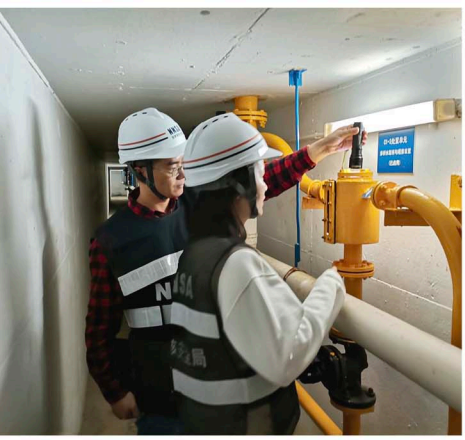
2022 Annual Report

National Nuclear Safety Administration

The People's Republic of China




生态环境部


生态环境部华东核与辐射安全监督站 2022年11月5日

Message from the Administrator

In 2022, the 20th National Congress of the Communist Party of China (NCCPC) was successfully convened, and National Nuclear Safety Administration (hereafter referred to as “NNSA”) forged ahead with enterprise and fortitude in nuclear safety regulation. Over the past year, NNSA resolutely implemented the decisions and plans of the CPC Central Committee, conscientiously performed our duties, identified and resolved risks, promoted special project, improved regulation capabilities, coordinated pandemic prevention & control and safety regulation, and completed various tasks thoroughly, thus effectively ensuring nuclear and radiation safety.

First, NNSA tightened routine regulation. NNSA kept a close eye on key projects such as Hualong One, high-temperature gas-cooled reactors (HTGRs) and small modular reactors (SMRs) demonstration projects, and key links such as fuel loading and overhaul of nuclear facilities, strengthened technical review, safety regulation and special inspection, and urged to enhance public communication. NNSA timely examined and approved the first “road-sea-rail” intermodal transportation project, and completed the review on the first spent fuel transport container life extension project. NNSA tightened environmental management over uranium mining/metallurgy and associated minerals disposal, and urged the rectification of prominent problems. NNSA organized electromagnetic radiation monitoring institutions to conduct special inspection and provide pre-EIA services. NNSA formulated and refined the nuclear equipment license management procedure and qualification management conditions, and tightened licensing examination and approval. NNSA optimized the qualification management over special nuclear safety technology personnel, and enhanced the connotation of qualification examination for non-destructive testing personnel.

Second, NNSA clarified the prime responsibilities of the entities. NNSA

issued the *Action Plan to Improve Safety and Quality in Nuclear Power Industry (2022-2025)* jointly with relevant departments, with a view to urging the enterprises to fulfill nuclear power safety and quality responsibilities and enhance nuclear power engineering quality and operational safety management capabilities. In view of the operational events of some nuclear facilities, NNSA strengthened top-level leadership by organizing independent investigation, special review and verification regulation, and urging the rectification. NNSA seriously investigated into and dealt with violations against laws or regulations by nuclear facility licensees, nuclear technology utilization organizations, organizations with nuclear safety equipment license, and special nuclear safety technology personnel. NNSA informed the competent authority and group companies of potential risks, and urged them to strengthen accountability. NNSA compiled, analyzed and studied cases of violations against laws or regulations in order to strengthen experience feedback.

Third, NNSA identified and remedied latent risks. NNSA completed the three-year action on identifying latent risks in nuclear and radiation safety, including over 6,100 on-site inspections, a working load of over 43,000 person-days, with over 7,300 problems found, and NNSA urged the enterprises to screen out and rectify the problems item by item. NNSA guided provincial competent departments to carry out special inspection on electron irradiation accelerators. NNSA completed the comprehensive risk survey of natural disasters of civil nuclear facilities across China, collected about 20,000 pieces of data from 500 hazard-bearing bodies such as nuclear facilities and nuclear technology utilization organizations, and established a database on natural disasters of civil nuclear facilities. NNSA fostered the treatment and disposal of legacy problems, approved a number of old nuclear facility decommissioning projects, and pushed the transfer of accumulated nuclear wastes from NPP for treatment and disposal. NNSA actively responded to the issue of the discharge of nuclear-polluted water from Fukushima NPP, Japan, and strengthened radioactivity monitoring in relevant sea areas.

Fourth, NNSA improved the regulatory system. The *Fourteenth Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control* was issued and implemented after being approved by the State Council of the People's Republic of China, consolidating the capability for on-site regulatory inspection of nuclear facilities. NNSA fostered the revision of the *Law of the People's Republic of China on the Prevention and Control of Radioactive Pollution* and the legislation on the prevention and control of electromagnetic radiation pollution, and issued one departmental rule, 6 technical guides and 2 standards. NNSA advanced the construction of regional supplies repositories for nuclear and radiation emergency monitoring, formed

the project siting prioritization scheme, and clarified the overall construction roadmap. NNSA reinforced operation management over the national radiation environment monitoring network, and achieved an over 97% data acquisition rate from automatic radiation monitoring stations across China. NNSA mobilized think tanks, group companies and industry capacities to jointly study and solve overall and systemic problems. The weak capacity on radiation safety regulation at prefecture level has been analyzed and the resolution has been promoted.

Fifth, NNSA strengthened international cooperation. NNSA kept working on multilateral and bilateral cooperations, continued to deepen exchanges with International Atomic Energy Agency (IAEA) and Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA), maintained nuclear safety cooperation with nuclear-power-developed countries such as Russia and France, and nuclear-power-emerging countries along the Belt and Road, as well as carried out China-Japan-South Korea and China-Europe regional cooperations. NNSA attended the seventh review meeting of contracting parties to the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management* to safeguard our national interests make China's contribution and demonstrate China's undertaking as a major nuclear powerhouse. China's achievement in 6 areas, including its new national centralized radioactive waste disposal facility for NPP, was recognized as good performance for reference by international counterparts. NNSA actively promoted the work related to the eighth and ninth joint review meetings of the contracting parties to the *Convention on Nuclear Safety*.

Responding to the complicated and volatile pandemic situation, NNSA promoted pandemic prevention & control and safety regulation coordinately. During the critical stage of epidemic prevention & control in particular, NNSA overcame many challenges and timely required the rotation and registration of key personal positions of nuclear facilities and on-site inspectors, closed-loop management, and guaranteed supplies to ensure uninterrupted work, fulfilled responsibilities, and tightened requirements, thus reassuring many enterprises.

Our nuclear safety regulation in 2022 was imbued with highlights in routine work, breakthroughs in key work, and improvements in basic work. The 55 operating nuclear power units, 17 in-service civil research reactors, 19 operating civil nuclear fuel cycle facilities and radioactive waste storage and treatment/disposal facilities in the Chinese mainland maintained good safety records, which are free of incidents or accidents at or above Level 2 as per the International Nuclear and Radiological Event Scale (INES), and

boast assured quality for nuclear facilities under construction. The quality of the nuclear facility under construction as well as the safety of 164,000 radioactive sources in use and 267,000 sets of radiation-emitting devices were well-control. I would like to express, on behalf of the Ministry of Ecology and Environment (National Nuclear Safety Administration), heartfelt gratitude to all colleagues contributing to nuclear and radiation safety and to friends from all walks of life who care about and support nuclear and radiation safety.

The year 2023 is the first year to fully implement the spirit of the 20th NCCPC, and also a crucial year of transition in carrying out the "14th Five-Year Plan". NNSA will integrate in-depth study and implementation of the spirit of the 20th NCCPC into actual nuclear safety regulation work, anchoring the goal of being a major nuclear powerhouse, and accelerate the modernization of nuclear safety regulation system and capability. **First, make progress while ensuring stability and make innovations based on tradition.** NNSA will draw wisdom and strength from nearly 40-year experience in nuclear safety regulation, sum up and form regular conception, abstract effective strategies and methods, and explore and practice new ideas, methods and strategies. Second, adhere to strict measures and law-based regulation. NNSA will strengthen regulatory inspection according to law, whole-process regulatory inspection, front-line regulatory inspection and closed-loop regulatory inspection, to promote self-discipline of the industry through external regulation. **Third, consolidate the foundation and improve capability.** NNSA will fix shortcomings and overcome weaknesses to comprehensively improve capabilities in safety analysis, test verification, radiation monitoring, and regulatory informatization, to enhance regulatory efficiency via consolidated technical support. **Fourth, promote development through persistent overall coordination.** Considering the unified goal of building China into a major nuclear powerhouse, NNSA will strengthen communication and positive interaction with the industry for joint efforts in studying and solving key and difficult problems, thus ensuring the high-quality development of nuclear energy.

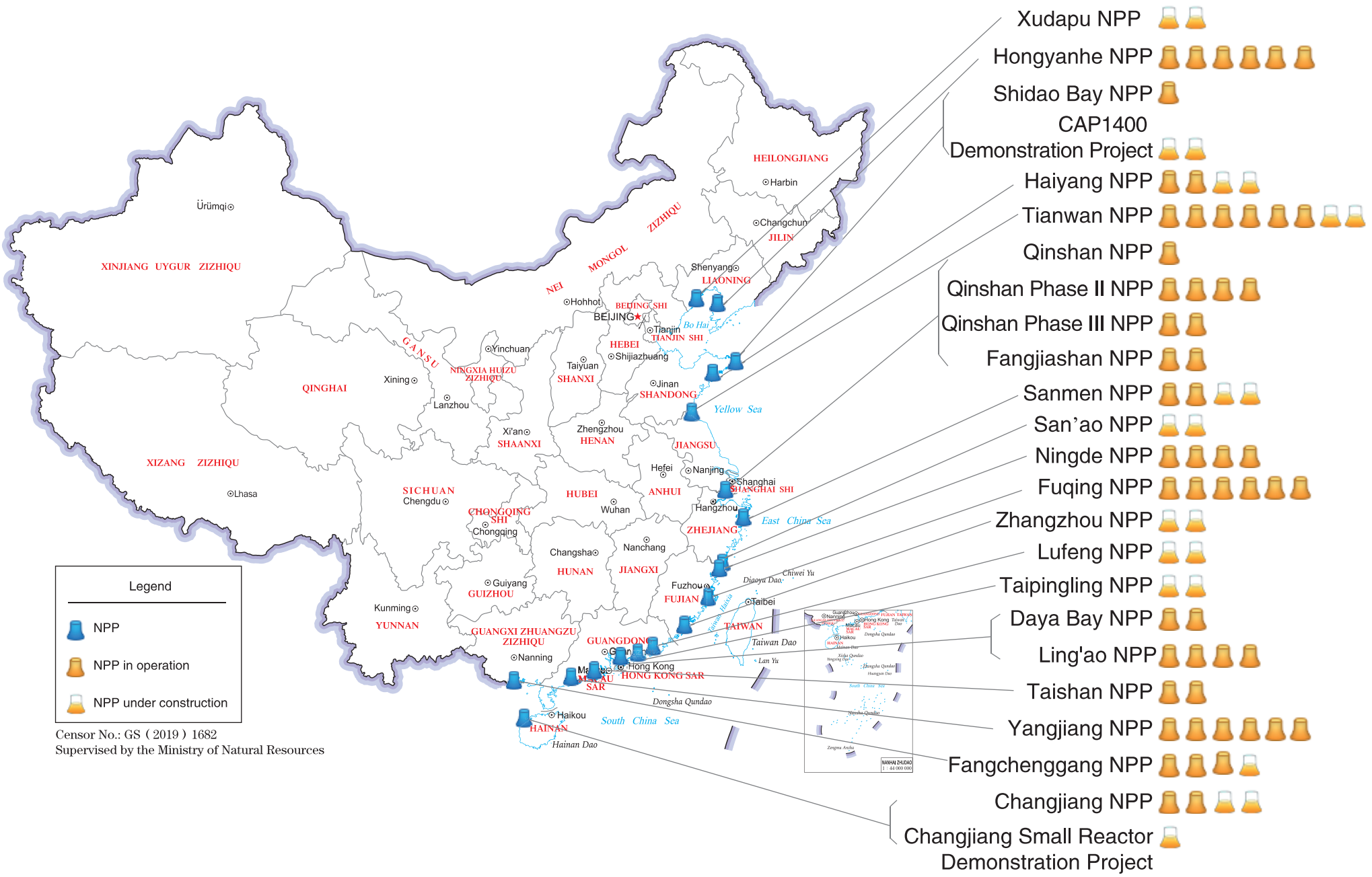
NNSA will adhere to the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, fully implement Xi Jinping's thought on ecological progress, adopt holistic approach to national security and China's Nuclear Safety Strategy, set high goals, promote the work with high standards and fulfill the responsibilities efficiently, devote ourselves to nuclear safety regulation with the consciousness and firmness of self-sacrifice, work assiduously and attentively, improve capability and perform our duties faithfully, and act to carry out the spirit of the 20th NCCPC!

Vice Minister of Ecology and Environment
Administrator of National Nuclear Safety Administration

DONG Baotong

May 15, 2023

Contents



A Map of Nuclear Power Plants in Chinese Mainland (as of December 31, 2022)

I. Introduction

In 2022, China's civil nuclear facilities continued to perform well in terms of operation safety and construction quality, and no incidents or accidents at or above Level 2 given in the International Nuclear and Radiological Event Scale (INES) occurred in operating nuclear power plants (NPPs), research reactors, fuel cycle facilities, radioactive waste storage and treatment/disposal facilities, or radioactive material transportation. All events related to operating and constructing nuclear facilities were handled properly.*

The quality of the radiation environment was generally favorable in 2022. Generally, there was no evident change in the level of environmental ionizing radiation around nuclear facilities, and in the radiation level around electromagnetic radiation emission facilities.

Rule of Law

NNSA worked on the revision of the *Law of the People's Republic of China on the Prevention and Control of Radioactive Pollution*, advanced the legislation research and demonstration for the prevention and control of electromagnetic radiation pollution, and cooperated in the atomic energy legislation. NNSA promoted the revision of the *Regulations on Nuclear Material Control* and continued to review the *Regulation on the Supervision and Management of Civil Nuclear Safety Equipment*. One departmental rule, 6 guides and 2 standards were issued.

Efforts were made to standardize nuclear safety regulation, and improve the operation and maintenance mechanism of nuclear and radiation safety management system. The formulation and revision of more than 100 system procedure documents were completed to continuously expand the "toolbox" of regulation systems. Special training courses on administration according to law, regulations and standards were held to improve both the theoretical and practical levels of administration according to law.

* This report does not contain relevant data of Hong Kong Special Administrative Region, Macau Special Administrative Region and Taiwan Province of the People's Republic of China.

Capacity Building

NNSA continued the capacity building of the National Nuclear and Radiation Safety Technology R&D Base. The work was promoted in an orderly manner regarding submission for approval of 3 regional material repositories for nuclear and radiation emergency monitoring, one of the 102 major national projects during the "14th Five-Year Plan" period. Operation conditions are available for the nuclear material accounting verification laboratory for reprocessing and the co-establishment of joint laboratory for visual security regulation and management. The nuclear power plant risk monitoring platform of the National Nuclear Safety Administration (NNSA) has been built comprehensively, and all operating unit models have been developed. The capacity building for nuclear safety regulation has achieved phased objectives and the State Commission Office for Public Sector Reform (SCOPSR) has approved the Ministry of Ecology and Environment (National Nuclear Safety Administration) to increase 102 staff post for nuclear safety regulation.

Strengthening Regulation

NNSA made utmost effort to ensure the safe operation of NPPs, strictly carried out technical review of safety-important modifications and regular safety evaluations for operating nuclear power plants, and conducted on-site regulatory inspection in accordance with the requirements of the regulatory inspection program and procedures; actively promoted risk-informed regulation mode and issued the *Implementation Plan for Risk-Informed Nuclear Safety Regulation Pilots During the "14th Five-Year Plan" Period*; actively advanced the optimization of technical specifications of relevant nuclear power plants, approved the application for optimizing the technical specifications of six units of the first pilot nuclear power plant in China, and successfully switched to the optimized technical specifications. NNSA carried out stringent regulatory inspection and evaluation of nuclear power plants under construction, focusing on regulatory inspection of the first reactors and new type reactors, and having fostered the review and approval of nuclear safety licensing and EIA documents for new nuclear power plants as planned. NNSA continued to strengthen the nuclear safety regulation of research reactors, conducted standardized routine regulatory inspection of under-construction/in-service research reactors according to law, and worked earnestly in the examination and approval of new research reactor projects. The NNSA experience feedback system ran effectively, organized independent evaluation for multiple typical events with experience feedback value; NNSA issued the *Design Guide for Prevention and Control of Blockage in Water Intake Engineering of Nuclear Power Plants* and the *Guide for Safe Operation and Anomaly*

Response Management of Water Intake of Nuclear Power Plants jointly with the National Energy Administration (NEA).

NNSA completed the life extension research and the first life extension review of spent fuel casks, and issued the operation license for the first national centralized disposal facility for wastes from nuclear power. Many achievements in implementing the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management* were recognized by international counterparts. Special inspections were organized for 314 organizations that produce and use electron irradiation accelerators. The first round of full coverage of EIA review on construction projects involving nuclear and radiation in 31 provinces, autonomous regions and municipalities across China. Continuous efforts were made to strengthen the regulation of nuclear safety equipment and special personnel, with the request of "zero tolerance" for concealment and false reporting and for illegal operations implemented resolutely. Multiple measures were taken to deal with violation of laws and regulations.

The three-year (2020-2022) action to investigate latent risk in nuclear and radiation safety themed with "full coverage, latent risk identification, and shortcoming fixation" ended successfully, with all tasks completed on schedule. The action covers civil nuclear facility licensees, uranium mining and metallurgy organizations, nuclear technology utilization organizations and organizations with nuclear safety equipment licenses throughout China. According to incomplete statistics, regional stations of nuclear and radiation safety inspection had carried out regulatory inspection for more than 6,100 times, a working load of over 43,000 person-days, with over 7,300 findings identified. NNSA urged the licensees to screen out and rectify the problems item by item. NNSA worked on the summative assessment of the latent risk investigation action, conducting comprehensive summary and analysis, clarifying common problems and prominent risks, summarizing good practices, putting forward countermeasures and suggestions, and forming the three-year action summary report.

Figure 1. SUN Jinlong, Secretary of the Leading Party Member Group of MEE, and YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, Surveying at Hongyanhe Nuclear Power Base

Technical Support

In 2022, the Nuclear and Radiation Safety Center (NSC) undertook 3,673 work tasks and 884 review tasks, dispatched a total of 560 person-times for technical support of on-site regulatory inspection, and prepared 2,473 technical documents, providing comprehensive technical support for national nuclear and radiation safety regulation. NNSA strengthened the technical support system for quality assurance, conducted the nuclear safety review of 22 under-construction NPPs in an orderly manner, ensured the safe and stable operation of 55 NPPs in Chinese mainland, and completed the safety review tasks with satisfactory outcome. NNSA comprehensively promoted radiation risk prevention and control, continuously deepened and enhanced safety regulation R&D capabilities, accelerated the informatization of nuclear and radiation safety regulation, made efforts in public publicity and communication, and carried out information exchange and international cooperation in an orderly manner.

In 2022, the Radiation Environment Monitoring Technology Center optimized the *National Radiation Environment Monitoring Plan*, organized and implemented the national radiation environment quality monitoring and the supervisory monitoring of national key nuclear facilities for 2022. NNSA actively carried out special monitoring of marine radiation environment in the territorial waters under the jurisdiction of China, and compiled the *Special Monitoring Report for Marine Radiation Environment*. NNSA provided special technical guidance for operation and maintenance of Automatic Radiation Environment Monitoring Stations in various provinces to ensure an over 97% data acquisition rate of these stations. NNSA summarized and analyzed the national radiation monitoring data, and prepared the *National Radiation Environment Quality Report* and the *Supervisory Monitoring Report of Nuclear and Radiation Facilities under National Key Regulation*, etc., providing strong support for nuclear and radiation safety regulation.

In 2022, China Environmental Culture Promotion Association officially changed its name to “China Nuclear Safety and Environmental Culture Promotion Association”, successfully held a national assembly, and established a “three-pronged” organizational structure consisting of the Council (the decision-making body), the Secretariat (the executive body), and the Expert Committee (the advisory body). NNSA organized such publicity and communication activities as “Active, Safe and Orderly, Towards a Clean World - Environmental and Social Responsibilities of Nuclear Power Enterprises”, “Celebrating the 20th NCCPC - Nuclear Safety in the Past Decade”, and “Beautiful China - Ecology and Environment Themed Painting and Calligraphy Exhibition”.

NNSA co-organized such communication forums as “China International Nuclear Power Industry and Equipment Exhibition” and “The Second Carbon Neutrality International Rule of Law Forum”.

In addition, in 2022, long-term technical support organizations such as Suzhou Nuclear Safety Center, China Productivity Center for Machinery Co., Ltd., Beijing Nuclear Safety Review Center, and Shanghai Nuclear Safety Review Center also fulfilled their respective for technical support review and regulation according to the annual work plan of NNSA.

International Cooperation

NNSA was fully involved in activities related to OECD/NEA Multinational Design Evaluation Programme (MDEP), effectively organized and advanced the work of Hualong One Task Force, and send personnel to attend VVER, EPR and other task force meetings. NNSA joined the “Nuclear Harmonization and Standardization Initiative (NHSI)” launched by the International Atomic Energy Agency (IAEA) to support safe and secure development of SMRs. NNSA was actively involved in institutional meetings at all levels of IAEA, attended meetings held by the Commission on Safety Standards, the Nuclear Safety Standards Committee, the Planning Committee of the International Conference on Effective Nuclear and Radiation Regulatory Systems, Steering Committee of the Regulatory Cooperation Forum, etc., and participated in the applicability review of safety standards for new advanced reactors. NNSA enhanced bilateral and multilateral cooperation and exchanges on nuclear safety regulation, with coordination and exchanges on nuclear safety issues facilitated by making full use of China-France, China-Pakistan, China-Russia and other bilateral communication mechanisms. The Chinese delegation went to Austria to attend the seventh review meeting of contracting parties to the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*. NNSA actively promoted the work related to the eighth and ninth joint review meetings of the contracting parties to the *Convention on Nuclear Safety*, and actively attended the 23rd Pacific Basin Nuclear Conference.

II. Polices, Plans, Regulations, Standards, and Nuclear Safety Culture

Nuclear Safety Polices and Plans

NNSA provided support for national high-end think tanks to make research on topics such as “China’s Nuclear Safety Strategy Theory and Practice” and “Further Exerting Institutional Advantages to Improve Nuclear Safety Governance Efficiency”. Approved by the State Council, MEE（NNSA）issued the *Fourteenth Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control*, jointly with the National Development and Reform Commission, the Ministry of Finance, the National Energy Administration and the State Administration of Science, Technology and Industry for National Defense, as well as organized its implementation. NNSA evaluated the fulfillment of the objectives and tasks for the “13th Five-Year Plan” period prescribed in the *13th Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control and Long-Range Objectives through the Year 2025*.

Figure 2. HUANG Runqiu, Minister of Ecology and Environment, TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of NNSA, Surveying at Fuel Cycle Facility Site and Urged to Implement the Instructions

Development/Revision of Regulations and Standards

NNSA revised and issued the departmental rule *Safety Rules on Commissioning and Operation of Nuclear Power Plants*; promoted the formulation and revision

of national standards and environmental standards issued by MEE such as *Monitoring and Assessment Method for Regional Electromagnetic Environment Quality (on trial)*; orderly formulated/revised supporting guides for the *Safety Specifications for Design of Nuclear Power Plant* as well as guides for uranium and other radioactive mines, radioactive wastes, transport of radioactive materials and other fields.

A total of 9 rules and standards were officially issued throughout the year, including 1 departmental rule, 6 nuclear safety guides, 1 national standard and 1 environmental standard issued by MEE, as shown in Table 1. The National Nuclear Safety Expert Commission reviewed 34 item-time rules and standards, including 5 item-time departmental rules, 6 item-time nuclear safety guides, 19 item-time standards and 4 item-time technical documents, as shown in Table 2.

