and black metal powder for additive manufacturing. Develop standards on functional materials, including ultra-large pipeline steel, high-performance electrical steel, special stainless steel, ultra-supercritical heat-resistant steel, hydrogen storage and transport steel, corrosion resistant alloy, amorphous nanocrystalline alloy etc.

Advanced non-ferrous metals and rare earth materials. With the application needs on lightweight, high performance and precision of materials, standards should be formulated for structural materials and testing methods on aluminum, magnesium, copper, titanium, nickel and other high performance non-ferrous. Develop standards for special welding materials, high-end coating materials, high/ultra-high purity metals and targets/evaporators, high temperature shape memory alloys, high strength and high elasticity and corrosion and wear resistant copper alloys, superconducting materials, precious metal slurry/catalyst and other functional materials and standards for their testing methods. Develop standards for advanced rare earth materials including rare earth permanent magnet, hydrogen storage, light function, polishing, catalysis, high purity etc., and standards on their testing methods. Standard pre-research should also be carried out for special rare earth functional materials

Advanced inorganic non-metallic materials. Formulate and revise standards for advanced inorganic non-metallic materials including but not limited in special glass, structural ceramics, and artificial crystals, and standards for relevant testing methods. Formulate and revise standards for functional materials covering technical glass, functional ceramics, advanced mineral functional materials, and energy-saving and long-life refractories. Guiding under the characteristics of high strength, high durability, recyclable, and green environmental protection, develop new building materials standards such as low-carbon cement, new wall materials, high-performance building waterproof materials, and high-performance lightweight heat insulation and sound insulation materials.

High-performance fibers and products, and high-performance fiber composites. Develop and revise standards for high-performance fiber and products, such as high performance carbon fiber, para-aramid fiber, polyimide fiber, special glass fiber, ceramic fiber and continuous basalt fiber. To meet the application requirements of lightweight, integrated and long life, standards for high-performance fiber composite material should also be developed.

Cutting-edge new materials. For the needs of integrated development and application scenarios for new material technology and information technology, nanotechnology, intelligent technology, etc., technical roadmap research should be strengthened on cutting-edge new materials (such as superconducting materials, intelligent bionics, liquid metal materials, and additive manufacturing materials); carry out standard pre-research on key technical standards and testing methods for cutting-edge new materials, so as to support the first applications and promotion of cutting-edge new materials.

4. High-end equipment. Develop basic and generic, key technologies, as well as industry application standards for industrial robots. Develop key and generic technology, complete machine, digital control, as well as core component standards for high-end computer numerical control (CNC) machine tools. Develop basic and general, key technologies, as well as high-end intelligent and green standards for agricultural machinery and equipment. Development basic and general, key materials, core components, electrification, as well as high-end intelligent and green standards for construction machinery. Develop key materials, core components, operation services and integrated application standards for medical equipment. Develop basic, key technology standards, as well as interconnection and intercommunication standards for intelligent testing equipment. Develop additive manufacturing equipment standards on core process and components, key technologies, testing and evaluation,

etc. Development equipment digitization and intelligent manufacturing standards on basics and generics, key technologies, typical industry applications, etc.

Column 4 High-end equipment

Industrial robots. Develop standards of terminology, classification, structure and other basic and generic standards for industrial robot; Develop standards of quality testing, performance evaluation, security communication, intelligent classification, cloud service platform and other key technical standards for industrial robot. Develop standards of process and special algorithm model standards, fusion device interface standards, application data security standards, and human-computer interaction safety and other standards for robot application in key industries; Develop general technical specifications, modular design and manufacturing standards, application safety and reliability standards, and other standards for new products of robots; Develop basic standards for proprietary safety, product standards, methodology standards and ethics standards in the field of emerging technologies of robots.

High-end CNC machine tools. Develop standards of high performance, high reliability, high precision retention test and evaluation standards, as well as product maturity evaluation and other key generic technical standards for CNC machine tool. Develop complete machine standards for high-end CNC machine tool standard. Develop high-grade numerical control system function and performance standards, high-grade numerical control system multi-sensor interface standards, intelligent process data interface standards, machine tool digital twin technology and interface standard and other digital standards. Develop standards of high-precision rolling functional parts, high-speed precision high-power electric spindle, large-capacity high-performance tool library, high-precision turntable, high-performance swing head, servo tool holder and other core components standards.

