The People's Republic of China

National Nuclear Safety Administration

2020 Annual Report


全力以赴防控疫情
齐心协力守护核安全
NNSA
国家核安全局

Message from the Administrator

The year 2020 marked the completion of the "13th Five-Year Plan", and a decisive year for winning the tough battle against pollution and building China into a moderately prosperous society in all respects. The year 2020 also bore witness to the important progress made in the modernization of nuclear safety governance. We earnestly implemented the decisions and arrangements of the CPC Central Committee and the State Council. Under the strong leadership of the Party Committee and the leaders of the Administration, we overcame the adverse effects of the pandemic, fulfilled our duties, cooperated and worked unitedly, strongly supported the "Year of Promoting Modernization" goal, and comprehensively completed various tasks, to effectively guarantee nuclear and radiation safety.

Over the past year, various nuclear and radiation safety regulation tasks moved forward smoothly and in an orderly manner, and we achieved satisfactory results. First, we consistently optimized the system and mechanism. We effectively implemented the national nuclear safety coordination mechanism, advanced the final evaluation of the "13th Five-Year Plan for Nuclear Safety" in an orderly manner and formulation of the "14th Five-Year Plan for Nuclear Safety", strengthened the license managements of nuclear safety equipment, optimized the qualification managements of special technicians, provided free-of-charge online training on radiation safety and protection, and reviewed environmental assessment documents for nuclear and radiation construction projects. Second, we constantly improved the laws, regulations, and standards. We promoted the formulation and revision of supporting regulations and standards of the *Nuclear Safety Law*, established the National Technical Committee for Nuclear Safety Standardization, and issued 37 regulations and standard documents such as the *Rules on Nuclear Safety Reporting of Nuclear*

Power Plant Licensees and the *Safety Rules on the Management System for Nuclear Power Plants* throughout the year. Third, we established a comprehensive management system. We formulated and revised all third-level procedures and established China's nuclear and radiation safety management system, including 1 general program, 49 guidelines, and 713 third level operating procedures, providing a strong institutional guarantee for nuclear governance and strict regulation according to law. Fourth, we strictly strengthened regulation according to law. We strengthened the review and regulation of important facilities and key components , guaranteed the success of the initial loading and critical cold test of the first reactor of "Hualong-1" and the cold test of the High Temperature Gas-cooled Reactor (HTGR) Demonstration Project, effectively implemented the national experience feedback system for Nuclear Power Plants and research reactors, improved the safety performance indicator system for Nuclear Power Plants, conducted "full coverage" inspections of national civil nuclear safety equipment manufacturer, and launched special remediation for the transportation of radioactive sources for oil (gas) field logging. Fifth, we steadily improved the basic capacity. We built 500 automatic radiation environmental quality monitoring stations for across the country, built a national real-time monitoring network for high-risk mobile radioactive sources, upgraded and transformed 31 urban radioactive waste storage facilities, advanced the construction of the national nuclear emergency coordination platform and big data platform, and steadily improved the verification ability of nuclear safety tests. Sixth, we continued to cultivate the safety culture. We vigorously advocated the spirit of nuclear safety and disseminated information on regulatory practice through authoritative media such as the *People's Daily, Outlook Weekly, National Business Daily* and *China Environmental News*, held popular science promotion activities such as the "Open Day of Nuclear Industry", and standardized the operation and maintenance of the website and official WeChat account, to comprehensively promote nuclear safety culture. Seventh, we extensively promoted international cooperation. We continued to promote cooperation with the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency of the Organization for Economic Co-operation and Development (NEA/OECD), proactively participated in the development of a multinational design evaluation mechanism for Nuclear Power Plants, practically established regulation cooperation on nuclear safety with Russia, the United Kingdom, Pakistan, the United Arab Emirates, Japan, the Republic of Korea, and other countries. We also provided supplies for COVID-19 prevention to the regulatory bodies of some countries where COVID-19 had worsened, and shared measures and our useful experiences in responding to the

pandemic to show the friendly of China's national regulatory body.

With the joint efforts of the whole society, China performed exceptionally well in terms of nuclear safety and maintained a high-quality radiation safety environment. By the end of 2020, 49 operating nuclear power units, 19 in-service civil research reactors (including critical assemblies), and 19 nuclear fuel cycle facilities in the mainland maintained good safety records, and no incidents or accidents at or above level 2 on the International Nuclear and Radiological Event Scale (INES) occurred. The construction quality of 15 under-construction nuclear power units and 1 under-construction research reactor were generally well controlled. Three low-level solid waste disposal sites, 149,000 radioactive sources, and 205,000 sets of irradiation devices were safely controlled, and no significant radiation accidents occurred. The annual incidence rate from radioactive sources remained below 1/10,000. On behalf of the National Nuclear Safety Administration (NNSA), I would like to express my heartfelt gratitude to all colleagues who contributed to nuclear and radiation safety and friends from all walks of life who cared about and supported nuclear and radiation safety!