Table 1. List of Nuclear and Radiation Safety Rules and Standards Issued in 2022

No.	Name	Category	Code	Document No.	Issue Date
1	*Safety Rules on Commissioning and Operation of Nuclear Power Plants*	Departmental rules	HAF103-2022	NNSA [2022] No. 97	June 9, 2022
2	*Safety Assessment for Decommissioning of Nuclear Facilities*	Guides	HAD401/15-2021	NNSA [2022] No. 1	January 5, 2022
3	*Operational Experience Feedback for Nuclear Power Plants*	Guides	HAD103/13-2022	NNSA [2022] No. 165	September 1, 2022
4	*Level 2 Probabilistic Safety Analysis of Nuclear Power Plants*	Guides	HAD002/08-2022	NNSA [2022] No. 191	September 21, 2022
5	*Design of Auxiliary and Supporting Systems for Nuclear Power Plants*	Guides	HAD102/22-2022	NNSA [2022] No. 220	November 2, 2022
6	*Nuclear Material Accounting for Nuclear Fuel Reprocessing Plants*	Guides	HAD501/09-2022	NNSA [2022] No. 237	November 18, 2022
7	*Development of Emergency Action Levels for PWR Nuclear Power Plants*	Guides	HAD002/08-2022	NNSA [2022] No. 239	November 21, 2022
8	*Characterization of Low-Level Radioactive Waste Packages - Cemented Waste*	Standards	GB 41930-2022	MEE Bulletin [2022] No. 23	September 9, 2022
9	*Technical Specifications for Siting, Design and Construction of Radioactive Waste Repository for Nuclear Technology Application*	Standards	HJ 1258-2022	MEE Bulletin [2022] No. 14	June 9, 2022

Table 2. List of Nuclear and Radiation Safety Rules and Standards Reviewed by the National Nuclear Safety Expert Commission in 2022

No.	Name	Status	Meeting
Departmental rules			
1	*Regulations on Nuclear Safety Reporting of Research Reactor Licensees (Including Guidelines)*	Draft for review and preliminary draft for approval	Q3 and Q4
2	*Safety Regulation for Site Evaluation of Nuclear Power Plants*	Draft for review and preliminary draft for approval	Q1 and Q2
3	*Measures on the Management of Radiation Environment Protection of Radioactive Associated Mines (NORM) (on trial)*	Draft for review	Q4
Nuclear Safety Guides			
1	*Development of Emergency Action Levels for PWR Nuclear Power Plants*	Draft for review and preliminary draft for approval	Q1 and Q2
2	*Level 2 Probabilistic Safety Analysis of Nuclear Power Plants*	Preliminary draft for approval	Q1
3	*Emergency Preparedness and Response of Licensees of Near Surface Disposal Facilities for Radioactive Waste*	Draft for review and preliminary draft for approval	Q1 and Q2
4	*Management of Modifications to Nuclear Power Plants*	Preliminary draft for approval	Q3
Standards			
1	*Technical Requirements for Radiation Safety Management of Radioactive Wastes from the Mining and Milling of Uranium Ores*	Preliminary draft for approval	Q1
2	*Radiation Safety and Protection of Radioactive Logging*	Preliminary draft for approval	Q1 and Q3
3	*Technical Specification for Radioactive Associated (NORM) Wastewater Treatment and Discharge*	Draft for review and preliminary draft for approval	Q1 and Q3
4	*Technical Specifications for Acceptance of Environmental Protection Facilities upon Completion of Construction Projects in Satellite up-Link Earth Station*	Draft for review and preliminary draft for approval	Q1 and Q2
5	*Technical Specifications for Acceptance of Environmental Protection Facilities in Uranium Mining or Milling Project upon Completion of Construction Projects*	Preliminary draft for approval	Q2
6	*Technical Specifications for Acceptance of Environmental Protection Facilities in Decommissioning Project of Uranium Mining or Milling upon Completion of Construction Projects*	Preliminary draft for approval	Q2
7	*Monitoring and Assessment Method for Regional Electromagnetic Environment Quality (on trial)*	Draft for review and preliminary draft for approval	Q2 and Q3
8	*Technical Specifications for Acceptance of Environmental Protection in Nuclear Technology Application Project upon Completion of Construction Projects*	Draft for review	Q2

continued

No.	Name	Status	Meeting
9	*Design Requirements of Pressurized Water Reactor Spent Fuel Transport Cask*	Draft for review and preliminary draft for approval	Q3 and Q4
10	*Technical Specifications for Environmental Protection Facilities Acceptance of in Nuclear Technology Application Project upon Completion of Construction Projects*	Preliminary draft for approval	Q3
11	*Analytical methods of Lead-210 in Water - α/β Counter Method*	Draft for review	Q4
12	*Analytical methods of Tritium and Carbon-14 in Biological Samples - Tube Furnace Oxidation Combustion Method*	Draft for review	Q4
13	*Criteria for Residual Radio-nuclide Activity Levels in Soil of Decommissioning Site of Nuclear Facility*	Draft for review	Q4
14	*Technical Guidelines for Environmental Impact Assessment - Format and Content of Environment Impact for Nuclear Facility Decommissioning*	Draft for review	Q4
15	*Safety Requirements of Lifting and Retention Devices for Shipping Cask Used to Transport Radioactive Material*	Draft for review	Q4
Technical Documents			
1	*Format and Content of Safety Analysis Report of Nuclear Facilities Decommissioning*	Preliminary draft for approval	Q4
2	*Format and Content of the Decommissioning Plan for Nuclear Facilities*	Preliminary draft for approval	Q4
3	*Guidelines for Nuclear Safety Reporting of Research Reactor Licensees*	Draft for review and preliminary draft for approval	Q3 and Q4

Fostering Nuclear Safety Culture

NNSA made research on fostering nuclear safety culture and the evaluation standard, and submitted the *General Requirements for Fostering Nuclear Safety Culture* to the Standardization Administration of the People's Republic of China for approval. NNSA moved forward with the formulation of the regulatory inspection program for nuclear safety culture. NNSA prepared top-level policy design for nuclear safety culture, organized surveys about the nuclear safety culture work of relevant organizations, and compiled documents on fostering nuclear safety culture of domestic nuclear-related enterprises and international nuclear safety culture regulations. NNSA formulated special experience-sharing training programs on nuclear safety culture for nuclear and radiation safety regulation authority and its subordinate organizations.

III. Safety Regulation on Nuclear Power Plants

In 2022, there are 55 nuclear power units in operation and 22 nuclear power units under construction in Chinese mainland. A total of 28 operational events and 3 construction events were reported by nuclear power plant licensees, and no radioactive events endangering public and environmental safety occurred in the nuclear power plants in operation. The monitoring results indicate that the integrity of the three physical barriers in all the nuclear power plants remained intact throughout the year.

In 2022, the review opinions on siting were issued for Lianjiang NPP Units 1 and 2, Taipingling NPP Units 3 and 4, Expansion Phase I Project of Shidao Bay NPP of China Huaneng Group Co., Ltd. Shandong Branch; the construction licenses were issued for Sanmen NPP Units 3 and 4, Haiyang NPP Units 3 and 4 and Lufeng NPP Units 5 and 6; and operation licenses were issued for Hongyanhe NPP Unit 6 and Fangchenggang NPP Unit 3.

The operation data of nuclear power plants in China in 2022 are shown in Table 3.

Table 3. Operation Data of Nuclear Power Plants in China in 2022

NPP Name	Nuclear Electricity (TWeh)	Unit	Unified Unit No.	Rated Power (MWe)	Nuclear Electricity by Unit (TWeh)	Load Factor (%)	Unit Capacity Factor (%)
Qinshan	2.79	1	CN01	350	2.79	91.10	92.96
Qinshan Phase II	21.58	1	CN04	670	5.22	88.91	89.42
		2	CN05	670	5.41	94.93	92.86
		3	CN14	670	5.83	100.90	100.00
		4	CN15	670	5.13	88.67	89.42
Qinshan Phase III	11.65	1	CN08	728	6.25	98.05	99.91
		2	CN09	728	5.39	84.57	86.31

continued

NPP Name	Nuclear Electricity (TWeh)	Unit	Unified Unit No.	Rated Power (MWe)	Nuclear Electricity by Unit (TWeh)	Load Factor (%)	Unit Capacity Factor (%)
Fangjiashan	17.54	1	CN24	1089	8.73	91.54	92.55
		2	CN25	1089	8.81	92.32	93.36
Daya Bay	16.14	1	CN02	984	8.02	93.02	91.96
		2	CN03	984	8.12	94.22	93.24
Ling'ao	32.34	1	CN06	990	7.00	80.73	82.03
		2	CN07	990	7.93	91.39	91.14
		3	CN12	1086	8.03	84.35	89.65
		4	CN13	1086	9.39	98.70	99.77
Tianwan	52.56	1	CN10	1060	8.75	94.20	100.00
		2	CN11	1060	7.94	85.51	90.98
		3	CN45	1126	9.42	95.47	100.00
		4	CN46	1126	8.93	90.57	93.63
		5	CN53	1118	9.53	97.26	99.97
		6	CN54	1118	7.99	81.62	85.25
Hongyanhe	44.76	1	CN16	1119	8.12	82.84	92.71
		2	CN17	1119	9.46	96.50	99.99
		3	CN26	1119	7.69	78.51	91.81
		4	CN27	1119	8.52	86.98	91.82
		5	CN49	1119	6.67	68.03	87.93
		6	CN50	1119	4.29	83.69	99.76
Ningde	33.52	1	CN18	1089	9.01	94.40	99.99
		2	CN19	1089	7.87	82.48	93.65
		3	CN34	1089	8.39	87.92	92.41
		4	CN35	1089	8.26	86.61	91.16
Fuqing	49.10	1	CN20	1089	8.66	90.80	90.99
		2	CN21	1089	8.93	93.58	100.00
		3	CN42	1089	8.69	91.07	100.00
		4	CN43	1089	8.49	89.04	89.60
		5	CN51	1161	7.15	70.25	75.72
		6	CN52	1161	7.19	91.81	96.72

continued

NPP Name	Nuclear Electricity (TWeh)	Unit	Unified Unit No.	Rated Power (MWe)	Nuclear Electricity by Unit (TWeh)	Load Factor (%)	Unit Capacity Factor (%)
Yangjiang	53.05	1	CN22	1086	8.89	93.43	94.41
		2	CN23	1086	8.66	91.07	91.78
		3	CN40	1086	9.55	100.38	99.99
		4	CN41	1086	8.32	87.50	93.07
		5	CN47	1086	8.77	92.15	92.72
		6	CN48	1086	8.86	93.13	93.56
Sanmen	19.49	1	CN28	1251	9.51	86.73	89.41
		2	CN29	1251	9.99	91.11	92.11
Haiyang	20.66	1	CN30	1253	10.20	98.23	96.61
		2	CN31	1253	10.46	95.28	98.97
Taishan	13.32	1	CN32	1750	4.44	29.00	29.03
		2	CN33	1750	8.88	57.93	57.65
Changjiang	10.52	1	CN36	650	5.60	98.30	99.92
		2	CN37	650	4.93	86.53	89.62
Fangchenggang	17.76	1	CN38	1086	9.03	94.88	98.93
		2	CN39	1086	8.73	91.80	93.09
Shidao Bay	0.0575	HTGR demonstration project	CN44	211	0.0575	N/A	N/A

Note: As of the end of December 2022, Fangchenggang NPP Unit 3 was at commissioning stage after the initial fuel loading, and there is no relevant operation data.

Qinshan NPP

In 2022, the one unit of Qinshan NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 21st refueling outage of Unit 1 was completed on March 31, 2022.

The nuclear safety-related regulatory approvals for Qinshan NPP in 2022 are shown in Table 4 and the occupational radiation doses at Qinshan NPP are shown in Table 5.

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 2,007 person-days for inspection at Qinshan Nuclear Power Base (including Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP), including 8 routine inspections. A total of 206 findings were identified and 27 regulatory requirements were imposed.

Table 4. Nuclear Safety-related Regulatory Approvals for Qinshan NPP in 2022

Date	Document No.	Document Title
05/25/2022	NNSA [2022] No. 84	*Notice on Approving the Modification to the Alarm Level Setpoint of the Oil Sump in the Emergency Diesel Engine System in Qinshan NPP Unit 1*
05/31/2022	NNSA [2022] No. 88	Reply on the Modification to Ionization Chamber and Counting Tube in the Reactor Building and Other Buildings for Qinshan NPP Unit 1
07/13/2022	NNSA [2022] No. 133	*Notice on Approving the Revision and Upgrading of the In-Service Inspection Program for Qinshan NPP Unit 1*
10/11/2022	NNSA [2022] No. 203	*Notice on Approving the Implementation of the "One Point Method" to Inter-Calibrate the Ex-core Nuclear Instrumentation of Qinshan NPP Unit 1*

Table 5. Occupational Radiation Doses at Qinshan NPP in 2022

Unit	Annual Average Effective Dose/Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Unit 1	0.088	5.810	0.378	0.135

Qinshan Phase II NPP

In 2022, the four units of Qinshan Phase II NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 17th refueling outage of Unit 1 was completed on December 8, 2022, the 15th refueling outage of Unit 2 on March 13, 2022 and the 9th refueling outage of Unit 4 on October 14, 2022.

The nuclear safety-related regulatory approvals for Qinshan Phase II NPP in 2022 are shown in Table 6. Qinshan Phase II NPP reported 2 operational events, as shown in Table 7. The occupational radiation doses at Qinshan Phase II NPP are shown in Table 8.

Table 6. Nuclear Safety-related Regulatory Approvals for Qinshan Phase II NPP in 2022

Date	Document No.	Document Title
09/02/2022	NNSA [2022] No. 168	*Reply on Partial Modification to the Final Safety Analysis Reports for Qinshan Phase II NPP Units 3 and 4*

continued

Date	Document No.	Document Title
09/02/2022	NNSA [2022] No. 169	*Notice on Approving the Modification to Filtered Containment Venting System Test in the Technical Specifications for Operation of Qinshan Phase II NPP Units 3 and 4*
09/02/2022	NNSA [2022] No. 170	*Reply on Partial Modification to the Final Safety Analysis Reports for Qinshan Phase II NPP Units 1 and 2*
09/02/2022	NNSA [2022] No. 171	*Notice on Approving the Modification to Rotating Filter Screen of the Safety-related Service Water System in the Technical Specifications for Operation of Qinshan Phase II NPP Units 1 and 2*
09/02/2022	NNSA [2022] No. 172	*Notice on Approving the Treatment and Renovation of Small Flow Pipeline Vibration for the Low-Pressure Safety Injection Pumps of Four Units at Qinshan Phase II NPP*
09/02/2022	NNSA [2022] No. 173	*Notice on Approving the Cancellation of Modification to Muddy Water Pipeline for Culvert Channels of the Safty-related Service Water System in Qinshan Phase II NPP Units 1 and 2*
10/11/2022	NNSA [2022] No. 205	*Notice on Approving the Modification of Adding Freight Transport Door to the Physical Enclosure in the Vital Area of Qinshan Phase II NPP Unit 1*

Table 7. Operational Events of Qinshan Phase II NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
03/08/2022	Unexpected start-up of Emergency Diesel Generator caused by false excitation of the bistable relay during the recovery of Unit 2 after the periodic testing	Human factor, equipment	0
05/23/2022	The test item “Temperature of Emergency Diesel Generator Thrust Bearing” of Unit 1 and Unit 2 failed to be effectively conducted, and it was not corrected in time	Human factor, management	0

Table 8. Occupational Radiation Doses at Qinshan Phase II NPP in 2022

Unit	Annual Average Effective Dose/ Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.238	5.337	0.832	0.078
Units 3 and 4	0.142	3.983	0.441	0.040

Qinshan Phase III NPP

In 2022, the two units of Qinshan Phase III NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 11th refueling outage of Unit 2 was completed on June 3, 2022.

The nuclear safety-related regulatory approvals for Qinshan Phase III NPP in 2022 are shown in Table 9. Qinshan Phase II NPP reported 1 operational event, as shown in Table 10. The occupational radiation doses at the Qinshan Phase III NPP are shown in Table 11.

Figure 3. DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration Surveying at Taishan Phase III NPP

Table 9. Nuclear Safety Regulatory Approvals for Qinshan Phase III NPP in 2022

Date	Document No.	Document Title
04/06/2022	NNSA [2022] No. 55	*Notice on Approving the Improvement of Fuel Bundle Structure for Qinshan Phase III NPP Units 1 and 2*
04/08/2022	NNSA [2022] No. 57	*Notice on Approving the Replacement of Cobalt Regulating Rod Assemblies with Regulating Rod Assemblies Containing Carbon-14 for Qinshan Phase III NPP Units 1 and 2*
04/13/2022	NNSA [2022] No. 58	*Notice on Approving the Defect Treatment Scheme for Fast Dew Point Rise Rate in the Annulus Gas System of Qinshan Phase III NPP Unit 2*
06/20/2022	NNSA [2022] No. 110	*Notice on Approving the Change to Construction Permit for the Temporary Dry Storage Facility of Spent Fuel at Qinshan Phase III NPP*
11/03/2022	NNSA Letter [2022] No. 78	*Letter on Approving the Second Periodic Safety Appraisal Program for Qinshan Phase III NPP*
09/01/2022	MEE App [2022] No. 139	*Reply on the Environmental Impact Form of Supporting Heavy Water Distillation Facility for Qinshan Phase III (Heavy Water Reactor) NPP Project*

Table 10. Operational Event of Qinshan Phase III NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
05/04/2022	During the replacement of a single pressure pipe in unit 2, accidentally brought out of the pressure pipe caused unplanned exposure of the staff	Human factor, equipment, management	Level 0 tentatively

Table 11. Occupational Radiation Doses at Qinshan Phase III NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.551	27.893	1.726	0.148

Fangjiashan NPP

In 2022, the two units of Fangjiashan NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 6th refueling outage of Unit 1 and that of Unit 2 were completed on April 28, 2022 and September 23, 2022 respectively.

The nuclear safety-related regulatory approvals for Fangjiashan NPP in 2022 are shown in Table 12. The occupational radiation doses at Fangjiashan NPP are shown in Table 13.

Table 12. Nuclear Safety Regulatory Approvals for Fangjiashan NPP in 2022

Date	Document No.	Document Title
03/23/2022	NNSA [2022] No. 45	*Notice on Approving the Modification to the Diesel Generator Set System of Hydrostatic Test Pump in the Technical Specifications for Fangjiashan NPP Units 1 and 2*
03/23/2022	NNSA [2022] No. 44	*Notice on Approving the Addition of a 200 kV Standby Power Supply to Fangjiashan NPP*
05/31/2022	NNSA [2022] No. 87	*Reply on Modification to the Final Safety Analysis Report of Fangjiashan NPP*
07/13/2022	NNSA [2022] No. 131	*Notice on Temporarily Not Approving the Adjustment of Inspection Plan for Rotating Probe in Heat Transfer Tube Expanding Transition Section of the Steam Generators for Fangjiashan NPP Units 1 and 2*

continued

Date	Document No.	Document Title
07/13/2022	NNSA [2022] No. 132	*Notice on Approving the Cancellation of Secondary Neutron Sources for Fangjiashan NPP Units 1 and 2*
10/11/2022	NNSA [2022] No. 204	*Notice on Temporarily Not Approving the Irradiation Testing for N45 Characterized Fuel Assemblies in Fangjiashan NPP Unit 2*

Table 13. Occupational Radiation Doses at Fangjiashan NPP in 2022

Unit	Annual Average Effective Dose/ Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/ Gwh)
Units 1 and 2	0.384	8.270	1.230	0.070

Daya Bay NPP

In 2022, the two units of Daya Bay NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 22nd refueling outage of Unit 1 and that of Unit 2 were completed on November 6, 2022 and April 23, 2022 respectively.

The nuclear safety-related regulatory approvals for Daya Bay NPP in 2022 are shown in Table 14. The Daya Bay NPP reported 1 operational event, as shown in Table 15. The occupational radiation doses at the Daya Bay NPP are shown in Table 16.

In 2022, Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 804 person-days for inspection of the 6 operating units of Daya Bay Nuclear Power Base (including Daya Bay NPP and Ling'ao NPP), including 8 routine inspections. A total of 99 issues were identified and 38 regulatory requirements were imposed.

Figure 4. Supervision Site of Daya Bay NPP

Table 14. Nuclear Safety Regulatory Approvals for Daya Bay NPP in 2022

Date	Document No.	Document Title
05/20/2022	NNSA [2022] No. 74	*Notice on Approving the Improvement of Steam Turbine Generator Unit System of Hydrostatic Test Pump for Daya Bay NPP*
06/29/2022	NNSA [2022] No. 126	Notice on Approving the Installation of New Exhaust Pipeline at the Top of Pressure Vessel of the Reactor Coolant System in Daya Bay NPP and Ling'ao NPP
09/02/2022	NNSA [2022] No. 177	*Notice on Approving the Upgrading of the Technical Specifications for Daya Bay NPP and Ling'ao NPP*
10/21/2022	NNSA [2022] No. 213	*Notice on Approving the Special Permission Application for the Improvement of Steam Turbine Generator Unit System of Hydrostatic Test Pump for Daya Bay NPP*
10/21/2022	NNSA [2022] No. 214	*Notice on Approving the Clearance Procedure of Metal Item in the Limited Access Area of Daya Bay Nuclear Power Base*
11/03/2022	NNSA [2022] No. 221	*Notice on Approving the Special Permission Application for Unavailability of Additional Diesel Generator Sets during the Renovation of New Diesel Generator Sets of Daya Bay NPP*
09/02/2022	NNSA Letter [2022] No. 60	*Letter on Confirming the Change of Registered Address on the Operation Licenses for Daya Bay NPP and Ling'ao NPP*

Table 15. Operational Event of Daya Bay NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
04/30/2022	Governor failure caused the unavailable time of Train B emergency diesel generator set of Unit 2 to exceed the time limit specified in the technical specifications for operation	Human factor	0

Table 16. Occupational Radiation Doses at Daya Bay NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/ Gwh)
Units 1 and 2	0.211	7.420	0.720	0.045

Ling'ao NPP

In 2022, the four units of Ling'ao NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 18th refueling outage of Unit 1 was completed on July 2, 2022, the

17th refueling outage of Unit 2 on February 11, 2022 and the 11th refueling outage of Unit 3 on October 31, 2022.

The nuclear safety-related regulatory approvals for Ling'ao NPP in 2022 are shown in Table 17. Ling'ao NPP reported 2 operational events, as shown in Table 18. The occupational radiation doses at Ling'ao NPP are shown in Table 19.

Table 17. Nuclear safety regulatory approvals for Ling'ao NPP in 2022

Date	Document No.	Document Title
01/19/2022	NNSA [2022] No. 14	*Notice on Approving the Application for Unavailability of Additional Diesel Generator Sets during the Reconstruction of New Diesel Generator Sets of Ling'ao NPP Units 1 and 2*
03/20/2022	NNSA [2022] No. 40	*Notice on Approving the Replacement of the Pipe Section and Other Improvements of Important Service Water Systems of Ling'ao NPP Units 1 and 2*
05/06/2022	NNSA [2022] No. 63	*Notice on Approving the Application for Postponing the Primary Circuit Hydrostatic Test of Ling'ao NPP Units 1 and 2*
05/22/2022	NNSA [2022] No. 75	*Notice on Approving the Addition of Domestic Spare Parts for Control Rod Guide Tube of Ling'ao NPP Units 1 and 2*
05/21/2022	NNSA [2022] No. 82	*Notice on Approving the Modification to the Supervision Requirements for Periodic Test of Safety-related Systems and Equipment of Ling'ao NPP Units 1 and 2*

Note: There are 3 approvals for both Ling'ao NPP and Daya Bay NPP, as shown in Table 14.

Table 18. Operational Events of Ling'ao NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
09/17/2022	Unexpected start-up of L4LHP emergency diesel engine during the periodic test of Ling'ao NPP Unit 4	Human factor	0
10/15/2022	Reactor trip due to a low water level of 3# steam generator (caused by the failure of ARE main feed water flow control board of Unit 4) and the steam-water mismatch signal	Equipment	0

Table 19. Occupational Radiation Doses at Ling'ao NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.572	8.341	1.888	0.127
Units 3 and 4	0.122	3.406	0.329	0.019

Tianwan NPP

In 2022, Units 1 to 6 of Tianwan NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 13th refueling outage of Unit 2 was completed on October 3, 2022, the 3rd refueling outage of Unit 4 on June 23, 2022 and the 1st refueling outage of Unit 6 on June 15, 2022. The first concrete date (FCD) for the nuclear island foundation of Unit 8 was February 25, 2022.

The nuclear safety-related regulatory approvals for Tianwan NPP in 2022 are shown in Table 20 and the regulatory inspection activities in Table 21. Tianwan NPP reported 2 operational events, as shown in Table 22. The occupational radiation doses at Tianwan NPP are shown in Table 23.

In 2022, the Northern Regional Office of Nuclear and Radiation Safety Inspection assigned 3,769 person-days for inspection at Tianwan NPP, including 14 routine inspections. A total of 115 findings were identified and 54 regulatory requirements were imposed.

Figure 5. Quality supervision of submerged arc-welding of steel lining base plate welds of Tianwan NPP Unit 8

Table 20. Nuclear safety regulatory approvals for Tianwan NPP in 2022

Date	Document No.	Document Title
01/19/2022	NNSA [2022] No. 13	*Notice on Approving the Modification of the Temperature Difference Setpoint Value of the Temperature Control Mode of the Pressurizer Control Module of Tianwan NPP Units 1 to 4*
02/25/2022	NNSA [2022] No. 31	*Notice on Releasing the Control Point for Pouring the First Concrete Date for the Nuclear Island Foundation of Tianwan NPP Unit 8*
05/13/2022	NNSA [2022] No. 69	*Notice on Approving the Safety-important Modifications to Optimization of Ex-core Nuclear Instrumentation in Refueling Monitoring System for Tianwan NPP Units 3 and 4*
09/02/2022	NNSA [2022] No. 175	*Notice on Approving the Safety-important Modifications to Ex-core Nuclear Instrumentation System for Tianwan NPP Units 1 and 2*

continued

Date	Document No.	Document Title
09/02/2022	NNSA [2022] No. 176	*Notice on Approving the Safety-Critical Modification to Irradiation of Carbon-14 production research targets for Tianwan NPP*
09/02/2022	NNSA [2022] No. 178	*Notice on Approving the Safety-important Modification of Normal operation I&C system for Tianwan NPP Units 1 and 2*

Table 21. Regulatory Inspection Activities at Tianwan NPP in 2022

Starting Date	Item	Main Contents of the Inspection
02/14/2022	Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of Tianwan NPP Unit 8	Implementation of the quality assurance programs for design and construction stages, consistency between organization staffing and those specified in the quality assurance programs, document control, procurement control and non-conformance management; preparation of technical conditions such as design documents and construction schemes; nuclear island construction organizing, construction plan, concrete production preparation, concrete transportation, and pouring preparation; preparation of construction management conditions such as emergency measures; establishment and operation of the experience feedback system; preparation of construction conditions before the FCD of the nuclear island foundation, including but not limited to preliminary engineering preparation, concealed engineering, material preparation and interface management; handling of remaining issues identified in preliminary construction regulatory inspection such as negative excavation of the nuclear island foundation pit

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 22. Operational Events Reported by Tianwan NPP in 2022

Date of Occurrence	Event	Cause	INES Level
06/14/2022	A reactor trip (turbine trip) was triggered by high-high level of the steam generator (caused by the fail-close of bypass valve 6M2GCT121VV) and its nuclear power greater than 10% FP	Equipment	0
09/09/2022	The containment isolation valve was closed due to false triggering of the containment primary isolation signal during calibration of instrumentation of Unit 2	Human factor	0

Table 23. Occupational Radiation Doses at Tianwan NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/ Gwh)
Units 1 and 2	0.116	1.953	0.372	0.022
Units 3 and 4	0.066	1.427	0.199	0.011
Units 5 and 6	0.176	6.596	0.475	0.027

Hongyanhe NPP

In 2022, six units of Hongyanhe NPP continued to operate stably and safely. The leakage rate of primary coolant pressure boundary and leakage rate of containment are both within the prescribed limits. The 7th refueling outage of Unit 1 was completed on April 5, 2022, the 6th refueling outage of Unit 3 on February 14, 2022, the 5th refueling outage of Unit 4 on May 2, 2022, and the 1st refueling outage of Unit 5 on September 23, 2022. The initial loading of Unit 6 began on March 5, 2022.

