



# 2023 Annual Report

**National Nuclear Safety Administration**

**The People's Republic of China**









# Message from the Administrator

The year 2023 is pivotal for materializing the “14<sup>th</sup> Five-Year Plan”. It marks a milestone for ecology and environment administration, as well as a witness of vigorous and progressive development of nuclear safety regulation. Over the past year, guided by the Rational, Coordinated and Balanced Nuclear Safety Strategy and under the firm leadership of the Leading Party Members Group of Ministry of Ecology and Environment (MEE), we have resolutely implemented the decisions and deployments of the central government. Adhering to an independent, professional, rigorous, efficient, open, and transparent approach to regulation, we strove for progress while ensuring stability and made innovations on the basis of good practices, adhered to strict measures and law-based regulation, consolidated the foundation and improved capability, promoted development through persistent overall coordination, and completed various tasks that ensured nuclear and radiation safety.

**First, we made innovations on the basis**



**of good practices to enhance regulatory efficiency.** Through concurrent review and assurance-oriented oversight, we ensured the smooth advancement of key projects like CAP1400, Hualong One, and high-temperature gas-cooled reactors (HTGR). We strictly regulated first-ever reactor projects like the thorium-based molten salt experimental reactor and the medical isotope experimental reactor. A quarterly nuclear safety situation analysis mechanism was established to strengthen situation analysis and risk assessment. A centralized feedback analysis mechanism was established to discuss on critical and challenging issues, explore the causes, and develop specific measures. A dialogue mechanism was established to solve problems efficiently by high-level exchanges with nuclear-related group companies. A mechanism on exchanges among regional offices of nuclear and radiation safety inspection was established to share dynamic information and inspection experience. Inter-

departmental collaboration was strengthened, realizing mutual accreditation for nuclear safety equipment licensing qualification review and information sharing with the State Administration of Science, Technology and Industry for National Defense. On-site inspection of nuclear safety equipment and non-compliance management was enhanced to continuously deepen the qualification management of special equipment operators. Licenses for radioactive waste disposal facilities were approved as scheduled to continuously enhance radioactive waste treatment and disposal capabilities.

**Second, we enforced strict regulation to control risks effectively.** We launched a special action to strengthen nuclear safety management in the nuclear power industry jointly with the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) and the National Energy Administration (NEA), in order to urge the enterprises to fulfill their primary responsibilities and improve safety management. The enterprises were required to handle nuclear facility incidents and anomalies by a scientific and prudent approach, strengthen feedback on common issues, and take active moves to steadily advance the settlement of issues such as fuel assemblies and water intake safety of nuclear power plants (NPPs). Key research reactor licensees were urged to strengthen technical modifications and improve management. Strict

law enforcement actions were launched for warning and deterrence, with administrative penalties imposed for five violations and regulatory talk conducted with three enterprises. In addition, timely notification and feedback were given to the group companies.

**Third, we consolidated the foundation to improve system capability.** Efforts were made to promote the incorporation of prevention and control of radioactive pollution and electromagnetic pollution into the ecology and environment code, solidify good practices, and deepen institutional design. The improvement of nuclear safety rules and standards was continuously promoted, with 11 regulations, standards, and guides issued throughout the year. The interim assessment of the Fourteenth Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control was completed. Key projects like regional emergency supply warehouse for nuclear and radiation monitoring were advanced. Nuclear safety research was promoted, with major technological needs for nuclear safety regulation identified, research on key technologies conducted, and the construction of test verification benches and laboratories advanced as planned. Marine radiation environment monitoring capability was enhanced, with two national marine radiation monitoring bases established. Information-based nuclear safety regulation was strengthened, with the big data center platform for nuclear power safety taking



shape. Our official website was optimized, and publicity was enhanced regarding its main responsibilities and work. The first National Security Education Day (April 15) event was held in Beijing for better public awareness about nuclear safety.

**Fourth, we made overall coordination and strengthened international cooperation.**

We have been actively implementing international conventions. We participated in the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS), and the implementation of China received high praise from the contracting parties. Cooperation and exchanges with the International Atomic Energy Agency (IAEA) and the OECD Nuclear Energy Agency (NEA) were deepened; international talents promotion was strengthened; efforts were successful in turning the Nuclear and Radiation Safety Center of the MEE into the first IAEA Collaborating Center for nuclear and radiation safety globally. Exchanges with nuclear safety regulatory bodies in the US, France, Russia, and the UK were enhanced, and strengthening China-Russia and China-France bilateral communication mechanisms were strengthened. The China-Pakistan Nuclear Safety Cooperation Center was established, and on-site joint oversight was conducted at the Karachi NPP and Chashma NPP, aiming to provide technical support for nuclear safety in countries along the “Belt and

Road”.

In 2023, the 55 operating nuclear power units, 18 in-service civil research reactors, 19 operating civil nuclear fuel cycle facilities and 33 radioactive waste storage and treatment/disposal facilities in the Chinese mainland maintained good safety records, which are free of incidents or accidents at or above Level 2 as per the International Nuclear and Radiological Event Scale (INES). The quality of nuclear facilities under construction was well assured. The safety of 169,600 radioactive sources in use and 289,700 sets of radiation-emitting devices were well controlled. As the administrator of the National Nuclear Safety Administration (NNSA), I would like to express heartfelt gratitude to all colleagues contributing to nuclear and radiation safety and to friends from all walks of life who care about and support nuclear and radiation safety.

The year 2024 marks the 10<sup>th</sup> anniversary of the proposition of the holistic approach to national security and China’s approach to nuclear security, as well as the 40<sup>th</sup> anniversary of nuclear safety regulation in China. Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, we will fully implement the spirit of the 20<sup>th</sup> CPC National Congress and the second plenary session of the 20<sup>th</sup> CPC Central Committee, implement the arrangement made at the National

Conference on Ecological and Environmental Protection, and firmly shoulder the political responsibility of ensuring nuclear safety. Specifically, NNSA will build a stringent nuclear safety responsibility system, foster a modern nuclear safety regulatory system compatible with the development of nuclear industry, advance the special action to comprehensively strengthen nuclear safety management in the nuclear power industry, strengthen nuclear safety regulation for key projects, continuously deepen the experience feedback system, intensify efforts to promote nuclear safety research, further enhance professional training

to improve regulatory capabilities, promote public awareness of nuclear safety, and actively participate in international nuclear safety cooperation, thus ensuring high-quality development of the nuclear industry by high-level nuclear safety!

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

DONG Baotong

May 5, 2024

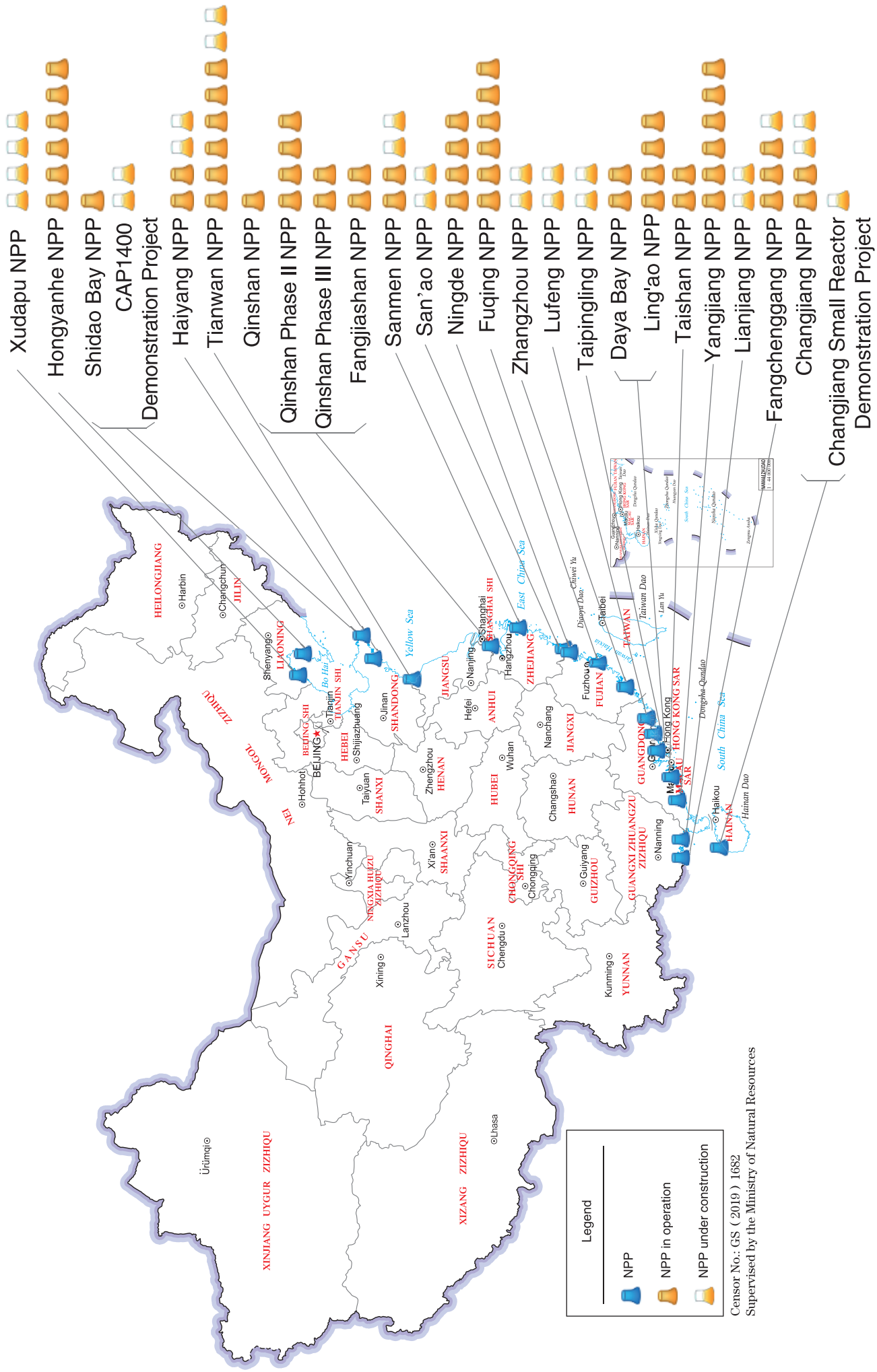




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A Map of Nuclear Power Plants in Chinese Mainland (as of December 31, 2023)



# I. Introduction

In 2023, China's civil nuclear facilities continued to perform well in terms of operation safety and construction quality, and no incidents or accidents at or above Level 2 as per the International Nuclear and Radiological Event Scale (INES) occurred in operating nuclear power plants (NPPs), research reactors, fuel cycle facilities, radioactive waste storage and treatment/disposal facilities, or radioactive material transportation. All operational and construction events of nuclear facilities were handled properly.\*

The quality of the radiation environment was generally favorable in 2023. There was no evident change in the level of environmental ionizing radiation around nuclear facilities, and in the radiation level around electromagnetic radiation emission facilities.

## Rule of Law

NNSA fostered the revision of the *Law of the People's Republic of China on the Prevention and Control of Radioactive Pollution* and the

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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.

legislation on the prevention and control of electromagnetic radiation pollution. NNSA coordinated with the National People's Congress (NPC) in including these revision and legislation efforts in the compilation of the ecology and environment code, continuously refining the relevant provisions of the draft code, and conducting in-depth system demonstrations and pilot projects. The revision of the *Regulation on the Administration of Transport Safety of Radioactive Articles* was promoted, with over twenty special studies organized, resulting in a preliminary report on the revision. The development and revision of rules and standards were continued, with 11 rules and standards issued.

## Capacity Building

NNSA continued the capacity building of the National Nuclear and Radiation Safety Technology R&D Base. Two ministry-level laboratories have been completed, the construction of five test benches was steadily advanced, the Hualong One simulator has taken shape, and China's first thermal risk assessment laboratory for reprocessing facilities and the structure ultimate safety

laboratory for nuclear facility structures. Sharing of independent audit calculation software and intra-industrial safety analysis software was achieved. The big data center platform for nuclear power safety has taken shape. The National Environmental Protection Engineering Technology Center for Radioactivity and Environmental Risk Control passed the acceptance inspection. The construction of regional emergency supply warehouses for nuclear and radiation monitoring was advanced, with the feasibility study report demonstrated by experts and submitted to the National Development and Reform Commission (NDRC) for approval.

## Strengthening Regulation

NNSA organized campaign to comprehensively strengthen nuclear safety management in nuclear power industry, pushing enterprises to take primary responsibilities, thoroughly identify risks and hidden hazards, and effectively implement corrective actions, so as to pursue absolute safety of nuclear power. The system of rules, standards, and regulatory documents for nuclear safety of NPPs and research reactors was continuously improved. Research was made for optimizing the NPP environmental impact assessment system and nuclear safety licensing work in the siting phase. Regulation was strengthened for the construction, commissioning, and beginning stage of operation of first-ever and new type reactors.

Special regulatory task force was established for the CAP1400 demonstration project and special working group for review and oversight of the HTGR. A concurrent review and assurance-oriented oversight model was established to efficiently conduct review and oversight work. Strict regulation was carried out for new type reactors such as thorium-based molten salt experimental reactor and the medical isotope experimental reactor. NNSA and NEA jointly issued the *Notice on Further Strengthening Management of Contractors for Nuclear Power Plants under Construction*, aiming to ensure engineering quality of NPP projects under construction.

A special inspection on discrepancy between management documents and practices in terms of front-end nuclear fuel cycle facilities was conducted. Decommissioning of old nuclear facilities and treatment of legacy radioactive waste were accelerated, and the safe disposal of radioactive waste was promoted. NNSA issued documents jointly with relevant departments to strictly control the online purchase and sale of radioactive isotopes and ray generation devices and eliminate safety risks. NNSA collaborated with the Ministry of Industry and Information Technology (MIIT) and the State Administration for Market Regulation (SAMR) in carrying out a comprehensive inspection of electromagnetic radiation environment monitoring at communication base stations in various provinces (autonomous regions



and municipalities directly under the central government). Forty-one power transmission and transformation construction projects were randomly selected for on-site verification if the environmental protection facilities were designed, constructed and put into operation synchronously with the main work, and if self-inspection of the environmental protection facilities was carried out upon project completion. NNSA adopted a strict approach and handled violations of laws and regulations seriously by utilizing means such as administrative penalties, warning talks, and urging improving actions according to law.

O&M management of the national radiation environment monitoring network was strengthened, and efforts were made to promote the building of on-site radiation environment supervisory monitoring systems for new nuclear facilities. Nuclear emergency regulation of civil nuclear facilities was tightened. NNSA completed regulatory inspections on emergency preparations as well as regulatory evaluation on the on-site comprehensive emergency exercises conducted before the initial fueling of Unit 1 of the CAP1400 demonstration project, and CNNC Lanzhou Uranium Enrichment Co., Ltd.'s new production capacity project during the "14<sup>th</sup> Five-Year Plan" period. Issues arising in the safety regulation of civil nuclear materials were summarized, and suggestions were proposed. The first national survey on natural disaster risks for civil nuclear facilities

was completed.

### Technical Support

In 2023, the Nuclear and Radiation Safety Center (NSC) of MEE provided comprehensive technical support for nuclear and radiation safety regulation. The NSC handled 4,822 tasks, participated in 703 inspections, and produced 2,581 technical outputs. NSC diligently conducted safety reviews of first-ever and new type reactors, provided support in establishing special regulatory task forces for CAP1400 and the HTGR, organized concurrent reviews, completed the review of preliminary safety analysis report for the medical isotope experimental reactor, continued the review of the small modular reactor (SMR) in Changjiang, and initiated the development of safety review principles for modular molten salt reactors (MSRs). Safety records for key nuclear facilities were established, and an index system for nuclear facility safety evaluation was formed. Key thematic studies were deepened, and nuclear safety situation analysis activities and experience feedback analysis meetings were conducted. Regulation of nuclear safety equipment was strengthened, and strict license reviews and safety inspections of imported nuclear safety equipment were conducted.

In 2023, the National Marine Environmental Monitoring Center (NMEMC) was formally

included in the technical support framework of NNSA. NMEMC took the responsibilities of the technical support center for national nuclear emergency marine radiation monitoring, participated in the formulation of top-level emergency response documents like the *Nuclear Emergency Response Plan of the Ministry of Ecology and Environment/ National Nuclear Safety Administration*, and supported the optimization and adjustment of national-level nuclear emergency professional technical support teams. NMEMC organized marine radiation environment monitoring within its jurisdiction, and incorporated such data into the *Bulletin of Marine Ecology and Environment Status of China*. NMEMC also provided marine-related technical support for over 20 coastal nuclear power plants (sites) of China.

In 2023, the China Nuclear Safety and Environmental Culture Promotion Association (CNSECPA) further improved its organizational structure and established an expert committee. CNSECPA promoted the formulation and issuance of group standards. It fostered the development of a nuclear safety culture assessment promotion mechanism jointly with the regional offices of nuclear and radiation safety inspection of the MEE. CNSECPA assessed nuclear power safety risks and civil nuclear safety equipment identification test institutions, and organized meetings for feedback and warning education relating to civil nuclear safety equipment.

It strengthened public communication, organized and planned themed reports on nuclear safety culture development, nuclear safety law development, and frontline nuclear safety practices, and held events such as the “National Security Education Day” (April 15) public communication seminar and the nuclear power industrial equipment exhibition.

In 2023, the Radiation Monitoring Technical Center (RMTC) of MEE strengthened the operation management of the national radiation environment monitoring network, and issued the annual national radiation environment monitoring plan. RMTC guided provincial radiation environment monitoring agencies in implementing annual national radiation environment quality monitoring and regulatory monitoring of nuclear facilities under prioritized regulation by the state. RMTC provided special technical guidance for operation and maintenance of Automatic Radiation Environment Monitoring Stations in various provinces, and released real-time monitoring data from 368 automatic radiation environment monitoring stations nationwide. RMTC summarized and analyzed national radiation environment monitoring data, conducted quarterly assessments of the national radiation environment monitoring situation, and prepared dozens of reports including the *National Radiation Environment Quality Report*, providing strong support for nuclear and radiation safety regulation. Strict monitoring quality control was conducted,



including the formulation of the *Quality Assurance Plan for National Radiation Environment Monitoring*, the implementation of the 2023 national radiation environment monitoring quality assessment, and innovative on-site assessment by certified radiation environment monitoring personnel. Research investment was increased to support the full operationalization of key laboratories.

### International Cooperation

NNSA made continuous efforts to advance cooperation with international organizations such as the IAEA, the OECD NEA, and the International Commission on Radiological Protection (ICRP). The IAEA signed a cooperation agreement with the NSC in Beijing, and designated the NSC as IAEA's first-ever Collaborating Center for Nuclear and Radiation Safety in the world. Representatives were sent to participate in institutional meetings at various levels in IAEA, conferences of the Multinational Design Evaluation Programme, meetings of Hualong One Task Force, annual meetings of ICRP, and the United Nations Scientific Committee on the Effects of Atomic Radiation, by which NNSA contributed to global nuclear safety

improvement. Bilateral cooperation was further consolidated. NNSA actively promoted nuclear safety cooperation with countries with advanced nuclear industry, such as the United States, France, Russia, as well as South Korea, and deepened cooperation with countries along the "Belt and Road" such as Pakistan, Nigeria, Thailand, Singapore, and Indonesia. Cooperation on nuclear and radiation safety with Hong Kong SAR and Macau SAR was also strengthened. The tasks in relation to the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the *Convention on Nuclear Safety* were successfully completed, and the implementation of China were recognized by contracting parties, with one good practice and eight good performances identified.

Additionally, NNSA optimized its website layout, with an electronic library of rules and standards and a database of regulating objects added. NNSA maintained its WeChat public account and website information as ever, organized and promoted a series of thematic reports on high-quality development of nuclear safety, and conducted extensive public outreach to enhance public communication.

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

### Nuclear Safety Polices and Plans

A quarterly nuclear safety situation analysis system was established to grasp the overall situation and trend. Responsibility fulfillment was promoted from the management level. Nuclear safety situation was summarized and reported to the superior authority. Important information was made available to national high-end think tanks in conducting research on topics related to high-quality nuclear safety development. Special studies were conducted on subjects such as strategies for regulating AI safety in the nuclear sector and the implications of criminalizing environmental impact assessment fraud for nuclear safety. Efforts were made to strengthen links with industry and enhance information exchange. NNSA conducted interim assessment for the *Fourteenth Five-Year Plan for Nuclear*

*Safety and Radioactive Pollution Prevention and Control* in collaboration with the NDRC and other ministries and commissions. Assessment report was compiled and submitted based on self-assessment results of local competent authorities for ecology and environment and nuclear-related enterprises and institutions.

### Development/Revision of Rules and Standards

Throughout the past year, 11 rules and standards were issued, including one departmental rule, two national standards, five MEE standards, and three guides, as detailed in Table 1. The National Nuclear Safety Expert Commission completed 28 reviews on rules and standards, as detailed in Table 2.

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

**Table 1. List of Nuclear and Radiation Safety Rules and Standards Issued in 2023**

| No. | Name   | Category           | Code            | Document No.               | Issue Date |
|-----|--|--------------------|-----------------|----------------------------|------------|
| 1   | <i>Site Evaluation for Nuclear Installations</i>   | Departmental rules | HAF101-2023     | NNSA [2023] No. 38         | 02/27/2023 |
| 2   | <i>Requirements for Environmental Radiation Monitoring around Near Surface Disposal Site of Radioactive Solid Waste</i>                                    | Standards          | GB/T 15950-2023 | MEE Bulletin [2023] No. 10 | 02/02/2023 |
| 3   | <i>Cylinders for the Transport of Uranium Hexafluoride</i>   | Standards          | GB/T 42343-2023 | MEE Bulletin [2023] No. 10 | 02/02/2023 |
| 4   | <i>Determination of Lead-210 in Water - Resin Separation- <math>\beta</math> Counter Method</i>  | Standards          | HJ 1323-2023    | MEE Bulletin [2023] No. 39 | 12/05/2023 |
| 5   | <i>Determination of Tritium and Carbon-14 in Biological Samples - Tube Furnace Oxidation Combustion Method</i>   | Standards          | HJ 1324-2023    | MEE Bulletin [2023] No. 39 | 12/05/2023 |
| 6   | <i>Radiation Safety and Protection of Radioactive Logging</i>  | Standards          | HJ 1325-2023    | MEE Bulletin [2023] No. 40 | 12/05/2023 |
| 7   | <i>Technical Specifications for Acceptance of Environmental Protection Facilities for Completed Construction Projects - Nuclear Technology Application</i> | Standards          | HJ 1326-2023    | MEE Bulletin [2023] No. 40 | 12/05/2023 |
| 8   | <i>Safety Requirements for Near Surface Disposal of Disused Radioactive Sources</i>  | Standards          | HJ 1336-2023    | MEE Bulletin [2023] No. 46 | 12/26/2023 |
| 9   | <i>Management of Modifications to Nuclear Power Plants</i>   | Guides             | HAD103/14-2023  | NNSA [2023] No. 25         | 02/09/2023 |
| 10  | <i>Management of Radioactive Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education</i>                     | Guides             | HAD401/16-2023  | NNSA [2023] No. 26         | 02/09/2023 |
| 11  | <i>Near Surface Disposal Facilities for Radioactive Waste: Emergency Preparedness and Response of Licensees</i>  | Guides             | HAD002/09-2023  | NNSA [2023] No. 70         | 04/28/2023 |



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**Table 2. List of Nuclear and Radiation Safety Rules and Standards Reviewed by the National Nuclear Safety Expert Commission in 2023**

| No. | Name  | Category           | Development/<br>Revision | Status        | Meeting                   |
|-----|---|--------------------|--------------------------|---------------|---------------------------|
| 1   | <i>Measures on the Management of Radiation Environment Protection of Radioactive Associated Mines (NORM) (on trial)</i>                         | Departmental rules | Development              | Second review | The second symposium      |
| 2   | <i>Regulations for Effluents and Radiation Environment Monitoring</i>   | National standards | Revision                 | First review  | The third symposium       |
| 3   | <i>Regulations for Disposal of Solid Radioactive Wastes in Rock Cavities</i>  | National standards | Revision                 | First review  | The fourth symposium      |
|     |   |                    |                          | Second review | The thirteenth symposium  |
| 4   | <i>The Regulation for Radiation Safety and Protection of Particle Accelerators</i>  | National standards | Revision                 | First review  | The fourth symposium      |
|     |   |                    |                          | Second review | The seventeenth symposium |
| 5   | <i>Regulations for Radiation Environment Protection of Decommissioning of Uranium Mining and Milling Facilities</i>                             | National standards | Revision                 | First review  | The seventh symposium     |
| 6   | <i>Regulations for Effluents and Radiation Environment Monitoring</i>   | National standards | Revision                 | Second review | Q2 regular meeting        |
| 7   | <i>Safety Requirements for Near Surface Disposal of Disused Radioactive Sources</i>   | MEE standards      | Development              | First review  | The fourth symposium      |
|     |   |                    |                          | Second review | Q2 regular meeting        |
| 8   | <i>Monitoring Method for Electromagnetic Radiation of Radar</i>   | MEE standards      | Development              | First review  | The fourth symposium      |
|     |   |                    |                          | Second review | Q2 regular meeting        |
| 9   | <i>Regulation for Residual Radionuclide Activity Levels in Soil of Decommissioning Site of Nuclear Facility</i>                                 | MEE standards      | Revision                 | Second review | Q1 regular meeting        |
| 10  | <i>Technical Guidelines for Environmental Impact Assessment - Format and Content of Environment Impact for Nuclear Facility Decommissioning</i> | MEE standards      | Development              | Second review | Q1 regular meeting        |

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

continued

| No. | Name   | Category      | Development/<br>Revision | Status          | Meeting                   |
|-----|--|---------------|--------------------------|-----------------|---------------------------|
| 11  | <i>Determination of Lead-210 in Water - Resin Separation- <math>\beta</math> Counter Method</i>                      | MEE standards | Development              | Second review   | Q1 regular meeting        |
| 12  | <i>Determination of Tritium and Carbon-14 in Biological Samples - Tube Furnace Oxidation Combustion Method</i>       | MEE standards | Development              | Second review   | Q1 regular meeting        |
| 13  | <i>Safety Requirements of Lifting and Retention Devices for Shipping Cask Used to Transport Radioactive Material</i> | MEE standards | Development              | Second review   | Q2 regular meeting        |
| 14  | <i>In-Service Inspection in Nuclear Power Plants</i>   | Guides        | Revision                 | First review    | The eighth symposium      |
|     |  |               |                          | Second review   | The fifteenth symposium   |
| 15  | <i>Operating Experience Feedback for Nuclear Fuel Cycle Facilities</i>   | Guides        | Development              | First review    | The eighth symposium      |
|     |  |               |                          | Second review   | The nineteenth symposium  |
| 16  | <i>Aging Management for Nuclear Power Plants</i>   | Guides        | Revision                 | First review    | The seventh symposium     |
|     |  |               |                          | Second review   | The fifteenth symposium   |
| 17  | <i>Evaluation of Seismic Hazards for Nuclear Power Plants</i>  | Guides        | Revision                 | First review    | The thirteenth symposium  |
|     |  |               |                          | First review II | Q4 regular meeting        |
| 18  | <i>Radiation Protection During Commissioning and Operation of Nuclear Power Plants</i>                               | Guides        | Revision                 | First review    | The seventeenth symposium |
| 19  | <i>Periodic Safety Review for Nuclear Power Plants</i>   | Guides        | Revision                 | First review    | Q4 regular meeting        |
| 20  | <i>Operating Limits and Conditions for Research Reactors</i>   | Guides        | Development              | First review    | Q4 regular meeting        |

## Nuclear Safety Culture

NNSA organized various activities for nuclear safety culture development, and reviewed application documents of industry standards. These efforts include but are not limited to organizing nuclear safety culture training courses and internal exchanges and discussions in the regulatory system; publishing a theoretical article *Building a Nuclear Safety Culture with Chinese*

*Characteristics and Leading the Innovative Development of Nuclear Safety Work in the New Era*; conducting pilot regulatory assessment of nuclear safety culture supported by regional offices of nuclear and radiation safety inspection; and participating in the meeting of the Working Group on Leadership and Safety Culture of the Committee on Nuclear Regulatory Activities (CNRA) of OECD/NEA.



