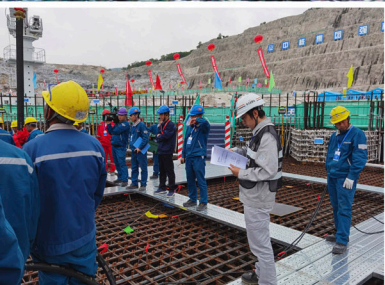




**2021 Annual Report**  
**National Nuclear Safety Administration**  
**The People's Republic of China**









# Message from the Administrator

The year 2021 ushered in the “14<sup>th</sup> Five-Year Plan” period (2021-2025) and witnessed our continuous effort for nuclear and radiation safety regulation. Over the past year, we resolutely implemented the decisions and plans of the CPC Central Committee. Under the strong leadership of the Leading Party Members Group of the Ministry of Ecology and Environment (MEE), we carried out in-depth learning and education of the Party’s history, improved the regulatory system, enhanced the regulation capabilities, and strictly strengthened regulation according to law to prevent and control safety risks. All the efforts have achieved remarkable results, effectively ensuring nuclear and radiation safety of China.

**First, we resolutely implemented and effected the decisions and plans of the CPC Central Committee.** We made efforts to deal with the issue on radioactivity-contaminated water from Fukushima, Japan. We supervised licensees to properly handle the fuel rod failure of Taishan NPP Unit 1.



We earnestly eliminated the potential safety risks and promoted the decommissioning of obsolescent nuclear facilities. We effectively promoted the construction of key radioactive waste disposal projects and completed the project approval ahead of schedule.

**Second, we strictly strengthened regulation according to law to effectively prevent and control safety risks.** We approved the renewal of the operation license of Qinshan NPP Unit 1, the first nuclear power unit in China, and completed the review, regulation and document issuance regarding the siting for 2 units, the construction licenses for 7 units and the operation licenses for 4 units. We strengthened the regulation of newly-designed nuclear power units, ensured the operational safety of units newly put into operation and the construction quality of newly-built projects, and conscientiously conducted nuclear safety regulation for research reactors. We enhanced experience feedback and strengthened the handling

of important and common problems. We completely eliminated the potential safety hazards of legacy radioactive wastes in Shenxiandong (located in Tonglu County, Zhejiang Province), deepened the reform to “streamline administration and delegate power, improve regulation, and upgrade services”, optimized the regulation of nuclear safety equipment, qualification management of special technicians for nuclear safety and the assessment mode for radiation safety training, and seriously investigated into and dealt with violations of laws and regulations.

**Third, we continuously improved the regulatory system and capabilities to consolidate the basic guarantee.** We effectively implemented the national nuclear safety coordination mechanism, advanced the formulation of the “14<sup>th</sup> Five-Year Plan” for Nuclear Safety and the final evaluation of the “13<sup>th</sup> Five-Year Plan” for Nuclear Safety in an orderly manner. We set up the National Technical Committee of Nuclear Safety Standardization, advanced the revision of the *Regulations on the Safety and Protection of Radioisotopes and Radiation-emitting Devices*, demonstrated the revised *Regulation on the Supervision and Management of Civil Nuclear Safety Equipment*, completed the ten-year evaluation of the *Regulation on the Administration of Transport Safety of Radioactive Materials*, and formulated/ revised 3 departmental rules, 20 nuclear safety guides, and 19 nuclear safety standards. We

studied the improvement of the licensing mode by issuing license to group companies and the regulation methods of equipment related to civil nuclear facilities. We continued the capacity building for the National Nuclear and Radiation Safety Technology R&D Base to strengthen technical support.

**Fourth, we strengthened public communication and international cooperation on nuclear safety.** We carried out nuclear safety publicity activities during “April 15” National Security Education Day, and took the lead in compiling and publishing the *Q&As on National Nuclear Safety* in various fields of national security. We made preparations for the review conference of the *Convention on Nuclear Safety*, the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management*, deeply involved in MDEP-related activities, strengthened cooperation with IAEA, enhanced exchanges with Japan, South Korea and France etc., and constructively participated in global nuclear safety governance.

By the end of 2021, good safety records had been maintained for 53 operating nuclear power units, 18 in-service civil research reactors (including critical assemblies), 19 civil nuclear fuel cycle facilities and 3 low-level solid waste disposal sites in the Chinese mainland. The construction quality of 18 nuclear power units and 1 under-construction



research reactor was generally well controlled. The safety of 156,000 radioactive sources and 229,000 sets of radiation-emitting devices were under control, and no significant radiation accidents occurred. The annual incidence rate from radioactive sources remained below 1/10,000. On behalf of the National Nuclear Safety Administration (NNSA), I would like to express my heartfelt gratitude to all colleagues who contributed to nuclear and radiation safety and to friends from all walks of life who cared about and supported nuclear and radiation safety.

The year 2022 is of special importance when China embarks on a new journey towards the Second Centenary Goal of building China into a modern socialist country in all aspects. It also marks the 20<sup>th</sup> National Congress of the Communist Party of China and a key year for the implementation of the 14<sup>th</sup> Five-Year Plan (2021-2025). The nuclear and radiation safety regulatory system should constantly improve its political awareness, adhere to the system approach, uphold making innovations on the basis of tradition, make overall plans for development and safety, effectively improve quality and efficiency, and carry out nuclear and radiation safety regulation in a powerful and orderly manner.

**First, improve the political awareness and thoroughly understand the holistic approach to national security.** We should thoroughly keep in alignment with the spirit of important directions and instructions given

by the leaders of the CPC Central Committee on nuclear and radiation safety regulation; accurately understand and grasp the principal contradiction and core tasks in current nuclear and radiation safety regulation; judge upon the overall, long-term and general situation and make due efforts in strategies, plans and their implementation; and firmly support the establishment of both Comrade Xi Jinping's core position on the Party Central Committee and in the Party as a whole and the guiding role of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, and firmly uphold Comrade Xi Jinping's core position on the Party Central Committee and in the Party as a whole and uphold the Central Committee's authority and its centralized, unified leadership.

**Second, uphold making innovations on the basis of tradition and keep to the right direction of nuclear and radiation safety regulation.** We should earnestly follow the rational, coordinated and balanced nuclear safety strategy as a fundamental, and practice the rigorous and meticulous work requirements; plan systematically and keep to the right direction; unwaveringly adhere to the testified and effective regulation experience, and take the first step soundly and get through the last step on the basis of tradition; and make greater efforts in building the platform, optimizing the system, carrying forward the style of work and creating a favorable atmosphere.



**Third, focus on improving quality and efficiency, and launch the “quality and efficiency improvement action” for nuclear and radiation safety regulation in full swing.**

We should strengthen awareness of the bottom line, implement regulatory responsibilities, and earnestly promote the construction of a risk-informed regulatory system; strengthen safety regulation of the first and new reactors, and conduct daily regulation to ensure the safe operation and construction quality of nuclear power plants, research reactors, nuclear fuel cycle facilities and radioactive waste disposal facilities; run the experience feedback system effectively and deepen the experience feedback work continuously; strengthen emergency monitoring to effectively prevent and control risks; promote manpower building for nuclear safety regulation, and carry out staff training by grade and category.

With the long river of history running constantly, the answers to the test of the times are ever in renewal. In 2022, we will rally more

closely around the CPC Central Committee with Comrade Xi Jinping at its core, to fully implement Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era and on ecological civilization, China’s overall national security framework and China’s nuclear safety strategy. We will stick to the original aspiration, shoulder the mission, be prepared for danger in times of peace, make innovations on the basis of tradition, and vigorously improve the efficiency of nuclear and radiation safety regulation to greet the successful convention of the 20<sup>th</sup> National Congress of the Communist Party of China with excellent achievements!

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



YE Min

June 2, 2022



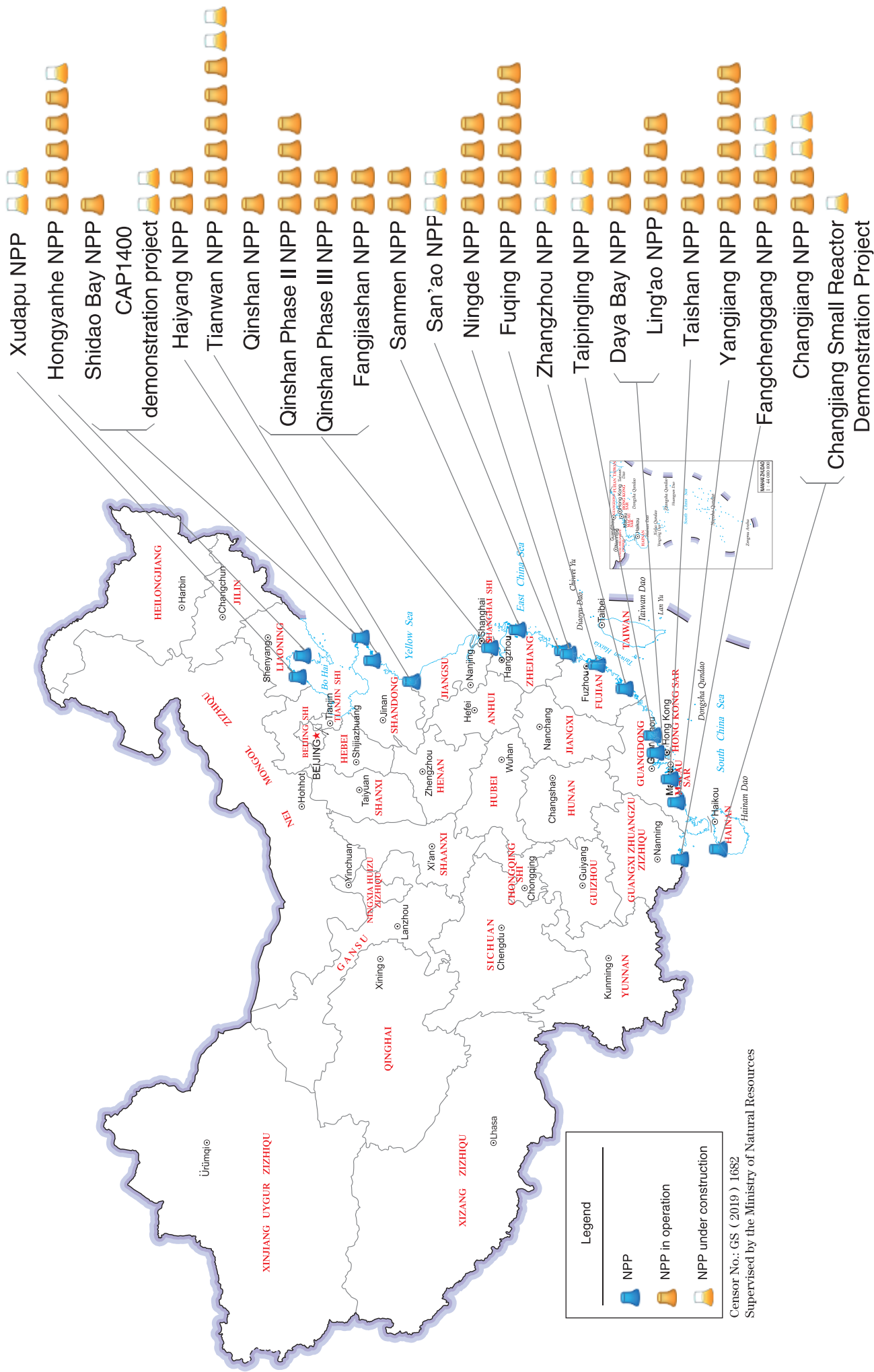


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*A Map of Nuclear Power Plants in Chinese Mainland (as of December 31, 2021)*

# I. Introduction

In 2021, China's civil nuclear facilities continued to perform well in terms of operation safety and construction quality, and no incident or accident 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, and 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 2021. 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

We organized special review of the *Law of the People's Republic of China on the Prevention*

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\* 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.

*and Control of Radioactive Pollution*, advanced the legislation research and demonstration for the prevention and control of electromagnetic radiation pollution, and cooperated with the legislation for the *Atomic Energy Law*. We worked on the revision of the *Regulations on the Safety and Protection of Radioisotopes and Radiation-emitting Devices*, which was formally included into the legislative plan of the State Council for 2021. We carried out the revision demonstration of the *Regulation on the Supervision and Management of Civil Nuclear Safety Equipment*. We completed the ten-year evaluation of the *Regulation on the Administration of Transport Safety of Radioactive Materials*. 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.

## Capacity Building

We continued the capacity building of the National Nuclear and Radiation Safety Technology R&D Base. The National Key Laboratory for Simulation Analysis and



Verification in Nuclear and Radiation Safety Review for Environmental Protection have passed the acceptance; construction of the experimental verification platforms were commenced successively, including the “Multi-purpose Test-bed for Comprehensive Safety Verification of Small Water Reactors” and “Laboratory for Nuclear Power Material Corrosion and Protective Performance Verification”, and a national platform was built for innovation and engineering application of radioactive pollution prevention and control technologies. We accelerated the construction of the “Belt and Road” Green Development International Exchange Center .

We carried out special planning researches in the field of nuclear safety scientific research, for example, collating information on deployment and capital investment of scientific R&D projects in the nuclear field, making surveys of the current scientific research status and demands about colleges and universities, scientific research institutions and nuclear safety technical support organizations, and forming the ideas for scientific research planning on nuclear and radiation safety. We strengthened the interim and ex-post management of nuclear safety technical support projects, improved the indicator system, and carried out performance evaluation.

## Strengthening Regulation

We further improved the technical documents

for nuclear power safety regulation, and issued the *Regulatory Inspection Program for 2MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)*, the *Safety Review Principles for VVER-1200 Project* and the *Procedure for Safety Performance Indicators Verification of Nuclear Power Plants*. We continued to optimize the format and content of the documents required for nuclear power plants to get the license, and issued the *Format and Content of the Commissioning Program for Nuclear Power Plants* and the *Format and Content of the Report for Commissioning before Loading and Feeding of Nuclear Power Plants*. We actively advanced the risk-informed regulation mode, continued to carry out pilot application of risk-informed regulation, and promoted and guided nuclear power plants to establish risk management systems and develop risk monitoring tools. We made every endeavor in the regulation of newly-built research reactor projects, and organized technical review for the application for renewal of operation licenses for 5 research reactors, and for the application for operation licenses for advanced research reactors in China. We enhanced reprocessing regulation, and coordinated to ensure the success of a number of special transportation tasks. We facilitated the decommissioning of China’s first heavy water research reactor and the construction of the first nuclear power waste disposal site. We strengthened radiation safety regulation in the highly risky nuclear technology utilization,

carried out special regulation over electron irradiation accelerators, and pushed forward “radiographic testing” and “irradiation processing” pilots for radiation safety standardization.



**Figure 1.** SUN Jinlong, Secretary of the Leading Party Member Group of MEE, Surveying Daya Bay Nuclear Power Base

## Technical Support

In 2021, the Nuclear and Radiation Safety Center (NSC) undertook more than 3,700 tasks and 718 review tasks, dispatched a total of 1,300 man-times for on-site regulation and technical support, and prepared 2,400 technical documents, providing comprehensive technical support for national nuclear and radiation safety regulation. We strengthened the technical support system for quality assurance, conducted the nuclear safety review of 18 NPPs under construction in an orderly manner, ensured the safe and stable operation of 53 NPPs in Chinese mainland, and completed the safety review tasks with satisfactory outcome. We thoroughly strengthened research on radiation

risk prevention and control and continuously deepened safety regulation technology R&D to enhance scientific research capabilities, and promoted key technology R&D projects in an orderly manner. We improved the system of regulations, standards, planning research for nuclear and radiation safety. We also accelerated the informatization of nuclear and radiation safety regulation, made efforts in public publicity and communication, and strengthened international cooperation and exchange in nuclear safety.

In 2021, the Radiation Environment Monitoring Technology Center (RMTC) actively provided technical support for nuclear and radiation safety regulation. We drafted 5 standards, including *General Regulation of Quality Assurance for Ionizing Radiation Monitoring*, etc. We prepared the *Implementation Plan for National Radiation Monitoring System and Monitoring Capacity Building during the “14<sup>th</sup> Five-Year Plan” Period*; provided technical review services for nuclear facility supervisory monitoring systems and UHVDC transmission projects; completed technical check of environmental impact assessment reports of more than 30 electromagnetic construction projects; and ensured the construction of supervisory monitoring system for San’ao nuclear power project located in Cangnan County, Wenzhou City, Zhejiang Province. We provided special technical guidance for the member organizations of the National Radiation Environment Monitoring Network,



ensured an over 97% data acquisition rate of the national radiation environment automatic monitoring stations, so that the real-time data and the national radiation environment quality report can be released normally. We applied a new model for assessment of national radiation environment monitoring quality and that of monitoring personnel certification in 2021, and organized technical exchanges among monitoring personnel. We continued to advance the construction of the quality control laboratory to improve our radiation monitoring capacity.

In 2021, China Environmental Culture Promotion Association convened a national assembly of members, by which it further improved the Council and the leading organ, established the “Expert Committee of China Environmental Culture Promotion Association”, “Nuclear Safety Branch of China Environmental Culture Promotion Association” and “Public Communication Branch of China Environmental Culture Promotion Association”, and developed 198 member organizations and 128 Council member organizations. It facilitated the orderly development of group standards on nuclear safety, and issued 8 professional group standards including *Technical Requirement for Configuration Risk Management at Nuclear Power Plants*, etc. to provide technical guidance for work in the industry. It accelerated preparations for founding nuclear safety science and technology awards, and

promoted the commercialization and sharing of outstanding scientific and technological achievements regarding nuclear safety. It completed the project of “Research on Assessment Mechanism of Nuclear Safety Culture”, held 6 seminars on nuclear safety technology and nuclear safety culture, and co-organized “2021 China International Nuclear Power Industry and Equipment Exhibition”. It facilitated the *Green Leaf* magazine in resuming publication and gradually transforming to popularization of nuclear safety culture.

## International Cooperation

We were fully involved in activities related to the Multinational Design Evaluation Programme (MDEP) for nuclear power plants of OECD/NEA, and effectively promoted the work of Hualong-1 working group, and studied the mode for MDEP transition and corresponding countermeasures. We actively participated in relevant meetings of the NEA Committee on Nuclear Regulatory Activities (CNRA) and the NEA Committee on the Safety of Nuclear Installations (CSNI). We participated in the meetings of the Nuclear Safety Standards Committee of the International Atomic Energy Agency (IAEA) and the exchange activities on regulation of small reactors as planned. We continued to maintain contact with the nuclear safety regulatory authorities of relevant countries

and steadily promote bilateral nuclear safety cooperation between China and France, China and Russia, China and Pakistan, China and the UK, and multilateral cooperation among

China, Japan and South Korea. We carried out work related to the ninth implementation of the *Convention on Nuclear Safety* in an orderly manner.



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

### Nuclear Safety Policies

We carried out special studies such as “Review and Prospect of China’s Nuclear Safety Work during the 13<sup>th</sup> Five-Year Plan Period”, “Promoting to Effect the Goal of Carbon Peaking and the Vision of Carbon Neutrality, and Coordinating Nuclear Energy Development and Safety”, and “Challenges and Suggestions on Preventing and Resolving Nuclear-related Social Risks in the New Stage”. We supported the research of national high-end think tank on “Gaming in Global Nuclear Safety Governance Rules”. We took a solid step in promoting the modernization of governance system and governance capacity, focused on legal construction and major events about ecology and environment, and carried out in-depth special research on the inventory of regulatory approvals, the power and responsibility, and the issue on discharge of radioactivity-contaminated water from Fukushima. We adhered to the bottom line thinking, gained a deep understanding of the urgency of nuclear safety risk prevention,

paid close attention to international regulatory experience, and carried out follow-up research.

### Nuclear Safety Plans

We completed the 14<sup>th</sup> *Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control* and the *Report on the Final Evaluation of the Objectives and Tasks of the 13<sup>th</sup> Five-Year Plan in the “13<sup>th</sup> Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control and Long-Range Objectives through the Year 2025”*, which have been adopted by the Standing Committee of MEE.

### Formulation and Revision of Regulations and Standards

We formulated and issued the *Rules on the Qualification of Operators of Civil Nuclear Facilities*, revised and issued departmental rules such as the *Measures for the Administration of Safety Licensing for*

## Polices, Plans, Regulations, Standards, and Nuclear Safety Culture



**Figure 2. HUANG Runqiu, Minister of Ecology and Environment, Surveying the Eastern China Regional Office of Nuclear and Radiation Safety Inspection**

*Radioisotopes and Radiation-emitting Devices and the Measures for the Administration of Transport Safety Licensing for Radioactive Materials*; promoted the formulation and revision of national standards and environmental standards issued by MEE such as the *General Regulation of Quality Assurance for Ionizing Radiation Monitoring*; orderly compiled and revised the 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. *General Requirements of Quality Assurance Program for Effluent and Environmental Radioactivity Monitoring at Nuclear Facilities* (GB 11216-1989) and *Design of Fuel Handling and Storage System for Nuclear Power Plants* (HAD 102/15-2007) were abolished, and *Measurement Methods for Determination of Radon in Environmental Air* (GB/T 14582-1993) was suspended with the implementation of corresponding national radioactive pollution prevention and control standards.

A total of 26 regulations and standards were officially issued throughout the year, including 3 departmental rules, 11 nuclear safety guides, 2 national standards and 10 environmental standards issued by MEE, as shown in Table 1. The National Nuclear Safety Expert Commission reviewed 38 item-time regulations and standards, including 2 item-time departmental rules, 15 item-time nuclear safety guides, 19 item-time standards and 2 item-time technical documents, as shown in Table 2.

