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Exclusive Interview

How to cultivate talent for standardization

Interview with experts from ISO, Lenovo and CSEDS

ISO、联想、中国教育发展战略学会专家谈标准化人才培养

Spotlight

A review of China's standardization work in 2024

2024中国标准化社会关注度评议

Special Report

International standards promote sustainable development of tourism

国际标准推动旅游业可持续发展

CSP
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The national standard GB/T 44130.1—2024, *Charging and battery swap service information exchange for electric vehicles—Part 1: General rules*, has taken effect since Sept. 1, 2024.

It is applicable to the information exchange among charging and battery swap platforms, and between these platforms and other systems and devices.

公益广告


Embracing 2025
with confidence and courage

Reflecting on the past year can help us figure out the wins and losses and improve our performance this year.

China Standardization Press (CSP) organized a campaign at the end of 2024 to vote the 10 big events, 10 outstanding figures and 10 standards that catch great attention of the year. The vote was taken on the WeChat account of CSP, receiving about 46,500 page views. You can find the results in the SPOTLIGHT column.

CSP also interviewed several experts during the International Standardization Youth Star Competition held in Beijing in November 2024. Anna Gallet, ISO's project manager on education, and Rachel Miller Prada, ISO's manager on capacity building, shared their insights into how to attract young people to participate in standardization work and their comments on the competition. Liu Wei, Director of Global Quality, Standards and Environmental Affairs of Lenovo, talked about the role of standardization in technological innovation and product upgrade of Lenovo, and what kind of standardization experts are needed in a tech company. Chen Guangju, Former Vice President of Beijing Normal University shared his opinions about the advantages of the competition and measures to cultivate standardization experts.

The SPECIAL REPORT column introduces a recently published international standard, ISO 14785:2024, *Tourism and related services—Tourist information services—Requirements and recommendations*, whose development was led by Chinese experts. The article details the development process and highlights of the revised version, China's efforts in the tourism industry, and progresses made so far. The standard is of great significance for promoting the sustainable development of global tourism.

The RESEARCH & EXPLORATION column presents three academic papers, which focus on the research into problems and countermeasures of technical barriers to trade in the photovoltaic industry, how standardization promotes the development of intelligent manufacturing, and the overview of China's standardization development.

2024 was a year of solid achievements. On this basis, we believe that the standardization community can make more impressive achievements in 2025!

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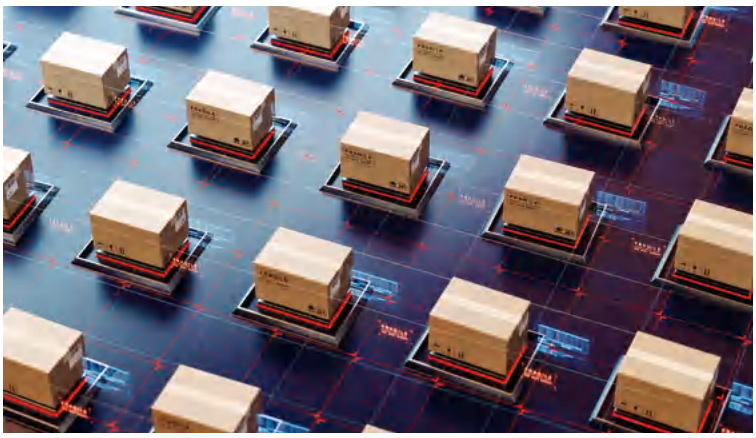


National standard proposals on digital transformation approved

The digital economy has become an important impetus of global economic growth. The rapid development of emerging and key technological fields, such as the new generation of information technology and biotechnology, has put forward new requirements for standards development.

However, the traditional mode of standards development relying on paper documents faces problems such as low efficiency, long cycle, and relatively low quality, which fails to meet current demands.

Therefore, major international and regional standards organizations as well as standardization bodies of developed countries have already begun to develop machine-readable standards, promoting the digital transformation of standards in terms of strategic planning, technological research, mechanism building, platform development, and industrial practice.

Learning from advanced practice, the National Standardization Administration of China (SAC) recently announced that China has initiated the research on digital transformation of standards. Led by the China National Institute of Standardization (CNIS), the research on digital transformation of standards in China has kicked off in all respects, covering top-level design, key technologies, full chain of application scenarios, and other projects.

The proposals of 15 national standards were approved in 2024, laying a foundation for providing the common knowledge and general technological rules of the transformation. In 2025, efforts will be made to carry out research on large language models of standards, intelligent standards development, data analysis, and other aspects. The construction of National Library of Standards will be improved to build the world's leading standards data resource center and standards research and service platform. Based on the newly established national collaboration mechanism of standardization research institutions, it is expected to improve the new mode of sharing and coordinating standard resources, to promote the digital cooperation of standards.

GCC Special Interest Group on Energy Saving and Decarbonization set up in Beijing

The Global Computing Consortium (GCC) established the Special Interest Group on Energy Saving and Decarbonization on December 20, 2024 in Beijing. The founding meeting was attended by nearly 40 representatives from universities and research institutions, R&D and production enterprises, operators, new-type household appliance manufacturers, third-party testing and certification bodies, and other units in the computing field online and on-site.

An expert committee was set up to enhance the strategic planning and systematical progress of the special interest group, which is composed of renowned professionals such as Guan Xiaohong, Academician of Chinese Academy of Sciences.

Experts from the Branch of Resource and Environment Research of CNIS, Huawei Technologies Co., Ltd., the Cloud Computing & Big Data Research Institute of the China Academy of Information and Communications Technology (CAICT), and related institutions were invited to make special reports on issues including the standardization progress of energy efficiency of computing infrastructure, ICT equipment facilitating green transformation, and technological application of green data centers.

Authorized by the Ministry of Civil Affairs, the GCC is an international non-profit social organization. The Special Interest Group will focus on the coordinated development of digitalization and greenness, welcome the participation of relevant international and domestic parties, strengthen international cooperation and exchanges, promote the energy-saving and low-carbon development of the computing industry, and boost the all-round green transformation of economic and social development by digital technologies, to realize the goals of carbon peak and neutrality.

National Railway Administration releases measures to manage railway technical standards

To address the standardization demands of the railway industry under the new circumstances, the National Railway Administration revised current regulations, and issued the *Measures for Management of Railway Technical Standards* to implement relevant deployments and mechanism construction, based on the current situation of railway standards system and standards management.

Taking effect on December 9, the Measures is an important basis for railway standardization work, and provides fundamental rules for formulating plans on railway standardization development, establishing railway standards system, developing and revising national and sectoral standards for railway, organizing standards implementation, and supervising the effect of standards implementation. It can strengthen the management of technical standards for railway, boosting scientific and technological progress, and guaranteeing safe construction and operation of railway.

There are 7 chapters and 56 articles in the Measures, which delineates the general provisions, management responsibilities, standards planning, standards development, standards publication, standards implementation and supervision, as well as other necessary information including general requirements for association and enterprise standards.

Catering to the new circumstances, the Measures stipulates the scope and implementation requirements of standards in the three major fields of equipment technology, engineering construction and transportation services, and clarifies requirements for procedures of standards development and revision. It further defines the type of national and sectoral standards, and the scope of sectoral railway standards.

The requirements for standards copyright, patents, standards implementation in the transitional period, standards interpretation and other aspects are improved as well.

CCSA convenes the 2024 work meeting

The 2024 work meeting of China Communications Standards Association (CCSA) was held on December 26, which was attended by over 260 officers and representatives from relevant authorities and institutions.

The meeting was virtually addressed by Shan Zhongde, Vice Minister of MIIT. Xi Guohua, Director of the Strategic Steering Committee of CCSA, Guo Huanxin, First-class Inspector of the Standards Technical Management Department of State Administration for Market Regulation (SAMR), Yu Xinli, President of China Association for Standardization, Wen Ku, Chair of CCSA, attended and addressed the meeting. Dai Xiaohui, Vice Chair and Secretary General of CCSA, made a work report to the attendees.

CCSA has vigorously participated in the development and promotion of domestic standards, and introduced standards for 3G, 4G and 5G to global partners, which has become a major player in China's standardization of information and communications technology (ICT), and a strong impetus to improve China's standards for ICT, said Shan Zhongde.

CCSA has made achievements in leading the development of the industry and implementing major national deployments, said Guo Huanxin. Facing the new trends of digital, intelligent, integrated, and green development of the global industrial chain, CCSA can make efforts to support the development of new quality productive forces with better standards, giving play to the fundamental role of standards in safeguarding the stability of industrial chains, driving the high-quality economic development with standards, and steadily expanding the institutional opening up of standards.

The meeting laid out the roadmap of standardization work in 2025, and initiated the standardization work plan of ICT in the 15th Five-Year Plan period (2026-2030).

Report on standardization achievements of the BRI on its 10th anniversary issued

SAMR (SAC) and relevant departments jointly issued the *Report on the Standardization Achievements of the 10th Anniversary of the Belt and Road Initiative (BRI)* recently, to summarize the fruitful results in promoting the connectivity of standardization among Belt and Road countries in the past 10 years.

The Report specifically introduces the achievements of standardization work within the framework of the BRI in the past decade in the five priority areas: policy, infrastructure, trade, financial integration, and people-to-people connectivity. It provides reference for further utilizing standards and promoting high-quality BRI development.

CMA publishes Annual Report on Meteorological Standardization Development (2024)

China Meteorological Administration (CMA) issued the *Annual Report on Meteorological Standardization Development (2024)* on December 27, 2024.

Composed of 6 chapters, the report thoroughly analyzes the development trend and status of meteorological standardization, its management, construction of meteorological standards system, application of meteorological standards, and basic capacity building of meteorological standardization. Through summarizing the development characteristics, and analyzing the existing problems, it puts forward suggestions for future development.

The report will be released year by year, aiming to put together the annual achievements in national meteorological standardization, and demonstrate the development status of China's meteorological standardization, and provide reference for meteorological departments at all levels and practitioners to understand the development trend and promote meteorological standardization work.

The 3rd Education Standardization Development Forum marks a new chapter

The Implementation Plan of Selection and Building of Pilot Colleges for SOP (Standard Operating Procedure) Standardization Talent Cultivation was released at the 3rd Education Standardization Development Forum on December 28, 2024, marking the establishment of service system for the pilot of integrated education of profession and standardization.

Witnessed by Zhang Tianbao, former Minister of Education, Zhang Xiaogang, former President of ISO, and over 100 attendees, cooperation agreements were signed between Chinese Society of Educational Development Strategy (CSEDS) and other parties, including OUC Education and Training Center, Beijing Zhongcai Guoke Education Technology Co., Ltd., and China Quality Certification Centre.

To address demands of building China's strengths in education under the new circumstances, we are now facing problems such as the shortage of standardization talent and incomplete training system, said Zhang Tianbao. After standardization engineering and standardization technology have been included in the list of undergraduate majors, the proportion of colleges carrying out standardization training nationwide is still less than 1%, which restrains the talent supply for China's standardization strategy.

In response to the problems, CSEDS and the OUC Education and Training Center worked together to set up the cooperation mechanism for the special action plan on standardization talent cultivation, integrating resources in industry and education, and leveraging the roles of colleges and academic associations.

Zhang Xiaogang stressed that China has made achievements in international standardization activities, but there is still a long way to go. From the manufacturing industry to the high-quality development of China, the demands for high-level standardization talent become increasingly prominent. Those who have a grasp of professions, standards, and foreign languages are capable of participating in international standardization activities.

China-CEEE standardization exchange on sci-tech innovation held

The China-CEEC Standardization Exchange Event on Science, Technology and Innovation was convened on December 12-13, 2024 in Yiwu, Zhejiang province.

Hosted by China Science and Technology Exchange Center and held by China Jiliang University (CJLU), the event was themed "standards innovation promotes high-quality development: tasks and challenges of standardization development of biomanufacturing", which is the third event of the series of activities, China-CEEC InnoShare, in 2024. More than 150 representatives from governments, universities, research institutions and enterprises in 15 countries attended the meeting to discuss cutting-edge achievements in sci-tech innovation.

The event aims to promote the technical innovation and achievement application through standardization, and facilitate international technical cooperation and exchange in the metrology sector. It highlights the coordinated research and mutual recognition of technical regulations and standards, which is expected to boost the high-quality Belt and Road cooperation, and build an international community of sci-tech innovation with openness, inclusiveness, and mutual benefit.

The International Intelligent Biomanufacturing Standard Development Alliance was launched during the event. It serves as a new approach to facilitate the industrial development with standardization, and will support the application of technologies in the field of biomanufacturing.

Three seminars were held as well, where 16 experts at home and abroad made keynote reports, including Song Mingshun, Chair of ISO/TC 321, Bron Kisler, Chair of ISO/TC 215/SC 1, Mi Xianqiang, Professor at Chinese Academy of Sciences, Midhat Jašić, Professor at the University Tuzla in Bosnia and Herzegovina, Wang Baojun, Professor at Zhejiang University, and Dr. Servet Atayeter, Manager of ISO/TC 34/SC 3.