Agricultural machinery equipment. Develop standards of agricultural machinery equipment special materials, special sensors, key core parts standards, as well as agricultural machinery operation communication protocols, agricultural machinery performance tests and other basic general standards. Develop key technical standards of high-efficiency and fine cultivation, multi-functional field management, high-efficiency and low-loss harvest of grain feed, etc. Develop high-end agricultural machinery and equipment standards of high-horsepower tractors, high-standard farmland construction equipment, seed breeding and fine sorting processing equipment, intensive livestock breeding equipment, large-scale agricultural initial processing equipment, modern facility agricultural equipment, etc. Develop standards of intelligent agricultural machinery equipment with function of information perception, intelligent decision-making, accurate control, etc. Develop green agricultural machinery and equipment standards of energy saving, water saving, seed saving, fertilizer saving, medicine saving, green products and green factories, etc.

Construction machinery. Develop basic and general construction machinery and equipment standards of safety requirements, performance test methods, etc.; key materials standards of carbon fiber, graphene, special alloys, etc.; core components standards of high-speed bearings, high-pressure hydraulic parts, high-reliability fasteners, high-performance seals, etc.; as well as lightweight design standards. Focus on the electrification of construction machinery development needs to develop standards of pure electric drive, hybrid power, etc. Develop large, super large and multi-function construction machinery standards. Develop standards of intelligent construction machinery with function of information perception, intelligent decision-making, precise control, unmanned driving, etc.

Medical equipment. To meet the needs of the coordinated development of the whole industrial chain of medical equipment, develop key material standards of medical pipelines and other key material standards; Develop core components standards of medical sensors, medical regulating valves, etc.; Develop operational service standards of medical equipment manufacturing engineering evaluation, operation and maintenance engineering, etc.; Develop integrated application standards of medical equipment digitalization, informationization, and interconnectivity and intercommunication, etc. Strengthen the application of standards in typical medical equipment such as ventilators, extracorporeal membrane oxygenation machines, testing equipment, surgical operating room equipment, large medical imaging equipment, radiation therapy equipment, etc.; Support the construction of collaborative

manufacturing and service system for medical equipment.

Intelligent testing equipment. For the needs of key industries, develop basic standards of testing technology, methodology, etc.; Develop key technology standards of intelligent testing equipment function, performance, safety, reliability, and components, etc.; Develop interconnectivity and intercommunication standards of intelligent testing equipment, manufacturing equipment, software systems, etc.

Additive manufacturing equipment. Develop basic processes and equipment standards of additive manufacturing binder injection, directed energy deposition, powder bed melting, etc.; Develop new processes and equipment standards of multi-material, multi-color flow, array and composite additive manufacturing, etc. Develop data and interface standards of process database, data conversion, coding requirements, file format, etc. Develop standards of equipment acceptance, personnel evaluation, key parts testing, etc.

5. New energy vehicles. Focus on the field of new energy vehicles, and develop whole vehicle standards of power testing, safety specifications, economic evaluation, etc.; Develop key components system standards of drive motor systems, power battery systems, fuel cell systems, etc.; Develop core components standards of automotive chips, sensors, etc.; Develop intelligent and connected technology standards of automatic driving systems, functional safety, information security, etc.; Develop charging/battery swap infrastructure standards of conduction charging, wireless charging, hydrogenation, etc.

Column 5 New energy vehicles

New energy vehicle: whole vehicles. To meet the needs of power, safety and economic evaluation of new energy vehicles, formulate and revise whole vehicle power testing and evaluation standards of pure electric vehicles, hybrid electric vehicles, fuel cell vehicles, etc.; Develop safety and remote supervision standards for electric vehicles, and post-crash safety and hydrogen safety standards for fuel cell vehicles; Formulate and revise energy consumption limits standards and energy consumption conversion methods standards for electric vehicles.