**Table 1. List of Nuclear and Radiation Safety Regulations and Standards Issued in 2021**

No.	Name	Category	Code	Document No.	Issue Date
1	<i>Measures for the Administration of Safety Licensing for Radioisotopes and Radiation-emitting Devices</i>	Departmental rules	-	MEE Decree No. 20	January 4, 2021
2	<i>Measures for the Administration of Transport Safety Licensing for Radioactive Materials</i>	Departmental rules	-	MEE Decree No. 20	January 4, 2021
3	<i>Rules on the Qualification of Operators of Civil Nuclear Facilities</i>	Departmental rules	-	MEE Decree No. 22	January 27, 2021

# NNSA 2021 Annual Report

continued

No.	Name	Category	Code	Document No.	Issue Date
4	<i>Safety of the Spent Fuel Reprocessing Facilities</i>	Guides	HAD 301/05-2021	NNSA [2021] No. 87	April 18, 2021
5	<i>Level 1 Probabilistic Safety Analysis of Nuclear Power Plants</i>	Guides	-	NNSA [2021] No. 114	May 19, 2021
6	<i>Deterministic Safety Analysis for Nuclear Power Plants</i>	Guides	-	NNSA [2021] No. 115	May 19, 2021
7	<i>Safety of Low-level Radioactive Solid Waste Storage Facilities</i>	Guides	HAD 401/13-2021	NNSA [2021] No. 119	May 22, 2021
8	<i>Safety of Uranium Conversion and Enrichment Facilities</i>	Guides	HAD 301/06-2021	NNSA [2021] No. 121	May 28, 2021
9	<i>Standard Format and Content of Safety Analysis Report for Front-end Nuclear Fuel Cycle Facilities</i>	Guides	HAD 301/01-2021	NNSA [2021] No. 196	September 2, 2021
10	<i>Power System Design for Nuclear Power Plants</i>	Guides	HAD 102/13-2021	NNSA [2021] No. 219	September 29, 2021
11	<i>Instrumentation and Control System Design for Nuclear Power Plants</i>	Guides	HAD 102/10-2021	NNSA [2021] No. 220	September 29, 2021
12	<i>Decommissioning of Nuclear Technology Application Facilities</i>	Guides	HAD 401/14-2021	NNSA [2021] No. 229	October 13, 2021
13	<i>Human Factor Engineering Design for Nuclear Power Plants</i>	Guides	HAD 102/21-2021	NNSA [2021] No. 276	December 17, 2021
14	<i>Design of Fuel Handling and Storage System for Nuclear Power Plants</i>	Guides	HAD 102/15-2021	NNSA [2021] No. 277	December 17, 2021
15	<i>General Regulation of Quality Assurance for Ionizing Radiation Monitoring</i>	Standards	GB 8999-2021	MEE Bulletin [2021] No. 18	May 7, 2021
16	<i>Load Combination and Design Criteria for Structural Analysis of Spent Fuel Transport Cask</i>	Standards	GB/T 41024-2021	MEE Bulletin [2021] No. 35	November 1, 2021
17	<i>Technical Specification for Radiation Environmental Monitoring</i>	Standards	HJ 61-2021	MEE Bulletin [2021] No. 6	February 24, 2021
18	<i>Technical Specification for the Measurement of Environmental Gamma Radiation Dose Rate</i>	Standards	HJ 1157-2021	MEE Bulletin [2021] No. 10	March 19, 2021
19	<i>Format and Content of the Nuclear and Radiation Safety Analysis Report for Transport of Radioactive Materials</i>	Standards	HJ 1187-2021	MEE Bulletin [2021] No. 37	August 27, 2021
20	<i>Radiation Protection and Safety Requirements for Nuclear Medicine</i>	Standards	HJ 1188-2021	MEE Bulletin [2021] No. 38	September 6, 2021



## Polices, Plans, Regulations, Standards, and Nuclear Safety Culture

continued

No.	Name	Category	Code	Document No.	Issue Date
21	<i>Requirements of Radiation Safety and Protection for Radiotherapy</i>	Standards	HJ 1198-2021	MEE Bulletin [2021] No. 49	October 17, 2021
22	<i>Monitoring Method for Electromagnetic Radiation Environment of Short-wave Broadcasting Transmitting Station</i>	Standards	HJ 1199-2021	MEE Bulletin [2021] No. 52	October 29, 2021
23	<i>Guidelines for the Safe Design of Packaging for Radioactive Material against Brittle Fracture</i>	Standards	HJ 1201-2021	MEE Bulletin [2021] No. 56	November 13, 2021
24	<i>General Technical Requirements for Fabrication of Steel Spent Fuel Transport Cask</i>	Standards	HJ 1202-2021	MEE Bulletin [2021] No. 56	November 13, 2021
25	<i>Measurement Methods for Determination of radon in Environmental Air</i>	Standards	HJ 1212 -2021	MEE Bulletin [2021] No. 63	November 26, 2021
26	<i>Technical Specification to Thermal Discharge Monitoring for Coastal Nuclear Power Plants Based on Satellite Remote Sensing (on trial)</i>	Standards	HJ 1213-2021	MEE Bulletin [2021] No. 64	November 26, 2021

**Table 2. List of Nuclear and Radiation Safety Regulations and Standards Reviewed by the National Nuclear Safety Expert Commission in 2021**

No.	Name	Status	Meeting
Departmental Rules			
1	<i>Measures for Monitoring of Radiation Environment</i>	Preliminary draft for approval	Q1
2	<i>Safety Rules on Commissioning and Operation of Nuclear Power Plants</i>	Preliminary draft for approval	Q3
Nuclear Safety Guides			
1	<i>Instrumentation and Control System Design for Nuclear Power Plants</i>	Preliminary draft for approval	Q1
2	<i>Power System Design for Nuclear Power Plants</i>	Preliminary draft for approval	Q1
3	<i>Standard Format and Content of Safety Analysis Report for Front-end Nuclear Fuel Cycle Facilities</i>	Preliminary draft for approval	Q1
4	<i>Design of Fuel Handling and Storage System for Nuclear Power Plants</i>	Draft for review and preliminary draft for approval	Q1 and Q2
5	<i>Human Factor Engineering Design for Nuclear Power Plants</i>	Draft for review and preliminary draft for approval	Q1 and Q2
6	<i>Operational Experience Feedback for Nuclear Power Plants</i>	Draft for review and preliminary draft for approval	Q2 and Q4

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continued

No.	Name	Status	Meeting
7	<i>Design of Auxiliary and Supporting Systems for Nuclear Power Plants</i>	Draft for review and preliminary draft for approval	Q3 and Q4
8	<i>Management of Radioactive Wastes from Medical, Industrial, Agricultural, Research and Teaching Applications</i>	Preliminary draft for approval	Q3
9	<i>Nuclear Material Accounting for Nuclear Fuel Reprocessing Plants</i>	Draft for review and preliminary draft for approval	Q3 and Q4
10	<i>Level 2 Probabilistic Safety Analysis of Nuclear Power Plants</i>	Draft for review	The 7th thematic meeting
Standards			
1	<i>Format and Content of the Nuclear and Radiation Safety Analysis Report for Transport of Radioactive Materials</i>	Preliminary draft for approval	Q1
2	<i>Requirements of Radiation Safety and Protection for Radiotherapy</i>	Preliminary draft for approval	Q1
3	<i>Monitoring Method for Electromagnetic Radiation Environment of Short-wave Broadcasting Transmitting Station</i>	Draft for review and preliminary draft for approval	Q1 and Q2
4	<i>Measurement Methods for Determination of radon in Environmental Air</i>	Draft for review and preliminary draft for approval	Q2 and Q3
5	<i>Technical Specification to Thermal Discharge Monitoring for Coastal Nuclear Power Plants Based on Satellite Remote Sensing</i>	Draft for review and preliminary draft for approval	Q2 and Q3
6	<i>Uranium Hexafluoride Transport Cask</i>	Draft for review and preliminary draft for approval	Q2 and Q3
7	<i>General Technical Requirements for Fabrication of Steel Spent Fuel Transport Cask</i>	Draft for review and preliminary draft for approval	Q2 and Q3
8	<i>Guidelines for the Safe Design of Packaging for Radioactive Material against Brittle Fracture</i>	Draft for review and preliminary draft for approval	Q2 and Q3
9	<i>Radiation Safety and Protection Requirements for Radioactive Logging</i>	Preliminary draft for approval	Q3
10	<i>Technical Requirements for Radiation Safety Management of Radioactive Wastes from the Mining and Milling of Uranium Ores</i>	Draft for review	Q3
11	<i>Technical Specifications for Environmental Protection in Uranium Mining or Milling Project for Check and Accept of Completed Project</i>	Draft for review	Q3
12	<i>Technical Specifications for Environmental Protection in Decommissioning Project of Uranium Mining or Milling for Check and Accept of Completed Project</i>	Draft for review	Q3

## Polices, Plans, Regulations, Standards, and Nuclear Safety Culture

No.	Name	Status	Meeting
13	<i>Technical Requirements for Radiation Safety Management of Radioactive Wastes from the Mining and Milling of Uranium Ores</i>	Preliminary draft for approval	Q4
Technical Documents			
1	<i>Safety Assessment Method for Newly Built Nuclear Power Plants Against Malicious Impact of Commercial Aircrafts</i>	Draft for review	Q3
2	<i>Technical Policy for Safety of Nuclear Power Plants Against Malicious Impact of Commercial Aircrafts</i>	Draft for review	Q3

### Preparation for Establishment of National Technical Committee of Nuclear Safety Standardization

The National Technical Committee of Nuclear Safety Standardization was founded in 2021. It guided the formulation of the *Constitution of the National Technical Committee of Nuclear Safety Standardization* and the *Working Rules of the Secretariat of National Technical Committee of Nuclear Safety Standardization* and promoted project approval for nuclear safety standards.

### Fostering Nuclear Safety Culture

Guided by the rational, coordinated and balanced nuclear safety concept, we consolidated the effectiveness in fostering nuclear safety culture, searched for the weakness, and put forward countermeasures and suggestions to promote the work. We

strengthened nuclear safety culture within regulatory agencies by organizing special training classes on nuclear safety culture for nuclear and radiation safety regulatory departments and organizations; and we made research on the inspection of nuclear safety culture in regional offices of nuclear and radiation safety, and enhanced nuclear safety culture in the front line of regulation. We continued to further strengthen nuclear safety culture of the industry, transform nuclear safety responsibilities into conscious actions of the employees, organized research on “Assessment Mechanism of Nuclear Safety Culture” and “Long-effect Mechanism of Nuclear Safety Culture”, prepared guidelines for different activities, summarized and popularized good practices in the industry, and guided the holding of experience exchange meeting on fostering nuclear safety culture in 2021.



## III. Safety Regulation on Nuclear Power Plants

China had 53 nuclear power units in operation and 18 nuclear power units under construction in 2021. A total of 27 operational events and 8 construction events were reported by the operating organizations of nuclear power plants, 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 the nuclear power plants remained intact throughout the year.

In 2021, the review opinions on siting for Lufeng NPP Units 5 and 6 in Guangdong were issued; the construction licenses for Changjiang NPP Units 3 and 4 in Hainan, Tianwan NPP Units 7 and 8 in Jiangsu, Changjiang multipurpose small modular reactor science and technology demonstration project in Hainan, Xudapu NPP Units 3 and 4 in Liaoning were issued; the operation licenses of Tianwan NPP Unit 6, Hongyanhe NPP Unit 5, the high-temperature gas-cooled



*Figure 3. 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 at the Ministry of Ecology and Environment, Surveying at the Northern China Regional Office of Nuclear and Radiation Safety Inspection*

reactor (HTGR) demonstration project at Shidao Bay NPP, and Fuqing NPP Unit 6 were issued. In 2021, the renewal of the operation license of Qinshan NPP Unit 1 was approved.

The operation data of the nuclear power plants in China in 2021 are shown in Table 3.

## Safety Regulation on Nuclear Power Plants

**Table 3. Operation Data of Nuclear Power Plants in China in 2021**

NPP Name	Nuclear Electricity (TWeh)	Unit	Unified Unit No.	Rated Power (MWe)	Nuclear Electricity by Unit (TWeh)	Load Factor (%)	Capacity Factor (%)
Qinshan	2.7449	1	CN01	330	2.7449	94.95	90.72
Qinshan Phase II	21.4281	1	CN04	650	5.3413	93.80	92.15
		2	CN05	650	5.7722	101.37	99.91
		3	CN14	660	5.1060	88.31	88.18
		4	CN15	660	5.2086	90.09	89.13
Qinshan Phase III	11.5714	1	CN08	728	5.4874	86.05	89.52
		2	CN09	728	6.0840	95.40	98.61
Fangjiashan	17.5489	1	CN24	1,089	9.4308	98.86	99.87
		2	CN25	1,089	8.1181	85.10	88.14
Daya Bay	16.467	1	CN02	984	7.759	90.01	87.89
		2	CN03	984	8.708	101.02	99.98
Ling'ao	31.867	1	CN06	990	7.763	89.52	90.94
		2	CN07	990	8.502	98.03	99.23
		3	CN12	1,086	7.769	81.66	83.8
		4	CN13	1,086	7.833	82.34	84.34
Tianwan	48.219	1	CN10	1,060	8.1294	87.55	90.13
		2	CN11	1,060	8.5593	92.18	93.50
		3	CN45	1,126	8.5892	87.08	93.38
		4	CN46	1,126	9.2997	94.28	95.87
		5	CN53	1,118	8.0481	82.18	85.95
		6	CN54	1,118	5.5933	98.29	99.99
Hongyanhe	39.624	1	CN16	1,119	9.565	97.59	99.99
		2	CN17	1,119	8.712	88.89	91.26
		3	CN26	1,119	8.460	86.32	88.16
		4	CN27	1,119	8.859	90.39	92.90
		5	CN49	1,119	4.028	97.99	99.97
Ningde	35.2944	1	CN18	1,089	8.5915	90.06	92.56
		2	CN19	1,089	8.5643	89.78	90.70
		3	CN34	1,089	8.6394	90.56	95.06
		4	CN35	1,089	9.4991	99.58	99.99

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continued

NPP Name	Nuclear Electricity (TWeh)	Unit	Unified Unit No.	Rated Power (MWe)	Nuclear Electricity by Unit (TWeh)	Load Factor (%)	Capacity Factor (%)
Fuqing	41.868	1	CN20	1,089	8.677	90.96	92.54
		2	CN21	1,089	8.148	85.42	88.15
		3	CN42	1,089	7.725	80.98	90.99
		4	CN43	1,089	9.025	94.61	100.00
		5	CN51	1,161	8.293	88.31	92.18
Yangjiang	52.328	1	CN22	1,086	8.420	88.51	88.72
		2	CN23	1,086	9.329	98.07	99.97
		3	CN40	1,086	8.314	87.39	93.32
		4	CN41	1,086	8.481	89.15	89.41
		5	CN47	1,086	8.716	91.62	94.40
		6	CN48	1,086	9.067	95.31	98.02
Taishan	19.75	1	CN32	1,750	8.13	53.03	55.79
		2	CN33	1,750	11.62	75.80	78.96
Changjiang	9.763	1	CN36	650	4.828	84.79	92.71
		2	CN37	650	4.935	86.66	92.01
Fangchenggang	17.05	1	CN38	1,086	8.16	91.26	92.69
		2	CN39	1,086	8.89	99.27	99.99
Sanmen	19.981	1	CN28	1,251	10.130	92.436	93.939
		2	CN29	1,251	9.851	89.888	91.538
Haiyang	19.707	1	CN30	1,253	9.771	89.68	93.18
		2	CN31	1,253	9.936	90.71	93.48
Shidao Bay	0.00252	HTGR	CN44	211	0.00252	NA	NA

Note: As of the end of December 2021, Fuqing NPP Unit 6 was at commissioning stage after the initial loading, and there is no relevant operation data; Shidao Bay NPP had not been put into commercial operation, so the unit capacity factor and load factor are inapplicable for the time being.

## Qinshan NPP

In 2021, 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 20<sup>th</sup> refueling outage of Unit 1 was completed on February 2, 2021.

The nuclear safety regulatory approvals for Qinshan NPP in 2021 are shown in Table



## Safety Regulation on Nuclear Power Plants

4 and the regulatory inspection activities in Table 5. The occupational radiation doses at Qinshan NPP are shown in Table 6.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,759 man-days for inspection

of Qinshan Nuclear Power Base (including Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP), including 55 routine inspections. A total of 171 findings were identified and 28 regulatory requirements were imposed.

**Table 4. Nuclear Safety Regulatory Approvals for Qinshan NPP in 2021**

Date	Document No.	Document Title
01/29/2021	NNSA [2021] No. 24	<i>Notice on Approving Weld Inspection Inaccessibility of Some Nuclear Grades 1 and 2 Tube Sockets of Qinshan NPP Unit 1 and Substitution of Hydrostatic Test</i>
05/19/2021	NNSA [2021] No. 113	<i>Notice on Approving the “Maintenance Program for Qinshan NPP Unit 1”</i>
07/21/2021	NNSA [2021] No. 155	<i>Notice on Approving the “Operation Quality Assurance Programs for Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP”</i>
07/30/2021	NNSA [2021] No. 167	<i>Notice on Approving Temporary Operation Extension of Qinshan NPP Unit 1</i>
09/03/2021	NNSA [2021] No. 198	<i>Notice on Approving Renewal of the Operation License of Qinshan NPP Unit 1</i>
09/05/2021	NNSA [2021] No. 201	<i>Notice on Approving the Modification of Water and Steam Sources in the Information Center of Qinshan NPP</i>
11/14/2021	NNSA [2021] No. 260	<i>Notice on Approving the Adjustment of the Technical Scheme for Protected Area Perimeter Intrusion Alarm System for Qinshan NPP Unit 1</i>
11/20/2021	NNSA [2021] No. 267	<i>Notice on Approving the Substitution of Hydrostatic Test with Weld Leakage Test for Some Nuclear Grades 2 and 3 Tube Sockets of Qinshan NPP Unit 1</i>

**Table 5. Regulatory Inspection Activity at Qinshan NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
05/25/2021	Comprehensive inspection before renewing the operation license of Qinshan Unit 1	Commitments for safety evaluation of renewal of operation license, and the results of engineering modification; preparation and implementation of final safety analysis report and technical specifications; continuous improvement of weaknesses in previous periodic safety reviews; implementation of the conditions required by the operation license; implementation of recent nuclear safety management requirements.

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

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**Table 6. Occupational Radiation Doses at Qinshan NPP in 2021**

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	0.165	4.199	0.386	0.141

## Qinshan Phase II NPP

In 2021, 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 8<sup>th</sup> refueling outage of Unit 4 was completed on February 22, 2021, the 16<sup>th</sup> refueling outage of Unit 1 on

May 24, 2021, and the 9<sup>th</sup> refueling outage of Unit 3 on November 25, 2021.

The nuclear safety regulatory approvals for Qinshan Phase II NPP in 2021 are shown in Table 7. Qinshan Phase II NPP reported 2 operational events, as shown in Table 8. The occupational radiation doses at Qinshan Phase II NPP are shown in Table 9.

**Table 7. Nuclear Safety Regulatory Approvals for Qinshan Phase II NPP in 2021**

Date	Document No.	Document Title
01/04/2021	NNSA [2021] No. 1	<i>Notice on Approving the Modification of the Level Setpoint of the Lubricating Oil for Diesel Engine Oil Sump in Qinshan Phase II NPP Units 3 and 4</i>
02/08/2021	NNSA [2021] No. 27	<i>Notice on Approving the Modification of Adding Bypass Injection Pipeline for Partial Load of the Component Cooling Water System in Qinshan Phase II NPP Units 3 and 4</i>
03/18/2021	NNSA [2021] No. 49	<i>Notice on Approving the Modification of Auxiliary Feed-Water System of the Steam Generator in the Technical Specifications for Qinshan Phase II NPP</i>
04/12/2021	NNSA [2021] No. 80	<i>Notice on Approving the Reconstruction of Spent Fuel Storage System in Qinshan Phase II NPP Units 3 and 4</i>
07/21/2021	NNSA [2021] No. 151	<i>Notice on Approving the "In-Service Inspection Programs for Units 1 to 4 of Qinshan Phase II NPP"</i>
07/21/2021	NNSA [2021] No. 155	<i>Notice on Approving the "Operation Quality Assurance Programs for Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP"</i>

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continued

Date	Document No.	Document Title
08/06/2021	NNSA [2021] No. 175	<i>Notice on Approving the Modification of Adding Bypass Injection Pipeline for Partial Load of the Component Cooling Water System in Qinshan Phase II NPP Units 1 and 2</i>
09/08/2021	NNSA [2021] No. 203	<i>Notice on Approving the Addition of “One Point Method” to Calibrate the Ex-core Nuclear Instrumentation in Qinshan Phase II NPP</i>
05/12/2021	NNSA Letter [2021] No. 55	<i>Letter on Approving the First Periodic Safety Review Program for Qinshan Phase II NPP Units 3 and 4</i>
04/12/2021	MEE APP [2021] No. 32	<i>Reply on Environmental Impact Report Forms for the Reconstruction of Spent Fuel Storage System in Qinshan Phase II NPP Units 3 and 4</i>

**Table 8. Operational Events of Qinshan Phase II NPP Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
07/20/2021	The thermometer 1RCP028MT in the hot leg of primary system in Unit 1 was not completely restored within the required time	Equipment	0
11/25/2021	Instrument 4KRT019MA in Unit 4 triggered an alarm and interlocked to start the iodine filtration unit in the air conditioning system for the main control room	Equipment	0

**Table 9. Occupational Radiation Doses at Qinshan Phase II NPP in 2021**

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 to 4	0.231	6.241	1.003	0.047

## Qinshan Phase III NPP

In 2021, 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 11<sup>th</sup> refueling outage of Unit 1 was completed on May 4, 2021.

The nuclear safety regulatory approvals for Qinshan Phase III NPP in 2021 are shown in Table 10. The occupational radiation doses at Qinshan Phase III NPP are shown in Table 11.



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**Table 10. Nuclear Safety Regulatory Approvals for Qinshan Phase III NPP in 2021**

Date	Document No.	Document Title
02/09/2021	NNSA [2021] No. 36	<i>Notice on Approving the Modification of Translocating the Drain Valve on the Pipeline Downstream of the Rupture Disk in the Emergency Core Cooling System in Qinshan Phase III NPP Unit 1</i>
03/28/2021	NNSA [2021] No. 57	<i>Notice on Approving Qinshan Phase III NPP to Cancel the Modification of On-line Dissolved Hydrogen Analyzer for the Moderator</i>
04/02/2021	NNSA [2021] No. 67	<i>Notice on Approving Qinshan Phase III NPP to Add Rhodium Detector Equipment for In-reactor Irradiation Test</i>
04/03/2021	NNSA [2021] No. 68	<i>Notice on Approving the Modification of Changing Radiation Zone in Some Areas of the Nuclear Auxiliary Building in Qinshan Phase III NPP</i>
04/12/2021	NNSA [2021] No. 81	<i>Notice on Approving the Replacement of Sampling Isolation Valve for the Heat Exchanger of Component Cooling Water System in the Sampling System of Qinshan NPP Unit 1</i>
07/21/2021	NNSA [2021] No. 155	<i>Notice on Approving the “Operation Quality Assurance Programs for Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP”</i>
07/21/2021	NNSA [2021] No. 156	<i>Notice on Approving the “In-Service Inspection Program for Qinshan Phase III NPP”</i>

**Table 11. Occupational Radiation Doses at Qinshan Phase III NPP in 2021**

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	0.303	8.175	0.889	0.077

## Fangjiashan NPP

In 2021, 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 5<sup>th</sup> refueling outage of Unit 2 was completed on March 1, 2021.

The nuclear safety regulatory approvals for Fangjiashan NPP in 2021 are shown in Table 12. The occupational radiation doses at Fangjiashan NPP are shown in Table 13.

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**Table 12. Nuclear Safety Regulatory Approvals for Fangjiashan NPP in 2021**

Date	Document No.	Document Title
01/12/2021	NNSA [2021] No. 6	<i>Notice on Rejecting the Irradiation Test with Higher Burnup for Localized Advanced Fuel Assemblies in Fangjiashan NPP Unit 2</i>
07/21/2021	NNSA [2021] No. 154	<i>Notice on Approving the “In-Service Inspection Program for Fangjiashan NPP”</i>
07/21/2021	NNSA [2021] No. 155	<i>Notice on Approving the “Operation Quality Assurance Programs for Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP”</i>

**Table 13. Occupational Radiation Doses at Fangjiashan NPP in 2021**

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	0.288	9.244	0.756	0.043

## Daya Bay NPP

In 2021, the two units of Daya Bay NPP continued to operate stably and safely. The integrity of the three physical barriers was maintained, with the failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment all within the prescribed limits. The 21<sup>st</sup> refueling outage of Unit 1 was completed on April 26, 2021.

The nuclear safety regulatory approvals for Daya Bay NPP in 2021 are shown in Table

14. Daya Bay NPP reported 1 operational event, as shown in Table 15. The occupational radiation doses at Daya Bay NPP are shown in Table 16.

In 2021, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 531 man-days for inspection of Daya Bay Nuclear Power Base (including Daya Bay NPP and Ling’ao NPP), including 8 routine inspections. A total of 159 findings were identified and 41 regulatory requirements were imposed.

**Table 14. Nuclear Safety Regulatory Approvals for Daya Bay NPP in 2021**

Date	Document No.	Document Title
02/24/2021	NNSA [2021] No. 40	<i>Notice on Approving the Overall Upgrading of Chapter 13 in “Final Safety Analysis Reports” for Daya Bay NPP and Ling’ao NPP</i>
04/08/2021	NNSA [2021] No. 79	<i>Notice on Approving Modifications to Some Ranges and Thresholds of the Radiation Monitoring Systems in Daya Bay NPP and Ling’ao NPP</i>

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Date	Document No.	Document Title
08/25/2021	NNSA [2021] No. 187	<i>Notice on Approving the Addition of An Emergency Diesel Generator Set in Daya Bay NPP</i>
10/21/2021	NNSA [2021] No. 239	<i>Notice on Approving the Upgrading of In-service Inspection Programs for Daya Bay NPP and Ling'ao NPP</i>
11/19/2021	NNSA [2021] No. 265	<i>Notice on Approving the Upgrading of Refueling Programs for Daya Bay NPP and Ling'ao NPP</i>
12/17/2021	NNSA [2021] No. 278	<i>Notice on Approving the Revision of Fuel Storage Standards for Emergency and Additional Diesel Generator in Daya Bay and Ling'ao NPP</i>

**Table 15. Operational Event of Daya Bay NPP Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
07/14/2021	Reverse polarity of the motor power wire of Unit 1 leads to B-train exhaust fan in the main ventilation system of the electrical building disabled for a period longer than the maintenance period specified in the <i>Technical Specifications</i>	Human factor	0

**Table 16. Occupational Radiation Doses at Daya Bay NPP in 2021**

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	0.229	11.854	0.642	0.039

## Ling'ao NPP

In 2021, 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 17<sup>th</sup> refueling outage of Unit 1 was completed on March 18, 2021,

the 10<sup>th</sup> refueling outage of Unit 3 on May 27, 2021 and the 9<sup>th</sup> refueling outage of Unit 4 on November 19, 2021.

The nuclear safety regulatory approvals for Ling'ao NPP in 2021 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.

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**Table 17. Nuclear Safety Regulatory Approvals for Ling'ao NPP in 2021**

Date	Document No.	Document Title
04/07/2021	NNSA [2021] No. 75	<i>Notice on Approving the Logic Optimization and Improvement of Steam Turbine Trip State Feedback Signals from Steam Turbine Protection Systems of Ling'ao Units 3 and 4</i>
05/06/2021	NNSA [2021] No. 99	<i>Notice on Approving the Loading and Start-up without Secondary Neutron Source for Ling'ao Units 3 and 4</i>
06/03/2021	NNSA [2021] No. 123	<i>Notice on Approving the Improvement of the Diesel Generators of the Hydraulic Test Pumps for Ling'ao Units 3 and 4</i>
09/17/2021	NNSA [2021] No. 208	<i>Notice on Approving the Improvement of Heat Exchangers for the Component Cooling Water System and Important Service Water Systems of Ling'ao NPP Units 3 and 4</i>
12/24/2021	NNSA [2021] No. 285	<i>Notice on Approving the Flexibility Optimization of Fuel Management in Ling'ao NPP</i>

Note: There are 5 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 2021**

Date of Occurrence	Event	Cause	INES Level
01/19/2021	The fire-fighting foamer in the emergency diesel generator building, which was identified as unqualified upon inspection, cannot be used over the maintenance period specified in the <i>Technical Specifications</i>	Equipment, management	0
03/31/2021	Relays for one train low pressure injection pump of Unit 1 cannot be used over the allowed outage time	Human factor	0

**Table 19. Occupational Radiation Doses at Ling'ao NPP in 2021**

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	0.360	11.854	0.946	0.058
Units 3 and 4	0.552	11.854	1.889	0.121

### Tianwan NPP

In 2021, 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 13<sup>th</sup> refueling outage of Unit 1 was completed on December 6, 2021, the 12<sup>th</sup> refueling outage of Unit 2 on March 29, 2021, the 3<sup>rd</sup> refueling outage of



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Unit 3 on October 22, 2021, the 2<sup>nd</sup> refueling outage of Unit 4 on January 9, 2021, and the 1<sup>st</sup> refueling outage of Unit 5 on October 22, 2021. Unit 6 was put into commercial operation on June 2, 2021. The first concrete date (FCD) for the nuclear island foundation of Unit 7 was May 19, 2021.