The nuclear safety-related regulatory approvals for Hongyanhe NPP in 2022 are shown in Table 24 and the regulatory inspection activities in Table 25. The Hongyanhe NPP reported 3 operational events, as shown in Table 26. The occupational radiation doses at Hongyanhe NPP are shown in Table 27.

Figure 6. The initial fuel loading of Hongyanhe NPP Unit 6

In 2022, the Northeast China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,680 person-days for inspection at Hongyanhe NPP, including 10 routine inspections. A total of 153 findings were identified and 56 regulatory requirements were imposed.

Figure 7. SUN Jinlong, Party Secretary of the Ministry of Ecology and Environment, expressed his gratitude to the resident inspectors

Table 24. Nuclear Safety Regulatory Approvals for Hongyanhe NPP in 2022

Date	Document No.	Document Title
01/21/2022	NNSA [2022] No. 17	*Notice on Approving the Improvement of Power Supply Circuit of Turbine Transmission Protection System Trip Signal Intermediate Relay of Safety Class Process Control Cabinet System of Hongyanhe NPP Units 1 to 4 in Liaoning*
01/22/2022	NNSA [2022] No. 18	*Notice on Approving the Improvement of Adding Closed Circuit Monitoring for 6.6kV Important Circuit Breakers of Hongyanhe NPP Units 1 to 4 in Liaoning*
01/22/2022	NNSA [2022] No. 19	*Notice on Approving Replacement of Manhole and Handhole Gaskets for Pressurizer and Steam Generator of Hongyanhe NPP Units 1 to 4 in Liaoning*
03/25/2022	NNSA [2022] No. 48	*Notice on Issuing the Operation License for Hongyanhe NPP Unit 6 in Liaoning*
04/06/2022	NNSA [2022] No. 56	*Notice on Approving the Implementation of 18-month Refueling for Hongyanhe NPP Units 3 and 4 in Liaoning*
04/15/2022	NNSA [2022] No. 59	*Notice on Approving the Application for Postponing the First Primary Circuits Rehydrostatic Test and Complete In-service Inspection of Hongyanhe NPP Unit 5 in Liaoning*
06/06/2022	NNSA [2022] No. 95	*Notice on Approving the Optimization and Improvement of Water Intake of Hongyanhe NPP in Liaoning*
08/25/2022	NNSA [2022] No. 160	*Notice on Approving the Extension Operation of the First Refueling Cycle of Hongyanhe NPP Units 5-6 in Liaoning*
08/25/2022	NNSA [2022] No. 161	*Notice on Approving the Modification of Addition of Redundant Hydrogen and Oxygen Detectors for the Exhaust Gas Treatment System of Hongyanhe NPP Units 5 and 6 in Liaoning*

continued

Date	Document No.	Document Title
01/22/2022	NNSA Letter [2022] No. 4	*Letter on Approving the First Periodic Safety Review Program of Hongyanhe NPP Units 1 to 4 in Liaoning*
03/14/2022	MEE App [2022] No. 29	*Reply on the Environmental Impact Form for 18-month Refueling and Reconstruction Projects in Hongyanhe NPP Units 3 and 4 in Liaoning*
03/25/2022	MEE App [2022] No. 32	*Reply on the Environmental Impact Form for Operation Mode Optimization Project of Hongyanhe NPPs in Liaoning*
10/09/2022	MEE App [2022] No. 166	*Reply on the Environmental Impact Form of Operation Status Change Project of Six Units of Hongyanhe NPPs in Liaoning*

Table 25. Regulatory Inspection Activity at Hongyanhe NPP in 2022

Starting Date	Item	Main Contents of the Inspection
02/14/2022	Comprehensive nuclear safety inspection before issuing the operation license for Hongyanhe Unit 6	Implementation of the quality assurance program; structures and nuclear safety equipment; system commissioning; operation and production preparation; radiation protection; emergency preparedness; physical protection and fuel storage; radioactive waste management and environmental monitoring; fire-fighting facilities; implementation of requirements for construction license, operation license application documents and issues identified in the documents review; implementation of regulatory requirements proposed in nuclear safety regulatory inspections for construction etc.

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 26. Operational Event of Hongyanhe NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
04/12/2022	Unexpected disconnection of trip breaker caused by wrong disconnection before flow inertia test of main pump of Unit 6	Human factor	0
05/24/2022	Excessive anode conductivity of the steam generator of Unit 6 causes the unit to withdraw to NS/SG mode	Equipment	0
06/11/2022	Reactor trip caused by manual block due to high-high turbine rotor vibration after full-power load rejection to house load test of Hongyanhe NPP Unit 6	Equipment	0

Table 27. Occupational Radiation Doses at Hongyanhe NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.160	3.528	0.346	0.020
Units 3 and 4	0.245	3.661	0.593	0.037
Units 5 and 6	0.121	3.690	0.335	0.031

Ningde NPP

In 2022, Units 1 to 4 of Ningde NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 6th refueling outage of Unit 2 was completed on October 13, 2022, the 5th refueling outage of Unit 3 on June 12, 2022 and the 4th refueling outage of Unit 4 on March 3, 2022.

The nuclear safety-related regulatory approvals for Ningde NPP in 2022 are shown in Table 28. The occupational radiation doses at Ningde NPP are shown in Table 29.

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,311 person-days for inspection at Ningde NPP, including 3 routine inspections. A total of 106 findings were identified and 8 regulatory requirements were imposed.

Table 28. Nuclear Safety Regulatory Approvals for Ningde NPP in 2022

Date	Document No.	Document Title
01/07/2022	NNSA [2022] No. 3	*Notice on Approving the Change of Perimeter in Physical Protection Control Area of Ningde NPP*
08/02/2022	NNSA [2022] No. 144	*Notice on Approving the "Refueling Program for Ningde NPP Units 1 to 4 (Version 5 - Draft for Approval)"*
08/02/2022	NNSA [2022] No. 145	*Notice on Approving the Reconstruction of Fuel Handling and Storage System for Ningde NPP Unit 1*
09/08/2022	NNSA [2022] No. 181	*Notice on Approving the Separate Preventive Maintenance of Component Cooling Water Systems and Important Service Water Systems during Refueling Outage for Ningde NPP Units 1 to 4*
11/02/2022	NNSA [2022] No. 218	*Notice on Approving the Adjustment of Emergency Air Compression Test Cycle for Ningde NPP Units 1 to 4*
12/30/2022	NNSA [2022] No. 271	*Notice on Approving the Modification of Lock-up and Enable Control Logic of Compressed Air Switch for Emergency Diesel Engine and Additional Diesel Engine of Ningde NPP Units 1 to 4*

Table 29. Occupational Radiation Doses at Ningde NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.151	2.934	0.396	0.023
Units 3 and 4	0.342	5.996	0.990	0.059

Fuqing NPP

In 2022, the six units of Fuqing NPP continued to operate stably and safely. The integrity of fuel cladding, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 6th refueling outage of Unit 1 was completed on September 18, 2022, the 4th refueling outage of Unit 4 on April 19, 2022 and the 1st refueling outage of Unit 5 on March 11, 2022. Unit 6 was put into commercial operation on March 25, 2022, and, in general, operated safely.

The nuclear safety-related regulatory approvals for Fuqing NPP in 2022 are shown in Table 30. Fuqing NPP reported 3 operational events, as shown in Table 31. The occupational radiation doses at Fuqing NPP are shown in Table 32.

Figure 8. Inspectors Surveying at the Diesel Engine Building of Fuqing NPP

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,461 person-days for inspection at Fuqing NPP, including 3 routine inspections. A total of 39 findings were identified and 13 regulatory requirements were imposed.

Table 30. Nuclear Safety Regulatory Approvals for Fuqing NPP in 2022

Date	Document No.	Document Title
04/18/2022	NNSA [2022] No. 60	*Notice on Approving the "Maintenance Program for Fuqing NPP Units 1 to 4 in Fujian" (Version 006)*
06/01/2022	NNSA [2022] No. 90	*Notice on Approving the "Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Fuqing NPP Units 1 and 2 in Fujian" (Version 6.1)*

continued

Date	Document No.	Document Title
06/01/2022	NNSA [2022] No. 91	*Notice on Approving the "Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Fuqing NPP Units 3 and 4 in Fujian" (Version 2.0)*
06/24/2022	NNSA [2022] No. 115	*Notice on Approving the "Technical Specifications for Operation of Fuqing NPP Units 1 and 2 in Fujian" (Version 6.0)*
06/24/2022	NNSA [2022] No. 116	*Notice on Approving the "Technical Specifications for Operation of Fuqing NPP Units 3 and 4 in Fujian" (Version 2.0)*
11/22/2022	NNSA [2022] No. 223	*Notice on Approving the Physical Protection System Integration of Fuqing NPP Units 1 to 6 in Fujian and Safety-important Modification of the Removal and Change of the Fence and Equipment of Units 4 and 5*
11/21/2022	NNSA [2022] No. 238	*Notice on Approving the Technical Specifications in Chapter 16 of the Final Safety Analysis Report (Version C) of Fuqing NPP Units 5 and 6 in Fujian*
12/31/2022	NNSA [2022] No. 272	*Notice on Approving the Revision of Section 10.3.4.2 of the Final Safety Analysis Report for of Fuqing NPP Units 1 to 4 in Fujian*
11/03/2022	NNSA Letter [2022] No. 77	*Letter on Confirming the Change of Legal Representative Information of Operation License for Fuqing NPP Units 1 to 6 in Fujian*

Table 31. Operational Events of Fuqing NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
01/29/2022	The 8KRT902MA of Unit 3 is not unlocked resulting in loss of auto-stop function during discharge of 8SEL002BA	Human factor	0
08/05/2022	Reactor trip was caused by differential protection action of main transformer of Unit 5	Equipment	0
08/18/2022	Reactor trip of Unit 5 was caused by mispressing the shutdown button	Human factor, management	0

Table 32. Occupational Radiation Doses at Fuqing NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.187	4.053	0.469	0.027
Units 3 and 4	0.164	4.066	0.424	0.025
Units 5 and 6	0.121	3.345	0.326	0.022

Yangjiang NPP

In 2022, the six units of Yangjiang NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 6th refueling outage of Unit 1 was completed on August 13, 2022, the 5th refueling outage of Unit 2 on February 27, 2022, the 4th refueling outage of Unit 4 on September 18, 2022, the 3rd refueling outage of Unit 5 on April 24, 2022, the 2nd refueling outage of Unit 6 on February 13, 2022.

The nuclear safety-related regulatory approvals for Yangjiang NPP in 2022 are shown in Table 33. The occupational radiation doses at Yangjiang NPP are shown in Table 34.

In 2022, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,058 person-days for inspection on the six units at Yangjiang NPP (including nuclear power environmental protection supporting projects), including 11 routine inspections. A total of 176 findings were identified and 56 regulatory requirements were imposed.

Figure 9. Supervision Site of Yangjiang NPP

Table 33. Nuclear Safety Regulatory Approvals for Yangjiang NPP in 2022

Date	Document No.	Document Title
01/05/2022	NNSA [2022] No. 2	*Notice on Approving the "Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Yangjiang NPP"*

Table 34. Occupational Radiation Doses at Yangjiang NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/ Gwh)
Units 1 and 2	0.315		0.988	0.056
Units 3 and 4	0.170	9.485	0.433	0.024
Units 5 and 6	0.250		0.715	0.041

Note: The annual maximum individual effective dose of Yangjiang NPP is the index of the whole plant.

Sanmen NPP

In 2022, Sanmen NPP Units 1 and 2 continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 3rd outage of Unit 1 was completed on December 16, 2022, the 2nd outage of Unit 2 on July 4, 2022. The first concrete date (FCD) for the nuclear island foundation of Unit 3 was June 28, 2022.

The nuclear safety-related regulatory approvals for Sanmen NPP in 2022 are shown in Table 35 and the regulatory inspection activities in Table 36. Sanmen NPP reported 3 operational events, as shown in Table 37. The occupational radiation doses of Sanmen NPP are shown in Table 38.

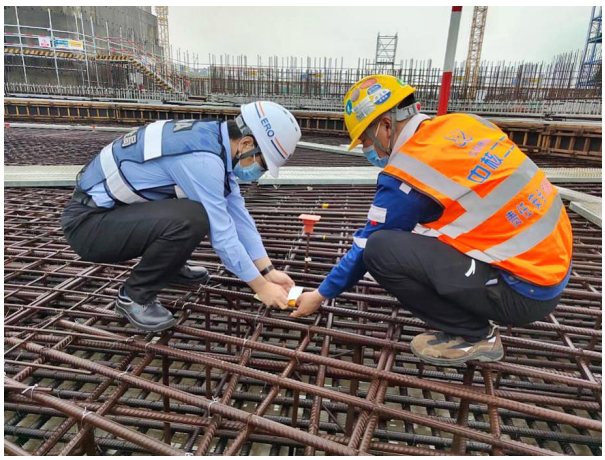


Figure 10. The inspector witnesses the steel bar sampling before the FCD of the nuclear island foundation of Sanmen NPP Unit 3

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,132 person-days for inspection at Sanmen NPP, including 3 routine inspections. A total of 103 findings were identified and 14 regulatory requirements were imposed.

Table 35. Nuclear Safety Regulatory Approvals for Sanmen NPP in 2022

Date	Document No.	Document Title
04/15/2022	NNSA [2022] No. 61	*Notice on Approving the Modification to Chapter 11 in the Final Safety Analysis Report (Version 3) of Sanmen NPP Phase I Project*

continued

Date	Document No.	Document Title
05/25/2022	NNSA [2022] No. 85	*Notice on Approving the Revision of Relevant Requirements for Opening of Containment 107'-2" Platform Hatch in Chapters 3, 6 and 16 of Final Safety Analysis Report for Sanmen NPP Units 1 and 2*
05/29/2022	NNSA [2022] No. 86	*Notice on Approving the "Quality Assurance Program (Construction Stage) for Sanmen NPP Units 3 and 4" (Version 7)*
05/31/2022	NNSA [2022] No. 89	*Notice on Approving the Modification to Chapter 16 "Technical Specifications" (Second Batch) of Final Safety Analysis Report (Version 3) of Sanmen NPP Units 1 and 2*
06/26/2022	NNSA [2022] No. 122	*Notice on Issuing the Construction Permits for Sanmen NPP Units 3 and 4*
07/26/2022	NNSA [2022] No. 143	*Notice on Approving the "Quality Assurance Program (Operational Stage) for Sanmen NPP Units 1 and 2" (Version 2)*
11/11/2022	NNSA [2022] No. 226	*Notice on Approving the Change of Control Rod Position Adjustment (Steps 264–266) of Sanmen NPP Units 1 and 2*
11/11/2022	NNSA [2022] No. 230	*Notice on Approving the Design Change for HRB500E Steel Bar Replacement in Nuclear Island of Sanmen NPP Units 3 and 4*
06/21/2022	MEE App [2022] No. 85	*Reply on the Environmental Impact Report for Sanmen NPP Units 3 and 4 (Construction Phase)*

Table 36. Regulatory Inspection Activity at Sanmen NPP in 2022

Starting Date	Item	Main Contents of the Inspection
05/10/2022	Nuclear safety inspection before the FCD for the nuclear island foundation of Sanmen NPP Unit 3	Handling of outstanding issues identified during early construction regulatory inspection such as excavation of the nuclear island foundation pit; preparation of technical conditions such as design documents and construction schemes; preparation of construction management conditions such as nuclear island construction organization and construction plan; preparation of construction conditions before the FCD for the nuclear island foundation.

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 37. Operational Event of Sanmen NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
04/28/2022	The failure of heat exchanger flow control valve of the passive residual heat removal system in Unit 1 actuates the shutdown signal, leading to reactor trip and safety injection startup	Equipment	0

continued

Date of Occurrence	Event	Cause	INES Level
06/22/2022	The failure of the main pump 1B Variable Frequency Drive of Unit 1 led to a lower flow rate in the hot leg of the reactor coolant loop I and actuated reactor trip.	Equipment	0
12/22/2022	The fault switching of frequency converter controller of main pump 1B in Unit 1 led to a low-low flow rate signal in the hot leg of reactor coolant loop I and actuated reactor trip.	Equipment	0

Table 38. Occupational Radiation Doses at the Sanmen NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/ Gwh)
Units 1 and 2	0.284	5.297	0.646	0.033

Haiyang NPP

In 2022, the Units 1 and 2 of Haiyang NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The first concrete date (FCD) for the nuclear island foundation of Unit 3 was July 07, 2022.

The regulatory approvals for matters involving nuclear safety in the Haiyang NPP in 2022 are shown in Table 39 and the regulatory inspection activities in Table 40. Haiyang NPP reported 2 operational events, as shown in

Figure 11. The site of the FCD of the nuclear island foundation of Haiyang NPP Unit 3

Table 41. The occupational radiation doses at Haiyang NPP are shown in Table 42.

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,444 person-days for inspection at Haiyang NPP, including 1 routine inspection. A total of 78 findings were identified and 21 regulatory requirements were imposed.

Table 39. Nuclear Safety Regulatory Approvals for Haiyang NPP in 2022

Date	Document No.	Document Title
06/01/2022	NNSA [2022] No. 94	*Notice on Approving the "Quality Assurance Program (Construction Stage) for Haiyang NPP Units 3 and 4" (Version B)*
06/29/2022	NNSA [2022] No. 127	*Notice on Issuing the Construction Permits for Haiyang NPP Units 3 and 4*
07/26/2022	NNSA [2022] No. 140	*Notice on Approving the Safety-related Modification of Opening Restriction Change of Hatch Door and Cofferdam in the Containment of Haiyang NPP Unit 1 and Unit 2*
11/16/2022	NNSA [2022] No. 234	*Notice on Approving the Design Change for Steel Bar Replacement in Nuclear Island buildings of Haiyang NPP Units 3 and 4*
06/21/2022	MEE App [2022] No. 87	*Approval Reply on the Environmental Impact Report (Construction Stage) for Haiyang NPP Units 3 and 4 in Shandong*

Table 40. Regulatory Inspection Activities at the Haiyang NPP in 2022

Starting Date	Item	Main Contents of the Inspection
05/09/2022	Nuclear safety inspection before the FCD for the nuclear island foundation of Haiyang NPP Unit 3	Operation of the quality assurance system; preparation of construction management conditions such as the nuclear island construction organization and construction plan; preparation of technical conditions such as design documents and construction schemes; handling of outstanding issues from early construction such as excavation of the nuclear island; site preparation before the FCD for nuclear island foundation
08/29/2022	Special inspection of experience feedback for Haiyang NPP	Establishment of Operational experience feedback system and operation effectiveness; investigation and implementation of experience feedback documents issued by the NNSA

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 41. Operational Event of Haiyang NPP Reported in 2022

Date of Occurrence	Event	Cause	INES Level
10/08/2022	The shutdown of the main pump 1B of Unit 2 leads to a low-low flow rate in the hot leg of the reactor coolant loop 1 and actuates reactor trip.	Equipment	0

continued

Date of Occurrence	Event	Cause	INES Level
10/19/2022	Power failure of the D train cabinet of protection and safety monitoring system in the Unit 1 results in a narrow range low-low level in the steam generator, which actuates reactor trip and safety injection	Equipment	0

Table 42. Operational Event of Haiyang NPP Reported in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.042	1.250	0.051	0.002

Taishan NPP

In 2022, the safety status of Taishan NPP Unit 2 is generally under control, and the failure rate of fuel elements, the leakage rate of primary coolant pressure boundary and the containment leakage rate were all within the specified limits. The temporary shutdown maintenance of Unit 1 was completed on August 15, 2022. The 2nd refueling overhaul of Unit 2 was completed on November 18, 2022.

The nuclear safety-related regulatory approvals for Taishan NPP in 2022 are shown in Table 43 and the regulatory inspection activities in Table 44. The occupational radiation doses at Taishan NPP are shown in Table 45.

In 2022, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 979 person-days for inspection of the two operating units of Taishan NPP, including 4 routine inspections. A total of 48 findings were identified and 15 regulatory requirements were imposed.

Figure 12. YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration of the People's Republic of China, Surveying at Taishan NPP

Table 43. Nuclear Safety Regulatory Approvals for Taishan NPP in 2022

Date	Document No.	Document Title
03/22/2022	NNSA [2022] No. 41	*Notice on Approving Waste Resin Clearance for Steam Generator Blowdown System of Taishan NPP*
03/25/2022	NNSA [2022] No. 47	*Notice on Approving the Reconstruction of Cooling and Purification System Tank) in New Fuel Pool for Taishan NPP Units 1 and 2*
07/23/2022	NNSA [2022] No. 138	*Notice on Approving the Related Report and Monitoring Operation Scheme of Refueling Design for Phase B of Cycle 2 of Taishan NPP Unit 1*
08/04/2022	NNSA [2022] No. 148	*Notice on Releasing the Reactor First Criticality Control Point after the Refueling Outage Maintenance of Taishan NPP Unit 1*
11/11/2022	NNSA [2022] No. 224	*Notice on Releasing the Reactor First Criticality Control Point (CCP) after the Second Refueling Outage Maintenance of Taishan NPP Unit 2*
03/20/2022	MEE App [2022] No. 30	*Reply on the Environmental Impact Report of Cooling and Purification System Tank Reconstruction Project in New Fuel Pool for Taishan NPP*

Table 44. Regulatory Inspection Activity at Taishan NPP in 2022

Starting Date	Item	Main Contents of the Inspection
07/26/2022	Nuclear safety inspection before reactor criticality after the temporary shutdown maintenance of Taishan NPP Unit 1	Operation of stage A of the second fuel cycle of Taishan NPP Unit 1; Implementation of T199 Refueling Outage maintenance; implementation of maintenance activities of safety-important systems and equipment, in-service inspection of safety-important systems and equipment, implementation of radiation protection work, implementation of safety-important modification and handling of significant anomalies; preparation of unit for first criticality after refueling outage; rectification and implementation of other nuclear safety management requirements
10/31/2022	Nuclear safety inspection before the first reactor criticality after the second refueling outage of Taishan NPP Unit 2	Operation for Phase B of the second Refueling of Taishan NPP Unit 2; Implementation of the second refueling outage; implementation of maintenance activities of safety-important systems and equipment, in-service inspection results of safety-important systems and equipment, implementation of radiation protection work, implementation of safety-important modification and handling of significant anomalies; preparation of unit for first criticality after refueling outage; rectification and implementation of other nuclear safety management requirements

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 45. Operational Events of Taishan NPP Reported in 2022

Unit	Annual Average Effective Dose/ Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.171	3.881	0.489	0.037

Changjiang NPP

In 2022, Units 1 and 2 of Changjiang NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 5th refueling outage of Unit 2 was completed on November 20, 2022.

The nuclear safety-related regulatory approvals for Changjiang NPP in 2022 are shown in Table 46. The occupational radiation doses at Changjiang NPP are shown in Table 47.

In 2022, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 668 person-days for inspection at Changjiang NPP, including 5 routine inspections. For operating organizations, a total of 53 findings were identified and 23 regulatory requirements were imposed; and for constructing units, a total of 53 findings were identified and 17 regulatory requirements were imposed

Figure 13 Inspection Site of Changjiang NPP

Table 46. Nuclear Safety Regulatory Approvals for Changjiang NPP in 2022

Date	Document No.	Document Title
02/08/2022	NNSA [2022] No. 27	*Notice on Approving the "Maintenance Program for Changjiang NPP Units 1 and 2 in Hainan" (Version A)*
02/17/2022	NNSA [2022] No. 29	*Notice on Approving the Improvement of Reactor Coolant System Flow Measurement System for Changjiang NPP Units 3 and 4 in Hainan*
05/07/2022	NNSA [2022] No. 65	*Notice on Approving the Revision of Periodic Testing and Inspection Period of Radiation Monitoring System of Changjiang NPP Units 1 and 2 Building in Hainan*
06/21/2022	NNSA [2022] No. 108	*Notice on Approving the Revision of the scope of Mechanical Overspeed Acceptance Criteria for Auxiliary Feedwater Steam Pump of Changjiang NPP Units 1 and 2 in Hainan*
06/24/2022	NNSA [2022] No. 117	*Notice on Approving Waste Resin Clearance for Steam Generator Blowdown System of Changjiang NPP in Hainan*
07/04/2022	NNSA [2022] No. 128	*Notice on Approving the Safety-Critical Modification of Auxiliary Building for Radioactive Solid Waste Treatment of Changjiang NPP in Hainan*
08/28/2022	NNSA [2022] No. 164	*Notice on Approving the Safety-Critical Modification of 2RRI036VN Valve Replacement for Component Cooling Water System of Changjiang NPP Unit 2 in Hainan*
09/01/2022	NNSA [2022] No. 167	*Notice on Approving the Improvement of Main Steam Safety Valve Setting of Changjiang NPP Units 3 and 4 in Hainan*
09/26/2022	NNSA [2022] No. 194	*Notice on Approving the Improvement of Water Supply Tank Capacity of Auxiliary Feedwater System of Changjiang NPP Units 3 and 4 in Hainan*
10/09/2022	NNSA [2022] No. 195	*Notice on Approving the Final Safety Analysis Report of Changjiang NPP Units 1 and 2 in Hainan*
10/11/2022	NNSA [2022] No. 202	*Notice on Approving the Safety-Critical Modification of the Firmware Upgrading for the DI Card in the KCS System of Changjiang NPP Units 1 and 2 in Hainan*

Table 47. Occupational Radiation Doses at Changjiang NPP in 2022

Unit	Annual Average Effective Dose/ Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.129	2.583	0.244	0.023

Fangchenggang NPP

In 2022, Units 1 and 2 of Fangchenggang NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 4th refueling outage of Unit 2 was completed on February 19, 2022. Unit 3 completed the hot functional test, and started the initial nuclear fuel loading on November 25, 2022 and the nuclear reactor achieved initial criticality on December 27, 2022.

The nuclear safety-related regulatory approvals for Fangchenggang NPP in 2022 are shown in Table 48 and the regulatory inspection activities in Table 49. Fangchenggang NPP reported 2 operational events, as shown in Table 50. The occupational radiation doses of Fangchenggang NPP are shown in Table 51.