ISO releases two standards on steel

Two international standards, ISO 6331:2024, *Chromium ores and concentrates—Determination of chromium content—Titrimetric method*, and ISO 6934-2:2024, *Steel for the prestressing of concrete—Part 2: Cold-drawn wire*, were officially published, to which Chinese experts have contributed efforts.

The revision of ISO 6331:2024 was led by experts from the Technical Center for Industrial Product and Raw Material Testing of Shanghai Customs District. The standard specifies a titrimetric method for the determination of the chromium content of chromium ores and concentrates. As the largest importing country of chromium ores and concentrates, China contributes its experience in this field, which benefits the trade settlement of enterprises.

Ren Cuiying, an expert from China Metallurgical Information and Standardization Institute, assumed the Convenor of ISO/TC 17/SC 16/WG 17, which is responsible for the revision of ISO 6934-2:2024. The standard was jointly drafted by relevant experts at home and abroad based on the technical consensus of product specifications, performance requirements, and test methods of stress relieving wire and cold-drawn wire for pressure pipelines.

ISO 6934-2 refers to China's national standard on the steel for the prestressing of concrete, specifies requirements for round, cold-drawn, high-tensile steel wire, that is either plain, indented, spiral ribbed or crimped. Without revision for approximately 30 years, the standard now meets the new demands of the market and the industrial development, provides technical support for regulating the production and trade of steel for concrete, and facilitate the going global of advanced products.

WTO's working group on MSMEs discusses trade development and standards cooperation

A session of the Informal Working Group on Micro, Small and Medium Enterprises (MSMEs) was convened in hybrid form on December 10, 2024, which is a mechanism within WTO to address burdensome barriers faced by MSMEs trying to engage in international trade, and widen the discussion on these issues at a multilateral level.

Yao Xin, Secretary-General of CCPIT Commercial Sub-council (CSC), made a keynote speech themed "empowering MSMEs to enter international market".

He introduced the good practices of CCPIT CSC to serve MSMEs in China, and focused on its service system covering standardization, information consulting, conference and exhibition, international liaison, commercial law, quality brand building, and talent training, which is based on the initiative on DCCN, an abbreviate for international trade and standards cooperation in French.

In response to the ISO President Sung Hwan Cho's call for DCCN at the 8th China Forum on Standardization of Trade in Services on September 14, 2024, CCPIT CSC led the release of the initiative on DCCN.

The participants showed interest in the background, vision, and progress of the initiative, and wanted to know more good practices of CCPIT CSC. The initiative is highly compatible with the work of the Informal Working Group on MSMEs, and its promotion and implementation can support MSMEs to better participate in the international market, further promoting global trade and economic development, said Matthew Wilson, Chair of WTO's Informal Working Group on MSMEs.

ISO/TS 9546 on third-party payment services released

Third-party payment (TPP) is an evolving model of payment services provided by third-party payment service providers (TPPSPs) for every end user using a payment account in another entity. TPP plays an important role globally by complementing the offer of the traditional financial market players and contributes to the efficiency of payment transactions and financial systems.

ISO/TS 9546:2024, *Guidelines for security framework of information systems of third-party payment services*, was issued by ISO recently, in which NetsUnion Clearing Corporation made great efforts.

As the second international document for TPP that led by China, ISO/TS 9546:2024 introduces the practice and experience of mobile payment in China. It stipulates the security framework, design principles, functional requirements and other aspects of TPP services. It will help enhance the security of information system, reduce the risk of payment and transactions, ensure the security of users' funds, and facilitate cross-border business, which will promote the healthy development of the payment industry.

In recent years, under the guidance of the People's Bank of China and SAC/TC 180 on finance, the NetsUnion Clearing Corporation has participated in the development of 31 financial standards, given its business and technical strengths in aspects including TPP security, interconnection of barcode payment, application of cloud computing and distributed technology, and open source software governance. It has contributed to 4 international standards and 27 standards at national, sectoral and association levels, facilitating the high-quality development of the financial industry.

How to cultivate talent for standardization

Interview with experts from ISO, Lenovo and CSEDS

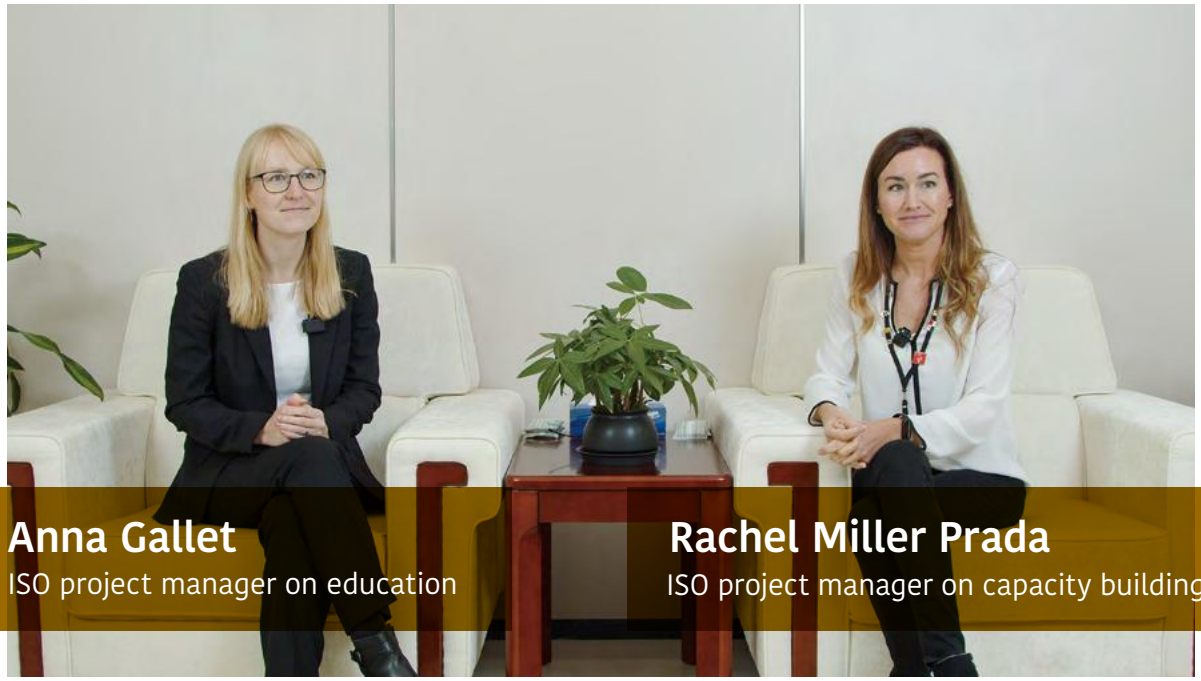
如何培养标准化人才

——专访国际标准化组织、联想集团、中国教育发展战略学会专家

Standardizers are the most active element in standards development, and education is the core of standardization talent cultivation.

To enrich students' experience in practical standardization work, the International Standardization Youth Star Competition 2024 was held in Beijing on November 10, in which students selected from universities and colleges across China prepared proposals and drafted standards with four different themes. The competition attracted the attention of both academia and industry.

During the interview with China Standardization Press, several experts engaging in standardization, business, and education gave their insights into the development of standardization education at home and abroad.



Anna Gallet
ISO project manager on education

Rachel Miller Prada
ISO project manager on capacity building

What is the role of training talent in the standardization work?

Anna Gallet: Standards are very important, but unfortunately they are often invisible. From ISO's point of view, standards and standardization make lives easier, safer, and better.

Ensuring that the next generation of experts actually learn about standards is very important. We want to ensure the environment is as diverse and inclusive as possible. Since many of our technical experts are currently nearing the end of their professional careers, we want to make sure that new generation is coming in, who come from different backgrounds and different domains, and we want to encourage the participation of different genders.

One of our goals is to have all voices heard within ISO. There has been research done on the fact that diversity and inclusion also boost innovation. So we want to make sure that our standards are at the forefront and we look forward to welcoming new experts.

How can we attract young people in the standardization work?

Rachel Miller Prada: Standardization work needs to be demystified, not only at the international level, but also at the national level. When you say the word "standardization", people think it is boring or it is really complicated to get into. But I think it is important for ISO and anyone involved in standardization to help those young people who want to be involved and build the future of the world, making sure that we make young people aware of why standardization is important and the role that it plays in society. I think the first thing is to promote standardization and its importance, and then remove those barriers for young people and anyone in general to get involved in standardization work.

What has ISO done to promote talent cooperation?

Anna Gallet: We have had several programs over the years. A good example is the ISO education programme and through that we are looking at how different ISO members are including standards and standardization in their educational curriculum.

This is very difficult, especially at primary and secondary level, so many of our members prefer to do this at higher education level. We are trying to understand how they are doing this in different countries and share as much information as possible because many members have questions about "where do I start", "how should I do this", and "what is that a student at primary, secondary or university level should know". When we share this information, our members can learn from each other and in many cases even collaborate to create systems that are similar.

What should China focus on to further promote education for standardization?

Anna Gallet: I would say that China is at the forefront. In comparison to what other countries are doing, China has a specific strategy on standardization education and is addressing it at different levels.

There are wonderful initiatives like the International Standardization Youth Star Competition that engages with students and gives them the opportunity to see firsthand standardization work and how they can potentially participate in it further. Now that these students know what standardization is, how they can actually get into the system and become the technical experts of tomorrow is an issue from the international standardization perspective.

What do you think of the competition?

Rachel Miller Prada: Any opportunity that helps young people and professionals get involved and exposed to standardization is great. I think this particular competition and the next generation award are particularly helpful because usually finance is a huge barrier to get young people to get involved in standardization and even be exposed to standardization.

The next generation award allows young standardizers at an ISO member to come to the ISO Central Secretariat in Switzerland to gain knowledge, find out what is going on in standardization, and work in different units involved. Then they are expected to take that knowledge they have learned at the international level and use that to further develop their own national strategy and responsibilities within their home countries. It is a really great opportunity to help standardizers get more knowledge and awareness and then develop that further.

Anna Gallet: If you want to be successful in standardization, you have to be very good at communicating. You have to be aware of cultural differences, and have good negotiation skills because it is really about bringing together experts from all around the world and finding the best possible solution to a problem. You also have to have the problem-solving mindset. All of those skills are very important, not only in standardization but also in other aspects of professional careers. Within the standardization world, young people are more willing to learn if they know the fact that the knowledge is going to be very useful for their future.

Why should students engage in standardization work?

Rachel Miller Prada: When I was a young student, I had no idea about standardization. It wasn't even in my realm of awareness, but understanding and working on standardization now makes me

see the value of anyone, more specifically young people, being involved in standardization. Because you literally are helping solve current problems, helping develop solutions for future problems, and building the world that we are all going to live in. Is there any better way to contribute to society than to participate in standardization?

As Anna said before, the exposure to standardization and having the knowledge and skills is extremely marketable as an employer, because you are going to have knowledge and skills that probably no one else in your circle of friends might have.

As a future employee in the job market, a student should actively communicate and make the future employer aware that these are specific skills that one has.

Anna Gallet: When you become part of the standardization world, the networking opportunities that you have are almost endless, because you will come together with technical experts from all around the world.

I think that is an invaluable opportunity. And I would say that unfortunately, as Rachel already mentioned, standards are not really understood by many people. But in general, when you think about international work and the work of international organizations, the documents of the UN, for example, are black-and-white. They are quite boring, technical, and dense, but that is the best possible way that we have found as a global community of addressing certain issues. So are standards. When hundreds of people have come together to solve one problem, I think that is very inspiring and I would love to know about this world and the role that I could play.

Do you have any expectations for the next International Standardization Youth Star Competition?

Rachel Miller Prada: I think it is really great exposure for young students and young professionals to build their knowledge and exposure to standardization. So my expectation is just simply to keep it going because any exposure is time well spent and it is contributing to current world problems by helping make solutions. I hope that the competition continues to grow more beyond the borders of China, and expand internationally. Let's see what the future holds for it.

Anna Gallet: I am just extremely looking forward to seeing the young talent, interacting more with participants, and learning a little bit more about them and how they came to participate in the initiative. I would totally agree with Rachel. We are very excited about what the future holds.

Liu Wei
Director of Global Quality, Standards and Environmental Affairs, Lenovo

What role does standardization play in the technological innovation and product upgrade of Lenovo as a world-leading technology company?

Standardization plays a crucial role in Lenovo's technological innovation and product design, which can be reflected in the following aspects:

First, standardization helps define the technical route of technological innovation and product upgrade. Through comparing it with internationally advanced routes, we can find a better one and standardize it.

Second, standardization is beneficial to technological R&D. It enables the better application of technological R&D in customers' usage scenarios.

Third, it also plays an essential role in quality management and control. Standardizing the manufacturing process of Lenovo and the component quality management process of suppliers can help improve the product reliability and user experience.