### III. Safety Regulation on Nuclear Power Plants

In 2023, there are 55 nuclear power units in operation and 26 nuclear power units under construction in China. A total of 22 operational events and five construction events were reported by nuclear power plant licensees, and no radioactive events endangering public and environmental safety occurred in the nuclear power plants in operation. The monitoring results indicate that the integrity of the three physical barriers in all the nuclear power plants remained intact throughout the year.

In 2023, siting permission was granted for Zhejiang San'ao NPP Units 3 and 4, Guangxi Fangchenggang NPP Units 5 and 6, Guangxi Bailong NPP Units 1 and 2, Zhejiang Jinqimen NPP Units 1 and 2, and Shandong Zhaoyuan NPP Phase I project of China General Nuclear Power Corporation (CGN), and construction licenses were issued for Guangdong Lianjiang NPP Units 1 and 2 and Liaoning Xudapu NPP Units 1 and 2.

The operation data of the nuclear power plants in China in 2023 are shown in Table 3.

**Table 3. Operation Data of Nuclear Power Plants in China in 2023**

| NPP Name          | Nuclear Electricity (TWh) | Unit | Unified Unit No. | Rated Power (MWe) | Nuclear Electricity by Unit (TWh) | Load Factor (%) | Unit Capacity Factor (%) |
|-------------------|---------------------------|------|------------------|-------------------|-----------------------------------|-----------------|--------------------------|
| Qinshan           | 2.85                      | 1    | CN01             | 350               | 2.85                              | 93.01           | 94.68                    |
| Qinshan Phase II  | 22.47                     | 1    | CN04             | 670               | 5.82                              | 99.11           | 99.97                    |
|                   |                           | 2    | CN05             | 670               | 5.36                              | 91.28           | 94.99                    |
|                   |                           | 3    | CN14             | 670               | 5.52                              | 94.02           | 95.56                    |
|                   |                           | 4    | CN15             | 670               | 5.78                              | 98.46           | 99.96                    |
| Qinshan Phase III | 11.95                     | 1    | CN08             | 728               | 5.73                              | 89.81           | 91.74                    |
|                   |                           | 2    | CN09             | 728               | 6.23                              | 97.62           | 100.00                   |

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continued

| NPP Name   | Nuclear Electricity (TWh) | Unit | Unified Unit No. | Rated Power (MWe) | Nuclear Electricity by Unit (TWh) | Load Factor (%) | Unit Capacity Factor (%) |
|------------|---------------------------|------|------------------|-------------------|-----------------------------------|-----------------|--------------------------|
| Fangjiasan | 18.31                     | 1    | CN24             | 1089              | 8.89                              | 93.18           | 94.29                    |
|            |                           | 2    | CN25             | 1089              | 9.42                              | 98.79           | 100.00                   |
| Daya Bay   | 15.15                     | 1    | CN02             | 984               | 8.70                              | 100.88          | 99.64                    |
|            |                           | 2    | CN03             | 984               | 6.46                              | 74.93           | 74.25                    |
| Ling'ao    | 33.70                     | 1    | CN06             | 990               | 8.24                              | 95.04           | 95.53                    |
|            |                           | 2    | CN07             | 990               | 7.28                              | 83.89           | 84.56                    |
|            |                           | 3    | CN12             | 1086              | 9.41                              | 98.89           | 99.99                    |
|            |                           | 4    | CN13             | 1086              | 8.77                              | 92.21           | 93.15                    |
| Tianwan    | 50.28                     | 1    | CN10             | 1060              | 8.43                              | 90.78           | 93.17                    |
|            |                           | 2    | CN11             | 1060              | 8.60                              | 92.64           | 100.00                   |
|            |                           | 3    | CN45             | 1126              | 7.54                              | 76.47           | 84.97                    |
|            |                           | 4    | CN46             | 1126              | 8.26                              | 83.72           | 92.34                    |
|            |                           | 5    | CN53             | 1118              | 8.57                              | 87.51           | 89.97                    |
|            |                           | 6    | CN54             | 1118              | 8.87                              | 90.60           | 93.70                    |
| Hongyanhe  | 40.07                     | 1    | CN16             | 1119              | 7.08                              | 76.90           | 80.53                    |
|            |                           | 2    | CN17             | 1119              | 8.14                              | 88.25           | 92.47                    |
|            |                           | 3    | CN26             | 1119              | 8.03                              | 87.12           | 90.83                    |
|            |                           | 4    | CN27             | 1119              | 7.77                              | 84.21           | 88.80                    |
|            |                           | 5    | CN49             | 1119              | 8.35                              | 90.83           | 99.86                    |
|            |                           | 6    | CN50             | 1119              | 7.70                              | 83.81           | 86.98                    |
| Ningde     | 34.48                     | 1    | CN18             | 1089              | 7.89                              | 82.74           | 84.07                    |
|            |                           | 2    | CN19             | 1089              | 9.29                              | 97.40           | 99.63                    |
|            |                           | 3    | CN34             | 1089              | 8.98                              | 94.13           | 96.42                    |
|            |                           | 4    | CN35             | 1089              | 8.32                              | 87.19           | 91.48                    |
| Fuqing     | 49.48                     | 1    | CN20             | 1089              | 9.53                              | 99.85           | 100.00                   |
|            |                           | 2    | CN21             | 1089              | 8.47                              | 88.77           | 92.97                    |
|            |                           | 3    | CN42             | 1089              | 8.25                              | 86.48           | 92.46                    |
|            |                           | 4    | CN43             | 1089              | 6.17                              | 64.67           | 67.27                    |
|            |                           | 5    | CN51             | 1150              | 9.11                              | 89.55           | 92.02                    |
|            |                           | 6    | CN52             | 1150              | 7.96                              | 78.28           | 80.91                    |
| Yangjiang  | 53.19                     | 1    | CN22             | 1086              | 9.41                              | 98.92           | 99.61                    |
|            |                           | 2    | CN23             | 1086              | 8.62                              | 90.58           | 94.04                    |
|            |                           | 3    | CN40             | 1086              | 8.58                              | 90.15           | 91.93                    |
|            |                           | 4    | CN41             | 1086              | 9.56                              | 100.50          | 99.99                    |
|            |                           | 5    | CN47             | 1086              | 8.51                              | 89.48           | 92.34                    |
|            |                           | 6    | CN48             | 1086              | 8.51                              | 89.45           | 90.91                    |

## Safety Regulation on Nuclear Power Plants

continued

| NPP Name      | Nuclear Electricity (TWh) | Unit                       | Unified Unit No. | Rated Power (MWe)             | Nuclear Electricity by Unit (TWh) | Load Factor (%) | Unit Capacity Factor (%) |
|---------------|---------------------------|----------------------------|------------------|-------------------------------|-----------------------------------|-----------------|--------------------------|
| Sanmen        | 20.63                     | 1                          | CN28             | 1251                          | 10.67                             | 97.40           | 98.65                    |
|               |                           | 2                          | CN29             | 1251                          | 9.96                              | 90.98           | 92.24                    |
| Haiyang       | 19.29                     | 1                          | CN30             | 1250                          | 9.61                              | 92.74           | 90.40                    |
|               |                           | 2                          | CN31             | 1250                          | 9.68                              | 89.64           | 89.81                    |
| Taishan       | 16.01                     | 1                          | CN32             | 1750                          | 2.22                              | 14.48           | 15.45                    |
|               |                           | 2                          | CN33             | 1750                          | 13.79                             | 89.98           | 91.33                    |
| Changjiang    | 10.50                     | 1                          | CN36             | 650                           | 5.00                              | 87.82           | 90.83                    |
|               |                           | 2                          | CN37             | 650                           | 5.50                              | 96.60           | 99.90                    |
| Fangchenggang | 24.86                     | 1                          | CN38             | 1086                          | 8.51                              | 89.43           | 91.84                    |
|               |                           | 2                          | CN39             | 1086                          | 8.60                              | 90.37           | 90.78                    |
|               |                           | 3                          | CN55             | 1188                          | 7.75                              | 98.90           | 98.20                    |
| Shidao Bay    | 0.06                      | HTGR demonstration project | CN44             | 150 (Transitional core stage) | 0.4693                            | 35.71           | 35.71                    |

### Qinshan NPP

In 2023, the Qinshan NPP Unit 1 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 22<sup>nd</sup> refueling outage of Qinshan NPP Unit 1 was completed on May 19, 2023.

The nuclear-safety-related administrative approvals for Qinshan NPP in 2023 are shown

in Table 4 and the occupational radiation doses at Qinshan NPP are shown in Table 5.

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,852 person-days for inspection at Qinshan Nuclear Power Base (including Qinshan NPP, Qinshan Phase II NPP, Qinshan Phase III NPP, and Fangjiashan NPP), including seven routine inspections. A total of 296 findings were identified and 202 regulatory requirements were imposed.

**Table 4. Nuclear-safety-related Administrative Approvals for Qinshan NPP in 2023**

| Date       | Document No.       | Document Title   |
|------------|--------------------|--|
| 01/10/2023 | NNSA [2023] No. 10 | <i>Notice on Approving the Further Optimization of Clearance Process of Qinshan Nuclear Power Base for Scrapped Metal Frames for Air Filters</i> |
| 03/07/2023 | NNSA [2023] No. 42 | <i>Notice on Approving to Increase Fuel Enrichment for Qinshan NPP Unit 1</i>  |



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**Table 5. Occupational Radiation Doses at Qinshan NPP in 2023**

| 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 | 0.062                                      | 3.244  | 0.276                                     | 0.097  |

## Qinshan Phase II NPP

In 2023, 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 16<sup>th</sup> refueling outage of Unit 2 was completed on September 18, 2023 and the tenth refueling outage of Unit 3 on April 16, 2023.

The nuclear-safety-related administrative approvals for Qinshan Phase II NPP in 2023 are shown in Table 6. The occupational

radiation doses at Qinshan Phase II NPP are shown in Table 7.



**Figure 1. Inspection Site of Qinshan Phase II NPP**

**Table 6. Nuclear-safety-related Administrative Approvals for Qinshan Phase II NPP in 2023**

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 03/07/2023 | NNSA [2023] No. 43  | <i>Letter on Approving the Second Periodic Safety Review Program for Qinshan Phase II NPP Units 1 and 2</i>  |
| 03/17/2023 | NNSA [2023] No. 49  | <i>Notice on Approving Adding Bypass Line to the Throttle Orifice Plate in Impulse Line on Dead Legs of the Residual Heat Removal System of Qinshan Phase II NPP Units 3 and 4</i> |
| 09/04/2023 | NNSA [2023] No. 168 | <i>Notice on Approving the Upgrading of the Periodic Test Requirements for Safety-Related Systems of Qinshan Phase II NPP Units 1 and 2 (Rev.000.14)</i>                           |
| 09/04/2023 | NNSA [2023] No. 171 | <i>Notice on Approving the New Auxiliary Steam Transmission Piping to Pass through the Physical Fence at Qinshan Phase II NPP</i>  |
| 10/27/2023 | NNSA [2023] No. 199 | <i>Notice on Approving the Upgrading of the Periodic Test Requirements for Safety-Related Systems of Qinshan Phase II NPP Units 3 and 4 (Rev.000.27)</i>                           |

## Safety Regulation on Nuclear Power Plants

**Table 7. Occupational Radiation Doses at Qinshan Phase II NPP in 2023**

| 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 | 0.092                                      | 2.572   | 0.301                                     | 0.027  |
| Units 3 and 4 | 0.079                                      | 2.306   | 0.236                                     | 0.021  |

### Qinshan Phase III NPP

In 2023, 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 12<sup>th</sup> refueling outage of Unit 1 was completed on April 24, 2023.

The nuclear-safety-related administrative approvals for Qinshan Phase III NPP in 2023 are shown in Table 8. The occupational radiation doses at the Qinshan Phase III NPP

are shown in Table 9.



**Figure 2. Inspection Site of Qinshan Phase III NPP**

**Table 8. Nuclear-safety-related Administrative Approvals for Qinshan Phase III NPP in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 01/10/2023 | NNSA [2023] No. 9   | <i>Notice on Approving Adding Heavy Water Distillation Facility in Qinshan Phase III NPP</i>  |
| 04/03/2023 | NNSA [2023] No. 62  | <i>Notice on Approving to Conduct Yttrium-90 Irradiation Test by Using the Vertical Flux Detector Channel at Qinshan Phase III NPP Unit 1</i> |
| 09/04/2023 | NNSA [2023] No. 169 | <i>Notice on the Approval for Applying the 37M Fuel Regional Overpower Protection Trip Setpoint at Qinshan Phase III NPP Units 1 and 2</i>    |

**Table 9. Occupational Radiation Doses at Qinshan Phase III NPP in 2023**

| 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 | 0.336                                      | 6.843   | 1.195                                     | 0.1  |

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## Fangjiashan NPP

In 2023, 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 seventh refueling outage

of Unit 1 was completed on October 3, 2023.

The nuclear-safety-related administrative approvals for Fangjiashan NPP in 2023 are shown in Table 10. Fangjiashan NPP reported one operational event, as shown in Table 11. The occupational radiation doses at Fangjiashan NPP are shown in Table 12.

**Table 10. Nuclear-safety-related Administrative Approvals for Fangjiashan NPP in 2023**

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 12/05/2023 | NNSA [2023] No. 214 | <i>Notice on Approving the Optimization of Technical Specification for Fangjiashan NPP Units 1 and 2</i> |

**Table 11. Operational Event of Fangjiashan NPP Reported in 2023**

| Date of Occurrence | Event  | Cause     | INES Level |
|--------------------|--|-----------|------------|
| 09/29/2023         | Inconsistency between the specifications of some valves installed in the construction phase of Fangjiashan NPP Unit 1 and those specified in the system design documents | Equipment | 0          |

**Table 12. Occupational Radiation Doses at Fangjiashan NPP in 2023**

| 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 | 0.197                                      | 3.509   | 0.541                                     | 0.030  |

## Daya Bay NPP

In 2023, the two units of Daya Bay NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and

leakage rate of containment were all within the prescribed limits.

The nuclear-safety-related administrative approvals for Daya Bay NPP in 2023 are shown in Table 13. The occupational radiation



## Safety Regulation on Nuclear Power Plants

doses at the Daya Bay NPP are shown in Table 14.

In 2023, Southern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,125 person-days for inspection on the six operating units at Daya Bay Nuclear Power Base (including Daya Bay NPP and Ling'ao NPP), including seven routine inspections. A total of 107 findings were identified and 40 regulatory requirements were imposed.



*Figure 3. On-Site Inspection of Daya Bay Nuclear Power Base*

**Table 13. Nuclear-safety-related Administrative Approvals for Daya Bay NPP in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 05/15/2023 | NNSA [2023] No. 81  | <i>Notice on Approving the Digital Improvements to the General Instrument and Control System of the Conventional Island and the Analog Control System of the Nuclear Island at Daya Bay NPP</i> |
| 05/24/2023 | NNSA [2023] No. 90  | <i>Notice on Approving the Clearance Process of Slightly Contaminated Waste Oil at Daya Bay Nuclear Power Base</i>  |
| 05/24/2023 | NNSA [2023] No. 91  | <i>Notice on Approving the Upgrading of the Maintenance Programs for Daya Bay NPP and Ling'ao NPP</i>   |
| 06/15/2023 | NNSA [2023] No. 106 | <i>Notice on Approving the Improvement to the 6.6 kV Emergency Power Distribution Panel at Daya Bay NPP</i>   |
| 06/30/2023 | NNSA [2023] No. 121 | <i>Notice on Approving the Upgrading of the Operational Quality Assurance Programs for Daya Bay NPP and Ling'ao NPP</i>   |
| 07/07/2023 | NNSA [2023] No. 132 | <i>Notice on Approving the Modifications to the Technical Specifications for Daya Bay NPP and Ling'ao NPP</i>   |
| 08/31/2023 | NNSA [2023] No. 161 | <i>Notice on Approving the Improvement to the Hydrogen Recombiner of the Atmospheric Monitoring System in the Containment of Daya Bay NPP and Ling'ao NPP</i>                                   |
| 09/04/2023 | NNSA [2023] No. 173 | <i>Notice on Approving the Upgrading of in-Service Inspection Programs for Daya Bay NPP and Ling'ao NPP</i>   |

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**Table 14. Occupational Radiation Doses at Daya Bay NPP in 2023**

| 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 | 0.366                                      | 10.358  | 1.324                                     | 0.087   |

## Ling’ao NPP

In 2023, 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 19<sup>th</sup> refueling outage of Unit 1 was completed on September 25,

2023, the 18<sup>th</sup> refueling outage of Unit 2 on May 27, 2023 and the tenth refueling outage of Unit 4 on February 8, 2023.

The nuclear-safety-related administrative approvals for Ling’ao NPP in 2023 are shown in Table 15. The occupational radiation doses at Ling’ao NPP are shown in Table 16.

**Table 15. Nuclear-safety-related Administrative Approvals for Ling’ao NPP in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 01/20/2023 | NNSA [2023] No. 14  | <i>Notice on Approving the Improvement to Address Settlement of Control Rod Drive Mechanism Thermal Sleeve at Ling’ao NPP</i>                                 |
| 01/20/2023 | NNSA [2023] No. 15  | <i>Notice on Approving the Addition of Domestic Spare Parts for Control Rod Guide Tube of Ling’ao NPP Units 3 and 4</i>                                       |
| 07/28/2023 | NNSA [2023] No. 143 | <i>Notice on Approving the Minimum Flow Adjustment of the Auxiliary Feedwater Pump at Rated Pressure of the Steam Generators at Ling’ao NPP Units 1 and 2</i> |

Note: Six joint approvals were granted to Ling’ao NPP and Daya Bay NPP, as shown in Table 13.

**Table 16. Occupational Radiation Doses at Ling’ao NPP in 2023**

| 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 | 0.467                                      | 7.344   | 1.585                                     | 0.102  |
| Units 3 and 4 | 0.128                                      | 5.780   | 0.347                                     | 0.019  |

# Safety Regulation on Nuclear Power Plants

## Tianwan NPP

In 2023, 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 14<sup>th</sup> refueling outage of Unit 1 was completed on May 23, 2023, the fourth refueling outage of Unit 3 on April 10, 2023, the fourth refueling outage of Unit 4 on December 25, 2023. The second refueling outage of Unit 5 was completed on January 24, 2023, and the second refueling outage of Unit 6 on October 19, 2023. The containment dome of Unit 7 was hoisted into place on May 19, 2023, and Unit 8 was in the construction and installation stage.

The nuclear-safety-related administrative approvals for Tianwan NPP in 2023 are shown in Table 17. Tianwan NPP reported two operational events, as shown in Table 18,

and 1 construction event, as shown in Table 19. The occupational radiation doses at the Tianwan NPP are shown in Table 20.



**Figure 4. Oversight of Pressure Vessel Hoisting of Tianwan NPP Unit 7**

In 2023, the Northern Regional Office of Nuclear and Radiation Safety Inspection assigned 4,352 person-days for inspection of Tianwan NPP, including 12 routine inspections. A total of 105 findings were identified and 50 regulatory requirements were imposed.

**Table 17. Nuclear-safety-related Administrative Approvals for Tianwan NPP in 2023**

| Date       | Document No.       | Document Title   |
|------------|--------------------|--|
| 03/27/2023 | NNSA [2023] No. 52 | <i>Notice on Approving the Optimization to the Degradation Logic of Reactor Protection System for Tianwan NPP Units 3 and 4</i>  |
| 03/27/2023 | NNSA [2023] No. 55 | <i>Notice on Approving the “Maintenance Program for Tianwan NPP Units 5 and 6” (Version D)</i>   |
| 05/24/2023 | NNSA [2023] No. 94 | <i>Notice on Approving Safety-Important Modifications for the Optimization of the Air Intake <math>\gamma</math> Dose Rate Monitoring Channel Protection Function of the Control Room at Tianwan NPP Units 5 and 6</i> |
| 05/28/2023 | NNSA [2023] No. 98 | <i>Notice on Approving Safety-Important Modifications for the Adjustment of the Control Rod Assembly Replacement Cycle for Tianwan NPP Units 1-4</i>   |

continued

| Date       | Document No.              | Document Title  |
|------------|---------------------------|---|
| 07/07/2023 | NNSA [2023] No. 133       | <i>Notice on Approving the Modifications to the Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment at Tianwan NPP Units 5 and 6</i>             |
| 09/04/2023 | NNSA [2023] No. 170       | <i>Notice on Approving Safety-Important Modifications for the Optimization of Safety Classification of Secondary Circuit Systems and Equipment at Tianwan NPP Units 1 and 2</i> |
| 09/04/2023 | NNSA [2023] No. 172       | <i>Notice on Approving Safety-Important Modifications to the Minimum Temperature of Primary System in Modes 5 and 6 for Tianwan NPP Units 1-4</i>                               |
| 12/13/2023 | NNSA Letter [2023] No. 78 | <i>Letter on Acknowledgment of the Periodic Safety Review Program (Version B) for Tianwan NPP Units 1-4</i>   |

**Table 18. Operational Events Reported by Tianwan NPP in 2023**

| Date of Occurrence | Event   | Cause     | INES Level |
|--------------------|---|-----------|------------|
| 01/22/2023         | Reactor trip signal triggered by the low-low water level of No.1 steam generator during the heating process of Tianwan NPP Unit 5                                 | Equipment | 0          |
| 10/29/2023         | Reactor trip triggered by low liquid level of the steam generator due to failure of the secondary regulating valve in the condensate system of Tianwan NPP Unit 1 | Equipment | 0          |

**Table 19. Construction Event Reported by Tianwan NPP in 2023**

| Date of Occurrence | Event   |
|--------------------|---|
| September 11, 2023 | Out-of-tolerance positions of the casings embedded in the steam generator support foundation in the reactor building of Tianwan NPP Units 7 and 8 |

**Table 20. Occupational Radiation Doses at the Tianwan NPP in 2023**

| 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 | 0.080                                      | 1.259   | 0.261                                     | 0.015   |
| Units 3 and 4 | 0.162                                      | 4.279   | 0.594                                     | 0.038   |
| Units 5 and 6 | 0.177                                      | 6.197   | 0.547                                     | 0.027   |



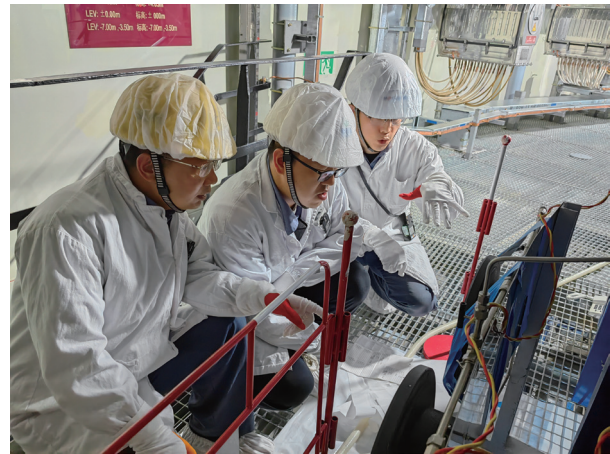
# Safety Regulation on Nuclear Power Plants

## Hongyanhe NPP

In 2023, Units 1 to 6 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 8<sup>th</sup> refueling outage of Unit 1 was completed on November 26, 2023, the 7<sup>th</sup> refueling outage of Unit 2 on April 9, 2023, the 7<sup>th</sup> refueling outage of Unit 3 on February 11, 2023, the 6<sup>th</sup> refueling outage of Unit 4 on September 25, 2023, and the first refueling outage of Unit 6 on July 13, 2023.

The nuclear-safety-related administrative approvals for Hongyanhe NPP in 2023 are shown in Table 21. Hongyanhe NPP reported 4 operational events, as shown in Table 22. The occupational radiation doses at Hongyanhe NPP are shown in Table 23.

In 2023, the North-Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 2,075 person-days for inspection of the Hongyanhe NPP, including six routine inspections and one non-routine inspection. A total of 159 findings were identified and 30 regulatory requirements were imposed.



**Figure 5. The Inspector Witnesses the Hydrostatic Test of Hongyanhe NPP Unit 6 Late at Night**

**Table 21. Nuclear-safety-related Administrative Approvals for Hongyanhe NPP in 2023**

| Date       | Document No.             | Document Title  |
|------------|--------------------------|---|
| 02/27/2023 | NNSA [2023] No. 36       | <i>Notice on Approving the Replacement and Improvement of Electronic Governor for 6.6kV AC Emergency Power Supply System of Hongyanhe NPP in Liaoning</i>   |
| 05/23/2023 | NNSA [2023] No. 87       | <i>Notice on Approving the Application for Postponing the First Primary System Periodic Hydrostatic Test and Complete in-Service Inspection of Hongyanhe NPP Unit 6 in Liaoning</i>                                 |
| 07/07/2023 | NNSA [2023] No. 129      | <i>Notice on Approving the Reliability Improvement of Turbine Trip Characterizing Signal (C8) of Hongyanhe NPP Units 5 and 6 in Liaoning</i>  |
| 02/13/2023 | NNSA Letter [2023] No. 8 | <i>Reply Letter on Approving the Design Plan (Version C) for the Reconstruction of the Frontier Station of the on-Site Supervisory Monitoring System for the Radiation Environment of Hongyanhe NPP in Liaoning</i> |

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**Table 22. Operational Events of Hongyanhe NPP Reported in 2023**

| Date of Occurrence | Event   | Cause        | INES Level |
|--------------------|---|--------------|------------|
| 01/24/2023         | Fault on the 220kV auxiliary external power grid side of Hongyanhe NPP resulted in automatic start-up of the emergency diesel generator in Train A of Unit 3 that is currently undergoing overhaul  | Equipment    | 0          |
| 01/11/2023         | Hongyanhe NPP Unit 5 experienced a reactor trip due to personnel accidentally touching the limit switch of the main feedwater isolation valve of No.1 steam generator   | Human factor | 0          |
| 07/20/2023         | Four units of Hongyanhe NPP experienced reactor trip due to invasion of marine organisms  | Equipment    | 0          |
| 09/21/2023         | The emergency diesel generator in Train B automatically started up during the response for discharging of the stator winding lead-out wire and stator core of the closed cooling water pump motor in No.2 conventional island of Hongyanhe NPP Unit 4 | Equipment    | 0          |

**Table 23. Occupational Radiation Doses at the Hongyanhe NPP in 2023**

| 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 | 0.351                                      | 6.654  | 1.118                                     | 0.069  |
| Units 3 and 4 | 0.277                                      | 5.634  | 0.784                                     | 0.047  |
| Units 5 and 6 | 0.186                                      | 4.018  | 0.535                                     | 0.031  |

## Ningde NPP

In 2023, 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 7<sup>th</sup> refueling outage of Unit 1 was completed on March 13, 2023, the 5<sup>th</sup>

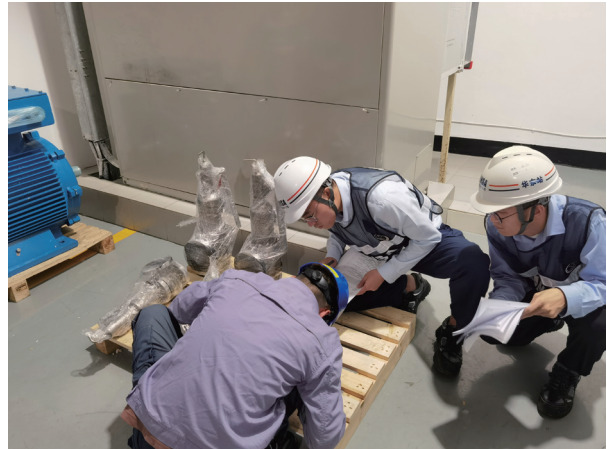
refueling outage of Unit 4 on October 17, 2023 and the 6<sup>th</sup> refueling outage of Unit 3 on December 19, 2023.

The nuclear-safety-related administrative approvals for Ningde NPP in 2023 are shown in Table 24. Ningde NPP reported 3 operational events, as shown in Table 25. The occupational radiation doses at Ningde NPP

## Safety Regulation on Nuclear Power Plants

are shown in Table 26.