In 2022, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,505 person-days for inspection at Fangchenggang NPP, including 6 routine inspections. For operating organizations, a total of 46 findings were identified and 19 regulatory requirements were imposed; and for constructing organizations, a total of 74 findings were identified and 26 regulatory requirements were imposed.

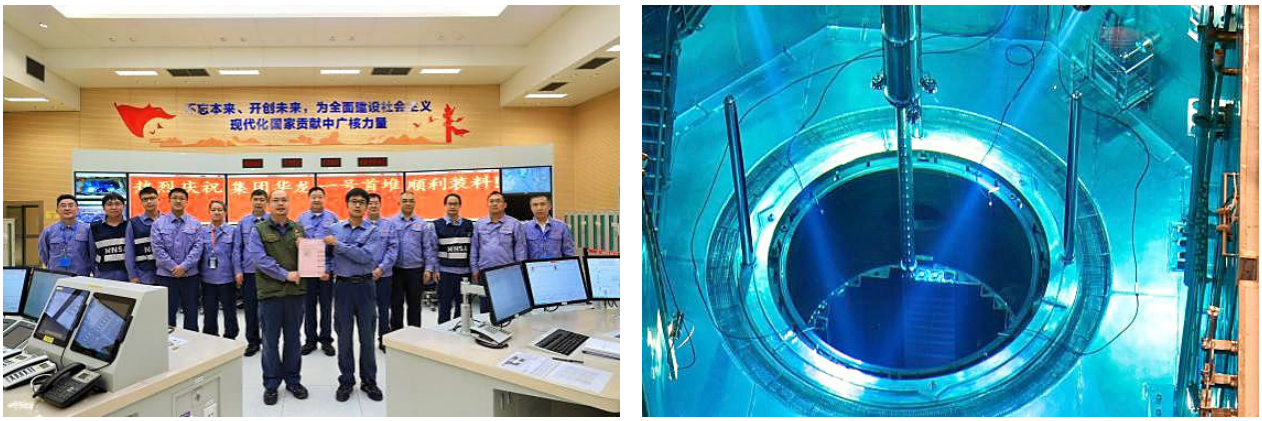


Figure 14. Initial Nuclear Fuel Loading Site of Fangchenggang NPP Unit 3

Table 48. Nuclear Safety Regulatory Approvals for Fangchenggang NPP in 2022

Date	Document No.	Document Title
01/21/2022	NNSA [2022] No. 16	*Notice on Approving the "Design Change Scheme for Connecting Pipes of Main Steam Isolation Valves of Fangchenggang NPP Units 3 and 4"*

continued

Date	Document No.	Document Title
03/20/2022	NNSA [2022] No. 38	*Notice on Approving the Loading and Start-up without Secondary Neutron Source for Fangchenggang NPP Units 1 and 2*
03/22/2022	NNSA [2022] No. 42	*Notice on Approving the "Commissioning Program for Fangchenggang NPP Units 3 and 4 in Guangxi (Version B)"*
05/22/2022	NNSA [2022] No. 77	*Notice on Approving the "Quality Assurance Program in Operational Phase for Fangchenggang NPP Units 3 and 4 in Guangxi" (Version 0)*
06/29/2022	NNSA [2022] No. 125	*Notice on Approving the Treatment Plan for the Insufficient Height of Concrete Slotting at the Periphery of the Power Range Guide Barrel of Fangchenggang NPP Unit 3 in Guangxi*
08/02/2022	NNSA [2022] No. 147	*Notice on Approving the Special Permission Application for Increasing the Replacement Time of Additional Diesel Generator for Fangchenggang NPP Unit 2 in Guangxi*
08/19/2022	NNSA [2022] No. 154	*Notice on Approving the "In-service Inspection Program for Fangchenggang NPP Units 3 and 4 in Guangxi" (Version 0)*
08/19/2022	NNSA [2022] No. 155	*Notice on Approving the "Refueling Program for Fangchenggang NPP Units 3 and 4 in Guangxi" (Version 0)*
10/09/2022	NNSA [2022] No. 196	*Notice on Approving the "Commissioning Program for Fangchenggang NPP Units 3 and 4 in Guangxi" (Version C)*
11/25/2022	NNSA [2022] No. 242	*Notice on Issuing the "Operation License for Fangchenggang NPP Unit 3 in Guangxi"*
12/13/2022	NNSA [2022] No. 255	*Notice on Approving Waste Resin Clearance for Steam Generator Blowdown System of Fangchenggang NPP Units 1 and 2 in Guangxi*
12/24/2022	NNSA [2022] No. 266	*Notice on Releasing the Initial Criticality Control Point for Fangchenggang NPP Unit 3 in Guangxi*
12/24/2022	NNSA [2022] No. 267	*Notice on Approving the revision on Schedule 15 of "Commissioning Program for Fangchenggang NPP Units 3 and 4 in Guangxi" (Version C)*
12/27/2022	NNSA [2022] No. 270	*Notice on Approving the Change of Relevant Terms of Operation License for Fangchenggang NPP Unit 3 in Guangxi*
07/06/2022	NNSA Letter [2022] No. 49	*Letter on Confirming the Change of Legal Representative Information of Operation License for Fangchenggang NPP Units 1 and 2 and the Construction Permit for Fangchenggang NPP Units 3 and 4 in Guangxi*
10/11/2022	NNSA Letter [2022] No. 69	*Letter on the Issuance of the Comprehensive Inspection Report before Issuing the Operation License for Fangchenggang NPP Unit 3 in Guangxi*
11/25/2022	MEE App [2022] No. 185	*Reply on the Environmental Impact Reports for Fangchenggang NPP Units 3 and 4 in Guangxi (Operation Phase)*

Table 49. Regulatory Inspection Activities at Fangchenggang NPP in 2022

Starting Date	Item	Main Contents of the Inspection
06/27/2022	Inspection on emergency preparedness for nuclear accidents & regulatory inspection and evaluation on on-site comprehensive emergency exercise before initial loading of Unit 3 at Fangchenggang NPP in Guangxi	Emergency preparedness for nuclear accidents; regulatory inspection and evaluation on the effectiveness of the emergency response plan and implementation procedures, availability of emergency facilities and equipment and exercise scenarios in the on-site comprehensive emergency exercise
09/19/2022	Comprehensive inspection before issuing the operation license for Fangchenggang NPP Unit 3 in Guangxi	Implementation of the quality assurance program for Unit 3; structures and nuclear safety equipment; system commissioning; operation and production preparation; radiation protection; emergency preparedness; physical protection and fuel storage; radioactive waste management and environmental monitoring; fire-fighting facilities; implementation of requirements for construction license, implementation of operation license application documents and issues identified in the document review; implementation of regulatory requirements proposed in the nuclear safety regulatory inspection at construction stage; etc.
12/19/2022	Nuclear safety inspection on the first critical control point of Fangchenggang NPP Unit 3 in Guangxi	Completion of commissioning test items of Unit 3 before its first criticality; implementation of design changes and defect treatment; preparation before the first criticality, implementation of technical specifications after initial loading, implementation of periodic tests, and other safety-related topics, etc.

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 50. Operational Events Reported by Fangchenggang NPP in 2022

Date of Occurrence	Event	Cause	INES Level
02/17/2022	Automatic shutdown of Unit 1 due to the signal of low coolant flow mistakenly triggered by foreign matter blockage in the common pipeline of the coolant flow meter in primary system	Management	0
12/15/2022	Unexpected action of the VDA atmospheric dump valve due to wrong switching time of the VDA protection setting in the initial design of the KDS system of Unit 3	Human factor, management	0

Table 51. Occupational Radiation Doses at Fangchenggang NPP in 2022

Unit	Annual Average Effective Dose/ Person(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/ Gwh)
Units 1 and 2	0.199	3.686	0.431	0.024

Shidao Bay NPP (High-temperature Gas-cooled Reactor Demonstration Project)

In 2022, the operation safety of the high-temperature gas-cooled reactor (HTGR) demonstration project was generally under control. As of December 2022, both Reactors 1 and 2 are in Operation Mode 2-Start

The nuclear safety-related regulatory approvals for the HTGR demonstration project in 2022 are shown in Table 52 and the regulatory inspection activities in Table 53. The HTGR demonstration project reported 7 operational events, as shown in Table 54. The occupational radiation doses of HTGR demonstration project are shown in Table 55.

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,044 person-days for inspection of the HTGR demonstration project, including 3 routine inspections. A total of 123 findings were identified and 15 regulatory requirements were imposed.

Table 52. Nuclear Safety Regulatory Approvals for the HTGR Demonstration Project in 2022

Date	Document No.	Document Title
08/25/2022	NNSA [2022] No. 162	*Notice on Approving the Modification of Mass Flow Ratio Settings for Primary and Secondary Systems of Reactor Protection System in the HTGR Demonstration Project at Shidao Bay NPP of China Huaneng Group Co., Ltd. Shandong Branch*
10/14/2022	NNSA [2022] No. 207	*Notice on Approving the Revision of Test Items on Stage C in the "Commissioning Program for the HTGR Demonstration Project" (Version F1)*
12/09/2022	NNSA [2022] No. 251	*Notice on Approving the Revision of Content on Stage B3-3 in the "Commissioning Program for the HTGR Demonstration Project" (Version F1)*

Table 53. Regulatory Inspection Activities for the HTGR Demonstration Project in 2022

Starting Date	Item	Main Contents of the Inspection
07/18/2022	Site reconnaissance and investigation and assessment of operational events in the HTGR Demonstration Project	Site walkdown and dialogues for technical reviews, discussions and exchanges; field investigation of some operational events

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 54. Operational Events of the HTGR Demonstration Project Reported in 2022

Date of Occurrence	Event	Cause	INES Level
03/20/2022	The fresh air filter unit of the ventilation and air conditioning system in main control room was started due to power loss of Instrument 0CFR17CR007	Equipment	0
03/25/2022	Protection action of 2# reactor upon local pressure fluctuation in primary system caused by great flow fluctuation on the secondary side of 2# steam generator	Human factor, equipment	0
07/03/2022	Unplanned discharge of waste liquid because the drainage sequence control process of 2# monitoring tank resumed operation along with fault reset after the PLC operator station in the liquid waste treatment system was restarted	Human factor, equipment	0
09/13/2022	Manual emergency shutdown of both reactors due to disruption of supply to steam turbine shaft seal because the auxiliary electric boiler was shut down due to the failure of 110kV auxiliary standby power supply	Equipment	0
10/13/2022	Protective shutdown of 1# reactor due to high mass flow ratio in primary and secondary systems caused by great fluctuation of feed water flow because the proportionality coefficient of feed water flow controller was set too high	Human factor	0
11/04/2022	Protective shutdown of 2# reactor upon “high cold helium temperature, ≥290 ℃” due to incomplete isolation boundary during troubleshooting of condensate pump A	Human factor, management	0
12/23/2022	Manual emergency shutdown of both reactors due to trip of a steam turbine caused by high temperature of low-pressure exhaust steam resulted from the trip of a circulating water pump	Human factor	0

Table 55. Occupational Radiation Doses at the HTGR Demonstration Project

Unit	Annual Average Effective Dose/ Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
HTGR demonstration project	0.002	0.079	0.002	0.036

CAP1400 Demonstration Project

In 2022, Unit 1 of the CAP1400 (also referred to as Guohe One) demonstration project was at the installation and commissioning stages, and Unit 2 was at the busiest period of construction and installation stages. Regarding Unit 1, the hoisting and installation of the dome was completed on June 20, 2022, and the primary system hydrostatic test was completed on December 23, 2022. Regarding Unit 2, the hoisting and installation of the pressure vessel was completed on January 7, 2022, and so that of the two steam generators on June 12, 2022. The main pipe welding was completed on September 27, 2022.

The nuclear safety-related regulatory approvals for the CAP1400 demonstration project in 2022 are shown in Table 56.

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,236 person-days for inspection of the CAP1400 demonstration project, including 3 routine inspections. A total of 148 findings were identified and 28 regulatory requirements were imposed.

Table 56. Nuclear Safety Regulatory Approvals for the CAP1400 Demonstration Project in 2022

Date	Document No.	Document Title
08/28/2022	NNSA [2022] No. 163	*Notice on Approving the "Quality Assurance Program (Construction Stage) for CAP1400 Units 1 and 2" (Version C)*
10/09/2022	NNSA [2022] No. 197	*Notice on Approving the "Commissioning Program for CAP1400 Units 1 and 2" (Version 3)*

Zhangzhou NPP

In 2022, Zhangzhou NPP Units 1 and 2 were at the civil construction and installation stages, and the construction was carried out orderly as planned, and the safety and quality were under control.

The nuclear safety-related regulatory approvals for Zhangzhou NPP in 2022 are shown in Table 57 and the regulatory inspection activities are shown in Table 58. Zhangzhou NPP reported 1 construction event, as shown in Table 59.

Figure 15. TANG Bo, Deputy Administrator of National Nuclear Safety Administration and the Director General of the Department of Nuclear Power Safety Regulation, Surveying at Zhangzhou NPP

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,744 person-days for inspection at Zhangzhou NPP, including 1 routine inspection. A total of 257 findings were identified and 32 regulatory requirements were imposed.

Table 57. Nuclear Safety Regulatory Approvals for Zhangzhou NPP in 2022

Date	Document No.	Document Title
05/22/2022	NNSA [2022] No. 78	*Notice on Approving the "Quality Assurance Program (Construction Stage) for Zhangzhou NPP Units 1 and 2 in Fujian" (Version D)*

Table 58. Regulatory Inspection Activities at Zhangzhou NPP in 2022

Starting Date	Item	Main Contents of the Inspection
03/07/2022	Special inspection for failure to conduct non-destructive testing according to the design requirements after some temporary accessories to steel lining were removed from Zhangzhou NPP Units 1 and 2	Inspection for failure to conduct non-destructive testing according to the design requirements after temporary accessories to steel lining were removed from Zhangzhou NPP Units 1 and 2 ; implementation of the quality assurance system in Zhangzhou NPP

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Table 59. Construction Event of Zhangzhou NPP Reported in 2022

Date of Occurrence	Event
03/10/2022	Failure to conduct non-destructive testing according to the design requirements after some temporary accessories were removed from Zhangzhou NPP Units 1 and 2

Taipingling NPP

In December 2022, Taipingling NPP was at the stages of civil construction and equipment installation. Regarding Unit 1, the hoisting and installation of the reactor pressure vessel was completed on November 8, 2022. Regarding Unit 2, the hoisting and installation of the dome was completed on September 25, 2022.

The nuclear safety-related regulatory approvals for Taipingling NPP in 2022 are shown in Table 60. Taipingling NPP reported 1 construction event, as shown in Table 61.

In 2022, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 441 person-days for inspection at Taipingling NPP, including 3 routine inspections. A total of 71 findings were identified and 29 regulatory requirements were imposed.

Table 60. Nuclear Safety Regulatory Approvals for Taipingling NPP in 2022

Date	Document No.	Document Title
03/09/2022	NNSA [2022] No. 34	*Notice on Approving the Design Change of New Circulating Water Monitoring and Pre-filtration System in Open Water Channel and Harbor Basin of Taipingling NPP*
03/30/2022	NNSA [2022] No. 52	*Notice on Approving Design Changes in Flow Measurement of Primary System in Taipingling NPP Units 1 and 2*
06/20/2022	NNSA [2022] No. 109	*Notice on Approving Changes in the Structure Form of Steam Generator Compartments within 17.5 m+ Internal Structure at Guangdong Taipingling NPP Unit 2*
07/20/2022	NNSA [2022] No. 135	*Notice on Approving the "Quality Assurance Program (Construction Stage) for CGN Guangdong Taipingling NPP Phase I Project" (Version 4)*
11/11/2022	NNSA [2022] No. 225	*Notice on Approving Major Design Changes in New Function of Locking Protection Signal against Non-uniform Boron Dilution for Taipingling NPP Units 1 and 2 in Guangdong*
11/11/2022	NNSA [2022] No. 227	*Notice on Approving Major Design Changes in Boron Misdilution Protection Caused by Chemical and Volume Control System Faults of Taipingling NPP Units 1 and 2 in Guangdong*
11/29/2022	NNSA [2022] No. 243	*Notice on Issuing the "Review Opinion on Siting of Taipingling NPP Phase II Project in Guangdong"*
12/24/2022	NNSA [2022] No. 268	*Notice on Approving Design Changes of In-containment Thermal Environment Curve under the Design Extension Conditions (Without Obvious Core Damage) for Taipingling NPP Units 1 and 2 in Guangdong*
11/29/2022	MEE App [2022] No. 186	*Approval Reply on the Environmental Impact Report (Siting Stage) for Guangdong Taipingling NPP Phase II Project*

Table 61. Construction Event of Taipingling NPP Reported in 2022

Date of Occurrence	Event
05/27/2022	Quality defects of floor crack in safety and fuel buildings of Taipingling NPP Unit 1

San'ao NPP

In 2022, San'ao NPP Unit 1 was at the civil construction and installation stages, and Unit 2 at the civil construction stage. The safety and quality were under control. The hoisting and installation of the containment dome of Unit 1 nuclear island was completed on November 3, 2022.

The nuclear safety-related regulatory approvals for San'ao NPP in 2022 are shown in Table 62. San'ao NPP reported 1 construction event, as shown in Table 63.

In 2022, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,386 person-days for inspection at San'ao NPP, including 1 routine inspection. A total of 268 findings were identified and 8 regulatory requirements were imposed.

Figure 16. Practical activities by Eastern China Regional Office of Nuclear and Radiation Safety Inspection at San'ao NPP: "Doing Practical Work for the People"

Table 62. Nuclear Safety Regulatory Approvals for San'ao NPP in 2022

Date	Document No.	Document Title
07/26/2022	NNSA [2022] No. 141	*Notice on Approving Changes in the Structure Form of Steam Generator Compartments within 17.5 m+ Internal Structure at CGN Zhejiang San'ao NPP Units 1 and 2*
07/26/2022	NNSA [2022] No. 142	*Notice on Approving the Quality Assurance Program (Construction Stage) for CGN Zhejiang San'ao NPP Units 1 and 2 (Version 3 - Draft for Approval)*
11/02/2022	NNSA [2022] No. 219	*Notice on Approving Design Changes of Differential Pressure Gauges in Front of and Behind Main Pumps of CGN Zhejiang San'ao NPP Units 1 and 2*
11/11/2022	NNSA [2022] No. 228	*Notice on Approving Major Design Changes in Start-up and Shutdown Function Configuration on Secondary Side of Steam Generators of CGN Zhejiang San'ao NPP Units 1 and 2*
11/15/2022	NNSA Letter [2022] No. 83	*Reply to Siting Opinions on Supervisory Monitoring Systems for Radiation Environment Site at CGN Zhejiang San'ao NPP*

Table 63. Construction Event of San'ao NPP Reported in 2022

Date of Occurrence	Event
04/22/2022	Local out-of-tolerance event for flatness of steel lining base plate at CGN Zhejiang San'ao NPP Unit 2

Xudapu NPP

In 2022, Xudapu NPP Units 3 and 4 were at the civil construction stage, and the safety and quality were under control. The FCD for the nuclear island foundation of Unit 4 was on May 19, 2022.

The nuclear safety-related regulatory approvals for Xudapu NPP in 2022 are shown in Table 64, and the regulatory inspection activities in Table 65.

In 2022, the Northeast China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,200 person-days for inspection at Xudapu NPP, including 3 routine inspections. A total of 61 findings were identified and 15 regulatory requirements were imposed.

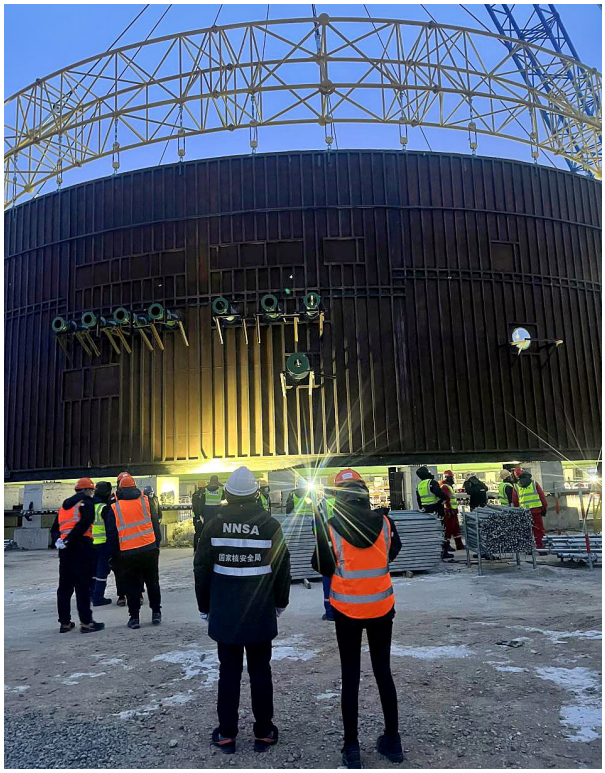


Figure 17. Hoisting and Installation of Steel Lining Module at Xudapu NPP Unit 3

Table 64. Nuclear Safety Regulatory Approval for Xudapu NPP in 2022

Date	Document No.	Document Title
05/17/2022	NNSA [2022] No. 70	*Notice on Releasing the FCD Control Point for the Nuclear Island Foundation of Xudapu NPP Unit 4*

Table 65. Regulatory Inspection Activities at Xudapu NPP in 2022

Starting Date	Item	Main Contents of the Inspection
04/19/2022	Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of Xudapu NPP Unit 4	Handling of outstanding issues identified during early construction regulatory inspection such as negative excavation of the nuclear island foundation pit; preparation of construction management conditions such as nuclear island construction organization and construction plan; preparation of technical conditions such as design documents and construction schemes; preparation of construction conditions before FCD for the nuclear island foundation; implementation of quality assurance program at design and construction stages

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

Lufeng NPP

In 2022, Lufeng NPP was at the stage of civil construction and steel lining installation. The FCD for the nuclear island foundation of Unit 5 was on September 8, 2022. Negative excavation of Unit 6 nuclear island foundation pit started on May 5, 2022, and completed on November 12, 2022.

The nuclear-safety regulatory approvals for Lufeng NPP in 2022 are shown in Table 66, and the regulatory inspection activities as shown in Table 67.

In 2022, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 55 person-days for inspection at Lufeng NPP, including 1 routine inspection. A total of 29 findings were identified and 4 regulatory requirements were imposed.

Figure 18. Concrete Pouring Site of Lufeng NPP Unit 5

Table 66. Nuclear Safety Regulatory Approvals for Lufeng NPP in 2022

Date	Document No.	Document Title
07/22/2022	NNSA [2022] No. 136	*Notice on Approving the “Quality Assurance Program (Construction Stage) for Lufeng NPP Units 5 and 6” (Version 3)*
09/07/2022	NNSA [2022] No. 179	*Notice on Issuing Construction Permits for Lufeng NPP Units 5 and 6 in Guangdong*
05/10/2022	NNSA Letter [2022] No. 33	*Letter on Soliciting Opinions on the Issuance of Construction Permits for Lufeng NPP Units 5 and 6 in Guangdong*
08/08/2022	NNSA Letter [2022] No. 53	*Letter on the Issuance of “Nuclear Safety Inspection Report for the Preparations Before FCD for the Nuclear Island Foundation of Lufeng NPP Unit 5”*
09/07/2022	MEE App [2022] No. 144	*Approval Reply on the Environmental Impact Reports (Construction Stage) for Lufeng NPP Units 5 and 6 in Guangdong*

Table 67. Regulatory Inspection Activities at Lufeng NPP in 2022

Starting Date	Item	Main Contents of the Inspection
08/02/2022	Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of Lufeng NPP Unit 5	Implementation of the quality assurance program at construction stage; preparation of construction management conditions such as the construction organization and construction plan; preparation of technical conditions such as design documents and construction schemes; handling of outstanding issues from early construction such as negative excavation of the nuclear island; site preparation before FCD for nuclear island foundation; establishment and operation of the experience feedback system

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

IV. Safety Regulation on Research Reactors

In 2022, there were 20 civil research reactors (critical assemblies) in China, of which 17 were in service, 2 were in decommissioning and 1 was under construction (see Table 68). Out of the 17 civil research reactors (critical assemblies) in service, 9 were either not in operation, or long-term shutdown, 1 was under closure management, and the rest 7 ones were operated well generally. According to the *Reporting System for Research Reactor Licensees*, in-service civil research reactors (critical assemblies) reported 7 operational events throughout the year, none of which caused adverse consequences for the environment outside the reactor building (see Table 69). One civil research reactor under construction was under construction quality control with one construction event reported (see Table 70).

In 2022, the *Review Opinion on Siting of the Medical Isotope Test Reactor* was issued to the Nuclear Power Institute of China. The nuclear safety-related regulatory approvals for research reactors in 2022 are shown in Table 71, and the regulatory inspection activities in Table 72.

Figure 19. Supervision Site of 2MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)

In 2022, the regional offices of nuclear and radiation safety inspection assigned 2,588 person-days for inspection of research reactor operation organizations（licensees）, including 22 routine inspections and 3 non-routine inspections. A total of 444 findings were identified and 137 regulatory requirements were imposed.