Last but not least, it is a great channel to enhance international communication and cooperation.

I would like to illustrate these effects with a few cases. At the just-concluded Technology Innovation Conference, Lenovo proposed full-stack new technologies for artificial intelligence (AI), including AI agents, a hybrid of AI and PC, and an artificial intelligence platform. In the AI technological upgrades, we believe that standardization plays a very significant role, accelerating the implementation of technologies. We also hope to standardize the practice of the implementation process.

We have currently developed the association standard for AI PC, and proposed an IEEE standard project. Next, we hope to promote the development of national standards for AI PC through efforts. I think the process of standardization can make our AI, AI and PC, and hybrid artificial intelligence technologies easier to copy and transplant.

The second case is about green manufacturing. Lenovo has won many awards for green manufacturing system, in which process standardization has played a vital role.

For example, the zero-carbon factory in Tianjin city was established through standardization. In a situation that the definition of zero-carbon factories is not very clear, we have developed the association standard for zero-carbon factories with the China Electronics Standardization Institute, and used it to establish the entire Tianjin zero-carbon factory from scratch. Standards are used as a tool in the entire construction process, selection of environment-friendly materials, subsequent energy and resource management, and the greening and intelligent production.

We have also participated in the development of many international and national standards on green environmental protection and ecological design throughout the entire life cycle in IEC/TC 111, *Environmental standardization for electrical and electronic products and systems*, and the National Standardization Technical Committee for Environment of Electrical and Electronic Products and Systems (SAC/TC 297). We have promoted green and low-carbon transformation in the upstream and downstream of products and supply chains through standards-led approaches.

Thank you for sharing your profound understanding of standardization work from a technical perspective. For Lenovo, are there any gaps in the area of standardization talents?

Standardization talent training is always the area that Lenovo attaches great importance to. I am Director of the Global Standards and Environmental Affairs Department, which is part of the overall organizational system of the Global Quality Department.

We have many professionals in quality with clear training programs. However, there is still a relatively large gap in standardization talents who know product sales, services and R&D well.

In fact, the role of the standardization talents is very significant. In our research institutes and R&D systems, for example, many artificial intelligence laboratories require standardization talents to participate in the development of standards. Our product R&D department also needs to standardize key technologies for product development, and use standards-led approaches to drive innovation in the product R&D system.

Our service system is designed to provide customers with a better service experience where standardization plays a vital role. So in the entire process of R&D, production, supply, marketing and services, there are many standardization tasks that can be done more professionally. I think these are the future employment directions for standardization talents.

For example, our standards department can participate in various national and international standardization organizations, and represent the company in these organizations, enhancing the external influence, and bringing external experience for implementation.

Compliance is fundamental. For example, if the EU has a new directive or a country has issued a new technical standard in a certain technical field, we will make comparison in the entire process of R&D, supply chain, production and manufacturing of our product chain. We also hope to innovate through standards-led approaches, and develop some standards to lead technological progress and change.

Chen Guangju

Former Vice President of Beijing Normal University
President of Education Standards Committee, Chinese Society of Educational Development Strategy

Can you share your understanding of standardization?

In November 2023, the National Standardization Administration of China (SAC), Ministry of Education, Ministry of Science and Technology, Ministry of Human Resources and Social Security, and All-China Federation of Industry and Commerce jointly issued the *Special Action Plan for Standardization Talent Cultivation (2023–2025)*. This is highly significant for standardization education.

My initial standardization experience was participating in talent-related projects in 2003, a part of medium- and long-term plans for national science and technology development. At that time standardization was emphasized at the national level. Now, it becomes more critical. To achieve high-quality development, high standards are essential, which requires standardization talent.

We need talent for researching, managing, and applying standards and making them internationalized. We also need educational talent, as education serves as the foundation. The 20th CPC National Congress and the Third Plenary Session of the 20th Central Committee both emphasized the critical role of educational talent. Without well-developed education, the vision of a strong educational nation cannot be realized, not to mention high standards and high-quality development. Therefore, the development of educational talent is of paramount importance.

We should provide systematic, multidisciplinary training. Developing standards requires both relevant expertise and the knowledge of standard-setting rules and international procedures. Otherwise, the standards may not align internationally. Hence, it is crucial to train professional and international standardization talent, especially those who are capable of bridging the gap with international standards.

What is your opinion of this year's International Standardization Youth Star Competition?

I think this competition is very successful and valuable.

First, it raises the public awareness of standards. Teaching standards solely in school is not enough. The public awareness of standards must be enhanced to help people know standards for agriculture, manufacturing, and other sectors.

Second, it helps talent cultivation. Professional talent must be knowledgeable in both expertise and standardization. The competition undoubtedly involves interdisciplinary elements, encouraging participants to explore more.

Third, it promotes self-directed learning. The participation in the competition requires creative thinking and learning. Students need to explore unfamiliar areas, such as Huawei's engineering reports, which are highly specialized. Without such self-directed study, students would find it challenging to compete in the competition.

Fourth, it innovates evaluation methods. The competition offers an excellent opportunity for new ways of evaluation. It attracts more students to participate in standardization. By mastering both professional knowledge and standardization processes, we can better promote social progress and high-quality development.

What further efforts are needed to cultivate standardization talent?

I think, first of all, a curriculum framework should be established. Without a foundational curriculum framework, it is unclear for students to know what to learn.

Second, practical training bases should be created. In the past, education often focused on textbooks. Now, more practice is needed. Standardization talent development must integrate practice, such as partnerships with enterprises like Huawei, CATL, and Hunan Sunsimiao Pharmaceutical Company. These companies can help build training bases to support this work.

Third, interdisciplinary approaches should be used to cultivate standardization talent. They need to learn both professional expertise and standardization knowledge. When I was working as the president of Beijing Normal University at Zhuhai, our model for public welfare education involved professional courses in the first two years and public welfare courses in the next two years. This approach ensured that students were proficient in both their specialties and public welfare undertakings. A similar model could work for standardization. Universities can offer minors, electives, or second-degree programs for standardization, integrating the concept into young talent and enabling China to advance further and faster.

Fourth, international exchange should be enhanced. Developed countries began their industrial revolutions one century ago, while China's reform and opening up only started over 40 years ago. We must draw from international experiences and share China's solutions.

I hope that more young students will participate in the competition. Through continuous self-improvement, they can make greater contributions to the development of the nation and society.

采访/方洛凡　编辑、翻译/方洛凡 曹欣欣

(Interviewer: Fang Luofan; edited and translated by Fang Luofan and Cao Xinxin)

A REVIEW of China's standardization work

2024中国标准化社会关注度评议

Waving goodbye to the past year and embracing the new year, we are happy to see the remarkable progresses in China's standardization field, and are optimistic about the future.

In 2024, the standardization community earnestly put the important policies and deployments of the Central Government in place, and implemented the *National Standardization Development Outline*, making outstanding achievements.

In last December, China Standardization Press conducted an online voting on its WeChat account to select the 10 major events, 10 outstanding figures, and 10 standards with greatest impact in 2024. The five-day campaign attracted the participation of standardizers and the public across the nation, reaching nearly 46,500 page views. Here, the results are presented to our readers.

10 major events
年度标准化新闻事件

1. SAMR issues the *Guidance on Antimonopoly of Standard Essential Patents*

On November 21, 2024, the State Administration for Market Regulation (SAMR) issued the *Guidance on the Anitimonopoly of Standard Essential Patents*, aiming to prevent and stop operators from abusing standard essential patents to eliminate and limit competition behaviors, and protect fair competition in the market. It can also foster innovation, improve the operational efficiency of economy, and protect consumers' interests and public interests.

2. SAMR and WTO jointly release the Chinese version of ePing SPS&TBT platform

On May 23, 2024, SAMR and WTO officially started to provide the Chinese version of the ePing sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) platform. The ePing platform is designed to facilitate SPS&TBT measures. On the platform, users can browse notifications on new and updated product regulations, search information on trade concerns discussed by the WTO SPS and TBT committees, and reach out to national and international counterparts.

Now, the official languages of the platform are English, French, and Spanish. Other three languages, Chinese, Portuguese and Vietnamese, are also provided.

3. *Action Plan on Promoting Large-scale Equipment Upgrades and Trade-ins of Consumer Goods Led by the Improvement of Standards* issued

SAMR and other six ministries and commissions issued the *Action Plan on Promoting Large-scale Equipment Upgrades and Trade-ins of Consumer Goods Led by the Improvement of Standards* on March 27, 2024, to support the implementation of the *Action Plan on Promoting Large-scale Equipment Upgrades and Trade-ins of Consumer Goods* released by the State Council earlier. It lays out a list of nearly 300 national standards to be developed and revised in 2024 and 2025, which will exert the role of standards in promoting upgrades, expanding consumption, and smoothing circulation.

4. First National Standardization Knowledge Competition held

The First National Standardization Knowledge Competition, hosted by SAMR and National Standardization Administration of China (SAC), came to a successful conclusion on October 14, 2024, the 55th World Standards Day.

A total of 519,000 standardizers participated in the competition with 270 million visits on the online competition platform. The competition popularized standardization knowledge broadly, creating a good atmosphere of enhancing the role of standards. As a result, 8 teams from provinces and municipalities including Heilongjiang, Shaanxi, Jiangsu, Fujian, Shandong, Shanghai, Anhui, and Hunan won the First, Second and Third Prizes of Group Awards respectively.

5. First AI National Standards Evaluation Benchmark System "Qiusuo" released

"Qiusuo", the First AI National Standards Evaluation Benchmark System, was released at the New Industry Standardization Navigation Meeting, which was jointly organized by China Electronics Standardization Institute (CESI) and CESI Certification Co., Ltd. on November 21.

The Qiusuo system was jointly developed by CESI and CESI Certification Co., Ltd., which contributes to the preparation of 12 national standard, provides series of evaluation benchmark tools, such as the AI system performance testing benchmark (AISBench), big model evaluation benchmark (LMBench), and AI software and hardware adaptation testing tools (AICL).

6. AI standardization TC of MIIT established

The Ministry of Industry and Information Technology (MIIT) established the AI standardization technical committee (MIIT/TC 1), which is responsible for the development and revision of sectoral standards in areas such as AI evaluation and testing, operation and maintenance, data set, basic hardware, software platform, big model, application maturity, application development and management, and AI risks.

The technical committee is composed of 41 members, and its secretariat is held by China Academy of Information and Communications Technology (CAICT).

7. National data standardization TC established

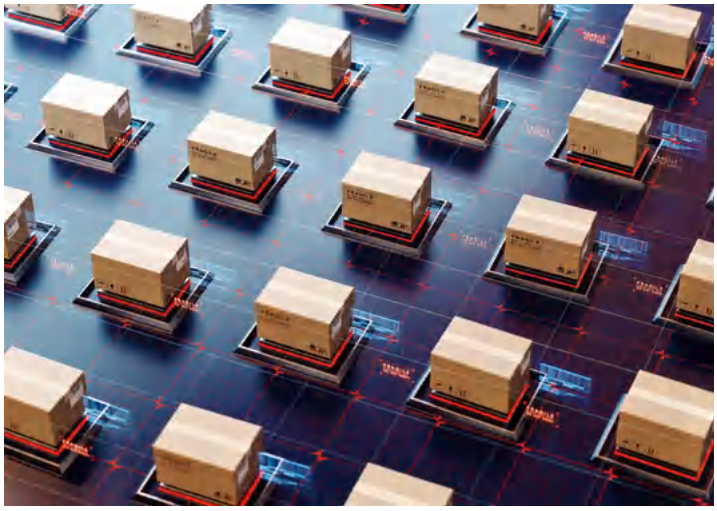
To promote the effective circulation and supply of data, and make good use of data safely, the national data standardization technical committee (SAC/TC 609) was approved to be established in October.

The technical committee is mainly responsible for the technical management, organization, and proposal submission and approval of national standards in the data area, including the common and fundamental standards on data resources, data technology, data circulation, smart cities, and digital transformation; data infrastructure standards to support data circulation and use; and security standards to safeguard data circulation and use.

8. Secretariat of ISO/TC 344 held by China

The inaugural meeting of ISO/TC 344, *Innovative logistics*, took place in Qingdao city, East China's Shandong province at the end of May 2024.

The work scope of the technical committee includes the development of general requirement, framework, metrics, guidance, performance indicator, and evaluation for innovative logistics; innovative provision of service assurance for logistics; innovative operation, service and synergy optimization in logistics. Now, it has 14 participating members and 12 observing members, with 2 ISO standards under development. Its secretariat is held by China.



9. SAC releases the Comprehensive Performance Evaluation Index System of Association Standards Organizations

In August 2024, SAC released the *Notice on Comprehensive Performance Evaluation Index System of Association Standards Organizations*. The Index System is composed of 4 first-level indexes, 21 second-level indexes, and 59 third-level indexes, covering 18 basic requirements for charge management, intellectual property management and others.