The nuclear safety regulatory approvals for Tianwan NPP in 2021 are shown in Table 20 and the regulatory inspection activities in Table 21. Tianwan NPP reported 6 operational events, as shown in Table 22. The occupational radiation doses at Tianwan NPP are shown in Table 23.

In 2021, the Northern China Regional Office of Nuclear and Radiation Safety Inspection assigned 4,230 man-days for inspection of Tianwan NPP, including 13 routine inspections and 2 non-routine inspections. A total of 140 findings were identified and 59 regulatory requirements were imposed.



Figure 4. Construction Site of Tianwan NPP Unit 7



Figure 5. Site Inspection by Inspectors on Maintenance During Tianwan NPP Unit 2 Overhaul

Table 20. Nuclear Safety Regulatory Approvals for Tianwan NPP in 2021

Date	Document No.	Document Title
02/08/2021	NNSA [2021] No. 25	Notice on Approving the “Quality Assurance Programs (at Design and Construction Stages) for Tianwan NPP Units 5 and 6” (Version F3)
02/08/2021	NNSA [2021] No. 30	Notice on Approving the “Operation Quality Assurance Program for Tianwan NPP” (Version A2)
02/09/2021	NNSA [2021] No. 35	Notice on Approving the Addition of Flanges at Both Ends of Containment Penetration of Tianwan NPP Units 3 and 4
04/14/2021	NNSA [2021] No. 82	Notice on Issuing the Operation License for Tianwan NPP Unit 6
05/19/2021	NNSA [2021] No. 112	Notice on Issuing Construction Licenses for Tianwan NPP Units 7 and 8

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continued

Date	Document No.	Document Title
05/19/2021	NNSA [2021] No. 116	<i>Notice on Approving the “Quality Assurance Programs (at Construction Stage) for Tianwan NPP Units 7 and 8” (Version B)</i>
09/12/2021	NNSA [2021] No. 206	<i>Notice on Approving Safety-important Modifications to Refueling Cycle Extension Projects for Tianwan NPP Units 5 and 6</i>
10/10/2021	NNSA [2021] No. 225	<i>Notice on Approving the “Loading and Refueling Program for Tianwan NPP Units 5 and 6” (Version D1)</i>
10/21/2021	NNSA [2021] No. 240	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transportation of (Russia-supplied) Fuel Assemblies from Manzhouli to Tianwan NPP of Jiangsu Nuclear Power Co., Ltd.</i>
10/29/2021	NNSA [2021] No. 245	<i>Notice on Approving the Clearance of Metal Frames in Scrapped Air Filters of Tianwan NPP</i>
11/04/2021	NNSA [2021] No. 251	<i>Notice on Approving the Modifications to Operating Temperature of Borated Water Tanks in Boron Water Storage Systems of Tianwan NPP Units 3 and 4</i>
11/14/2021	NNSA [2021] No. 257	<i>Notice on Approving Safety-important Modifications to Irradiation Testing of Domestic Materials for J6 Fuel Assemblies of Tianwan NPP</i>
12/24/2021	NNSA [2021] No. 282	<i>Notice on Approving Safety-important Modifications to Spent Fuel Dry Storage System of Tianwan NPP</i>
05/19/2021	MEE App [2021] No. 40	<i>Reply on the Environmental Impact Reports for Tianwan NPP Units 7 and 8 (at Construction Stage)</i>
09/12/2021	MEE App [2021] No. 79	<i>Reply on the Environmental Impact Report Forms for Construction of Refueling Cycle Extension Projects in Tianwan NPP Units 5 and 6</i>

**Table 21. Regulatory Inspection Activities at Tianwan NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
02/01/2021	Comprehensive inspection before issuing the operation license for Tianwan 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 the nuclear safety regulatory inspection at construction stage; etc.

continued

Starting Date	Item	Main Contents of the Inspection
05/05/2021	Comprehensive inspection before issuing the construction license for Tianwan NPP Unit 7	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, 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 2021**

Date of Occurrence	Event	Cause	INES Level
03/09/2021	The CD11 signal was triggered by #2 steam generator during the cooling process of Unit 2	Equipment	0
05/12/2021	A reactor trip and turbine shutdown were triggered by high-high level of the steam generator caused by abnormal opening of 6M2GRE004VV	Equipment	0
07/08/2021	5M1KRT018MA (used to monitor the air gamma dose rate in the main control room) gave one or two over-threshold alarms	Others	0
08/27/2021	The emergency filter pipeline of the air conditioning system in main control room was started due to the failure of the interlocked instrument which monitors the air gamma dose rate at the inlet of main control room of Unit 6	Equipment	0
10/19/2021	The reactor was shut down for protection due to AA17 trip signal in Unit 1	Equipment	0
11/04/2021	The 1BBC bus instantaneous switching test failed due to the failure of 1BCA00GS002 linkage closing during such test	Equipment	0

**Table 23. Occupational Radiation Doses at Tianwan NPP in 2021**

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	0.175	3.285	0.673	0.040
Units 3 and 4	0.100	2.170	0.337	0.019
Units 5 and 6	0.144	5.883	0.476	0.035

# Safety Regulation on Nuclear Power Plants

## Hongyanhe NPP

In 2021, Units 1 to 5 of Hongyanhe 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 6<sup>th</sup> refueling outage of Unit 2 was completed on November 19, 2021, the 5<sup>th</sup> refueling outage of Unit 3 on March 10, 2021 and the 4<sup>th</sup> refueling outage of Unit 4 on May 25, 2021. The initial loading of Unit 5 began on May 15, 2021, and the unit was ready for commercial operation since July 31, 2021. The hot functional test of Unit 6 was completed on August 14, 2021.

The nuclear safety regulatory approvals for Hongyanhe NPP in 2021 are shown in Table 24 and the regulatory inspection activities in Table 25. Hongyanhe NPP reported 1



**Figure 6. An Inspector Signing On-site to Release the 50% Rated Power (Thermal) Control Point for Hongyanhe Unit 5**

operational event, as shown in Table 26. The occupational radiation doses at Hongyanhe NPP are shown in Table 27.

In 2021, the Northeast China Regional Office of Nuclear and Radiation Safety Inspection assigned 2,640 man-days for inspection of Hongyanhe NPP, including 9 routine inspections. A total of 139 findings were identified and 47 regulatory requirements were imposed.

**Table 24. Nuclear Safety Regulatory Approvals for Hongyanhe NPP in 2021**

Date	Document No.	Document Title
01/06/2021	NNSA [2021] No. 3	<i>Notice on Approving the “Quality Assurance Program for Hongyanhe NPP (Phase II) in Liaoning at Operation Stage” (Version 1)</i>
03/19/2021	NNSA [2021] No. 52	<i>Notice on Approving the “Loading and Refueling Programs for Hongyanhe NPP Units 5 and 6”</i>
03/19/2021	NNSA [2021] No. 53	<i>Notice on Approving the “Commissioning Programs for Hongyanhe NPP Units 5 and 6” (Version C)</i>
04/16/2021	NNSA [2021] No. 86	<i>Notice on Approving the improvement of Adding Expansion Joints to the Outlet of Diesel Engine Pre-lubrication Pump in 6.6 kV AC Emergency Power Supply System (LHP/LHQ/LHS) of Hongyanhe NPP Units 1 to 4 in Liaoning</i>
06/22/2021	NNSA [2021] No. 132	<i>Notice on Approving the Improvement of Temperature Settings in Preheating Circuit of 6.6 kV AC Emergency Power Supply System in Hongyanhe NPP in Liaoning</i>
07/12/2021	NNSA [2021] No. 143	<i>Notice on Approving the Replacement/Remodeling of Safety Valve Limit Switches for Main Steam System of Hongyanhe NPP Units 1 to 4</i>



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continued

Date	Document No.	Document Title
07/12/2021	NNSA [2021] No. 144	<i>Notice on Approving the Use of "One-Point Method" to Calibrate the Power Range Channel of Nuclear Instrumentation in the Four Units of Hongyanhe NPP (Phase I) in Liaoning</i>
08/25/2021	NNSA [2021] No. 188	<i>Notice on Approving Modifications to Technical Specifications of Hongyanhe NPP Units 1 to 4 in Liaoning</i>
09/22/2021	NNSA [2021] No. 215	<i>Notice on Approving the Replacement of Humidity Switches in the Nuclear Auxiliary Buildings Ventilation System and the Containment Annulus Ventilation System of Hongyanhe NPP Units 1 to 4 in Liaoning</i>
09/22/2021	NNSA [2021] No. 216	<i>Notice on Approving the Application for Optimization and Reconstruction of Low Temperature Alarm Settings and Alarm Logic for Spent Fuel Pool Hall of Hongyanhe NPP Units 1 to 4 in Liaoning</i>
09/22/2021	NNSA [2021] No. 217	<i>Notice on Approving the Reliability Improvement of Turbine Trip Characterizing Signal (C8) of Hongyanhe NPP Units 1 to 4 in Liaoning</i>

**Table 25. Regulatory Inspection Activity at Hongyanhe NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
03/22/2021	Comprehensive nuclear safety inspection before issuing the operation license for Hongyanhe Unit 5	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 licence, operation license application documents and issues identified in the documents review; implementation of regulatory requirements proposed in previous nuclear safety regulatory inspections; 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 2021**

Date of Occurrence	Event	Cause	INES Level
11/25/2021	Misoperations of operators in the main control room during the T2LHQ001 test of Unit 2 led to accidental start-up and loading of emergency diesel engine H2LHP001AP	Human factor	0

**Table 27. Occupational Radiation Doses at Hongyanhe NPP in 2021**

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	0.245	4.066	0.559	0.031
Units 3 and 4	0.219	4.625	0.550	0.032
Unit 5	0.006	0.451	0.009	0.002

## Safety Regulation on Nuclear Power Plants

### Ningde NPP

In 2021, 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 4<sup>th</sup> refueling outage of Unit 3 was completed on January 16, 2021, the 5<sup>th</sup> refueling outage of Unit 2 on March 14, 2021 and the 6<sup>th</sup> refueling outage of Unit 1 on November 03, 2021. Preparations for construction of Units 5 and 6 were underway.

The nuclear safety regulatory approvals for Ningde NPP in 2021 are shown in Table 28. Ningde NPP reported 2 operational events, as shown in Table 29. The occupational radiation doses at Ningde NPP are shown in Table 30.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,322 man-days for inspection of Ningde NPP, including 35 routine inspections. A total of 121 findings were identified and 29 regulatory requirements were imposed.



**Figure 7. An Inspector Performing On-site Witness Regulation on the Single Emergency Drill of Emergency Water Replenishment to the Spent Fuel Pool in PF Improvement of Ningde NPP**

**Table 28. Nuclear Safety Regulatory Approvals for Ningde NPP in 2021**

Date	Document No.	Document Title
01/08/2021	NNSA [2021] No. 4	<i>Notice on Approving the Optimization and Adjustment of Half-year Discharge Test Cycle of Nuclear Island Batteries at Ningde NPP</i>
02/08/2021	NNSA [2021] No. 29	<i>Reply on the Revision and Upgrading of the Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment at Ningde NPP</i>
04/22/2021	NNSA [2021] No. 92	<i>Reply on the Modifications to the Technical Specifications of Ningde NPP</i>
05/12/2021	NNSA [2021] No. 104	<i>Notice on Approving the Modifications to the Alarm Logic for Abnormal Boric Acid Recharge Concentration in the Reactor Boron and Water Make-up System of Ningde NPP Units 1 to 4</i>
06/16/2021	NNSA [2021] No. 129	<i>Notice on Approving the Cancellation of Secondary Neutron Sources for Ningde NPP Units 1 to 4</i>

continued

Date	Document No.	Document Title
07/21/2021	NNSA [2021] No. 158	<i>Notice on Approving the Use of Independent Calibration Method for the Power Range Detector of Nuclear Instrumentation System in Ningde NPP Units 1 to 4</i>
08/06/2021	NNSA Letter [2021] No. 80	<i>Letter on Approving the First Periodic Safety Evaluation Program of Ningde NPP Units 1 to 4</i>

**Table 29. Operational Events of Ningde NPP Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
05/03/2021	The surface radiation dose monitor for the spent fuel pool of Unit 4 cannot be used over the time specified in the Technical Specifications	Human factor	0
11/18/2021	Unexpected suspension of normal discharge due to the low value displayed on the flow monitoring instrument in the waste liquid discharge system of Unit 1	Equipment	0

**Table 30. Occupational Radiation Doses at Ningde NPP in 2021**

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	0.273	5.182	0.800	0.047
Units 3 and 4	0.134	2.723	0.352	0.019

## Fuqing NPP

In 2021, Units 1 to 5 of Fuqing 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 5<sup>th</sup> refueling outage of Unit 1 was completed on April 19, 2021, the 4<sup>th</sup> refueling outage of Unit 3 on September 19, 2021 and the 5<sup>th</sup> refueling outage of Unit 2 on

December 03, 2021. The 1<sup>st</sup> refueling outage of Unit 5 began on December 06, 2021. Unit 6 was under commissioning, and, in general, operated safely. It was loaded with fuel for the first time after obtaining the operation license on November 5, 2021, reached initial criticality on December 10, 2021, and was connected to the grid for the first time on January 1, 2022.

The nuclear safety regulatory approvals for Fuqing NPP in 2021 are shown in Table 31

## Safety Regulation on Nuclear Power Plants

and the regulatory inspection activities in Table 32. Fuqing NPP reported 3 operational events, as shown in Table 33, and 1 construction event, as shown in Table 34. The occupational radiation doses at Fuqing NPP are shown in Table 35.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,517 man-days for inspection of Fuqing NPP, including 38 routine inspections.

A total of 135 findings were identified and 39 regulatory requirements were imposed.



**Figure 8. Units 1 to 6 of Fuqing NPP**

**Table 31. Nuclear Safety Regulatory Approvals for Fuqing NPP in 2021**

Date	Document No.	Document Title
01/11/2021	NNSA [2021] No. 5	<i>Notice on Releasing Fuqing Unit 5 from the 87% Rated Power (Thermal) Control Point</i>
05/21/2021	NNSA [2021] No. 118	<i>Notice on Approving Safety-important Modifications to Iodine Absorber Test Method for Air Conditioning Systems in Main Control Rooms of Fuqing NPP Units 1 to 4 in Fujian</i>
06/18/2021	NNSA [2021] No. 127	<i>Notice on Approving the “Commissioning Program for Fuqing NPP Units 5 and 6 in Fujian” (Version E0)</i>
07/21/2021	NNSA [2021] No. 153	<i>Notice on Approving Safety-important Modifications to Hard Logic of Direct Safety Injection and Direct Safety Spray on the Emergency Operation Console of Fuqing NPP Units 1 to 4 in Fujian</i>
08/02/2021	NNSA [2021] No. 166	<i>Notice on Approving the “Quality Assurance Programs (at Design and Construction Stages) for Fuqing NPP Units 5 and 6” (Version 5)</i>
08/12/2021	NNSA [2021] No. 173	<i>Notice on Approving the Application for Postponing the First In-service Primary System Hydrostatic Test and Complete In-service Inspection of Fuqing NPP Unit 5 in Fujian</i>
08/12/2021	NNSA [2021] No. 174	<i>Notice on Approving the In-reactor Irradiation Test for Group 1 Chromium Coated Cladding Characterized Assemblies of Fuqing NPP Unit 2 in Fujian</i>
08/26/2021	NNSA [2021] No. 189	<i>Notice on Approving Safety-important Modifications to Drum Strainer Driving Mode of Fuqing NPP Units 1 to 4 in Fujian</i>
11/05/2021	NNSA [2021] No. 250	<i>Notice on Issuing the Operation License for Fuqing NPP Unit 6 in Fujian</i>
11/17/2021	NNSA [2021] No. 262	<i>Notice on Approving Waste Resin Clearance for Steam Generator Blowdown System of Fuqing NPP</i>



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continued

Date	Document No.	Document Title
12/10/2021	NNSA [2021] No. 272	<i>Notice on Releasing the Initial Criticality Control Point for Fuqing NPP Unit 6 in Fujian</i>
12/31/2021	NNSA [2021] No. 289	<i>Notice on Approving the “Chemical and Radiochemical Technical Specification for Fuqing NPP Units 1 and 2 in Fujian” (Version F)</i>
12/31/2021	NNSA [2021] No. 290	<i>Notice on Approving the “Chemical and Radiochemical Technical Specification for Fuqing NPP Units 3 and 4 in Fujian” (Version E)</i>

**Table 32. Regulatory Inspection Activities at Fuqing NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
01/04/2021	Nuclear safety inspection for Releasing Fuqing NPP Unit 5 in Fujian from 87% power platform control point	System commissioning activities from 50% to 87% power of Fuqing NPP Unit 5 in Fujian; power escalation preparation and risk response plan; operation management; equipment abnormality and maintenance management; implementation of regulatory requirements proposed in previous nuclear safety regulatory inspections.
09/06/2021	Comprehensive inspection before issuing the operation license for Fuqing NPP Unit 6 in Fujian	Implementation of the quality assurance program for Fuqing NPP Unit 6 in Fujian; 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.
11/30/2021	Nuclear safety inspection on the first critical control point of Fuqing NPP Unit 6 in Fujian	Completion of commissioning test items of Fuqing NPP Unit 6 from initial loading to criticality, main commissioning anomalies, changes, initial criticality preparation, commissioning preparation after initial criticality, implementation of technical specifications after initial loading, implementation of periodic tests and implementation of regulatory requirements proposed in the comprehensive inspection before issuing the operation license

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

**Table 33. Operational Events of Fuqing NPP Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
01/16/2021	Fuqing NPP Unit 5 triggered reactor shutdown during a turbine shutdown test without reactor trip	Equipment	0

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continued

Date of Occurrence	Event	Cause	INES Level
02/20/2021	A reactor trip and turbine shutdown caused by failure of the protective relay for on-load voltage regulating switch of auxiliary transformer A of Fuqing NPP Unit 3	Equipment	0
06/02/2021	Emergency filter pipeline of air conditioning system in main control room activated by interlocking of instrument failure in the power plant radiation monitoring system of Fuqing NPP Unit 5	Equipment	0

**Table 34. Construction Event of Fuqing NPP Reported in 2021**

Date of Occurrence	Event
07/30/2021	Visual inspection by disintegrating the nuclear-level cooler of the motor in Fuqing NPP Unit 6 shows a result not in compliance with the standard

**Table 35. Occupational Radiation Doses at Fuqing NPP in 2021**

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	0.210	4.845	0.582	0.035
Units 3 and 4	0.102	2.513	0.265	0.016
Unit 5	0.074	0.146	0.211	0.025

### Yangjiang NPP

In 2021, 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 fifth refueling outage of Unit 1, the fourth refueling outage of Unit 3, the third refueling outage of Unit 4 and the second refueling outage of Unit 5 were completed on March 9, 2021, October 15, 2021, March 18 and January 19, 2021, respectively.

The nuclear safety regulatory approvals for Yangjiang NPP in 2021 are shown in Table 36. Yangjiang NPP reported one operational event, as shown in Table 37. The occupational radiation doses at Yangjiang NPP are shown in Table 38.

In 2021, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 987 man-days for inspection of Yangjiang NPP, including 10 routine inspections and 1 non-routine inspection. A total of 230 findings were identified and 59 regulatory requirements were imposed.

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**Table 36. Nuclear Safety Regulatory Approvals for Yangjiang NPP in 2021**

Date	Document No.	Document Title
01/17/2021	NNSA [2021] No. 10	<i>Notice on Approving the Upgrading of Technical Specification for Yangjiang NPP</i>
01/28/2021	NNSA [2021] No. 20	<i>Notice on Partially Approving the Reconstruction of the Third Batch of Safety-related Process Control Cabinet System of Yangjiang NPP</i>
04/22/2021	NNSA [2021] No. 93	<i>Notice on Approving Waste Resin Clearance for Steam Generator Blowdown System of Yangjiang NPP</i>
06/03/2021	NNSA [2021] No. 124	<i>Notice on Approving the Upgrading of “Yangjiang NPP Material Refueling Program”</i>
07/21/2021	NNSA [2021] No. 149	<i>Notice on Approving the Use of Independent Calibration Method for the Power Range Detector in the Nuclear Instrumentation System of Yangjiang NPP</i>
09/05/2021	NNSA [2021] No. 199	<i>Notice on Partial Approving the Fourth Batch of Reconstruction of the Safety-related Process Control Cabinet System of Yangjiang NPP</i>
09/21/2021	NNSA [2021] No. 213	<i>Notice on Approving the In-reactor Irradiation Test of STEP-12C Pilot Assembly and AZ Thimble Plug Assembly in Yangjiang NPP Unit 3</i>

**Table 37. Operational Event of Yangjiang NPP reported in 2021**

Date of Occurrence	Event	Cause	INES Level
01/06/2021	Unavailability of power supply circuit of 220V AC important load power supply system transformer due to irregular online activities of the electrical system during overhaul	Human factor	0

**Table 38. Occupational Radiation Doses at Yangjiang NPP in 2021**

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 to 6	0.389	8.831	1.681	0.032

## Changjiang NPP

In 2021, 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 fifth refueling outage of Unit 1 and the fourth refueling outage of Unit 2 were completed on September 26 and April 26, 2021 respectively. The FCD for the nuclear island foundation and the FCD for the conventional island foundation of Unit 3 were March 31 and September 30, 2021,

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respectively. The FCD for the nuclear island foundation of Unit 4 was December 28, 2021. For Changjiang multipurpose small modular reactor science and technology demonstration project in Hainan Province, the FCD for nuclear island foundation was July 13, 2021, and the FCD for conventional island was December 13, 2021.

The nuclear safety regulatory approvals for Changjiang NPP in 2021 are shown in Table 39 and the regulatory inspection activities in Table 40. Changjiang NPP reported one construction event, as shown in Table 41. The occupational radiation doses at Changjiang NPP are shown in Table 42.

In 2021, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,025 man-days for inspection

of Changjiang NPP, including 11 routine inspections. For operating organizations, a total of 98 findings were identified and 41 regulatory requirements were imposed; and for constructing organizations, a total of 157 findings were identified and 41 regulatory requirements were imposed.