Table 68. Operation of Research Reactors in 2022

Facility	Design Power	Licensee	Operation Situation
China Experimental Fast Reactor (CEFR)	65MW	China Institute of Atomic Energy	Not in operation
China Advanced Research Reactor (CARR)	60MW	China Institute of Atomic Energy	In operation
49-2 Swimming Pool Reactor (49-2 SPR)	3.5MW	China Institute of Atomic Energy	In operation
Prototype Miniature Neutron Source Reactor (PMNSR)	27kW	China Institute of Atomic Energy	Not in operation
Zero-power Assembly of MNSR	—	China Institute of Atomic Energy	Not in operation
Critical Assembly of Solid-State Zirconium-hydride Reactor (SSZR)	—	China Institute of Atomic Energy	Long-term shutdown
DF-VI Fast Neutron Critical Assembly	—	China Institute of Atomic Energy	Long-term shutdown
Nuclear Criticality Safety Test Facility in Pilot Plant	—	China Institute of Atomic Energy	In operation
101 Heavy Water Research Reactor (101 HWRR)	10MW	China Institute of Atomic Energy	Decommissioning
5MW Low Temperature Nuclear Heating Test Reactor (NHR-5)	5MW	Tsinghua University	Closure management
10 MW High Temperature Gas-Cooled Test Reactor (HTR-10)	10MW	Tsinghua University	Not in operation
Bulk Shielding Reactor (BSR)	1MW	Tsinghua University	Decommissioning
High Flux Engineering Test Reactor (HFETR)	125MW	Nuclear Power Institute of China	In operation
Critical Assembly of High Flux Engineering Test Reactor (HFETR)	—	Nuclear Power Institute of China	Not in operation
China Pulsed Reactor (CPR)	1MW	Nuclear Power Institute of China	Not in operation
Minjiang Test Reactor (MJTR)	5MW	Nuclear Power Institute of China	In operation
18-5 Critical Assembly	—	Nuclear Power Institute of China	In operation
Miniature Neutron Source Reactor (MNSR) in Shenzhen University	30kW	Shenzhen University	Closure management

continued

Facility	Design Power	Licensee	Operation Situation
In-Hospital Neutron Irradiator (IHNI)	30kW	Beijing Capture Tech Co., Ltd.	In operation
2MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)	2MW	Shanghai Institute of Applied Physics, Chinese Academy of Sciences	Under construction

Table 69. Operational Events of Research Reactors in 2022

Date of Occurrence	Facility	Event	Cause	INES Level
06/01/2022	MJTR	Manual shutdown of MJTR caused by a 6.1-magnitude earthquake in Lushan County, Ya'an City	External events	0
06/01/2022	Critical Assembly of HFETR	Manual emergency shutdown due to a 6.1-magnitude earthquake in Lushan County, Ya'an City	External events	0
06/06/2022	CEFR	Violation of the license conditions of CEFR because its 2nd neutron source assembly has been left in core for more than 600 days	Management	0
06/10/2022	MJTR	Protective shutdown of MJTR upon "external power supply loss" signal triggered by great fluctuation of voltage in external power supply Section II	Equipment	0
06/21/2022	CARR	Protective shutdown triggered by fluctuation of emergency bypass flow signal	Equipment	0
09/05/2022	MJTR	Unscheduled shutdown of MJTR caused by a 6.8-magnitude earthquake in Luding County, Sichuan Province	External events	0
09/17/2022	Critical Assembly of HFETR	Protective shutdown due to power loss of high voltage Section I of HFETR	Equipment	0

Table 70. Construction Event of Research Reactors Reported in 2022

Date of Occurrence	Facility	Event
01/12/2022	2 MWt TMSR-LF	Delayed integral hoisting of TMSR-LF proper

Table 71. Nuclear Safety Regulatory Approvals for Research Reactors in 2022

Date	Document No.	Document Title
05/06/2022	NNSA [2022] No. 64	*Notice on Issuing the Review Opinion on Siting of the Medical Isotope Test Reactor to Nuclear Power Institute of China*
06/27/2022	NNSA [2022] No. 124	*Notice on Approving the Construction of Material Irradiation Gas Circuit and Carrying out Material Irradiation Test Activities in MJTR*
07/22/2022	NNSA [2022] No. 137	*Notice on Approving the Operation Quality Assurance Program for Categories I and II Research Reactors of China Institute of Atomic Energy (Version B)*
08/02/2022	NNSA [2022] No. 146	*Notice on Approving the Commissioning Program for 2MWt TMSR-LF (Version V1.3)*
08/11/2022	NNSA [2022] No. 150	*Notice on Approving the Quality Assurance Program (Construction Stage) for 2MWt TMSR-LF (V2.4)*
08/12/2022	NNSA [2022] No. 151	*Notice on Approving the Modification to the Driving Mechanism of CARR Shim and Regulating Rods*
09/01/2022	NNSA [2022] No. 166	*Notice on Approving Fuel Preprocessing Activities of 2MWt TMSR-LF*
09/21/2022	NNSA [2022] No. 192	*Notice on Approving the Operation Quality Assurance Program for Categories III Research Reactors of China Institute of Atomic Energy (Version B)*
10/09/2022	NNSA [2022] No. 201	*Notice on Safety Management of 49-2 SPR after Expiry of Its Operation License*
12/10/2022	NNSA [2022] No. 252	*Notice on Approving Partial Modification to CARR Main System and Emergency Bypass*
02/08/2022	NNSA Letter [2022] No. 8	*Reply on Confirming Changes in Legal Representative Information on Nuclear and Radiation Safety License of China Institute of Atomic Energy*
06/29/2022	NNSA Letter [2022] No. 46	*Notice on Terminating the Review of the Application for Extended Use of CEFR's 2nd Neutron Source Assembly*
09/02/2022	MEE App [2022] No. 141	*Approval Reply on the Environmental Impact Report for the Superconducting Proton Linac of the Accelerator-driven Transmutation Research Facility of the Institute of Modern Physics, Chinese Academy of Sciences*

Table 72. Regulatory Inspection Activities at the Research Reactors in 2022

Starting Date	Item	Main Contents of the Inspection
03/22/2022	Site reconnaissance for physical protection facilities of China Institute of Atomic Energy	Verification of the setting, aging, reformation and renewal of physical protection facilities in the site area of China Institute of Atomic Energy

continued

Starting Date	Item	Main Contents of the Inspection
04/21/2022	Site reconnaissance in response to application for renewal of 49-2 reactor operation license by China Institute of Atomic Energy	Checking the aging situation of system, equipment and structures of the 49-2 reactor, and communicating on the application for renewal of 49-2 reactor operation license with China Institute of Atomic Energy
6/28/2022	Site reconnaissance for 2 MWt TMSR-LF	Checking the status of the fuel preprocessing plant and on-site work preparation, and carry out on-site review dialogue on the fuel preprocessing scheme
09/27/2022	Site reconnaissance for 2 MWt TMSR-LF	Checking the engineering progress of safety-related structures and nuclear safety equipment, and communicating on key issues during FSAR and EIR reviews

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

V. Safety Regulation on Nuclear Fuel Cycle Facilities

In 2022, China's in-service nuclear fuel production, processing, storage and reprocessing facilities were operated safely and continued to maintain a good safety record, and the quality of facilities under construction was effectively controlled. Nuclear and radiation safety of nuclear fuel cycle facilities was under control and did not pose any unacceptable nuclear and radiation hazard to the staff, the public and the environment. The main facilities are listed in Table 73.

In 2022, environmental impact reports for 17 construction projects were approved, two construction permits (one for modification) were issued, one operation license extension was approved to be renewed, and ten nuclear safety technical reformations were approved. Regulatory inspections on the latent safety risks of relevant nuclear facilities were organized.

Figure 20. Kurexi Maihesuti, Chief Inspector of Central Commission for Discipline Inspection (CCDI) Inspector's Office and Chief Supervisor of the State Supervisory Commission (SSC) Supervisor's Office Stationing at the Ministry of Ecology and Environment, Surveying at the CNNC Lanzhou Uranium Enrichment Co., Ltd.

In 2022, the regional offices of nuclear and radiation safety inspection put into 3,087 person-days for inspection of the nuclear fuel cycle facility licensees, including 16 routine inspections. A total of 343 findings were identified and 192 regulatory requirements were imposed.

Table 73. Major Civil Nuclear Fuel Production, Processing and Storage Facilities in China

Facility	Licensee	Major Product Form	Current Status
Dry Fabrication Line for Chemical Conversion	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO_2 powder	In operation
Powder Metallurgical Fabrication Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO_2 pellet	In operation
Fuel Element Assembly Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	PWR nuclear fuel element	In operation
IDR Process Research and Equipment Production Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO_2 powder	In operation
Nuclear Fuel Element Fabrication Line Extension and Technical Reformation Project	CNNC Jianzhong Nuclear Fuel Co., Ltd.	PWR nuclear fuel element	In operation
HWR Nuclear Fuel Element Fabrication Line	China North Nuclear Fuel Co., Ltd.	HWR Nuclear fuel element	In operation
PWR Nuclear Fuel Element Fabrication Line	China North Nuclear Fuel Co., Ltd.	PWR nuclear fuel element	In operation
Nuclear Fuel Element Fabrication Line for the HTGR Demonstration Project	China North Nuclear Fuel Co., Ltd.	HTGR fuel element	In operation
Nuclear Fuel Element Fabrication Line for PWR NPPs Extension Project	China North Nuclear Fuel Co., Ltd.	PWR Fuel element	In operation
Nuclear Fuel Element Fabrication Line for AP1000 NPP	China North Nuclear Fuel Co., Ltd.	Nuclear fuel element for AP1000 NPP	In operation
405-1A Project	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
New Centrifuge Project, Phase IV	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
Centrifuge Project Extension in North Region, Phase I	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
Centrifuge Project Extension in North Region, Phase II	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
Centrifuge Project	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
Commercial Demonstration Project of Domestic Centrifuge	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation

continued

Facility	Licensee	Major Product Form	Current Status
Uranium Enrichment Project, Phase III	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
Uranium Enrichment Project, Phase IV	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF_6 with low enrichment	In operation
Temporary Dry Storage Facility for Spent Fuel of Qinshan Phase III NPP	CNNC Nuclear Power Operation Management Co., Ltd.	—	In operation
CGN Advanced Fuel Development Center	CGN Uranium Resources Co., Ltd.	PWR nuclear fuel element	Civil engineering
Hot Cell Facility Construction Project for China Nuclear Power Technology Research Institute Co., Ltd.	China Nuclear Power Technology Research Institute Co., Ltd.	—	Civil engineering

VI. Radiation Environmental Regulation on Uranium Mines and Radioactive Associated (NORM) Minerals / Ores

Administrative Approvals

In 2022, the Ministry of Ecology and Environment (National Nuclear Safety Administration) approved the environmental impact assessment (EIA) documents of 13 uranium mining and milling and uranium geological exploration projects and decommissioning projects, including technical research on combined ex-situ & in-situ bioremediation of groundwater in decommissioned in situ recovery (ISR) mining panel of Deposit No. 512 (see Table 74).

Table 74. Nuclear-Safety Regulatory Approvals for the Uranium Mining and Milling Radiation Environmental Regulation in 2022

Date	Document No.	Document Title
02/09/2022	MEE App [2022] No. 20	*Approval Reply on the Environmental Impact Report Form for Shannan and Zoujiashan High-concentration Mine Water Emergency Treatment Project of CNNC Fuzhou Jin'an Uranium Co., Ltd.*
03/26/2022	MEE App [2022] No. 33	*Approval Reply on the Environmental Impact Report Form for In Situ Recovery Experimental Research Extension Project at Deposit No. 738*
03/26/2022	MEE App [2022] No. 34	*Approval Reply on Environmental Impact Report Form for In Situ Recovery High-efficiency Mining Technology Research in Nalinggou Extra-large Sandstone-hosted Uranium Mine*
05/13/2022	MEE App [2022] No. 54	*Approval Reply on the Environmental Impact Report Forms of Four Projects Including the Investigation, Assessment and Exploration of Uranium Resources in Erlian Basin and Surrounding Areas of Inner Mongolia*

continued

Date	Document No.	Document Title
06/14/2022	MEE App [2022] No. 76	*Approval Reply on the Environmental Impact Report Forms of Nine Projects Including the Investigation, Assessment and Exploration of Uranium Resources in Xiangshan Ore Field and Adjacent Area of Jiangxi Province*
06/13/2022	MEE App [2022] No. 73	*Approval Reply on the Environmental Impact Report Form of In Situ Recovery Uranium Research and Innovation Base*
07/11/2022	MEE App [2022] No. 98	*Approval Reply on the Environmental Impact Report Forms of 6 Projects Including the Investigation, Evaluation and Exploration of Uranium Resources in Southern Zhuguang Pluton, Guangdong Province*
07/11/2022	MEE App [2022] No. 99	*Approval Reply on the Environmental Impact Report Forms of Nine Projects Including the Investigation, Assessment and Exploration of Uranium Resources in Wuqia-Yuli Area, Tarim Basin, Xinjiang*
08/12/2022	MEE App [2022] No. 127	*Approval Reply on the Environmental Impact Report Form for BSK1 Exploration Project*
08/18/2022	MEE App [2022] No. 132	*Approval Reply on Environmental Impact Report Form for In-situ Recovery Experimental Research Project at Large Sandstone-hosted Uranium Deposit in Northern Ordos Basin*
09/19/2022	MEE App [2022] No. 157	*Approval Reply on Environmental Impact Report Form for CNNC Guyuan Uranium Co., Ltd.'s Ammonia Stripping and Recovery Technical Reconstruction Project Capable of Treating 120 m^3 Mother Liquor of Molybdic Acid Sediment Daily*
11/29/2022	MEE App [2022] No. 188	*Approval Reply on Environmental Impact Report Form for Groundwater Bioremediation Technical Research Project in Final Mining Panels of In-situ Recovery Uranium Mines*
11/29/2022	MEE App [2022] No. 189	*Approval Reply on the Environmental Impact Report Form for Technical Research on Combined Ex-situ & In-situ Bioremediation of Groundwater in Decommissioned In-situ Recovery (ISL) Mining Panel of Deposit No. 512*

Regulatory Inspection

NNSA organized a review of annual effluent and environmental monitoring reports for 2021 submitted by uranium mining and milling enterprises, and a special verification on environmental radiation monitoring and information disclosure conditions of other radioactive mines development and utilization enterprises.

In accordance with the requirements of the *Notice on Identifying Nuclear and Radiation Safety Hazards* (Nuclear Facility Document [2020] No. 215 of the General Office of MEE), NNSA organized regulatory inspections

on uranium mining and milling facilities to identify potential hazards so as to urge these enterprises to speed up decommissioning treatment and eliminate potential environmental hazards in a timely manner.

In 2022, the regional offices of nuclear and radiation safety inspection assigned 363 person-days to regulation of uranium mining and milling facilities, including 68 routine inspections. A total of 222 findings were identified and 240 regulatory requirements were imposed.

Figure 21. Regulatory Inspections on Sites of Uranium Mining and Milling Enterprises

VII. Safety Regulation on Radioactive Waste

NNSA vigorously promoted the construction of radioactive waste disposal facilities, strengthened safety regulation of radioactive wastes, promoted the treatment and disposal of legacy radioactive wastes and the decommissioning treatment of old nuclear facilities, and made efforts in operational safety regulation of radioactive waste disposal facilities, radioactive waste storage and treatment facilities.

Figure 22. HUANG Runqiu, Minister of Ecology and Environment, Surveying the Feifengshan Disposal Facility

Administrative Licensing

In 2022, NNSA issued an operation license for the Longhe near-surface disposal facility to Gansu Longhe Environmental Protection Technology Co., Ltd., and approved the modification of the licensing limits on the Operation License of the Feifengshan Low- and Intermediate-level Solid Waste Disposal Facility.

Operation and Safety Regulation of Radioactive Waste Disposal Facilities

In 2022, the northwest disposal facility received a total of 3,581 low- and intermediate-level radioactive waste packages, with a total volume of 2,047.3 m^3, and a total waste radioactivity of 5.89 E+12 Bq. By the end of 2022, the northwest disposal facility had received an accumulative total of 71,925 radioactive waste packages, with a total volume of 29,755.59 m^3, and a total waste radioactivity of 6.57 E+14 Bq.

In accordance with the requirements of the operation license, regular safety evaluation for Stage I of the Northwest Disposal Facility Phase I has been completed.

In 2022, the Feifengshan disposal facility received a total of 13,589 radioactive waste packages, with a total volume of 5,691.1 m^3, and a total waste radioactivity of 5.20 E+14 Bq. By the end of 2022, the Feifengshan disposal facility had received an accumulative total of 91,532 radioactive waste packages, with a total volume of 40,701.48 m^3, and a total waste radioactivity of 2.40 E+15 Bq.

In 2022, no waste was received at Beilong disposal facility. By the end of 2022, the Beilong disposal facility had received an accumulative total of 2,240 radioactive waste packages, with a total volume of 2,526.44 m^3, and a total waste radioactivity of 7.95 E+13 Bq.

In 2022, the Longhe disposal facility began to receive radioactive wastes. It had received an accumulative total of 2,585 radioactive waste packages, with a total volume of 1,052.5 m^3 and a total waste radioactivity of 2.48 E+12 Bq.

In 2022, the Jinta very low-level radioactive waste landfill site received 1,086 radioactive waste packages, with a total volume of 400.7 m^3, and a total waste radioactivity of 8.67 E+09 Bq. By the end of 2022, the Jinta very low-level radioactive waste landfill site had received an accumulative total of 1,874 radioactive waste packages, with a total volume of 590.5 m^3, and a total waste radioactivity of 1.11 E+10 Bq.

In 2022, in the Beishan underground research laboratory project, 496 m spiral ramp and 160 m staff shaft were tunneled in the main work, and water, electricity and communication signals were supplied to the site, and a quality assurance system was established with reference to those of nuclear facilities.

In 2022, the regional offices of nuclear and radiation safety inspection assigned 576 person-days to regulate radioactive waste disposal facilities, including 24 routine inspections and 10 non-routine inspections. A total of 167 findings were identified and 141 regulatory requirements were imposed.

Treatment of Legacy Radioactive Wastes and Decommissioning of Nuclear Facilities

NNSA further strengthened the safety regulation of legacy radioactive wastes to promote the decommissioning of old nuclear facilities and the treatment and disposal of legacy radioactive wastes. In 2022, NNSA issued approvals for the decommission of four projects, including the Phase I of Tsinghua University's Bulk Shielding Reactor (BSR) and the radioactive waste incineration facility of CNNC Jianzhong Nuclear Fuel Co., Ltd. In 2022, a total of ten environmental impact assessment-related documents were approved and ten special inspections were carried out.

VIII. Safety Regulation on Radioisotopes and Radiation-emitting Devices

By the end of 2022, in our country, the total number of organization producing, selling or using radioisotopes and radiation-emitting devices was 104,603, including 9,656 organizations producing, selling and using radioisotopes and 94,947 organizations only producing, selling and using radiation-emitting devices. The number of radioactive sources in use was 164,028 (including 15,746 Category I radioactive sources, 18,051 Category II radioactive sources, 1,654 Category III radioactive sources, and 128,577 other radioactive sources); the number of various radiation-emitting devices was 266,921. The radioactive waste temporary storage facilities in provinces, autonomous regions, and municipalities directly under the Central Government collected and stored 50,502 disused radioactive sources. Totally, 163,021 disused radioactive sources were transferred or collected to the national repository for centralized storage of disused radioactive sources or recycled by the manufacturers.

In 2022, there were 213 organizations producing radioisotopes [excluding those for self-use to prepare radiopharmaceuticals for Positron Emission Computed Tomography (PET)], selling and using Category I radioactive sources (excluding Category I radioactive sources for medical use), selling (including construction) and using Class I radiation-emitting devices, and workplaces with Class A unsealed radioactive materials under the regulation of the Ministry of Ecology and Environment (National Nuclear Safety Administration). The radiation safety for all these organizations was under control.

Strengthening Informatization Construction

To further improve the informatization capacity and level of radiation safety regulation in the nuclear technology application field, preparations were being made for upgrading the functions of the National Nuclear Technology Utilization Radiation Safety Management System (hereinafter referred to as the “management system”) to incorporate

the development of functions such as automatic data check, approval authority setting and the improvement of modules such as automatic data verification into the upgrade plan. To ensure that the management system would be upgraded orderly, NNSA prepared a management system upgrade plan, held discussions and exchanged views with local ecological and environmental authorities and nuclear technology utilization organizations, and made research and evaluation to improve the upgrade plan. After receiving the project fund, NNSA held several discussions with relevant departments and system development organizations for many times to identify difficulties and problems for system upgrade, and actively assisted these system development organizations in designing the system function audit requirements, determining the system function upgrade prototype, etc., well performed in tracking, coordination and overall planning.

Deepening the Reform to "Streamline Administration and Delegate Power, Improve Regulation, and Upgrade Services"

According to the *Measures for Regulation on Preparation of Environmental Impact Report (Form) for Construction Project* and the requirements to carry out regular review on environmental impact report (form), NNSA organized a technical review on 69 environmental impact reports (forms) in the nuclear technology application field approved by 12 provinces (autonomous regions and municipalities), namely, Hebei, Jiangsu, Jiangxi, Chongqing, Shaanxi, Zhejiang, Ningxia, Inner Mongolia, Guangdong, Tibet, Hubei and Sichuan and transferred the identified clues of problems to relevant provincial ecological environment authorities, which then organized investigation and evidence collection, and imposed punishment to and deducted scores of integrity for relevant organizations and personnel in accordance with the regulations.

Continuing to Perform Well in Radiation Safety Training

In 2022, a total of 3,605 on-site assessments were held in 31 provinces (cities, districts), with a total of 162,015 persons registering for the assessments, 124,381 persons participating the assessments and 88,468 passing the assessments, with a passing rate of 71.1% and 392 malpractices handled; the independent assessment on employees of three classes of radiation-emitting devices has been continuously promoted, and 89,851 persons involved in independent assessments has been entered by the regulation platform; the cumulative registered users of the radiation protection training platform have reached 164,000.

A WeChat official account focusing on radiation safety and protection assessment was created to facilitate both enterprises and radiation workers. 28 issues of the WeChat official account of “Radiation Safety Training” had been released, with a total of 44 pieces of related information; the image texts have been viewed for more than 1.002 million times, the amount of forwarding has reached 17,407, and the WeChat official account has owned 300,900 followers. The WeChat official account of “Radiation Safety Training” has become the main channel and a new platform for releasing assessment and regulation information. It has achieved good results by releasing relevant regulatory policies and standards on the application of nuclear technology and actively organizing public communication activities.

License Approvals and Regulatory Inspections

In 2022, radiation safety licenses were issued to 5 nuclear technology utilization organizations. Licenses of 37 organizations were renewed, licenses of 21 organizations were reapplied, new items were added to the licenses of 28 organizations, and licenses of 33 organizations were modified. One licensee’s activities were partially cancelled (see Table 75).

Approvals were provided for the environmental impact assessment of 1 decommissioned nuclear technology utilization project as well as and letter reply for 1 conditional exemption (see Table 76).

In 2022, NNSA have done well in the following work: It continued to track and regulate the special regulatory inspection of electron irradiation accelerators in all provinces and the implementation of rectification, regularly scheduled the work progress, and urged all units to complete rectification as required. At the same time, based on the radiation exposure accident of personnel in a company in 2021,NNSAconducted accident experience feedback, organized the preparation of accident experience feedback materials, and earnestly summarized post-accident experience; combining with the investigation of nuclear and radiation safety risks , NNSA requested regulatory authorities at all grades to pay attention to the production, sales, and use of portable radiation-emitting devices, further strengthening the regulation of radiation-emitting devices, and preventing future recurrence of similar accidents.

In 2022, the regional offices of nuclear and radiation safety inspection assigned 1,050 person-days in regulation of nuclear technology utilization organizations, including 281 routine inspections and 45 non-routine inspections. A total of 878 issues were identified and 934 regulatory requirements were imposed.

Figure 23. Demonstrative Inspection of Electron Irradiation Accelerator

Review and Approval of Radioisotope Imports and Exports

There were totally 2,614 import and export applications for radioactive sources and unsealed radioactive materials (containing radiopharmaceuticals and their raw materials) approved in 2022, including 1,195 applications for importing and exporting radioactive sources and 848 applications for exporting radioactive sources. The total number of imported radioactive sources was 8,717 and that of exported radioactive sources was 2,369. The gross radioactivity of imported unsealed radioactive materials was 2.81 E+16 Bq, and the gross radioactivity of exported unsealed radioactive materials was 3.7 E+16 Bq.

Training on Radiation Safety Regulation

NNSA continued to promote scientization, institutionalization, elaboration of radiation safety regulation in nuclear technology application, and standardized the regulation at all levels nationwide to improve the regulation levels. It overcame the difficulties during the COVID epidemic and held four training courses for inspectors through online training according to the training plan of 2022, with more than 500 local inspectors being trained.

Radiation Accidents

In 2022, 2 radiation accidents occurred in all provinces, autonomous regions and municipalities, and all of them were ordinary accidents. Among such accidents, 1 accident involved the sealing of the well after the radioactive source used for measuring well fell into the well, and 1 involved an over-dose exposure of radiation-emitting device to the staff.