The comprehensive performance evaluation of association standards organizations can be carried out according to the Index System, and the full score of evaluation result is 100. Organizations with over 95 scores are graded three stars, and those with 85-94 scores and 70-84 scores are graded two stars and one star respectively.

10. *Action Plan on Implementing the National Standardization Development Outline (2024-2025)* issued

On March 18, 2024, SAMR and 17 other ministries and commissions jointly issued the *Action Plan on Implementing the National Standardization Development Outline (2024-2025)*, to guide the implementation of the Outline in the next two years.

The Action Plan puts forward specific requirements for key tasks, which includes 35 provisions in 3 parts. It requires the relevant governmental departments in all regions to earnestly implement the Action Plan based on their actual situation.

10 outstanding figures
年度标准化新闻人物

1. Guo Chenguang
elected the chair of PASC Executive Committee

The 46th Pacific Area Standards Congress (PASC) was held in July 2024. At the meeting, Guo Chenguang, Deputy Director-General of Standards Innovative Management Department, SAMR, was elected as the Chair of the PASC Executive Committee (PASC EC) for the 2025-2027 term. It is the first time for a Chinese official to take a leading post at PASC.

PASC EC reports to PASC, and is open to all members of PASC. On recommendation of the PASC EC, the Chair of the PASC EC is appointed by PASC for a three-year term from the members of the PASC EC and can be reappointed for additional three-year term as agreed by PASC.

2. Li Xiaobin
receives ISO Excellence Award

In September 2024, Li Xiaobin, Research Fellow from Chinese Academy of Machinery Science and Technology Group Co., Ltd. (CAM) and Committee Manager of ISO/TC 1 on screw threads won the ISO Excellence Award this year. Prof. Li is the first Chinese expert in the field to win the award, marking that China's standardization work in the screw threads area has won the recognition of the international community.

ISO/TC 1 was established in the same year as ISO. Since 2004, China has held the secretariat of ISO/TC 1, and led the development and revision of more than 20 international standards.

The ISO Excellence Award recognizes the contribution of individuals for recent achievements related to ISO's technical work that can be considered as a major contribution to furthering the interests of standardization and related activities.

3. Liu Meng

elected as project leader of 8 ISO standards for solar energy

The plenary meeting of ISO/TC 180/SC 1, *Climate—Measurement and data*, took place online on October 23, 2024, which was attended by some 20 representatives from countries such as China, the U.S., Germany, Spain and South Korea.

At the meeting, Liu Meng, Research Fellow from China National Institute of Standardization (CNIS) was elected the project leader of 8 series international standards of ISO 24871, *Solar energy—Test methods for pyranometer performance*. He is responsible for leading the development of these 8 standards. Prior to this, Li served as the convenor of ISO/TC 301/WG 19 on integrated district energy system.

4. Yao Xin

serves as convenor of ISO/TC 260/WG 17

Yao Xin, Secretary-General of Commercial Sub-council, China Council for the Promotion of International Trade (CCPIT CSC) served as the convenor of WG 17 on performance management under ISO/TC 260, *Human resource management*.

The proposal of ISO/AWI 30442, *Human Resource Management—Performance Management—Guidelines*, was approved by ISO. It is the first standard proposal of China approved by ISO/TC 260 since its establishment in 2011. The standard will become the first international standard for performance management in the world.

5. Qu Liang
assumes the manager of ISO/TC 349 on cultural heritage conservation

The inaugurating ceremony of ISO/TC 349, *Cultural heritage conservation*, was convened in Beijing on May 13, 2024. Its secretariat is held by the Palace Museum. Qu Liang, Head of the Standardization Institute for Cultural Heritage Conservation, the Palace Museum, serves as the committee manager.

The establishment of the technical committee was approved by ISO/TMB in March 2024. It is the first of its kind in the area ever since ISO was established in 1947. It indicates that Chinese standards in the cultural heritage field have taken full stride in internationalization.

At present, ISO/TC 349 has 32 participating members and 13 observing members.

6. Qin Daqing
awarded the title of National Outstanding Engineer

A grand ceremony was held at the Great Hall of the People in Beijing on January 19, 2024 to present for the first time the National Engineer Award, the nation's highest honor in the field of engineering. Qin Daqing, Chair of SAC/TC 546 on marine energy converters and Secretary General of SAC/TC 175 on hydraulic turbines, was awarded the title of National Outstanding Engineer, who gave a speech at the event.

Taking advantage of his expertise, Qin has promoted standardization to coordinate and interact with technological innovation and engineering application in the industry, and applied standards in the manufacturing of hydropower equipment.

The hydroelectric generating set with world's largest single capacity has been completed in China, which marks that it has taken the lead in the manufacturing of hydropower equipment. Standardization has played a crucial role in promoting the high-quality development of China.

7. Gu Zhengbiao

assumes the convenor of ISO/TC 93/WG 9 on modified starches

Nominated by China Federation of Commerce, Gu Zhengbiao, Vice President of Jiangnan University and Secretary General of SAC/TC 552, *Starch and starch derivations*, was officially appointed as the convenor of ISO/TC 93/WG 9, *Modified starches*, at the 18th plenary meeting on July 1 and 2, 2024 after a vote within the technical committee. He will serve for a three-year term until the end of 2026.

Created in 1958, ISO/TC 93 has only one working group. The committee focuses on the standardization of terminology, methods of sampling, methods of analysis and examination of starch (including hydrolysis products and dextrins) and its by-products.

8. Ma Guanghui

serves as the chair of SAC/SWG 36 on bioprocess

SAC/SWG 36, *Bioprocess*, was approved for establishment by SAC in April 2024, whose secretariat is held by the China National Institute of Standardization (CNIS). Bioprocess, closely related to the upstream technologies and downstream industries, is a key process for the manufacturing of bioproducts, which can greatly support the continuous innovative development of biotechnologies.

SAC/SWG 36 is composed of 39 experts from research institutes, universities, industry associations, biotechnology enterprises and other organizations across the country. Ma Guanghui, Academician of the Chinese Academy of Sciences, serves as the chair of the working group.

The working group is in charge of the development and revision of national standards in the areas such as fundamental and general aspects, design, constituent materials, equipment and technical control of bioprocess.

9. Bai Yuqi receives the ISO Excellence Award

At the 58th plenary meeting of ISO/TC 211, *Geographic information/ Geomatics*, in June 2024, Dr. Bai Yuqi, Professor in the Department of Earth System Science, Tsinghua University, received the ISO Excellence Award for his outstanding contribution to the geographic information standardization area.

As the convenor of ISO/TC 211/WG 7, *Information communities*, Dr. Bai has led the development of ISO/TS 19130-3:2022, *Geographic information—Imagery sensor models for geopositioning—Part 3: Implementation schema*. The standard addresses the shortage of coding schemes for remote-sensing image geopositioning models. It helps integrate multi-source remote sensing data in an accurate and rapid way, conduct the reliability test of geographic information, and improve the compatibility and robustness of related software.

10. Thirty-two experts honored with IEC 1906 Award

In September 2024, 228 outstanding international standardization experts from 25 countries were honored with the IEC 1906 Award. Created in 2004, the annual award recognizes experts with outstanding contribution to the international electrotechnical standardization.

A total of 32 Chinese experts won this award this year, hitting a record high. They are Li Yun, Liu Jie, Ding Zhenpei, Pan Aiqiang, Wu Ming, Liu Haitao, Liang Xidong, Zhang Tianjue, Peng Chunrong, Guo Hai, He Jian, Rong Ling, Xiong Zhuang, Chen Yi, Zheng Dongning, Liu Shenxing, Mou Xi, Huang Qiuxin, Teng Yun, Zhang Yewen, Tan Bo, Song Weihong, He Huiwen, Sun Huadong, Du Chao, Xing Lin, Yang Shuping, Yuan Wangtan, Huang Hua, Chen Zhengwei, Wan Biyu, and Wang Feifei.

To date, 233 Chinese experts have won the IEC 1906 Award. More and more Chinese experts have participated in the development of IEC international standards, and practically made breakthroughs in international standardization with growing recognition from the international community.

10 standards attracting great attention

年度最受关注标准

1. GB 45067-2024, *Criteria for major accident potential of special equipment judgment*

The mandatory national standard GB 45067-2024, *Criteria for major accident potential of special equipment judgment*, was released on November 28, 2024, and put into effect on December 1, 2024.

Based on the *Measures of Special Equipment Safety Supervision and Inspection* and relevant technical regulations for safety, the standard defines major accident hazards in the use of special equipment, and provides explicit judging criteria for identifying and dealing with special equipment hazards. It is of great significance for improving the safety level of special equipment.

2. Three national standards for furniture: GB 28008-2024, GB 18584-2024, GB 28007-2024

On June 25, 2024, SAMR (SAC) released three mandatory national standards for furniture, which are GB 28008-2024, *Technical specification for the safety of furniture structure*, GB 18584-2024, *Limit of harmful substances of furniture*, and GB 28007-2024, *Technical specifications for the safety of infants' and children's furniture*.

GB 28008-2024 specifies the basic safety requirements and relevant safety requirements based on the characteristics of different products, playing a key technical supporting role in ensuring users' personal safety.

GB 18584-2024 stipulates the limit of harmful substances in various furniture, adds the definition and limit value of total volatile organic compounds, harmonizes related testing indicators, and puts forward the new nondestructive testing method for formaldehyde emission. It helps improve the quality and safety level of furniture.

GB 28007-2024 outlines the general safety requirements of the furniture for infants and children under 14 years old as well as the safety requirements and relevant test and verification methods for specific products. It helps regulate the design, production and sales of such furniture.

3. General management guidelines for product quality reliability

General management guidelines for product quality reliability, the first of its kind in China, was jointly released by the market regulation departments of Beijing, Tianjin, Shanghai and Chongqing municipalities in Shanghai on November 26, 2024.

The standard focuses on prevailing problems in product quality reliability management, establishes a complete quality management framework, and sets out overall requirements for the design, analysis, test, and assessment of reliability, as well as evaluation and improvement of use reliability. It provides a clear implementation path for enterprises by illustrating items and types of reliability work and giving detailed requirements and implementation steps.

It helps enterprises improve quality and efficiency in fields such as information technology, and intelligent manufacturing, which is of importance to the quality improvement, production safety and industrial upgrading of the manufacturing industry.

4. Two national standards for electric vehicles: GB 44263-2024 and GB 39752-2024

Two mandatory national standards for electric vehicles, GB 44263-2024, *Safety requirements for electric vehicle conductive charging system*, and GB 39752-2024, *Safety requirements of electric vehicle conductive supply equipment*, released on July 24, 2024, will be put into effect on August 1, 2025.

GB 44263-2024 defines the basic requirements for electric safety, environment adaptation, mechanical strength, electromagnetic compatibility and other aspects of the charging system, and GB 39752-2024 puts emphasis on installation position, structural design, fault protection and other aspects of the supply equipment.

The two standards will improve the charging safety and reliability of charging piles, ensure the safety of people, equipment and vehicles in the charging process, and promote the development of charging infrastructure in a healthy, safe and sustainable way.

5. GB 2760-2024, *National food safety standard for uses of food additives*

A total of 47 national standards for food safety and 6 ones with modification were jointly released by the National Health Commission (NHC) and SAMR on March 12, 2024, including the high-profile GB 2760-2024, *National food safety standard for uses of food additives*.

The revised mandatory national standard will come into effect on February 8, 2025. It specifies the types of additives allowed in food, and specifies the scope and amount of use. It is of great significance for regulating the use of food additives and ensuring food safety.

It deletes the types of food additives that are no longer technically necessary after conducting a survey and their terms of use. Enterprises should avoid using such food additives.

6. GB/T 24067-2024, *Greenhouse gases—Carbon footprint of products—Requirements and guidelines for quantification*

GB/T 24067-2024, *Greenhouse gases—Carbon footprint of products—Requirements and guidelines for quantification*, whose development was led by CNIS, was released by SAMR (SAC) on August 23, 2024. Proposed by the Ministry of Ecology and Environment, the standard is in the charge of SAC/TC 548 on carbon management.

With an adoption of ISO 14067, the standard defines the research scope, principles and qualification methods of product footprint. It is designed to fill the gap of common standards for product carbon footprint accounting in China, and provide an important basis for relevant standards for specific products.

It helps enterprises explore the potential of energy conservation and emission reduction, and actively respond to the barriers of green trade around the world.

7. GB 44917-2024, *Hygienic requirements for the bulk transportation of edible vegetable oils*

The mandatory national standard GB 44917-2024, *Hygienic requirements for the bulk transportation of edible vegetable oils*, was released by SAMR (SAC) on October 28, 2024. The standard will be put into effect on February 1, 2025.

The standard specifies the terminologies in the bulk transportation of edible vegetable oil, as well as the basic requirements, cleaning, maintenance, management, transportation operation, records, and sanitary requirements for bulk transportation containers.