**Figure 9. Inspectors Inspecting at the Site of Changjiang NPP**

**Table 39. Nuclear Safety Regulatory Approvals for Changjiang NPP in 2021**

Date	Document No.	Document Title
01/18/2021	NNSA [2021] No. 11	<i>Notice on Approving the Safety-Critical Modification of Changing the Shellfish Trap Filter Model for Mesh Size Expansion in Important Service Water System of Changjiang NPP Units 1 and 2 in Hainan</i>
03/01/2021	NNSA [2021] No. 43	<i>Notice on Approving the Safety-important Modification of the Firmware Upgrading for the Remote Rack Communication Module Card in the Digital Nuclear Safety Instrumentation and Control System of Changjiang NPP Units 1 and 2 in Hainan</i>
03/01/2021	NNSA [2021] No. 44	<i>Notice on Approving the Safety-important Modification of Adding Isolators in the Auxiliary Feedwater System Analog Channel for Safety-class Cabinets of Changjiang NPP Units 1 and 2 in Hainan</i>
03/09/2021	NNSA [2021] No. 45	<i>Notice on Approving the Modification of the Periodic Testing Acceptance Criteria of Intermediate Range of Nuclear Instrumentation System for Changjiang NPP Units 1 and 2 in Hainan</i>
03/31/2021	NNSA [2021] No. 58	<i>Notice on Issuing the Construction Licenses for Changjiang NPP Units 3 and 4 in Hainan</i>



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continued

Date	Document No.	Document Title
04/02/2021	NNSA [2021] No. 63	<i>Notice on Approving the Application of the Dynamic Rod Worth Measurement Method for Changjiang NPP Units 1 and 2 in Hainan</i>
05/13/2021	NNSA [2021] No. 109	<i>Notice on Approving the Radiation Zoning Optimization and Adjustment for Changjiang NPP Units 1 and 2 in Hainan</i>
05/14/2021	NNSA [2021] No. 108	<i>Notice on Approving the “Quality Assurance Program for Changjiang Multipurpose Small Modular Reactor Science and Technology Demonstration Project in Hainan Province (Construction Stage)” (Version C)</i>
06/03/2021	NNSA [2021] No. 122	<i>Notice on Approving the “In-Service Inspection Program for Changjiang NPP Units 1 and 2 in Hainan” (Version 003)</i>
06/19/2021	NNSA [2021] No. 131	<i>Notice on Approving the “Quality Assurance Program for Changjiang Multipurpose Small Modular Reactor Science and Technology Demonstration Project in Hainan Province (Construction Stage)” (Version D)</i>
07/01/2021	NNSA [2021] No. 134	<i>Notice on Issuing the Construction License for Changjiang Multipurpose Small Modular Reactor Science and Technology Demonstration Project in Hainan Province</i>
08/09/2021	NNSA [2021] No. 177	<i>Notice on Approving the Extension of the Repetitive Hydrostatic Test for Four Nuclear-class Pressure Vessels of Changjiang NPP Unit 1 in Hainan</i>
08/30/2021	NNSA [2021] No. 192	<i>Notice on Approving the Safety-important Modification of Changes in the Feedwater Flow Control System Acquisition Channel for Changjiang NPP Units 1 and 2 in Hainan</i>
09/08/2021	NNSA [2021] No. 204	<i>Notice on Approving the Implementation of the “One Point Method” to Calibrate the Ex-core Nuclear Instrumentation of Changjiang NPP Units 1 and 2 in Hainan</i>
10/01/2021	NNSA [2021] No. 221	<i>Notice on Approving the Special Measures for Planting Bars in L0006 Wall of the Electrical Building and Raft Foundation of the Fuel Building in Changjiang NPP Unit 3 in Hainan</i>
10/17/2021	NNSA [2021] No. 231	<i>Notice on Approving the “Chemical and Radiochemical Technical Specifications for Changjiang NPP Units 1 and 2 in Hainan” (Version 004)</i>
10/17/2021	NNSA [2021] No. 232	<i>Notice on Approving the “Technical Specifications for Changjiang NPP Units 1 and 2 in Hainan” (Version 004)</i>
10/18/2021	NNSA [2021] No. 235	<i>Notice on Approving the “Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Changjiang NPP Units 1 and 2 in Hainan” (Version 005)</i>
03/31/2021	MEE App [2021] No. 21	<i>Reply on the Environmental Impact Reports for Changjiang NPP Units 3 and 4 in Hainan (Construction Phase)</i>

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**Table 40. Regulatory Inspection Activities at Changjiang NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
03/16/2021	Nuclear safety inspection for the preparations before the FCD for the nuclear island foundation of Changjiang NPP Unit 3 in Hainan	Implementation of quality assurance system; preparation of nuclear island construction organization, construction design and construction scheme; site preparation before the FCD for nuclear island foundation; implementation of experience feedback corrective action; handling of outstanding issues identified during early construction regulatory inspection of nuclear island foundation.
04/18/2021	Nuclear safety inspection for the preparations before the FCD for the nuclear island foundation of Changjiang NPP multipurpose small modular reactor science and technology demonstration project in Hainan Province	Site preparation before the FCD for nuclear island foundation; establishment and implementation of quality assurance system; preparation of nuclear island construction organization, construction design and construction scheme; establishment and operation of experience feedback system; handling of outstanding issues identified during early construction of nuclear island foundation.

**Table 41. Construction Event of Changjiang NPP Reported in 2021**

Date of Occurrence	Event
08/10/2021	The diameter of the bars planted in the raft foundation L0006 wall of the electrical building of NPP Unit 3 fails to comply with the design

**Table 42. Occupational Radiation Doses at Changjiang NPP in 2021**

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	0.173	4.197	0.410	0.042

## Fangchenggang NPP

In 2021, 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 fourth refueling outage of Unit 1 was completed on

September 16, 2021. Unit 3 is at the peak stage of joint commissioning and start-up, with important engineering nodes such as cold functional test and containment pressurization completed, and is at the preparation stage of hot functional test. Unit 4 is at the peak stage of civil construction and the dome installation was successfully completed in January 2021.

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The nuclear safety regulatory approvals for Fangchenggang NPP in 2021 are shown in Table 43 and the regulatory inspection activities in Table 44. Fangchenggang NPP reported two construction events, as shown in Table 45. The occupational radiation doses of Fangchenggang NPP are shown in Table 46.

In 2021, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,453 man-days for inspection of Fangchenggang NPP, including 7 routine inspections. For operating organizations, a total of 49 findings were identified and 32 regulatory requirements were imposed; and

for constructing organizations, a total of 100 findings were identified and 25 regulatory requirements were imposed.



Figure 10. Cold Test Site of Unit 3 of Fangchenggang NPP

Table 43. Nuclear Safety Regulatory Approvals for Fangchenggang NPP in 2021

Date	Document No.	Document Title
04/07/2021	NNSA [2021] No. 77	Notice on Approving the “Technical Specification for Fangchenggang NPP Units 1 and 2 of” (Version 2)
04/22/2021	NNSA [2021] No. 144	Notice on Approving the “Commissioning Program for Fangchenggang NPP Units 3 and 4 in Guangxi” (Version 2)
07/26/2021	NNSA [2021] No. 159	Notice on Approving the Reconstruction by Adding Bypass Sample Cups on the Iodine Absorber of the Air-conditioning System for the Emergency Habitability Chamber of Main Control Room in Fangchenggang NPP Units 1 and 2 in Guangxi
07/26/2021	NNSA [2021] No. 160	Notice on Approving the “Maintenance Program for Fangchenggang NPP Units 3 and 4 in Guangxi” (Version 0)
08/16/2021	NNSA [2021] No. 179	Notice on Partially Approving the “Regulatory Requirements for Periodic Tests of Safety-related Systems and Equipment of Fangchenggang NPP Units 1 and 2 in Guangxi” (Version 2)

Table 44. Regulatory Inspection Activity at Fangchenggang NPP in 2021

Starting Date	Item	Main Contents of the Inspection
05/06/2021	Nuclear safety inspection of control points before cold functional test of Fangchenggang NPP Unit 3	Preparation for cold functional test of Fangchenggang NPP Unit 3

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

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**Table 45. Construction Events of Fangchenggang NPP Reported in 2021**

Date of Occurrence	Event
09/10/2021	Insufficient height of concrete slotting at the periphery of the power range guide barrel of Units 3 and 4
11/15/2021	The dimensions at the connection ends of inlet and outlet of main steam isolation valves of Units 3 and 4 fail to meet the requirements of the Technical Specifications

**Table 46. Occupational Radiation Doses at Fangchenggang NPP in 2021**

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	0.200	3.608	0.443	0.024

### Sanmen NPP

In 2021, 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 first refueling outage of Unit 2 and the second refueling outage of Unit 1 were completed on February 28 and June 24, 2021, respectively.

The nuclear safety regulatory approvals for

Sanmen NPP in 2021 are shown in Table 47 and the regulatory inspection activities in Table 48. The occupational radiation doses of Sanmen NPP are shown in Table 49.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,208 man-days for inspection of Sanmen NPP, including 27 routine inspections. A total of 99 findings were identified and 14 regulatory requirements were imposed.

**Table 47. Nuclear Safety Regulatory Approvals for Sanmen NPP in 2021**

Date	Document No.	Document Title
02/08/2021	NNSA [2021] No. 28	<i>Notice on Approving the Partial Revision of the Technical Specifications for Sanmen NPP Units 1 and 2</i>
02/24/2021	NNSA [2021] No. 38	<i>Notice on Releasing the Reactor Criticality Control Point (CCP) after the First Refueling Outage of Sanmen NPP Unit 2</i>
04/21/2021	NNSA [2021] No. 88	<i>Notice on Approving the "Maintenance Program for Sanmen NPP Units 1 and 2" (Version 4)</i>

**Table 48. Regulatory Inspection Activity at Sanmen NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
02/19/2021	Nuclear safety inspection before the reactor criticality after first refueling outage of Sanmen NPP Unit 2	Operation of the first fuel cycle of Sanmen NPP Unit 2; the implementation of the first refueling outage activities of Unit 2; the preparation for the criticality of Unit 2 after the refueling outage; and the implementation of other nuclear safety management requirements.

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

**Table 49. Occupational Radiation Doses at Sanmen NPP in 2021**

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	0.259	6.848	0.570	0.029

## Haiyang NPP

In 2021, Haiyang 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 second refueling outage of Units 1 and 2 were completed on September 13 and October 7, 2021, respectively.

The nuclear safety regulatory approvals for Haiyang NPP in 2021 are shown in Table

50 and the regulatory inspection activities in Table 51. Haiyang NPP reported one operational event, as shown in Table 52. The occupational radiation doses at Haiyang NPP are shown in Table 53.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 1,333 man-days for inspection of Haiyang NPP, including 27 routine inspections. A total of 56 findings were identified and 16 regulatory requirements were imposed.

**Table 50. Nuclear Safety Regulatory Approvals for Haiyang NPP in 2021**

Date	Document No.	Document Title
06/17/2021	NNSA [2021] No. 128	Notice on Approving the "Final Safety Analysis Report for Haiyang NPP Units 1 and 2 in Shandong" (Version 3).
08/02/2021	NNSA [2021] No. 170	Notice on Approving the Application for Extending the Operation of the Second Fuel Cycle Slip Power of Haiyang NPP Units 1 and 2
08/06/2021	NNSA [2021] No. 171	Notice on Approving Safety-important Modification of Changing the Position of Thermal Expansion Pressure Relief Valve on the Main Feed-water Pipe in Haiyang NPP Unit 1



# Safety Regulation on Nuclear Power Plants

continued

Date	Document No.	Document Title
08/06/2021	NNSA [2021] No. 172	<i>Notice on Approving the Optimization of Periodic Test of Protection and Safety Monitoring System of Haiyang NPP Units 1 and 2</i>
08/17/2021	NNSA [2021] No. 181	<i>Notice on Approving the Safety-important Modification of Reconstructing the Exhaust Pipeline Support for Reactor Vessel Top Cover in Haiyang NPP Units 1 and 2</i>
09/03/2021	NNSA [2021] No. 197	<i>Notice on Approving the Modification of Adding Four New Fuel Assemblies in Cycle 3 of Haiyang NPP Units 1 and 2</i>

**Table 51. Regulatory Inspection Activities at Haiyang NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
06/01/2021	On-site communication activities at Haiyang NPP	On-site communication activities on the chimney alarm light problem for the containment air filtration system of Haiyang Unit 2
09/06/2021	Control point inspection before the reactor criticality after the second refueling outage of Haiyang NPP Unit 1	Operation of the second fuel cycle of the unit, implementation of overhaul activities, implementation of safety-important system and equipment maintenance activities, implementation of equipment changes, in-service inspection and defect treatment, as well as preparation for the criticality conditions of the unit after refueling
09/26/2021	Control point inspection before the reactor criticality after the second refueling outage of Haiyang NPP Unit 2	Operation of the second fuel cycle of the unit, implementation of overhaul activities, implementation of safety-important system and equipment maintenance activities, implementation of equipment changes, in-service inspection and defect treatment, as well as preparation for the criticality conditions of the unit after refueling

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

**Table 52. Operational Event of Haiyang NPP Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
08/23/2021	The shutdown of reactor coolant pump 2B of Unit 2 leads to a 2% lower flow rate of reactor coolant in hot section, which triggers automatic reactor shutdown.	Equipment	0

**Table 53. Occupational Radiation Doses at Haiyang NPP in 2021**

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	0.135	2.803	0.255	0.026
Unit 2	0.210	3.263	0.328	0.033

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## Taishan NPP

In 2021, the safety status of Taishan NPP Units 1 and 2 is generally under control, and the failure rate fuel elements, the leakage rate of primary coolant pressure boundary and the containment leakage rate were all within the specified limits. One unplanned reactor shutdown event occurred at Units 1 and 2 respectively. The temporary shutdown maintenance of Unit 1 began on July 31, 2021. The first refueling outage of Unit 2 began on April 2, 2021, and was completed on June 10, 2021.

The nuclear safety regulatory approvals for Taishan NPP in 2021 are shown in Table 54 and the regulatory inspection activities in Table 55. Taishan NPP reported two operational events, as shown in Table 56. The occupational radiation doses at Taishan NPP are shown in Table 57.

In 2021, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 983 man-days for inspection of the two operating units of Taishan NPP, including 6 routine inspections. A total of 119 findings were identified and 35 regulatory requirements were imposed.



*Figure 11. YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration of the People's Republic of China, Surveying Taishan NPP*

**Table 54. Nuclear Safety Regulatory Approvals for Taishan NPP in 2021**

Date	Document No.	Document Title
01/22/2021	NNSA [2021] No. 14	<i>Notice on Approving the "Chemical and Radiochemical Technical Specification for Taishan NPP Units 1 and 2" (Version E)</i>

**Table 55. Regulatory Inspection Activity at Taishan NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
06/11/2021	Non-routine nuclear safety inspection of Taishan Unit 1	Operation of the second cycle of Taishan NPP Unit 1; fuel management of Unit 1; radiochemical parameter control of Unit 1; environmental monitoring of Taishan NPP, etc.

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

## Safety Regulation on Nuclear Power Plants

**Table 56. Operational Events of Taishan NPP Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
02/21/2021	Automatic reactor shutdown due to a main pump tripping during normal power operation of Unit 1	Human factor	0
04/05/2021	Small amount of gas released for a short period of time during the operation of the exhaust gas treatment system (TEG) of Unit 1	Human factor	0

**Table 57. Occupational Radiation Doses at Taishan NPP in 2021**

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	0.122	4.425	0.348	0.043
Unit 2	0.181	4.096	0.495	0.043

### Shidao Bay NPP (High-temperature Gas-cooled Reactor Demonstration Project) of China Huaneng Group Co., Ltd. Shandong Branch

In 2021, the construction quality and operation safety of the high-temperature gas-cooled reactor (HTGR) demonstration project were generally under control. On August 20, 2021, the operation license for the HTGR demonstration project was issued,

and the power plant entered the post-loading commissioning stage.

The nuclear safety regulatory approvals for the HTGR demonstration project in 2021 are shown in Table 58 and the regulatory inspection activities in Table 59. There were 6 operational events reported for the HTGR demonstration project, as shown in Table 60; three construction events were reported, see Table 61. The occupational radiation doses at the HTGR demonstration project are shown in Table 62.

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In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 809 man-days for inspection of the HTGR demonstration project, including 4 routine inspections. A total of 94 findings were identified and 14 regulatory requirements were imposed.



*Figure 12. Site Inspection for Initial Criticality of the HTGR Unit 1*

**Table 58. Nuclear Safety Regulatory Approvals for the HTGR Demonstration Project in 2021**

Date	Document No.	Document Title
04/07/2021	NNSA [2021] No. 78	<i>Notice on Approving the “Quality Assurance Program for the HTGR Demonstration Project at Shidao Bay NPP of China Huaneng Group Co., Ltd. Shandong Branch (Operation Stage)” (Version A1)</i>
05/11/2021	NNSA [2021] No. 103	<i>Notice on Approving the “Commissioning Program for the HTGR Demonstration Project” (Version F1)</i>
05/13/2021	NNSA [2021] No. 110	<i>Notice on Approving the Design Change of Control Rod Lower Limit Switch of the HTGR Demonstration Project</i>
08/20/2021	NNSA [2021] No. 182	<i>Notice on Issuing the Operation License to the HTGR Demonstration Project</i>
08/20/2021	NNSA [2021] No. 184	<i>Notice on Approving the “Refueling Program for the HTGR Demonstration Project” (Version B1)</i>
08/20/2021	NNSA [2021] No. 185	<i>Notice on Approving the Modification of Rod Drop Plan for Emergency Shutdown of the HTGR Demonstration Project</i>
11/11/2021	NNSA [2021] No. 254	<i>Notice on Approving the Revision of Content on Stage B in the Commissioning Program for the HTGR Demonstration Project</i>
03/01/2021	NNSA Letter [2021] No. 21	<i>Letter on Confirmation for Information Change of Legal Representative on the Construction Licence for the HTGR Demonstration Project</i>
06/22/2021	NNSA Letter [2021] No. 70	<i>Letter on the Issuance of “Comprehensive Inspection Report before Issuing the Operation License to the HTGR Demonstration Project at Shidao Bay NPP of China Huaneng Group Co., Ltd. Shandong Branch”</i>
08/06/2021	NNSA Letter [2021] No. 78	<i>Letter on Soliciting Opinions on the Issuance of Operation License for the HTGR Demonstration Project</i>

# Safety Regulation on Nuclear Power Plants

continued

Date	Document No.	Document Title
08/06/2021	NNSA Letter [2021] No. 79	<i>Letter on Soliciting Opinions on the Issuance of Operation License for the HTGR Demonstration Project</i>

**Table 59. Regulatory Inspection Activities for the HTGR Demonstration Project in 2021**

Starting Date	Item	Main Contents of the Inspection
01/06/2021	On-site regulation on hot leakage rate test at the primary coolant pressure boundary for the HTGR demonstration project	On-site regulation on the implementation of the hot leakage rate test at the primary coolant pressure boundary for HTGR demonstration project.
06/08/2021	Comprehensive inspection of the HTGR demonstration project before issuing the operation license	Twelve aspects including the implementation of quality assurance program, structures and nuclear safety equipment, and system commissioning, etc. were inspected.
09/10/2021	Regulation and witness of initial criticality of the HTGR demonstration project	Witness of initial criticality of the HTGR demonstration project

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

**Table 60. Operational Events of the HTGR Demonstration Project Reported in 2021**

Date of Occurrence	Event	Cause	INES Level
09/25/2021	Automatic activation of fresh air filter unit of main control room habitability system	Equipment	0
10/11/2021	Automatic activation of emergency negative pressure exhaust system KLC20 due to abnormal pressure rise in fuel handling chamber	Equipment	0
10/12/2021	Automatic activation of emergency negative pressure exhaust system due to abnormal pressure rise in Helium purification system chamber	Equipment	0
10/16/2021	Protection action upon “SR nuclear power higher by $\geq 0.004\%$ ” in 1# reactor due to bad point of the quality bit in nuclear measurement system	Equipment	0
11/09/2021	Protection action upon “MR nuclear power higher by $\geq 1.5\%$ ” in 2# reactor due to bad point of the quality bit in nuclear measurement system	Equipment	0



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continued

Date of Occurrence	Event	Cause	INES Level
12/10/2021	The operator opened the valve by mistake, causing the primary coolant pressure to drop rapidly, leading to the protective shutdown of 1# reactor	Human factor	0

**Table 61. Construction Events Reported by the HTGR Demonstration Project in 2021**

Date of Occurrence	Event
12/27/2020*	The inner cavity temperature of the drive mechanism of the absorber sphere shutdown system exceeds that specified in the technical specifications.
01/09/2021	Rupture of heat exchange pipe of air cooler in residual heat removal system of 1# reactor
01/22/2021	Dislocation of the adjusting pad for reactor pressure vessel

Note: \* - The event was reported in 2021.

**Table 62. 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	0.000244	0.018	0.000256	0.102

## CAP1400 demonstration project

In 2021, the CAP1400 demonstration project was at the civil construction and module installation stages, and Unit 1 was ready for commissioning activities. Regarding Unit 1, the hoisting and installation of the second ring of steel containment CV was completed on March 31, 2021, the pressurizer on April 16, the first steam generator on May 9, the third ring of steel containment on May 18, the second steam generator on June 7, the steel containment top head plate on July 19,

the main pipe welding on August 26, the ring crane was available on September 6 and the voltage stabilizer was installed on November 8. Regarding Unit 2, the hoisting and installation of the first ring of steel containment was completed on February 4, 2021, and the CA01 module on February 27, and the construction of the 2.200 m structure in Unit 2 reactor building was completed on December 16.

The nuclear safety regulatory approvals for the CAP1400 demonstration project in 2021 are shown in Table 63.

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In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 732 man-days for inspection of the CAP1400 demonstration project, including 9 routine inspections. A total of 120 findings were identified and 9 regulatory requirements were imposed.



*Figure 13. TANG Bo, Deputy Administrator of National Nuclear Safety Administration and the Director General of the Department of Nuclear Power Safety Regulation, Surveying the CAP1400 Demonstration Project*

**Table 63. Nuclear Safety Regulatory Approvals for the CAP1400 Demonstration Project in 2021**

Date	Document No.	Document Title
02/25/2021	NNSA [2021] No. 42	<i>Notice on Approving the “Quality Assurance Program (Design and Construction Stages) for CAP1400 Units 1 and 2” (Version A)</i>
03/18/2021	NNSA [2021] No. 48	<i>Notice on Approving the “Cause Analysis and Repair Plan for Cracking in the Base Material after Removal of the First Ring Lifting Lug of the CV Barrel of the No. 1 Nuclear Island of the CAP1400 Demonstration Project” (Version C)</i>
06/16/2021	NNSA Letter [2021] No. 68	<i>Reply Letter on Approving the Technical Capability Verification Program for Non-destructive Testing during Pre-service and In-service Inspection of CAP1400 Units 1 and 2</i>

### Zhangzhou NPP

In 2021, Zhangzhou NPP Units 1 and 2 were at the civil construction stage, and the construction was carried out orderly as planned, and the safety and quality were under control.

The nuclear safety regulatory approvals for Zhangzhou NPP in 2021 are shown in Table 64. Zhangzhou NPP reported 1 construction

event, as shown in Table 65.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 719 man-days for inspection of Zhangzhou NPP, including 8 routine inspections. A total of 105 findings were identified and 12 regulatory requirements were imposed.



**Figure 14. Dome Installation of Zhangzhou Unit 1**



**Figure 15. Inspectors Performing Regulatory Inspection for the Reactor Pressure Vessel Installation of Zhangzhou Unit 1**

**Table 64. Nuclear Safety Regulatory Approvals for Zhangzhou NPP in 2021**

Date	Document No.	Document Title
01/28/2021	NNSA [2021] No. 21	<i>Notice on Approving the Design Change of Main Control Room Layout for Zhangzhou NPP Units 1 and 2</i>
01/28/2021	NNSA [2021] No. 22	<i>Notice on Approving the Design Change of Main Steam Safety Valve Configuration for Zhangzhou NPP Units 1 and 2</i>
08/06/2021	NNSA [2021] No. 176	<i>Notice on Approving the Design Change of Minimum Available Capacity of Auxiliary Feed-water Tank for Zhangzhou NPP Units 1 and 2 in Fujian</i>
10/01/2021	NNSA [2021] No. 223	<i>Notice on Approving the Design Change of Nuclear Island Ventilation &amp; Chilled Water System for Zhangzhou NPP Units 1 and 2 in Fujian</i>
11/02/2021	NNSA [2021] No. 248	<i>Notice on Approving the Design Change of Protection Measures Against Thermometer Projectiles in Zhangzhou NPP Units 1 and 2 in Fujian</i>

**Table 65. Construction Event of Zhangzhou NPP Reported in 2021**

Date of Occurrence	Event
02/10/2021	Cracking in the head plate of pressurizer relief tank of Zhangzhou NPP Unit 1

# Safety Regulation on Nuclear Power Plants

## Taipingling NPP

In 2021, Taipingling NPP was at the stage of civil construction and steel lining installation. The welding of steel lining cylinder of Taipingling NPP Unit 1 was completed on August 31, the corbel was available on November 10, and the dome installation was completed on December 24. The internal structure construction of Unit 2 was started on March 10, the installation of Module 2 of BRX steel lining of Unit 2 was completed on April 22, the installation of Module 3 was completed on June 29, and the welding of the 5<sup>th</sup> layer of steel lining was completed on December 23.

The nuclear safety regulatory approvals for Taipingling NPP in 2021 are shown in Table 66.

In 2021, the Southern China Regional Office of Nuclear and Radiation Safety Inspection assigned 472 man-days for inspection of Taipingling NPP, including 5 routine inspections. A total of 94 findings were identified and 38 regulatory requirements were imposed.



Figure 16. Construction Site of Taipingling NPP Unit 1

Table 66. Nuclear Safety Regulatory Approvals for Taipingling NPP in 2021

Date	Document No.	Document Title
02/08/2021	NNSA [2021] No. 33	<i>Notice on Approving the Major Design Change for Automatic Control of Boron Dilution Method in Power Operation Mode of Taipingling NPP Units 1 and 2 in Guangdong</i>
07/29/2021	NNSA [2021] No. 164	<i>Notice on Approving the Changes of Negative Pressure Design Basis of the Containment Annulus of Taipingling NPP Units 1 and 2 in Guangdong</i>
11/01/2021	NNSA [2021] No. 247	<i>Approval of the Design Change of Adding Startup and Shutdown Auxiliary Feed-water System on the Secondary Side of the Steam Generator for Taipingling NPP Units 1 and 2 in Guangdong</i>

## San'ao NPP

In 2021, San'ao NPP Units 1 and 2 were at the civil construction stage, and the safety and quality were under control. The first tank

of concrete for the nuclear island foundation of Unit 2 was poured on December 30, 2021.

The nuclear safety regulatory approvals for San'ao NPP in 2021 are shown in Table 67,



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and the regulatory inspection activities are shown in Table 68.

In 2021, the Eastern China Regional Office of Nuclear and Radiation Safety Inspection assigned 844 man-days for inspection of San'ao NPP, including 6 routine inspections and 1 non-routine inspection. A total of 91 findings were identified and 36 regulatory requirements were imposed.



**Figure 17. Concrete Pouring Site of San'ao NPP Unit 2**

**Table 67. Nuclear Safety Regulatory Approvals for San'ao NPP in 2021**

Date	Document No.	Document Title
12/29/2021	NNSA [2021] No. 287	<i>Notice on Releasing the FCD Control Point for the Nuclear Island Foundation of San'ao NPP Unit 2 in Zhejiang</i>

**Table 68. Regulatory Inspection Activity at San'ao NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
10/11/2021	Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of San'ao NPP Unit 2 in Zhejiang	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; implementation of quality assurance program at design and construction stages; the establishment and operation of the experience feedback system.