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,574 person-days for inspection of Ningde NPP, including three routine inspections. A total of 101 findings were identified and 23 regulatory requirements were imposed.



*Figure 6. Inspection Site of Ningde NPP*

**Table 24. Nuclear-safety-related Administrative Approvals for Ningde NPP in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 01/25/2023 | NNSA [2023] No. 16  | <i>Notice on Approving the Minimum Metal Temperature for the Primary System Hydrostatic Test in the First Ten-Year Refueling Outage of Ningde NPP Units 1 and 2</i>                         |
| 04/07/2023 | NNSA [2023] No. 63  | <i>Notice on Approving the Adjustment of the Execution Platform for the Quick Closing Test of the Main Steam Isolation Valves of Ningde NPP Units 1-4</i>                                   |
| 06/30/2023 | NNSA [2023] No. 122 | <i>Notice on Approving the “Quality Assurance Program in Operational Phase for Ningde NPP Units 1-4” (Version 3 - Draft for Approval)</i>   |
| 09/04/2023 | NNSA [2023] No. 163 | <i>Notice on Approving the “Chemical and Radiochemical Specifications for Ningde NPP Units 3 and 4” (Version 2 - Draft for Approval)</i>  |
| 09/04/2023 | NNSA [2023] No. 164 | <i>Notice on Approving the Adjustment of Cycle of Periodic Tests such as Water Pump Availability Test in the Fire Fighter Water Supply System of Ningde NPP Units 1-4</i>                   |
| 09/04/2023 | NNSA [2023] No. 167 | <i>Notice on Approving the “Chemical and Radiochemical Specifications for Ningde NPP Units 1 and 2” (Version 2 - Draft for Approval)</i>  |
| 09/08/2023 | NNSA [2023] No. 175 | <i>Notice on Approving the “Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Ningde NPP Units 1 and 2 in Fujian” (Version 7 - Draft for Approval)</i> |
| 09/08/2023 | NNSA [2023] No. 176 | <i>Notice on Approving the “Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Ningde NPP Units 3 and 4 in Fujian” (Version 4 - Draft for Approval)</i> |
| 11/16/2023 | NNSA [2023] No. 211 | <i>Notice on Approving the in-Service Inspection and Adjustment of Main Feedwater Flow Control System and Other Systems for Ningde NPP Units 1-4</i>  |

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**Table 25. Operational Events of Ningde NPP Reported in 2023**

| Date of Occurrence | Event   | Cause        | INES Level |
|--------------------|---|--------------|------------|
| 04/05/2023         | The failure of the main feedwater control valve in No.1 steam generator of Ningde NPP Unit 2 resulted in abnormal water level, triggering the reactor trip  | Equipment    | 0          |
| 09/14/2023         | The smoke exhaust baffle in the computer room of Ningde NPP Unit 2 was obstructed by the suspended ceiling, resulting in its unavailable time exceeding that specified in Technical Specification for Operation | Human factor | 0          |
| 09/20/2023         | There was inconsistency between the specifications of some valves installed in the construction phase of Ningde NPP Units 1-4 and those specified in the system design documents                                | Human factor | 0          |

**Table 26. Occupational Radiation Doses at Ningde NPP in 2023**

| 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 | 0.347                                      | 5.819  | 1.032                                     | 0.060  |
| Units 3 and 4 | 0.320                                      | 6.144  | 0.899                                     | 0.052  |

## Fuqing NPP

In 2023, the six units 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 1<sup>st</sup> refueling outage of Unit 6 was completed on March 28, 2023, the 5<sup>th</sup> refueling outage of Unit 3 on April 15,

2023, the 2<sup>nd</sup> refueling outage of Unit 5 on June 13, 2023, the 6<sup>th</sup> refueling outage of Unit 2 on June 13, 2023, and the 5<sup>th</sup> refueling outage of Unit 4 on September 15, 2023.

The nuclear-safety-related administrative approvals for Fuqing NPP in 2023 are shown in Table 27. Fuqing NPP reported 2 operational events, as shown in Table 28. The occupational radiation doses at Fuqing NPP



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are shown in Table 29.

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,432 person-days for inspection of Fuqing NPP, including six routine inspections. A total of 170 findings were identified and 24 regulatory requirements were imposed.



*Figure 7. Inspection Site of Fuqing NPP*

**Table 27. Nuclear-safety-related Administrative Approvals for Fuqing NPP in 2023**

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 06/30/2023 | NNSA [2023] No. 123 | <i>Letter on Approving the First Periodic Safety Review Program of Fuqing NPP Units 1-4</i>  |
| 08/31/2023 | NNSA [2023] No. 154 | <i>Notice on the Approving the Implementation of the Hardwired Circuit Renovation for the Manual Shutdown via Emergency Control Panel in the Main Control Room of Fuqing NPP Units 1-4</i> |

**Table 28. Operational Events of Fuqing NPP Reported in 2023**

| Date of Occurrence | Event  | Cause      | INES Level |
|--------------------|--|------------|------------|
| 07/04/2023         | Fire breakout of the sealing material used for exhaust pipe of emergency diesel generator in Fuqing NPP Unit 2 in Fujian | Management | 0          |
| 09/26/2023         | Abnormal increase in radiochemical parameters of the primary system of Fuqing NPP Unit 4 in Fujian                       | Management | 0          |

**Table 29. Occupational Radiation Doses at Fuqing NPP in 2023**

| 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 | 0.213                                      | 5.314  | 0.665                                     | 0.037  |
| Units 3 and 4 | 0.268                                      | 5.564  | 0.942                                     | 0.065  |
| Units 5 and 6 | 0.247                                      | 7.206  | 0.930                                     | 0.055  |

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## Yangjiang NPP

In 2023, 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 specified limits, except for the leakage rate of the primary system exceeding 230L/h for a short period of time during the T4RPA010 (executing safety injection via RPA601KC) test conducted for Unit 4 on November 20, 2023 due to the manual shutoff valve 4RIS610VP at the boundary of the boric acid recirculation loop not being tightly closed. The 6<sup>th</sup> refueling outage of Unit 2 was completed on September 18, 2023, the 5<sup>th</sup> refueling outage of Unit 3 on February 17, 2023, the 4<sup>th</sup> refueling outage of Unit 5 on October 19, 2023, and the 3<sup>rd</sup> refueling outage of Unit 6 on July 30, 2023.

The nuclear-safety-related administrative approvals for Yangjiang NPP in 2023 are

shown in Table 30. The occupational radiation doses at Yangjiang NPP are shown in Table 31.

In 2023, the Southern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,123 person-days for inspection of the six operating units of Yangjiang NPP, including 8 routine inspections. A total of 105 findings were identified and 41 regulatory requirements were imposed.



Figure 8. Supervision Site of Yangjiang NPP

Table 30. Nuclear-safety-related Administrative Approvals for Yangjiang NPP in 2023

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 01/10/2023 | NNSA [2023] No. 8   | Notice on Approving the "Quality Assurance Program at Operation Stage (Upgraded Version) for Yangjiang NPP"     |
| 08/31/2023 | NNSA [2023] No. 160 | Notice on Approving the Coated Zirconium Alloy Pilot Rod Fuel Assembly for In-core Test in Yangjiang NPP Unit 2 |
| 12/05/2023 | NNSA [2023] No. 215 | Notice on Approving the "Quality Assurance Program for Yangjiang NPP at Operation Stage (Version 14)"           |

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**Table 31. Occupational Radiation Doses at Yangjiang NPP in 2023**

| 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 |  |  | 0.041                                     |  |
| Unit 2 |  |  | 0.487                                     |  |
| Unit 3 | 0.494                                      | 10.500   | 0.485                                     | 0.040  |
| Unit 4 |  |  | 0.026                                     |  |
| Unit 5 |  |  | 0.394                                     |  |
| Unit 6 |  |  | 0.676                                     |  |

*Note: The annual average effective dose per person, annual maximum individual dose and normalized collective effective dose are plant-wide indicators for Yangjiang NPP.*

### Sanmen NPP

In 2023, 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 2<sup>nd</sup> refueling outage of Unit 2 was started on November 27, 2023. Unit 3 was at the civil construction and installation stages, and the FCD for the nuclear island foundation of Unit 4 was March 22, 2023.

The nuclear-safety-related administrative approvals for Sanmen NPP in 2023 are shown in Table 32 and the regulatory inspection activities in Table 33. Sanmen NPP reported 1 operational event, as shown in Table 34, and 1 construction event, as shown in Table 35. The occupational radiation doses at Sanmen NPP are shown in Table 36.



**Figure 9. Inspection Site of Sanmen NPP**

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,483 person-days for inspection of Sanmen NPP, including four routine inspections. A total of 208 findings were identified and 163 regulatory requirements were imposed.

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**Table 32. Nuclear-safety-related Administrative Approvals for Sanmen NPP in 2023**

| Date       | Document No.       | Document Title  |
|------------|--------------------|---|
| 01/10/2023 | NNSA [2023] No. 4  | <i>Notice on Approving Design Changes Related to Noise Optimization of the Main Control Room of Sanmen NPP Units 3 and 4</i>                                |
| 03/10/2023 | NNSA [2023] No. 45 | <i>Notice on Approving Design Changes to Improve the Convenience of on-Site Installation of Reactor Vessel Support Systems for Sanmen NPP Units 3 and 4</i> |

**Table 33. Regulatory Inspection Activity at Sanmen NPP in 2023**

| Starting Date | Item  | Main Contents of the Inspection  |
|---------------|---|--|
| 02/06/2023    | Nuclear safety inspection before FCD for the nuclear island foundation of Sanmen NPP Unit 4 | Handling of legacy problems identified in preliminary construction regulatory inspection such as excavation of the nuclear island foundation; preparation of technical conditions such as design documents and construction schemes; preparation of construction management conditions such as nuclear island construction organization and construction plan; preparation of construction conditions before the FCD for the nuclear island; implementation of quality assurance program in design and construction stages; and establishment and operation of the experience feedback system. |

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

**Table 34. Operational Event of Sanmen NPP Reported in 2023**

| Date of Occurrence | Event   | Cause     | INES Level |
|--------------------|---|-----------|------------|
| 10/10/2023         | The trip-out of the main pump 1A of Sanmen NPP Unit 2 led to a low-2 flow signal in the hot leg of the reactor coolant loop I, which triggers reactor trip. | Equipment | 0          |

**Table 35. Construction Event of Sanmen NPP Reported in 2023**

| Date of Occurrence | Event   |
|--------------------|---|
| 07/16/2023         | The failure to implement the regulations and provisions for Sanmen NPP Units 3 and 4 led to the overdue completion of reports on some nuclear-grade welder performance qualifications |

**Table 36. Occupational Radiation Doses at Sanmen NPP in 2023**

| Unit          | Annual Average Effective Dose/ Person(mSv) | Annual Maximum Individual Effective Dose (mSv) | Annual Collective Effective Dose (man·Sv) | Normalized Collective Effective Dose (man·mSv/Gwh) |
|---------------|--|--|---|--|
| Units 1 and 2 | 0.171                                      | 3.197  | 0.374                                     | 0.018  |



## Safety Regulation on Nuclear Power Plants

### Haiyang NPP

In 2023, the Units 1 and 2 of Haiyang NPP continued to operate stably and safely. The failure rate of fuel elements, leakage rate of primary coolant pressure boundary, and leakage rate of containment were all within the prescribed limits. The 3<sup>rd</sup> refueling outage of Unit 1 and that of Unit 2 were completed on April 10, 2023 and February 11, 2023 respectively. The hoisting and installation of the second ring of steel containment in Haiyang NPP Unit 3 was completed on December 25, 2023, and the FCD for the nuclear island was April 22, 2023, with the safety and quality of the project construction controllable.

The nuclear-safety-related administrative approvals in the Haiyang NPP in 2023 are shown in Table 37 and the regulatory inspection activities in Table 38. Haiyang NPP reported 2 operational events, as shown in



*Figure 10. SUN Jinlong, Secretary of the Leading Party Member Group of MEE, Inspects Haiyang NPP*

Table 39. The occupational radiation doses at Haiyang NPP are shown in Table 40.

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,691 person-days for inspection of Haiyang NPP, including four routine inspections. A total of 156 findings were identified and 16 regulatory requirements were imposed.

**Table 37. Nuclear-safety-related Administrative Approvals for Haiyang NPP in 2023**

| Date       | Document No.       | Document Title   |
|------------|--------------------|--|
| 01/10/2023 | NNSA [2023] No. 3  | <i>Notice on Approving Design Changes Related to Noise Optimization of the Main Control Room of Haiyang NPP Units 3 and 4</i>  |
| 01/25/2023 | NNSA [2023] No. 19 | <i>Notice on Approving Safety-Important Modifications for the Replacement and Renovation of Check Valves (CVS-V217) in Containment for the Hydrogenation Pipeline of Chemical and Volume Control System in Haiyang NPP Units 1 and 2</i> |
| 02/09/2023 | NNSA [2023] No. 27 | <i>Notice on Approving the Sliding Power-Based Operation Project at the End of the Third Cycle Life of Haiyang NPP Unit 1</i>  |
| 02/27/2023 | NNSA [2023] No. 37 | <i>Notice on Approving Design Changes of the Reactor Vessel Support Foundation for Haiyang NPP Units 3 and 4</i>   |

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continued

| Date       | Document No.       | Document Title   |
|------------|--------------------|--|
| 03/27/2023 | NNSA [2023] No. 51 | <i>Notice on Approving the Adjustment and Modification of Positions of Control Rod Withdrawal in Haiyang NPP Units 1 and 2</i>   |
| 03/28/2023 | NNSA [2023] No. 56 | <i>Notice on Approving the Implementation of Safety-Important Modifications to the In-core Irradiation Test of SAF-14 New Zirconium Alloy Pilot Rods for Haiyang NPP Unit 1</i>            |
| 04/11/2023 | NNSA [2023] No. 64 | <i>Notice on Releasing the FCD Control Point for the Nuclear Island Foundation of Haiyang NPP Unit 4</i>   |
| 05/08/2023 | NNSA [2023] No. 75 | <i>Notice on Approving the Physical Protection and Renovation of 900MW Nuclear Energy Heating Project (Phase III) Regarding Comprehensive Utilization of Nuclear Energy in Haiyang NPP</i> |

**Table 38. Regulatory Inspection Activities at the Haiyang NPP in 2023**

| Starting Date | Item   | Main Contents of the Inspection  |
|---------------|--|--|
| 03/13/2023    | Nuclear safety inspection before FCD for the nuclear island foundation of Haiyang NPP Unit 4 | Operation of the quality assurance system; preparation of construction management conditions such as the nuclear island construction organization and construction plan; preparation of technical conditions such as design documents and construction schemes; handling of outstanding issues from early construction such as excavation of the nuclear island; site preparation before the first concrete date (FCD) for nuclear island foundation |

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

**Table 39. Operational Events of Haiyang NPP Reported in 2023**

| Date of Occurrence | Event   | Cause     | INES Level |
|--------------------|---|-----------|------------|
| 02/09/2023         | The low differential pressure in the main control room of Haiyang NPP Unit 1 led to the automatic triggering of the emergency habitable system in the main control room | Equipment | 0          |
| 06/01/2023         | The shutdown of the main pump 2B of Haiyang NPP Unit 2 led to a low-2 flow in the hot leg of the reactor coolant loop 2, which triggers a reactor trip.                 | Equipment | 0          |

**Table 40. Occupational Radiation Doses at the Haiyang NPP in 2023**

| 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 | 0.166                                      | 2.649  | 0.322                                     | 0.034  |
| Unit 2 | 0.172                                      | 3.691  | 0.318                                     | 0.033  |

## Safety Regulation on Nuclear Power Plants

### Taishan NPP

In 2023, the safety status of Taishan NPP Unit 2 was generally under control, and the failure rate of fuel elements, leakage rate of primary coolant pressure boundary and leakage rate of containment were all within the specified limits. The 2<sup>nd</sup> refueling outage of Unit 1 was completed on November 27, 2023, and Unit 2 continues to operate stably and safely.

The nuclear-safety-related administrative approvals for Taishan NPP in 2023 are shown in Table 41 and the regulatory inspection activities in Table 42. The occupational radiation doses at Taishan NPP are shown in Table 43.

In 2023, the Southern Regional Office of

Nuclear and Radiation Safety Inspection assigned 979 person-days for inspection of the two operating units of Taishan NPP, including six routine inspections. A total of 91 findings were identified and 32 regulatory requirements were imposed.



**Figure 11. Inspection at Taishan NPP**

**Table 41. Nuclear-safety-related Administrative Approvals for Taishan NPP in 2023**

| Date       | Document No.              | Document Title   |
|------------|---------------------------|--|
| 05/28/2023 | NNSA [2023] No. 97        | <i>Notice on Partially Approving the Improvement of AFA 3GLE Fuel Assembly for Taishan NPP</i>   |
| 08/07/2023 | NNSA [2023] No. 145       | <i>Notice on Approving the in-Service Inspection Program (Version F) for Taishan NPP Units 1 and 2</i>   |
| 09/08/2023 | NNSA Letter [2023] No. 61 | <i>Reply Letter on Approving the “On-Site Nuclear Emergency Response Plan for Taishan NPP”</i>   |
| 09/22/2023 | NNSA [2023] No. 179       | <i>Notice on Approving the “Quality Assurance Program in Operational Phase for Taishan NPP Units 1 and 2 (Version D)”</i>                                      |
| 10/09/2023 | NNSA [2023] No. 191       | <i>Notice on Approving the Renewal of Approval Letter for the Use of FCC4-V1 New Fuel Shipping Containers of Taishan Nuclear Power Joint Venture Co., Ltd.</i> |
| 11/20/2023 | NNSA [2023] No. 212       | <i>Notice on Releasing the Control Point of the First Reactor Criticality after the Second Refueling Outage of Taishan NPP Unit 1</i>                          |

**Table 42. Regulatory Inspection Activity at Taishan NPP in 2023**

| Starting Date | Item   | Main Contents of the Inspection   |
|---------------|--|---|
| 11/13/2023    | Nuclear safety inspection before the first reactor criticality after the second refueling outage of Taishan NPP Unit 1 | Second fuel cycle operation of Unit 1, implementation of refueling outage activities, radiation protection, management of radioactive wastes, preparation before criticality, quality control, handling of important issues, implementation of nuclear safety commitments and experience feedback |

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

**Table 43. Occupational Radiation Doses at Taishan NPP in 2023**

| 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 | 0.057                                       | 2.242  | 0.171                                     | 0.011  |

## Changjiang NPP

In 2023, 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 6<sup>th</sup> refueling outage of Unit 1 was completed on March 10, 2023. The hoisting and installation of inner dome of Unit 3 were completed on February 21, 2023, and the welding of the main pipe was started on October 19, 2023. The hoisting and installation of inner dome of Unit 4 were completed on December 27, 2023. The integrated pressure vessels of small reactor were installed in place on August 10, 2023, and the top head of steel containment of small

reactor was installed in place on November 3, 2023.

The nuclear-safety-related administrative approvals for Changjiang NPP in 2023 are shown in Table 44. The occupational radiation doses at Changjiang NPP are shown in Table 45. Changjiang NPP reported one operational event, as shown in Table 46, and one construction event, as shown in Table 47.

In 2023, the Southern Regional Office of Nuclear and Radiation Safety Inspection assigned 795 person-days for inspection of Changjiang NPP, including eleven routine inspections. A total of 271 findings were identified and 75 regulatory requirements were imposed.



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**Figure 12. Hoisting and Installation of Inner Dome of Changjiang NPP Unit 3**



**Figure 13. Inspection at Changjiang NPP**

**Table 44. Nuclear-safety-related Administrative Approvals for Changjiang NPP in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 01/10/2023 | NNSA [2023] No. 12  | <i>Notice on Approving the Risk-Informed in-Service Inspection and Optimization for Parts of the Pipeline in the Main Feedwater Flow Control and Auxiliary Feedwater Systems of Changjiang NPP Units 1 and 2 in Hainan</i>                  |
| 03/24/2023 | NNSA [2023] No. 54  | <i>Notice on Approving the Modifications to Provisions Regarding the Safety Video Display Unit in the Technical Specification for Operation of Changjiang NPP Units 1 and 2 in Hainan</i>   |
| 04/18/2023 | NNSA [2023] No. 69  | <i>Notice on Approving the Design Change for the Pressure Relief and Discharge from the Safety Valve of the Residual Heat Removal System into the in-Containment Refueling Water Storage Tank of Changjiang NPP Units 3 and 4 in Hainan</i> |
| 05/15/2023 | NNSA [2023] No. 79  | <i>Notice on Approving the Modifications to the Switching Time Criteria for the Pressure Stabilizer Protection Valves and Isolation Valves of Changjiang NPP Units 1 and 2 in Hainan</i>  |
| 07/28/2023 | NNSA [2023] No. 142 | <i>Notice on Approving the Modifications to the Radioactive Wet Waste Discharge Connection in the Nuclear Auxiliary Buildings of Changjiang NPP Units 1 and 2 in Hainan</i>   |
| 08/07/2023 | NNSA [2023] No. 149 | <i>Letter on Approving the Postponed Submission of the Supplementary Test Report on Fuel Assemblies for the Changjiang Multi-Purpose Small Modular Reactor Science and Technology Demonstration Project in Hainan Province</i>              |
| 09/04/2023 | NNSA [2023] No. 165 | <i>Notice on Approving the Safety-Important Modification of Replacing the Seven-Blade Impellers in the Important Service Water Pumps of Changjiang NPP Units 1 and 2 in Hainan</i>  |

continued

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 09/22/2023 | NNSA [2023] No. 180 | <i>Notice on Approving the Modifications to the Regulations Regarding the Periodic Testing Period for the Compressed Air Production System of Changjiang NPP Units 1 and 2 in Hainan</i> |
| 09/22/2023 | NNSA [2023] No. 181 | <i>Notice on Approving the Modifications to the Regulations Regarding the Periodic Testing Period for the Main Steam System of Changjiang NPP Units 1 and 2 in Hainan</i>                |

**Table 45. Occupational Radiation Doses at Changjiang NPP in 2023**

| 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 | 0.141                                       | 3.357  | 0.285                                     | 0.027  |

**Table 46. Operational Event Reported by Changjiang NPP in 2023**

| Date of Occurrence | Event   | Cause     | INES Level |
|--------------------|---|-----------|------------|
| 08/06/2023         | Reactor trip of Changjiang NPP Unit 1 initiated due to the excessively high water level in the two steam generators caused by the disengagement of the two high-pressure heaters resulting from the inadvertent activation of the deaerator liquid level switch | Equipment | 0          |

**Table 47. Construction Event of Changjiang NPP Reported in 2023**

| Date of Occurrence | Event  |
|--------------------|--|
| 08/22/2023         | Failure to comply with the requirements for the unpacking, acceptance and hoisting inspections of the core makeup tanks for the Changjiang Multi-Purpose Small Modular Reactor Science and Technology Demonstration Project in Hainan Province |

## Fangchenggang NPP

In 2023, Units 1, 2, and 3 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 5<sup>th</sup> refueling outage of Units 1 and 2 were completed on April 7, 2023, and September 1, 2023, respectively. Unit 3 was officially put into commercial operation on March 25, 2023.

The nuclear-safety-related administrative

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approvals for Fangchenggang NPP in 2023 are shown in Table 48 and the regulatory inspection activities in Table 49. Fangchenggang NPP reported two operational events, as shown in Table 50. The occupational radiation doses of Fangchenggang NPP are shown in Table 51.

In 2023, the Southern Regional Office of

Nuclear and Radiation Safety Inspection assigned 1,685.5 person-days for inspection at Fangchenggang NPP, including 11 routine inspections. For operating organizations, a total of 93 findings were identified and 44 regulatory requirements were imposed; and for constructing organizations, a total of 60 findings were identified and 15 regulatory requirements were imposed.

**Table 48. Nuclear Safety Related Administrative Approvals for Fangchenggang NPP in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 01/10/2023 | NNSA [2023] No. 5   | <i>Notice on Approving the “Refueling Program for Fangchenggang NPP Units 1 and 2 in Guangxi (Version 3)”</i>   |
| 03/07/2023 | NNSA [2023] No. 40  | <i>Notice on Approving the “Quality Assurance Program for the Engineering Design and Construction Stage of Fangchenggang NPP Units 3 and 4 in Guangxi (Version 5)”</i>  |
| 03/07/2023 | NNSA [2023] No. 41  | <i>Notice on Approving the “Quality Assurance Program for the Operational Stage of Fangchenggang NPP Units 1 and 2 in Guangxi (Version 2)”</i>  |
| 03/10/2023 | NNSA [2023] No. 44  | <i>Notice on Approving the in-Service Inspection and Optimization for the Main Feedwater Flow Control and Other Systems of Fangchenggang NPP Units 1 and 2 in Guangxi</i>   |
| 08/07/2023 | NNSA [2023] No. 147 | <i>Notice on Approving the Use of Independent Calibration Method for the Power Range Detector of Nuclear Instrumentation System of Fangchenggang NPP Units 1 and 2</i>  |
| 09/22/2023 | NNSA [2023] No. 183 | <i>Notice on Approving the “Commissioning Program for Fangchenggang NPP Units 3 and 4 in Guangxi (Version D)”</i>   |
| 10/27/2023 | NNSA [2023] No. 201 | <i>Notice on Approving the Change in Negative Uncertainty Range of the Set Values for Opening and Closing Pressures of the Safety Valve for the Pressure Stabilizer of Fangchenggang NPP Units 3 and 4 in Guangxi</i> |
| 10/27/2023 | NNSA [2023] No. 202 | <i>Notice on Approving the Change in Activation Delay Time for the Signal of Water Level Above 0 Signal of the Steam Generators in Fangchenggang NPP Units 3 and 4 in Guangxi</i>                                     |
| 11/16/2023 | NNSA [2023] No. 210 | <i>Notice on Approving the “Regulatory Requirements for Periodic Tests of Safety-Related Systems and Equipment for Fangchenggang NPP Units 1 and 2 in Guangxi (Version 3 - Draft for Approval)”</i>                   |

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**Table 49. Regulatory Inspection Activity at Fangchenggang NPP in 2023**

| Starting Date | Item  | Main Contents of the Inspection  |
|---------------|---|--|
| 02/21/2023    | Nuclear Safety Inspection on Releasing Fangchenggang NPP Unit 3 in Guangxi from the 87% Rated Power (Thermal) Control Point | System commissioning, power ramp-up preparation and risk plan, operation management, equipment anomalies and maintenance management, experience feedback, etc. |

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

**Table 50. Operational Events Reported by Fangchenggang NPP in 2023**

| Date of Occurrence | Event   | Cause        | INES Level |
|--------------------|---|--------------|------------|
| 01/06/2023         | Inoperable time of the iodine filtration circuit in Train B of F3DWL exceeding that allowed by operating limits and conditions due to reverse connection on the high and low voltage sides of F3DWL6280SP | Human factor | 0          |
| 05/22/2023         | Unplanned rollback at Fangchenggang NPP Unit 3 due to the GGR barring gear outage and the inability to manually operate the barring gear  | Human factor | 0          |

**Table 51. Occupational Radiation Doses at Fangchenggang NPP in 2023**

| 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 | 0.313                                      | 7.217  | 0.931                                     | 0.059  |
| Unit 3        | 0.004                                      | 0.314  | 0.007                                     | 0.001  |

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

In 2023, the operation safety of the high-temperature gas-cooled reactor (HTGR) demonstration project was generally under

control. As of December 2023, both Reactors 1 and 2 were in power operation mode.

The nuclear-safety-related administrative approvals for the HTGR demonstration project in 2023 are shown in Table 52 and the regulatory inspection activities in Table 53.

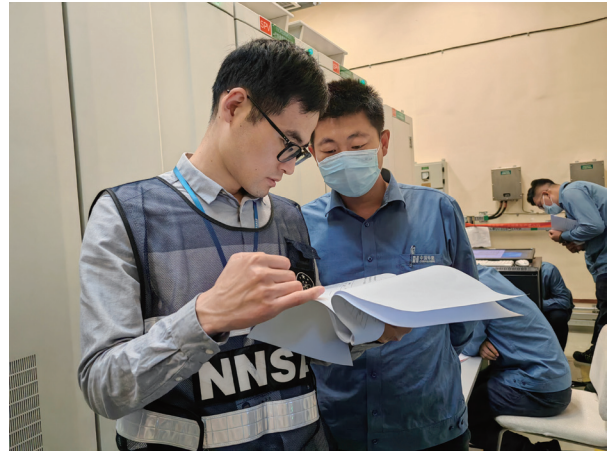


## Safety Regulation on Nuclear Power Plants

The HTGR demonstration project reported four operational events, as shown in Table 54. The regulatory inspection activities are shown in Table 55.