Table 75. List of Approved Radiation Safety Licenses in 2022

No.	Organization	Type
1	Our United Corporation	Re-application and change
2	Hubei Province Nuclear and Radiation Environment Monitoring Technology Center	Re-application
3	Suzhou CNNC Huadong Radiation Co., Ltd	Change

continued

No.	Organization	Type
4	Hefei CAS Ion Medical and Technical Devices Co., Ltd.	Change, re-application and addition
5	Shanghai Institute of Measurement and Testing Technology	Change
6	East China University of Science and Technology	Change
7	Lanzhou Ion Therapy Co., Ltd.	Change
8	Nanjing University of Aeronautics and Astronautics	Addition
9	Jilin Zhonghe Irradiation Technology Co., Ltd.	Addition
10	Nuclear Power Institute of China	Addition
11	Dalian Institute of Chemical Physics, Chinese Academy of Sciences	Addition and renewal
12	Heilongjiang Institute of Atomic Energy	Addition and renewal
13	Hefei Institutes of Physical Science, Chinese Academy of Sciences	Re-application and addition
14	Chengdu Gaotong Isotope Co., Ltd. (CNNC)	Change and addition
15	Hainan Province Radiation Environment Monitoring Station	Change and renewal
16	Chifeng Ziguang Irradiation Technology Co., Ltd.	Renewal
17	Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences	Re-application
18	HTA Co., Ltd.	Re-application
19	Tsinghua University	Addition and re-application
20	Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.	Addition and change
21	Zhongjin Irradiation Chongqing Co., Ltd.	Renewal
22	Yunnan Radiation Environment Supervision Station	Renewal
23	Dongguan Campus, Institute of High Energy Physics, Chinese Academy of Sciences	Addition and re-application
24	Radiation Environment Supervision Station of Jilin Province	Re-application
25	Dc Ams Pharma	Addition
26	Fujian Compton Irradiation Technology Co., Ltd.	Renewal
27	Qingdao Baoan Irradiation Co., Ltd.	Renewal
28	Zhongjin Irradiation Incorporated Company	Renewal and change
29	Guangdong Environmental Radiation Monitoring Center	Renewal
30	Kunming Longhui Sterilization Technology Development Co., Ltd.	Change
31	Hefei Ion Medical Center	Change

continued

No.	Organization	Type
32	Huazhong University of Science and Technology	Change and re-application
33	CGNPC Uranium Resources Co., Ltd.	Re-application
34	Hebei Radiation Environment Management Station	Renewal and change
35	The 18th Research Institute of China Electronics Technology Group Corporation	Re-application and renewal
36	Guangzhou Furui Gaoneng Technology Co., Ltd.	Change
37	Peking University	Re-application
38	China Isotope & Radiation Corporation (CIRC)	Re-application, renewal and change
39	Wuhan 2nd Ship Design and Research Institute	Addition and change
40	Chengdu New Radiomedicine Technology Co., Ltd.	Addition
41	Beijing ZHIBO Bio-Medical Technology Co., Ltd.	Re-application
42	Lixiahe Agricultural Research Institute of Jiangsu Province	Re-application and renewal
43	Shandong Quangang Radiate Technology Development Co., Ltd.	Change
44	Institute of Nuclear and New Energy Technology, Tsinghua University	Change
45	Harbin Radiance Radiation Technology Co., Ltd.	Change
46	China Institute of Atomic Energy	Re-application, addition and partial cancellation
47	CNNC Xinjiang Supply Chain Co., Ltd.	Re-application
48	Yunnan Huayuan Nuclear Radiation Technology Co., Ltd.	Renewal
49	Biotechnology and Nuclear Technology Research Institute, Sichuan Academy of Agricultural Sciences	Renewal
50	Institute of Modern Physics, Chinese Academy of Sciences	Re-application
51	Hunan Radiation Environment Supervision Station	Renewal
52	Guangxi Nanxiang Environmental Protection Co., Ltd.	Renewal
53	China Institute for Radiation Protection	Renewal and addition
54	Linyi Xingda Engineering Co., Ltd.	Renewal
55	Jinxiang Dajiang Technology and Trade Co., Ltd.	Renewal
56	Nanjing Kaisu Technology Co., Ltd.	Renewal
57	Sichuan Gaotong Pharmaceutical Co., Ltd. (CNNC)	Change
58	Guangzhou Concord Cancer Center	Initial application and re-application
59	Cancer Hospital of Shandong First Medical University	Initial application
60	Institute of High Energy Physics, Chinese Academy of Sciences	Addition

continued

No.	Organization	Type
61	Sichuan Yuanzigaotong Pharmaceutical Co., Ltd	Addition
62	Southwestern Institute of Physics	Addition
63	Shanghai Institute of Applied Physics, Chinese Academy of Sciences	Addition
64	Ruijin Hospital, Shanghai Jiao Tong University School of Medicine	Addition
65	The 404 Company Limited., China National Nuclear Corporation	Re-application
66	Institute of Nuclear physics and Chemistry, China Academy of Engineering Physics	Addition
67	Zhejiang Academy of Agricultural Sciences	Renewal
68	Zhejiang Radiation Environment Monitoring Station	Change
69	Jiangsu Nuclear and Radiation Safety Supervision and Management Center	Change
70	Zhengzhou Hongyuan Bioengineering Co., Ltd.	Addition
71	Xianyang Huake Irradiation Technology Co., LTD	Renewal
72	Shinva Medical Instrument Co., Ltd.	Renewal
73	Liaoning Ecological Environment Affairs Service Center	Renewal
74	Soochow University	Change
75	Shanghai Advanced Research Institute, Chinese Academy of Sciences	Addition and change
76	Mevion Medical Systems	Initial application
77	Nanchang University	Initial application
78	Radiation Environment Workstation of Qinghai Province	Change
79	Gansu Tianchen Irradiation Technology Co., Ltd.	Change
80	Chongqing Jian'an Instrument Co., Ltd.	Change
81	Shanghai AMS Co., Ltd.	Addition and renewal
82	State Nuclear Uranium Resource Development Co., Ltd.	Renewal
83	Beijing Hefuyuan Science & Technology Development Co., Ltd.	Addition
84	Nanjing University of Aeronautics and Astronautics	Renewal
85	Jiangxi Keyuan Irradiation Technology Development Co., Ltd.	Renewal
86	Shandong Feida Group Irradiation Sterilization Co., Ltd.	Renewal and change
87	Jiangxi Radiation Environment Supervision Station	Renewal
88	Radiation Environment Supervision Station of Anhui Province	Renewal
89	Shanghai Dragon of The Century Technology Co., Ltd.	Renewal

continued

No.	Organization	Type
90	Shanxi Huakang Pharmaceuticals Co., Ltd.	Renewal
91	Radiation Environment Supervision and Management Station of Guangxi Zhuang Autonomous Region	Renewal
92	Zhongxin (Qingdao) Health Industry Co., Ltd.	Initial application
93	Liaoning Branch of JYAMS Ltd.	Addition
94	Yunnan Nuclear Application Technology Co., Ltd.	Renewal
95	Wuxi EL Pont Group	Addition
96	Zibo Bashan Wanjie Hospital	Change
97	Xiamen Wanheyuan Development Co., Ltd.	Change
98	Hunan Nuclear Industry Honghua Machinery Co., Ltd.	Change
99	Masep Medical Science & Technology Development (Shenzhen) Co., Ltd.	Change
100	Shanghai JPY Ion-Tech Co., Ltd.	Change

Table 76. Other Environmental Protection Approval and Punishment Documents in the Field of Safety Regulation of Radioisotopes and Radiation-emitting Devices in 2022

Date	Document No.	Document Title
02/10/2022	MEE App [2022] No. 21	Reply on the Environmental Impact Report Form of the To-be-retired Urban Radioactive Waste Storage Facility (Old) in Hubei
02/10/2022	MEE RL [2022] No. 51	Letter on the Issuance of Radiation Safety Licenses in 2021
06/09/2022	MEE Bulletin [2022] No. 14	Announcement on Issuing the Ecological Environment Standard of the Nation *Technical specifications for siting, design and construction of radioactive waste storage facility for nuclear technology application*
02/10/2022	MEE RL [2022] No. 258	Reply Letter on Approving Exemption Management of Nickel-63 Radioactive Sources in GC 2000 and EXPEC 2000 Gas Chromatographs of Hangzhou EXPEC Technology Co., Ltd.

IX. Nuclear Material Control and Physical Protection of Nuclear Facilities

In 2022, the duties on control of nuclear materials had been performed well and regional offices of nuclear and radiation safety have carried out relevant inspections on nuclear material license holders in accordance with the *Nuclear Safety Law of the People's Republic of China*, the *Regulations of the PRC on the Control of Nuclear Materials* and the *Detailed Rules for the Implementation of the Regulations on Nuclear Material Control* as well as other relevant laws and regulations, effectively strengthening the regulatory control of nuclear materials.

Nuclear Material License Verification and Approval

NNSA has conducted technical review and on-site inspection on the nuclear material licenses applications of CNNC Xinjiang Supply Chain Co., Ltd. and completed the verification and approval procedures.

X. Safety Regulation on Transportation of Radioactive Materials

In 2022, the transportation activities of radioactive materials were safely implemented without occurrence of any nuclear and radiation accidents or incidents in China.

Figure 24. DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, is investigating the "road-sea-rail" intermodal terminal in Dalian Changxing Island

In 2022, 12 certificates of approval for the design of transport containers for Category I radioactive materials (including 11 changes and renewals) were issued. 3 manufacturing licenses of transport containers for Category I radioactive materials (including 2 changes and renewals) were issued. 11 transport containers designed and manufactured abroad for Category I radioactive materials (including 6 changes and renewals) were approved for use in China. 44 nuclear and radiation safety analysis reports for the transportation of radioactive materials (including 28 changes and renewals) were approved. The major regulatory approvals in the field of safety regulation on radioactive material transportation in 2022 are shown in Table 77.

The regulatory inspection activities on transportation safety of radioactive materials in 2022 are shown in Table 78 .

Table 77. Main Regulatory Approvals in the Field of Safety Regulation on Radioactive Material Transportation in 2022

Date	Document No.	Document Title
01/19/2022	NNSA [2022] No. 9	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Radioactive Raw Materials Iodine-131 and Molybdenum-99 Imported by Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.*
01/19/2022	NNSA [2022] No. 10	*Notice on Approving the Use of Nordion (Canada) Inc.'s R7021 Transport Containers in the People's Republic of China*
01/19/2022	NNSA [2022] No. 11	*Notice on Approving the Renewal of the Design Approval for XAYT-I Transport Containers*
01/19/2022	NNSA [2022] No. 12	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transport of Uranium Tetrafluoride by China North Nuclear Fuel Co., Ltd. from Baotou to Wuwei TMSR Experimental Reactor Base of Shanghai Institute of Applied Physics*
01/28/2022	NNSA [2022] No. 22	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Domestic Transport of Imported Medical Co-60 Radioactive sources (GB/2773A Containers)*
01/30/2022	NNSA [2022] No. 23	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transport of Cobalt Control Rod Bundles (GY-40 Containers) for CANDU Reactors from Jiaxing to Beijing*
01/31/2022	NNSA [2022] No. 25	*Notice on Issuing the Manufacturing License for Transport Containers for Category I Radioactive Materials of CNNC Shaanxi Uranium Enrichment Hanzhong Mechanical & Electrical Equipment Manufacturing Co, Ltd.*
01/31/2022	NNSA [2022] No. 26	*Notice on Approving the Adjustment of Plan for Road Transport of Fuel Assemblies from Baotou to Tianwan NPP Units 5 and 6*
02/11/2022	NNSA [2022] No. 28	*Notice on Issuing Approval Letters for the Design of 16 Sealed Radioactive Sources (Special Form Radioactive Materials)*
03/09/2022	NNSA Letter [2022] No. 17	*Reply on Approving the Change of Information about Legal Representative in Two Approval Letters Such as Approval Letter on Use of FCC4-V1 New Fuel Transport Containers of Taishan Nuclear Power Joint Venture Co., Ltd.*
03/20/2022	NNSA [2022] No. 36	*Notice on Approving the Change of Nuclear and Radiation Safety Analysis Report for Road Transport of Co-60 Radioactive Source of Beijing Beike Radioisotope Science & Trade Co., Ltd.*
03/25/2022	NNSA [2022] No. 46	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022~2026) for Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Ningde NPP*
03/26/2022	NNSA [2022] No. 49	*Notice on Approving the Change of the Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Ir-192, Se-75 and I-131 Radioactive Raw Materials Imported by Chengdu Gaotong Isotope Co., Ltd. (CNNC)*

continued

Date	Document No.	Document Title
03/26/2022	NNSA [2022] No. 50	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022~2026) for Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Fuqing NPP*
03/26/2022	NNSA [2022] No. 51	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022~2027) for Transport of Medical Co-60 Radioactive Source (XAYT-I Containers) of Chengdu Gaotong Isotope Co., Ltd. (CNNC)*
05/01/2022	NNSA [2022] No. 62	*Notice on Approving the Renewal of the Design Approval for RY-IA Transport Containers*
05/10/2022	NNSA [2022] No. 67	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Road Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Hongyanhe NPP*
05/20/2022	NNSA [2022] No. 73	*Notice on Approving the Change of the Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Fuel Assemblies Imported by Taishan Nuclear Power Joint Venture Co., Ltd. from Daya Bay Wharf to Taishan NPP*
05/21/2022	NNSA [2022] No. 80	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of 300MW Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Qinshan NPP*
05/21/2022	NNSA [2022] No. 81	*Notice on Approving the Change of the Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Radioactive Sources Ir-192 and Se-75 of Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.*
05/21/2022	NNSA [2022] No. 83	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of Disused Radioactive Sources and Radioactive Waste from Jurong, Zhenjiang (Urban Radioactive Waste Storage Facility in Jiangsu Province) to Jiayuguan*
05/22/2022	NNSA [2022] No. 76	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of TVS-2M Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Tianwan NPP*
05/22/2022	NNSA [2022] No. 79	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Domestic Transport of C-188 Co-60 Radioactive Source (F-168 (F-168-X) Transport Containers) of Beijing Sanqiang Nuclear Radiation Engineering Technology Co., Ltd.*
06/17/2022	NNSA [2022] No. 103	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (Change Supplement Report) for Domestic Transport of Co-60 Raw Material Imported/Waste Source Exported (F-168/F-168-X Containers) of Chengdu Gaotong Isotope Co., Ltd. (CNNC)*

continued

Date	Document No.	Document Title
06/17/2022	NNSA [2022] No. 106	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (Change Supplement Report) for Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Changjiang NPP in Hainan*
06/17/2022	NNSA [2022] No. 107	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Domestic Transport of Cobalt Source (for Nordion γ Knife) (F-127 (F-127-S) Transport Containers) of Beijing Sanqiang Nuclear Radiation Engineering Technology Co., Ltd.*
06/20/2022	NNSA [2022] No. 111	*Notice on Approving the Change of the Design Approval for GY-20 Co-60 Transport Containers*
06/21/2022	NNSA [2022] No. 112	*Notice on Approving the Change of the Nuclear and Radiation Safety Analysis Report for Transport of Cobalt Source (GY-20 Containers)*
06/21/2022	NNSA [2022] No. 113	*Notice on Approving the Use of 30B Transport Container and UX-30 Outer Package for Low-enriched Uranium in the People's Republic of China*
06/24/2022	NNSA [2022] No. 114	*Notice on Approving the Change of Contents in the Design Approval for RY-IA Transport Containers*
06/24/2022	NNSA [2022] No. 118	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Domestic Transport of Cobalt Source (for Leksell γ Knife) (GB 2773 B(U) Transport Containers) of Beijing Sanqiang Nuclear Radiation Engineering Technology Co., Ltd.*
06/24/2022	NNSA [2022] No. 119	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Road Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Ningde NPP*
06/24/2022	NNSA [2022] No. 120	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Road Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Fuqing NPP*
07/10/2022	NNSA [2022] No. 130	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Multimodal Transport of Spent Fuel of CGNPC Uranium Resources Co., Ltd. from Daya Bay NPP Base to CNNC404 Corporation*
07/14/2022	NNSA [2022] No. 134	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of Fuel Cladding Sample Assemblies of China Institute of Atomic Energy from Beijing to Jiayuguan*
08/11/2022	NNSA [2022] No. 149	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transport of Fuel Assemblies of CGNPC Uranium Resources Co., Ltd. from Alataw Pass to Yangjiang NPP*
08/23/2022	NNSA [2022] No. 157	*Notice on Approving the Change of Design Approval for STC-NF1A New Fuel Transport Containers of Shanghai Nuclear Engineering Research & Design Institute Co., Ltd.*

continued

Date	Document No.	Document Title
08/23/2022	NNSA [2022] No. 158	*Notice on Approving the Increase of Quantity of YKTIB(U)-96-18M Transport Containers for the Use in the People's Republic of China*
08/23/2022	NNSA [2022] No. 159	*Notice on Approving the Change of Nuclear and Radiation Safety Analysis Report for Road Transport of Medical Co-60 Radioactive Source of Beijing Hefuyuan Science & Technology Development Co., Ltd.*
09/02/2022	NNSA [2022] No. 174	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for "Road-Sea-Rail" Intermodal Transportation of Spent Fuel of CNNC Qingyuan Environmental Technology Engineering Co., Ltd. from Daya Bay to Jiayuguan*
09/07/2022	NNSA [2022] No. 180	*Notice on Approving the Renewal of YKTIB-160000/4300 Radioactive Source Transport Containers for the Use in the People's Republic of China*
09/09/2022	NNSA [2022] No. 182	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (Special Arrangement) for Transport of Co-60 Medical Source (GW-01 Containers) of Chengdu Gaotong Isotope Co., Ltd. (CNNC)*
09/16/2022	NNSA [2022] No. 183	*Notice on Approving the Use of ZA/NNR 1006/B(U)-96 Transport Containers in the People's Republic of China*
09/19/2022	NNSA [2022] No. 187	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transport of I-131 Radioactive Raw Material Imported by Chengdu Gaotong Isotope Co., Ltd. (CNNC)*
10/09/2022	NNSA [2022] No. 198	*Notice on Approving the Change of the Nuclear and Radiation Safety Analysis Report for Domestic Transport of Imported Medical Co-60 Radioactive Source (GB/2773A Containers) of Chengdu Gaotong Isotope Co., Ltd. (CNNC)*
10/09/2022	NNSA [2022] No. 199	*Notice on Approving the Renewal of the Design Approval for CNSC Spent Fuel Transport Containers*
10/14/2022	NNSA [2022] No. 208	*Notice on Approving the Renewal and Change of the Design Approval for 27 Special Form Radioactive Materials of HTA Co., Ltd.*
10/14/2022	NNSA [2022] No. 209	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Daya Bay NPP and Ling'ao NPP*
10/14/2022	NNSA [2022] No. 210	*Notice on Approving the Request for Change of Nuclear and Radiation Safety Analysis Report for Road Transport of Medical Co-60 Radioactive Source of Beijing Hefuyuan Science & Technology Development Co., Ltd.*
10/14/2022	NNSA [2022] No. 211	*Notice on Approving the Number Increase of 3977A Transport Containers for the Use in the People's Republic of China*

continued

Date	Document No.	Document Title
10/14/2022	NNSA [2022] No. 212	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2022-2027) for Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Yangjiang NPP*
11/02/2022	NNSA [2022] No. 216	*Notice on Approving the Renewal of the Design Approval for CEFR-MOX-N01 Transport Containers of China Institute of Atomic Energy*
11/02/2022	NNSA [2022] No. 217	*Notice on Approving the Renewal of the Service Life of 14 RY-IA Spent Fuel Transport Containers*
11/03/2022	NNSA [2022] No. 222	*Notice on Approving the Renewal and Change of the Design Approval for XN3000 UF_6 Transport Containers of Nucleus Industry No.7 Research Design Institute*
11/11/2022	NNSA [2022] No. 231	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of* Co-60*Disused Radioactive Sources from Anning, Kunming (Urban Radioactive Waste Storage Facility in Yunnan Province) to Jiayuguan*
11/11/2022	NNSA [2022] No. 232	*Notice on Approving the Renewal of the Design Approval for CNFC-300 New Fuel Transport Containers*
11/16/2022	NNSA [2022] No. 235	*Notice on Approving the Renewal of the Design Approval for STC-NF1A New Fuel Transport Containers of Shanghai Nuclear Engineering Research & Design Institute Co., Ltd.*
11/16/2022	NNSA [2022] No. 236	*Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of Co-60 Disused Radioactive Sources from Yongji, Jilin (Urban Radioactive Waste Storage Facility in Jilin) to Jiayuguan*
11/29/2022	NNSA [2022] No. 248	*Notice on Issuing the Approval Letter for the Use of 40 Traveller XL New Fuel Transport Containers of Shandong Nuclear Power Company Ltd.*
12/10/2022	NNSA [2022] No. 253	*Notice on Approving the Nuclear and Radiation Safety Analysis Report on Transport of Radioactive Source (ZA1006 Containers) of CNNC Tongxing (Beijing) Nuclear Technology Co., Ltd.*
12/16/2022	NNSA [2022] No. 256	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2027) for Transport of Fuel Assemblies by CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Qinshan Nuclear Power Base*
12/16/2022	NNSA [2022] No. 257	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (Change Supplement Report) for Transport of Tianwan NPP TVS-2M Fuel Assemblies by CNNC Jianzhong Nuclear Fuel Co., Ltd.*
12/16/2022	NNSA [2022] No. 260	*Notice on Approving the Use of PO-09 Transport Containers in the People's Republic of China*

continued

Date	Document No.	Document Title
12/22/2022	NNSA [2022] No. 265	*Notice on Approving the Nuclear and Radiation Safety Analysis Report (Special Arrangement) for Transport of Co-60 Medical Source (GW-01 Containers) of Chengdu Gaotong Isotope Co., Ltd. (CNNC) Through 3 Routes such as Chongzhou-Jiajiang Route*
01/30/2022	NNSA Letter [2022] No. 6	*Reply on Approving the Information Change of Manufacturing License for Transport Containers for Category I Radioactive Materials of CNNC Lanzhou Uranium Enrichment Co., Ltd.*
03/09/2022	NNSA Letter [2022] No. 17	*Reply on Approving the Change of Information about Legal Representative in Two Approval Letters Such as Approval Letter on Use of FCC4-V1 New Fuel Transport Containers of Taishan Nuclear Power Joint Venture Co., Ltd.*
03/20/2022	NNSA Letter [2022] No. 24	*Reply on Approving the Change of Information about Legal Representatives in the Approval Letter for the Nuclear and Radiation Safety Analysis Report for Transport of Category I Radioactive Materials of Chengdu CNNC Qualcomm Isotope Co., Ltd.*
07/10/2022	NNSA Letter [2022] No. 50	Reply on Approving the Change of Information about Address and Legal Representative in the Approval Letter for the Nuclear and Radiation Safety Analysis Report for Transport of Category I Radioactive Materials by CNNC Tongxing (Beijing) Nuclear Technology Co., Ltd.
08/24/2022	NNSA Letter [2022] No. 59	*Reply on Approving the Change of Information about Legal Representatives in the Approval Letter for the Use of transport containers for Category I radioactive materials and the Approval Letter for the Nuclear and Radiation Safety Analysis Report for the Transport of Category I Radioactive Sources of CNNC Qingyuan Environmental Technology Engineering Co., Ltd.*
11/02/2022	NNSA Letter [2022] No. 74	*Reply on Approving the Change of Information about Legal Representative in Manufacturing License for Transport Containers for Category I Radioactive Materials of CNNC Shaanxi Uranium Enrichment Hanzhong Mechanical & Electrical Equipment Manufacturing Co, Ltd.*

Table 78. Regulatory Inspection Activities in the Field of Safety Regulation on Transportation of Radioactive Materials in 2022

Starting Date	Item	Main Contents of the Inspection
08/28/2022	Pre-transportation regulatory inspection on “road-sea-rail” intermodal transportation of spent fuels of CGNPC Uranium Resources Co., Ltd.	Transportation safety inspection
06/10/2022	Witness of end-of-manufacturing test of autonomous dual-purpose transport containers for uranium dioxide pellet/powder by Luoyang Ship Material Research Institute	Vessel test witness

continued

Starting Date	Item	Main Contents of the Inspection
06/21/2022	Inspection on prerequisite for fabrication of Tc-24p spent fuel transport container prototype by Shanghai Apollo Machinery Co., Ltd.	Vessel test witness
06/30/2022	Witness of the design verification test of QJ4U320 pellet transport containers by Nucleus Industry No.7 Research Design Institute	Vessel test witness
08/04/2022	Witness of license test of autonomous dual-purpose transport containers for uranium dioxide pellet/powder by Shanghai Nuclear Engineering Research & Design Institute Co., Ltd.	Vessel test witness
08/10/2022	Inspection on prerequisite for application for change of manufacturing license for fabrication of prototype of transport containers for Category I radioactive materials (CNFC-HL01 new fuel transport containers) by Xi'an Nuclear Equipment Co., Ltd.	Vessel test witness
08/31/2022	Witness of the design verification test of PX-DP-A neutron source transport containers by Tianjin Pengxuan Environmental Protection Technology Co., Ltd.	Vessel test witness
09/13/2022	Witness of end-of-manufacturing test of CNFC-HL01 new fuel transport containers by Xi'an Nuclear Equipment Co., Ltd.	Vessel test witness
09/23/2022	Witness of the design verification test of GT/CIRP-RS-01 radioactive source transport containers by China Institute for Radiation Protection	Vessel test witness
10/08/2022	Witness of lead filling test of TC-24P spent fuel transport containers by Shanghai Apollo Machinery Co., Ltd.	Vessel test witness

Note: Inspections organized by regional offices of nuclear and radiation safety inspection are not included.

XI. Regulation on Civil Nuclear Safety Equipment

Regulatory Approvals

In 2022, NNSA received and reviewed a total of 127 organizations' applications for civil nuclear safety equipment licenses, and approved 122 organizations' applications, including 9 organizations' new applications for licenses (see Table 79), 40 organizations' applications for renewal (see Table 80) and 73 organizations' applications for change (see Table 81). As of the end of 2022, a total of 224 organizations were licensed for the design, manufacture, installation and non-destructive testing (NDT) of civil nuclear safety equipment.

53 organizations' applications for registration of civil nuclear safety import equipment were received and reviewed, of which 21 applications were approved (see Table 82). As of the end of 2022, the total number of foreign organizations holding registration confirmations for design, manufacture, or NDT of civil nuclear safety equipment was 181.