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

## Xudapu NPP

In 2021, Xudapu NPP Units 3 and 4 were at the civil construction stage, and the safety and quality were under control. The first tank of concrete for nuclear island foundation of Unit 3 was poured on July 28, 2021, and the

installation of steel lining composite module of core shaft was completed on November 18, 2021. On May 28, the trench inspection of the foundation pit for Unit 4 was completed and the filling and leveling work was started.

The nuclear safety regulatory approvals for

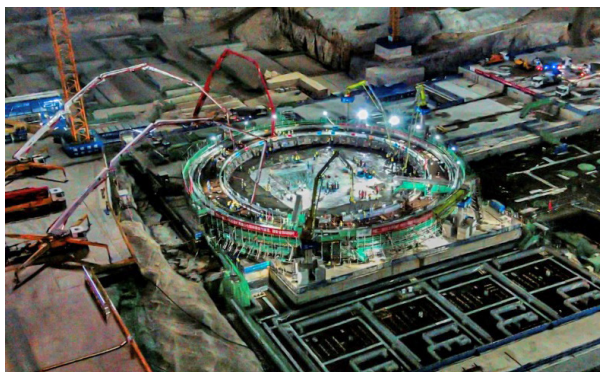


## Safety Regulation on Nuclear Power Plants

Xudapu NPP in 2021 are shown in Table 69, and the regulatory inspection activities are shown in Table 70.

In 2021, the Northeast China Regional Office

of Nuclear and Radiation Safety Inspection assigned 240 man-days for inspection of Xudapu NPP, including 2 routine inspections. A total of 39 findings were identified and 14 regulatory requirements were imposed.



**Figure 18. Concrete Pouring Site of Xudapu NPP Unit 3**



**Figure 19. Issuance of Construction Licenses for Xudapu NPP Units 3 and 4**

**Table 69. Nuclear Safety Regulatory Approvals for Xudapu NPP in 2021**

Date	Document No.	Document Title
06/16/2021	NNSA [2021] No. 130	Notice on Approving the “Quality Assurance Program for Xudapu NPP Units 3 and 4 in Liaoning (Construction Phase)” (Version C0)
07/27/2021	NNSA [2021] No. 162	Notice on Issuing the Construction Licenses for Xudapu NPP Units 3 and 4 in Liaoning
07/27/2021	MEE App [2021] No. 62	Reply on the Environmental Impact Reports for Xudapu NPP Units 3 and 4 in Liaoning (Construction Phase)

**Table 70. Regulatory Inspection Activity at Xudapu NPP in 2021**

Starting Date	Item	Main Contents of the Inspection
05/24/2021	Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of Xudapu NPP Unit 3 in Liaoning	Implementation of quality assurance program for Xudapu NPP Unit 3, preparation of nuclear island construction organization, construction plan and construction scheme, site preparation before FCD for nuclear island foundation, implementation of rectification requirements for on-site nuclear safety inspection, etc.

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

## IV. Safety Regulation on Research Reactors

In 2021, there were 20 civil research reactors (critical assemblies) in China, of which 18 were in service, 1 was in decommissioning and 1 was under construction (see Table 71). Among the 18 civil research reactors (critical assemblies) in service, 8 were in operation (including commissioning), 4 were under long-term shutdown management, 5 were not in operation, and 1 was under permanently shutdown management. According to the *Reporting System for Research Reactor Licensees*, 6 operational events were reported throughout the year, none of which caused adverse consequences to the environment outside the reactor building (see Table 72). One civil research reactor under construction was under safety and quality control with no construction events.

In 2021, the renewal of the operation licenses of the Minjiang Test Reactor (MJTR), the China Pulsed Reactor (CPR), the Critical Assembly of High Flux Engineering Test Reactor, the 18-5 Critical Assembly and the High Flux Engineering Test Reactor (HFETR), was approved. The nuclear safety regulatory approvals for the research reactors in 2021 are shown in Table 73, and the regulatory inspection activities are shown in Table 74.

In 2021, the regional offices of nuclear and radiation safety inspection assigned 1,917 man-days for inspection of the research reactor, including 11 routine inspections and 4 non-routine inspections. A total of 226 findings were identified and 64 regulatory requirements were imposed.

**Table 71. Operation of Research Reactors in 2021**

Facility	Design Power	Licensee	Operation Situation
China Experimental Fast Reactor (CEFR)	65MW	China Institute of Atomic Energy	In operation
China Advanced Research Reactor (CARR)	60MW	China Institute of Atomic Energy	In operation

## Safety Regulation on Research Reactors

continued

Facility	Design Power	Licensee	Operation Situation
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	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 Criticality Facility	-	China Institute of Atomic Energy	Long-term shutdown
Nuclear Criticality Safety Test Facility in Pilot Plant	-	China Institute of Atomic Energy	Not in operation
101 Heavy Water Research Reactor (101 HWRR)	10MW	China Institute of Atomic Energy	Decommissioning
Bulk Shielding Reactor (BSR)	1MW	Tsinghua University	Long-term shutdown
5MW Low Temperature Nuclear Heating Test Reactor (NHR-5)	5MW	Tsinghua University	Long-term shutdown
10 MW High Temperature Gas-Cooled Test Reactor (HTR-10)	10MW	Tsinghua University	Not in operation
High Flux Engineering Test Reactor (HFETR)	125MW	Nuclear Power Institute of China	In operation
Critical Assembly of High Flux Engineering Test Reactor	-	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 Facility	-	Nuclear Power Institute of China	In operation
Miniature Neutron Source Reactor (MNSR) in Shenzhen University	30kW	Shenzhen University	Permanently shutdown
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	In construction

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**Table 72. Operational Events of Research Reactors in 2021**

Date of Occurrence	Facility	Event	Cause	INES Level
01/08/2021	HFETR	Manual reactor shutdown caused by abnormal increase in total $\gamma$ of test circuit during failure detection	Equipment failure	0
01/27/2021	CEFR	Protective reactor shutdown caused by abnormal action of feedwater regulating valve F04107	Equipment fault	0
02/10/2021	CEFR	Protective reactor shutdown caused by abnormal closure of 1# feedwater pump	Equipment fault	0
03/03/2021	CEFR	Protective reactor shutdown caused by removal of primary sodium pump	Equipment fault	0
08/13/2021	CEFR	The calibration of nuclear measurement channel of China Experimental Fast Reactor (CEFR) failed to meet regulation requirements of the technical specifications	Management reason	1
10/13/2021	HFETR	Protective reactor shutdown caused by “high pressure in small circuit #2”	Equipment fault	0

**Table 73. Nuclear Safety Regulatory Approvals for Research Reactors in 2021**

Date	Document No.	Document Title
01/12/2021	NNSA [2021] No. 7	<i>Notice on Approving the Revised Technical Specifications for China Experimental Fast Reactor</i>
01/29/2021	NNSA [2021] No. 23	<i>Notice on Issuing the Operation Licenses (Renewal) for Minjiang Test Reactor, China Pulsed Reactor, Critical Assembly of High Flux Engineering Test Reactor and 18-5 Critical Assembly</i>
03/11/2021	NNSA [2021] No. 47	<i>Notice on Approving to Conduct Criticality Tests on the Nuclear Criticality Safety Experimental Device in the Pilot Plant</i>
10/29/2021	NNSA [2021] No. 243	<i>Notice on Approving the Renewal of the Operation License for the High Flux Engineering Test Reactor</i>
11/11/2021	NNSA [2021] No. 255	<i>Notice on Approving the Accident-resistant Fuel Irradiation Test for the High Flux Engineering Test Reactor</i>
04/24/2021	NNSA Letter [2021] No. 49	<i>Reply Letter on the Application of Shenzhen University to Terminate the Renewal of the MNSR Operation License</i>
06/21/2021	NNSA Letter [2021] No. 69	<i>Letter on Confirming the Change of Safety License Information for China Experimental Fast Reactor and Other Nuclear Facilities</i>
09/28/2021	NNSA Letter [2021] No. 92	<i>Reply on the Implementation Plan of the Physical Protection Project of the Institute of Nuclear and New Energy Technology (INET) of Tsinghua University</i>

## Safety Regulation on Research Reactors

continued

Date	Document No.	Document Title
10/09/2021	NNSA Letter [2021] No. 96	<i>Letter on the Issuance of “Comprehensive Inspection Report on Preparation of Renewal Application for the Operation License of the High Flux Engineering Test Reactor”</i>
12/19/2021	NNSA Letter [2021] No. 112	<i>Reply on Application for the Interlock Logic Optimization and Modification of Main Pump of the China Experimental Fast Reactor</i>

**Table 74. Regulatory Inspection Activity at the Research Reactors**

Starting Date	Item	Main Contents of the Inspection
09/07/2021	Comprehensive inspection on the renewal preparations for the operation license of the High Flux Engineering Test Reactor (HFETR)	Inspection was conducted on the basic situation, periodic safety assessment, aging management, operation management and technical reconstruction of HFETR

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



## V. Safety Regulation on Nuclear Fuel Cycle Facilities

V

In 2021, China’s in-service nuclear fuel production, processing, storage and reprocessing facilities 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 or the environment. The main facilities are listed in Table 75.

In 2021, environmental impact reports for 4 construction projects were approved, 2 construction licenses were issued, and 7 nuclear safety technical reconstructions were approved. Regulation and inspection on the potential safety hazards of relevant nuclear facilities were organized.



*Figure 20. HUANG Runqiu, Minister of Ecology and Environment, and YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, Surveying a Nuclear Fuel Cycle Facility*

In 2021, the regional offices of nuclear and radiation safety inspection assigned 2,902 man-days for inspection of the nuclear fuel cycle facility operator, including 17 routine inspections. A total of 293 findings were identified and 180 regulatory requirements were imposed.

**Table 75. Major Civil Nuclear Fuel Production, Processing and Storage Facilities in China**

Facility/Project	Licensee	Major Product Form	Current Status
Dry Fabrication Line for Chemical Conversion	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO <sub>2</sub> powder	In operation

## Safety Regulation on Nuclear Fuel Cycle Facilities

continued

Facility/Project	Licensee	Major Product Form	Current Status
Powder Metallurgical Fabrication Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO <sub>2</sub> 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 <sub>2</sub> powder	In operation
Nuclear Fuel Element Fabrication Line Extension and Technical Reconstruction 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 <sub>6</sub> with low enrichment	In operation
New Centrifuge Project, Phase IV	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation
Centrifuge Project Extension in North Region, Phase I	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation
Centrifuge Project Extension in North Region, Phase II	CNNC Shaanxi Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation
Centrifuge Project	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation
Commercial Demonstration Project of Domestic Centrifuge	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation
Uranium Enrichment Project, Phase III	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation
Uranium Enrichment Project, Phase IV	CNNC Lanzhou Uranium Enrichment Co., Ltd.	UF <sub>6</sub> with low enrichment	In operation

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continued

Facility/Project	Licensee	Major Product Form	Current Status
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

V

# Radiation Environmental Regulation on Uranium Mines and Other Radioactive Mines

## VI. Radiation Environmental Regulation on Uranium Mines and Other Radioactive Mines

### Regulatory Approvals

In 2021, Environmental Impact Assessment (EIA) approval was conducted for the construction and decommissioning projects

of 9 uranium mining and milling and uranium geological exploration projects including Decommissioning Treatment of 745 Mine, Phase II Project (see Table 76).

VI

**Table 76. Nuclear Safety Regulatory Approvals for the Uranium Mining and Milling Radiation Environmental Regulation in 2021**

Date	Document No.	Document Title
01/19/2021	MEE App [2021] No. 3	<i>Reply to the Revised Environmental Impact Report for the Detailed Investigation of the 5,000-ton Heap Leaching Industrial Test Project Decommissioning and Treatment Engineering of the Guangshigou Uranium Deposit in Shangnan County, Shaanxi Province</i>
01/19/2021	MEE App [2021] No. 4	<i>Reply to the Environmental Impact Report for Mine 745 Decommissioning Treatment Project Phase II of the CNNC Shaoguan Jinyuan Uranium Industry Co., Ltd.</i>
01/19/2021	MEE App [2021] No. 5	<i>Reply to the Environmental Impact Report for the Decommissioning Treatment Project of the Huangnihu Mine Site (Including Dashewei Mine Site)</i>
05/22/2021	MEE App [2021] No. 41	<i>Reply to the Environmental Impact Report Form of the Industrial Test of In Situ Recovery in Barun Section of Bayanwula Uranium Deposit</i>
05/22/2021	MEE App [2021] No. 42	<i>Reply to the Environmental Impact Report Form for Hydrogeological Investigation in Key Sections of Baolongshan Uranium Mine in Tongliao</i>
05/22/2021	MEE App [2021] No. 43	<i>Reply to the Environmental Impact Report Form for Qianjiadian Uranium Deposit Exploration from 2021 to 2023</i>
07/21/2021	MEE App [2021] No. 60	<i>Reply to the Environmental Impact Report Forms of 12 Projects Including the Investigation, Assessment and Exploration of Hydrothermal Uranium Resources in Central Inner Mongolia</i>

Date	Document No.	Document Title
08/21/2021	MEE App [2021] No. 70	<i>Reply to the Environmental Impact Report Form of Uranium Exploration Project in Lianshanguan Region, Benxi County, Liaoning Province</i>
09/21/2021	MEE App [2021] No. 85	<i>Reply to the Environmental Impact Report Forms of 2 Projects Including the Investigation and Assessment of Uranium Resources in Hailar Area, Hulun Buir City, Inner Mongolia</i>

## Regulatory Inspections

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), the relevant regional offices of nuclear and radiation safety inspection were organized to inspect uranium mining and milling facilities. NNSA organized review of the environmental radiation monitoring information of uranium mining and milling enterprises in 2021, issued the review opinions, and urged the enterprises to make rectification. NNSA organized the development of uranium mining and milling regulatory information system and put it online for operation.

In 2021, the regional offices of nuclear and radiation safety inspection assigned 223 man-days to regulation of uranium mining and milling facilities, including 37 routine inspections. A total of 131 findings were

identified and 132 regulatory requirements were imposed.



**Figure 21. Inspectors Inspecting the Longjiang Uranium Mine**

NNSA organized a review of environmental radiation monitoring information of other radioactive mines development and utilization enterprises in various provinces in 2021, and issued the *List of Other Radioactive Mines Development and Utilization Enterprises in 2020* (MEE Bulletin [2021] No.28).



# VII. Safety Regulation on Radioactive Waste

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

## Administrative Licensing

In 2021, NNSA issued a construction license for the stage I construction project of Longhe near-surface disposal site Phase I to Gansu Longhe Environmental Protection Technology Co., Ltd., and approved the stage II construction of Feifengshan Disposal Site Phase I and the operation of Jinta very low-level waste landfill.

## Operation and Safety Regulation of Radioactive Waste Disposal Sites

In 2021, the northwest disposal site received a total of 3,365 low- and intermediate-level

radioactive waste packages, with a total volume of 1,660.1 m<sup>3</sup>, and a total waste radioactivity of 1.52 E+13 Bq. By the end of 2021, the northwest disposal site had received an accumulative total of 68,344 radioactive waste packages, with a total volume of 27,708.29 m<sup>3</sup>, and a total waste radioactivity of 6.51 E+14 Bq. In accordance with the requirements of the operation license, the northwest disposal site was undergoing regular safety assessment.

In 2021, the Feifengshan disposal site received a total of 16,092 low- and intermediate-level radioactive waste packages, with a total volume of 8,426.4 m<sup>3</sup>, and a total waste radioactivity of 4.60 E+14 Bq. By the end of 2021, the Feifengshan disposal site had received an accumulative total of 77,944 radioactive waste packages, with a total volume of 35,005.38 m<sup>3</sup>, and a total waste radioactivity of 1.89 E+15 Bq.

In 2021, no waste was received at Beilong disposal site. By the end of 2021, the Beilong disposal site had received an accumulative total of 2,240 radioactive waste packages,



*Figure 22. Site Investigation by YE Min, the Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration of the People's Republic of China*

with a total volume of 2,526.44 m<sup>3</sup>, and a total waste radioactivity of 7.95 E+13 Bq.

In 2021, Jinta very low-level radioactive waste landfill began to receive radioactive solid wastes, with a total volume of 189.8 m<sup>3</sup> and a total waste radioactivity of 2.43 E+09 Bq.

In 2021, the construction of Beishan

underground research laboratory was commenced.

In 2021, the regional offices of nuclear and radiation safety inspection assigned 670 man-days to regulation of radioactive waste disposal site, including 14 routine inspections and 7 non-routine inspections. A total of 112 findings were identified and 14 regulatory requirements were imposed.

## Treatment of Legacy Radioactive Wastes

NNSA further strengthened the safety regulation of legacy radioactive wastes to promote the treatment and disposal of legacy radioactive wastes. In 2021, a total of three environmental impact assessment-related documents were approved and five special inspections were carried out.

# VIII. Safety Regulation on Radioisotopes and Radiation-emitting Devices

By the end of 2021, in our country, the total number of organization producing, selling or using radioisotopes and radiation-emitting devices was 92,453, including 9,618 organizations producing, selling and using radioisotopes and 82,835 organizations only producing, selling and using radiation-emitting devices. The number of radioactive sources in use was 156,539 (including 15,624 Category I radioactive sources, 17,735 Category II radioactive sources, 1,861 Category III radioactive sources, and 120,979 other radioactive sources); the number of various radiation-emitting devices was 229,002. The radioactive waste temporary storage facilities in provinces, autonomous regions, and municipalities directly under the Central Government collected and stored 58,672 disused radioactive sources. Totally, 150,936 disused radioactive sources were transferred or collected to the national repository for centralized storage of disused radioactive sources or recycled by the manufacturers. In 2021, 17,102 spent radioactive sources were

conditioned and delivered to the disposal site for final disposal.

In 2021, there were 206 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 is under control.

## Strengthening the Safety Regulation of High-risk Mobile Radioactive Sources

In order to enhance the regulation of high-risk mobile radioactive sources and strengthen the

enterprises' awareness of compliance with the law, we provided active assistance with strictly regulation. NNSA notified all provinces and the fault detection industry regarding the law-enforcement results of personnel exposure accidents caused by illegal borrowing of diagnostic machines and radiation safety licenses in 2020, strengthened cooperation with China Association of Special Equipment Inspection and other industry associations, publicized relevant cases and radiation safety regulation policies and regulatory requirements at the industry annual conference and other platforms, so as to impel the industry to improve awareness and fulfill the primary responsibility of radiation safety of the organizations, and effectively guarantee radiation safety. NNSA investigated some operating sites where high-risk mobile radioactive source are centralized, conducted face-to-face discussions with enterprises, listened to the opinions and suggestions of enterprises on regulation, and answered the concerns of the industry.

NNSA improved the efficiency of the high-risk mobile radioactive source monitoring platforms, organized the assessment of the data upload rate of the high-risk mobile radioactive source online monitoring platforms, regularly fed back the data upload rate to each province, and continuously urged each province to improve the data upload rate.

### Deepening the Reform to “Streamline Administration and Delegate Power, Improve Regulation, and Upgrade Services”

According to the requirements of *Notice on Deepening the Reform of “Separating Permits from the Business License” to Further Stimulate the Development Vitality of Market Entities* (SC [2021] No. 7) issued by the State Council, the approval authority of radiation safety license for Classes B and C radioisotope production organizations shall be delegated to provincial ecology and environment authorities; after approval by the provincial government, the radiation safety license for using Categories IV and V radioactive sources and Class III radiation-emitting devices may be issued by the ecology and environment authority of corresponding city with districts. In July 2021, the regulation responsibilities of 62 radiopharmaceutical manufacturing enterprises with Site Classes B and C licensed and supervised by the Ministry of Ecological Environment were transferred from the regional offices of nuclear and radiation safety inspection to local ecological environment authorities.

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),

## Safety Regulation on Radioisotopes and Radiation-emitting Devices

NNSA organized a technical review on 57 environmental impact reports (forms) in the nuclear technology application field approved by 12 provinces (autonomous regions and municipalities), namely, Tianjin, Shanghai, Qinghai, Hainan, Anhui, Guangxi, Fujian, Shaanxi, Henan, Jilin, Guizhou and Xinjiang. In June 2021, NNSA informed the public of the problems identified in Q1, announced the criticism to construction organizations, EIA document compilation organizations and staff to deduct their score of integrity, as well as criticism to relevant technical assessment organizations and approval authorities. After July 2021, NNSA transferred the identified clues of problems to relevant provincial ecological environment authorities, which organized investigation and evidence collection, and punished and deducted score of integrity for relevant units and personnel in accordance with the law.

The archival exemption supporting documents for radioisotopes and radiation-emitting devices approved by provinces were summarized, and the Announcement on the Archival Exemption Supporting Documents of Radioisotopes and Radiation-emitting Devices (9th Batch) and the Announcement on the Archival Exemption Supporting Documents of Radioisotopes and Radiation-emitting Devices (10th Batch) were issued. The archival exemption supporting documents for radiation-emitting devices and the activities listed in the announcement and documents

for the radioactive sources or unsealed radioactive materials used in such activities, are valid nationwide, and archival exemption will no longer be applied individually.

### Optimizing Radiation Safety Training & Assessment Mechanism

NNSA further optimized the management of works using nuclear technology, consolidated the achievements of radiation safety and protection training reform, and continuously optimized the radiation safety protection training and assessment mechanism. It optimized and adjusted the contents of the examination database for radiation protection training, adjusted the examination scope of the examination questions, enhanced the pertinence of the questions and made the improved examination questions public. It also optimized the assessment mode, changed the off-line centralized assessment for workers only engaged in the sales and use of Class III radiation-emitting devices to independent assessment by the owners, and ecological environment departments at all levels shall regulate the performance of the owners' assessment responsibilities. After the adjustment, the principle of conducting regulations by level and class was followed in the radiation safety training and assessment further, which has reduced the burden on enterprises, especially micro-, small-, and medium-sized enterprises, further clarified



the main responsibilities of the owners, eased the shortage of assessment resources, and better achieved the expected results. In 2021, a total of 4,014 radiation safety assessments were organized nationwide, with 200,000 radiation workers registered for the assessment, 160,000 persons participated in the assessment and 116,000 persons passed. The number of self-assessments related to Class III radiation-emitting devices that were effectively entered in the National Nuclear Technology Utilization Radiation Safety Management System has exceeded 32,000 man-times.

A WeChat official account focusing on radiation safety and protection assessment was created to facilitate both enterprises and radiation workers. The WeChat official account of “Radiation Safety Training” has owned more than 200,000 followers, and has become the main channel and a new platform for releasing assessment and regulation information. Thanks to the fast, flexible and high audience rate of the WeChat official account, it has achieved good results by releasing relevant regulatory policies and standards on the application of nuclear technology and actively organizing public communication activities.

### Promoting “Internet + Government Services”

NNSA organized the “Ten-year Periodic Assessment” of the National Nuclear

Technology Utilization Radiation Safety Management System, comprehensively analyzed and evaluated the role played by the management system in the regulation work, scientifically evaluated the design and implementation effect of each functional module, and laid the foundation for the “Internet + government service” and for upgrading and optimization of the management system. The survey results showed that the use of the management system has greatly improved the informatization level of radiation safety regulation, provided a large amount of data support for regulatory decision-making, promoted the sound development of the nuclear technology application industry, and ensured the radiation environment safety and public safety.

NNSA actively promoted the interlinking of the management system with the national integrated government service platform. Starting from 2021, provincial government platforms can realize data sharing with the regulation system by interlinking with the national integrated government affairs service platform. By doing so, it has resolved problems hindering “one-stop government services”, such as repeated entry of data in grass-roots service offices and repeated login of enterprises and individuals. At present, data push and transmission among provinces were completed.

# Safety Regulation on Radioisotopes and Radiation-emitting Devices

## Regulatory Approval and Inspection

In 2021, radiation safety licenses were issued to 8 nuclear technology utilization organizations. Licenses of 48 organizations were renewed, licenses of 7 organizations were reapplied, new items were added to the licenses of 24 organizations, and licenses of 43 organizations were modified. Six licensees' activities were partially cancelled (see Table 77).

The licenses of 2 nuclear technology utilization organizations were cancelled. Approvals were provided for the environmental impact assessments of 2 decommissioned nuclear technology utilization projects as well as for 11 conditional exemption letters (see Table 78).

In 2021, NNSA focused on key areas and weakness to promote the investigation of potential nuclear and radiation safety hazards in depth and detail. Based on the issues identified in the investigation of an radiation accident of an electron accelerator irradiation enterprise in Tianjin, combined with the three-year action of investigating potential nuclear and radiation safety hazards, special regulatory inspection on radiation safety hazards of electron irradiation accelerators was launched to thoroughly investigate and resolve potential radiation safety hazards in industrial irradiation field, furtherly train regulation team, and enhance the overall

radiation safety level of accelerators in industrial irradiation field.

In 2021, the regional offices of nuclear and radiation safety inspection assigned 1,262 man-days in regulation of nuclear technology utilization organizations, including 360 routine inspections and 23 non-routine inspections. A total of 1,124 issues were identified and 1,015 regulatory requirements were imposed.