**Figure 14.** HUANG Runqiu, Minister of Ecology and Environment, and DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, Conduct a Field Study for the HTGR Demonstration Project



**Figure 15.** Inspection Site of HTGR Demonstration Project

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,473 person-days for inspection of the HTGR demonstration project, including three routine inspections. A total of 128 findings were identified and 20 regulatory requirements were imposed.

**Table 52. Nuclear-safety-related Administrative Approvals for the HTGR Demonstration Project in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 02/21/2023 | NNSA [2023] No. 29  | <i>Notice on Approving Changes Including the Modifications to Nuclear Power Signal Quality Thresholds in the Protection System of the HTGR Demonstration Project</i>        |
| 04/18/2023 | NNSA [2023] No. 68  | <i>Notice on Approving Changes to the Physical Protection System of the HTGR Demonstration Project</i>  |
| 05/23/2023 | NNSA [2023] No. 86  | <i>Notice on Approving Changes to Certain Protection Signals Under the 200 MWt Platform During the Transitional Core Stage of the HTGR Demonstration Project</i>            |
| 06/30/2023 | NNSA [2023] No. 118 | <i>Notice on Approving the Use of 200 MWt Test Platform During the Transitional Core Stage in the Commissioning Program for the HTGR Demonstration Project (Version F1)</i> |
| 09/27/2023 | NNSA [2023] No. 186 | <i>Notice on Approving the Maintenance Program of the HTGR Demonstration Project (Version C - Draft for Approval)</i>   |



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**Table 53. Regulatory Inspection Activities for the HTGR Demonstration Project in 2023**

| Starting Date | Item  | Main Contents of the Inspection   |
|---------------|---|---|
| 04/25/2023    | Regulatory communication meeting on the HTGR Demonstration Project and dialogue on related topics                     | Site survey and dialogues for technical reviews, discussions and exchanges  |
| 07/24/2023    | Independent evaluation of operational events and review of past operational events for the HTGR Demonstration Project | Site survey, independent evaluation of operational events, and verification of the implementation of corrections to past operational events |

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

**Table 54. Operational Events of the HTGR Demonstration Project Reported in 2023**

| Date of Occurrence | Event   | Cause                    | INES Level |
|--------------------|---|--------------------------|------------|
| 05/22/2023         | Activation of the fresh air filter unit of the ventilation and air conditioning system in the main control room triggered by a false alarm from the inert gas $\beta$ monitor 2 for radioactivity monitoring at the fresh air intake of the main control room | Design, management       | 0          |
| 05/31/2023         | Non-operational protection channel for negative change in nuclear power rate in dual reactors due to deviation in the setting for negative change in nuclear power rate in the reactor protection system  | Human factor, management | 0          |
| 09/22/2023         | Impact on radiation protection partitions due to non-compliance of the shielding capacity of the doors of certain rooms in the nuclear Island buildings with the requirements of the final safety analysis report   | Design                   | 0          |
| 10/08/2023         | Emergency trip of Reactor 1 triggered by the guard signal "low mass flow ratio of primary and secondary circuits" due to tripping of the main helium circulator   | Equipment, management    | 0          |

**Table 55. Occupational Radiation Doses at the HTGR Demonstration Project**

| Unit                       | Annual Average Effective Dose/ Person (mSv) | Annual Maximum Individual Effective Dose (mSv) | Annual Collective Effective Dose (man-Sv) | Normalized Collective Effective Dose (man-mSv/Gwh) |
|----------------------------|---|--|---|--|
| HTGR demonstration project | 0.012                                       | 0.607  | 0.009                                     | 0.020  |

## Safety Regulation on Nuclear Power Plants

### CAP1400 Demonstration Project

In 2023, Unit 1 of the CAP1400 Demonstration Project was at the commissioning stage, while Unit 2 was at the installation and commissioning stages. Regarding Unit 1, the topping out of the shield building was completed on January 17, 2023; the turbine was prepared to accept steam on May 5, 2023; the thermal test commenced on June 29, 2023; nuclear fuel was introduced on July 31, 2023; and all thermal tests, except for the bypass valve test, were completed on December 27, 2023. Regarding Unit 2, the first main shield pump was introduced on February 26, 2023; installation of all four main shield pumps was completed on June 12, 2023; the topping out of the shield building was completed on November 30, 2023; and back-feeding of electricity at 500 kV was completed on December 8, 2023.

The nuclear-safety-related administrative approvals for the CAP1400 demonstration project in 2023 are shown in Table 56.



*Figure 16. Inspection Site of CAP1400 Demonstration Project*

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,543 person-days for inspection of the CAP1400 demonstration project, including four routine inspections. A total of 267 findings were identified and 202 regulatory requirements were imposed.

**Table 56. Nuclear-safety-related Administrative Approvals for the CAP1400 Demonstration Project in 2023**

| Date       | Document No.       | Document Title   |
|------------|--------------------|--|
| 02/27/2023 | NNSA [2023] No. 35 | <i>Notice on Approving the “Maintenance Program for CAP1400 Units 1 and 2 (Version B)”</i>   |
| 03/27/2023 | NNSA [2023] No. 53 | <i>Notice on Approving the Design Change for the Addition of Load Shedding Function and the Adjustment of the Normal Operating Temperature Range in the Main Control Room of CAP1400 Units 1 and 2</i> |

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 05/20/2023 | NNSA [2023] No. 84  | <i>Notice on Approving the “Quality Assurance Program (Operational Stage) for CAP1400 Units 1 and 2 (Version B)”</i>          |
| 07/05/2023 | NNSA [2023] No. 124 | <i>Notice on Approving the “In-Service Inspection Program for CAP1400 Units 1 and 2 (Version 0)”</i>                          |
| 08/07/2023 | NNSA [2023] No. 146 | <i>Notice on Approving the Change in Protection Level of the Class 1E Junction Boxes in the CAP1400 Demonstration Project</i> |
| 09/22/2023 | NNSA [2023] No. 182 | <i>Notice on Approving the “Quality Assurance Program (Construction Stage) for CAP1400 Units 1 and 2 (Version C1)”</i>        |

## Zhangzhou NPP

In 2023, Zhangzhou NPP Units 1 and 2 were at the civil construction, installation, and commissioning stages, and the construction was carried out orderly as planned, and the safety and quality were under control.

The nuclear-safety-related administrative approvals for Zhangzhou NPP in 2023 are shown in Table 57 and the regulatory inspection activities in Table 58. Zhangzhou NPP reported two construction events, as shown in Table 59.

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection

assigned 1,441 person-days for inspection of Zhangzhou NPP, including two routine inspections. A total of 452 findings were identified and 21 regulatory requirements were imposed.



Figure 17. Inspection Site of Zhangzhou NPP

**Table 57. Nuclear-safety-related Administrative Approvals for Zhangzhou NPP in 2023**

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 08/31/2023 | NNSA [2023] No. 153 | <i>Notice on Approving the “Commissioning Program for Zhangzhou NPP Units 1 and 2 in Fujian (Version A2)”</i>                          |
| 08/31/2023 | NNSA [2023] No. 155 | <i>Notice on Approving the “Quality Assurance Program (Construction Stage) for Zhangzhou NPP Units 1 and 2 in Fujian (Version E1)”</i> |

# Safety Regulation on Nuclear Power Plants

continued

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 08/31/2023 | NNSA [2023] No. 156 | <i>Notice on Approving the “Quality Assurance Program (Construction Stage) for Zhangzhou NPP Units 3 and 4 in Fujian (Version B1)”</i> |

**Table 58. Regulatory Inspection Activities at Zhangzhou NPP in 2023**

| Starting Date | Item   | Main Contents of the Inspection   |
|---------------|--|---|
| 03/20/2023    | Non-routine nuclear safety inspection of Units 1 and 2                           | Management of non-compliance and design changes in civil construction; management of non-compliance and design changes in equipment installation; implementation of the quality assurance program, personnel qualifications, and feedback on experiences; related non-destructive testing conditions  |
| 12/12/2023    | Nuclear safety inspection before FCD for the nuclear island foundation of Unit 3 | Handling of outstanding issues identified during early construction regulatory inspection such as excavation of the nuclear island foundation pit; preparation of technical conditions such as design documents and construction schemes; preparation of construction management conditions such as nuclear island construction organization and construction plan; preparation of construction conditions before FCD for the nuclear island foundation |

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

**Table 59. Construction Events of Zhangzhou NPP Reported in 2023**

| Date of Occurrence | Event  |
|--------------------|--|
| 06/29/2023         | Non-compliance with design requirements for the secondary concrete pouring of the partition wall in the N381 stairwell of the nuclear island of Zhangzhou NPP Unit 1 |
| 11/10/2023         | Linear indication on the exterior surface of the weld between the safety end and the upper head nozzle of the pressure stabilizer in Zhangzhou NPP Unit 1            |

## Taipingling NPP

In 2023, Taipingling NPP Units 1 and 2 were at the stages of civil construction, equipment installation, and system commissioning. For Unit 1, the welding of the main pipeline was

started on January 25, 2023, and the cold functional test of the primary system was started on December 22, 2023. For Unit 2, the welding of the main pipeline was started on December 27, 2023.

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The nuclear-safety-related administrative approvals for Taipingling NPP in 2023 are shown in Table 60.

In 2023, the Southern Regional Office of Nuclear and Radiation Safety Inspection assigned 589 person-days for inspection of Taipingling NPP, including four routine inspections. A total of 109 findings were identified and 34 regulatory requirements were imposed.



Figure 18. On-site Inspection of Taipingling NPP

Table 60. Nuclear-safety-related Administrative Approvals for Taipingling NPP in 2023

| Date       | Document No.              | Document Title  |
|------------|---------------------------|---|
| 03/01/2023 | NNSA [2023] No. 39        | <i>Notice on Approving the Design Changes in Start-up and Shutdown Function Configuration on the Secondary Side of Steam Generators of Taipingling NPP Units 1 and 2 in Guangdong</i>                           |
| 05/15/2023 | NNSA [2023] No. 80        | <i>Notice on Approving the Adjustment of Design Change Scheme for Certain Sections of the Pipes for Backwash Water in the Circulating Water Filtration System of Taipingling NPP Units 1 and 2 in Guangdong</i> |
| 12/08/2023 | NNSA [2023] No. 217       | <i>Notice on Approving the “Commissioning Program for Taipingling NPP Units 1 and 2 (Version A2)”</i>   |
| 07/07/2023 | NNSA Letter [2023] No. 41 | <i>Reply Letter on Approving the Technical Capability Verification Program for Non-destructive Inspection in Pre-service and in-Service Inspection of Taipingling NPP Units 1 and 2</i>                         |

## San’ao NPP

In 2023, San’ao NPP Units 1 and 2 were at the civil construction and installation stages, and the safety and quality were under control. For Unit 1, the main equipment was introduced on July 31, 2023, and the welding of the main pipeline was started on

October 16, 2023. For Unit 2, the installation of the nuclear island was started on June 30, 2023, and the hoisting and installation of the containment dome of the nuclear island was completed on September 28, 2023.

The nuclear-safety-related administrative approvals for San’ao NPP in 2023 are shown



## Safety Regulation on Nuclear Power Plants

in Table 61, and the regulatory inspection activities in Table 62.

In 2023, the Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,403 person-days for inspection of San'ao NPP, including three routine inspections. A total of 181 findings were identified and 9 regulatory requirements were imposed.



*Figure 19. Inspection Site of San'ao NPP*

**Table 61. Nuclear-safety-related Administrative Approvals for San'ao NPP in 2023**

| Date       | Document No.          | Document Title  |
|------------|-----------------------|---|
| 01/10/2023 | NNSA [2023] No. 6     | <i>Notice on Approving Major Design Change to the Analysis Method of Boron Dilution Accident under Automatic Control Mode during Power Operation of CGN Zhejiang San'ao NPP Units 1 and 2</i> |
| 01/10/2023 | NNSA [2023] No. 7     | <i>Notice on Approving Major Design Change for Certain Sections of the Pipes for Backwash Water in the Circulating Water Filtration System of CGN San'ao NPP Units 1 and 2</i>                |
| 02/23/2023 | NNSA [2023] No. 31    | <i>Notice on Issuing the "Review Opinion on Siting of San'ao NPP Units 3 and 4 in Zhejiang"</i>   |
| 06/26/2023 | NNSA [2023] No. 114   | <i>Notice on Approving the Design Change to the in-Containment Thermal Environment Curve under DEC-A Accident Conditions of CGN Zhejiang San'ao NPP Units 1 and 2</i>                         |
| 02/15/2023 | MEE App [2023] No. 13 | <i>Approval Reply on the Environmental Impact Report (Siting Stage) for CGN Zhejiang San'ao NPP Phase II Project</i>  |

**Table 62. Regulatory Inspection Activity at the San'ao NPP in 2023**

| Starting Date | Item  | Main Contents of the Inspection  |
|---------------|---|--|
| 04/10/2023    | Non-destructive testing and regulatory inspection for Units 1 and 2 | Operation of quality assurance system in non-destructive inspection; inspection and sampling of non-destructive testing activities |

### Xudapu NPP

In 2023, Xudapu NPP Units 3 and 4 were at the civil construction stage, and the safety

and quality were under control. For Unit 3, the construction of the internal structure up to the +26.3 m landing slab in the reactor

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building was completed on July 17, 2023; the hoisting and installation of the dome were completed on July 27, 2023; dome welding of the reactor building was completed on August 18, 2023; the ring crane became operational on September 28, 2023; and the installation of the reactor pressure vessel was started on December 12, 2023. For Unit 4, construction of the internal structure at the 0.00 m landing slab was completed on April 4, 2023; prefabrication and assembly of the inner dome was started on June 12, 2023; the third module of the reactor containment steel lining was hoisted into place on September 12, 2023; and the 10<sup>th</sup> level of the inner containment was poured on December 2, 2023.

On November 3, 2023, the construction license for Xudapu NPP Units 1 and 2 was obtained. Units 1 and 2 were at the civil construction stage and construction preparation stage, respectively, and the

safety and quality were under control. The construction of the nuclear island for Unit 1 was officially started on November 15, 2023; concrete curing for the nuclear island was completed on December 27, 2023. On December 30, 2023, the construction of the lower mudmat of the nuclear island for Unit 2 was completed.

The nuclear-safety-related administrative approvals for Xudapu NPP in 2023 are shown in Table 63, and the regulatory inspection activities in Table 64.

In 2023, the North-Eastern Regional Office of Nuclear and Radiation Safety Inspection assigned 1,462 person-days for inspection of Xudapu NPP, including seven routine inspections. A total of 141 findings were identified and 26 regulatory requirements were imposed.



*Figure 20. Construction Site of Xudapu NPP Units 3 and 4*

# Safety Regulation on Nuclear Power Plants

**Table 63. Nuclear-safety-related Administrative Approvals for Xudapu NPP in 2023**

| Date       | Document No.              | Document Title   |
|------------|---------------------------|--|
| 10/09/2023 | NNSA [2023] No. 192       | <i>Notice on Approving the “Quality Assurance Program (Construction Phase) for Xudapu NPP Units 1 and 2 in Liaoning (Version D0)”</i>                      |
| 11/03/2023 | NNSA [2023] No. 203       | <i>Notice on Issuing the Construction License for Xudapu NPP Units 1 and 2 in Liaoning</i>   |
| 02/23/2023 | NNSA Letter [2023] No. 10 | <i>Letter on Confirming the Changes in Legal Representative Information of Construction License for Xudapu NPP Units 3 and 4 in Liaoning</i>               |
| 09/04/2023 | NNSA Letter [2023] No. 56 | <i>Letter on the Issuance of “Nuclear Safety Inspection Report for the Preparations Before FCD for the Nuclear Island Foundation of Xudapu NPP Unit 1”</i> |
| 11/03/2023 | MEE App [2023] No. 119    | <i>Approval Reply on the Environmental Impact Reports (Construction Stage) for Xudapu NPP Units 1 and 2 in Liaoning</i>                                    |

**Table 64. Regulatory Inspection Activity at Xudapu NPP in 2023**

| Starting Date | Item   | Main Contents of the Inspection  |
|---------------|--|--|
| 08/21/2023    | Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of Xudapu NPP Unit 1 | Handling of outstanding issues identified during early construction regulatory inspection such as 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 construction stages |

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

## Lufeng NPP

In 2023, Lufeng NPP Units 5 and 6 were at the civil construction stage. For Unit 5, the installation of the corbel was completed on December 26, 2023. For Unit 6, the FCD for the nuclear island foundation was on August 26, 2023.

The nuclear-safety-related administrative

approvals for Lufeng NPP in 2023 are shown in Table 65.

In 2023, the Southern Regional Office of Nuclear and Radiation Safety Inspection assigned 549 person-days for inspection of Lufeng NPP, including 5 routine inspections. A total of 27 regulatory requirements were imposed.



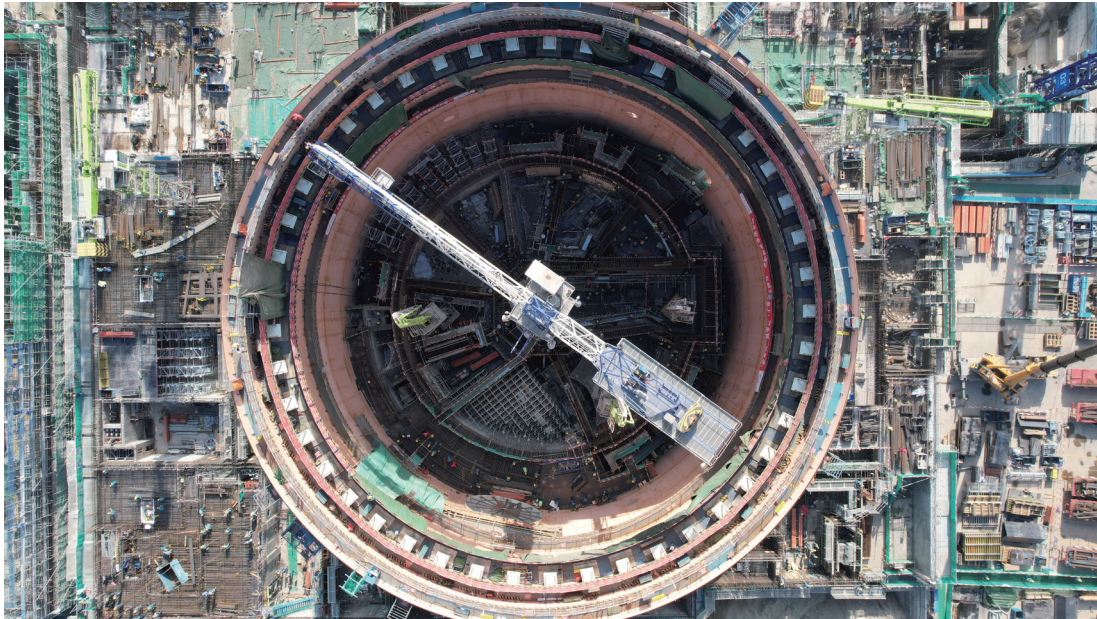


Figure 21. Installation of Steel Lining Ring Crane Corbels for Nuclear Island of Lufeng NPP Unit 5 Completed

Table 65. Nuclear-safety-related Administrative Approvals for Lufeng NPP in 2023

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 05/15/2023 | NNSA [2023] No. 82  | <i>Notice on Approving Design Changes of in-Containment Thermal Environment Curve under the Design Extension Conditions (Without Obvious Core Damage) for Lufeng NPP Units 5 and 6 in Guangdong</i> |
| 05/29/2023 | NNSA [2023] No. 99  | <i>Notice on Approving the Design Changes in Start-up and Shutdown Function Configuration on the Secondary Side of Steam Generators of Lufeng NPP Units 5 and 6 in Guangdong</i>                    |
| 10/30/2023 | NNSA [2023] No. 197 | <i>Notice on Approving the “Quality Assurance Program (Construction Stage) for Lufeng NPP Units 5 and 6 (Version 4)”</i>  |
| 11/16/2023 | NNSA [2023] No. 209 | <i>Notice on Approving the Design Change for Certain Sections of the Pipes for Backwash Water in the Circulating Water Filtration System of Lufeng NPP Units 5 and 6</i>                            |

## Lianjiang NPP

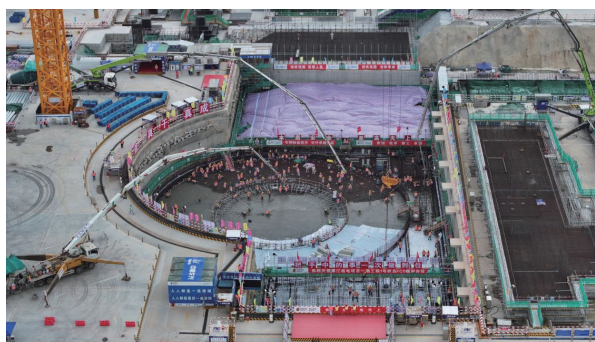
In 2023, Lianjiang NPP Units 1 and 2 were at the civil construction stage. For Unit 1, the FCD for the nuclear island foundation was on September 27, 2023. For Unit 2, the excavation of the nuclear island foundation pit

was started on April 15, 2023, and completed on November 16, 2023.

The nuclear-safety-related administrative approvals for Lianjiang NPP in 2023 are shown in Table 66, and the regulatory inspection activities in Table 67.

## Safety Regulation on Nuclear Power Plants

In 2023, the Southern Regional Office of Nuclear and Radiation Safety Inspection assigned 467 person-days for inspection of Lianjiang NPP, including four routine inspections. A total of 50 findings were identified and 23 regulatory requirements were imposed.



*Figure 22. FCD of Lianjiang NPP Unit 1*

**Table 66. Nuclear-safety-related Administrative Approvals for Lianjiang NPP in 2023**

| Date       | Document No.              | Document Title  |
|------------|---------------------------|---|
| 06/15/2023 | NNSA [2023] No. 107       | <i>Notice on Approving the “Quality Assurance Programs (Construction Stage) for Lianjiang NPP Units 1 and 2 in Guangdong (Version B)”</i>                     |
| 09/25/2023 | NNSA [2023] No. 184       | <i>Notice on Issuing Construction Licenses for Lianjiang NPP Units 1 and 2 in Guangdong</i>   |
| 07/11/2023 | NNSA Letter [2023] No. 43 | <i>Letter on the Issuance of “Nuclear Safety Inspection Report for the Preparations Before FCD for the Nuclear Island Foundation of Lianjiang NPP Unit 1”</i> |
| 09/25/2023 | MEE App [2023] No. 106    | <i>Approval Reply on the Environmental Impact Reports (Construction Stage) for Lianjiang NPP Units 1 and 2 in Guangdong</i>                                   |

**Table 67. Regulatory Inspection Activity at Lianjiang NPP in 2023**

| Starting Date | Item  | Main Contents of the Inspection   |
|---------------|---|---|
| 07/04/2023    | Nuclear safety inspection for the preparations before FCD for the nuclear island foundation of Lianjiang NPP Unit 1 | Implementation of the quality assurance program at the construction stage; preparation of construction management conditions such as the construction organization and construction plan of the nuclear island; preparation of technical conditions such as design documents and construction schemes; handling of outstanding issues from early construction such as excavation of the nuclear island foundation pit; site preparation before First Concrete Date (FCD) for nuclear island foundation; establishment and operation of the experience feedback system |

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



## IV. Safety Regulation on Research Reactors

In 2023, there were 21 civil research reactors (critical assemblies) in China, of which 17 were in service, three were in decommissioning and one was under construction (see Table 68). Out of the 17 civil research reactors (critical assemblies) in service, four were in long-term shutdown, two were under closure management, and the rest 11 were operated well generally. According to the *Reporting System for Research Reactor Licensees*, in-service civil research reactors (critical assemblies) reported three operational events throughout the year (see Table 69), none of which caused unacceptable consequences for the environment outside the reactor building. One civil research reactor under construction was under construction quality control.

In 2023, the Review Opinion on Siting of the Tianhong Nuclear Science and Technology R&D Center Project was issued, along with the Construction License for the Medical Isotope Test Reactor, and the Operation License for the 2 MWt Liquid-Fueled Thorium



**Figure 23. On-Site Inspection of China Advanced Research Reactor (CARR)**

Molten Salt Reactor (TMSR-LF). The nuclear-safety-related administrative approvals for research reactors in 2023 are shown in Table 70, and the regulatory inspection activities in Table 71.

In 2023, the regional offices of nuclear and radiation safety inspection assigned 3,023 person-days for inspection of research reactor licensees, including 15 routine inspections and two non-routine inspections. A total of 166 findings were identified and 82 regulatory requirements were imposed.