Critical component system. Develop drive motor system standards of motor controller, reducer assembly, etc. Focus on improving the performance requirements of power batteries, and formulate and revise the safety, electrical performance, cycle performance, and thermal management system standards for power batteries. Develop power battery echelon utilization, recycling, carbon accounting standards to support battery life cycle management. Develop fuel cell systems standards of air compressors, hydrogen circulating pumps and durability.

Core components. Focus on the main application scenarios of power system, chassis system, body system, cockpit system and intelligent driving, etc., and develop automotive chip general requirement of environment and reliability, electromagnetic compatibility, functional safety, information security, etc.; Develop standards for chip products and technology applications for control, computing, sensing, etc.; Develop test standards of system matching, vehicle matching, etc.; Formulate device standards of high-precision sensors, LiDAR, high-precision cameras.

Intelligent and connected technology. Develop basic intelligent and connected vehicles standards of terminology and definition, autonomous driving system design, operating conditions, etc.; Develop general specifications of functional safety and expected functional safety process, audit and evaluation, whole vehicle network security, data security, software upgrade, digital certificate and password application, test targets; Develop product and technology application standards of emergency assistance, combined driving assistance, autonomous driving, vehicle operating system, data interaction, LTE-V2X connectivity function, etc.

Charging/battery swap infrastructure. For the needs of new energy vehicle in terms of conducted charging, wireless charging, hydrogenation, vehicle network interaction, etc., develop and revise

electrical vehicles standards of conducted charging connection device, interoperability, conducted charging performance, wireless charging communication consistency requirements, fuel cell vehicle hydrogen gun, hydrogenation communication protocol, and two-way charging and discharging interaction. For the needs of new energy vehicles in terms of battery swap, develop standards of pure electric vehicle on-board battery swap system interchangeability, general platform for battery swap, pure electric commercial vehicle batter swap safety, etc.

6. Green and environmental protection. Focus on the goal of achieving carbon peak and carbon neutrality, develop greenhouse gas standards such as basics and general standards, accounting verification standards, technology and equipment standards, monitoring standards, management and evaluation standards. Improve standards for green products, green factories, green industrial parks and green supply chains, etc. Develop standards for industrial energy conservation, industrial water conservation, industrial environmental protection, comprehensive utilization of industrial resources, etc.

Column 6 Green and environmental protection

Carbon peak and carbon neutrality. Develop basic and general standards of terminology and definition, data quality, marking and labeling, report declaration, information disclosure, etc. Develop standards for accounting and verification of greenhouse gas emissions, project greenhouse gas emission reduction and product carbon footprint. Develop technology and equipment standards of source control, production process control, end-of-pipe treatment, collaborative carbon reduction, etc. Develop monitoring standards of greenhouse gas emission monitoring technology, analysis methods, equipment and system, etc. Develop management and evaluation standards of green low-carbon evaluation, carbon emission management, carbon asset management, etc.

Green manufacturing. Formulate and revise basic general standards such as green manufacturing terms and attributes standards, etc.; Develop and revise green factory evaluation standards for each subsector and areas; Develop and revise green park standards of green industrial park evaluation general rules, etc.; Develop and revise green supply chain standards for industries with long supply chains and strong driving force; Develop and revise green design standards for key products, and continue to improve the green manufacturing standard system.

Industrial energy conservation. Develop new energy conservation standards for infrastructure. Develop equipment energy conservation standards of advanced energy-saving technologies and processes of key industries, energy-saving renovation of key energy-using equipment systems, etc. Develop energy saving methods and technology application standards of distributed energy, industrial green microgrid, renewable energy, waste heat and waste energy recovery and utilization, etc. Formulate and revise supporting management and service standards of energy measurement, energy efficiency testing, energy efficiency evaluation, energy system optimization and cascade utilization, energy management system, energy performance evaluation, energy auditing, energy conservation monitoring, energy conservation services, etc.

Industrial water saving. Develop standards of water intake quotas, water-saving enterprises and water-saving parks for key water-using industries such as petrochemicals, iron and steel, non-ferrous metals, gold, building materials, light industry, textiles electronics, etc. Develop water-saving process and technology application standards of waste water recycling and non-conventional water utilization, etc. Formulate and revise management and service standards on water balance testing, water footprint, water-saving diagnosis, etc.