*Figure 23. Inspectors Conducting On-site Regulatory Inspection in a Nuclear Technology Utilization Organization*

## Review and Approval of Radioisotope Imports and Exports

There were totally 2,488 import and export applications for radioactive sources and unsealed radioactive materials (containing radiopharmaceuticals and their raw materials) approved in 2021, including 1,266 applications for importing and exporting radioactive sources and 744 applications for exporting radioactive sources. The total number of

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imported radioactive sources was 9,187 and that of exported radioactive sources was 2,082. The gross radioactivity of imported unsealed radioactive materials was 1.67 E+16 Bq, and the gross radioactivity of exported unsealed radioactive materials was 3.71 E+16 Bq.

## Law Enforcement and Training on Radiation Safety Regulation

In 2021, NNSA performed its duties in accordance with laws and regulations to ensure that laws are observed and strictly enforced and that lawbreakers are brought to book, and four administrative resolution and penalty decisions were made.

NNSA continued to promote radiation safety

regulation in nuclear technology application to be increasingly scientific, institutionalized and refined, standardized radiation safety regulation and management at all levels nationwide to improve the regulation and management level. According to the training plan of 2021, four training courses for inspectors were held to train more than 200 local inspectors.

## Radiation Accidents

In 2021, 5 radiation accidents occurred in all provinces, autonomous regions and municipalities, and all of them were ordinary accidents. Among them, 3 accidents involved the loss of 3 radioactive sources, and 2 involved an over-dose exposure to the staff.

**Table 77. List of Approved Radiation Safety Licenses in 2021**

No.	Organization	Type
1	Anhui Zhuobo Biotechnology Co., Ltd.	Change
2	Beijing North Institute of Biotechnology Co., Ltd.	Change
3	Beijing Beike Radioisotope Science & Trade Co., Ltd.	Addition
4	Beijing Guoyuan New Technology Co., Ltd.	Initial application
5	Beijing Hefuyuan Science & Technology Development Co., Ltd.	Renewal
6	Beijing Hongyisifang Radiation Technology Co., Ltd.	Renewal
7	Beijing Senke Pharmaceutical Co., Ltd.	Change
8	Beijing Shanweizhengzi Pharmaceutical Technology Co., Ltd.	Addition
9	Beijing Hongyisifang Radiation Technology Co., Ltd.	Change
10	Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.	Renewal
11	Changshu Irradiation Technology Application Factory	Renewal
12	Changzhou Atomic Hi-Tech Radiation Co., Ltd.	Renewal
13	Chengdu New Radiomedicine Technology Co., Ltd.	Re-application
14	Chengdu Gaotong Isotope Co., Ltd., CNNC	Re-application

## Safety Regulation on Radioisotopes and Radiation-emitting Devices

continued

No.	Organization	Type
15	Daqing Irradiation Center	Renewal
16	Foshan Raypoly High-Energy Technology Co., Ltd.	Renewal
17	Fujian Office of Radiation Environment Inspection	Change and renewal
18	Nuclear and Radiation Safety Center of Gansu Province	Change
19	Gansu Heavy Ion Hospital Co., Ltd.	Renewal
20	Fuzhou Branch of Guangdong Ci Medicine Co., Ltd	Renewal
21	Guizhou Office of Radiation Environment Regulation	Change and renewal
22	Guizhou Academy of Agricultural Sciences	Change and partial cancellation
23	State Nuclear Uranium Resource Development Co., Ltd.	Change and addition
24	Harbin Radiance Radiation Technology Co., Ltd.	Renewal
25	Hainan Zheda Irradiation Technology Co., Ltd.	Change
26	Hefei (National) Forestry Irradiation Center	Renewal
27	Hefei Ion Medical Center	New application
28	Hefei CAS Ion Medical and Technical Devices Co., Ltd.	Re-application
29	Hebei Tongfang Nuclear Radiation Polytron Technologies Co., Ltd.	Renewal
30	Radiation Environment Safety Technology Center of Henan Province	Change
31	Southwestern Institute of Physics	Addition and change
32	Institute of Technical Physics, Heilongjiang Academy of Sciences	Change
33	Institute of Maize, Heilongjiang Academy of Agricultural Sciences	Change
34	Hubei AMS Pharmaceutical Co., Ltd.	Initial application
35	Hunan Nuclear Industry Honghua Machinery Co., Ltd.	Renewal
36	Jilin Ce Yuan Biotechnology Co., Ltd.	Renewal
37	Jilin Office of Radiation Environment Inspection	Renewal
38	Lixiahe Agricultural Research Institute of Jiangsu Province	Re-application
39	Jiangxi Keyuan Irradiation Technology Development Co., Ltd.	Change
40	Jiangxi Tianzhao Technical Development Co., Ltd.	Renewal
41	Jinxiang Dajiang Technology and Trade Co., Ltd.	Change
42	Liaoning Cobalt Source Irradiation Center	Change
43	Liaoning Huayi Paite Technology Co., Ltd.	Initial application
44	Longyao Hefuyuan Technology Development Co., Ltd.	Renewal
45	JYAMS Ltd.	Addition
46	Fuzhou Branch of JYAMS Ltd.	Change

continued

No.	Organization	Type
47	Shenyang Branch of JYAMS Ltd.	Change
48	Nantong Michael Irradiation Co., Ltd.	Renewal
49	Nuclear and Radiation Monitoring Center of Inner Mongolia Autonomous Region	Renewal
50	Qinghai Office of Radiation Environment Regulation	Renewal
51	Xiamen Wanheyuan Development Co., Ltd.	Change and renewal
52	Shandong Quangang Radiate Technology Development Co., Ltd.	Change and renewal
53	Shandong Office of Radiation Environment Regulation	Change
54	Ecological Environment Monitoring and Emergency Support Center of Shanxi Province	Change
55	Shaanxi Fangyuan Hi-Tech Industry Co., Ltd.	Renewal
56	Radioactive Waste Collection and Storage Management Center of Shaanxi Province	Renewal
57	Shanghai AMS Co., Ltd.	Addition
58	Shanghai Gammastar Technology Development Co., Ltd.	Renewal
59	Shanghai Heming Radiation Technology Co., Ltd.	Renewal
60	Ruijin Hospital, Shanghai JiaoTong University School of Medicine	Initial application
61	Shanghai Office of Radiation Environment Inspection	Change and addition
62	Shanghai Institute of Measurement and Testing Technology	Change
63	Shanghai Xinke Pharmaceutical Co., Ltd.	Renewal
64	Shenzhen OUR New Medical Technology Development Co., Ltd.	Change
65	Shenzhen JPY Ion-Tech. Co., Ltd.	Change, partial cancellation and renewal
66	Shenzhen Holy Medical Technology Development Co., Ltd.	Change and renewal
67	Shenzhen Zhonghe Headway Bio-Sci & Tech Co., Ltd.	Partial cancellation
68	Sichuan Jinhe Irradiation Technology Co., Ltd.	Change
69	Sichuan Institute of Atomic Energy	Change
70	Soochow University	Addition
71	Tangshan Heli Irradiation Co., Ltd.	Renewal
72	Tianjin Huayi Paite Technology Co., Ltd.	Change
73	Tianjin JPY Ion-Tech. Co., Ltd.	Renewal
74	Seeds Pharmaceuticals Research Institute (Tianjin) Ltd.	Addition
75	Tianjin Huaming High-Tech Irradiation Co., Ltd.	Renewal
76	Tianjin Eco-Environment Monitoring Center	Renewal



## Safety Regulation on Radioisotopes and Radiation-emitting Devices

continued

No.	Organization	Type
77	Wuxi EL Pont Group	Renewal and re-application
78	Wuhan Century Golden Bridge Data System Co., Ltd.	Change
79	Wuhan Digital Knife Medical Co., Ltd.	Initial application and change
80	Wuhan ESUN Technology Co., Ltd.	Renewal
81	Wuhan Yuanyi Kang Medical Technology Co., Ltd.	Initial application
82	Xinjiang Office of Radiation Environment Inspection	Change
83	Ion Beam Applications Co., Ltd.	Addition
84	Youyou Foods Chongqing Manufacturing Co., Ltd.	Renewal
85	HTA Co., Ltd.	Change, renewal and addition
86	Yunnan Nuclear Application Technology Co., Ltd.	Change
87	Zhangjiagang CNNC Huakang Radiation Co., Ltd.	Renewal
88	Zhejiang Hengdian Atomic Hi Tech Pharmaceutical Co., Ltd.	Renewal
89	National Institute of Measurement and Testing Technology	Renewal
90	Nuclear Power Institute of China	Partial cancellation and addition
91	National Institute of Metrology, China	Addition
92	University of Science and Technology of China	Addition
93	Dalian Institute of Chemical Physics, Chinese Academy of Sciences	Partial cancellation
94	Institute of High Energy Physics, Chinese Academy of Sciences	Renewal
95	Dongguan Campus, Institute of High Energy Physics, Chinese Academy of Sciences	Change and addition
96	Institute of Modern Physics, Chinese Academy of Sciences	Addition
97	Shanghai Advanced Research Institute, Chinese Academy of Sciences	Re-application
98	Shanghai Institute of Applied Physics (SINAP), Chinese Academy of Sciences	Re-application
99	Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences	Change
100	China Isotope & Radiation Corporation	Addition
101	China National Uranium Corporation Limited	Change and addition
102	China Institute of Atomic Energy	Change, renewal, partial cancellation and addition
103	CNNC 272 Uranium Industry Co. Ltd.	Change

continued

No.	Organization	Type
104	CNNC Hainan Haiyuan Development Co., Ltd.	Renewal
105	CNNC Everclean Co. Ltd.	Renewal
106	The 404 Company Limited., China National Nuclear Corporation	Addition
107	CNNC Tongxing. (Beijing) Nuclear Technology Co., Ltd.	Change
108	Zhongjin Irradiation Incorporated Company	Addition
109	Zhongjin Irradiation Chongqing Co., Ltd.	Change
110	Chongqing Office of Radiation Environment Regulation	Initial application
111	Chongqing Weige Industry Co., Ltd.	Renewal
112	Zibo Bashan Wanjie Hospital	Renewal

**Table 78. Other Environmental Protection Approval and Punishment Documents in the Field of Safety Regulation of Radioisotopes and Radiation-emitting Devices in 2021**

Date	Document No.	Document Title
03/04/2021	MEE Bulletin [2021] No. 7	<i>Announcement on the Archival Exemption Supporting Documents of Radioisotopes and Radiation-emitting Devices (9<sup>th</sup> Batch)</i>
08/17/2021	MEE Bulletin [2021] No. 33	<i>Announcement on the Archival Exemption Supporting Documents of Radioisotopes and Radiation-emitting Devices (10<sup>th</sup> Batch)</i>
08/14/2021	MEE App [2021] No. 65	<i>Reply on the Environmental Impact Report Form of the Radioactive Waste Storage Facility Decommissioning Project in Hebei</i>
09/17/2021	MEE App [2021] No. 80	<i>Reply on the Environmental Impact Report Form of the Waste Storage Facility (Old) Decommissioning Project of Tianjin Eco-Environment Monitoring Center (Former Tianjin Radiation Management Institute)</i>
09/02/2021	MEE Decree [2021] No. 170	<i>Order for Rectification (to Guangdong Cyclotron Medical Science Co., Ltd.)</i>
09/02/2021	MEE Decree [2021] No. 171	<i>Order for Rectification of Illegal Conduct (to Zhengzhou HTA Pharmaceutical Co., Ltd.)</i>
07/30/2021	NNSA Letter [2021] No. 76	<i>Letter on Approving the Change of Information of Radioactive Solid Waste Storage License of 4 Organizations Including Nuclear and Radiation Safety Center of Gansu Province</i>
01/07/2021	MEE RL [2021] No. 4	<i>Letter on the Issuance of Radiation Safety License in 2020</i>
01/25/2021	MEE RL [2021] No. 38	<i>Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in A60 Gas Chromatographs of Changzhou Panna Instrument Co., Ltd.</i>
01/25/2021	MEE RL [2021] No. 39	<i>Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in GC4000 Gas Chromatographs of Anhui Wanyi Science and Technology Co., Ltd. (Wayeal)</i>

## Safety Regulation on Radioisotopes and Radiation-emitting Devices

continued

Date	Document No.	Document Title
04/08/2021	MEE RL [2021] No. 160	<i>Reply Letter on Approving Exemption Management of Nickel-63 Radioactive Sources in SP-3400A, SP-3510 and SP-3530 Gas Chromatographs of Beijing Beifen-Ruilu Analytical Instrument (Group) Co., Ltd.</i>
04/21/2021	MEE RL [2021] No. 181	<i>Reply Letter on Approving Exemption Management of Nickel-63 Radioactive Sources in AT6600 All-in-One Intelligent Hazardous Materials Detector and AT6700 Hand Held Toxic Gas Detector of Safeway Inspection System Company Limited (Safeway System)</i>
05/22/2021	MEE RL [2021] No. 250	<i>Reply Letter on Approving Beifen Instrument Technology Co., Ltd. to Change its Name in Exemption Approval</i>
07/14/2021	MEE RL [2021] No. 333	<i>Reply Letter on Approving Exemption Management of Nickel-63 Radioactive Sources in PAN2100 Gas Chromatographs of Tengzhou Zhiheng Analytical Instrument Co., Ltd.</i>
07/21/2021	MEE RL [2021] No. 347	<i>Reply Letter on Approving Exemption Management of Nickel-63 Radioactive Sources in ITEMISER 3 ENHANCED (IT3E) Ion Trap Drift Mass Spectrometer of Beijing Ruiyuan Huade Technologies Co., Ltd.</i>
08/02/2021	MEE RL [2021] No. 377	<i>Letter on the Cancellation of Irradiation Safety License of Lanzhou Weite Irradiation Co., Ltd.</i>
08/06/2021	MEE RL [2021] No. 381	<i>Reply Letter on Approving Exemption Management of Nickel-63 Radioactive Sources in EI-GD800 Portable Chemical Toxic Gas Detector of Shanghai Imaging Security Technologies Co., Ltd.</i>
08/14/2021	MEE RL [2021] No. 386	<i>Letter on Cancellation of the Radiation Safety License of Xinjiang Maifei Investment Co., Ltd.</i>
08/21/2021	MEE RL [2021] No. 403	<i>Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in GC126N, GC127, GC128, GC136 and GC138 Gas Chromatographs of INESA Analytical Instrument Co., Ltd.</i>
11/13/2021	MEE RL [2021] No. 528	<i>Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in GC-1949 and PGC-80 Plus Gas Chromatographs of Changzhou Panna Instrument Co., Ltd.</i>
12/16/2021	MEE RL [2021] No. 591	<i>Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in Clarus 580, Clarus 590, Clarus 680 and Clarus 690 Gas Chromatographs of PerkinElmer Instrument (Suzhou) Co., Ltd.</i>
12/10/2021	MEE IL [2021] No. 564	<i>Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in 436i and 456i Gas Chromatographs of Shanghai Techcomp Scientific Instrument Co., Ltd.</i>

# IX. Nuclear Material Control and Physical Protection of Nuclear Facilities

## Nuclear Material License Verification and Approval

To advance the reform to “streamline administration and delegate power, improve regulation, and upgrade services” for nuclear material license verification and approval, NNSA has accepted and reviewed application documents for nuclear material licenses in

parallel and reduced the review period by 30 days. NNSA has conducted technical review and on-site inspection on nuclear material license applications of Shanghai Institute of Applied Physics, Chinese Academy of Sciences and CNNC High Energy Equipment (Tianjin) Co., Ltd. and completed the verification and approval procedures.

# X. Safety Regulation on Transportation of Radioactive Materials

In 2021, the transportation activities of radioactive materials were safely implemented without the occurrence of any nuclear and radiation accidents or incidents in China, and the ten-year evaluation of the *Regulation on the Administration of Transport Safety of Radioactive Materials* was completed.

In 2021, 4 certificates of approval for the design of transport containers for Category I radioactive materials (including 3 changes and renewals) were issued. One change to the manufacturing license of transport containers for Category I radioactive materials was approved. 11 transport containers designed and manufactured abroad for Category I radioactive materials (including 4 renewals and changes) were approved for use in China. Twenty nuclear and radiation safety analysis reports for the transportation of radioactive materials (including 4 changes and renewals) were approved. The regulatory approvals in the field of safety regulation on radioactive material transportation in 2021 are shown in



**Figure 24. LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Radiation Source Safety Regulation, Listening to the Ten-year Evaluation Report of the Regulation on the Administration of Transport Safety of Radioactive Materials**

Table 79.

In 2021, regulatory inspection activities on transport safety of radioactive materials are shown in Table 80. The regional offices of nuclear and radiation safety inspection conducted 1 regulatory inspection for transportation of radioactive materials. Four findings were identified, and four regulatory requirements were imposed.



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**Table 79. Major Regulatory Approvals for Radioactive Material Transportation in 2021**

Date	Document No.	Document Title
01/06/2021	NNSA [2021] No. 2	<i>Notice on Approving the Use of Nordion (Canada) Inc.'s R7006 and R7008 Transport Containers in the People's Republic of China</i>
01/15/2021	NNSA [2021] No. 9	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Cobalt Source (GY-20 Containers)</i>
02/08/2021	NNSA [2021] No. 26	<i>Notice on Approving the Use of BEATRICE Transport Containers and JANE Transport Containers in the People's Republic of China</i>
02/08/2021	NNSA [2021] No. 32	<i>Notice on Issuing the Design Approval of Transport Containers for QY4U013 Uranium Compound Powder to Nucleus Industry No.7 Research Design Institute</i>
02/09/2021	NNSA [2021] No. 34	<i>Notice on Approving the Renewal of the Design Approval for CNFC-HTR New Fuel Transport Containers</i>
03/24/2021	NNSA [2021] No. 55	<i>Notice on Approving the Renewal of Approval for Nuclear and Radiation Safety Analysis Report for Fuel Assemblies Transportation from Baotou to Qinshan Nuclear Power Base of China North Nuclear Fuel Company</i>
03/25/2021	NNSA [2021] No. 56	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Fresh-Fuel Assemblies from Baotou to Haiyang</i>
07/08/2021	NNSA [2021] No. 136	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transportation of Fuel Assemblies from Yibin to Daya Bay NPP and Ling'ao NPP of CNNC Jianzhong Nuclear Fuel Co., Ltd.</i>
07/08/2021	NNSA [2021] No. 137	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transportation of Fuel Assemblies from Yibin to Zhanjiang for PC Projects and PK Projects of CNNC Jianzhong Nuclear Fuel Co., Ltd.</i>
07/08/2021	NNSA [2021] No. 138	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transportation of Fuel Assemblies from Yibin to Yangjiang NPP of CNNC Jianzhong Nuclear Fuel Co., Ltd.</i>
07/08/2021	NNSA [2021] No. 139	<i>Notice on Approving the Use of RIA Transport Containers in the People's Republic of China</i>
07/08/2021	NNSA [2021] No. 140	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Domestic Transportation of Ir-192 and Se-75 (RIA Containers) Imported by Sichuan Chihengyuan Nuclear Technology Utilization Co., Ltd.</i>
07/08/2021	NNSA [2021] No. 141	<i>Notice on Approving the Use of Nordion (Canada) Inc.'s F-127-S Containers in the People's Republic of China</i>
07/22/2021	NNSA [2021] No. 157	<i>Notice on Approving the Renewal of the Validity Period of F-168 (F-168-X) Transport Containers for the Use in the People's Republic of China</i>
07/27/2021	NNSA [2021] No. 161	<i>Notice on Approving the Change of "Nuclear and Radiation Safety Analysis Report for Domestic Motor-rail Multimodal Transportation of PK Fuel Projects from Yibin to Shanghai/Zhanjiang" of CNNC Jianzhong Nuclear Fuel Co., Ltd.</i>

# Safety Regulation on Transportation of Radioactive Materials

continued

Date	Document No.	Document Title
07/27/2021	NNSA [2021] No. 163	<i>Notice on Approving the Change of “Nuclear and Radiation Safety Analysis Report for Domestic Motor-rail Multimodal Transportation of PC Fuel Projects from Yibin to Shanghai/Zhanjiang” of CNNC Jianzhong Nuclear Fuel Co., Ltd.</i>
07/30/2021	NNSA [2021] No. 168	<i>Notice on Approving the Use of UKT1B-25-Se75, NE24-42 and NE25-50 Transport Containers within the Territory of the People’s Republic of China</i>
07/30/2021	NNSA [2021] No. 169	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Domestic Road Transportation of Co-60 Radioactive Source (F147 Transport Container) Imported by China Isotope &amp; Radiation Corporation (CIRC)</i>
08/16/2021	NNSA [2021] No. 180	<i>Notice on Approving the Change of Contents in the Design Approval of RY-IA Spent Fuel Transport Containers</i>
08/20/2021	NNSA [2021] No. 183	<i>Notice on Approving the Use of SUK50 Transport Containers in the People’s Republic of China</i>
08/27/2021	NNSA [2021] No. 191	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Domestic Road Transportation of Ir-192, Se-75 and I-131 Radioactive Raw Materials Imported by Chengdu Gaotong Isotope Co., Ltd., CNNC</i>
09/21/2021	NNSA [2021] No. 210	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transportation of Fuel Assemblies from Baotou to Fuqing NPP of China North Nuclear Fuel Company</i>
09/21/2021	NNSA [2021] No. 211	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Fuel Assemblies Transport from Baotou to Qinshan Nuclear Power Base of China North Nuclear Fuel Company</i>
09/21/2021	NNSA [2021] No. 212	<i>Notice on Approving the Renewal of the Nuclear and Radiation Safety Analysis Report for Road Transportation of Fuel Assemblies from Daya Bay Wharf to Taishan NPP of Taishan Nuclear Power Joint Venture Co., Ltd.</i>
10/09/2021	NNSA [2021] No. 227	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Motor-Sea-Rail Multimodal Transportation of Spent Fuel of CGN Uranium Resources Co., Ltd.</i>
10/21/2021	NNSA [2021] No. 240	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transportation of (Russia-supplied) Fuel Assemblies from Manzhouli to Tianwan NPP of Jiangsu Nuclear Power Co., Ltd.</i>
10/26/2021	NNSA [2021] No. 242	<i>Notice on Approving the Treatment Scheme of Containers Loaded with UF<sub>6</sub> Exceeding its Maximum Loading</i>
11/11/2021	NNSA [2021] No. 256	<i>Notice on Approving the Renewal of the Design Approval for CNFC-3G New Fuel Transport Containers</i>
11/14/2021	NNSA [2021] No. 258	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Domestic Transportation of Co-60 Raw Material Import/Waste Source Export (F-168/F-168-X Containers) of Chengdu Gaotong Isotope Co., Ltd., CNNC</i>

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continued

Date	Document No.	Document Title
11/13/2021	NNSA [2021] No. 259	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Natural UF<sub>6</sub> Transportation of CNNC Shaanxi Uranium Enrichment Co., Ltd</i>
11/14/2021	NNSA [2021] No. 261	<i>Notice on Approving the Change of Design Approval of ENUN 24P Spent Fuel Transport Containers</i>
11/25/2021	NNSA [2021] No. 268	<i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transportation of Annular Fuel Test Assemblies (TK-C57 Container) from Baotou to Manzhouli of China North Nuclear Fuel Company</i>
11/25/2021	NNSA [2021] No. 269	<i>Notice on Approving the Change of the Approval for the Use of TK-C57 Containers Transporting Radioactive Materials</i>
12/20/2021	NNSA Letter [2021] No. 113	<i>Reply on Approving the Information Change of Manufacturing License for Transport Containers for Category I Radioactive Materials of CNNC Jiahua Nuclear Equipment Manufacturing Co., Ltd.</i>
12/20/2021	NNSA [2021] No. 279	<i>Notice on Approving the Use of YKTIB (U)-96-18, YKTIB (U)-96-18M, YKTIB (U)-96-7, and UK20 Transport Containers in the People's Republic of China</i>
12/21/2021	NNSA [2021] No. 280	<i>Notice on Approving the Renewal of the Validity Period and Increase of Quantity of GB/2773A Transport Containers for the Use in the People's Republic of China</i>

**Table 80. Regulatory Inspection Activities of Radioactive Material Transportation in 2021**

Starting Date	Item	Main Contents of Inspection
04/07/2021	Regulatory inspection on CNNC Lanzhou Uranium Enrichment Co., Ltd. for UF <sub>6</sub> transport safety	Transportation safety inspection
05/06/2021	Regulatory inspection on Chengdu Gaotong Isotope Co., Ltd., CNNC, for nuclear and radiation safety of radioactive source transport	Transportation safety inspection
06/11/2021	Witness of ZTIS transport container design and test of China Institute of Atomic Energy	Vessel test witness
06/21/2021	Regulatory inspection on transport container manufacturing in Luoyang Ship Material Research Institute	Vessel manufacturing inspection
07/08/2021	Regulatory inspection on filling of transport containers for Category II radioactive materials of Tianjin Pengxuan Environmental Protection Technology Co., Ltd.	Vessel design inspection
07/08/2021	Regulatory inspection on filling of transport containers for Category II radioactive materials of Tianjin Wanmu Radiation Protection Engineering Co., Ltd.	Vessel design inspection

## Safety Regulation on Transportation of Radioactive Materials

continued

Starting Date	Item	Main Contents of Inspection
07/09/2021	Regulatory inspection on the safety of transport and container for neutron sources for oil and gas field logging in China National Offshore Oil Corporation	Transportation safety inspection
09/23/2021	Regulatory inspection on transport container manufacturing in CNNC Jianzhong Nuclear Fuel Co., Ltd.	Vessel manufacturing inspection
10/11/2021	Witness of the design verification test of transport containers for radioactive materials in special forms of Chengdu Gaotong Isotope Co., Ltd., CNNC	Vessel design inspection
10/21/2021	Regulatory inspection on transportation safety of radioactive materials in Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.	Transportation safety inspection

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

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## XI. Regulation on Civil Nuclear Safety Equipment

### Regulatory Approvals

In 2021, NNSA received and reviewed a total of 157 organizations’ applications for civil nuclear safety equipment licenses, and approved 139 organizations’ applications, including 8 organizations’ new applications for licenses (see Table 81), 46 organizations’ applications for renewal (see Table 82) and 85 organizations’ applications for change (see Table 83). As of the end of 2021, a total of 225 organizations were licensed for the design,

manufacture, installation and non-destructive testing (NDT) of nuclear safety equipment.