## Safety Regulation on Research Reactors

**Table 68. Operation of Research Reactors in 2023**

| 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        |
| 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 | Long-term shutdown  |
| Zero-power Assembly of MNSR                                       | —            | China Institute of Atomic Energy | Long-term shutdown  |
| DF-VI Fast Neutron Critical Assembly                              | —            | China Institute of Atomic Energy | Long-term shutdown  |
| Nuclear Criticality Safety Test Facility in Pilot Plant           | —            | China Institute of Atomic Energy | Long-term shutdown  |
| Critical Assembly of Solid State Zirconium-hydride Reactor (SSZR) | —            | China Institute of Atomic Energy | Decommissioning     |
| 101 Heavy Water Research Reactor (101 HWRR)                       | 10MW         | China Institute of Atomic Energy | Decommissioning     |
| 10 MW High Temperature Gas-Cooled Test Reactor (HTR-10)           | 10MW         | Tsinghua University              | In operation        |
| 5 MW Low Temperature Nuclear Heating Test Reactor (NHR-5)         | 5MW          | Tsinghua University              | Closure management  |
| Bulk Shielding Reactor (BSR)                                      | 1MW          | Tsinghua University              | Decommissioning     |
| Medical Isotope Test Reactor                                      | 200kW        | Nuclear Power Institute of China | Under construction  |
| High Flux Engineering Test Reactor (HFETR)                        | 125MW        | Nuclear Power Institute of China | In operation        |
| Critical Assembly of High Flux Engineering Test Reactor (HFETR)   | —            | Nuclear Power Institute of China | In operation        |
| China Pulsed Reactor (CPR)  | 1MW          | Nuclear Power Institute of China | In operation        |
| Minjiang Test Reactor (MJTR)                                      | 5MW          | Nuclear Power Institute of China | In operation        |
| 18-5 Critical Assembly  | —            | Nuclear Power Institute of China | In operation        |
| Miniature Neutron Source Reactor (MNSR) in Shenzhen University    | 30kW         | Shenzhen University              | Closure management  |

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continued

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

**Table 69. Operational Events of Research Reactors in 2023**

| Date of Occurrence | Facility                               | Event  | Cause      | INES Level |
|--------------------|--|--|------------|------------|
| 03/20/2023         | Minjiang Test Reactor (MJTR)           | Temporary increase in $\gamma$ radiation levels in certain areas outside the building due to single crystal silicon irradiation and production at MJTR | Management | 0          |
| 03/24/2023         | China Advanced Research Reactor (CARR) | Reactor trip triggered by a power failure in the control cabinet of the cold neutron source device control system at CARR                              | Equipment  | 0          |
| 03/27/2023         | China Experimental Fast Reactor (CEFR) | Inconsistency between components of the steam generator protection system of the CEFR and the final safety analysis report                             | Management | 0          |

**Table 70. Nuclear-safety-related Administrative Approvals for Research Reactors in 2023**

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 04/18/2023 | NNSA [2023] No. 67  | <i>Notice on Approving the Loading of the Third Neutron Source Assembly into the China Experimental Fast Reactor</i>   |
| 05/23/2023 | NNSA [2023] No. 85  | <i>Notice on Approving the Reliability Enhancement Modification of the Safety-Related Instruments and Control Systems of the China Experimental Fast Reactor</i> |
| 06/07/2023 | NNSA [2023] No. 100 | <i>Notice on Issuing the Operation License for 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)</i>   |
| 06/15/2023 | NNSA [2023] No. 105 | <i>Notice on Approving the Modification to the Drive Loop of CARR Safety Rod</i>   |
| 06/30/2023 | NNSA [2023] No. 119 | <i>Notice on Approving the Modification to Burst Pressure for the Rupture Discs in the CEFR Steam Generator Accident Protection System</i>                       |
| 07/11/2023 | NNSA [2023] No. 134 | <i>Notice on Approving the Operation of the China Experimental Fast Reactor under Limited Conditions</i>   |

## Safety Regulation on Research Reactors

continued

| Date       | Document No.           | Document Title   |
|------------|------------------------|--|
| 09/18/2023 | NNSA [2023] No. 177    | <i>Notice on Approving the Replacement of the Primary Sodium Pump Motor with a Double Winding Motor in the China Experimental Fast Reactor</i> |
| 11/07/2023 | NNSA [2023] No. 204    | <i>Notice on Issuing the "Review Opinion on Siting of Tianhong Nuclear Science and Technology R&amp;D Center Project"</i>                      |
| 11/11/2023 | NNSA [2023] No. 206    | <i>Notice on Issuing the "Safety Review Principles for Solution-Type Medical Isotope Test Reactor"</i>   |
| 12/27/2023 | NNSA [2023] No. 223    | <i>Notice on Approving the Renewal of the Operation License for 49-2 Swimming Pool Reactor</i>   |
| 12/29/2023 | NNSA [2023] No. 224    | <i>Notice on Issuing the Construction License for the Medical Isotope Test Reactor to Nuclear Power Institute of China</i>                     |
| 12/30/2023 | NNSA [2023] No. 226    | <i>Notice on Approving the Resumption of High-power Operation of the China Experimental Fast Reactor</i>                                       |
| 06/07/2023 | MEE App [2023] No. 46  | <i>Approval Reply on the Environmental Impact Reports (Operational Stage) for 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)</i>    |
| 11/06/2023 | MEE App [2023] No. 120 | <i>Approval Reply on the Environmental Impact Report (Siting Stage) for the Tianhong Nuclear Science and Technology R&amp;D Center Project</i> |

**Table 71. Regulatory Inspection Activities at the Research Reactors in 2023**

| Starting Date | Item   | Main Contents of the Inspection  |
|---------------|--|--|
| 01/05/2023    | Verification of operation management rectification at China Institute of Atomic Energy   | Conducting on-site verification for the rectification of safety operation management of the China Institute of Atomic Energy, verifying the corrective actions taken for operational events related to CIAE China Experimental Fast Reactor and the implementation of license conditions, and promoting the effective implementation of safety and quality management improvement actions for CIAE's research reactors |
| 02/06/2023    | Comprehensive inspection before issuing the operation license for 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)                | Conducting comprehensive inspections to verify whether the nuclear safety and environmental protection facilities are designed, constructed, and put into operation with the main facilities before issuing the operation license for 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)  |
| 02/08/2023    | Site reconnaissance for China initiative Accelerator Driven System (CiADS) of the Institute of Modern Physics, Chinese Academy of Sciences | Conducting on-site survey and reconnaissance for China initiative Accelerator Driven System (CiADS) of Institute of Modern Physics, Chinese Academy of Sciences  |

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continued

| Starting Date | Item   | Main Contents of the Inspection  |
|---------------|--|--|
| 02/13/2023    | Site reconnaissance for the review of the construction license for the medical isotope test reactor of Nuclear Power Institute of China  | Conducting on-site verification for the site location, conditions, topography, etc. of the medical isotope test reactor  |
| 06/07/2023    | Site reconnaissance for “environmental impact assessment and safety analysis and evaluation” for the siting of Tianhong Nuclear Science and Technology R&D Center Project in Jiangxi     | Conducting on-site verification for the site location, conditions, topography, etc. of Tianhong Nuclear Science and Technology R&D Center Project  |
| 06/27/2023    | Inspection of China Experimental Fast Reactor prior to its operation under limited conditions  | Checking the completion of system equipment modifications at the China Experimental Fast Reactor and the results of post-modification performance tests; the comprehensiveness, accuracy, and consistency of operation management documents during operation under limited conditions; personnel training, retraining, assessments, authorizations, and allocation; regular testing, maintenance, and inspection of safety-important systems and equipment, and feedback from operational events |
| 10/10/2023    | Inspection of China Experimental Fast Reactor prior to the resumption of high-power operation  | Verifying the completion of the modifications to relevant systems and equipment after the approval of the operation of the China Experimental Fast Reactor under limited conditions, the results of the post-modification performance tests, and the revision, dissemination, and implementation of operation-related documents  |
| 10/10/2023    | On-site inspection for the criticality of 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF)  | Conducting on-site inspection for the criticality of 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF) of Shanghai Institute of Applied Physics, Chinese Academy of Sciences, which achieved its first criticality at 11:08 AM on October 11   |
| 10/17/2023    | Independent investigation for the temporary increase in $\gamma$ radiation levels in certain areas outside the building due to single crystal silicon irradiation and production at MJTR | Conducting an on-site independent investigation for the temporary increase in $\gamma$ radiation levels in certain areas outside the building due to single crystal silicon irradiation and production at MJTR   |
| 11/24/2023    | Comprehensive inspection before issuing the construction license for the medical isotope test reactor to Nuclear Power Institute of China  | Inspecting the operation of the quality assurance system for the medical isotope test reactor project, management of contractors, site preparation, preparation of technical conditions, and the preparation of construction management conditions such as the construction organization and construction plan   |

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



# V. Safety Regulation on Nuclear Fuel Cycle Facilities

In 2023, China's in-service nuclear fuel production, processing, storage and reprocessing facilities were operated safely and maintained a good safety record continuously. The quality of facilities under construction was controlled effectively. Nuclear and radiation safety of nuclear fuel cycle facilities was under control. The facilities did not pose any unacceptable nuclear and radiation hazard to staff, public and the environment. The main facilities are listed in Table 72.

In 2023, NNSA issued administrative approval to two projects for nuclear safety technical modification. NNSA organized special inspections on the implementation of licensing documents for nuclear fuel cycle facilities, and promoted the investigation and rectification of hidden hazards actively.

In 2023, the regional offices of nuclear and radiation safety inspection assigned 3,993.5 person-days for inspection of the nuclear fuel cycle facility licensees, including 24 routine and special inspections, and one non-routine inspection. A total of 307 findings were identified and 231 regulatory requirements were imposed.



*Figure 24. SUN Jinlong, Party Secretary of MEE, and TIAN Weiyong, Chief Engineer for Nuclear Safety of MEE and Deputy Administrator of NNSA, Surveying at CNNC Lanzhou Uranium Enrichment Co., Ltd.*



*Figure 25. LIAO Xiyuan, Chief Inspector of Central Commission for Discipline Inspection (CCDI) Inspector's Office and Chief Supervisor of the State Supervisory Commission (SSC) Supervisor's Office Stationing at MEE, Surveying at CNNC Jianzhong Nuclear Fuel Co., Ltd.*

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**Table 72. Major Civil Nuclear Fuel Production, Processing and Storage Facilities in China**

| Facility   | Licensee                                  | Major Product Form                  | Current Status |
|--|---|-------------------------------------|----------------|
| Dry Fabrication Line for Chemical Conversion   | CNNC Jianzhong Nuclear Fuel Co., Ltd.     | UO <sub>2</sub> powder              | In operation   |
| 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  | CNNC North Nuclear Fuel Co., Ltd.         | HWR Nuclear fuel element            | In operation   |
| PWR Nuclear Fuel Element Fabrication Line  | CNNC North Nuclear Fuel Co., Ltd.         | PWR nuclear fuel element            | In operation   |
| Nuclear Fuel Element Fabrication Line for the HTGR Demonstration Project             | CNNC North Nuclear Fuel Co., Ltd.         | HTGR fuel element                   | In operation   |
| Nuclear Fuel Element Fabrication Line for PWR NPPs Extension Project                 | CNNC North Nuclear Fuel Co., Ltd.         | PWR Fuel element                    | In operation   |
| Nuclear Fuel Element Fabrication Line for AP1000 NPP                                 | CNNC North Nuclear Fuel Co., Ltd.         | Nuclear fuel element for AP1000 NPP | In operation   |
| 405-1A Project   | CNNC Shaanxi Uranium Enrichment Co., Ltd. | Low enriched UF <sub>6</sub>        | In operation   |
| New Centrifuge Project, Phase IV   | CNNC Shaanxi Uranium Enrichment Co., Ltd. | Low enriched UF <sub>6</sub>        | In operation   |
| Centrifuge Project Extension in North Region, Phase I                                | CNNC Shaanxi Uranium Enrichment Co., Ltd. | Low enriched UF <sub>6</sub>        | In operation   |
| Centrifuge Project Extension in North Region, Phase II                               | CNNC Shaanxi Uranium Enrichment Co., Ltd. | Low enriched UF <sub>6</sub>        | In operation   |
| Centrifuge Project   | CNNC Lanzhou Uranium Enrichment Co., Ltd. | Low enriched UF <sub>6</sub>        | In operation   |
| Commercial Demonstration Project of Domestic Centrifuge                              | CNNC Lanzhou Uranium Enrichment Co., Ltd. | Low enriched UF <sub>6</sub>        | In operation   |

## Safety Regulation on Nuclear Fuel Cycle Facilities

continued

| Facility   | Licensee  | Major Product Form           | Current Status |
|--|---|------------------------------|----------------|
| Uranium Enrichment Project, Phase III  | CNNC Lanzhou Uranium Enrichment Co., Ltd.                 | Low enriched UF <sub>6</sub> | In operation   |
| Uranium Enrichment Project, Phase IV   | CNNC Lanzhou Uranium Enrichment Co., Ltd.                 | Low enriched UF <sub>6</sub> | In operation   |
| Temporary Dry Storage Facility for Spent Fuel of Qinshan Phase III NPP                               | CNNC Nuclear Power Operation Management Co., Ltd.         | —                            | In operation   |
| CGN Advanced Fuel Development Center   | CGN Uranium Resources Co., Ltd.                           | PWR nuclear fuel element     | Commissioning  |
| Hot Cell Facility Construction Project for CGN Nuclear Power Technology Research Institute Co., Ltd. | CGN Nuclear Power Technology Research Institute Co., Ltd. | —                            | Commissioning  |

V

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

VI

### Administrative Approvals

In 2023, MEE/NNSA approved the environmental impact assessment (EIA) documents of 10 uranium mining and milling

and uranium geological exploration projects, including the reconstruction and extension project for the uranium extraction from pit water at Gongchangling open pit mine (see Table 73).

**Table 73. Nuclear Safety Related Administrative Approvals for Regulation of the Uranium Mining and Milling Radiation Environment in 2023**

| Date       | Document No.          | Document Title  |
|------------|-----------------------|---|
| 04/28/2023 | MEE App [2023] No. 36 | <i>Approval Reply on the Environmental Impact Report Form for CNNC Guyuan Uranium Co., Ltd.'s Research on the Recycling Technology of Molybdenum from Uranium and Molybdenum Mine Tailings</i>          |
| 06/30/2023 | MEE App [2023] No. 62 | <i>Approval Reply on the Environmental Impact Report for CNNC Guyuan Uranium Co., Ltd.'s Comprehensive Hydrometallurgical Technology Reformation Project</i>  |
| 06/30/2023 | MEE App [2023] No. 63 | <i>Approval Reply on the Environmental Impact Report for CNNC Xinjiang Tianshan Uranium Co., Ltd.'s 737 and 739 in-Situ Recovery Extension Project</i>  |
| 06/30/2023 | MEE App [2023] No. 64 | <i>Approval Reply on the Environmental Impact Report for CNNC Inner Mongolia Mining Co., Ltd.'s in-Situ Recovery Project at Bayanwula Uranium Deposit in Inner Mongolia, Phase II (Manglai Deposit)</i> |
| 06/30/2023 | MEE App [2023] No. 65 | <i>Approval Reply on the Environmental Impact Report for CNNC Shaoguan Jinyuan Uranium Industry Co., Ltd.'s Mianhuakeng Mine Project, Phase III</i>   |

# Regulation of Radiation Environment on Uranium Mines and Radioactive Associated (NORM) Minerals/Ores

continued

| Date       | Document No.           | Document Title  |
|------------|------------------------|---|
| 06/30/2023 | MEE App [2023] No. 66  | <i>Approval Reply on the Environmental Impact Report Form for the Research and Application of Integrated Exploration and Mining Development of Hailijin Uranium Deposit</i>   |
| 06/30/2023 | MEE App [2023] No. 67  | <i>Approval Reply on the Environmental Impact Report for the Comprehensive Utilization of Co-associated Uranium Resources (Monazite) in Jiangxi (Uraniothorite Resource Recovery Section)</i>                         |
| 07/16/2023 | MEE App [2023] No. 79  | <i>Approval Reply on the Environmental Impact Report for CNNC Inner Mongolia Mining Co., Ltd.'s in-Situ Recovery Project at Nalinggou Uranium Deposit in Inner Mongolia</i>   |
| 10/18/2023 | MEE App [2023] No. 115 | <i>Approval Reply on the Environmental Impact Report Form for Five Projects Including the Investigation, Assessment and Exploration of Uranium Resources (2023~2025) in Xingguo-Xiajiang Area of Jiangxi Province</i> |
| 12/26/2023 | MEE App [2023] No. 146 | <i>Approval Reply on the Environmental Impact Report for the Reconstruction and Extension Project of Uranium Extraction from Pit Water at the Gongchangling Open Pit Mine</i>   |

VI

## Regulatory Inspections

NNSA organized a review on the annual effluent and environmental monitoring reports for 2022 submitted by uranium mining and milling enterprises, and a special verification on the environmental radiation monitoring and information disclosure conditions of radioactive associated (norm) mineral/ore development and utilization enterprises.

In accordance with the requirements of the *Notice on Identifying Nuclear and Radiation Safety Hazards* (Nuclear Facility Document

[2020] No. 215 of the General Office of MEE), NNSA organized regulatory inspections on uranium mining and milling facilities to identify potential hazards, urged relevant organizations to take corrective actions, and summarized the work above.

In 2023, the regional offices of nuclear and radiation safety inspection assigned 430 person-days for inspection of uranium mining and milling facilities, including 53 routine inspections and one non-routine inspection. A total of 168 findings were identified and 146 regulatory requirements were imposed.



## VII. Safety Regulation on Radioactive Waste

NNSA vigorously promoted the construction of radioactive waste disposal facilities, strengthened safety regulation of radioactive waste, promoted the treatment and disposal of legacy radioactive wastes as well as the decommissioning and remediation of old nuclear facilities, and made efforts in operational safety regulation of radioactive waste disposal facilities, radioactive waste storage and treatment facilities. NNSA has issued three technical documents: *Format and Content of Solid Radioactive Waste Near Surface Disposal Facility Safety Analysis Report*, *Format and Content of the Decommissioning Safety Analysis Report for Nuclear Facilities*, and *Format and Content of the Decommissioning Plan for Nuclear Facilities*.

### Administrative Licensing of Radioactive Waste Management Facilities

In 2023, NNSA issued a license for the storage and disposal of radioactive solid waste

to Gansu Longhe Environmental Protection Technology Co., Ltd., an operation license for a demonstration project on smelting scrap metals from NPPs to Hunan Nuclear Industry Honghua Machinery Co., Ltd., and modified the operation license of Northwest Low Level Solid Waste Disposal Facility.

### Operation and Safety Regulation of Radioactive Waste Disposal Facilities

In 2023, the Northwest disposal facility received 1,989 radioactive waste packages, with a volume of 1,313.06 m<sup>3</sup> and a radioactivity of 7.45 E +12 Bq. By the end of 2023, Northwest disposal facility had received 73,914 radioactive waste packages in total, with a volume of 31,068.65 m<sup>3</sup> and a radioactivity of 6.65 E + 14 Bq.

In 2023, the Feifengshan disposal facility received 14,198 radioactive waste packages, with a volume of 7,155.4 m<sup>3</sup>, and a radioactivity of 6.50 E + 14 Bq. By the end of

## Safety Regulation on Radioactive Waste

2023, the Feifengshan disposal facility had received 105,730 radioactive waste packages in total, with a volume of 47,856.88 m<sup>3</sup>, and a radioactivity of 3.05 E + 15 Bq.

In 2023, no waste was received at Beilong disposal facility. By the end of 2023, the Beilong disposal facility had received 2,240 radioactive waste packages in total, with a volume of 2,526.44 m<sup>3</sup>, and a radioactivity of 7.95 E + 13 Bq.

In 2023, the Longhe disposal facility received 2,632 radioactive waste packages, with a volume of 2,309.3 m<sup>3</sup>, and a radioactivity of 6.72 E + 13 Bq. By the end of 2023, the Beilong disposal facility had received 3,242 radioactive waste packages in total, with a volume of 2,989.3 m<sup>3</sup>, and a radioactivity of 6.96 E + 13 Bq.

In 2023, the Jinta very low-level radioactive waste landfill received 7,583 radioactive waste packages, with a volume of 3,244.79 m<sup>3</sup>, and a radioactivity of 5.83 E+10 Bq. By the end of 2023, the Jinta very low-level radioactive waste landfill had received 9,457 radioactive waste packages in total, with a volume of 3,835.29 m<sup>3</sup>, and a radioactivity of 6.88 E+10 Bq.

In 2023, Beishan URL completed three curve sections of the main spiral ramp project successfully, with a combined length of 3,116 meters for the turnaround areas, drilled to the design depth of -590 m for personnel shaft,

and excavated 305 m for auxiliary test level at -280 m.

In 2023, the regional offices of nuclear and radiation safety inspection assigned 342 person-days for inspection of the facilities of radioactive waste disposal facility, including 8 routine inspections and 1 non-routine inspection. A total of 137 findings were identified and 64 regulatory requirements were imposed.



*Figure 26 Special Inspection on Radiation Monitoring Work at Feifengshan Disposal Facility*

### Treatment of Legacy Radioactive Waste and Decommissioning of Nuclear Facilities

NNSA further strengthened the safety regulation of legacy radioactive waste to promote the decommissioning of old nuclear facilities and the treatment and disposal of legacy radioactive waste. NNSA approved the disposition of a batch of disused sealed sources at near surface disposal facilities, and issued approval documents

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for the decommissioning of the two old nuclear facilities. In 2023, a total of seven environmental impact assessment-related documents were approved and eight special inspections were carried out.

In 2023, the regional offices of nuclear

and radiation safety inspection assigned 726 person-days for inspection of the legacy radioactive waste treatment and decommissioning of nuclear facilities, including four routine inspections. A total of 37 findings were identified and 42 regulatory requirements were imposed.

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

By the end of 2023, the total number of organization producing, selling or using radioisotopes and radiation-emitting devices was 121,076 in China, including 9,577 organizations producing selling and using radioisotopes and 111,499 organizations only producing, selling and using radiation-emitting devices. The number of radioactive sources in use was 169,593 (including 16,115 Category I radioactive sources, 18,784 Category II radioactive sources, 1,706 Category III radioactive sources, and 132,988 other radioactive sources); the number of various radiation-emitting devices was 289,732. The temporary storage facilities for radioactive waste in provinces, autonomous regions, and municipalities directly under the Central Government collected and stored 51,729 disused sealed sources. Totally, 165,360 disused sealed sources were transferred or collected to the national repository for centralized storage of disused sealed sources or recycled by the manufacturers.

In 2023, 219 organizations were under direct

regulation of NNSA, which involve those 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, having workplaces with Class A unsealed radioactive materials, and using Magnetic confinement fusion devices. The radiation safety of these organizations was under control.

### Strengthening Regulation of Purchase and Sale of Radioisotopes and Radiation-emitting Devices Online

In response to the emerging challenges and issues surrounding the online sale of radioactive materials in recent years, NNSA has actively engaged in extensive communication with relevant departments to foster inter-departmental collaborative

management. It has jointly issued the *Notice on Strengthening the Safety Management of Purchase and Sale of Radioisotopes and Radiation Devices Online* with the Office of the Central Cyberspace Affairs Commission, the Ministry of Industry and Information Technology, the Ministry of Public Security, the State Administration for Market Regulation, and the State Post Bureau of the People's Republic of China. This collaborative effort clarifies regulatory responsibilities among departments and represents a significant milestone in cross-departmental management. It provides a policy guarantee to address current challenges related to online transactions involving radioisotopes and radiation-emitting devices while establishing a new framework for joint governance.

### Completion of Phase III Upgrade of National Radiation Safety Management System for Nuclear Technology Application

NNSA continued to enhance the functionality of the National Radiation Safety Management System for the Application of Nuclear Technology (hereinafter referred to as the Management System). In July 2023, an upgraded version of the Management System was officially launched, with further optimization in licensing approval authority management and unit information maintenance. Additionally, improvements

were made in query and statistical functions as well as mobile terminal capabilities, along with adaptations of domestic substitutes.

The model for radiation safety licenses was simultaneously enhanced, and the *Letter on Matters Relating to the Online Operation of the Third Phase of the National Radiation Safety Management System for Nuclear Technology Applications* was issued.

Additionally, the specimen of revised license and guidelines for completing application forms were disseminated to provincial ecology and environment departments and made publicly available online. This initiative aims to facilitate adherence to rules and regulations governing nuclear technology application organizations when filling out application forms. A training course was conducted for system administrators to provide an overview of the upgraded system's new functions and features, as well as to highlight key considerations for completing the application content of the new version of licenses.

### Conducting investigation on the regulation of radiation-emitting devices

The past few years have witnessed a significant increase in the type and quantity of radiation-emitting devices, as well as the number of application organizations in China. In order to understand the application of radiation-emitting devices in various fields across China, as well as to ascertain the



## Safety Regulation on Radioisotopes and Radiation-emitting Devices

specific practices adopted by local regulatory bodies regarding the classification, licensing, regulatory inspection, and exemptions pertaining to radiation-emitting devices, NNSA has undertaken research on the policy for regulating radiation safety in relation to such devices. The research was divided into 16 topics and conducted in 12 provinces, including Shanghai, Shaanxi, Jiangsu, and other 16 cities. It involved more than 30 application units of radiation-emitting devices to comprehensively assess the on-site radiation safety situation across various types of devices. In-depth discussions were held with representatives from production, sales, and application units as well as local regulatory bodies to gather concerns from all stakeholders and compile a comprehensive research report.

### Observing and Strictly Enforcing the Law

The law was enforced in 2023, imposing an administrative penalty of over CNY 1.33 million on Shaanxi Fangyuan Hi-Tech Industry Co., Ltd., which had been found to be utilizing radiation-emitting devices beyond the authorized type and scope specified in their license. Additionally, it was revealed that there were violations of the law during the initial stages of the investigation due to failure to accurately report the situation and provide necessary information.

### Recheck of EIA Documents

In 2023, in accordance with the *Measures for Regulation on Preparation of Environmental Impact Report (Form) for Construction Project* and the relevant requirements for regular review on environmental impact report (form), NNSA organized a technical review on 17 environmental impact reports (forms) for nuclear technology application in Sichuan, Hubei, and Inner Mongolia, dispatched 9 of them with suspected quality problems to relevant provincial ecology and environment authorities, and imposed a punishment and scored dishonest behaviors to relevant organizations and personnel in accordance with the law.

### Radiation Safety Trainings and Assessments

In 2023, a total of 5,819 on-site assessments were held in 31 provinces (autonomous regions, and municipalities directly under the Central Government), with a total of 282,008 persons registering for the assessments, 232,179 persons participating the assessments and 163,621 passing the assessments, with a passing rate of 70.4% and 324 cheaters handled; The independent assessment of Class III radiation-emitting device employees has been consistently promoted, with a total of 317,001 individuals participating in the independent assessments entered within the Management System. The

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number of entries for centralized assessments reached 301,560. The cumulative registered users of the radiation protection training platform have reached 194,000.

## License Approvals and Regulatory Inspections

In 2023, NNSA issued radiation safety licenses to 8 nuclear technology application organizations. Licenses of 52 organizations were renewed, licenses of 10 organizations were reapplied, new items were added to the licenses of 31 organizations, and licenses of 10 organizations were modified. The licensees of four organizations were partially cancelled (see Table 74).

NNSA approved environmental impact assessment for two decommissioning projects of nuclear technology application, as well as replied to five conditional exemption letters (see Table 75).

In 2023, the regional offices of nuclear and radiation safety inspection assigned 1,721 person-days for inspection of nuclear technology application organizations, including 323 routine inspections, 31 non-routine inspections and 32 special inspections. A total of 734 issues were identified and 1,050 regulatory requirements were imposed.

## Review and Approval of Radioisotope Imports and Exports

In 2023, NNSA approved 3,208 import and export applications for radioactive sources and unsealed radioactive materials (containing radiopharmaceuticals and their raw materials), including 1,363 applications for importing and exporting radioactive sources and 1,063 applications for exporting radioactive sources, with 8,645 radioactive sources imported and 4,032 exported. The gross radioactivity of imported unsealed radioactive materials was  $3.78 \text{ E} + 16 \text{ Bq}$ , and the gross radioactivity of exported unsealed radioactive materials was  $4.49 \text{ E} + 13 \text{ Bq}$ .

## Training on Radiation Safety Regulation

In 2023, NNSA continued to promote scientization, institutionalization, elaboration of radiation safety regulation in nuclear technology application, and standardized the regulation at all levels nationwide to improve the regulation levels. According to the training plan for 2023, training courses on oversight and law enforcement in nuclear technology application, administrators of the State Radiation Safety Management System for Nuclear Technology Application, and radiation safety regulation personnel for nuclear technology application were conducted in June, August, and September respectively,

## Safety Regulation on Radioisotopes and Radiation-emitting Devices

with 135-participants on-site sessions and simultaneous web-based sessions to enhance participation opportunities.

### Radiation Accidents

In 2023, 5 radiation incidents, classified as ordinary radiation accidents, were reported by the ecology and environment departments (bureaus) of 31 provinces, autonomous regions, and municipalities directly under the Central Government, as well as the ecology and environment bureau of the Xinjiang Production and Construction Corps. Among them, 1 accident occurred in which gamma mobile flaw detection personnel were exposed to overdosed irradiation, 3 accidents were

reported due to the loss or lack of control over Class IV and V radioactive sources, while another 1 accident involved the sealing of a well after a radioactive source used for measuring fell into it.