Industrial environmental protection. Develop and revise the control standards for restricted substances in the automobile production process; Develop and revise the control standards for restricted substances in shipbuilding, electronics and other industries; Continue to promote the control requirements of hazardous substances in line with international standards. Formulate and revise technical standards for pollution reduction in key processes of industries of the petrochemical industries, iron and steel, non-

ferrous metals, gold, building materials, light industry, textiles, etc. Develop low noise technology product standards and industrial environmental protection equipment standards on low energy consumption, decentralized, modular, intelligent treatment of sewage, smoke, solid waste, etc.

Comprehensive utilization of industrial resources. Develop comprehensive utilization of industrial solid waste standards on tailings, smelting slag, industrial by-product gypsum, red mud, chemical waste slag, coal gangue, fly ash, etc. Formulate and revise standards for the comprehensive utilization standards on scrap iron and steel, scrap non-ferrous metals, recycled gold, waste paper, waste plastics, waste power batteries of new-energy vehicles, waste tires, waste glass, waste textiles, waste electrical and electronic products, waste photovoltaic products, waste wind power plants, waste marine engineering equipment, etc. Develop high value-added products remanufacturing standards on construction machinery, machine tools, mining machinery, etc.

7. Civil aviation. Develop aircraft standards on commercial aircraft, amphibious aircraft, helicopters, unmanned aerial vehicles, new power and new configuration of aircraft, etc. Develop engine standards on complete aircraft, key important components, airworthiness compliance, customer service, etc. Develop airborne system standards on avionics systems, flight control systems and electromechanical systems, etc. Develop aviation general basic standards on basic products, full life cycle data, manufacturing, etc. Develop operational support standards.

Column 7 Civil aviation

Aircraft. Develop commercial aircraft design standards on aircraft/engine integration, noise and drag reduction, fire prevention for the whole air craft, etc.; Develop standards on modular development, digital prototype, ergonomic simulation verification, system layout, weight control, etc. Develop general standards, air and water movement, wading structure, water load, water test and flight test, water support standards for amphibious aircraft. Develop ball-bearing rotor system, high performance transmission system with large load, bearingless tail rotor, rotor ice protection and deicing device standards for rotary wing aircraft. Develop standards for unmanned aerial systems, platforms, data links, ground control stations, and standards for cluster drones, internet connected drones, and intelligent drones. Develop new power standards on electric, hybrid and hydrogen energy, etc. Develop new configuration standards on variant aircraft, multi-rotor aircraft, etc.

Engine. Develop airworthiness compliance standards for turboshaft engine and large bypass ratio turbofan engine as well as key components and systems. Develop customer service standards for civil aviation engine delivery data, data accompanying the aircraft, maintenance/overhaul, etc.

Onboard system. Develop civil aircraft avionics system standards on communication and navigation software, hardware, data, collision warning equipment, automatic testing of airborne products, etc. Develop flight control system standards on flight control electronics, actuators, hydraulic control, flight control, etc. Develop electromechanical system standards on electric power, hydraulic, fuel, environmental control, oxygen, landing gear, etc.

General and basics & operational support. Develop basic product standards on civil aircraft materials, standard components, special components etc. Develop product data standards in different stages: aircraft product design, manufacturing, installation, delivery, service and other stages. Develop manufacturing standards on advanced forming technology, composite materials and component manufacturing, flexible assemble, etc. Develop operational support standards for flight operations engineering, aircraft operation safety, operations engineering, maintenance engineering, training engineering and technical publications, etc.

8. Ships and marine engineering equipment. Focus on the field of high-tech ships, and develop the overall design, final assembly, and construction standards for ship types; Develop key parts and system standards, and green management standards. Focus on the field of marine engineering equipment, develop overall design, final

assembly and construction, key system standards, and develop submersible standards.