In 2021, 53 organizations’ applications for registration of civil nuclear safety equipment import were received and reviewed, of which 36 applications were approved (see Table 84). As of the end of 2021, the total number of foreign organizations holding registration confirmations for design, manufacture, or NDT of civil nuclear safety equipment was 192.

**Table 81. Issuance of New Licenses for Civil Nuclear Safety Equipment in 2021**

Date	Document No.	Document Title
04/07/2021	NNSA [2021] No. 70	<i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Weihai Creditfan Ventilator Co., Ltd.</i>
04/07/2021	NNSA [2021] No. 71	<i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Cowin Valve Co., Ltd.</i>
04/16/2021	NNSA [2021] No. 83	<i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Zibo Torch Energy Co., Ltd.</i>
04/16/2021	NNSA [2021] No. 84	<i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Zhejiang Lunte Electromechanical Co., Ltd.</i>
08/30/2021	NNSA [2021] No. 190	<i>Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Wuxi Xitang Nuclear Equipment Co., Ltd.</i>
08/30/2021	NNSA [2021] No. 194	<i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Ningbo Auqi Auto-Instrument Equipment Co., Ltd.</i>



## Regulation on Civil Nuclear Safety Equipment

continued

Date	Document No.	Document Title
08/30/2021	NNSA [2021] No. 195	<i>Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Wuxi Paike New Materials Technology Co., Ltd.</i>
12/30/2021	NNSA [2021] No. 288	<i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Emerson Process Management (TIANJIN) Valves Co., Ltd.</i>

**Table 82. Approvals of License Renewal for Civil Nuclear Safety Equipment in 2021**

Date	Document No.	Document Title
01/26/2021	NNSA [2021] No. 15	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Neway Valve (Suzhou) Co., Ltd.</i>
01/26/2021	NNSA [2021] No. 16	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Dalian Deep BLUE PUMP Co., Ltd.</i>
01/26/2021	NNSA [2021] No. 17	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Nanfang Ventilator Co., Ltd.</i>
01/26/2021	NNSA [2021] No. 18	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Dongfang Electric (Wuhan) Nuclear Equipment Co., Ltd. and the Change of Its License Scope</i>
01/26/2021	NNSA [2021] No. 19	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Jiangsu Haida Pipe Fittings Group Company Ltd. and the Change of Its License Scope</i>
02/24/2021	NNSA [2021] No. 41	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Shanghai Automation Instrumentation Co., Ltd.</i>
03/31/2021	NNSA [2021] No. 59	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Lanzhou LS Heat Exchange Equipment Co., Ltd.</i>
03/31/2021	NNSA [2021] No. 60	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Angang Heavy Machine Co., Ltd.</i>
03/31/2021	NNSA [2021] No. 61	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Jiangsu Xinghe Valve Co., Ltd.</i>
03/31/2021	NNSA [2021] No. 62	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Pangang Group Chengdu Steel &amp; Vanadium Co., Ltd.</i>
04/01/2021	NNSA [2021] No. 64	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Changzhou Green Power Machinery Manufacturing Co., Ltd.</i>
04/02/2021	NNSA [2021] No. 65	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Shanghai Electric-KSB Nuclear Pumps and Valves Co., Ltd.</i>

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continued

Date	Document No.	Document Title
04/07/2021	NNSA [2021] No. 72	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Shanghai NO.1 Machine Tool Works Co., Ltd.</i>
04/07/2021	NNSA [2021] No. 73	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Fangda Carbon New Material Co., Ltd.</i>
04/07/2021	NNSA [2021] No. 74	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Installation License of China Energy Engineering Group Anhui No.2 Electric Power Construction Co., Ltd.</i>
04/16/2021	NNSA [2021] No. 85	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Yuan Cheng Cable Co., Ltd.</i>
07/05/2021	NNSA [2021] No. 135	<i>Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 9 Enterprises such as China First Heavy Industries Co., Ltd.</i>
08/24/2021	NNSA [2021] No. 186	<i>Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of HERMETIC-Pumps Dalian Co., Ltd.</i>
10/01/2021	NNSA [2021] No. 222	<i>Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 15 Enterprises such as Xi'an Nuclear Equipment Co., Ltd.</i>
10/29/2021	NNSA [2021] No. 244	<i>Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 3 Enterprises such as He Harbin Power Plant Valve Company Limited</i>
12/16/2021	NNSA [2021] No. 273	<i>Notice on Approving the Renewal of Civil Nuclear Safety Equipment Licenses of 2 Enterprises such as State Nuclear Power Automation System Engineering Company Ltd.</i>

**Table 83. Approvals of License Change for Civil Nuclear Safety Equipment in 2021**

Date	Document No.	Document Title
01/15/2021	NNSA [2021] No. 8	<i>Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Baoyin Special Steel Tube Co., Ltd.</i>
04/30/2021	NNSA [2021] No. 96	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for China-Kinwa Chuangchun High Technology Co., Ltd.</i>
04/30/2021	NNSA [2021] No. 97	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Harbin Electric Power Equipment Company Limited</i>
05/03/2021	NNSA [2021] No. 98	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shenzhen Woer Heat-Shrinkable Material Co., Ltd.</i>
05/11/2021	NNSA [2021] No. 102	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for State Nuclear Power Automation System Engineering Company Ltd.</i>

## Regulation on Civil Nuclear Safety Equipment

continued

Date	Document No.	Document Title
07/08/2021	NNSA [2021] No. 142	<i>Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Qingdao LS Heavy Machinery Equipment Co., Ltd.</i>
07/20/2021	NNSA [2021] No. 146	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Nuclear Power Institute of China</i>
07/20/2021	NNSA [2021] No. 147	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shenzhen Auto Electric Power Plant Co., Ltd.</i>
07/20/2021	NNSA [2021] No. 148	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Zhejiang Sanfang Control Valve Co., Ltd.</i>
07/20/2021	NNSA [2021] No. 150	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Sunway Co., Ltd.</i>
09/05/2021	NNSA [2021] No. 200	<i>Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Jiangsu Xinyang Industrial Co., Ltd.</i>
11/17/2021	NNSA [2021] No. 263	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shenzhen Woer Heat-Shrinkable Material Co., Ltd.</i>
11/17/2021	NNSA [2021] No. 264	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Henan Senyuan Electric Co., Ltd.</i>
11/19/2021	NNSA [2021] No. 266	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for China Nuclear Power Technology Research Institute Co., Ltd.</i>
01/10/2021	NNSA Letter [2021] No. 4	<i>Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Dongfang Boiler Co., Ltd.</i>
01/10/2021	NNSA Letter [2021] No. 5	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 6 Enterprises such as ShanDong BeiChen Mechanical &amp; Electrical Equipment Co., Ltd.</i>
01/19/2021	NNSA Letter [2021] No. 9	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Jiangsu Shangshang Cable Group Co., Ltd.</i>
01/22/2021	NNSA Letter [2021] No. 11	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 2 Enterprises such as Shanghai Apollo Machinery Co., Ltd.</i>
02/08/2021	NNSA Letter [2021] No. 15	<i>Reply on the Application for Change of Scope of Activities of Emergency Diesel Generator Set Design License for China Nuclear Power Design Co., Ltd. (Shenzhen)</i>

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continued

Date	Document No.	Document Title
03/15/2021	NNSA Letter [2021] No. 26	<i>Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Nuclear Power Institute of China</i>
03/18/2021	NNSA Letter [2021] No. 29	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 5 Enterprises such as Wuhan Heavy Industry Casting and Forging Co., Ltd.</i>
04/15/2021	NNSA Letter [2021] No. 36	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for China Nuclear Control System Engineering Co., Ltd.</i>
05/06/2021	NNSA Letter [2021] No. 51	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 7 Enterprises such as Hengyang Valin Steel Tube Co., Ltd.</i>
08/19/2021	NNSA Letter [2021] No. 82	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 7 Enterprises such as Shanghai Electric Nuclear Power Equipment Co., Ltd. and Registration Confirmation of 5 Overseas Enterprises such as Meggitt Safety Systems Inc.</i>
08/25/2021	NNSA Letter [2021] No. 83	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Sunway Co., Ltd.</i>
08/25/2021	NNSA Letter [2021] No. 84	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Jiangsu Shentong Valve Co., Ltd.</i>
08/30/2021	NNSA Letter [2021] No. 85	<i>Notice on Approving the Change of Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Anhui Cable Co., Ltd.</i>
09/24/2021	NNSA Letter [2021] No. 91	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 5 Enterprises such as Nuclear Power Institute of China and Registration Confirmation of Overseas Organization such as Mitsubishi Electric Corporation</i>
10/26/2021	NNSA Letter [2021] No. 99	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 3 Enterprises such as Jiangsu Power Equipment Co., Ltd.</i>
11/11/2021	NNSA Letter [2021] No. 103	<i>Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 6 Enterprises such as CITIC Heavy Industries Co., Ltd.</i>
11/25/2021	NNSA Letter [2021] No. 107	<i>Notice on Approving the Change of Civil nuclear safety equipment Licenses of 15 Enterprises such as China Nuclear Power Design Co., Ltd. (Shenzhen) and Registration Confirmation of 2 Overseas Enterprises such as LOWSERVE POMPES SAS</i>
12/05/2021	NNSA Letter [2021] No. 110	<i>Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Yangzhou Huayu Pipe Fitting Co., Ltd.</i>

# Regulation on Civil Nuclear Safety Equipment

continued

Date	Document No.	Document Title
12/31/2021	NNSA Letter [2021] No. 116	<i>Notice on Approving the Change of Civil nuclear safety equipment Licenses of 6 Enterprises such as Dongfang Electric Co., Ltd. and Registration Confirmation of Overseas Organization such as Framatome Grenoble</i>

**Table 84. Issuance of Registration Confirmation for Civil Nuclear Safety Equipment Activities to Overseas Enterprises in 2021**

Date	Document No.	Document Title
02/22/2021	NNSA [2021] No. 13	<i>Notice on Issuing the Registration Confirmations to 7 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Joint Stock Company Scientific Research and Design Institute for Energy Technologies ATOMPROEKT of Russia</i>
03/19/2021	NNSA [2021] No. 51	<i>Notice on Issuing the Registration Confirmation to ZPA Pecky, a.s., an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities</i>
04/02/2021	NNSA [2021] No. 66	<i>Notice on Issuing the Registration Confirmations to 8 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Japan Steel Works ME Inc.</i>
07/14/2021	NNSA [2021] No. 145	<i>Notice on Issuing the Registration Confirmations to 14 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including LLC "TMK-INOX" of Russia</i>
09/17/2021	NNSA [2021] No. 207	<i>Notice on Issuing the Registration Confirmation to Joint Stock Company "Atomenergoproekt" of Russia, an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities</i>
10/13/2021	NNSA [2021] No. 230	<i>Notice on Issuing the Registration Confirmation to L'UNION DES FORGERONS of France, an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities</i>
11/11/2021	NNSA [2021] No. 252	<i>Notice on Issuing the Registration Confirmation to ETTORE CELLA S.p.A. of Italy, an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities</i>
12/24/2021	NNSA [2021] No. 281	<i>Notice on Issuing the Registration Confirmations to 3 Foreign Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including THERMOCOAX SAS of France</i>

XI

## 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 304 batches of safety



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inspection application documents (for customs and opening package inspection) (including 130 for mechanical equipment, 150 for electrical equipment, and 24 for combined mechanical and electrical equipment), among which, 249 were released, 55 were rejected, and 38 were opened for inspections.

## Regulatory Inspection

The Northern China Regional Office of Nuclear and Radiation Safety Inspection conducted 30 comprehensive inspections

(see Table 85) and 22 special inspections (see Table 86) of domestic enterprises according to the regulatory inspection program and plan, 354 issues were identified and 366 regulatory requirements were imposed. The Regional Office promptly raised requirements for correcting the problems discovered in these inspections, and organized experts to review and perform special inspections on major non-conformance that affect nuclear safety. In 2021, the quality of design, manufacture, installation, and non-destructive testing of civil nuclear safety equipment is under control.

**Table 85. Comprehensive Inspection on Civil Nuclear Safety Equipment of Domestic Enterprises in 2021**

Starting Date	Inspected Enterprises
02/03/2021	China Institute of Atomic Energy
03/15/2021	Shanghai Feizhou Electric Co., Ltd.
03/23/2021	Institute of Nuclear and New Energy Technology, Tsinghua University
03/23/2021	China First Heavy Industries Co., Ltd.
03/23/2021	Dalian Deep BLUE PUMP Co., Ltd.
03/29/2021	Jiangsu Suzhong Switch Factory Co., LTD
04/12/2021	ABB Xiamen Low Voltage Equipment Co., Ltd.
04/13/2021	China Nuclear Power Design Co., Ltd. (Shenzhen) (China Nuclear Power Technology Research Institute Co., Ltd.)
04/14/2021	Jindun Fans Holding Co., Ltd.
04/26/2021	Shanghai Electric Power Generation Equipment Co., Ltd.
04/26/2021	Jiangsu Huaguan Electric Appliance Group Co., Ltd.
04/27/2021	Jiangsu Huayang Pipe & Fittings Co., Ltd.
05/11/2021	Jilin Sino-Italy Nuclear Piping Components Manufacturing Co., Ltd.
05/11/2021	Shandong Hualing Cable Co., Ltd.
05/18/2021	Nuclear Power Institute of China
05/24/2021	Changzhou Power Station Auxiliary Equipment Co., Ltd.
05/31/2021	CNNC Xi'an Nuclear Instrument Co., Ltd.

## Regulation on Civil Nuclear Safety Equipment

continued

Starting Date	Inspected Enterprises
06/15/2021	Shenyang Xintong Power Plant Equipment Manufacturing Co., Ltd.
06/21/2021	China-Kinwa Changchun High Technology Co., Ltd.
07/12/2021	Dongfang Electric Co., Ltd.
07/27/2021	Yantai Taihai Manoir Nuclear Power Equipment. Co., Ltd.
07/27/2021	TBEA Hengyang Transformer Co., Ltd.
09/27/2021	Shanghai Nagamori Machinery Co., Ltd.
10/12/2021	State Nuclear Power Plant Service Company
10/18/2021	Baoding Tianwei Baobian Electric Co., Ltd.
10/19/2021	Shanghai Electric Nuclear Power Group Co., Ltd.
10/19/2021	Dongfang Electric (Guangzhou) Heavy Machinery Co., Ltd.
10/20/2021	Taiyuan Heavy Industry Co., Ltd.
10/26/2021	Shanghai Electric Nuclear Power Equipment Co., Ltd.
12/21/2021	Harbin Electric Co., Ltd.

**Table 86. Special Inspection of Civil Nuclear Safety Equipment of Domestic Enterprises in 2021**

Starting Date	Inspected Enterprises
03/30/2021	China Nuclear Industry Huaxing Construction Company Limited
03/25/2021	Wuxi Huaertai Machinery Manufacture Company Ltd.
04/01/2021	Zhejiang Shangfeng SPECIAL Blower Industrial Co., Ltd.
04/12/2021	Shanghai Apollo Machinery Co., Ltd.
04/19/2021	Shaanxi Diesel Heavy Industry Co., Ltd.
04/27/2021	China Nuclear Industry 23 Construction Co., Ltd.
05/12/2021	China First Heavy Industries Co., Ltd.
05/26/2021	Erzhong (Deyang) Heavy Equipment Co., Ltd.
06/02/2021	Shanghai Liangong Valve Factory Co., Ltd.
06/02/2021	Shangwu Valve Co., Ltd.
06/07/2021	Shanghai NO.1 Machine Tool Works Co., Ltd.
06/07/2021	Shanghai Automation Instrumentation Co., Ltd.
06/15/2021	CGN Inspection Technology Co., Ltd.
07/07/2021	Yangzhou Electric Power Equipment Manufacture Factory Co., Ltd.
07/12/2021	Dongfang Electric (Wuhan) Nuclear Equipment Co., Ltd.
07/14/2021	LISEGA Pipe Support Technologies (Shanghai) Co., Ltd.

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continued

Starting Date	Inspected Enterprises
09/06/2021	Jiamusi Electric Machine Co., Ltd.
09/06/2021	Nuclear Power Institute of China
09/08/2021	Changzhou Green Power Machinery Manufacturing Co., Ltd.
09/13/2021	Guangdong Zhengchao Electric Co., Ltd.
09/15/2021	China Nuclear Power Design Co., Ltd. (Shenzhen)
09/15/2021	China Techenergy Co., Ltd. (China Nuclear Power Design Co., Ltd.)

## XII. Regulation on Electromagnetic Radiation Environment

### Regulatory Approvals

In 2021, eight electromagnetic radiation construction projects, including THE Baihetan-

Zhejiang  $\pm 800$ kV UHV DC transmission project, were approved for EIA (see Table 87).

**Table 87. Regulatory Approvals for EIA of Electromagnetic Radiation Construction Projects in 2021**

Date	Document No.	Document Title
01/10/2021	MEE App [2021] No. 1	<i>Approval Reply on the Environmental Impact Report for the Nanchang-Changsha 1,000kV UHV AC Power Transmission and Transformation Project</i>
04/21/2021	MEE App [2021] No. 33	<i>Approval Reply on the Environmental Impact Report for Fujian-Guangdong Networking Project</i>
06/16/2021	MEE App [2021] No. 46	<i>Approval Reply on the Environmental Impact Report Form for the Ground-based Measurement and Control Management System and the Gateway Station for the “Zhongxing-26” Satellite Project</i>
06/16/2021	MEE App [2021] No. 48	<i>Approval Reply on the Environmental Impact Report for Phase II of the Qinhuangdao Ship Traffic Management System Renovation and Expansion Project of Hebei Maritime Safety Administration</i>
06/21/2021	MEE App [2021] No. 51	<i>Approval Reply on the Environmental Impact Report for the 750kV Third Line Project from Guolong, Qinghai to Wusheng, Gansu</i>
06/23/2021	MEE App [2021] No. 52	<i>Approval Reply on the Environmental Impact Report for the 500kV Delivery Project of Suwalong Hydropower Station in Sichuan Province</i>
09/21/2021	MEE App [2021] No. 86	<i>Approval Reply on the Environmental Impact Report for the Ground-based Application System and Ground-based Calibration Station for the “Zhongxing-26” Satellite Project</i>
11/06/2021	MEE App [2021] No. 95	<i>Approval Reply on the Environmental Impact Report for Baihetan-Zhejiang <math>\pm 800</math>kV UHV DC Transmission Project</i>

## 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 64

EIA documents on nuclear and radiation construction projects approved by the competent ecological environment authorities at all levels in 12 provinces (autonomous regions) including Anhui, Shaanxi, Guangxi, Fujian, Jilin, Henan, Guizhou and Xinjiang.



# XIII. Radiation Environmental Monitoring

NNSA continued to strengthen the operation and management of the national radiation environment monitoring network, guiding ecological environmental authorities of all provinces (autonomous regions and municipalities) to overcome the impact of the epidemic, conscientiously implement the management measures for operation of automatic stations, and the data acquisition rate for real-time monitoring by automatic stations is stable at over 97%. The marine environmental radioactivity monitoring was strengthened, and a program was worked out to make overall plans for marine environmental radioactivity monitoring capacity development. The supervisory monitoring of nuclear facilities was strengthened, and the reviews of and approvals for site selections and construction plans of the supervisory monitoring systems were completed for Xudabao NPP and Zhangzhou NPP. The quality management for radiation environment monitoring was strengthened. Organizations that have failed in the quality assessment were organized to conduct self-examination and rectification. The Radiation Environment Monitoring Technology Center was organized

to provide technical audits and training make-up examinations, conduct in-depth monitoring of the front line and provide one-on-one technical assistance to monitoring technicians of relevant organizations, effectively improving the professional ability level of radiation environment monitoring personnel. The formulation and revision of radiation environmental monitoring standards were accelerated, four standards such as *General Regulation of Quality Assurance for Ionizing Radiation Monitoring* were issued, and research was conducted for compilation of monitoring method standards for krypton-85 in air and gross  $\beta$  of liquid effluent.

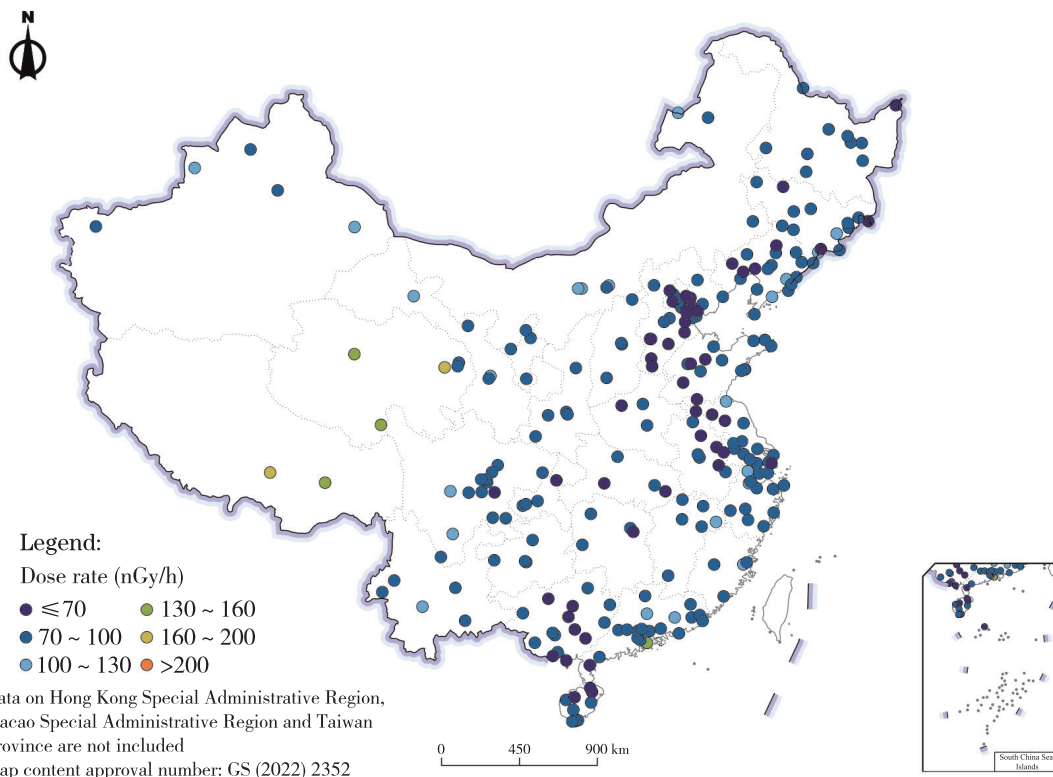
## Ionizing Radiation Environment Monitoring

In 2021, the nationwide environmental ionizing radiation level was within the range of background fluctuations. The dose rates and accumulated doses of  $\gamma$ -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

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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  $\alpha$  and gross  $\beta$  in urban centralized drinking water source and underground drinking water were lower than the guidance values specified in the

*Standards for Drinking Water Quality* (GB 5749-2006). The activity concentrations of natural 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 in seawater were significantly lower than the limits specified in the *Sea Water Quality Standard* (GB 3097-1997). The activity concentrations of natural occurring radionuclides in the soil were at the background level, and no abnormal activity concentration of artificial radionuclides was detected.