According to the standard, containers for edible vegetable oil must be packaged in dedicated food-grade containers clearly marked "for edible oil only" or "food use only". The interior and exterior of the containers must be clean and sanitary. Containers used for non-food items are prohibited from transporting edible vegetable oil.

8. ISO 14785:2024, *Tourism and related services—Tourist information services—Requirements and recommendations*

The international standard ISO 14785:2024, *Tourism and related services—Tourist information services—Requirements and recommendations*, was officially published, whose development was led by Chinese experts, according to a press conference held by the Ministry of Culture and Tourism on December 5, 2024.

The international standard focuses on tourist information services, injecting Chinese elements into international tourism standards, which will play an essential role in participating in the international tourism governance and promoting the sustainable development of tourism.

The standard will facilitate the normative management and quality improvement of global tourism industry, and provide important support for overseas tourists to travel in China.

9. GB/T 44831-2024, *General technical requirements of skin-on-a-chip*

GB/T 44831-2024, *General technical requirements of skin-on-a-chip*, the first of its kind, was published on October 26, 2024, whose development was led by Gu Zhongze, President of Suzhou Institute of Medical Devices, Southeast University.

The standard defines the relevant terminologies of skin-on-a-chip and the technical requirements including appearance, cell source, component performance, and biological performance. It can be applied to the design, production and testing of skin-on-a-chip products with micro-fluidic chips as a carrier.

The standard indicates a major progress of organ chip standardization in China, which is of great significance for pushing forward the normative development of its scientific research and industrial application. It will effectively enable the high-quality development of the industry.

10. GB 15979-2024, *Hygienic requirements for disposable sanitary products*

GB 15979-2024, *Hygienic requirements for disposable sanitary products*, was released by SAMR (SAC) on June 25, 2024 together with other 17 mandatory national standards. The standard was revised by the National Disease Control and Prevention Administration with highlights in the following five aspects.

First, the scope of the standard is adjusted. The definition of disposable sanitary products is modified, and the terminologies and definitions of sanitary wipes, antibacterial agents, bacteriostatic agents and others are added. Second, the sanitary requirements for raw materials are refined, and the prohibited substances of raw materials and requirements for production water supply are increased. Third, the sanitary requirements for production process are optimized. Fourth, the sanitary requirements of products are strengthened, physicochemical indicators are added, and the requirements for microbial contamination indicators and toxicological safety are modified. Fifth, relevant testing methods are updated and supplemented. GS

编译/靳吉丽 曹欣欣
(Edited and translated by Jin Jili and Cao Xinxin based on the results)

International standards promote sustainable development of tourism

国际标准推动旅游业可持续发展

By Jin Jili
文/靳吉丽

The Ministry of Culture and Tourism (MCT) held a press conference on December 5, 2024 in Beijing, inviting several guests to give a comprehensive introduction to ISO 14785:2024, *Tourism and related services—Tourist information services—Requirements and recommendations*. The international standard was published by ISO recently, whose development was participated in by Chinese experts with great efforts.

The international standard focuses on tourism information services, which is of great significance for promoting the sustainable development of global tourism. It also indicates a new chapter for China, as it is the first time to contribute its best practice to the development of an international tourism standard.

Background and process of developing ISO 14785:2024

Li Yubing
Deputy Director-General of Standards Innovative Management Department, SAMR

Standardization work has always been highly valued by the Chinese government. The 20th CPC National Congress in October 2022 emphasized the steady expansion of the opening up of rules, regulations, management, standards, and other institutions. Now, China is opening up in an unprecedented way, contributing its solutions to the development of international standardization.

SAMR (SAC) has actively fulfilled its obligations in ISO on behalf of China, a member body of ISO, and vigorously participated in international standardization activities in various fields.

To date, SAMR (SAC) has participated in the activities of 751 ISO technical bodies as a participating member, with the participation rate reaching 99.4%, and more than 10,000 Chinese experts have registered as ISO experts, said Li Yubing, Deputy Director-General of Standards Innovative Management Department, SAMR, at the conference.

ISO/TC 228, *Tourism and related services*, has published 57 international standards since it was set up in 2005. At present, it has 11 working groups, covering the areas such as diving, sustainable tourism, and accommodation. It has 106 members, including 59 participating members and 47 observing members.

In November 2021, the international standard proposal on requirements and recommendations of tourist information services was approved by ISO, which was put forward by China, aiming to keep up with the informationized development trend of tourist services.

In January 2022, ISO/TC 228/WG 3 on tourist information and reception services was established, and Chinese expert Fang Lin served as its convenor. The working group gathered experts from 19 countries such as Spain, Germany and France as well as two international organizations including UN Tourism to jointly develop international standards. After three years' efforts, ISO 14785:2024 was published on schedule with a unanimous vote.

As a revised version of ISO 14785:2014, *Tourist information offices—Tourist information and reception services—Requirements*, ISO 14785:2024 provides minimum quality requirements and recommendations for onsite tourist information services and online tourist information services. It is designed to make tourist information services more professional, efficient and diversified, and enhance the travel experience and satisfaction of tourists.

The international standard will facilitate the normative management, and

improve the quality of global tourism, which is of profound significance to the tourism industry.

SAMR (SAC) will work with MCT to further exert the leading and supporting role of standards, actively promote the wide application of the international standard in China, and steadily advance the high-quality development of tourism, said Li Yubing.

Highlights of the revised version

ISO 14785:2024 is expected to adapt to the needs of informationized development, specify the scope, content and quality requirements of tourist information services in each country, and provide more considerate and friendly services to tourists via online and offline channels.

The international standard is composed of six parts, including the main content, work requirements, destination promotion, service personnel, infrastructure, as well as recommendations and complaint management. Compared with the 2014 version, the revised standard has significant improvements in several aspects, said Fang Lin, convenor of ISO/TC 228/WG 3.

Fang Lin
Convenor of ISO/TC 228/WG 3

Firstly, the objects are expanded. The previous version was applicable to physical tourist information centers of all types and sizes. The new standard expands the objects to all agencies that provide tourist information services, including online platforms, which enables a more comprehensive and systematic coverage, and adapts to the global informationized and intelligent developmental trend.

Secondly, the service content is enriched. The previous version focused on the accuracy and comprehensiveness of tourist information. In contrast, the new version expands the content of the information, which includes ticket purchase, currency exchange, health services, safety protection, and foreign language services. The standard stipulates the responsibilities of related posts in tourist information service agencies, and defines the basic techniques and knowledge that an employee should have. It also puts forward that the time for tourist destination information services should be adjusted according to specific conditions such as slack or peak season.

Thirdly, the requirements for online tourist information services are added. The revised version specially emphasizes the requirements for web design, data storage, online equipment and related facilities, and other aspects, and guides various

travel agencies to provide more complete tourist information services and more efficient tourism planning experience by making full use of modern information technologies and online channels. The standard also increases two appendixes on recommendations for supporting the UN's 2030 Agenda for Sustainable Development and providing accessible services for the disabled, the elderly and other special groups respectively.

It pays more attention to sustainable development and humanistic care, and provides all-round guidance on global tourist information services. The standard has been adopted by Spain, the U.K., South Africa, and other countries, which demonstrates its strong applicability. If it is adopted by more countries, tourists will enjoy harmonious and normative information services when travelling around the world, according to Fang Lin.

China's tourism standardization efforts

Liu Dongyan
Deputy Director-General of Science, Technology and Education Department, MCT

ISO 14785:2024 is a key breakthrough in the field of tourism standards. The past three years has witnessed China's remarkable progress in the international standardization of tourism, said Liu Dongyan, Deputy Director-General of Science, Technology and Education Department, MCT.

On the one hand, the working mechanism has been straightened out. After effective communication with SAMR, MCT supported its subordinate Tourism Quality Supervision and Management Bureau to become the domestic mirror committee of ISO/TC 228, and upgraded the role of China in the technical committee to a participating member. It reached a new stage of China's participation in the international tourism standardization work.

On the other hand, a batch of international standards proposals have been submitted and approved. To follow the trends of digital, networked and intelligent development, MCT has focused on the quality improvement of tourism services, analyzed the fields with gaps, and submitted seven international

standards proposals. In addition to ISO 14785:2024, proposals in the fields such as exhibitions and events and online travel agencies have been successively approved. The convenors of several working groups of ISO/TC 228 are assumed by Chinese experts.

Meanwhile, the institutional support has been strengthened. The administrative measures and working rules for the standardization work on culture and tourism have been successively released, incorporating the international standardization work of culture and tourism as an important content with explicit requirements. The research on such standards and the feasibility analysis of adopting international standards have been conducted to lay a theoretical foundation.

According to the *National Standardization Development Outline*, by 2025, the driving force of standardization will shift from the domestic work to the interaction of domestic and international work. During the development of international standards, MCT has also promoted the development of national standards, and fully absorbed the internationally advanced ideas and practices, better harmonizing the content of national and international standards.

The relevant national standard will be released soon. Then, MCT will well publicize and interpret the standard, encourage more enterprises to implement the standard, and create a high-quality environment for tourist services, according to Liu Dongyan.

Progress of culture and tourism standardization

Liu Jianming
Director of Tourism Quality Supervision and Management Bureau, MCT

Since 2020, Tourism Quality Supervision and Management Bureau, as the domestic mirror committee of ISO/TC 228, has actively participated in international standards development, examination, voting, expert registration, meetings and activities, achieving prominent results, said Liu Jianming, Director of Tourism Quality Supervision and Management Bureau, MCT.

Breakthrough has been made in standards development. Up to now, seven international standards proposals submitted by Chinese experts have been approved by ISO, among which the international standard on guidelines for online accommodation booking platform services will be published soon. In the development of these international standards, Chinese experts have disseminated China's good practice and advanced experience of tourism to the globe. Meanwhile, efforts have been made to adopt relevant international standards in China, including ISO 21621:2021, *Tourism and related services—Traditional restaurants—Visual aspects, decoration and services*, and ISO 21902:2021, *Tourism and related services—Accessible tourism for all—Requirements and recommendations*.

A lot of work has been done. Chinese experts have assumed the convenors of four working groups in ISO/TC 228 on online travel agencies, tourism information and reception services, exhibitions and events, and communication respectively. They have led the development of international standards, and worked with more than a hundred of experts from 27 countries including France, Germany, Spain and Russia.

Activities have been actively attended or supported. The Chinese delegation has actively participated the plenary meeting of ISO/TC 228 in 2023 and 2024, introducing the status of tourism standardization in China, and proactively advancing standards development. The plenary meeting of the technical committee will be held in Hangzhou city, East China's Zhejiang province.

Capacity building has been strengthened. An expert database on tourism international standardization has taken shape with 30 interdisciplinary experts. Nearly 100 experts have been reserved to provide intellectual support for the participation of international standards development.

Notable progress has been made in the international standardization of culture. In ITU, four ITU international standards in mobile phone animation, digital art display, and other fields have been successively published since 2017, and six approved ITU international standards proposals, involving information system for cultural relics and works of art, digital national clothing, and other areas, have been

put forward by Chinese experts. The first study group on culture has been set up, which is chaired by a Chinese expert.

In IEC, the international standard for stage lighting has been revised with the contribution of Chinese experts, which is an important part of the most widely used series of standards in the global lighting industry. In ISO, ISO/TC 349, *Cultural heritage conservation*, the secretariat of which is held by the Palace Museum since March 2024.

The cultural and tourism standardization work has laid a solid foundation and achieved good results through long-term efforts and exploration. According to Liu Dongyan, in recent years, MCT has continued to improve related standards systems. At present, there are 268 national and sectoral standards for culture and tourism, about 60% of which are cultural standards and about 40% are tourism standards.

These standards are accessible on the National Public Service Platform of Standards Information of SAMR or the portal of MCT. Many of these standards are directly related to people's lives, which can effectively improve the service and management level of the cultural and tourism industry.

Prospect

China has always vigorously promoted the opening up of standardization, and actively built an coherent institutional system, an open and integrated working system, and an internationally compatible standards system.

Positive progress has been made in participating in the governance of international standards organizations, advancing Chinese standards to be harmonized with international ones, deepening international exchanges and cooperation on standards, and strengthening the training of international standardization talent, said Li Yubing.

Standardization, as a bond connecting different countries, cultures and industries, is an indispensable technical basis for the global governance system and economic and trade cooperation.

In the next step, greater efforts will be made in the following aspects. Firstly, promote the institutional opening up of standards, and improve the harmonization of Chinese and international standards. Secondly, participate in the governance and activities of ISO, and encourage stakeholders to take part in international standardization activities, to help improve the international standards systems. Thirdly, release the *Administrative Measures for the Adoption of International Standards*, revise the *Administrative Measures for the Participation in ISO and IEC International Standardization Activities*, and increase the training of international standardization talent, contributing to the development of new quality productive forces.

In terms of culture and tourism, MCT will further promote the standardization work, and release more national standards and sectoral standards to meet the needs of people for a better life, according to Liu Dongyan.