Column 8 Ships and marine engineering equipment

High-tech ships. Develop the overall design, assembly and construction standards for key ship types such as large cruise ships, green and intelligent ships, polar ships, LNG ships, carbon dioxide carriers, and electric ships. Develop standards for marine diesel engines and key components, low carbon/zero carbon fuel engines, fuel supply systems, pod propeller, new deck machinery, medium and high voltage gas equipment, etc. Develop standards for ship energy efficiency management, energy consumption limit for marine products, carbon intensity calculation and carbon emission accounting, etc.

Marine engineering equipment. Develop overall design and assembly construction standards for new type of marine engineering equipment such as deep-sea oil and gas development equipment, offshore wind power equipment, deep-sea mining equipment, natural gas hydrate drilling and production vessels, deep-sea aquaculture equipment, large artificial floating islands, and offshore hydrogen energy equipment, etc. Develop key system standards for new type of marine engineering equipment, such as dynamic positioning system, single point mooring device, platform lifting device, underwater system, etc. Develop standards on submersible design and construction, testing and verification, operational support, etc.

(IV) Research on future industry standards for forward-looking layout

1. Meta-universe. Conduct research on the standardization roadmap of the meta-universe. Accelerate the development of basic and general standards for meta universe terminology, classification, marking, etc.; key technical standards for meta universe identity system, digital content generation, cross-domain interoperability, technology integration, etc; and service standards for virtual digital people, digital asset transfer, digital content rights determination, and data asset protection, etc. Research on application standards on industrial meta-universe, urban meta-universe, commercial meta-universe, cultural and entertainment meta-universe, etc; Carry out pre-research on standards of privacy protection, content supervision, and data security, etc.

2. Brain-computer interface. Carry out research on standardization roadmap of brain computer interface. Accelerate the development of basic and generic standards on brain-computer interface terminology, reference architecture, etc. Research on input-output interface standards on brain information reading and writing, etc.; Research on standards of data format, transfer, storage, presentation and preprocessing; Research on brain information encoding and decoding algorithm standards. Carry out pre-researching on manufacturing, medical health, education, entertainment and other industry applications standards, as well as safety and ethics standards.

3. Quantum information. Conduct research on standardization roadmap of quantum information technology. Accelerate the development of basic and generic standards on quantum information terminology and definition, functional model, reference framework, benchmark evaluation, etc. Focus on the field of quantum computing, and develop standards of quantum computing processors, quantum compilers, quantum computer operating systems, quantum cloud platforms, quantum artificial intelligence, quantum optimization, quantum simulation, etc. Focus on the field of quantum communication, and develop standards of quantum communication devices, systems, networks, protocols, operation and maintenance, service, testing, etc. Focus on the field of quantum measurement, and develop standards of quantum ultra-precision positioning, quantum navigation and timing, quantum high-sensitivity detection and target recognition, etc.

4. Humanoid robots. Develop basic standards of humanoid robot terminology, general ontology, whole machine structure, social ethics, etc. Conduct pre-research on humanoid robot basic standards on components, drive parts, electromechanical system components, controllers, high-performance computing chips and modules, energy supply components, etc. Develop intelligent perception-based decision and control standards on humanoid robot perception system, positioning and navigation, human-computer interaction, autonomous decision making and cluster control, etc. Conduct pre-research on system evaluation standards of humanoid robot movement, operation, interaction, intelligence ability classification and grading, performance evaluation,

etc. Conduct pre-research on safety standards on electromechanical systems, human-computer interaction, data privacy, etc. Conduct pre-research on humanoid robot application standards for scenarios such as the industry, home services, public services, special operation, etc.

5. Generative artificial Intelligence. For multi-modal and cross-modal data sets, develop basic standards on annotation requirements, quality evaluation, management capabilities, open source sharing, and transaction circulation etc. for data sets and corpora covering the data format of video, image, language, speech, etc. In the field of key technology of large models, develop general technical requirement, capability evaluation indicators, reference architecture, and technical standards on training, reasoning, deployment, and interface, etc. For the application and service based on generative artificial intelligence, and for the key directions of application platform, data access, service quality and application trust, etc., develop application standards on generative artificial intelligence model capability, service platform technical requirements, application ecological framework, service capability maturity assessment, generated content evaluation, etc. Conduct pre-research on risk management and ethical compliance of generative artificial intelligence products and services in key industries of the industry, medical care, finance, transportation, etc.