*Figure 27. On-site Regulatory Inspection on Nuclear Technology Application*

**Table 74. List of Radiation Safety Licenses Approved in 2023**

| No. | Organization   | Item                                    |
|-----|--|---|
| 1   | Liaoning Academy of Agricultural Sciences                    | Re-application and renewal              |
| 2   | Xinjiang Office of Radiation Environment Inspection          | Renewal                                 |
| 3   | Soochow University   | Addition, renewal, partial cancellation |
| 4   | Gansu Tianchen Irradiation Technology Co., Ltd.              | Renewal                                 |
| 5   | Institute of Modern Physics, Chinese Academy of Sciences     | Re-application and renewal              |
| 6   | China Institute of Atomic Energy                             | Addition and change                     |
| 7   | CNNC Xinjiang Supply Chain Co., Ltd.                         | Re-application                          |
| 8   | The 404 Company Limited., China National Nuclear Corporation | Re-application                          |
| 9   | Chongqing Dongcheng AMS Pharmaceutical Co., Ltd.             | Re-application                          |
| 10  | Shanghai AMS Co., Ltd.                                       | Addition                                |
| 11  | Shinva Medical Instrument Co., Ltd.                          | Addition                                |
| 12  | Chengdu New Radiomedicine Technology Co., Ltd.               | Addition, re-application, and renewal   |

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continued

| No. | Organization   | Item                                  |
|-----|--|---------------------------------------|
| 13  | Cancer Hospital of Shandong First Medical University                               | Addition and renewal                  |
| 14  | Zibo Wanjie Cancer Hospital  | Addition                              |
| 15  | Varian Medical Systems Trading (Beijing) Co., Ltd.                                 | Addition and renewal                  |
| 16  | China Institute for Radiation Protection   | Addition                              |
| 17  | Beijing Normal University  | Addition and renewal                  |
| 18  | Chengdu Gaotong Isotope Co., Ltd. (CNNC)   | Addition, re-application, and renewal |
| 19  | Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences | Addition and renewal                  |
| 20  | Radiation Environment Supervision Station of Anhui Province                        | Addition                              |
| 21  | Hubei Renzheng Irradiation Co., Ltd.   | Initial application                   |
| 22  | C-Ray Therapeutics Biopharmaceutical (Chengdu) Co., Ltd                            | Initial application                   |
| 23  | Institute of isotope research, Henan Academy of Sciences                           | Renewal                               |
| 24  | Nanjing University of Aeronautics and Astronautics                                 | Addition                              |
| 25  | Dalian Institute of Chemical Physics, Chinese Academy of Sciences                  | Addition                              |
| 26  | Lanzhou Ion Therapy Co., Ltd.  | Addition                              |
| 27  | Peking University  | Addition                              |
| 28  | Hubei Province Nuclear and Radiation Environment Monitoring Technology Center      | Partial cancellation and change       |
| 29  | Dongguan Campus, Institute of High Energy Physics, Chinese Academy of Sciences     | Addition and change                   |
| 30  | Zhejiang Jiaxiang Radiation Technology Co., Ltd.                                   | Addition                              |
| 31  | Shanghai Advanced Research Institute, Chinese Academy of Sciences                  | Addition                              |
| 32  | Heilongjiang Institute of Atomic Energy  | Addition                              |
| 33  | Institute of High Energy Physics, Chinese Academy of Sciences                      | Addition                              |
| 34  | HTA Co., Ltd.  | Addition                              |
| 35  | Shanghai Gamma Star Technology Development Co., Ltd.                               | Addition                              |
| 36  | Shaanxi Star Torus Fusion Technology Co., Ltd.                                     | Initial application                   |
| 37  | Liaoning Branch of JYAMS Ltd.  | Re-application                        |
| 38  | Jiangxi Andike Pharmaceutical Co., Ltd.  | Initial application                   |
| 39  | University of Science and Technology of China                                      | Addition                              |
| 40  | Chengdu Yunke Pharmaceutical Co., Ltd.   | Initial application                   |
| 41  | Hubei 303 storage  | Re-application                        |

## Safety Regulation on Radioisotopes and Radiation-emitting Devices

continued

| No. | Organization  | Item  |
|-----|---|---|
| 42  | Xi'an ET Medical Technology Co., Ltd.   | Renewal and change                          |
| 43  | Shaanxi Fangyuan Hi-Tech Industry Co., Ltd.   | Addition                                    |
| 44  | JYAMS Ltd.  | Initial application                         |
| 45  | Wuxi EL Pont Group  | Addition and partial cancellation           |
| 46  | Changchun Radiation Technology Co., Ltd., CIRC  | Change                                      |
| 47  | Gansu Heavy Ion Hospital Co., Ltd.  | Re-application                              |
| 48  | Dalian Fu'an Radiation New Technology Co., Ltd.   | Renewal                                     |
| 49  | Kunming Longhui Sterilization Technology Development Co., Ltd.  | Renewal                                     |
| 50  | Siemens Medical Systems Limited   | Addition, partial cancellation, and renewal |
| 51  | Elekta Medical Instruments (Shanghai) Co., Ltd.   | Addition and renewal                        |
| 52  | Harbin Institute of Technology  | Initial application                         |
| 53  | Seeds Pharmaceuticals Research Institute (Tianjin) Ltd.   | Addition                                    |
| 54  | Shanghai Atom Kexing Pharmaceuticals Co., Ltd.  | Addition                                    |
| 55  | National Institute for Radiological Protection, Chinese Center for Disease Control and Prevention                         | Renewal                                     |
| 56  | Lucky Star Irradiation Science Co., Ltd. Shanghai   | Renewal                                     |
| 57  | Yantai Dongfang Irradiation Application Co., Ltd.   | Renewal                                     |
| 58  | Zhejiang Radiation Environment Monitoring Station   | Renewal                                     |
| 59  | Zibo Liyuan High Tech Radiation Technology Co., Ltd.  | Renewal and change                          |
| 60  | Institute of Agricultural Products Processing and Nuclear Agricultural Technology, Hubei Academy of Agricultural Sciences | Renewal and change                          |
| 61  | Guangzhou Furui Gaoneng Technology Co., Ltd.  | Renewal                                     |
| 62  | Sichuan Institute of Atomic Energy  | Renewal                                     |
| 63  | Guizhou Academy of Agricultural Sciences  | Renewal                                     |
| 64  | Beijing Sanqiang Nuclear Radiation Engineering Technology Co., Ltd.   | Change                                      |
| 65  | Nuclear Power Institute of China  | Change and renewal                          |
| 66  | Nanchang University   | Change                                      |
| 67  | Zhongjin Irradiation Wuhan Co., Ltd.  | Renewal                                     |
| 68  | Hunan Institute of Nuclear Agronomy and Seed Cultivation  | Renewal                                     |
| 69  | Zhongjin Irradiation Chengdu Co., Ltd.  | Renewal                                     |
| 70  | Anhui Union Radiation Chemical Co., Ltd.  | Renewal                                     |
| 71  | Changzhou Second Electronic Instrument Co., Ltd.  | Renewal                                     |



continued

| No. | Organization   | Item                |
|-----|--|---------------------|
| 72  | Jining Irradiation Co., Ltd.   | Renewal             |
| 73  | Nanjing Xiyue Technology Co., Ltd.   | Renewal             |
| 74  | Suzhou CNNC Huadong Radiation Co., Ltd.  | Renewal             |
| 75  | Hefei Institutes of Physical Science, Chinese Academy of Sciences                | Renewal             |
| 76  | Anhui Huajing New Material Co., Ltd.   | Renewal             |
| 77  | Nipro Medical (Hefei) Co., Ltd.  | Renewal             |
| 78  | Nuclear and Radiation Safety Center of Shandong Province                         | Renewal             |
| 79  | Shanghai Institute of Measurement and Testing Technology                         | Renewal             |
| 80  | Shanghai Proton and Heavy Ion Center Co., Ltd.                                   | Renewal             |
| 81  | Shanghai Institute of Applied Physics, Chinese Academy of Sciences               | Renewal             |
| 82  | CNNC (Taizhou) Irradiation Technology Co., Ltd.                                  | Renewal             |
| 83  | Nuclear and Radiation Safety Center of Beijing                                   | Renewal             |
| 84  | China Nuclear Energy Industry Corp.  | Renewal             |
| 85  | CGN Uranium Resources Co., Ltd.  | Renewal             |
| 86  | Ion Beam Applications Co., Ltd.  | Renewal             |
| 87  | CNNC 272 Uranium Industry Co., Ltd.  | Renewal             |
| 88  | Guangxi Guilin Zhenghan Irradiation Center Co., Ltd.                             | Renewal             |
| 89  | Masep Medical Science & Technology Development (Shenzhen) Co., Ltd.              | Renewal             |
| 90  | Institute of Nuclear physics and Chemistry, China Academy of Engineering Physics | Renewal             |
| 91  | Southwestern Institute of Physics  | Renewal             |
| 92  | ShanghaiTech University  | Initial application |

**Table 75. Other Environmental Protection Approval and Punishment Documents in the Field of Safety Regulation of Radioisotopes and Radiation-emitting Devices in 2023**

| Date       | Document No.             | Document Title  |
|------------|--------------------------|---|
| 02/13/2023 | NNSA Letter [2023] No. 6 | <i>Letter on Approving the Change of Information of Radioactive Solid Waste Storage License of 10 Organizations Including Nuclear and Radiation Safety Center of Beijing</i>                      |
| 05/23/2023 | MEE App [2023] No. 44    | <i>Reply on the Environmental Impact Report Form of the Decommissioning Project of the Nuclear Medicine Department of Ruijin Hospital North, Shanghai Jiao Tong University School of Medicine</i> |

## Safety Regulation on Radioisotopes and Radiation-emitting Devices

continued

| Date       | Document No.                | Document Title  |
|------------|-----------------------------|---|
| 06/26/2023 | MEE App [2023] No. 59       | <i>Reply on the Environmental Impact Report Form of the Decommissioning Project of Cobalt Source irradiation facilities at East China University of Science and Technology</i>  |
| 03/28/2023 | MEE Decree [2023] No. 14    | <i>Decision on Administrative Penalty (Case of Illegal Use of Radiation-Emitting Devices of Shaanxi Fangyuan Hi-Tech Industry Co., Ltd.)</i>  |
| 09/27/2023 | MEE Radiation [2023] No. 66 | <i>Notice on Strengthening the Safety Management of Purchase and Sale of Radioisotopes and Radiation Devices Online</i>   |
| 01/25/2023 | MEE RL [2023] No. 32        | <i>Reply Letter on Approving the Exemption Management for the End-User Applications of SEED-PM Multifunction Contraband Detector and SEED-HG Handheld Poison Gas Detector of Shanghai Sin-Cere Technology Co., Ltd.</i> |
| 01/25/2023 | MEE RL [2023] No. 33        | <i>Reply Letter on Approving the Exemption Management for the End-User Applications of Model YWGA02 and RFDG01 Chemical Agent Alarms of Yunnan Radio Co., Ltd.</i>  |
| 02/27/2023 | MEE RL [2023] No. 69        | <i>Letter on the Issuance of Radiation Safety Licenses in 2022</i>  |
| 04/29/2023 | MEE RL [2023] No. 151       | <i>Reply Letter on Approving the Exemption Management for the End-User Applications of Trace 1600 and Trace 1610 Gas Chromatograph of Thermo Fisher Scientific (Shanghai) Instruments Co., Ltd.</i>                     |
| 10/27/2023 | MEE RL [2023] No. 351       | <i>Reply Letter on Approving the Exemption Management for the End-User Applications of MIC EC-912 ion concentration meter of Force Technology (Beijing) Co., Ltd.</i>   |
| 11/28/2023 | MEE RL [2023] No. 394       | <i>Reply Letter on Approving the Exemption Management for the End-User Applications of Models 6820, 6850, 6890, 7820, and 7890 Gas Chromatographs of Agilent Technologies (Shanghai) Co., Ltd.</i>                      |
| 09/11/2023 | RL [2023] No. 20            | <i>Reply letter on the consultation on relevant provisions of nuclear medicine standards</i>  |

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

In 2023, NNSA performed its duties on nuclear material control well, and the regional offices of nuclear and radiation safety inspection carried out relevant inspections on nuclear material license holders, in accordance with the *Nuclear Safety Law of the People's Republic of China*, the *Regulations of the PRC on the Control of Nuclear Materials* as well as other relevant laws and regulations, which has effectively strengthened the regulatory control of nuclear materials.

### Nuclear Material License Verification and Approval

NNSA conducted technical review and on-site inspection on the nuclear material licenses applications of State Nuclear Power

Demonstration Plant Co., Ltd. and CNNC-Guodian Zhangzhou Energy Company and completed the verification and approval procedures.

### Strengthening the construction of nuclear material control system

In order to further standardize the reports related to the safety of civil nuclear materials by nuclear material license holders, strengthen the safety regulation of the whole process of civil nuclear materials, and closely guard against the safety risks of civil nuclear materials, NNSA publicized *Notice on the Standardization of Matters Relating to the Safety Reporting of Civil Nuclear Materials* (NNSA Letter [2023] No. 80).

## X. Safety Regulation on Transportation of Radioactive Materials

In 2023, the transportation activities of radioactive materials were safely implemented without the occurrence of any nuclear and radiation accidents or incidents in China.

In 2023, NNSA issued 6 certificates of approval for the design of transport containers for Category I radioactive materials (including 4 changes and renewals); issued 3 manufacturing licenses of transport containers for Category I radioactive materials (including 3 changes and renewals); approved 8 transport containers designed and manufactured abroad for Category I radioactive materials (including 6 changes

and renewals) for use in China; issued 6 certificates of approval for the design of special form radioactive materials (including 2 changes and renewals); approved 26 nuclear and radiation safety analysis reports for the transportation of radioactive materials (including 7 changes and renewals). The major administrative approvals in the field of safety regulation on radioactive material transportation in 2023 are shown in Table 76.

The regulatory inspection activities on transportation safety of radioactive materials in 2023 are shown in Table 77.

**Table 76. Main Administrative Approvals in the Field of Safety Regulation on Radioactive Material Transportation in 2023**

| Date       | Document No.      | Document Title   |
|------------|-------------------|--|
| 01/09/2023 | NNSA [2023] No. 1 | <i>Notice on Issuing the Approval Letter on Use of Seven HI-STAR 100MB Spent Fuel Transport Casks of CNNC Everclean Environmental Technology Engineering Co., Ltd.</i> |
| 01/09/2023 | NNSA [2023] No. 2 | <i>Notice on Approving the Number Increase of JANE Transport Casks for the Use in the People's Republic of China</i>   |

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continued

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 01/25/2023 | NNSA [2023] No. 18  | <i>Notice on Approving the Changes to “The Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Radioactive Raw Materials Iodine-131 and Molybdenum-99 Imported” of Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.</i> |
| 02/09/2023 | NNSA [2023] No. 24  | <i>Notice on Approving the Use of BEATRICE Transport Casks in the People’s Republic of China</i>   |
| 02/22/2023 | NNSA [2023] No. 30  | <i>Notice on Approving the Change of the Design Approval for ANT-12A Fresh Fuel Transport Containers</i>   |
| 03/14/2023 | NNSA [2023] No. 47  | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of Co-60 Disused Sealed Sources from Huaxi, Guiyang (Urban Radioactive Waste Storage Facility in Guiyang) to Jiayuguan</i>                              |
| 03/27/2023 | NNSA [2023] No. 50  | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transport of Fuel Assemblies of CGN Uranium Resources Co., Ltd. from Alataw Pass to Fangchenggang NPP</i>  |
| 03/29/2023 | NNSA [2023] No. 57  | <i>Notice on Approving the Special Arrangement to Implement the “Road-Sea-Rail” Intermodal Transport Tasks of the Second Batch of Spent Fuel in 2022</i>   |
| 04/14/2023 | NNSA [2023] No. 66  | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2027) for Transport of Cobalt Source (GY-20 Containers) of China Isotope &amp; Radiation Corporation (CIRC)</i>  |
| 05/15/2023 | NNSA [2023] No. 83  | <i>Notice on Approving the Renewal of the Validity Period of the Approval Letters for the Design of CN-101D Cobalt-60 Sealed Radioactive Sources (Special Form Radioactive Materials) of the China Institute of Atomic Energy</i>                  |
| 05/24/2023 | NNSA [2023] No. 92  | <i>Notice on Approving the Renewal of TYK-39M1 Transport Casks of Ulba Metallurgical Plant Joint-Stock Company for the Use in the People’s Republic of China</i>   |
| 05/24/2023 | NNSA [2023] No. 93  | <i>Notice on Approving the Renewal of the Design Approval for ZHQY-QG-001 Transport Casks</i>  |
| 05/24/2023 | NNSA [2023] No. 95  | <i>Notice on Approving the Renewal of the Validity Period of the Approval Letters for the Design of CN-101E Cobalt-60 Sealed Radioactive Sources (Special Form Radioactive Materials) of the China Institute of Atomic Energy</i>                  |
| 06/07/2023 | NNSA [2023] No. 102 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Road-Railway Transport of Fuel Assemblies of China North Nuclear Fuel Co., Ltd. from Baotou to Fuqing NPP</i>  |
| 06/07/2023 | NNSA [2023] No. 103 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of Fuel Assemblies from Baotou to Rongcheng National Nuclear Demonstration Power Station of China North Nuclear Fuel Co., Ltd.</i>                      |



# Safety Regulation on Transportation of Radioactive Materials

continued

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 06/15/2023 | NNSA [2023] No. 104 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Transport of Co-60 Radioactive Source (SY-I Transport Casks) of Chengdu Gaotong Isotope Co., Ltd. (CNNC)</i>                           |
| 06/15/2023 | NNSA [2023] No. 108 | <i>Notice on Issuing Approval Letters for the Design of C-451 Co-60 Sealed Radioactive Sources (Special Form Radioactive Materials) of China Institute of Atomic Energy</i>  |
| 06/15/2023 | NNSA [2023] No. 109 | <i>Notice on Approving the Change of the Nuclear and Radiation Safety Analysis Report for Transport of Radioactive Sources Ir-192 and Se-75 of Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.</i>                         |
| 06/25/2023 | NNSA [2023] No. 110 | <i>Notice on Approving the Renewal of Manufacture License for Transport Casks for Category I Radioactive Materials of CNNC Jiahua Nuclear Equipment Manufacturing Co., Ltd.</i>  |
| 06/25/2023 | NNSA [2023] No. 111 | <i>Notice on Approving the Renewal of Manufacture License for Transport Casks for Category I Radioactive Materials of Nantong CIMC Energy Equipment Co., Ltd.</i>  |
| 06/26/2023 | NNSA [2023] No. 113 | <i>Notice on Approving of the Report on Nuclear and Radiation Safety Analysis for Road - Sea Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Changjiang NPP</i>                            |
| 06/26/2023 | NNSA [2023] No. 115 | <i>Notice on Issuing the Design Approval for QY740 UF<sub>6</sub> Transport Containers of Nucleus Industry No.7 Research Design Institute</i>  |
| 06/27/2023 | NNSA [2023] No. 116 | <i>Notice on Issuing Approval Letters for the Design of 26 Special Form Radioactive Materials of Chengdu Gaotong Isotope Co., Ltd. (CNNC)</i>  |
| 06/30/2023 | NNSA [2023] No. 120 | <i>Notice on Approving the Renewal of the Design Approval for SY-I Transport Casks</i>   |
| 07/07/2023 | NNSA [2023] No. 126 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (Special Arrangement) for Transport of Medical Co-60 Radioactive Source (SY-I Containers) of Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.</i>   |
| 07/07/2023 | NNSA [2023] No. 127 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report on the Railway Transport of Low-Enriched Uranium of China Nuclear Energy Industry Corporation from Xigu, Lanzhou to Alataw Pass</i>                    |
| 07/07/2023 | NNSA [2023] No. 128 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Road Transport of Co-60 Disused Sealed Sources from Bin County, Harbin (Urban Radioactive Waste Storage Facility in Heilongjiang) to Jiayuguan</i> |
| 07/21/2023 | NNSA [2023] No. 136 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Road Transport of Kazakhstan UO<sub>2</sub> pellets from Alataw Pass to Yibin</i>  |
| 07/21/2023 | NNSA [2023] No. 137 | <i>Notice on Approving the Change of Manufacture License for Transport Casks for Category I Radioactive Materials of CNNC Jiahua Nuclear Equipment Manufacturing Co., Ltd.</i>   |

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continued

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 08/19/2023 | NNSA [2023] No. 151 | <i>Notice on Approving the Renewal of TK-C5-M Transport Casks of TVEL for the Use in the People's Republic of China</i>   |
| 08/19/2023 | NNSA [2023] No. 152 | <i>Notice on Approving the Number Increase of RIA Transport Casks for the Use in the People's Republic of China</i>   |
| 08/31/2023 | NNSA [2023] No. 157 | <i>Notice on Issuing Approval Letters for the Design of Eight Special Form Radioactive Materials of Chengdu Gaotong Isotope Co., Ltd. (CNNC)</i>  |
| 08/31/2023 | NNSA [2023] No. 159 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Road-Rail Intermodal Transport of 300 MW Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Urumchi PC Project</i>            |
| 09/04/2023 | NNSA [2023] No. 166 | <i>Notice on Approving the "Disposal Program of Cobalt-60 Gamma Knife Source of the Second Hospital of Changchun"</i>   |
| 09/08/2023 | NNSA [2023] No. 174 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) on Transport of Co-60 Disused Sealed Source (R7021 Containers) of CNNC Tongxing (Beijing) Nuclear Technology Co., Ltd.</i>                            |
| 09/27/2023 | NNSA [2023] No. 187 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Road Transport of Fuel Assemblies of China North Nuclear Fuel Co., Ltd. from Baotou to Hongyanhe NPP</i>  |
| 09/27/2023 | NNSA [2023] No. 188 | <i>Notice on Approving the Content Change of "The Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Ir-192, Se-75 and I-131 Radioactive Raw Materials Imported" of Chengdu Gaotong Isotope Co., Ltd. (CNNC)</i> |
| 09/27/2023 | NNSA [2023] No. 189 | <i>Notice on Approving the Renewal of Two NAC-STC Spent Fuel Transport Casks of CNNC Everclean Environmental Technology Engineering Co., Ltd.</i>   |
| 10/09/2023 | NNSA [2023] No. 191 | <i>Notice on Approving the Renewal of Approval Letter for the Use of FCC4-V1 New Fuel Transport Casks of Taishan Nuclear Power Joint Venture Co., Ltd.</i>  |
| 10/12/2023 | NNSA [2023] No. 194 | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Road-Rail Intermodal Transport of 300 MW Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Qinshan</i>                       |
| 11/16/2023 | NNSA [2023] No. 207 | <i>Notice on Approving the content Change of the Nuclear and Radiation Safety Analysis Report for Transport of Co-60 Radioactive Source (SY-I(A) Containers) of Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.</i>                   |

# Safety Regulation on Transportation of Radioactive Materials

continued

| Date       | Document No.              | Document Title   |
|------------|---------------------------|--|
| 11/16/2023 | NNSA [2023] No. 208       | <i>Notice on Approving the Content Changes to the Nuclear and Radiation Safety Analysis Report for Domestic Road Transport of Radioactive Raw Materials Iodine-131 and Molybdenum-99 of Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.</i>                        |
| 12/13/2023 | NNSA [2023] No. 218       | <i>Notice on Issuing the Design Approval for QJ4U320 Pellets Transport Casks of Nucleus Industry No.7 Research Design Institute</i>  |
| 12/13/2023 | NNSA [2023] No. 219       | <i>Notice on Issuing Approval Letters for the Design of Three Special Form Radioactive Materials of Chengdu Gaotong Isotope Co., Ltd. (CNNC)</i>   |
| 12/13/2023 | NNSA [2023] No. 220       | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report for Transport of the Source for Initial Inspection Hot Cell Shielding Test for the Demonstration Fast Reactor of China Institute of Atomic Energy</i>  |
| 12/30/2023 | NNSA [2023] No. 225       | <i>Notice on Approving the Nuclear and Radiation Safety Analysis Report (2023-2028) for Full Road Transport of Fuel Assemblies of CNNC Jianzhong Nuclear Fuel Co., Ltd. from Yibin to Zhangzhou NPP</i>  |
| 03/27/2023 | NNSA Letter [2023] No. 23 | <i>Reply on Approving the Change of Information about Legal Representative in the Approval Letter for the Nuclear and Radiation Safety Analysis Report for Transport of Category I Radioactive Materials by CNNC Tongxing (Beijing) Nuclear Technology Co., Ltd.</i>   |
| 03/27/2023 | NNSA Letter [2023] No. 27 | <i>Reply Letter on Approving the Change of the Name of the Licensee of STC-NF1A Design Approval for New Fuel Transport Containers</i>  |
| 08/31/2023 | NNSA Letter [2023] No. 54 | <i>Reply on Approving the Change of Information about Registered Address in the Approval Letter for the Nuclear and Radiation Safety Analysis Report for Transport of Category I Radioactive Materials by Beijing Beike Radioisotope Science &amp; Trade Co., Ltd.</i> |

**Table 77. Regulatory Inspection Activities in the Field of Safety Regulation on Transportation of Radioactive Materials in 2023**

| Starting Date | Item   | Main Contents of the Inspection  |
|---------------|--|--|
| 02/24/2023    | Witness for design verification test of LC-C-200 transport packages for Category II radioactive materials of Renqiu Jinke Petroleum Equipment Co., Ltd.  | Witness for package design test (shielding test)   |
| 04/06/2023    | Oversight regarding reloading of spent fuel of CNNC Everclean Environmental Technology Engineering Co., Ltd. during “road-sea-rail” intermodal transport | Transportation safety inspection   |
| 04/18/2023    | Design verification test of special form radioactive materials of Chengdu Gaotong Isotope Co., Ltd. (CNNC)   | Witness for design verification test of special form radioactive materials (Class 4 impact test, heat resistance test, and leakage assessment) |

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continued

| Starting Date | Item   | Main Contents of the Inspection  |
|---------------|--|--|
| 05/31/2023    | Inspection on pre-conditions for fabrication of simulating parts during application for change of manufacturing license for transport packages for Category I radioactive materials (with STC-NF2B new fuel transport packages added) of Nantong CIMC Energy Equipment Co., Ltd. | Inspection on pre-conditions (Point H)   |
| 08/07/2023    | Inspection on pre-condition for fabrication of prototype during application for change of manufacturing license for transport packages for Category I radioactive materials (with CNFC-3GS new fuel transport packages added) from Xi'an Nuclear Equipment Co., Ltd.             | Inspection on pre-conditions (Point H)   |
| 08/15/2023    | Witness for lead filling test of Tc-24p spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness of package test (lead filling test)  |
| 09/11/2023    | Witness for lead filling test of GY-20A Co-60 spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness of package test (lead filling test)  |
| 09/13/2023    | Witness for ultrasonic test (UT) for welds of TC-24P D1 spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness for package test (ultrasonic test)   |
| 10/11/2023    | Witness for end-of-manufacturing tests (including hydrostatic test) of GY-20A Cobalt-60 transport packages of Shanghai Apollo Machinery Co., Ltd.  | Witness for package tests (containment system test, hydrostatic test, and lifting lug test)  |
| 10/12/2023    | Witness for lead filling test of TC-24P spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness for package test (load test)   |
| 10/12/2023    | Witness for lead filling test of CNSC spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness of package test (lead filling test)  |
| 11/13/2023    | Witness for design verification test of R911 Ir-192 transport packages of HTA Co., Ltd.  | Witness for package design test (water spray test, lifting device verification, stacking test, free drop test, penetration test, and shielding test) |
| 11/21/2023    | Witness for lead filling test of TC-24P spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness for package test (load test)   |
| 11/27/2023    | Witness for $\gamma$ shielding test of CNSC spent fuel transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness for package test (shielding test)  |
| 12/20/2023    | Witness for helium leakage test, hydrostatic test, and lifting lug load test of GY-20A Cobalt-60 transport packages of Shanghai Apollo Machinery Co., Ltd.   | Witness for package tests (helium leak test, hydrostatic test, and lifting lug test)   |
| 12/21/2023    | Witness for design verification test of SCTC-ZZY01 transport packages of China Institute for Radiation Protection  | Witness for vessel design tests (water spray test, stacking test, free drop test, penetration test, and shielding test)                              |

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

## XI. Regulation on Civil Nuclear Safety Equipment

### Administrative Approvals

In 2023, NNSA received and reviewed 70 applications for civil nuclear safety equipment licenses, and approved 115 applications, including 10 new applications for licenses (see Table 78), 43 applications for renewal (see Table 79), 62 applications for change (see Table 80), and 3 applications for cancellation (see Table 81). As of the end of 2023, a total of 221 organizations have been licensed for the design, manufacture, installation and non-destructive testing (NDT) of civil nuclear safety equipment.

Forty-six applications for registration of civil nuclear safety equipment import were received and reviewed, of which 17 applications were approved (see Table 82).

As of the end of 2023, the total number of foreign organizations holding confirmation of registrations for design, manufacture, or NDT of civil nuclear safety equipment was 172.