**Figure 26. Schematic Diagram for Distribution of Dose Rates of  $\gamma$ -Radiation Measured by National Automatic Radiation Environment Monitoring Stations in 2021**

# Radiation Environmental Monitoring

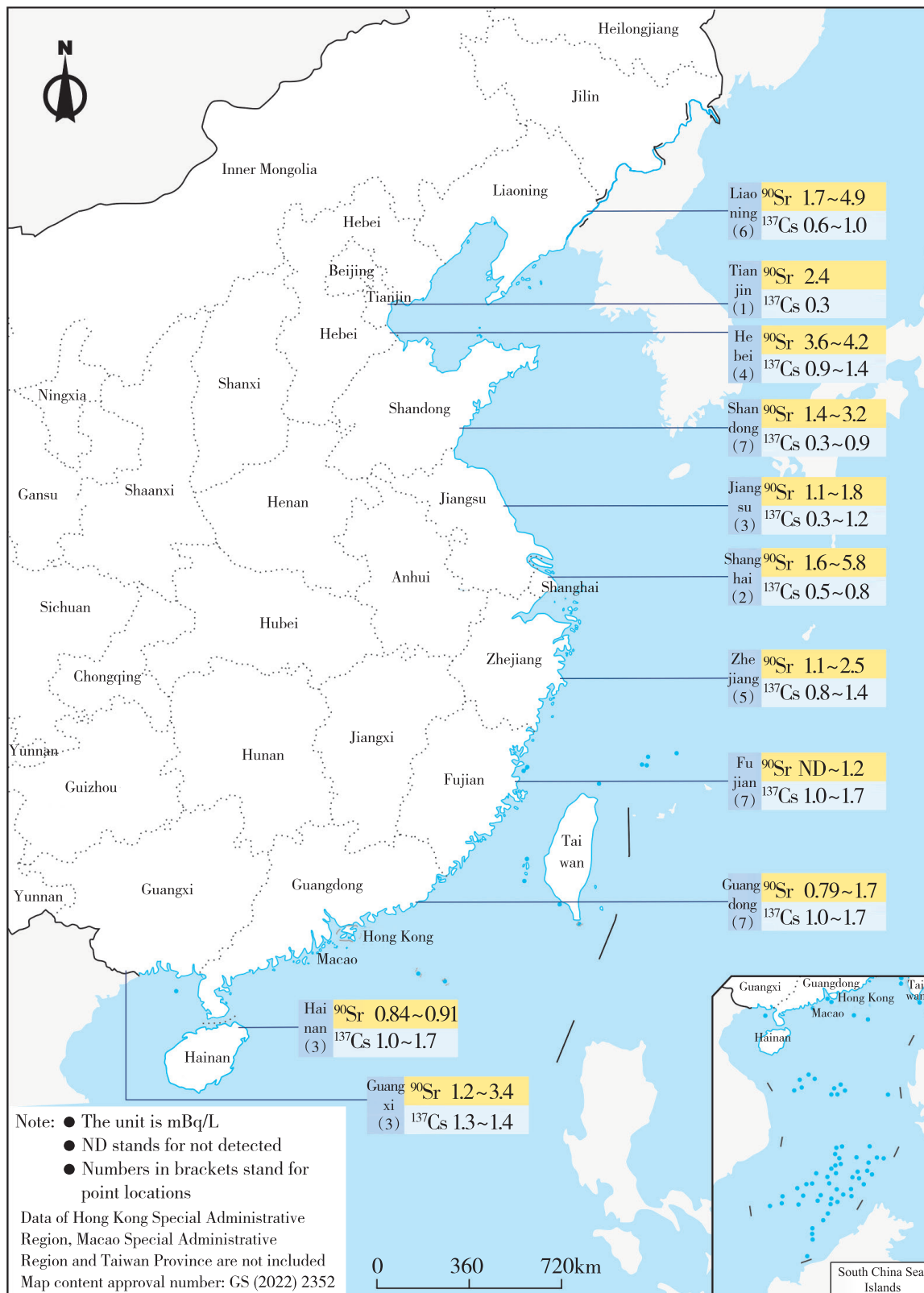


Figure 27. Distribution of Strontium-90 and Cesium-137 Activity Concentrations in Offshore Marine Area of China in 2021

## 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  $\gamma$ -radiation were generally within the fluctuation range over the years, and so were the activity concentrations of radionuclides related to activities of such facilities in air, water, soil, organisms and other environmental media. The assessment results indicate that the radiation doses exposure to the public caused by the operation of the above nuclear facilities were far lower than the national limits, without impact on environmental safety and public health.

## Ionizing Radiation Environmental Monitoring Around Uranium Mining and Metallurgy Facilities

Around uranium mining and metallurgy facilities, the dose rates of  $\gamma$ -radiation were generally within the fluctuation range over the years, and so were the activity concentrations of radionuclides in air, water and soil related to activities of such facilities.



*Figure 28. SUN Jinlong, Party Secretary of the Ministry of Ecology and Environment, Surveying at the Radiation Monitoring and Evaluation Laboratory of Northern China Regional Office of Nuclear and Radiation Safety Inspection*

## Electromagnetic Radiation

In 2021, the environmental electromagnetic radiation levels at the state control points for electromagnetic radiation environment monitoring in 31 provinces (autonomous regions and municipalities), and the electromagnetic radiation levels at the electromagnetic environment 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

## Regulation of Nuclear Facility Emergency Preparation

In 2021, the regional offices of nuclear and radiation safety inspection completed the supervision and evaluation on the comprehensive emergency exercises carried out on the site of 10 nuclear facility operating organizations such as Daya Bay NPP, Hongyanhe NPP, Fangchenggang NPP, Tianwan NPP, etc. In response to the problems found in the special inspection and supervision/evaluation, the regional offices of nuclear and radiation safety inspection proposed requirements for nuclear safety management.

## Approval of On-site Emergency Plans

NNSA reviewed and approved 6 on-site nuclear accident emergency plans developed for Yangjiang NPP, Hongyanhe NPP, Ningde NPP, Daya Bay NPP, Civil Nuclear Facilities of China Institute of Atomic Energy and the

HTGR demonstration project at Shidao Bay NPP.

## 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 Guizhou, Jilin, Henan, Hubei and Qinghai 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 main 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

NNSA established the nuclear and radiation accident emergency training classes of the Ministry of Ecology and Environment (National Nuclear Safety Administration), and organized the Ministry of Ecology and Environment to conduct joint exercises with Changjiang NPP in Hainan (on-site and off-site nuclear accident emergency exercises) and Qinghai (radiation accident emergency exercises). The Northeast China Regional Office of Nuclear and Radiation Safety Inspection organized the implementation of the *Work Plan for Long-Term Response to Nuclear and Radiation Environmental Safety Risks in Border Areas of Northeast China*. It also organized the revision of the implementation plan of regular and emergency monitoring of environmental radiation in border areas. In addition, the regional offices of nuclear and radiation safety inspection implemented the 24-hour emergency duty system, and



*Figure 29. JIANG Guang, Deputy Administrator of National Nuclear Safety Administration, Director General of the Nuclear and Radiation Emergency Office of MEE, and Director General of the Department of Nuclear Facility Safety Regulation, Participating in the Nuclear Accident Emergency Exercise Conducted Jointly with the Hainan Nuclear Emergency Coordination Committee and Changjiang NPP*

organized nuclear and radiation emergency duty during major events, holidays and festivals. It strengthened the operation and maintenance management of nuclear and radiation emergency command and dispatch platform, and carried out special emergency communication exercises every month to ensure the high sustainability of emergency response capability.

## XV. Personnel Qualification

In 2021, the *Rules on the Qualification of Operators of Civil Nuclear Facilities* were published and implemented, and the supporting documents *Notice on Matters Related to Qualification of Operators of Civil Nuclear Facilities*, *Requirements for Licensing Examination of Operators of Research Reactors (Trial)* and *Requirements for Licensing Examination of Operators of Nuclear Fuel Reprocessing Facilities (Trial)* were issued to ensure the smooth and orderly implementation of the rules. The qualification management of personnel in charge of special processes was enhanced, the development of examination resources was promoted, the improvement of examination content was promoted, the service to enterprises was strengthened, and all the necessary examinations are guaranteed to be conducted. The qualification management of registered nuclear safety engineers was optimized, and relevant suggestions were proposed in cooperation with the Ministry of Human Resources and Social Security. The training was carried out in depth, and the *Professional Training Plan of the National Nuclear Safety Administration in 2021* was published. The

standardized management of administrative law enforcement certificates for nuclear and radiation safety regulators was promoted, and the *Syllabus and Exam Question Bank for Administrative Law Enforcement for Nuclear and Radiation Safety Regulators* was compiled.

### Qualification of Civil Nuclear Reactor Operators

In 2021, 3 Civil Nuclear Reactor Operator Qualification Approval Committee Meetings were convened, and civil nuclear facility operator licenses were issued in 3 batches (see Table 88) by NNSA to 1,286 operators in total, including 1,114 NPP operators, 119 civil research reactor operators and 53 reprocessing facility operators.

As of December 2021, there were 2,784 persons in total holding NPP operator licenses (see Table 89), including 1,680 persons holding senior operator licenses and 1,104 holding operator licenses. There were 273 persons holding research reactor operator licenses (see Table 90), including

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135 persons holding senior operator licenses and 138 holding operator licenses. There were also 53 persons holding reprocessing facility

operator licenses (see Table 91), including 9 persons holding senior operator licenses and 44 holding operator licenses.

**Table 88. Regulatory Approvals for Civil Nuclear Facility Reactor Operator License in 2021**

Date	Document Title
02/07/2021	<i>Notice on Issuing the First Batch of Licenses for Nuclear Reactor Operators of Civil Nuclear Facilities in 2021</i>
08/19/2021	<i>Notice on Issuing the Second Batch of Licenses for Operators of Civil Nuclear Facilities in 2021</i>
10/19/2021	<i>Notice on Issuing the Third Batch of Licenses for Operators of Civil Nuclear Facilities in 2021</i>

**Table 89. Statistics on NPP Operator Licenses**

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
CNNC Nuclear Power Operation Management Co., Ltd.	Qinshan NPP	34	16	50
	Qinshan Phase II NPP Units 1 and 2	53	24	77
	Qinshan Phase II NPP Units 3 and 4	59	28	87
	Qinshan Phase III NPP Units 1 and 2	64	40	104
Daya Bay Nuclear Power Operations and Management Co., Ltd.	Fangjiashan NPP Units 1 and 2	64	24	88
	Daya Bay NPP	66	23	89
	Ling'ao NPP Units 1 and 2	66	27	93
Jiangsu Nuclear Power Co., Ltd.	Ling'ao NPP Units 3 and 4	61	26	87
	Tianwan NPP Units 1 and 2	79	76	155
	Tianwan NPP Units 3 and 4	69	43	112
Fujian Ningde Nuclear Power Co., Ltd.	Tianwan NPP Units 5 and 6	38	64	102
	Ningde NPP Units 1 and 2	72	45	117
Liao Ning Hong Yan He Nuclear Power Co., Ltd.	Ningde NPP Units 3 and 4	64	42	106
	Hongyanhe NPP Units 1 and 2	72	30	102
	Hongyanhe NPP Units 3 and 4	59	35	94
Yangjiang Nuclear Power Co., Ltd.	Hongyanhe NPP Units 5 and 6	41	29	70
	Yangjiang NPP Units 1 and 2	49	23	72
	Yangjiang NPP Units 3 and 4	57	26	83
	Yangjiang NPP Units 5 and 6	47	19	66

continued

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
Fujian Fuqing Nuclear Power Co., Ltd.	Fuqing NPP Units 1 and 2	67	43	110
	Fuqing NPP Units 3 and 4	71	47	118
	Fuqing NPP Units 5 and 6	33	57	90
Guangxi Fangchenggang Nuclear Power Co., Ltd.	Fangchenggang NPP Units 1 and 2	54	33	87
	Fangchenggang NPP Units 3 and 4	41	43	84
Hainan Nuclear Power Co., Ltd.	Changjiang NPP Units 1 and 2	69	38	107
Sanmen Nuclear Power Co., Ltd.	Sanmen NPP Units 1 and 2	84	41	125
Shandong Nuclear Power Company Ltd.	Haiyang NPP Units 1 and 2	50	54	104
Taishan Nuclear Power Joint Venture Co., Ltd.	Taishan NPP Units 1 and 2	71	46	117
Huaneng Shandong Shidao Bay Nuclear Power Co., Ltd.	Units 1 and 2 of HTGR Demonstration Project	26	62	88
<b>Total</b>		<b>1,680</b>	<b>1,104</b>	<b>2,784</b>

**Table 90. 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)	8	10	18
	Nuclear Criticality Safety Test Facility in Pilot Plant	5	18	23
	Prototype Miniature Neutron Source Reactor (PMNSR)	3	5	8
	China Experimental Fast Reactor (CEFR)	22	14	36
	China Advanced Research Reactor (CARR)	9	11	20
	Zero-power Assembly of MNSR	3	4	7
Nuclear Power Institute of China	High Flux Engineering Test Reactor (HFETR)	25	21	46
	Minjiang Test Reactor (MJTR)	7	11	18
	China Pulsed Reactor (CPR)	6	2	8
	Critical Assembly of High Flux Engineering Test Reactor	5	3	8
	18-5 Critical Facility	7	3	10

continued

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
Institute of Nuclear and New Energy Technology, Tsinghua University	5MW Low Temperature Nuclear Heating Test Reactor (NHR-5)	14	11	25
	10MW High Temperature Gas-cooled Test Reactor (HTR-10)	21	6	27
Shenzhen University	Shenzhen MNSR	0	2	2
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)	0	15	15
Total		135	138	273

**Table 91. 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 2021, NNSA published 4 batches of civil nuclear safety equipment NDT personnel examination plans and organized 5 NDT personnel examination centers authorized to hold 23 examinations, and issued civil nuclear safety equipment NDT personnel qualification certificates in 8 batches (see Table 92),

approving a total of 1,911 persons and 2,198 items.

As of December 2021, a total of 6,456 persons held 15,390 civil nuclear safety equipment NDT personnel qualification certificates, including 896 advanced (Level III) certificates, 11,477 intermediate (Level II) certificates and 3,017 primary (Level I) certificates.



**Table 92. Regulatory Approvals for Civil Nuclear Safety Equipment NDT Personnel Qualification in 2021**

Date	Document Title
02/01/2021	<i>Notice on Issuing the First Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
03/31/2021	<i>Notice on Issuing the Second Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
04/29/2021	<i>Notice on Issuing the Third Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
05/25/2021	<i>Notice on Issuing the Fourth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
07/22/2021	<i>Notice on Issuing the Fifth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
09/30/2021	<i>Notice on Issuing the Sixth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
11/04/2021	<i>Notice on Issuing the Seventh Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>
12/03/2021	<i>Notice on Issuing the Eighth Batch of Qualification Certificates for Civil Nuclear Safety Equipment NDT Personnel in 2021</i>

### Qualification of Civil Nuclear Safety Equipment Welders

In 2021, NNSA issued 4 batches of examination plans for civil nuclear safety equipment welders and authorized 13 civil nuclear safety equipment welder examination centers to hold 37 exams. Eight batches of civil nuclear safety equipment welder qualification certificates were issued, and a

total of 1,621 persons and 1,912 certificates were approved (see Table 93).

As of December 2021, a total of 4,487 persons held 10,804 civil nuclear safety equipment welding operation qualification certificates, and a total of 2,341 persons held 2,959 civil nuclear safety equipment welder qualification certificates.

**Table 93. Regulatory Approvals for Civil Nuclear Safety Equipment Welder Qualification in 2021**

Date	Document Title
02/01/2021	<i>Notice on Issuing the First Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>
03/31/2021	<i>Notice on Issuing the Second Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>

continued

Date	Document Title
04/29/2021	<i>Notice on Issuing the Third Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>
05/25/2021	<i>Notice on Issuing the Fourth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>
07/22/2021	<i>Notice on Issuing the Fifth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>
09/30/2021	<i>Notice on Issuing the Sixth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>
11/04/2021	<i>Notice on Issuing the Seventh Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>
12/03/2021	<i>Notice on Issuing the Eighth Batch of Qualification Certificates for Civil Nuclear Safety Equipment Welders in 2021</i>

## Qualification of Registered Nuclear Safety Engineers

Considering the limitation by the COVID-19 epidemic, the 2021 National Unified Examination for Qualification of Registered Nuclear Safety Engineers was canceled. In 2021, NNSA conducted 4 batches of registration of nuclear safety engineers (see Table 94) and approved 411 applications,

including 286 initial registrations, 71 renewals and 54 with changed registered organizations.

As of December 2021, a total of 4,640 applicants nationwide had obtained the certificates of the Registered Nuclear Safety Engineer Qualification, and 2,140 registered nuclear safety engineers were working in 249 organizations in China.

**Table 94. Regulatory Approvals for Qualification of Registered Nuclear Safety Engineers in 2021**

Date	Document Title
02/25/2021	<i>Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration and Registration Renewal in 2021 (Batch 1)</i>
07/30/2021	<i>Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration and Registration Renewal in 2021 (Batch 2)</i>
08/25/2021	<i>Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration and Registration Renewal in 2021 (Batch 3)</i>
11/20/2021	<i>Notice on Publishing the List of Registered Nuclear Safety Engineers Approved for Initial Registration, Registration Renewal and Registration Change in 2021 (Batch 4)</i>

### **Training for Staff in Charge of Nuclear and Radiation Safety Supervision and Inspection**

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 2021*. Following such plan, we carried out 22 trainings, 9 online and 13 offline. The series of training served 1,842 trainees, and outputted many training audios and videos in 118 subjects and 18 training summaries (including feedbacks).

## XVI. International Cooperation

### Strengthening of International Communication

In May 2021, at the invitation of Rafael Mariano Grossi, IAEA Director General, HUANG Runqiu, Minister of Ecology and Environment delivered a video speech to the Asia-Pacific Online Roundtable on Control of Plastic Pollution by Nuclear Technology, elaborating China's regulatory policies and achievements in marine plastic waste prevention/control and nuclear technology application.

In 2021, YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, exchanged ideas (via 19 letters) with the heads of nuclear safety regulatory agencies of multiple countries, including sending letters to congratulate the commercial operation of Karachi Nuclear Power Plant Unit 2, Pakistan, and the 10<sup>th</sup> anniversary of the establishment of Korea Nuclear Safety and Security Commission, actively sustaining high-level exchanges with other countries on nuclear safety supervision.

### Continuing to Promote Multilateral Cooperation

Cooperation with the International Atomic Energy Agency (IAEA). NNSA assigned its staff to participate in the establishment and revision of important mechanisms, regulations and standards under IAEA, including meetings convened by the IAEA Commission on Safety Standards, IAEA Nuclear Safety Standards Committee, the Steering Committee of the IAEA Global Nuclear Safety and Security Network, the Steering Committee of the IAEA Regulatory Cooperation Forum, as well as International Conference on Nuclear Safety on a Decade of Progress after Fukushima-Daiichi. Experts recommended by NNSA continued to serve as members of the IAEA Commission on Safety Standards, members of the Steering Committee of the IAEA Global Nuclear Safety and Security Network, and liaison officers of the Irradiation Safety Information Management System. NNSA organized and participated in a series of institutional meetings and activities the IAEA sponsored or convoked.

Cooperation with the OECD Nuclear

Energy Agency. In March, TANG Bo, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Power Safety Regulation, attended the special on-line meeting of the Policy Group of the Multinational Design Evaluation Programme (MDEP) for nuclear power plants. NNSA carried out the preparatory work for the Fifth Conference of Multinational Design Evaluation Programme for nuclear power plants as scheduled. It organized and participated in the meetings convoked by the Policy Group, Technical Steering Committee, Transition Team, Hualong One Task Force, VVER Task Force, EPR Task Force, Supplier Supervision Task Force as well as meetings by sub-task forces under the Programme, and participated in the major activities regarding the Programme at multiple levels to promote the smooth transition of the Programme to the next stage. NNSA continued to 1) assign persons to serve as Technical Secretary of OECD Nuclear Energy Agency, 2) support persons to serve as members of the NEA Committee on Nuclear Regulatory Activities and the NEA Committee on the Safety of Nuclear Installations, and 3) organize and participate in the activities initiated by these committees and their task forces.

### Consolidation of Bilateral Cooperation

NNSA promoted cooperation with developed

nuclear countries in nuclear safety steadily. In November, TANG Bo, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Power Safety Regulation, attended the on-line meeting of the China-UK Nuclear Safety Cooperation Steering Committee. NNSA assigned its staff to attend the 25<sup>th</sup> Meeting of the Nuclear Sub-Committee of the Chinese and Russian Prime Ministers' Regular Exchange Committee, the China-French Bilateral Exchange Meeting on Nuclear Safety, the China-US PUNT Training Meeting, and the China-Italy Special Training Meeting on Nuclear Waste Management.

NNSA made efforts to strengthen cooperation in nuclear safety with the Belt and Road Initiative countries. It attended the preparatory meeting of the International Atomic Energy Agency's Comprehensive Assessment Team on Nuclear and Radiation Safety Supervision in Pakistan. It kept communication with the nuclear safety regulatory bodies of 12 Belt and Road Initiative countries that have signed agreements.

NNSA made efforts to consolidate regional cooperation in nuclear safety. In November and December, JIANG Guang, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Facility Safety Regulation, attended the 13<sup>th</sup> China-Japan-Korea Senior Officials On-line Meeting on



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Nuclear Safety Supervision to share the latest progress in nuclear safety.

### Performance of Its Obligations under International Conventions

The ninth review conference on implementation of the *Convention on Nuclear Safety* (CNS) was launched. NNSA participated in the officials meetings and organizational meetings regarding the selection of the officials of Country Group on the Convention Implementation. NNSA prepares the CNS implementation national

reports.

The seventh review conference on implementation of the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management* progressed orderly. NNSA raised questions on the reports proposed by other State Parties, carried out the preparatory work for the fourth extraordinary conference of State Parties, and conducted the questionnaire on the 20<sup>th</sup> anniversary of the Joint Convention implementation.

## XVII. Milestones

On January 4, the *Measures for the Administration of Safety Licensing for Radioisotopes and Radiation-emitting Devices* and the *Measures for the Administration of Transport Safety Licensing for Radioactive Materials* (MEE Decree No. 20) was issued.

On January 27, the *Rules on the Qualification of Operators of Civil Nuclear Facilities* (MEE Decree No. 22) was issued.

On January 29, the validity period renewal of operation licenses of Minjiang Test Reactor, China Pulsed Reactor, Critical Assembly of High Flux Engineering Test Reactor and 18-5 Critical Facility was approved.

On February 27, HUANG Runqiu, Minister of Ecology and Environment, and ZHANG Bo, Chief Engineer, surveyed the Eastern China Regional Office of Nuclear and Radiation Safety Inspection and held a symposium.

On March 24, the meeting on establishment of the National Technical Committee of Nuclear Safety Standardization was convened.

On March 26, TANG Bo, Deputy Administrator of National Nuclear Safety Administration and

Director General of the Department of Nuclear Power Safety Regulation, attended the special on-line meeting of the Policy Group of the Multinational Design Evaluation Programme for nuclear power plants.

On March 31, the construction licenses for Changjiang NPP Units 3 and 4 in Hainan were issued.

On April 14, the operation license for Tianwan NPP Unit 6 was issued.

On May 7, the *General Regulation of Quality Assurance for Ionizing Radiation Monitoring* (GB 8999-2021) was issued.

On May 13, the Review Opinion on Siting of Lufeng NPP Units 5 and 6 in Guangdong was issued.

On May 18, HUANG Runqiu, Minister of Ecology and Environment delivered a speech via video to the IAEA Asia-Pacific Online Roundtable on Control of Plastic Pollution by Nuclear Technology, elaborating China's regulatory policies and achievements in marine plastic waste prevention and control and nuclear technology application.

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On May 19, the construction licenses for Tianwan NPP Units 7 and 8 were issued. The leaders of China and Russia witnessed the kick-off of China-Russia nuclear energy cooperation project via video call.

On May 19, 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 at the Ministry of Ecology and Environment, inspected at the Northern China Regional Office of Nuclear and Radiation Safety Inspection.

On June 11-14, YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, inspected at Taishan NPP.

On July 1, the construction license for Changjiang multipurpose small modular reactor science and technology demonstration project in Hainan Province was issued.

On July 4-8, YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, held the expert symposium at Taishan NPP.

On July 27, the construction licenses for Xudapu NPP Units 3 and 4 were issued.

On August 12, the construction license for Hot Cell facility construction project for China Nuclear Power Technology Research Institute

Co., Ltd. was issued.

On August 20, the operation license for the HTGR demonstration project at Shidao Bay NPP was issued.

On August 31, the National Key Laboratory for Simulation Analysis and Verification in Nuclear and Radiation Safety Review for Environmental Protection has passed the acceptance conducted by the Ministry of Ecology and Environment.

On September 3, the renewal of the operation license of Qinshan NPP Unit 1 was approved.

On September 10, YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, inspected at the Shidao Bay NPP.

On September 11, YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, inspected at the Shandong NPP and CAP1400 demonstration project.

On September 12, the construction license for CGN Advanced Fuel Development Center was issued.

On October 12-13, YE Min, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, inspected at Taishan NPP.

On November 1, *Load Combination and Design Criteria for Structural Analysis of*

*Spent Fuel Transport Cask* (GB/T 41024-2021) was issued.

On November 4, the operation license for Fuqing NPP Unit 6 was issued.

On November 23, TANG Bo, Deputy Administrator of National Nuclear Safety Administration and Director General of the Department of Nuclear Power Safety Regulation, attended the on-line meeting of the China-UK Nuclear Safety Cooperation Steering Committee.

From November 30 to December 1, JIANG Guang, Deputy Administrator of National Nuclear Safety Administration and Director of the Department of Nuclear Facility Safety Regulation, attended the 13<sup>th</sup> China-Japan-Korea Senior Officials On-line Meeting on

Nuclear Safety Supervision.

On December 8, the Ministry of Ecology and Environment (NNSA) and Qinghai Provincial Government launched their first-ever joint radiation accident emergency exercise.

On December 10, China's first Nuclear and Radiation Safety Supervision Exhibition Hall was built up.

On December 27, SUN Jinlong, Party Secretary of the Ministry of Ecology and Environment, ZHAI Qing, Vice Minister of Ecology and Environment, and ZHANG Bo, Chief Engineer, et al. went to South-western China Regional Office of Nuclear and Radiation Safety Inspection for expression of gratitude and guidance.









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