6. Bio-manufacturing. Develop standards of sensors and other key components; Develop standards of bioreactors and other production equipment; Develop standards of production technical specifications and other process standards. Optimize and improve standards of products, testing, evaluation methods, etc. in the fields of bio-manufactured food, pharmaceuticals, fine chemicals, etc.

7. Future display. Conduct pre-research on advanced technical standards of quantum dot display, holographic display, and retina display, etc. Develop key technical standards of Micro-LED display, laser display, printing display, etc; Develop key product standards of a new generation of display materials, special equipment, process devices, etc.; Develop scenarios application standards on smart city, smart home, smart terminal, etc.

8. Future networks. Conduct pre-research on standards of 6G basic theory, vision needs, typical applications, key capabilities, etc. For the next generation of internet upgrade and evolution, construct the "IPv6+" technical standard system; Develop core technical standards of segmented routing (SRv6), application-aware network (APN6), and in-situ flow information telemetry (iFit), etc. To meet the urgent needs of industrial and digital transformation, accelerate the development of key network technical standards on deterministic network, digital twin network, computing network convergence/computing power network, self-intelligent network, and endogenous network security, etc; For new scenarios of the land-sea-air-space integration, high-throughput and holographic communication, massive human-cyber-physical communication, etc.; Conduct pre-research on standards of new network system and architecture, routing protocols, and intelligent management and control, etc. Conduct pre-research on Web3.0 standards, develop basic standards of terminology, reference architecture, etc.; Develop technical standards of cross-chain technical requirements, distributed digital identity distribution, etc.; Develop application standards for scenarios of data asset trading, digital identity authentication, digital collection management, etc.

9. New energy storage. Focus on the field of lithium-ion batteries, and develop basic and general standards of battery carbon footprint, traceability management, etc.; Develop key raw materials and components standards of positive and negative electrode materials, protection devices, etc.; Develop recycling standards. For the development trend of new energy storage technologies of sodium-ion batteries, hydrogen energy storage/hydrogen fuel cells, and solid-state batteries, etc., accelerate the research on basic and general standards of terminology and definitions, transportation safety, etc.; accelerate the research on battery product standards of portable battery, small power battery, energy storage battery, etc.

(V) Expand new space for the development of high-level international standardization

1. Increase level of standard institutional openness. Actively create an environment for domestic and foreign-funded enterprises to participate in standardization work openly, fairly and impartially, and ensure that foreign-invested enterprises can participate in the formulation of standards in accordance with the law. Focus on trade facilitation, actively promote the effective alignment of quality standards, inspection and testing, certification and accreditation via major international cooperation projects in order to strive to achieve the goal that products sold domestically are produced on the same production lines, meet the same standards, and be of the same

quality as products for export. Focus on the needs of connection between policies, rules and standards, continue to promote the development of foreign versions of national standards and sector standards, and help China's technologies, products, projects and services "go global".

2. Accelerate the transformation of international standards. Organize relevant industry associations, standardization technical committees, and standardization professional institutions to systematically carry out comparative research and analysis of domestic and foreign standards in key areas of emerging industries, and study and refine the list of international standard projects that need to be converted in light of the actual development of China's industry. Prioritize the conversion of international standards projects in implementing the national standards plan and sector standards plan, continue to improve the conversion rate of international standards, and promote the compatibility of Chinese standards and international standards system.

3. Deep engagement in international standardization activities. Encourage domestic enterprises and public institutions to actively participate in the activities of international standards organizations and various international professional standard organizations, improve the international standardization working mechanism with enterprises as the main body and with the interaction between the industry, universities and research institutes, give full play to the technical support role of standardization research institutions and standardization technical organizations, contribute China's technical solutions, and work with upstream and downstream enterprises in the global industrial chain to jointly develop international standards. Set up an international standardization information resource database of key areas, and improve the standard information sharing and service level at home and abroad.