ITU Year in Review 2024: Secretary-General's message

If 2024 has taught me anything, it's that digital is an irrefutable force for unity—a much-needed catalyst for global cooperation in an increasingly fragmented world.

This truth has been on display all year long, sometimes against the odds. And it's evident in the adoption of the Pact for the Future and Global Digital Compact at the United Nations General Assembly, in the outcomes of the World Telecommunication Standardization Assembly (WTSA-24), and in the wide endorsement of the COP29 Declaration on Green Digital Action.

The achievements you'll find in these pages confirm the key role of the International Telecommunication Union (ITU) in the world's constantly shifting digital landscape. As the UN Secretary-General said when he visited our headquarters in Geneva this year, ITU's "technical expertise and commitment to collaboration are the very qualities our world needs as we navigate a new digital age."

But beyond the policies and milestones, what will stay with me from this year are personal stories of hope, innovation, and resilience.

Some incredible women in rural India are using digital tools to deliver banking services and drive precision farming in their local community. Luis, a young man who lost his voice to amyotrophic lateral sclerosis (ALS), regained it thanks to artificial intelligence (AI). And young "digital natives" are using tech to advance all 17 Sustainable Development Goals.

These are the faces of digital change in 2024. They remind us why our work is so important.

As we get ready to mark ITU's 160th anniversary in 2025, digital solutions have taken their rightful place in our shared vision of transformative and sustainable progress.

The world needs ITU's leadership now, more than ever before, to coordinate radiocommunication, set global standards, and drive inclusive digital development for all.

The digital future is already here. Together, let's ensure it works for all of humanity, for our planet, and for generations to come.

(Source: ITU)

Keeping our young people safer and more secure while encouraging them to explore the world around them

Each year, millions of young people around the world take part in trips for a wide range of reasons, including: educational, training and development, religious, cultural and sports. Schools and other educational institutions, commercial operators, youth organizations, charities, cultural and religious groups, among others, provide opportunities for young people to travel for those reasons. A new standard guides organizations on how to manage travel risks, including how they can respond should an incident occur.

ISO 31031, *Managing risks for youth and school trips*, provides guidance for both domestic and international travel with specific attention to minors.

The standard provides a broad set of risk treatment options for activities related to trips. It also includes guidance for creating an emergency response plan.

Joël Marier, Convenor of the group of experts that developed the standard, said ISO 31031 helps organizations strike a balance between protecting the health, safety and well-being of children at the same time as seizing opportunities that support their growth and development.

He said: "Trip organizers have a duty of care towards children, youths and vulnerable adults involved in these trips. Safeguarding applies to the adults, teachers or instructors involved as well as the children and youths participating. This is a key component of ISO 31031."

"One of the aims of this new standard is to promote a culture where the risk involved in organizing trips for children and youths is taken seriously, resourced adequately and managed effectively, and where the benefits to the organization and relevant stakeholders are recognized."

(Source: ISO)

Third meeting of the High-Level Forum on Standardization

January 29, Brussels, Belgium

The 3rd meeting of the High-Level Forum on Standardization will take place on January 29, 2025 in the Berlaymont building.

The Executive Vice-President Stéphane Séjourné will personally chair the meeting that will gather high-level representatives of Member States and relevant stakeholders in standardization.

CEN and CENELEC will be represented at the meeting by our two presidents, Stefano Calzolari and Riccardo Lama.

The upcoming meeting will highlight achievements and seek approval for current activities, while also setting a strategic direction to offer new political guidance. For more information on the event website: **https://www.cencenelec.eu/news-and-events/events/2025/2025-01-29-third-meeting-of-the-high-level-forum-on-standardization**

ETSI AI Conference—How Standardization is Shaping the Future of AI

February 10-12, Sophia Antipolis, France

The ETSI Artificial Intelligence Conference—How Standardization is Shaping the Future of AI will take place face-to-face on February 10-12, 2025, in France.

The ETSI AI Conference has been designed to provide attendees with the unique opportunity to exchange with AI subject-experts and learn about the state of the art work that is being done in AI-related standardization, regulation and service deployments.

Attending this face-to-face event will provide exclusive insights into the most relevant applications of AI, the related challenges and key enablers that need to be put in place to ensure the deployment of "trustworthy" AI-enabled products and services. Attendees will also learn about current and future opportunities to contribute to standardization, and therefore play a role in actively shaping the future of the technology. For more information on the event website: **https://www.etsi.org/events/2451-etsi-ai-conference-2025**

Partner2Connect Annual Meeting 2024

January 30, Geneva, Switzerland & online

As we step into a pivotal moment in the journey toward universal and meaningful connectivity, the Partner2Connect (P2C) Annual Meeting promises to be a transformative gathering of global leaders, innovators, and changemakers. This year's programme reflects the dynamic and evolving spirit of P2C, offering engaging discussions, interactive sessions, and valuable networking opportunities. Together, we will not only celebrate our collective achievements but also confront the challenges that remain—ensuring that progress toward digital inclusion is sustainable and equitable.

Guided by the principles of the newly adopted Global Digital Compact, this meeting is more than a celebration of progress—it is a rallying call to action. By uniting our efforts, embracing shared responsibility, and committing to bold, transformative solutions, we can advance a more inclusive and sustainable digital future. For more information on the event website: **https://www.itu.int/itu-d/sites/partner2connect/partner2connect-annual-meeting-2024**

9th Cybersecurity Standardization Conference

March 20, Brussels, Belgium/Online

The European Standardization Organizations, CEN, CENELEC and ETSI, are pleased to join forces with ENISA, the EU Agency for Cybersecurity, to organize the 9th Cybersecurity Standardization Conference.

The 2025 Conference will address the following topics: state of play of the European standardization, interplay of cybersecurity legislation, overarching cybersecurity by standards, and visions of the future.

The event will be hybrid, favoring networking opportunities and live interactions for the onsite participants and speakers. For more information on the event website: **https://www.cencenelec.eu/news-and-events/events/2025/2025-03-20-9th-cybersecurity-standardization-etsi-enisa-cenclc**

Problems and countermeasures of technical barriers to trade in the photovoltaic industry

关于光伏产业技术性贸易措施的问题与应对策略

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Abstract: After 20 years of rapid development, China's photovoltaic industry has become a leading industry in the international market. In recent years, photovoltaic power, a renewable and clean energy, has attracted global attention. This paper sorts out the technical barriers to trade related to the photovoltaic industry in Europe and the United States, analyzes the short-term and long-term impact on China, and finally puts forward countermeasures.
Keywords: photovoltaic industry, technical barriers to trade

The Communique of the Third Plenary Session of the 20th CPC Central Committee pointed out that "Adhering to the decisions and arrangements of the CPC Central Committee on economic work, we should implement macro policies, actively expand domestic demand, develop new quality productive forces in accordance with local conditions, accelerate the cultivation of new drivers of foreign trade, and steadily promote green and low-carbon development". Photovoltaic industry is China's emerging industry with strengths internationally, which is of active technology research and development, complete industrial chain, and growing industrial scale. However, with the slowdown of global economic growth and the rise of trade protectionism, more technical barriers to trade emerge in exports, which hinder the continuous and stable growth of photovoltaic industry exports. Therefore, we should take precautions and think about the method to respond in advance.

1. Policy analysis of technical barriers to trade in Europe and the U.S.

1.1 EU technical barriers to trade

1.1.1 Requirements of laws and regulations

Since 2019, the European Union has issued the European Green Deal, the European Climate Law, and "Fit for 55" package for carbon reduction, to assist the European countries. The documents aim to speed up the deployment of low carbon transformation in the economic sector, make the European policies on climate, energy, land use, transportation and tax in line with the objective of reducing net greenhouse gas emissions at least 55% by 2030 compared to those in 1990. The Table 1 shows the relevant legal situation of the EU that has had a direct impact on the photovoltaic industry in recent years.

1.1.2 Requirements for carbon footprint survey

The Regulation (EU) 2023/1542 and other laws, stipulate that products entering the EU market must meet the carbon footprint requirements. 1) Carbon footprint certification. Through establishing the EU Emission Trading Scheme (EU ETS), the European Union establishes the Product Environmental Footprint (PEF) method, defines the calculation rules and accounting boundary, and requires the accounting and disclosure of greenhouse gas emissions of products from material production to waste disposal. 2) Disclosure of carbon footprint information in product labels or related documents.

1.2 U.S. technical barriers to trade

The Inflation Reduction Act (IRA), which came into force in 2023, is the largest one-way investment in climate and energy in U.S. history, aiming to accelerate the development of domestic industries such as electric vehicles and clean energy in the U.S. The specific subsidy situation is shown in Table 2.

2. Impact of EU and U.S. technical barriers to trade on Chinese companies

2.1 Carbon footprint management emission mechanism is urgently needed

Currently, China has not established management systems such as evaluation standards for the carbon footprint of

Name	Year of release	Year of implementation	Main content
Regulation on Batteries and Waste Batteries[1]	2023	2023	1. Power batteries and industrial batteries (more than 2 kWh) must declare the product carbon footprint, and must meet the limit requirements of the relevant carbon footprint by July 2027; 2. Strictly restrict the use of lead, mercury, hexavalent chromium, cadmium and other harmful substances; 3. After January 1, 2026, the Battery Digital Passport shall be provided, including the information of the battery manufacturer, battery model, raw materials, and total battery carbon footprint.
Foreign Subsidies Regulation (FSR)[2]	2023	2023	1. It is applicable to all economic activities within the EU, including mergers and acquisitions, government procurement and other market activities. 2. It mainly targets non-EU companies' investment in the EU and participation in government procurement projects. In the event of violating relevant regulations, such companies shall be prohibited from acquisitions within the EU and from participating in public tender projects. 3. When the annual operating amount of the relevant enterprise exceeds 500 million euros and the accumulated subsidy from a third country exceeds 50 million euros in the past 3 years, a declaration is required. When the relevant enterprise bids for the EU public bidding project of 250 million euros, the subsidy from the third country must not exceed 4 million euros. 4. The foreign subsidies that the applicant needs to disclose include the following five types: (a) a foreign subsidy granted to an ailing undertaking, namely an undertaking which will likely go out of business in the short or medium term in the absence of any subsidy; (b) a foreign subsidy in the form of an unlimited guarantee for the debts; (c) an export financing measure that is not in line with the OECD Arrangement on officially supported export credits; (d) a foreign subsidy directly facilitating a concentration; (e) a foreign subsidy enabling an undertaking to submit an unduly advantageous tender on the basis of which the undertaking could be awarded the relevant contract.
Net-Zero Industry Act[3]	2024	2024	1. Support the development of 8 net-zero technologies, including PV, and propose that the EU's overall net zero technical manufacturing capacity (including solar PV) will approach or meet at least 40% of annual deployment requirements by 2030; 2. Priority and approval procedures; 3. Create a European coordination platform; 4. Establish a net-zero college; 5. Create a net-zero sandbox regulatory model.
Critical Raw Materials Act (CRMA)[4]	2024	2024	1. List 34 key materials and 17 strategic raw materials, including important raw materials needed for photovoltaic industries such as silicon, lithium and nickel; 2. No key material provided by any third country shall exceed 65% of the annual European consumption; 3. By 2030, annual EU consumption will include at least 10% of locally mined minerals, 40% of intra-EU processed elements and 25% of recycled materials.

Table 1: Relevant laws and regulations of EU photovoltaic industry

Subsidy categories	Subsidy credit object	Subsidy basis	Subsidy rules	
			Basic credit	Additional credit
Investment Tax Credit (ITC)	Photovoltaic power station investors (increment)	Initial investment cost	① Projects less than 1 MW directly enjoy the 30% tax rate credit; ② Projects greater than 1MW can directly enjoy the tax rate credit of 6%. If the project starts construction or meets specific requirements within the specified period, you can enjoy the 30% tax rate credit.	①Projects that meet local manufacturing standards can receive an additional 2% or 10% credit based on the tax rate of the underlying credit; ②At the same time, projects located in specific energy communities or low-income communities can also enjoy an additional 10% or 20% tax rate credit.
Production Tax Credit (PTC)	Photovoltaic power station investors (stock)	generating capacity	① Projects less than 1 MW directly enjoy the credit unit price of 1.5 cent/kWh; ② Projects greater than 1 MW can directly enjoy the credit price of 0.3 cent/KW. If the project starts construction within the specified period, it can enjoy a tax rate credit of 1.5 cent/kWh.	①Projects that meet local manufacturing standards can receive an additional 10% credit based on the unit price of the base credit. ②Projects located in specific energy communities will receive an additional 10% tax rate credit.
Advanced manufacturing production tax credit	Local manufacturing enterprises		The tax credit amount available for the current year, provided that the products are produced and sold (must be sold to an independent third party) within the same year, is the sum of the following based on the products produced: · Solar cells: 4 cents/W; · Silicon wafers: 12 USD/m^2; · Polysilicon: 3 USD/kg; · Backsheets: 0.4 USD/m^2; · Solar modules: 7 cents/W; · Tracking systems: 2.28 USD/kg; · Inverters, etc.	