Figure 25. Independent verification for nuclear-grade digital protection system of Zhangzhou NPP Unit 1

Table 79. Issuance of New Licenses for Civil Nuclear Safety Equipment in 2022

Date	Document No.	Document Title
02/25/2022	NNSA [2022] No. 32	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Xuanrui Damping Equipment Co., Ltd.*
06/15/2022	NNSA [2022] No. 100	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Shanghai Ivco Valve Shares Co., Ltd.*

continued

Date	Document No.	Document Title
06/17/2022	NNSA [2022] No. 104	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Shanghai Rocksensor Automation Co., Ltd.*
09/16/2022	NNSA [2022] No. 185	*Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Zhejiang Bofine Power Equipment Co., Ltd.*
09/21/2022	NNSA [2022] No. 188	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Changzhou Tianli Intelligent Control Co., Ltd.*
09/21/2022	NNSA [2022] No. 189	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Suzhou East Instrument Electric Technology Co., Ltd*
12/16/2022	NNSA [2022] No. 258	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Shanghai Xingshen Instrument Co., Ltd.*
12/16/2022	NNSA [2022] No. 259	*Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Schneider Electric Information Technology (Xiamen) Co., Ltd.*
12/16/2022	NNSA [2022] No. 261	*Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Yangzhou Lontrin Steel Tube Co., Ltd.*

Table 80. Approvals of License Renewal for Civil Nuclear Safety Equipment in 2022

Date	Document No.	Document Title
03/20/2022	NNSA [2022] No. 39	*Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 9 Enterprises such as Erzhong (Deyang) Heavy Equipment Co., Ltd.*
06/17/2022	NNSA [2022] No. 105	*Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 7 Enterprises such as TBEA Hengyang Transformer Co., Ltd.*
09/16/2022	NNSA [2022] No. 184	*Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 4 Enterprises such as SBW Nuclear Pump Corporation*
09/21/2022	NNSA [2022] No. 190	*Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 11 Enterprises such as Schneider Electric (Xiamen) Switchgear Co., Ltd.*
12/27/2022	NNSA [2022] No. 269	*Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 9 Enterprises such as Jilin Sino-Italy Nuclear Piping Components Manufacturing Co., Ltd.*

Table 81. Approvals of License Change for Civil Nuclear Safety Equipment in 2022

Date	Document No.	Document Title
01/15/2022	NNSA [2022] No. 4	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Shanghai No.1 Machine Tool Works Co., Ltd.*
01/15/2022	NNSA [2022] No. 5	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Jiangsu Yanxin Science & Technology Incorporated Corporation*
01/15/2022	NNSA [2022] No. 7	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Wuhan 2nd Ship Design and Research Institute*
01/25/2022	NNSA [2022] No. 21	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Anshan Electromagnetic Valve Co., Ltd.*
06/15/2022	NNSA [2022] No. 99	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for HE Harbin Power Plant Valve Company Limited*
06/17/2022	NNSA [2022] No. 102	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for CNNC Xi'an Nuclear Instrument Co., Ltd.*
08/19/2022	NNSA [2022] No. 153	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Jiangsu Shentong Valve Co., Ltd.*
11/21/2022	NNSA [2022] No. 240	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for China Nuclear Industry 23 Construction Co., Ltd.*
11/21/2022	NNSA [2022] No. 241	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Wuxi Huaertai Machinery Manufacture Company Ltd.*
11/29/2022	NNSA [2022] No. 244	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for China Techenergy Co., Ltd.*
11/29/2022	NNSA [2022] No. 245	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Dongfang Electric (Wuhan) Nuclear Equipment Co., Ltd.*
11/29/2022	NNSA [2022] No. 247	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Baosheng Science & Technology Innovation Co., Ltd.*
11/29/2022	NNSA [2022] No. 249	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Siait Cable Co., Ltd.*

continued

Date	Document No.	Document Title
11/29/2022	NNSA [2022] No. 250	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Jiangsu Biaoxin Industrial Co., LTD.*
01/21/2022	NNSA Letter [2022] No. 3	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 6 Enterprises such as Lanzhou LS Heat Exchange Equipment Co., Ltd.*
02/22/2022	NNSA Letter [2022] No. 12	*Notice on Approving the Change of the Scope of Activities of Non-destructive Testing License for Civil Nuclear Safety Equipment of China Nuclear Power Operation Technology Corporation, Ltd.*
03/07/2022	NNSA Letter [2022] No. 16	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 7 Enterprises such as China Nuclear Industry 23 Construction Co., Ltd. and Registration Confirmation of 2 Overseas Enterprises such as Meggitt Safety Systems, Inc.*
04/01/2022	NNSA Letter [2022] No. 26	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 7 Enterprises such as Dongfang Electric (Guangzhou) Heavy Machinery Co., Ltd.*
05/06/2022	NNSA Letter [2022] No. 32	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 3 Enterprises such as China First Heavy Industries Co., Ltd. and Registration Confirmation of 2 Overseas Enterprises such as Crane Nuclear PFT CORP*
06/14/2022	NNSA Letter [2022] No. 40	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Anhui Cable Co., Ltd.*
06/14/2022	NNSA Letter [2022] No. 41	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shenzhen Woer Heat-Shrinkable Material Co., Ltd.*
06/17/2022	NNSA Letter [2022] No. 42	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Zhejiang Sanfang Control Valve Co., Ltd.*
06/17/2022	NNSA Letter [2022] No. 43	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Installation License for China Nuclear Industry Fifth Construction Co., Ltd.*
07/20/2022	NNSA Letter [2022] No. 52	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 6 Enterprises such as Xi'an United Pressure Vessel Co., Ltd. and Registration Confirmation of 4 Overseas Enterprises such as JSC "Pervouralsky Pipe Plant"*
09/15/2022	NNSA Letter [2022] No. 66	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 7 Organizations such as CITIC Heavy Industries Co., Ltd.*

continued

Date	Document No.	Document Title
11/02/2022	NNSA Letter [2022] No. 75	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for SBW Nuclear Pump Corporation*
11/11/2022	NNSA Letter [2022] No. 82	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 8 Enterprises such as China Nuclear Power Technology Research Institute Co., Ltd. and Registration Confirmation of 2 Overseas Enterprises such as AB Sandvik Materials Technology*
11/21/2022	NNSA Letter [2022] No. 84	*Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Zhejiang Sanfang Control Valve Co., Ltd.*
11/29/2022	NNSA Letter [2022] No. 86	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 3 Organizations such as Wuhan 2nd Ship Design and Research Institute*
12/21/2022	NNSA Letter [2022] No. 92	*Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 5 Organizations such as China Nuclear Control System Engineering Co., Ltd.*

Table 82. Issuance of Registration Confirmation for Civil Nuclear Safety Equipment Activities to Overseas Enterprises in 2022

Date	Document No.	Document Title
01/15/2022	NNSA [2022] No. 6	*Notice on Issuing the Registration Confirmation to Crane Nuclear, Inc., an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities*
05/12/2022	NNSA [2022] No. 68	*Notice on Issuing the Registration Confirmations to 10 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including POMPES RUTSCHI*
06/24/2022	NNSA [2022] No. 121	*Notice on Issuing the Registration Confirmations to 2 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including HOLTEC INTERNATIONAL*
08/18/2022	NNSA [2022] No. 152	*Notice on Issuing the Registration Confirmations to 4 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Trubodetal JSC*
11/29/2022	NNSA [2022] No. 246	*Notice on Issuing the Registration Confirmations to 4 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including HEW-KABEL GmbH*

Safety Inspection of Imported Equipment

NNSA conducted safety inspections of imported civil nuclear safety equipment in accordance with law, and further standardized and optimized the safety inspection process. Applicants submitted 497 batches of safety inspection application documents (for customs and opening package inspection) (including 260 for mechanical equipment, 214 for electrical equipment, and 23 for combined mechanical and electrical equipment), among which, 433 were released, 64 were rejected, and 39 were opened for inspections.

Regulatory Inspection

The Northern China Regional Office of Nuclear and Radiation Safety Inspection conducted 30 comprehensive inspections (see Table 83) and 21 special inspections (see Table 84) of domestic enterprises according to the regulatory inspection program and plan, 469 issues were identified and 182 regulatory requirements were imposed. The Regional Office promptly raised requirements for correcting the problems discovered during these inspections, and organized experts to review and perform special inspections on major non-conformance that could affect nuclear safety. In 2022, the quality of design, manufacture, installation, and non-destructive testing of civil nuclear safety equipment is under control.

Table 83. Comprehensive Inspection on Civil Nuclear Safety Equipment of Domestic Enterprises in 2022

Starting Date	Inspected Enterprises
02/22/2022	China Institute of Atomic Energy
03/07/2022	China Tianshui Changcheng Switchgear Group Co., Ltd
03/21/2022	China Nuclear Power Engineering Co., Ltd.
06/10/2022	Shanghai Kaiquan Pump (Group) Co., Ltd.
07/05/2022	Jiangsu Saide Electric Co., Ltd.
07/17/2022	Dongfang Boiler Group Co., Ltd.
07/18/2022	China Nuclear Power Operation Technology Corporation, Ltd.
07/18/2022	Shaanxi Diesel Heavy Industry Co., Ltd.
07/19/2022	Shijiazhuang No.1 Valve Company Ltd.
07/20/2022	Shandong BeiChen Mechanical Electrical Equipment Co., Ltd.
07/26/2022	Changshu Walsin Specialty Steel Co., Ltd.

continued

Starting Date	Inspected Enterprises
07/26/2022	Zhejiang Shangfeng SPECIAL Blower Industrial Co., Ltd.
08/11/2022	Dalian Deep BLUE PUMP Co., Ltd.
08/23/2022	Harbin Boiler Co., Ltd.
08/23/2022	Iraeta Energy Equipment Co., Ltd.
08/29/2022	China First Heavy Industries Co. Ltd.
09/05/2022	Shanghai Nuclear Engineering Research & Design Institute Co., Ltd
09/05/2022	Lanzhou LS Heat Exchange Equipment Co., Ltd.
09/06/2022	Shandong Nuclear Power Equipment Manufacturing Co., Ltd.
09/06/2022	Changsha Pump Works Co., Ltd.
09/19/2022	Shanghai Automation Instrumentation Co., Ltd.
09/20/2022	China Nuclear Power Operation Technology Corporation, Ltd., Jiangsu Branch
09/26/2022	SUFA Technology Industry Co., Ltd., CNNC
09/27/2022	Jiangsu Xingyang Pipe Fittings Share Co., Ltd.
10/17/2022	Shanghai Power Equipment Research Institute Co., Ltd.
10/24/2022	Shanghai Electric Machinery Co., Ltd.
10/26/2022	China Techenergy Co., Ltd.
11/08/2022	CGN Inspection Technology Co., Ltd.
11/15/2022	Nuclear Power Institute of China
11/16/2022	Jiangsu Wujin Stainless Steel Pipe Group Co., Ltd.

Table 84. Special Inspection of Civil Nuclear Safety Equipment of Domestic Enterprises in 2022

Starting Date	Inspected Enterprises
06/02/2022	China Techenergy Co., Ltd.
07/07/2022	Sichuan Sanzhou SCMP Nuclear Equipment Manufacture Co., Ltd.
07/12/2022	Harbin Electric Group (Qinhuangdao) Heavy Equipment Co., Ltd.
08/08/2022	Dalian Dagao Valve Co., Ltd.
08/09/2022	SUFA Technology Industry Co., Ltd., CNNC
08/11/2022	Jiangsu Xinghe Valve Co., Ltd.

continued

Starting Date	Inspected Enterprises
08/15/2022	Jiangsu Shentong Valve Co., Ltd.
08/16/2022	Shanghai Lianggong Valve Factory Co., Ltd.
08/16/2022	HE Harbin Power Plant Valve Company Limited
08/17/2022	Shanghai EHO Valve Co., Ltd.
08/18/2022	Shanghai Automation Instrumentation Co., Ltd.
08/22/2022	Zhejiang Sanfang Control Valve Co., Ltd.
08/30/2022	China Nuclear Power Design Co., Ltd. (Shenzhen)
09/01/2022	Jiamusi Electric Machine Company Limited
09/19/2022	Shanghai Electric Nuclear Power Equipment Co., Ltd.
09/19/2022	Yangzhou Electric Power Equipment Manufacture Factory Co., Ltd.
09/21/2022	Changzhou Power Station Auxiliary Equipment Co., Ltd.
09/22/2022	Shanghai No.1 Machine Tool Works Co., Ltd.
10/19/2022	China Institute of Atomic Energy
11/21/2022	China Nuclear Power Engineering Co., Ltd.
11/07/2022	CGN Inspection Technology Co., Ltd.

XII. Regulation on Electromagnetic Radiation Environment

Regulatory Approvals

In 2022, the Ministry of Ecology and Environment (National Nuclear Safety Administration) approved the Environmental Impact Assessment (EIA) documents of 8 electromagnetic radiation construction projects, including the Jinshang-Hubei ±800 kV UHV DC transmission project (see Table 85).

Table 85. Regulatory Approvals for EIA of Electromagnetic Radiation Construction Projects in 2022

Date	Document No.	Document Title
02/09/2022	MEE App [2022] No. 17	*Approval Reply on the Environmental Impact Report for the Changes in Zhumadian-Wuhan 1,000 kV UHV AC Power Transmission and Transformation Project*
04/06/2022	MEE App [2022] No. 40	*Approval Reply on the Environmental Impact Report for Construction Power Supply Project (Phase II) of Chamdo-Nyingchi Section of the Sichuan-Tibet Railway*
08/04/2022	MEE App [2022] No. 120	*Approval Reply on the Environmental Impact Report for Wuhan-Nanchang 1,000kV UHV AC Power Transmission and Transformation Project*
11/11/2022	MEE App [2022] No. 173	*Approval Reply on the Environmental Impact Report for 500 kV Hecheng Power Transmission and Transformation Project (Hecheng-Duole)*
11/11/2022	MEE App [2022] No. 175	*Approval Reply on the Environmental Impact Report for Ship Traffic Management System Renovation and Expansion Project of Hebei Maritime Safety Administration*
11/11/2022	MEE App [2022] No. 176	*Approval Reply on the Environmental Impact Report for the Ground-based Application System for Fengyun 4 Batch-02 Meteorological Satellite*

continued

Date	Document No.	Document Title
11/29/2022	MEE App [2022] No. 187	*Approval Reply on the Environmental Impact Report for the Jinshang-Hubei ±800 kV UHV DC Transmission Project*
12/10/2022	MEE App [2022] No. 196	*Approval Reply on the Environmental Impact Report for the Ground-based Application System and Ground-based Calibration Station for the "Zhongxing-26" Satellite Project*

Re-check of EIA Documents

The normalized review of EIA documents for nuclear and radiation construction projects were organized and conducted. NNSA organized technical re-check of 50 EIA documents on electromagnetic radiation construction projects approved by the competent ecological environment authorities at all levels in 8 provinces (autonomous regions) including Zhejiang, Ningxia, Shanxi, Inner Mongolia, Hubei, Guangdong, Sichuan and Tibet.

Regulatory Inspection

In collaboration with the Ministry of Industry and Information Technology and the State Administration for Market Regulation, NNSA organized the departments (bureaus) of ecology and environment, communications administration, and administration (departments and commissions) for market regulation of each province (autonomous region and municipality) to verify the progress of electromagnetic radiation environmental monitoring of communication base stations. NNSA organized relevant departments (bureaus) of ecology and environment in various provinces (districts, and cities) to conduct on-site verification on the implementation of the environmental protection "Three Synchronizations Principles" (i.e., all measures and facilities of pollution prevention and control for construction project should be designed, constructed, and operated synchronously with the design, construction, and operation of the main body of the construction project) for environmental protection and independent environmental protection self-acceptance checks for completion of 41 power transmission and transformation construction projects.

XIII. Radiation Environmental Monitoring

NNSA issued and implemented the national radiation environmental monitoring plan for 2022, and organized provinces to efficiently operate and manage the State control network. Throughout the year, the acquisition rate of real-time monitoring data from automatic radiation monitoring stations remained stable at over 97% on average. NNSA continued to enhance its quality management. NNSA revised the implementation rules for certifying and assessing radiation environment monitoring personnel, conducted the annual quality assessment and professional training for monitoring projects, and organized training courses on sample collection and processing of aerosols and precipitation, quality assurance and quality control techniques for radiation environmental monitoring, automatic monitoring of the radiation environment and operation and maintenance of automatic radiation environment monitoring stations, as well as sampling and measurement of carbon-14 in environmental media. NNSA approved the relocation of State controlled points for radiation environment monitoring in Hunan, Guangdong, Henan and other provinces, as well as the siting plan for the supervisory monitoring systems in San'ao, Zhejiang and the construction plan for the supervisory monitoring system in Taipingling NPP in Guangdong, and accepted the supervisory monitoring system for Shidao Bay NPP in Shandong.

Monitoring of Ionizing Radiation Environment

In 2022, the nationwide environmental ionizing radiation level was within the range of background fluctuations. The dose rates of γ-radiation were within the range of local natural background fluctuation. The activity concentrations of natural radionuclides in the air were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of natural occurring radionuclides in the seven major river basins including the Yangtze River, the Yellow River, the Pearl River, the Songhua River, the Huaihe River, the Haihe River, and the Liaohe River, the rivers in the Zhejiang-Fujian basin, the northwestern rivers, the southwestern rivers,

and the key lakes (reservoirs) were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of gross α and gross β in urban centralized drinking water source and groundwater for drinking purposes were lower than the guidance values specified in the *Standards for Drinking Water Quality* (GB 5749-2006). The activity concentrations of naturally occurring radionuclides in seawater and marine life in coastal waters were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of artificial radionuclides Strontium-90 and Cesium-137 in seawater were much lower than the limits specified in seawater quality standard, while the activity concentrations of those in marine life were lower than the limits specified in the *Limited Concentrations of Radioactive Materials in Foods* (GB 14882-94). The activity concentrations of naturally occurring radionuclides in the soil were at the background level, and no abnormal activity concentration of artificial radionuclides was detected.

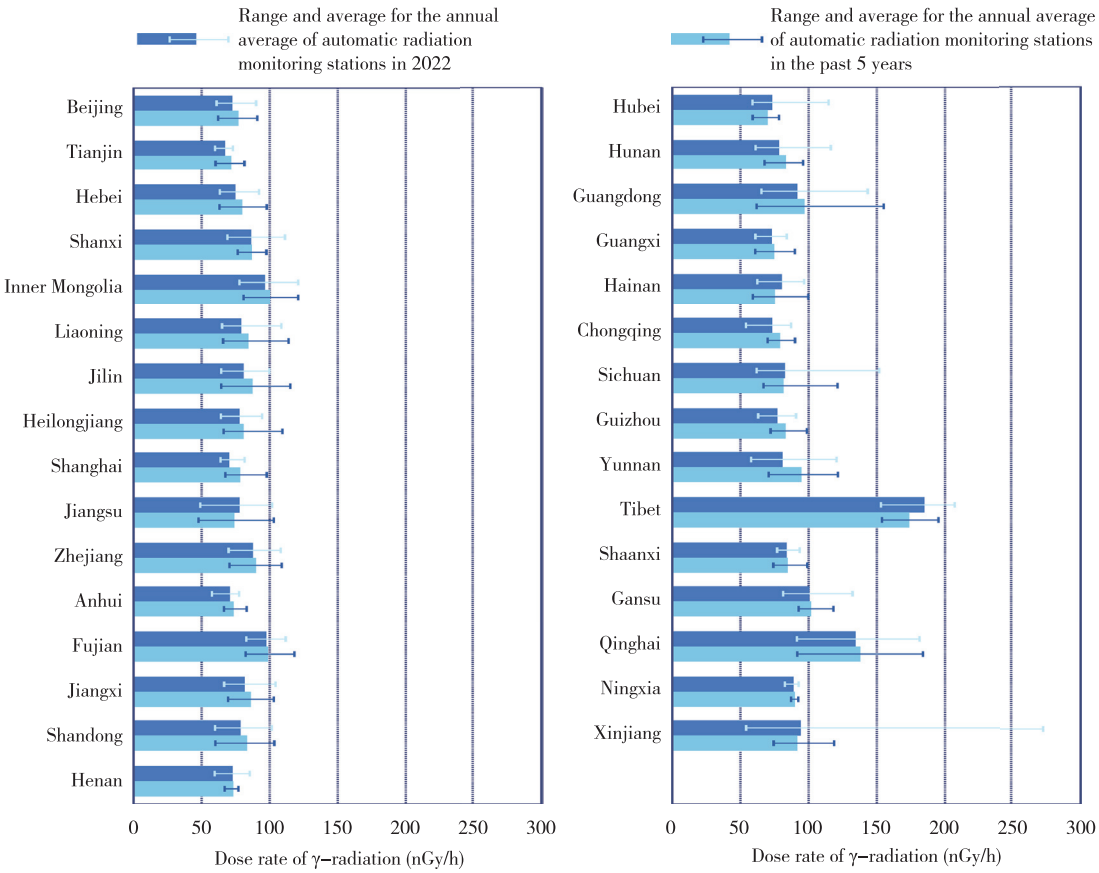


Figure 26. Results of Automatic Monitoring of Dose Rate of γ-radiation in the Environment in 2022 (Note: The data for the year 2022 includes monitoring results from 234 newly added automatic radiation monitoring stations)

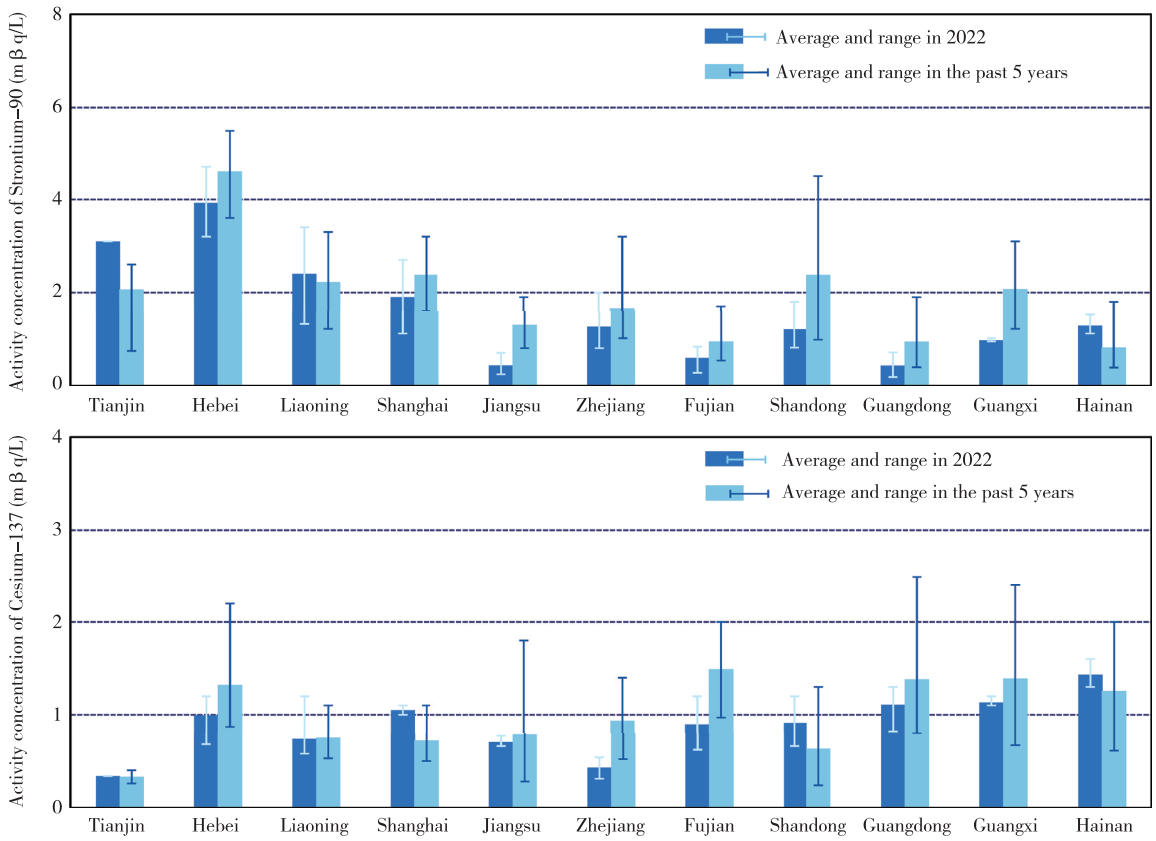


Figure 27. Monitoring Results of Strontium-90 and Cesium-137 Activity Concentrations in Offshore Marine Area of China in 2022

Ionizing Radiation Environmental Monitoring Around Nuclear Facilities

Around operating nuclear power bases, civil research reactors, nuclear fuel cycle facilities and radioactive waste disposal facilities, the dose rates of γ-radiation as well as , the activity concentrations of radionuclides related to activities of such facilities in air, water, soil, organisms and other environmental media were generally within the fluctuation range over the years. The assessment results indicate that the radiation doses exposure to the public caused by the operation of the above-mentioned nuclear facilities were far lower than the national limits, without any impact on environmental safety and public health.

Ionizing Radiation Environmental Monitoring Around Uranium Mining and Milling Facilities

Around uranium mining and milling facilities, the dose rates of γ-radiation were generally within the fluctuation range over the years, as well as the activity concentrations of

radionuclides in air, water and soil related to activities of such facilities.

Electromagnetic radiation

In 2022, the environmental electromagnetic radiation levels at the State controlled points for electromagnetic radiation environment monitoring in 31 provinces (autonomous regions and municipalities), and the electromagnetic radiation levels at the electromagnetic radiation sensitive targets around the monitored broadcast and television transmitting facilities, power transmission and transformation facilities, and mobile communication bases were all lower than the public exposure control limits specified in the *Controlling Limits for Electromagnetic Environment* (GB 8702-2014).

XIV. Emergency Management of Nuclear and Radiation Accidents

In 2022, NNSA reviewed and re-examined the on-site emergency plans for civil nuclear facilities in accordance with the law. It also conducted inspection, and evaluation on the daily emergency preparations as well as comprehensive on-site emergency exercises for nuclear facilities, with the aim of effectively strengthening the regulatory inspection and management of emergency preparations for nuclear facilities. NNSA continued to strengthen its emergency preparation and response capabilities and successfully completed several tasks concerning nuclear and radiation emergency response.

Regulation of Nuclear Facility Emergency Preparation

In 2022, NNSA completed the inspection on the on-site comprehensive emergency exercise conducted before the initial loading of Fangchenggang NPP Unit 3. It also completed special inspections on emergency preparations as well as regulatory inspection and evaluation on the on-site comprehensive emergency exercise of nuclear facility licensees such as Qinshan NPP, Ningde NPP, Fuqing NPP, Sanmen NPP, Haiyang NPP, Shidao Bay NPP, Daya Bay NPP, Yangjiang NPP, Taishan NPP, Tianwan NPP, Hongyanhe NPP, Institute of Nuclear and New Energy Technology (INET) of Tsinghua University, China Institute of Atomic Energy, China North Nuclear Fuel Co., Ltd., 404 Company Limited., Shanghai Institute of Applied Physics, Chinese Academy of Sciences, CNNC Jianzhong Nuclear Fuel Co., Ltd. and Sichuan Honghua Industry Co., Ltd.

Approval of On-site Emergency Plans

NNSA reviewed and approved 2 on-site nuclear accident emergency plans developed for Fangchenggang NPP and Sichuan Honghua Industry Co., Ltd.

Coordinate and Guide Provincial Ecology and Environment Authorities on Radiation Accident Emergency Exercises

The regional offices of nuclear and radiation safety inspection coordinated and guided provincial ecology and environment authorities in Guangxi and Shanxi to take the lead in implementing comprehensive radiation accident emergency exercises. Through these exercises, the impetus placed by the local governments on radiation accident emergency was enhanced, and the primary responsibilities of the local governments in radiation accident emergency were implemented. The emergency teams were comprehensively trained, the emergency plans and facilities were examined, the emergency response and handling capabilities were improved, and the radiation safety regulation was further promoted.