4. Promote the establishment of a sound international standardization cooperation environment. Advocate the concept of open, inclusive, cooperative and win-win international standardization, and safeguard the work system of international standards organizations. Continue to improve bilateral and multilateral cooperation mechanisms in the field of standardization, actively carry out standardization exchanges with BRICS countries and Asia-Pacific Economic Cooperation (APEC), continue to deepen standardization cooperation with Northeast Asia, Europe and the Asia-Pacific region, etc., and promote domestic and foreign associations and standardization organizations to establish mutually beneficial and win-win partnerships. Give full play to the role of the "soft power of the initiative" of international forums, publicize China's standardization policies and positions, tell the "China's story" well, and actively expand the international "circle of friends" in terms of standardization work.

V. Supporting Measures

1. Strengthen organizational leadership. Improve the cooperation mechanism for standardization work in emerging industries, improve the standardization technical organization system, strengthen horizontal coordination and vertical interaction, and timely study and solve problems in project implementation. Accelerate the development of comprehensive standardization research institutions and build high-end standardization think tanks. Relevant industry associations, local competent authorities for industries and information, science and technology, market regulation, energy, etc. should strengthen cooperation, formulate solid and feasible implementation measures, and coordinate the implementation of various tasks.

2. Increase resource input. Promote the increase of support to standards research while carrying out national science and technology planned projects and major industrial projects. Increase financial support for the standardization of emerging industries and strengthen policy support. Give full play to the advantages of the national advanced manufacturing cluster, support local governments to attach more attention to standardization work in key areas of emerging industries, encourage key enterprises to increase standardization related funding input, and actively guide social capital to gather in the field of new industrial standards, thus ensuring diversified sources of funding.

3. Conduct dynamic examination and evaluation. Strengthen the dynamic monitoring and effect feedback of the implementation of the program, and summarize and promote the new progress and new results of the standardization of emerging industries. Carry out regular evaluation of the progress and effect of the implementation of the program, and make dynamic adjustments of schemes.

4. Improve the capacity of talent team. Strengthen special training for standardization practitioners and improve

the standardization training system. Encourage standardization research institutions to train and attract high-end standardization talents and strengthen the construction of international standardization research institutions. Support enterprises to include standardized talents in the scope of professional ability evaluation and incentive, expand the "reservoir" of standardization professionals, and dedicate to standardization talent team building.

5. Pay attention to publicity and incentives. Hold the new industry standardization pilot summit to exchange the achievements and typical experiences of new industry standardization. Support units and individuals that have made outstanding contributions to the standardization of emerging industries to participate in evaluation of national awards. Local governments and social organizations are encouraged to reward outstanding units, individuals, and advanced standard projects in the area of standardization of emerging industries in accordance with the relevant provisions of the State.

Introduction of SESEC Project



The Seconded European Standardization Expert in China (SESEC) is a visibility project co-financed by the European Commission (EC), the European Free Trade Association (EFTA) secretariat and the three European Standardization Organizations (CEN, CENELEC and ETSI). Since 2006, there has been four SESEC projects in China, SESEC I (2006-2009), SESEC II (2009- 2012), SESEC III (2014-2017), SESEC IV (2018- 2022) and SESEC V (2022-2025). Dr. Betty XU is nominated as the SESEC expert and will spend the next 36 months on promoting EU-China standardization information exchange and EU-China standardization cooperation.

The SESEC project supports the strategic objectives of the European Union, EFTA and the European Standardization Organizations (ESOs). The purpose of SESEC project is to:

- **Promote European and international standards in China;**

- **Improve contacts with different levels of the Chinese administration, industry and standardization bodies;**
- **Improve the visibility and understanding of the European Standardization System (ESS) in China;**
- **Gather regulatory and standardization intelligence.**

The following areas have been identified as sectoral project priorities by the SESEC project partners: Internet of Things (IoT) & Machine-to-Machine(M2M) communication, communication networks & services, cybersecurity & digital identity, Smart Cities (including transport, power grids & metering), electrical & electronic products, general product safety, medical devices, cosmetics, energy management & environmental protection (including eco-design & labeling, as well as environmental performance of buildings).