*Figure 28. DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, Surveying Harbin Electric Group (Qinhuangdao) Heavy Equipment Co., Ltd.*

**Table 78. Issuance of New Licenses for Civil Nuclear Safety Equipment in 2023**

| Date       | Document No.       | Document Title   |
|------------|--------------------|--|
| 05/15/2023 | NNSA [2023] No. 76 | <i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Shenyang Yuanda Compressor Co., Ltd.</i> |



continued

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 05/15/2023 | NNSA [2023] No. 77  | <i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Chongqing Wecan Precision Instruments Co., Ltd.</i>         |
| 05/15/2023 | NNSA [2023] No. 78  | <i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Zhenjiang Klockner-Moeller Electrical Systems Co., Ltd.</i> |
| 07/21/2023 | NNSA [2023] No. 135 | <i>Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Xiangchun Technology Co., Ltd.</i>                             |
| 07/21/2023 | NNSA [2023] No. 138 | <i>Notice on Issuing Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Biaoxin Industrial Co., LTD</i>                                    |
| 07/28/2023 | NNSA [2023] No. 140 | <i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Shentong Nuclear Energy Equipment Co., Ltd.</i>     |
| 07/28/2023 | NNSA [2023] No. 144 | <i>Notice on Issuing the Licenses for Non-Destructive Testing of Civil Nuclear Safety Equipment to China Nuclear Industry 23 Construction Co., Ltd.</i>     |
| 09/27/2023 | NNSA [2023] No. 185 | <i>Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Yangzhou Pipe Fitting Factory Co., Ltd.</i>                            |
| 10/18/2023 | NNSA [2023] No. 195 | <i>Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Western Titanium Technologies Co., Ltd.</i>                 |
| 10/20/2023 | NNSA [2023] No. 196 | <i>Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Iraeta Energy Equipment Co., Ltd.</i>                                  |

**Table 79. Approvals of License Renewal for Civil Nuclear Safety Equipment in 2023**

| Date       | Document No.        | Document Title  |
|------------|---------------------|---|
| 03/29/2023 | NNSA [2023] No. 58  | <i>Notice on Approving the Renewal of Licenses for Civil Nuclear Safety Equipment of 6 Organizations including China Nuclear Power Engineering Co., Ltd.</i>                    |
| 03/29/2023 | NNSA [2023] No. 59  | <i>Notice on Approving the Renewal of Licenses for Civil Nuclear Safety Equipment of 7 Organizations including Shanghai Electric Nuclear Power Equipment Co., Ltd.</i>          |
| 06/25/2023 | NNSA [2023] No. 110 | <i>Notice on Approving the Renewal of Manufacture License for Transport Casks for Category I Radioactive Materials of CNNC Jiahua Nuclear Equipment Manufacturing Co., Ltd.</i> |
| 06/25/2023 | NNSA [2023] No. 111 | <i>Notice on Approving the Renewal of Manufacture License for Transport Casks for Category I Radioactive Materials of Nantong CIMC Energy Equipment Co., Ltd.</i>               |
| 06/28/2023 | NNSA [2023] No. 117 | <i>Notice on Approving the Renewal of Licenses for Civil Nuclear Safety Equipment of 10 Organizations including Wuhan Heavy Industry Casting and Forging Co., Ltd.</i>          |

# Regulation on Civil Nuclear Safety Equipment

continued

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 09/18/2023 | NNSA [2023] No. 178 | <i>Notice on Approving the Renewal of Licenses for Civil Nuclear Safety Equipment of 10 Organizations including China Nuclear Industry 23 Construction Co., Ltd.</i> |
| 12/30/2023 | NNSA [2023] No. 227 | <i>Notice on Approving the Renewal of Licenses for Civil Nuclear Safety Equipment of 8 Organizations including Wuxi Xinfeng Pipe Industry Co., Ltd.</i>              |

**Table 80. Approvals of License Change for Civil Nuclear Safety Equipment in 2023**

| Date       | Document No.              | Document Title  |
|------------|---------------------------|---|
| 01/25/2023 | NNSA [2023] No. 20        | <i>Notice on Approving the Change of the Scope of Design and Manufacturing License for Civil Nuclear Safety Equipment of Nuclear Power Institute of China</i>                           |
| 01/25/2023 | NNSA [2023] No. 21        | <i>Notice on Approving the Change of the Scope of Design and Manufacturing License for Civil Nuclear Safety Equipment of Wujiang Dong Wu Machinery Co., Ltd.</i>                        |
| 04/29/2023 | NNSA [2023] No. 73        | <i>Notice on Approving the Change of the Scope of Design and Manufacturing License for Civil Nuclear Safety Equipment of Chongqing Chuanyi Automation Co., Ltd.</i>                     |
| 05/23/2023 | NNSA [2023] No. 88        | <i>Notice on Approving the Change of the Scope of Manufacturing License for Civil Nuclear Safety Equipment of Changzhou Green Power Machinery Manufacturing Co., Ltd.</i>               |
| 05/23/2023 | NNSA [2023] No. 89        | <i>Notice on Approving the Change of the Scope of Manufacturing License for Civil Nuclear Safety Equipment of Wuxi Xinfeng Pipe Industry Co., Ltd.</i>                                  |
| 07/07/2023 | NNSA [2023] No. 130       | <i>Notice on Approving the Change of the Scope of Manufacturing License for Civil Nuclear Safety Equipment of Shanghai Nagamori Machinery Co., Ltd.</i>                                 |
| 07/21/2023 | NNSA [2023] No. 137       | <i>Notice on Approving the Change of Manufacture License for Transport Casks for Category I Radioactive Materials of CNNC Jiahua Nuclear Equipment Manufacturing Co., Ltd.</i>          |
| 08/08/2023 | NNSA [2023] No. 150       | <i>Notice on Approving the Change of the Scope of Design and Manufacturing License for Civil Nuclear Safety Equipment of Baosheng Science &amp; Technology Innovation Co., Ltd.</i>     |
| 01/20/2023 | NNSA Letter [2023] No. 4  | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 5 Organizations including Baosheng Science &amp; Technology Innovation Co., Ltd.</i> |
| 03/17/2023 | NNSA Letter [2023] No. 21 | <i>Notice on Approving the Change of the Scope of Design and Manufacturing License for Civil Nuclear Safety Equipment of SUFA Technology Industry Co., Ltd., CNNC</i>                   |

continued

| Date       | Document No.                 | Document Title  |
|------------|------------------------------|---|
| 03/27/2023 | NNSA Letter [2023]<br>No. 24 | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 6 Organizations including Yangzhou Electric Power Equipment Manufacture Factory Co., Ltd. and that in Confirmation of Registration of 3 Overseas Organizations including FRAMATOME SAS</i> |
| 04/29/2023 | NNSA Letter [2023]<br>No. 30 | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 9 Organizations including Shandong Hualing Cable Co., Ltd. and that in Confirmation of Registration of the Overseas Organization AO Alfa Laval Potok</i>                                   |
| 06/30/2023 | NNSA Letter [2023]<br>No. 39 | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 8 Organizations including Henan Senyuan Electric Co., Ltd. and that in Confirmation of Registration of Doosan Heavy Industries &amp; Construction Co., Ltd.</i>                            |
| 07/21/2023 | NNSA Letter [2023]<br>No. 46 | <i>Notice on Approving the Change of the Scope of Manufacturing License for Civil Nuclear Safety Equipment of Wuxi Flange Forging Co., Ltd.</i>   |
| 08/18/2023 | NNSA Letter [2023]<br>No. 50 | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 4 Organizations such as China Nuclear Control System Engineering Co., Ltd.</i>   |
| 08/31/2023 | NNSA Letter [2023]<br>No. 52 | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 7 Organizations including Shanghai Electric Nuclear Power Equipment Co., Ltd. and that in Confirmation of Registration of 5 Overseas Organizations including Delta Mobrey Ltd.</i>         |
| 08/31/2023 | NNSA Letter [2023]<br>No. 53 | <i>Notice on Approving the Change of Licenses for Civil Nuclear Safety Equipment of 4 Organizations including LISEGA Pipe Support Technologies (Shanghai) Co., Ltd.</i>   |
| 10/12/2023 | NNSA Letter [2023]<br>No. 63 | <i>Notice on Approving the Change of Information in Licenses for Civil Nuclear Safety Equipment of 8 Organizations including China Institute of Atomic Energy and that in Confirmation of Registration of the Overseas Organization HOLTEC INTERNATIONAL</i>                                  |
| 10/27/2023 | NNSA Letter [2023]<br>No. 68 | <i>Notice on Approving the Change of the Scope of Design and Manufacturing License for Civil Nuclear Safety Equipment of Jiangsu Power Equipment Co., Ltd.</i>  |

**Table 81. Cancellation of licenses for Civil Nuclear Safety Equipment in 2023**

| Date       | Document No.                 | Document Title  |
|------------|------------------------------|---|
| 09/27/2023 | NNSA Letter [2023]<br>No. 62 | <i>Notice on Canceling the Design and Manufacturing License for Civil Nuclear Safety Equipment of Siemens Factory Automation Engineering Ltd.</i> |

## Regulation on Civil Nuclear Safety Equipment

continued

| Date       | Document No.              | Document Title   |
|------------|---------------------------|--|
| 11/11/2023 | NNSA Letter [2023] No. 74 | <i>Notice on Canceling the Design and Manufacturing License for Civil Nuclear Safety Equipment of Neway Industrial Materials (Suzhou) Co., Ltd.</i>                |
| 11/29/2023 | NNSA Letter [2023] No. 77 | <i>Notice on Canceling the Design and Manufacturing License for Civil Nuclear Safety Equipment of Schneider Electric Information Technology (Xiamen) Co., Ltd.</i> |

**Table 82. Issuance of Registration Confirmation for Civil Nuclear Safety Equipment Activities to Overseas Enterprises in 2023**

| Date       | Document No.        | Document Title   |
|------------|---------------------|--|
| 01/25/2023 | NNSA [2023] No. 17  | <i>Notice on Issuing the Registration Confirmations to Two Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, Including Curtiss-Wright Flow Control Corporation</i> |
| 03/31/2023 | NNSA [2023] No. 60  | <i>Notice on Issuing the Registration Confirmations to Nine Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Valcor Engineering Corporation</i>         |
| 07/07/2023 | NNSA [2023] No. 131 | <i>Notice on Issuing the Registration Confirmations to Two Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including FORGITAL FMDL SAS</i>                       |
| 08/07/2023 | NNSA [2023] No. 148 | <i>Notice on Issuing the Registration Confirmation to Meggitt Safety Systems Inc., an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities</i>                          |
| 09/04/2023 | NNSA [2023] No. 162 | <i>Notice on Issuing the Registration Confirmation to JEUMONT Electric, an Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities</i>                                     |
| 10/27/2023 | NNSA [2023] No. 198 | <i>Notice on Issuing the Registration Confirmations to Two Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Siderforgerossi Group S.p.A</i>             |

XI

### Safety Inspection of Imported Equipment

NNSA conducted safety inspections of imported civil nuclear safety equipment in accordance with national laws, and further standardized and optimized the safety inspection process. Applicants submitted

571 batches of safety inspection application documents (for customs and unboxing inspection) (including 303 for mechanical equipment, 234 for electrical equipment, and 34 for combined mechanical and electrical equipment), among which, 521 were released, 50 were rejected, and 97 were unboxed for inspections.

## XII. Regulation on Electromagnetic Radiation Environment

### Administrative Approvals

In 2023, the MEE/NNSA approved the EIA

documents of seven electromagnetic radiation construction projects, including the Sichuan-Chongqing UHV AC Project (see Table 83).

**Table 83. Administrative Approvals for EIA of Electromagnetic Radiation Construction Projects in 2023**

| Date       | Document No.           | Document Title  |
|------------|------------------------|---|
| 01/09/2023 | MEE App [2023] No. 2   | <i>Approval Reply on the Environmental Impact Report for the Sichuan-Chongqing UHV AC Project (Ganzi-Tianfu South-Chengdu East, and Tianfu South-Tongliang 1,000kV AC Projects)</i> |
| 01/09/2023 | MEE App [2023] No. 3   | <i>Approval Reply on the Environmental Impact Report for the Balin-Naiman (Jinsha)-Fuxin 500kV Power Transmission and Transformation Project</i>                                    |
| 06/15/2023 | MEE App [2023] No. 55  | <i>Approval Reply on the Environmental Impact Report for the Eastern Gansu-Shandong ±800kV UHV DC Power Transmission Project</i>  |
| 07/21/2023 | MEE App [2023] No. 80  | <i>Approval Reply on the Environmental Impact Report for the Zhangbei-Shengli 1,000kV UHV AC Power Transmission and Transformation Project</i>                                      |
| 10/13/2023 | MEE App [2023] No. 113 | <i>Approval Reply on the Environmental Impact Report for the Hami-Chongqing ±800kV UHV DC Power Transmission Project</i>  |
| 10/17/2023 | MEE App [2023] No. 114 | <i>Approval Reply on the Environmental Impact Report for the Ningxia-Hunan ±800kV UHV DC Power Transmission Project</i>   |
| 12/05/2023 | MEE App [2023] No. 135 | <i>Approval Reply on the Environmental Impact Report for the Xiazhou-Qingyang North 750kV Power Transmission and Transformation Project</i>   |



# Regulation on Electromagnetic Radiation Environment

## Pilot Program

In 2023, Zhejiang, Shaanxi, Guangdong and other provinces implemented a pilot pollutant discharging licensing program for power transformation projects. Under this program, pollutant discharging licenses were issued and post-issuance management implemented for 102 power transformation projects, which scientifically verified the feasibility of including electromagnetic radiation in the pollutant discharging licensing program; some provinces rolled out a pilot project to investigate the current situation of regional electromagnetic environment to identify the level of electromagnetic environment in typical regions, supporting the legislation on the prevention and control of electromagnetic radiation pollution.

## Regulatory Inspections

In 2023, NNSA, together with the Ministry of Industry and Information Technology, and the State Administration for Market Regulation, inspected the electromagnetic radiation environment monitoring work performed by communication base stations throughout China. During these inspections, over 15,000 monitoring reports were sampled and inspected to get the big picture of the electromagnetic radiation environment monitoring work of communication base stations throughout China, good practices and problems identified in various regions

were summarized, and the falsification of environmental monitoring data were investigated and punished seriously. The three authorities mentioned above have carried out joint inspection demonstration activities in Shanghai, where significant progress has been made and outstanding results achieved in such inspection work, and notified all licensees, China Tower Corporation Limited and monitoring agencies concerned of the inspection opinions. In addition, they also strengthened the interim and post-event regulation of power transmission and transformation construction projects, and organized regulatory inspections on ecological and environmental protection during the construction phase of the Sichuan-Chongqing UHV AC project.

## Re-check of EIA Documents

In 2023, NNSA reviewed 34 EIA documents for the power construction projects with electromagnetic radiation impact in five provinces (autonomous regions), namely, Inner Mongolia, Hubei, Guangdong, Sichuan, and Tibet. Seven EIA documents suspected of quality problems were transferred to the corresponding provincial ecological environment department, and organizations and personnel involved were punished in accordance with the law, with their credit scores deducted for their breach of trust. So far, the first round of EIA document review covering 31 provinces (autonomous regions

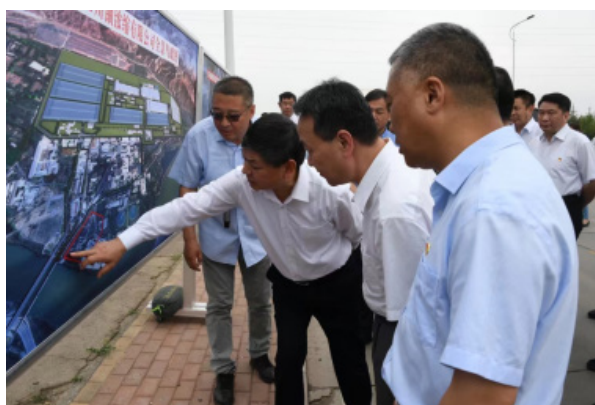
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and municipalities) in China has been completed. Moreover, NNSA has started a new round of EIA document review, during which, EIA documents of electromagnetic

radiation construction projects in Tianjin, Liaoning, Hunan and Hainan provinces (municipality directly under the central government) were sampled and reviewed.

### XIII. Radiation Environmental Monitoring

NNSA organized provinces to efficiently operate and manage the national radiation environment monitoring network. Throughout the year, the data acquisition rate of real-time monitoring at automatic radiation monitoring stations remained stable at over 97% on average. NNSA continued to enhance its quality management. NNSA conducted the annual quality assessment and professional training for monitoring projects, and organized a series of training courses on: automatic monitoring of the radiation environment and operation and management of automatic radiation environment monitoring stations; application of portable spectrometers in emergency monitoring; and radiochemical analysis of strontium-90 and cesium-137 in aerosols and fallout. NNSA approved the relocation of state-possessed points for radiation environment monitoring in Qinghai, Zhejiang, Jilin, Jiangsu and other provinces, as well as the construction plan for the supervisory monitoring system in San'ao NPP, Zhejiang, the reconstruction plan for the supervisory monitoring system in the frontier station of Hongyanhe NPP, Liaoning,



*Figure 29. HUANG Runqiu, Minister of Ecology and Environment, Surveys the Regional Emergency Supply Warehouse for Nuclear and Radiation Monitoring (Northwest) Project at CNNC Lanzhou Uranium Enrichment Co., Ltd.*

the supplementary construction plan for the supervisory monitoring system of Yangjiang NPP, and the supervisory monitoring plans of radiation environment for the 404 Spent Fuel Reprocessing Industrial Demonstration Plant, Thorium Molten Salt Reactor (TMSR), Haiyang NPP, Shidao Bay NPP, Xiapu NPP, and Tianwan NPP; it also completed the pre-acceptance of the supervisory monitoring system in the 404 Spent Fuel Reprocessing Industrial Demonstration Plant. NNSA vigorously advanced the construction of regional emergency supply warehouses for

nuclear and radiation monitoring, selected the warehouse project site, prepared and reviewed the project feasibility study report, and submitted the project feasibility report to the National Development and Reform Commission for project approval. NNSA assessed the licensees of operating NPPs for their radiation monitoring capability, with special inspections conducted.

### Monitoring of Ionizing Radiation Environment

In 2023, the nationwide environmental ionizing radiation level was within the range of background fluctuations. The dose rates of  $\gamma$ -radiation were within the range of local natural background fluctuation. The activity concentrations of naturally occurring radionuclides in the air were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of naturally 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 groundwater met those specified for Category III in *Standard for Groundwater Quality* (GB/T 14848-2017). The activity concentrations of gross  $\alpha$  and gross  $\beta$  in urban centralized drinking water source met those specified in the *Standards for Drinking Water Quality* (GB 5749-2022). The activity concentrations of naturally occurring radionuclides in seawater and marine organisms in coastal waters were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of relevant artificial radionuclides, such as Strontium-90 and Cesium-137, in seawater were much lower than the limits specified in *Sea Water Quality Standard* (GB 3097-1997), while the activity concentrations of those in marine organisms were much lower than the limits specified in the *Limited Concentrations of Radioactive Materials in Foods* (GB 14882-94). The activity concentrations of naturally occurring radionuclides in the soil were at the background level, and no abnormal activity concentration of artificial radionuclides was detected.

## Radiation Environmental Monitoring

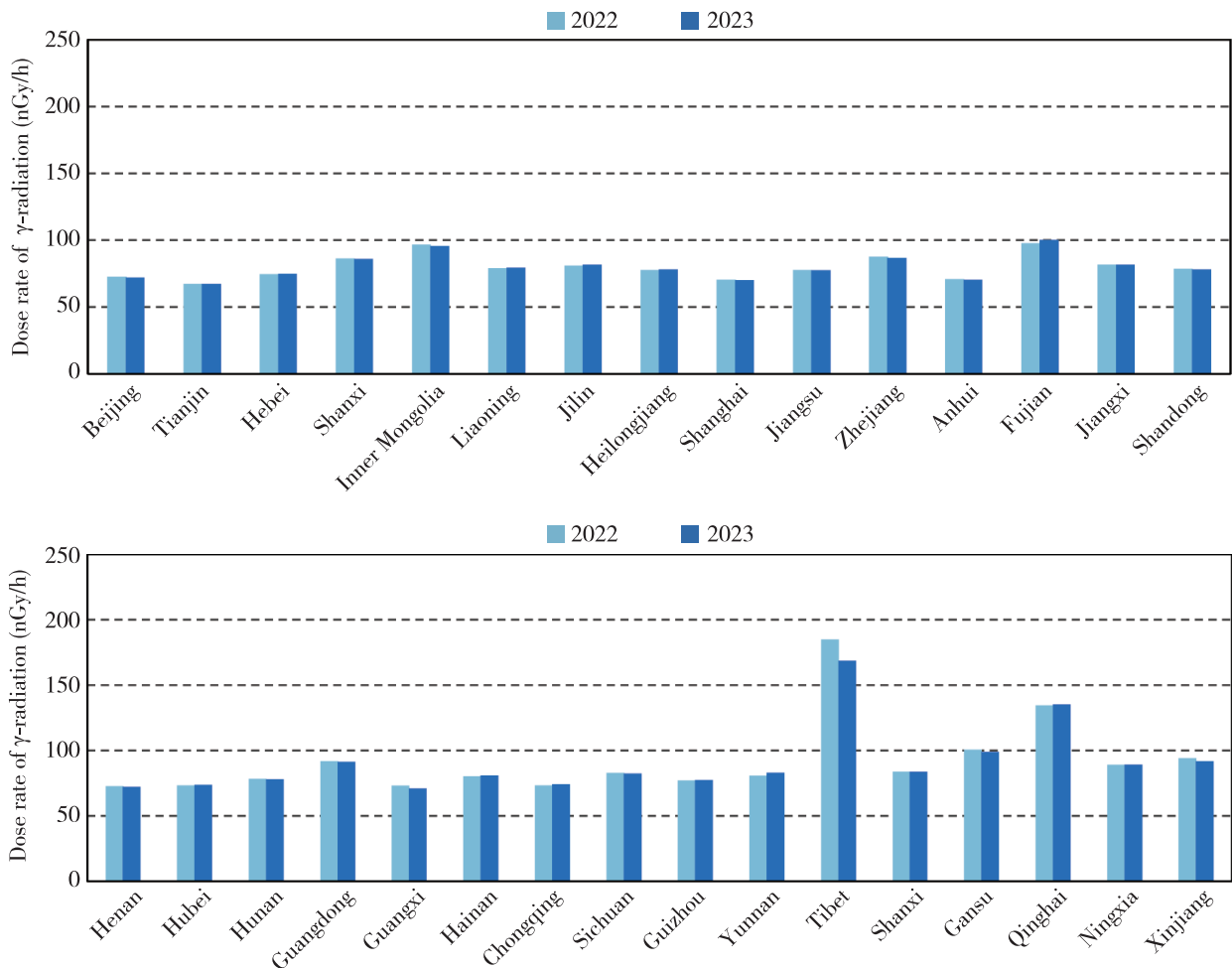


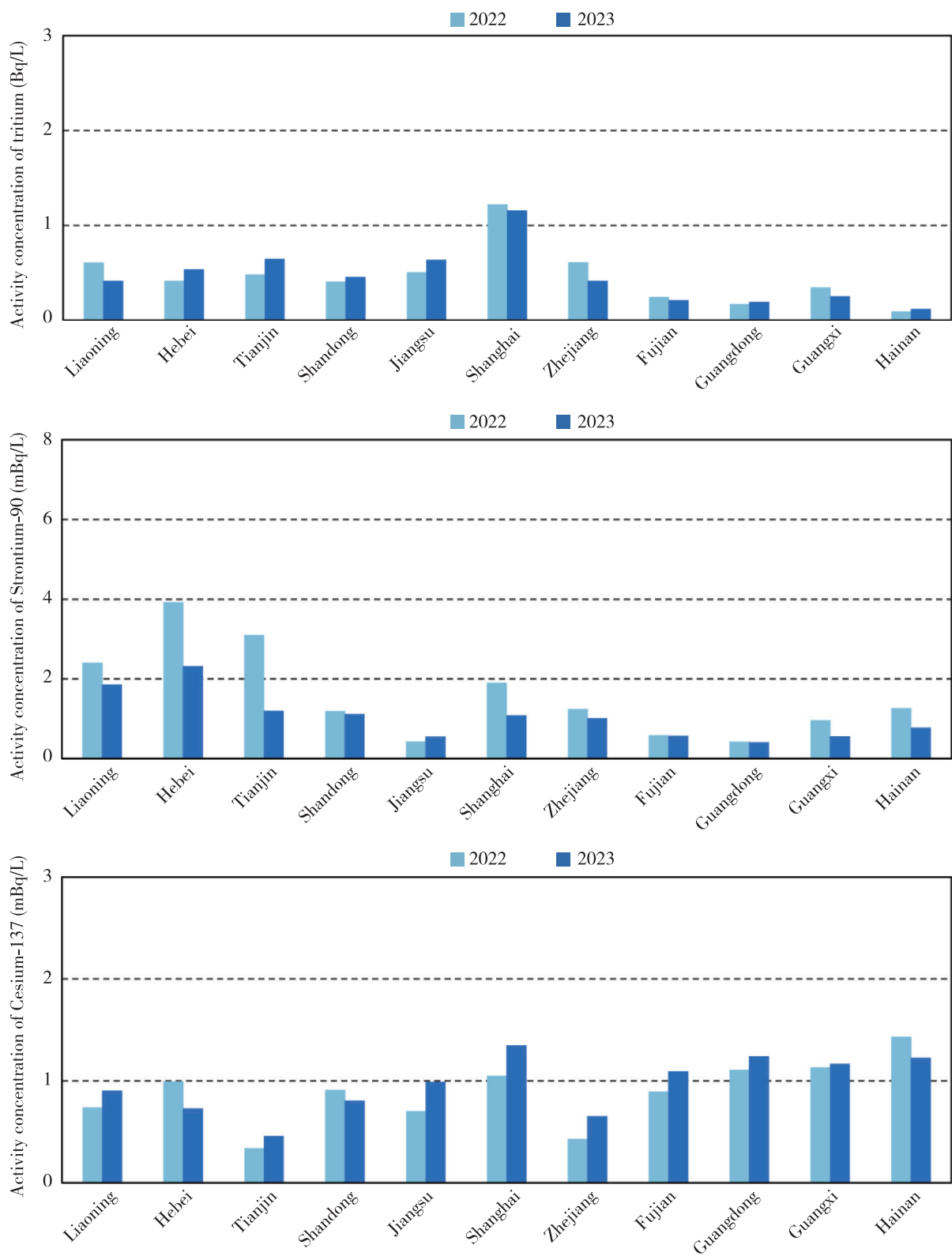
Figure 30. Results of Automatic Monitoring of Dose Rate of  $\gamma$ -radiation in the Environment in 2023\*

### Ionizing Radiation Environmental Monitoring Around Nuclear Facilities

In 2023, around operating nuclear power bases, civil research reactors, nuclear fuel cycle facilities and radioactive waste disposal facilities, the dose rates of  $\gamma$ -radiation as well as, the activity concentrations of radionuclides

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





**Figure 31. Monitoring Results of Tritium, Strontium-90 and Cesium-137 Activity Concentrations in Offshore Marine Area of China in 2023**

### **Ionizing Radiation Environmental Monitoring Around Uranium Mining and Milling Facilities**

In 2023, around uranium mining and milling facilities, the dose rates of  $\gamma$ -radiation were generally within the fluctuation range over the years, so were the activity concentrations of radionuclides in air, water and soil related to activities of such facilities.

### **Electromagnetic Radiation**

In 2023, 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 radiation sensitive targets around the monitored broadcast and television transmitting facilities, power transmission and transformation facilities, and mobile communication bases all complied with the *Controlling Limits for Electromagnetic Environment* (GB 8702-2014).

## XIV. Emergency Management of Nuclear and Radiation Accidents

In 2023, NNSA reviewed and re-examined the on-site emergency plans for civil nuclear facilities in accordance with the law. NNSA also conducted regulatory inspection and evaluation on the daily emergency preparedness as well as comprehensive on-site emergency exercises for nuclear facilities, with the aim of effectively strengthening the regulation of emergency preparedness for nuclear facilities. NNSA continued to strengthen its emergency preparedness and response capabilities and successfully completed several tasks concerning nuclear and radiation emergency response.

### Regulation of Nuclear Facility Emergency Preparedness

In 2023, NNSA completed regulatory inspections on emergency preparedness as well as regulatory evaluation on the on-site comprehensive emergency exercise conducted before the initial loading of Unit 1 of the CAP1400 Demonstration Project, and

CNNC Lanzhou Uranium Enrichment Co., Ltd.'s new production capacity project during the “14th Five-Year Plan” period.

NNSA completed the regulatory evaluation on the on-site comprehensive emergency exercise of 17 nuclear facility licensees such as Tianwan NPP, Qinshan NPP, Ningde NPP, and Nuclear Power Institute of China. During the inspection, it conducted systematic analysis on the problems found and experience feedback, strengthened follow-up inspections, and supervised the implementation of rectification measures.