Strengthen Emergency Preparation for Nuclear and Radiation Accidents

In 2022, the nuclear and radiation accident emergency training classes of the Ministry of Ecology and Environment (National Nuclear Safety Administration) were held online. NNSA instructed the Northeast China Regional Office of Nuclear and Radiation Safety Inspection to organize a special drill for emergency monitoring in border areas of Northeast China in 2022. NNSA strengthened the operation and maintenance management of nuclear and radiation emergency command and dispatch platform, and conducted special emergency communication exercises every month to ensure the high sustainability of emergency response capability.

Figure 28. Evaluation on the Comprehensive Nuclear Emergency Exercise at the China Institute of Atomic Energy

XV. Personnel Qualification

In 2022, the NNSA further advanced the scientific and standardized management for operator qualifications, and streamlined the operator approval process. It also upgraded the operator information system to improve the information level of operator qualification management. In addition, the NNSA developed mid-term and post-event management measures for personnel in charge of special process, and compiled the *Collection of Violation Cases of Personnel in Charge of Special Processes of Civil Nuclear Safety Equipment*, and strengthened the regulatory inspection and management system of personnel in charge of special process. NNSA also revised the Examination *Syllabus for Nondestructive Testing Personnel of Civil Nuclear Safety Equipment* and the *Explanation for Revision of the Examination Syllabus* to enhance the core competence of NDT personnel. Furthermore, NNSA prepared the *Organization and Implementation Plan for the Training and Examination of Administrative Enforcement Certificates for Nuclear and Radiation Safety Regulators in 2022* and the question bank for the examination of administrative law enforcement certificates, and issued the *Syllabus for the Training of Administrative Enforcement Certificates for Nuclear and Radiation Safety Regulators*, in order to enhance and standardize the training and examination for administrative enforcement certificates.

Qualification of Civil Nuclear Reactor Operators

In 2022, the civil nuclear facility operator licenses were issued in 5 batches (see Table 86) by NNSA to 1,237 operators in total, including 1,126 NPP operators, and 111 civil research reactor operators.

As of December 2022, there were 2,855 persons in total holding NPP operator licenses (see Table 87), including 1,676 persons holding senior operator licenses and 1,179 holding operator licenses. There were 276 persons holding research reactor operator licenses (see Table 88), including 150 persons holding senior operator licenses and 126 holding operator licenses. There were

also 53 persons holding reprocessing facility operator licenses (see Table 89), including 9 persons holding senior operator licenses and 44 holding operator licenses.

Table 86. Regulatory Approvals for Civil Nuclear Facility Reactor Operator License in 2022

Date	Document Title
01/18/2022	*Notice on Issuing the First Batch of Licenses for Operators of Civil Nuclear Facilities in 2022*
04/05/2022	*Notice on Issuing the Second Batch of Licenses for Operators of Civil Nuclear Facilities in 2022*
08/19/2022	*Notice on Issuing the Third Batch of Licenses for Operators of Civil Nuclear Facilities in 2022*
11/02/2022	*Notice on Issuing the Fourth Batch of Licenses for Operators of Civil Nuclear Facilities in 2022*
12/31/2022	*Notice on Issuing the Fifth Batch of Licenses for Operators of Civil Nuclear Facilities in 2022*

Table 87. Statistics on Licenses for Operators of Nuclear Power Plants

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
CNNC Nuclear Power Operation Management Co., Ltd.	Qinshan NPP	31	22	53
	Qinshan Phase II NPP Units 1 and 2	57	19	76
	Qinshan Phase II NPP Units 3 and 4	63	25	88
	Qinshan Phase III NPP Units 1 and 2	64	40	104
	Fangjiashan NPP Units 1 and 2	64	26	90
Daya Bay Nuclear Power Operations and Management Co., Ltd.	Daya Bay NPP	75	21	96
	Ling'ao NPP Units 1 and 2	73	26	99
	Ling'ao NPP Units 3 and 4	69	26	95
Jiangsu Nuclear Power Co., Ltd.	Tianwan NPP Units 1 and 2	89	66	155
	Tianwan NPP Units 3 and 4	65	53	118
	Tianwan NPP Units 5 and 6	31	64	95
Fujian Ningde Nuclear Power Co., Ltd.	Ningde NPP Units 1 and 2	68	46	114
	Ningde NPP Units 3 and 4	57	43	100
Liaoning Hongyanhe Nuclear Power Co., Ltd.	Hongyanhe NPP Units 1 and 2	73	27	100
	Hongyanhe NPP Units 3 and 4	64	28	92
	Hongyanhe NPP Units 5 and 6	36	35	71
Yangjiang Nuclear Power Co., Ltd.	Yangjiang NPP Units 1 and 2	50	21	71
	Yangjiang NPP Units 3 and 4	57	23	80
	Yangjiang NPP Units 5 and 6	50	15	65

continued

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
Fujian Fuqing Nuclear Power Co., Ltd.	Fuqing NPP Units 1 and 2	49	33	82
	Fuqing NPP Units 3 and 4	54	33	87
	Fuqing NPP Units 5 and 6	39	50	89
Guangxi Fangchenggang Nuclear Power Co., Ltd.	Fangchenggang NPP Units 1 and 2	48	42	90
	Fangchenggang NPP Units 3 and 4	49	55	104
Hainan Nuclear Power Co., Ltd.	Changjiang NPP Units 1 and 2	73	39	112
Sanmen Nuclear Power Co., Ltd.	Sanmen NPP Units 1 and 2	69	31	100
Shandong Nuclear Power Company Ltd.	Haiyang NPP Units 1 and 2	63	62	125
Taishan Nuclear Power Joint Venture Co., Ltd.	Taishan NPP Units 1 and 2	71	34	105
Huaneng Shandong Shidao Bay Nuclear Power Co., Ltd.	Units 1 and 2 of HTGR Demonstration Project	25	70	95
State Nuclear Power Demonstration Plant Co., Ltd.	Units 1 and 2 of CAP1400 Demonstration Project	0	104	104
Total		1676	1179	2855

Table 88. Statistics on Civil Research Reactor Operator Licenses

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
China Institute of Atomic Energy	49-2 Swimming Pool Reactor (49-2 SPR)	11	8	19
	Nuclear Criticality Safety Test Facility in Pilot Plant	9	19	28
	Prototype Miniature Neutron Source Reactor (PMNSR)	3	6	9
	China Experimental Fast Reactor (CEFR)	23	11	34
	China Advanced Research Reactor (CARR)	9	13	22
	Zero-power Assembly of MNSR	3	6	9

continued

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
Nuclear Power Institute of China	High Flux Engineering Test Reactor (HFETR)	26	18	44
	Minjiang Test Reactor (MJTR)	7	13	20
	China Pulsed Reactor (CPR)	6	1	7
	Critical Assembly of High Flux Engineering Test Reactor (HFETR)	4	5	9
	18-5 Critical Assembly	7	2	9
Institute of Nuclear and New Energy Technology, Tsinghua University	5 MW Low Temperature Nuclear Heating Test Reactor (NHR-5)	14	10	24
	10 MW High Temperature Gas-Cooled Test Reactor (HTR-10)	20	5	25
Beijing Capture Tech Co., Ltd.	In-Hospital Neutron Irradiator (IHNI)	0	2	2
Shanghai Institute of Applied Physics, Chinese Academy of Sciences	2MWt Liquid Fuel Thorium Molten Salt Reactor (TMSR-LF)	8	7	15
Total		150	126	276

Table 89. Statistics on Reprocessing Facility Operator Licenses

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
The 404 Company Limited., China National Nuclear Corporation	Reprocessing facility for power reactor spent fuel	9	44	53

Qualification of Civil Nuclear Safety Equipment Non-destructive Testing Personnel

In 2022, NNSA published 2 batches of civil nuclear safety equipment NDT personnel examination plans and organized 5 NDT personnel examination centers authorized to hold 17 examinations, and issued civil nuclear safety equipment NDT personnel qualification certificates in 7 batches (see Table 90), approving a total of 737 persons and 790 items.

As of December 2022, a total of 7,119 persons held 17,062 civil nuclear safety equipment NDT personnel qualification certificates, including 1,118 advanced (Level III) certificates, 12,023 intermediate (Level II) certificates and 3,921 primary (Level I) certificates.

Table 90. Regulatory Approvals for Civil Nuclear Safety Equipment NDT Personnel Qualification in 2022

Date	Document Title
03/04/2022	*Notice on Issuing the First Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*
05/07/2022	*Notice on Issuing the Second Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*
06/17/2022	*Notice on Issuing the Third Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*
08/09/2022	*Notice on Issuing the Fourth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*
09/05/2022	*Notice on Issuing the Fifth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*
10/13/2022	*Notice on Issuing the Sixth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*
11/08/2022	*Notice on Issuing the Seventh Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2022*

Qualification of Civil Nuclear Safety Equipment Welders

In 2022, NNSA issued 2 batches of examination plans for civil nuclear safety equipment welders and authorized 13 civil nuclear safety equipment welder examination centers to hold 35 exams. Seven batches of civil nuclear safety equipment welder qualification certificates were issued, and a total of 2,582 persons and 2,893 certificates were approved (see Table 91). As of December 2022, a total of 4,946 persons held 6,627 civil nuclear safety equipment welding operation qualification certificates.

Table 91. Regulatory Approvals for Civil Nuclear Safety Equipment Welder Qualification in 2022

Date	Document Title
03/04/2022	*Notice on Issuing the First Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*
05/07/2022	*Notice on Issuing the Second Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*
06/17/2022	*Notice on Issuing the Third Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*
08/09/2022	*Notice on Issuing the Fourth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*

continued

Date	Document Title
09/05/2022	*Notice on Issuing the Fifth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*
10/13/2022	*Notice on Issuing the Sixth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*
11/08/2022	*Notice on Issuing the Seventh Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2022*

Qualification of Registered Nuclear Safety Engineers

In 2022, a total of 1,382 applicants applied for the National Unified Examination for Qualification of Registered Nuclear Safety Engineers, 586 applicants took the examinations, and 141 applicants obtained the Registered Nuclear Safety Engineer Qualification. In the whole year, NNSA conducted 4 batches of registration of nuclear safety engineers (see Table 92), and approved 314 applications, including 154 new registrations, 140 renewals, and 20 with changed registered organizations.

As of December 2022, a total of 4,781 applicants nationwide had obtained the certificates of the Registered Nuclear Safety Engineer Qualification, and 1,837 registered nuclear safety engineers were working in 235 organizations in China.

Table 92. Regulatory Approvals for Qualification of Registered Nuclear Safety Engineers in 2022

Date	Document Title
01/24/2022	*Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration, Registration Renewal and Registration Change in 2022 (Batch 1)*
05/13/2022	*Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration, Registration Renewal and Registration Change in 2022 (Batch 2)*
08/11/2022	*Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration, Registration Renewal and Registration Change in 2022 (Batch 3)*
11/11/2022	*Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration, Registration Renewal and Registration Change in 2022 (Batch 4)*

Training for Staff in Charge of Regulatory Inspection on Nuclear and Radiation Safety

As a response to the working demands in the context of the COVID-19 epidemic, NNSA released the *Professional Training Plan of the National Nuclear Safety Administration in 2022*. Following such plan, NNSA carried out 19 trainings, including 16 online and 3 offline. The series of training served 1,707 trainees, and captured many training video materials in 141 subjects.

XVI. International Cooperation

Continue to Promote Multilateral Cooperation

Cooperation with the International Atomic Energy Agency. NNSA actively participated in institutional meetings at all levels of IAEA, and assigned its staff to attend meetings held by the Commission on Safety Standards, the Nuclear Safety Standards Committee, Transport Safety Standards Committee, the Planning Committee of the International Conference on Effective Nuclear and Radiation Regulatory Systems, Steering Committee of the Regulatory Cooperation Forum, etc. NNSA also actively supported the "Nuclear Harmonization and Standardization Initiative (NHSI)" launched by IAEA for SMRs, which helped to amplify China's influence and representation on multilateral platforms.

Cooperation with the OECD Nuclear Energy Agency. NNSA took part in the Multinational Design Evaluation Programme for nuclear power plants. NNSA was an active participant in the work related to Hualong One Task Force, VVER Task Force, EPR Task Force, and Supplier Supervision Task Force. It also attended the meetings and technical seminars of the relevant task forces under NEA Committee on Nuclear Regulatory Activities and the NEA Committee on the Safety of Nuclear Installations.

Figure 29. JIANG Guang, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Facility Safety Regulation, attending the 14th China-Japan-South Korea Senior Officials On-line Meeting on Nuclear Safety Supervision

Continuing to Consolidate Bilateral Cooperation

NNSA promoted cooperation with major nuclear power countries in nuclear safety steadily. NNSA attended the 26th Meeting of the Nuclear Sub-Committee of the Chinese and Russian Prime Ministers' Regular Exchange Committee, the China-France Bilateral Exchange Meeting on Nuclear

Safety, video conference of Task Force V of Agreement on Cooperation Concerning Peaceful Uses of Nuclear Technology between the United States and China, etc.

NNSA made efforts to strengthen cooperation in nuclear safety with the Belt and Road Initiative countries. NNSA communicated with Pakistan Nuclear Regulatory Authority on technical issues related to Hualong One project. It also provided support for the "Seminar on Nuclear Safety Regulation and Technical Capacity for Pakistan", and helped with the training work, thereby enhancing Pakistan's capacity for nuclear safety regulation. It kept communication with the nuclear safety regulatory bodies of Belt and Road Initiative countries that have signed agreements.

NNSA made efforts to consolidate regional cooperation in nuclear safety. It attended the 14th China-Japan-South Korea Senior Officials On-line Meeting on Nuclear Safety Supervision to share the latest progress in nuclear safety, and expressed China's stance on Japan's plan to release nuclear-contaminated water from the damaged Fukushima nuclear plant into the ocean.

XVII. Performance of Obligations under International Conventions

The seventh review meeting of contracting parties to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management

From June 27 to July 8, 2022, the Ministry of Ecology and Environment (National Nuclear Safety Administration) led the Chinese government delegation, comprising representatives from relevant ministries and commissions as well as nuclear power groups, to attend the seventh review meeting of contracting parties to the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management* at the headquarters of the International Atomic Energy Agency (IAEA) in Vienna, successfully completing the seventh review implementation of the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*.

On 30 June, 2022, the Chinese government delegation reported to the review meeting on China's implementation of the Convention.

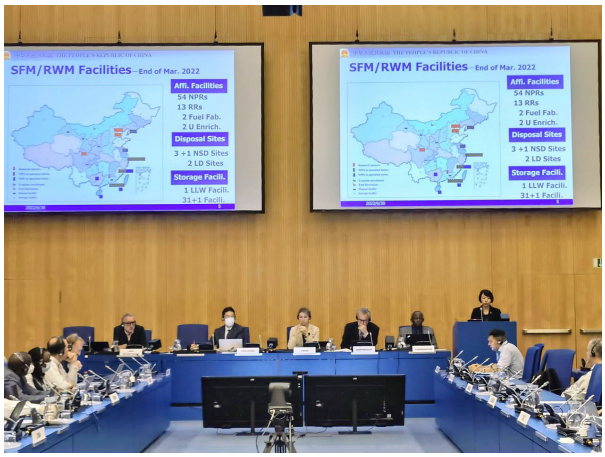


Figure 30. LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Radiation Source Safety Regulation, Delivering the National Report of China at the 7th Review Meeting of Contracting Parties to the Joint Convention

The head of the Chinese delegation, as the reporter, briefed the Country Group on China's response to the reviews and recommendations from the last Conference during the seventh round of Convention implementation, and highlighted China's progress in safety of spent fuel management and safety of radioactive waste management, including the construction of an underground laboratory for geological disposal of high-level radioactive waste, the siting and

establishment of a new near-surface disposal facility, the release of "Nuclear Safety in China", as white paper, the development of a series of standard guidelines for the safety management of radioactive waste, the safety management of spent fuel and the safety management of decommissioning of nuclear facilities, as well as the implementation of radioactive waste management measures across the entire process. The Chinese delegation also addressed questions from other contracting parties during the briefing.

China's implementation of the Convention was highly praised and acknowledged by the other contracting parties. The contracting parties attending the review meeting believed that China, through multi-level assessments for radioactive waste management, had significantly enhanced the management of radioactive waste safety, and has accomplished remarkable results. China had made remarkable progress in six areas, including establishing the world's first cooperation center for geological disposal of high-level radioactive waste, implementing measures to minimize generation and release of radioactive waste in the entire process, improving nuclear safety standards based on relevant international standards prepared by IAEA, promoting disposal for disused radioactive sources, constructing a national centralized disposal facility for nuclear power radioactive waste, and commencing work on an underground laboratory for the geological disposal of high-level radioactive waste. These accomplishments are valuable examples for other countries to follow.

The contracting parties reached an agreement to host the eighth review meeting of contracting parties at the IAEA headquarters in Vienna, Austria, from March 17 to 28, 2025. The Ministry of Ecology and Environment had already commenced preparations as scheduled for the eighth round of implementation.

Implementation of the Convention on Nuclear Safety

The NNSA was actively advancing the preparations for the eighth and ninth joint review meetings of the contracting parties to the *Convention on Nuclear Safety*, and has completed the preparation of China's national report and participated in the task force meetings of the Convention to safeguard China's fundamental interests and fulfill China's responsibilities.

XVIII. Milestones

On January 8, the 2022 National Assembly of China Environmental Culture Promotion Association was held in Beijing. YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the meeting and delivered a speech. China Environmental Culture Promotion Association was officially renamed as China Nuclear Safety and Environmental Culture Promotion Association On September 13.

On January 12, the 2021 Annual Review of Nuclear and Radiation Safety Supervision was held, and YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the meeting and delivered a speech.

On February 11, SUN Jinlong, Secretary of the Leading Party Member Group of MEE, and TIAN Weiyong, Chief Engineer for Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, visited the Eastern China Regional Office of Nuclear and Radiation Safety Inspection to conduct a survey on nuclear and radiation safety regulation.

On February 11, the approval for decommissioning (Phase I) of Tsinghua University's Bulk Shielding Reactor (BSR) was issued.

On February 16, TANG Bo, Deputy Administrator of National Nuclear Safety Administration and the Director General of the Department of Nuclear Power Safety Regulation, attended the 2022 Annual Meeting of the Leading Group of the Domestic Coordination Mechanism for Hualong One Task Force.

On February 25-26, YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, conducted an on-site survey at the Taishan NPP.

On March 16-18, HUANG Runqiu, Minister of Ecology and Environment, YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and

Deputy Administrator of National Nuclear Safety Administration, and LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Radiation Source Safety Regulation, conducted surveys at the South-western China Regional Office of Nuclear and Radiation Safety Inspection, as well as some nuclear facilities in Sichuan.

On March 25, the operation license for Unit 6 of Hongyanhe NPP was issued.

On April 1, the review opinion on siting of Lianjiang NPP units 1 and 2 was issued.

On April 18, SUN Jinlong, Secretary of the Leading Party Member Group of MEE, TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, and TANG Bo, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Power Safety Regulation, conducted an on-site survey at the Zhangzhou NPP.

On May 6, the review opinion on siting of medical isotope test reactor of Nuclear Power Institute of China was issued.

On May 16, YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, took part in a video conference with Rafael Mariano Grossi, the Director General of the International Atomic Energy Agency, by invitation to discuss the “Nuclear Harmonization and Standardization Initiative (NHSI)” for SMRs.

On June 7, SUN Jinlong, Secretary of the Leading Party Member Group of MEE, Kurssiy Mexsut, Head of the Discipline Inspection and Supervision Office of MEE from the Central Commission for Discipline Inspection and the National Supervisory Commission, YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, and TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, conducted an on-site survey at Hongyanhe NPP.

On June 8, The *Fourteenth Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control* was jointly issued by the Ministry of Ecology and Environment and four other ministries and commissions.

On June 10, the *Safety Rules on Commissioning and Operation of Nuclear Power Plants* (NNSA [2022] No.97) was issued.

On June 26, the Construction Permit for Sanmen NPP Units 3 and 4 were issued.

On June 27-July 8, LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Radiation Source Safety Regulation, led a Chinese delegation to

Vienna to attend the seventh review meeting of contracting parties to the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*.

On June 29, the Construction Permits for Haiyang NPP Units 3 and 4 were issued.

On July 3, HUANG Runqiu, Minister of Ecology and Environment, and TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, conducted an on-site survey at Tianwan NPP.

On July 3-6, Kurssiy Mexsut, then Head of the Discipline Inspection and Supervision Office of MEE from the Central Commission for Discipline Inspection and the National Supervisory Commission, and JIANG Guang, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Facility Safety Regulation, conducted an on-site survey at the Northwest China Regional Office of Nuclear and Radiation Safety Inspection and some nuclear facilities in Gansu.

On July 4, HUANG Runqiu, Minister of Ecology and Environment, and TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, conducted an on-site survey at Fangchenggang NPP.

On July 6, the operation license for Longhe near-surface disposal facility was issued.

On August 18, YE Min, the then Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, and LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Radiation Source Safety Regulation, attended the China Isotope & Radiation Industry Summit 2022.

On September 2, the environmental impact report for the superconducting proton linac of the accelerator-driven transmutation research facility of the Institute of Modern Physics, Chinese Academy of Sciences, was approved.

On September 7, the Construction Permits for Lufeng NPP Units 5 and 6 were issued.

On September 25-28, NNSA organized the ecological environment departments in Heilongjiang, Jilin, Liaoning, and Shandong provinces, along with the Nuclear and Radiation Safety Center and Radiation Environment Monitoring Technology Center, to conduct special drills for emergency radiation environment monitoring in border areas of Northeast China.

On September 27, HUANG Runqiu, Minister of Ecology and Environment, TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, and LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Radiation Source Safety

Regulation, conducted a survey at China Institute of Atomic Energy.

In October, DONG Baotong was appointed as Vice Minister and Member of the Leading Party Member Group of MEE and Administrator of National Nuclear Safety Administration.

On October 13, the change of operation license for Feifengshan low- and intermediate-level radioactive solid waste disposal facility was approved, and the Stage II of Phase I of Feifengshan low- and intermediate-level radioactive solid waste disposal facility was officially put into operation.

On October 31, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, along with JIANG Guang, Deputy Administrator of the National Nuclear Safety Administration and Director General of the Department of Nuclear Facility Safety Regulation, conducted a survey at the Northern China Regional Office of Nuclear and Radiation Safety Inspection.

In November, the State Commission Office of Public Sectors Reform approved to increase a total staff of 102 for regional offices of nuclear and radiation safety inspection.

On November 1, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the 23rd Pacific Basin Nuclear Conference (PBNC 2022) and delivered a speech.

On November 5-6, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, and JIANG Guang, Deputy Administrator of the National Nuclear Safety Administration and Director General of the Department of Nuclear Facility Safety Regulation, conducted surveys at the Eastern China Regional Office of Nuclear and Radiation Safety Inspection, Shanghai Nuclear Engineering Research & Design Institute Co., Ltd. and Shanghai Electric Nuclear Power Group Co., Ltd.

On November 6-10, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, and TANG Bo, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Power Safety Regulation, conducted on-site surveys at Qinshan Nuclear Power Base, Sanmen NPP and San'ao NPP.

On November 14, the review opinion on siting of Expansion Phase I Project of Shidao Bay NPP was issued.

On November 24, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, conducted a survey at the

Northeast China Regional Office of Nuclear and Radiation Safety Inspection.

On November 25, the operation license for Fangchenggang NPP Unit 3 was issued.

On November 25, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, conducted a survey at Hongyanhe NPP, nuclear equipment manufacturer, and the like.

On November 29, the review opinion on the Siting of Taipingling NPP Units 3 and 4 was issued.

On December 3-5, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, conducted an on-site survey at the HTGR Demonstration Project and CAP1400 demonstration project.

On December 9, JIANG Guang, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Facility Safety Regulation, attended the 14th China-Japan-South Korea Senior Officials On-line Meeting on Nuclear Safety Supervision.

In December, the Three-year Action Plan of investigating latent nuclear and radiation risks was accomplished.


甘肃省环境
甘肃省生态

National Nuclear Safety Administration

Address：No. 12, East Chang 'an Street, Dongcheng District, Beijing　　Postcode：100006
Tel：（010）65646114　　Fax：（010）65646901

Northern Regional Office of the Nuclear and Radiation Safety Inspection
Address： No. 54, South Honglian Village, Haidian District, Beijing　　**Telephone：**（010）82212600

Eastern Regional Office of the Nuclear and Radiation Safety Inspection
Address： Floor 5, Building 1, No. 396, Guilin Road, Xuhui District, Shanghai　　**Telephone：**（021）60740666

Southern Regional Office of the Nuclear and Radiation Safety Inspection
Address： Floor 21 C, Olympic Building, Shangbao Road, Futian District, Shenzhen　　**Telephone：**（0755）83521248

Southwest Regional Office of the Nuclear and Radiation Safety Inspection
Address： No. 1308, Section 1, Chenglong Avenue, Jinjiang District, Chengdu　　**Telephone：**（028）82337600

Northwest Regional Office of the Nuclear and Radiation Safety Inspection
Address： Floor 5, Environmental Protection Technology Building, No. 225, Yan'er Bay, Lanzhou　　**Telephone：**（0931）8682816

Northeast Regional Office of the Nuclear and Radiation Safety Inspection
Address： No. 127, Nanshan Road, Zhongshan District, Dalian　　**Telephone：**（0411）82697501

Nuclear and Radiation Safety Center
Address： No. 9, East Zhixing Road, Changyang Town, Fangshan District, Beijing　　**Telephone：**（010）82205555

Radiation Environment Monitoring Technology Center
Address： No. 306, Wenyi Road, Hangzhou　　**Telephone：**（0571）28869209

National Marine Environmental Monitoring Center
Address： No.42 Linghe Street, Shahekou District, Dalian　　**Telephone：**（0411）84783268

China Nuclear Safety and Environmental Culture Promotion Association
Address： No.54 South Honglian Village, Haidian District, Beijing　　**Telephone：**（010）82200099