Note: Investors can only choose one between ITC and PTC credit.

Table 2: Photovoltaic subsidy measures of the Inflation Reduction Act

photovoltaic products that are aligned with international standards, nor a unified and comprehensive Chinese carbon emission factor database. The lack of unified evaluation standards makes it difficult to achieve international mutual recognition. Photovoltaic enterprises face significant pressure and challenging tasks in conducting carbon footprint assessments and certification management. New "green barriers" such as carbon footprints, carbon labels, and environmental product declarations have severely impacted the free circulation of China's photovoltaic products in the international market, forcing many photovoltaic enterprises to change their development strategies for overseas markets.

2.2 Changes in the export structure

The EU has established strict technical standards and certification requirements, limiting the market access for photovoltaic products, which may directly impact the export revenues and market shares of Chinese photovoltaic enterprises. In response to foreign technical barriers to trades, Chinese photovoltaic companies need to adjust the structure of their exports and seek export opportunities from other countries and regions. However, this may require time and resources to build new sales channels and customer relationships.

2.3 Increasing pressure on innovation

As a provider of green energy, photovoltaics inevitably produce pollutants and greenhouse gas emissions during their manufacturing process. The "green barriers" proposed by developed countries are aimed at addressing the issue of green manufacturing and sustainable development in photovoltaic enterprises. In order to cope with foreign technical barriers to trade, Chinese photovoltaic enterprises need to increase technological innovation, and improve the technical content and added value of their products, which will contribute to higher quality and efficiency of China's photovoltaic industry.

3. Solutions

3.1 Strengthen international coordination related to carbon

Efforts should be made to develop high standards of carbon footprint evaluation for photovoltaic products in line with international standards, and make the voice of Chinese photovoltaic industry heard in international trade. An internationally compatible carbon footprint management system should be established, including accounting platform, database, carbon identification certification, and other systems, to promote international mutual recognition of accounting results. Photovoltaic enterprises ought to be encouraged to actively participate in the construction and operation of the database, and provide necessary technical support.

3.2 Strengthen the connection of international platforms

Through the mechanisms such as U.S.-China Clean Energy Research Center (CERC), the EU-China Energy Cooperation Platform (ECECP), the energy science and technology cooperation platform, the Belt and Road Energy Ministerial Conference, the Belt and Road Energy Partnership Forum and other activities, China-African union, and China-APEC energy cooperation platform, a multilateral new energy cooperation center should be established, focusing on cooperation and innovation in fields such as basic research and development, demonstration, capital introduction, achievements transformation, in order to strengthen international cooperation and mutual recognition. More focus should be placed on building a multi-level enterprise cooperation mechanism and carry out international cooperation through trade, engineering contracting, investment, technology cooperation, and other means[5].

3.3 Actively expand the foreign markets

In 2023, the 28th Conference of the Parties (COP28) of the United Nations Framework Convention on Climate Change, held in Dubai, United Arab Emirates, achieved the *UAE Consensus* that calls for net-zero emissions by 2050. To achieve this goal, the United Arab Emirates, Qatar, Egypt, Botswana, Eritrea and other countries and regions are increasing investment in the photovoltaic industry and starting the construction and operation of large-scale photovoltaic projects. China can gain a foothold in emerging markets with its advantages of mature technology, low cost and complete industrial chain. At the same time, due to differences in policies and laws across countries, Chinese companies should fully know local policies and market entry requirements. They can shift from exporting one technology or one product to exporting an industrial chain, including equipment and raw materials, such as factories and zero-carbon industrial parks overseas.

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Research on the standardization promoting the development of intelligent manufacturing

标准化助力智能制造发展的研究

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Abstract: Intelligent manufacturing is a crucial path for promoting the transformation and upgrading of the manufacturing industry. Standardization, connecting innovation, production, markets and services, plays an indispensable role in the development of intelligent manufacturing. This paper aims to explore the mechanism by which standardization aids in the high-quality development of the manufacturing industry in three aspects: standards are useful tools to identify the intelligent shortcomings of manufacturing enterprises; standards provide intelligent solutions for manufacturing enterprises; standards system guides the development of manufacturing industry. It is expected to provide insights for enterprises to facilitate their intelligent construction via standards, thereby boosting the intelligent development of the industry.
Keywords: standardization, manufacturing industry, intelligent manufacturing

1. Introduction

The *National Standardization Development Outline* points out that it is necessary to "implement the standardization projects on high-end equipment manufacturing, and develop a series of standards for industrial optimization and upgrading, such as standards for intelligent, green and service-oriented manufacturing, making key standards in some areas moderately ahead of the average level of industrial development"[1]. As a means of unifying and coordinating technical specifications, standardization can effectively play a supporting role by providing a knowledge base for various industries. It guides service institutions in conducting intelligent manufacturing assessment services for enterprises to identify the weakness, and clarify the intelligent manufacturing work in the next steps. The standards systems and relevant researches can also guide industries and regions to achieve the intelligent development.

2. Intelligent manufacturing and standardization

Manufacturing is the most significant indicator of a country's productivity level. Leveraging advantages such as abundant labor force, China is a major manufacturing country with a solid foundation. However, with the development of technology, it has entered the era of intelligent manufacturing. The traditional manufacturing production model in China has faced significant challenges. Industrial transformation and upgrading become an urgent task. After Industry 4.0 of Germany and the Industrial Internet of the United States, China has introduced "Made in China 2025", which identifies "intelligent manufacturing" as a crucial means to achieve the development of the manufacturing industry.

Standardization refers to the process of achieving uniformity in repeated things and concepts through the development, release and implementation of standards in social practices such as economics, technology, science and management, so as to obtain optimal order and social benefits. In the manufacturing industry, standardization is a crucial means to enhance product quality, foster technological innovation, reduce costs, strengthen quality supervision and facilitate international trade. The development of intelligent manufacturing cannot be achieved without the strong support of standardization. Standards are the common language and a decisive factor in the equipment manufacturing industry. In recent years, many developed countries have increasingly emphasized the important role of standardization in promoting the development of intelligent manufacturing. Major developed countries such as Japan, Germany and the United States have introduced relevant standardization policies to support the development of intelligent manufacturing. Competition in standards is increasingly prominent.

3. The mechanism of standardization in intelligent manufacturing

3.1 Standards are useful tools to identify the weaknesses in intelligent manufacturing process

The concept of "diagnosis" originated from medicine, which refers to the assessment of a person's mental and physical state. Currently, the idea of diagnosis has been introduced into the evaluation of manufacturing enterprises' intelligent manufacturing capabilities. Then the concept of "intelligent manufacturing diagnosis services" has been proposed in many regions across the country. "Intelligent manufacturing diagnostic service" is a third-party standard conformity assessment activity based on national and local standards. Third-party institutions organize professionals to discuss with enterprises, conduct on-site surveys and evaluate the level of enterprise intelligence. By benchmarking with standards and conducting gap analysis, these institutions formulate diagnostic reports and advice, thereby making a "prescription" for enterprises' next moves in intelligent construction.

The national standards GB/T 39116-2020, *Maturity model of intelligent manufacturing capability*[2], and GB/T 39117-2020, *Maturity assessment method of intelligent manufacturing capability*[3], which were published in 2020 and implemented in 2021, proposed the intelligent manufacturing capability maturity model—Personnel, Technology, Resources, and Manufacture (PTRM) and five levels of maturity (Planning, Specification, Integration, Optimization, Leading), as shown in Figure 1. These standards provide a standard model for assessing the level of intelligent manufacturing within enterprises. By benchmarking with these standards, intelligent manufacturing diagnosis services enable enterprises to recognize their current level, identify the weakness in their intelligent development process and clarify the direction for future improvements.

In June 2024, Shanxi province developed and released a local standard DB14/T 3027-2024, *Diagnosis service specification of intelligent manufacturing*[4], which was the first local regulation in the field of intelligent manufacturing diagnosis services in China. This standard stipulates the requirements, content, processes and report compilation requirements for intelligent manufacturing diagnosis services. It clarifies 17 dimensions for diagnosing the current state of intelligent manufacturing capabilities and five key indicators for evaluating the effectiveness of intelligent manufacturing of an enterprise. It also provides clearer and more specific service standards for the implementation of intelligent manufacturing diagnosis services within Shanxi. Shanxi has already conducted intelligent manufacturing diagnosis services for two years, providing on-site diagnoses for a total of 500 manufacturing enterprises, and guiding a large number of enterprises to carry out intelligent upgrading and reconstruction.

3.2 Standards provide solutions for the construction of smart factories

Currently, China has established a relatively comprehensive standards system in the manufacturing industry, which includes smart equipment, smart factories, smart technologies, industrial networks, supply chains, etc. There are standards related to smart factory design, construction, delivery, acceptance, intelligent design, intelligent production, intelligent management, intelligent logistics, and system integration. The content of standards

Figure 1: Intelligent manufacturing capability maturity model

includes computer-aided design tools, digital workshops, automation equipment, robot-assisted equipment, intelligent systems, data formats, industrial control network architectures, integration interfaces, automated production, equipment status monitoring, production order management, quality traceability, intelligent warehouse management, and virtual factories. By studying the standards system, enterprises can find solutions suitable for their own factories.

The flange forging industry is a distinctive and advantageous industry in Xinzhou city, Shanxi province, where there are more than 300 forging enterprises. Shanxi Administration for Market Regulation has issued a series of standards to regulate the intelligent upgrading and reconstruction activities of these enterprises. Taking DB14/T 2553-2022, *Guide for information construction of flange forging enterprises*[5], as an example, this standard provides specific guidance on information system architecture, development processes, requirement analysis, system design, function implementation, subsequent operation, maintenance and security for flange forging enterprises. The systematic content covers various aspects of enterprise operations, including sales, design, technology, procurement, planning, production, quality, finance and after-sales services. It establishes a standard template for flange forging enterprises. During the research, it is found that multiple local forging enterprises in the area had entrusted a local software development company to customize and develop an enterprise information management software. Based on the actual needs of flange forging enterprises, this information software integrates some core functions of ERP and MES, enabling the enterprises to meet their information management needs at a relatively low cost.

3.3 The standards system provides guidance for the manufacturing in different industries and regions

In November 2021, the Ministry of Industry and Information Technology (MIIT) released the *Guidelines for the Construction of National Intelligent Manufacturing Standards System (2021)*[6]. The guide outlines the achievements and challenges faced by China in intelligent manufacturing standardization, as well as the standardization needs for new technologies and the status of international standardization efforts. It provides guidance for the development of industry-specific application standards and the construction of the standards system for intelligent manufacturing in the coming period.

Subsequently, MIIT has released a series of intelligent manufacturing standards systems for different industries, including the steel, non-ferrous metals, petrochemical and building materials. These guides aim to support and lead the development of intelligent manufacturing by leveraging standards. Taking the steel industry as an example, the *Guidelines for the Construction of the Intelligent Manufacturing Standards System in the Steel Industry (2023)*[7] establishes an intelligent manufacturing standards system for the steel industry, which includes basic and common standards, equipment-level standards, workshop-level standards, factory-level standards, enterprise-level standards and collaboration-level standards. Based on the characteristics of steel industry processes, products and smart factory construction, this guide clarifies tasks for developing basic and common standards, as well as standards for key application scenarios such as green and low-carbon operations, product quality and production safety, thereby guiding the intelligent development of the steel industry.

In June 2024, the research project "Intelligent Manufacturing Standards System for the Equipment Manufacturing Industry in Shanxi", the first of its kind in China, was approved by the Shanxi Bureau of Industry and Technology. Focusing on the equipment manufacturing industry in Shanxi, the system, with a review of existing standards, identifies a series of local standards need to be developed in the future. The research centering on local characteristic industries such as rail transit equipment, new energy vehicles, coal mining equipment, special equipment, energy-saving and environmental protection equipment, new energy equipment, general aviation equipment and intelligent manufacturing equipment. By leveraging the supporting and leading role of standards, the standards system aims to guide the optimization and upgrading of the equipment manufacturing industry in Shanxi over the coming period.

4. Initiatives to promote the development of intelligent manufacturing by standardization

The role of standardization in the development of intelligent manufacturing is significant, and it is imperative to effectively implement standardization in intelligent manufacturing.

4.1 Reinforce the development and release of standards for intelligent manufacturing

Although the standards system for intelligent manufacturing has been improved gradually, the supporting standards are still incomplete and the number of intelligent manufacturing standards is relatively small. There is still a long way to go to meet the development needs of intelligent manufacturing. The current shortage of standards for intelligent manufacturing can easily lead to various irregularities in the process of intelligent manufacturing. Therefore, developing and releasing standards that meet the needs of intelligent manufacturing is crucial, which requires more efforts.