*Figure 32. Regulatory Evaluation on Comprehensive Nuclear Emergency Exercise*

# Emergency Management of Nuclear and Radiation Accidents

## Approval of on-site Emergency Plans

NNSA approved the on-site nuclear emergency response plans for three nuclear facility licensees, namely, the 2 MWt Liquid Fuel Thorium Molten Salt Reactor (TMSR-LF), Taishan NPP, and CNNC Lanzhou Uranium Enrichment Co., Ltd. NNSA filed the on-site nuclear emergency response plans for four nuclear facility licensees, namely, Hongyanhe NPP, Qinshan NPP, Ningde NPP, and Nuclear Power Institute of China.

## Nuclear and Radiological Emergency and Security Preparedness

NNSA implemented a 24-hour emergency duty system, and kept making good emergency duty preparedness during important events and major festivals. In 2023, NNSA kept making good nuclear emergency duty preparedness during important meetings and major events such as the “Two Sessions”, the Asian Games Hangzhou, the FISU Chengdu Summer Universiade, and the China International Import Expo in Shanghai, as well as during important festivals such as the Spring Festival, Qingming Festival, May Day, Dragon Boat Festival, National Day, and Mid-Autumn Festival.

## Coordinating and Guiding Nuclear and Radiation Accident Emergency Exercises

From January 11 to 13, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, led a delegation to Hong Kong to participate in the “Chessboard III” nuclear emergency exercise; the delegation exchanged views with all parties on further deepening cooperation in related fields such as nuclear safety, environmental monitoring and radiation environment monitoring, and supporting the Hong Kong-Guangdong nuclear emergency cooperation mechanism in playing an active role.

The regional offices of nuclear and radiation safety inspection coordinated and guided provincial ecology and environment authorities in Hebei, Jiangsu, Anhui, Shandong, Hunan, Sichuan, Ningxia, Xinjiang and other provinces (autonomous regions) to take the lead in implementing comprehensive radiation accident emergency exercises. Through these exercises, the impetus placed by the local governments on radiation accident emergency was enhanced, and the primary responsibilities of the local governments in radiation accident emergency were implemented. The emergency teams were comprehensively trained, the emergency plans and facilities were examined, the emergency response and handling

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capabilities were improved, and the radiation safety regulation was further promoted.

### Strengthening Emergency Preparedness for Nuclear and Radiation Accidents

In 2023, the nuclear and radiation accident emergency training classes of the MEE/NNSA were held. Under the organization of NNSA, organizations subordinate to the Ministry of Ecology and Environment conducted special emergency drills jointly with the Chongqing Ecology and Environment Bureau, the Department of Ecology and Environment of Heilongjiang Province, and the Tianwan NPP, respectively. NNSA instructed the North-

Eastern Regional Office of Nuclear and Radiation Safety Inspection, and the Nuclear and Radiation Safety Center to organize a special drill for emergency monitoring of radiation environment in border areas and surrounding areas of Northeast China, and coordinated the departments of ecology and environment of Hebei Province and Inner Mongolia Autonomous Region to support the emergency monitoring. NNSA strengthened the operation and maintenance management of nuclear and radiation emergency command and dispatch platform, and conducted special emergency communication exercises every month to maintain the emergency response capability.



## XV. Personnel Qualification

### Qualification of Civil Nuclear Reactor Operators

In 2023, the civil nuclear facility operator licenses were issued in four batches by NNSA to 719 operators in total, including 648 NPP operators, and 71 civil research reactor operators.

As of December 2023, there were 3,247 persons in total holding NPP operator licenses (see Table 84), including 2,026 persons holding senior operator licenses and 1,221 holding operator licenses. There were 264 persons holding civil research reactor operator licenses (see Table 85), including 158 persons holding senior operator licenses and 106 holding operator licenses.

**Table 84. Statistics on Licenses for Operators of Nuclear Power Plants**

| Licensee   | Nuclear Facility                    | Senior operators | Operators | Subtotal |
|--|-------------------------------------|------------------|-----------|----------|
| CNNC Nuclear Power Operation Management Co., Ltd.          | Qinshan NPP                         | 44               | 32        | 76       |
|  | Qinshan Phase II NPP Units 1 and 2  | 69               | 35        | 104      |
|  | Qinshan Phase II NPP Units 3 and 4  | 83               | 31        | 114      |
|  | Qinshan Phase III NPP Units 1 and 2 | 82               | 52        | 134      |
|  | Fangjiashan NPP Units 1 and 2       | 84               | 34        | 118      |
| Daya Bay Nuclear Power Operations and Management Co., Ltd. | Daya Bay NPP                        | 84               | 22        | 106      |
|  | Ling'ao NPP Units 1 and 2           | 86               | 27        | 113      |
|  | Ling'ao NPP Units 3 and 4           | 72               | 28        | 100      |
| Jiangsu Nuclear Power Co., Ltd.                            | Tianwan NPP Units 1 and 2           | 101              | 33        | 134      |
|  | Tianwan NPP Units 3 and 4           | 58               | 74        | 132      |
|  | Tianwan NPP Units 5 and 6           | 43               | 62        | 105      |
| Fujian Ningde Nuclear Power Co., Ltd.                      | Ningde NPP Units 1 and 2            | 69               | 36        | 105      |
|  | Ningde NPP Units 3 and 4            | 74               | 46        | 120      |

continued

| Licensee  | Nuclear Facility                               | Senior operators | Operators   | Subtotal    |
|---|--|------------------|-------------|-------------|
| Liaoning Hongyanhe Nuclear Power Co., Ltd.          | Hongyanhe NPP Units 1 and 2                    | 72               | 35          | 107         |
|   | Hongyanhe NPP Units 3 and 4                    | 75               | 24          | 99          |
|   | Hongyanhe NPP Units 5 and 6                    | 39               | 34          | 73          |
| Yangjiang Nuclear Power Co., Ltd.                   | Yangjiang NPP Units 1 and 2                    | 63               | 20          | 83          |
|   | Yangjiang NPP Units 3 and 4                    | 86               | 23          | 109         |
|   | Yangjiang NPP Units 5 and 6                    | 66               | 15          | 81          |
| Fujian Fuqing Nuclear Power Co., Ltd.               | Fuqing NPP Units 1 and 2                       | 75               | 43          | 118         |
|   | Fuqing NPP Units 3 and 4                       | 75               | 43          | 118         |
|   | Fuqing NPP Units 5 and 6                       | 42               | 55          | 97          |
| Guangxi Fangchenggang Nuclear Power Co., Ltd.       | Fangchenggang NPP Units 1 and 2                | 78               | 32          | 110         |
|   | Fangchenggang NPP Units 3 and 4                | 49               | 63          | 112         |
| Hainan Nuclear Power Co., Ltd.                      | Changjiang NPP Units 1 and 2                   | 74               | 42          | 116         |
| Sanmen Nuclear Power Co., Ltd.                      | Sanmen NPP Units 1 and 2                       | 71               | 57          | 128         |
| Shandong Nuclear Power Company Ltd.                 | Haiyang NPP Units 1 and 2                      | 76               | 94          | 170         |
| Taishan Nuclear Power Joint Venture Co., Ltd.       | Taishan NPP Units 1 and 2                      | 68               | 38          | 106         |
| Huaneng Shandong Shidao Bay Nuclear Power Co., Ltd. | Units 1 and 2 of HTGR Demonstration Project    | 29               | 26          | 55          |
| State Nuclear Power Demonstration Plant Co., Ltd.   | Units 1 and 2 of CAP1400 Demonstration Project | 39               | 65          | 104         |
| <b>Total</b>  |  | <b>2026</b>      | <b>1221</b> | <b>3247</b> |

**Table 85. 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)                   | 13               | 5         | 18       |
|                                  | Nuclear Criticality Safety Test Facility in Pilot Plant | 9                | 19        | 28       |
|                                  | Prototype Miniature Neutron Source Reactor (PMNSR)      | 3                | 6         | 9        |
|                                  | China Experimental Fast Reactor (CEFR)                  | 34               | 0         | 34       |
|                                  | China Advanced Research Reactor (CARR)                  | 11               | 12        | 23       |
|                                  | Zero-power Assembly of MNSR                             | 3                | 6         | 9        |

continued

| Licensee  | Nuclear Facility  | Senior operators | Operators  | Subtotal   |
|---|---|------------------|------------|------------|
| Nuclear Power Institute of China                                    | High Flux Engineering Test Reactor (HFETR)                      | 24               | 19         | 43         |
|   | Minjiang Test Reactor (MJTR)                                    | 10               | 10         | 20         |
|   | Critical Assembly of High Flux Engineering Test Reactor (HFETR) | 5                | 5          | 10         |
|   | China Pulsed Reactor (CPR)                                      | 6                | 1          | 7          |
|   | 18-5 Critical Assembly  | 6                | 1          | 7          |
| Institute of Nuclear and New Energy Technology, Tsinghua University | 5 MW Low Temperature Nuclear Heating Test Reactor (NHR-5)       | 7                | 8          | 15         |
|   | 10 MW High Temperature Gas-Cooled Test Reactor (HTR-10)         | 19               | 5          | 24         |
| Beijing Capture Tech Co., Ltd.                                      | In-Hospital Neutron Irradiator (IHNI)                           | 0                | 2          | 2          |
| Shanghai Institute of Applied Physics, Chinese Academy of Sciences  | 2 MWt Liquid Fuel Thorium Molten Salt Reactor (TMSR-LF)         | 8                | 7          | 15         |
| <b>Total</b>  |   | <b>158</b>       | <b>106</b> | <b>264</b> |

### Qualification of Non-destructive Testing Personnel for Civil Nuclear Safety Equipment

In 2023, NNSA issued two batches of examination plans for civil nuclear safety equipment NDT personnel and authorized five NDT personnel examination centers to hold 29 exams. Eleven batches of civil nuclear safety equipment NDT personnel qualification certificates were issued, and a total of 2,978 persons and 3,012 certificates were approved.

As of December 2023, a total of 8,227 persons held 20,652 civil nuclear safety equipment NDT personnel qualification

certificates, including 1,533 advanced (Level III) certificates, 13,473 intermediate (Level II) certificates and 5,646 primary (Level I) certificates.

### Qualification of Civil Nuclear Safety Equipment Welders

In 2023, NNSA issued two batches of examination plans for civil nuclear safety equipment welders and authorized 13 civil nuclear safety equipment welder examination centers to hold 33 exams. Eleven batches of civil nuclear safety equipment welder qualification certificates were issued, and a

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total of 4,111 persons and 4,150 certificates were approved. As of December 2023, a total of 7,254 persons held 10,955 civil nuclear safety equipment welder qualification certificates.

### Qualification of Registered Nuclear Safety Engineers

In 2023, a total of 2,420 applicants applied for the National Unified Examination for Qualification of Registered Nuclear Safety Engineers, 1,453 applicants took the examinations, and 246 applicants obtained the Registered Nuclear Safety Engineer Qualification. In the whole year, NNSA conducted 4 batches of registration of nuclear safety engineers, and approved 615 applications, including 290 new registrations, 299 renewals, and 26 with changed registered organizations.

As of December 2023, a total of 5,027 applicants nationwide had obtained the certificates of the Registered Nuclear Safety Engineer Qualification, including 1,691 registered nuclear safety engineers on-duty in 228 organizations in China.

### Professional Training for Staff in Charge of Nuclear and Radiation Safety Regulation

NNSA developed and released the *Professional Training Plan of the National Nuclear Safety Administration in 2023*. Following such plan, NNSA carried out 18 offline trainings. The series of training served 654 trainees, and captured many training video materials in 97 subjects, enriching online training resources.



Figure 33. Closing Ceremony of the Orientation Training for Regulatory Inspection Staff in 2023

# XVI. International Cooperation

### Continually Promoting Multilateral Cooperation

Cooperation with the International Atomic Energy Agency. On March 20 and May 25, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, held talks with Rafael Mariano Grossi, Director General of the International Atomic Energy Agency, respectively. During the talks, the two sides expressed their intention to deepen cooperation and their willingness to contribute to global nuclear safety improvement. On May 22, the Nuclear and Radiation Safety Center of MEE signed an agreement with the IAEA in Beijing to establish the IAEA's first Global Collaboration Center for Nuclear and Radiation Safety. NNSA actively participated in institutional meetings at all levels of IAEA, and assigned its staff to attend the IAEA General Conference, meetings held by the Commission on Safety Standards, the Nuclear Safety Standards Committee, and the Radiation Safety Standards Committee, the International Conference on Climate Change and the Role of Nuclear Power, the Nuclear

Harmonization and Standardization Initiative (NHSI) Plenary, etc.



*Figure 34. DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, Holds Talks with Rafael Mariano Grossi, Director General of the International Atomic Energy Agency*

Cooperation with the OECD Nuclear Energy Agency. On March 24 and July 25, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with William Magwood, Director-General of the OECD Nuclear Energy Agency (NEA), respectively. At the meeting, the two sides had a discussion on further deepening cooperation. NNSA sent its staff to attend



meetings, such as the annual meeting of the Multinational Design Evaluation Programme (MDEP) for nuclear power plants, the meetings of the MDEP Management Board, the MDEP Hualong One Working Group, and other working groups, the meetings of the Committee on Nuclear Regulatory Activities (CNRA) and the Committee on the Safety of Nuclear Installations (CSNI) and their working groups and technical seminars held by them, and the meetings of the NEA Emergency Working Group and the nuclear emergency seminars held by them.

Cooperation with other international organizations. In 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with QU Dongyu, Director-General of the United Nations Food and Agriculture Organization (FAO), Sylvie Bermann, President of the World Nuclear Exhibition (WNE), and Sama Bilbao y Leon, Director General of the World Nuclear Association (WNA), etc. NNSA sent its staff to attend meetings, such as the annual meeting of the International Commission on Radiological Protection & the 7<sup>th</sup> International Symposium on the System of Radiological Protection, the meeting of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), etc.

### Continually Consolidating Bilateral Cooperation

NNSA promoted cooperation with major nuclear power countries in nuclear safety actively. In March 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited France, where he met with François Jacq, Chairman of the French Alternative Energies and Atomic Energy Commission (CEA), and Jean-Christophe Niel, Director General of the French Institute for Radiation Protection and Nuclear Safety (IRSN). On November 14, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, co-chaired a meeting of the China-France Steering Committee for Nuclear Safety Cooperation with Bernard Doroszczuk, President of the French Nuclear Safety Authority (ASN) in Beijing, and the bilateral cooperation agreement was renewed by them. On December 15, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Alexey Ferapontov, Deputy Chairman of Rostekhnadzor (Federal Environmental, Industrial and Nuclear Supervision Service of Russia). At the meeting, the two sides had a discussion on deepening cooperation in the future and relevant arrangements for the China-Russia Joint Coordination Meeting on Nuclear Safety

## International Cooperation

to be held in 2024. On September 26, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Patrick Fragman, President and Chief Executive Officer of Westinghouse Electric Company to urge Westinghouse to play an active role in promoting the lifting of U.S. civilian nuclear energy sanctions against China. In 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, also met with Christopher Hanson, Chair of the U.S. Nuclear Regulatory Commission, Mark Foy, Chief Executive of the UK Office for Nuclear Regulation (ONR), and LIM Seungcheol, Secretary General of the Korea Nuclear Safety and Security Commission (NSSC).

NNSA made efforts to strengthen cooperation in nuclear safety with the Belt and Road Initiative countries. From August 1 to 5, 2023, DONG Baotong, Vice Minister of

Ecology and Environment and Administrator of National Nuclear Safety Administration, led a delegation to Pakistan to attend the meeting of the China-Pakistan Nuclear Safety Cooperation Steering Committee, and went to the Karachi NPP and Chashma NPP to conduct on-site joint oversight. A memorandum of understanding was signed by the two sides to establish the China-Pakistan Nuclear Safety Cooperation Center. On September 14, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with visiting Dr. Yau Usman Idris, Director General of the Nigerian Nuclear Regulatory Authority to exchange views on nuclear safety regulation of the two countries. In 2023, the relevant department-level leaders of NNSA also met with visiting heads of nuclear regulatory agencies of Thailand, Singapore, Indonesia and other countries.

# XVII. Performance of Obligations under International Conventions

## Implementation of the Convention on Nuclear Safety

From March 19 to 26, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, led a Chinese government delegation to Austria to attend the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the *Convention on Nuclear Safety*. China's implementation of the Convention was highly praised and acknowledged by the other contracting parties.

During the Review Meeting, the Chinese delegation introduced in detail China's nuclear safety status, nuclear safety regulation and implementation of the *Vienna Declaration on Nuclear Safety*, and answered questions raised by the parties frankly. The delegation clarified that China, as a responsible nuclear country, had always developed nuclear power on the premise of safety, kept improving its capabilities of nuclear safety regulation, implemented regulation in accordance with the strictest standards, maintained



*Figure 35. Members of the Delegation at the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety*

good safety performance, and continuously strengthened international cooperation in nuclear safety to build a community with a shared future for nuclear safety.

The parties believed that China had achieved and maintained a high level of nuclear safety and achieved remarkable results. China innovatively reviewed the implementation of the first-ever reactor regulation method, and actively shared relevant knowledge and experience internationally, which has been recognized as a good practice; The work of China in eight aspects, including

## Performance of Obligations under International Conventions

actively coping with the COVID-19 pandemic and conducting relevant exercises, and establishing special working groups to study common issues, was recognized as a good practice for reference by international counterparts.

### Implementation of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management

On February 28, 2023, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety

Administration, attended the first meeting of the China National Report Review Committee (NRRC) for the Eighth Review Meeting of the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management* (hereinafter referred to as the “Joint Convention”) & the Review of the Seventh Implementation of the Joint Convention. NNSA took a leading role in establishing the China National Report Review Committee (NRRC) for the Eighth Implementation of the Joint Convention. NNSA drafted the *China National Report for the Eighth Implementation of the Joint Convention*, incorporating the comments from all NRRC members.

## XVIII. Milestones

From January 11 to 13, DONG Baotong, Vice Minister of MEE and Administrator of NNSA, led a delegation to the Hong Kong Special Administrative Region to witness the “Chessboard III” response exercise.

On January 15, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Daya Bay NPP and Taipingling Nuclear Power Base in Guangdong.

On January 17, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Dongfang Electric (Guangzhou) Heavy Machinery Co., Ltd.

On January 19, the Annual Work Promotion Meeting on Nuclear and Radiation Safety Regulation was held, and DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the meeting and delivered a speech.

From January 30 to February 3, DONG Baotong, Vice Minister of Ecology and

Environment and Administrator of National Nuclear Safety Administration, visited the 404 Company Limited., China National Nuclear Corporation, CNNC Lanzhou Uranium Enrichment Co., Ltd., the Institute of Modern Physics, Chinese Academy of Sciences, etc.

From February 3 to 5, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Nuclear Power Institute of China.

On February 5, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Erzhong (Deyang) Heavy Equipment Co., Ltd. and other organizations engaged in nuclear equipment.

On February 6, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Tony d’Aletto, Counsellor for Nuclear Energy Affairs at the Embassy of France in China.

On February 23, the review opinion on the



siting of San'ao NPP Units 3 and 4 in Zhejiang was issued.

On February 27, the document titled *Site Evaluation for Nuclear Installations* was issued.

On March 9, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with QU Dongyu, Director-General of the United Nations Food and Agriculture Organization (FAO).

From March 19 to 26, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, led a Chinese government delegation to Vienna, Austria, to attend the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the *Convention on Nuclear Safety*.

From March 19 to 23, during the Review Meeting of the Contracting Parties to the *Convention on Nuclear Safety*, the Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration met with Christopher Hanson, Chair of the U.S. Nuclear Regulatory Commission, Rafael Mariano Grossi, Director General, LIU Hua, Deputy Director General, Lydie Evrard, Deputy Director General of the International Atomic Energy Agency, Bernard Doroszczuk, President of the French Nuclear Safety Authority (ASN), Mark Foy,

Chief Executive and Chief Nuclear Inspector of the UK Office for Nuclear Regulation (ONR), Alexey Ferapontov, Deputy Chairman of Rostekhnadzor (Federal Environmental, Industrial and Nuclear Supervision Service of Russia), LIM Seungcheol, Secretary General of the Korea Nuclear Safety and Security Commission (NSSC), Faizan Mansoor, Chairman of Pakistan Nuclear Regulatory Authority, etc.

From March 24 to 25, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, led a delegation to visit France, where he held talks with François Jacq, Chairman of the French Alternative Energies and Atomic Energy Commission (CEA), Jean-Christophe Niel, Director General of the French Institute for Radiation Protection and Nuclear Safety (IRSN), William Magwood, Director-General of the OECD Nuclear Energy Agency (NEA), and Bernard Fontana, Chief Executive Officer of Framatome.

On March 25, the Fangchenggang NPP Unit 3 was put into commercial operation officially.

From March 29 to 30, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Taishan NPP.

On April 15, the first National Security Education Day nuclear safety themed event was held in Beijing. DONG Baotong, Vice

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Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the event and delivered a speech.

From April 20 to 21, the Symposium on Radiation Safety Regulation was held in Yunnan, and DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the meeting online and delivered a speech.

On April 28, NNSA issued the operation license for the demonstration project of Hunan Nuclear Industry Honghua Machinery Co., Ltd. for smelting of scrap metals from NPPs.

From May 8 to 12, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Haiyang NPP in Shandong, and CAP1400 Demonstration Project.

On May 12, LIAO Xiyuan, 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, went to the North-Eastern Regional Office of Nuclear and Radiation Safety Inspection to check the work related to full and rigorous governance over the Party and nuclear safety management.

On May 22, the Nuclear and Radiation Safety Center of MEE signed an agreement with the IAEA in Beijing to establish the IAEA's first global collaboration center for nuclear and radiation safety. TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, and Rafael Mariano Grossi, Director General of the International Atomic Energy Agency, attended the awarding ceremony of the collaboration center.

On May 25, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Rafael Mariano Grossi, Director General of the International Atomic Energy Agency. At the meeting, the two sides expressed their intention to deepen cooperation and their willingness to contribute to global nuclear safety improvement.

On June 7, the review opinion on the siting of Fangchenggang NPP Units 5 and 6 in Guangxi was issued.

On June 7, the Operation License for 2 MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF) was issued.

On June 9, LIAO Xiyuan, 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, visited

the Eastern Regional Office of Nuclear and Radiation Safety Inspection.

On June 25, the review opinion on the siting of Bailong NPP Units 1 and 2 in Guangxi was issued.

On June 29, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the China Institute of Atomic Energy.

On July 2, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Harbin Electric Group (Qinhuangdao) Heavy Equipment Co., Ltd.

On July 5, HUANG Runqiu, Minister of Ecology and Environment, inspected the regional emergency supply warehouse for nuclear and radiation monitoring (Northwest) project at CNNC Lanzhou Uranium Enrichment Co., Ltd.

On July 8, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Tianwan NPP in Jiangsu.

On July 14, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Kamran Rasheed, Counselor (Scientific & Technical Affairs), Embassy of Pakistan in China.

On July 20, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Zhangzhou NPP.

On July 21, the 2023 National NPP and Research Reactor Regulation Experience Exchange Conference was held in Fujian, and DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the meeting and delivered a speech.

On July 21, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Fuqing NPP in Fujian.

On July 22, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Changjiang NPP in Hainan.

On July 24, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Sama Bilbao y Leon, Director General of the World Nuclear Association (WNA).

On July 25, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with William Magwood, Director-General of the OECD Nuclear Energy Agency (NEA). At the meeting, the two sides had a discussion on further deepening cooperation.

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On July 27, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the 2023 Closing Ceremony of the Orientation Training for Nuclear and Radiation Safety Regulators, and delivered a speech.

From August 1 to 5, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, led a delegation to Pakistan to attend the meeting of the China-Pakistan Nuclear Safety Cooperation Steering Committee, and went to the Karachi NPP and Chashma NPP to conduct on-site joint oversight. A memorandum of understanding was signed by the two sides to establish the China-Pakistan Nuclear Safety Cooperation Center.

On August 28, SUN Jinlong, Secretary of the Leading Party Member Group of MEE, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, and TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, visited the Haiyang NPP in Shandong.

On September 14, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Dr. Yau Usman Idris, Director General of the Nigerian Nuclear Regulatory Authority to exchange views on

nuclear and radiation safety regulation of the two countries.

From September 18 to 21, SUN Jinlong, Secretary of the Leading Party Member Group of MEE, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, and TIAN Weiyong, Chief Engineer of Nuclear Safety of MEE and Deputy Administrator of National Nuclear Safety Administration, visited the 404 Company Limited., China National Nuclear Corporation, and CNNC Lanzhou Uranium Enrichment Co., Ltd.

On September 25, the construction licenses for Lianjiang NPP Units 1 and 2 were issued.

From September 25 to 29, LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director of the Department of Radiation Source Safety Regulation, attended the 67<sup>th</sup> IAEA General Conference.

On September 26, 2023, HUANG Runqiu, Minister of Ecology and Environment, ZHAI Qing, Vice Minister of Ecology and Environment, visited the Eastern Regional Office of Nuclear and Radiation Safety Inspection.

On September 26, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, met with Patrick Fragman, President and Chief Executive Officer of Westinghouse Electric Company.

On September 27, NNSA issued the *Notice on Strengthening the Safety Management of Purchase and Sale of Radioisotopes and Radiation Devices Online* (MEE Radiation [2023] No. 66) jointly with the Office of the Central Cyberspace Affairs Commission, the Ministry of Industry and Information Technology (MIIT), the Ministry of Public Security (MPS), the State Administration for Market Regulation and the State Post Bureau of the People's Republic of China.

From October 17 to 18, LIAO Xiyuan, 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, visited the CNNC Jianzhong Nuclear Fuel Co., Ltd.

On October 29, HUANG Runqiu, Minister of Ecology and Environment, and DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the High Temperature Gas-Cooled Reactor (HTGR) Demonstration Project in Shandong, and CAP1400 Demonstration Project.

On November 3, the Construction Licenses for Units 1 and 2 of Xudapu NPP in Liaoning were issued.

On November 7, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety

Administration, visited and inspected the Fuqing NPP in Fujian.

On November 7, the review opinion on the siting of the Tianhong Nuclear Science and Technology R&D Center Project was issued.

On November 10, the review opinion on the siting of Jinqimen NPP Units 1 and 2 in Zhejiang was issued.

On November 14, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, co-chaired a meeting of the China-France Steering Committee for Nuclear Safety Cooperation with Bernard Doroszczuk, President of the French Nuclear Safety Authority (ASN), in Beijing, and the bilateral cooperation agreement was renewed by both parties.

On November 17, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, visited the Tsinghua University.

On November 22, the review opinion on the siting of Shandong Zhaoyuan NPP Phase I project of China General Nuclear Power Corporation (CGN) was issued.

From November 28 to 30, LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director of the Department of Radiation Source Safety Regulation, attended the 54<sup>th</sup> Meeting of the IAEA



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Commission on Safety Standards.

On November 30, NNSA organized a kick-off meeting for a special action to strengthen nuclear safety management in the nuclear power industry (hereinafter referred to as the “special action”) jointly with the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) and the National Energy Administration (NEA) in Beijing. DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, attended the meeting and delivered a speech.

On December 4, LIAO Xiyuan, 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, visited the Daya Bay Nuclear Power Base.

On December 5, LIU Lu, Deputy Administrator of National Nuclear Safety Administration and Director of the Department of Radiation Source Safety Regulation, held talks with Sugeng Sumbarjo, Chairman of the Indonesia’s Nuclear Energy Regulatory Agency (BAPETEN).

From December 9 to 10, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, inspected the CNNC Sichuan Environmental Protection Engineering Co., Ltd.

On December 15, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, held talks with Alexey Ferapontov, Deputy Chairman of Rostekhnadzor (Federal Environmental, Industrial and Nuclear Supervision Service of Russia). The two sides had a discussion on deepening cooperation in the future and relevant arrangements for the China-Russia Joint Coordination Meeting on Nuclear Safety.

On December 19, DONG Baotong, Vice Minister of Ecology and Environment and Administrator of National Nuclear Safety Administration, inspected CNNC Lanzhou Uranium Enrichment Co., Ltd. for its post-earthquake situation.

On December 29, the Construction Permit for the Medical Isotope Test Reactor of the Nuclear Power Institute of China was issued.









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