4.2 Reinforce the promotion and implementation of standardization in intelligent manufacturing

Many entrepreneurs are lack of awareness of

standardization, they think standardization is optional and has little impact on their enterprises. So they merely pay lip service to standardization, and do not effectively standardize their innovative technologies and management, thus failing to achieve results. The standardization of intelligent manufacturing requires the participation of all employees within an enterprise to quickly expand the market and enhance its influence. Therefore, the promotion and implementation of standardization in intelligent manufacturing companies should be reinforced. Entrepreneurs should improve their awareness of standardization and contribute to the development of intelligent manufacturing.

4.3 Promote the transformation of scientific and technological innovation achievements into high standards

Technological innovation is crucial for intelligent manufacturing. High-level and high-standard technological innovation achievements are crucial for the continuous progress of intelligent manufacturing. Standards serve as an important foundation and prerequisite for intelligent manufacturing, and the development of these standards requires the support of innovative technologies. Therefore, only technological innovation achievements are insufficient, and these achievements are needed to transformed into high standards. To further leverage the guiding and supporting role of standards, technological innovation achievements can create productivity, thereby driving the development of intelligent manufacturing.

4.4 Strengthen international exchanges and cooperation on standards

With the globalization of the economy, standards are also internationalized. International standardization has become a competitive hotspot for countries to promote their economic development and seize market shares. China should participate in more international standardization activities. The standards for intelligent manufacturing must be based on national conditions while having an international perspective. The standards system with openness and compatibility can meet the basic requirements of intelligent manufacturing. Therefore, it is necessary to continue to reinforce international exchanges and cooperation, achieving harmonization with international standards.

5. Conclusion

Standards are the first step of intelligent manufacturing. Standardization plays a supporting and leading role in the development of the manufacturing industry. So it is essential to fully leverage the mechanisms of standardization and manufacturing, and use high standards to promote high-quality development of the manufacturing industry.

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An overview of the development of China's standardization

中国标准化工作的发展历程

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Abstract: Since the end of World War II, international standards, as the common language of the world, have become an important reference for international trade and building strengths. In the current situation, it is necessary to summarize the development history of China's standardization work. This paper reviews the formation of China's standardization concept and explores the relationship between standardization work and the shifts in the global situation.
Keywords: standardization work, international standards, international situation

At present, international standards serve as international rules in technical area. Based on the historical development of China's standardization work, this paper explores the development and transformation of China's standardization work, and finds out the reasons for the changes.

1. The development of China's standardization work and participation in international affairs

1.1 The initial stage (1978-1990): the accession to the International Organization for Standardization

In 1978, China officially joined the International Organization for Standardization (ISO) and started the process of independent standardization work. The opportunities for international trade brought by the reform and opening up gradually put China's standardization work on the normal track. Since the reform and opening up, China has implemented a comprehensive policy, and more and more factories and enterprises have invested in exports. But the quality indicators of export products were difficult to meet foreign requirements, which often led to a high rejection rate of product exports.

In order to fully meet the needs of market, facilitate the transaction process and promote the maximization of economic benefits, China's attitude of adopting international standards has changed from "active adoption" to "direct adoption". In June 1986, a national conference on the adoption of international standards was convened, where then Chinese Premier Zhu Rongji proposed a new model of "direct adoption, practical verification, and supplementary revision"[1], requiring relevant departments to accelerate the adoption of international standards in accordance with the new model. After that, the standardization process was truly established in the form of law.

In the meantime, China was neither fully accepting international rules nor accepting them indiscriminately. Actually, China formulated a standard strategy in line with China's reality on the premise of participating in and adhering to international rules. The degree of international standards adoption was divided into "equivalent adoption and reference adoption". In the 1980s, China adopted the ISO 9000 series standards on quality management based on its own conditions, and the quality certification system was gradually developed.

1.2 The development stage (1990-2012): China's accession to the WTO

Since 2000, China's economic strength has taken a huge leap forward, and its international status has also been significantly enhanced. On December 11, 2001, the WTO announced China's accession. This major shift has made China's standardization work in line with the market and international standards, but it has also brought China opportunities for international economic cooperation. However, during this period, compared with developed countries, China's standardization work was still weak, with its management and operation mechanism not compatible with international standards. There were problems such as lagging market response, long standards revision period, and inadequate participation in international standards development[2].

At this time, China was a participant and advocator of international rules. China participated in the development of international rules under the premise of promoting an independent development strategy, and maintained an

attitude of upholding the international standards and rules adopted by various countries.

1.3 A new leap (2012-present): the emergence and development of China's partipation in global governance in the new era

With the continuous development of science and technology systems in developing countries, there are increasing participants in the development of international standards day by day. In optimizing the standards systems, improving the management level, and strengthening the degree of integration with international standards. In 2023, the conversion rate of international standards in the fields of new-generation information technology and key equipment manufacturing exceeded 90%, and the consistency between Chinese standards and international standards for major consumer goods reached 95%, indicating that China's standardization reform has achieved great results.

This international situation provides an opportunity for the development of China's standardization work. With the continuous increase of international exchanges, China has become an "important stakeholder" and a "participant" of international affairs.

China has entered a new stage in which countries work together to reform, improve, and shape the international governance system[3]. The official promulgation of the *National Standardization Development Outline* in 2021 means that China has vigorously participated in international standards development, marking that China's standardization work has entered a new period[4].

2. Standardization work and the international situation interact with each other

To some extent, common international standards play a role in various aspects, and the development and revision of international rules can have an impact on different countries' participation in international affairs. It has been pointed out that rules may have certain characteristics in their application. From a certain theoretical perspective, international rules are often regarded as elements that countries utilize in the international arena.

In fact, since the end of World War II, the United States, as a developed country, has been a significant contributor in developing international standards and norms. The main reasons why China's standardization work is influenced by the international situation in the development process are mainly as follows:

2.1 Standardization caters to the improvement of national strength

Since the beginning of the 21st century, the all-round development has enabled China to gain more participation and opportunities on the international stage.

Firstly, China has accumulated experience in many fields. In the area of mechanical engineering, Germany has rich experience in standards development. In the digital realm, the United States and China have strong advantages. In areas such as rare earths, plastics and lithium, China has taken the lead[5]. With the continuous improvement of talent training and scientific and technological innovation, China has gradually become more important in the international community, and has become one of the world's leading countries in the fields of aerospace, aircraft carriers, nuclear power and energy, further promoting the development of Chinese standards.

Secondly, China's participation in international organizations has been increasing. In 2023, 1,311 experts registered in ISO or IEC, and 244 international standard proposals were submitted to ISO and IEC. More and more Chinese standardizers are holding posts of technical bodies, which lays a solid foundation for China's progress in the development of international standards.

From the perspective of participation in international organizations, China's influence in global governance has been enhanced since 2008, when SAC officially became a permanent member of the ISO Council on behalf of China as the sixth largest contributor to ISO. Based on their own needs and advantages in scientific and technological innovation, some associations in China have independently developed association standards with higher technological requirements than national and sectoral standards, which have been promoted to the world. For example, the WAPI Alliance has led its members to independently develop testing communication security technology, which has become an international standard (ISO/IEC 22425:2017)[6] promoted by ISO and IEC to countries around the world.

2.2 Standardization aligns with the needs of global development

As an important means to enhance international influence, standardization should serve the needs of the overall development of the international community. On the one hand, with the deepening of China's opening up to the world, as the largest trading country, China's economy and trade ties with other countries more and more closely.

The *Outline for the 14th Five-Year Plan for Customs Development* issued by the General Administration of Customs in July 2021 mentions that "China should deeply participate in the development and revision of international standards, strengthen research on relevant basic supporting technologies such as impact assessment of technical trade measures, trend prediction, and negotiation response, and enhance its ability to use rules to safeguard national security and development interests"[7].

Moreover, the in-depth development of globalization has brought increasingly severe global challenges, such as public health, maritime security, and network security, which need

to be solved urgently. In order to build a unified and efficient response, establish a channel for standards information exchange, maintain the international order, and protect global interests, it is particularly important for standardization work to keep pace with the times.

Major technological progress not only reshapes the international situation, but also leads to global competition and cooperation to a large extent. The development of standardization work can often drive the innovation of technologies in a certain field domestically and internationally.

3. An overview of China's standardization work experience

From the history of China's standardization work after World War II and the change of the world pattern, we can see some practical experience in the development of China's standardization work.

China will gradually participate in making international rules that are widely used. It is an important approach for China to coordinate the pace and process of its domestic reform with existing international rules, thus enabling itself to achieve prosperity and stability. Although China's standardization work has made great progress, there are still some shortcomings such as weak foundations, slow updating speed, low quality, and other problems. Another obvious problem is that there are certain obstacles in the promotion and application of Chinese standards in the international market.

In the implementation of the standardization strategy in the future, more attention should be paid to the role of association standards and enterprise voluntary standards. It is necessary to fully activate market vitality, foster a benign interaction between technologies and standards, and seize development opportunities in the current era of significant changes. In this way, it can contribute to the continuous improvement of China's standardization work and better facilitate China's integration into the international community and active participation in international cooperation.

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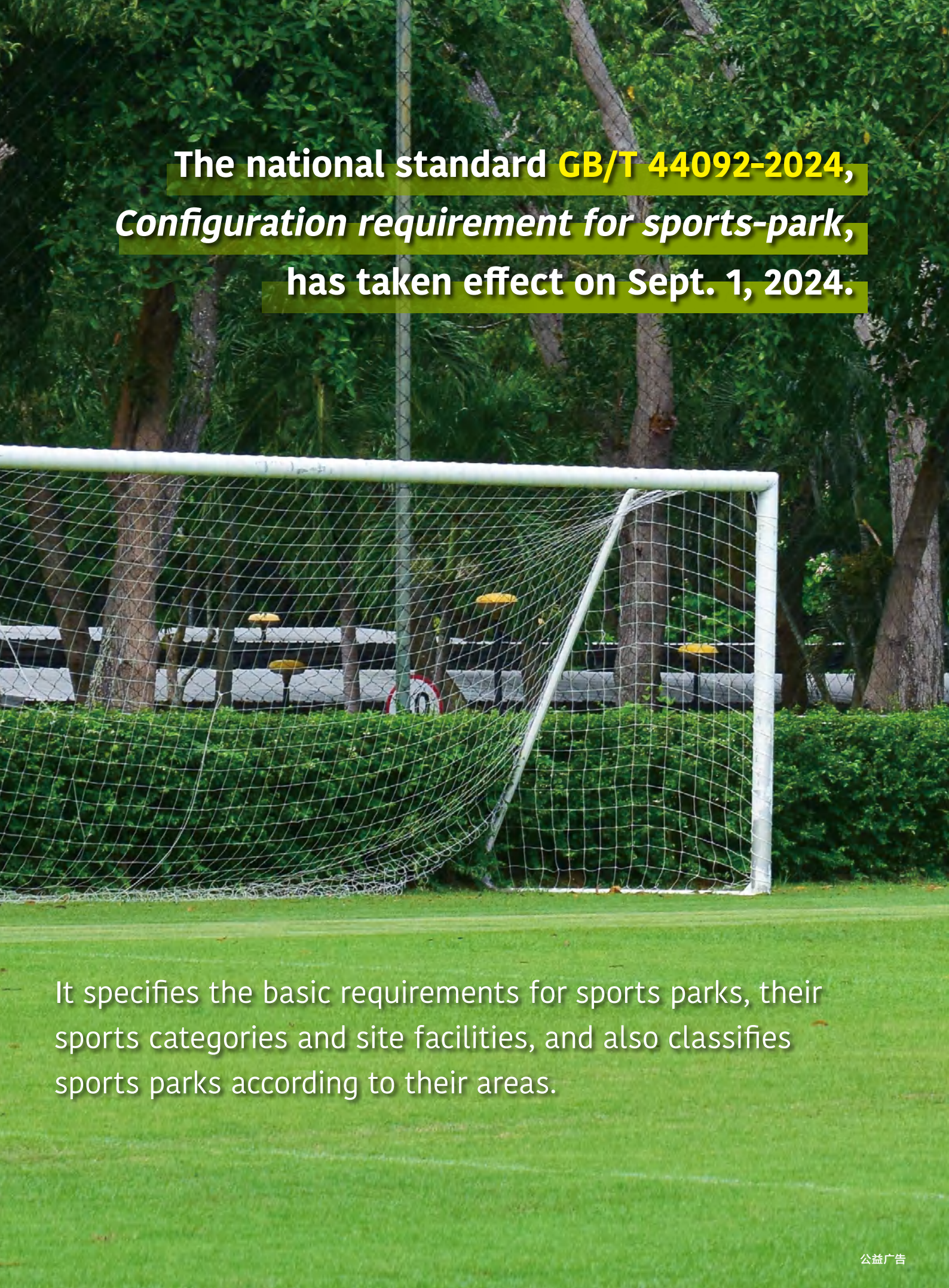

The national standard GB/T 44092-2024, *Configuration requirement for sports-park*, has taken effect on Sept. 1, 2024.

It specifies the basic requirements for sports parks, their sports categories and site facilities, and also classifies sports parks according to their areas.

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