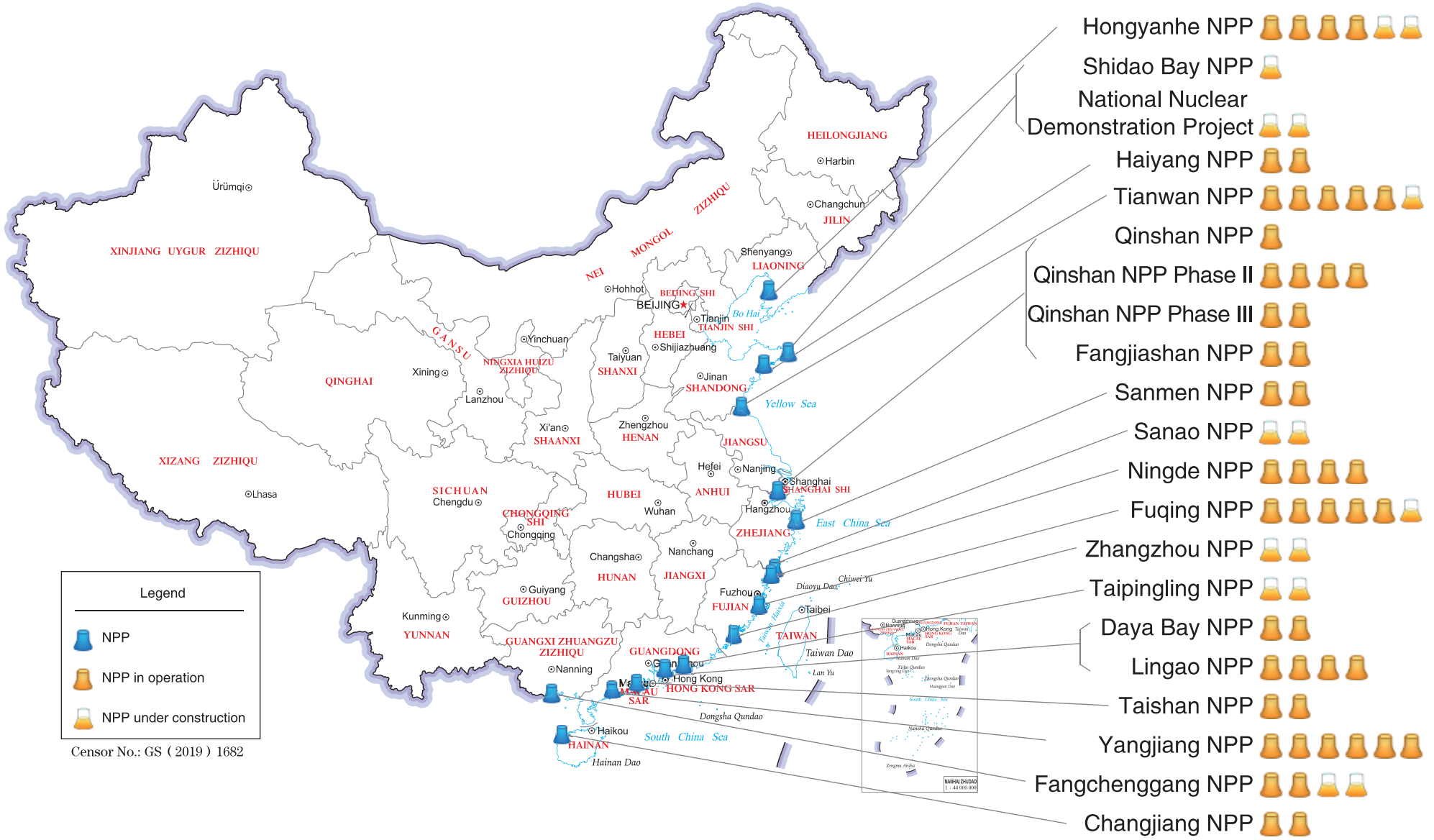
The year 2021 marks the 100th anniversary of the founding of the Communist Party of China, a year of special importance in advancing China's modernization, and the beginning of the "14th Five-Year Plan", hence, it is of great significance to maintain nuclear safety. Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, NNSA will comprehensively implement Xi Jinping Thought on Ecological Civilization, fully put into effect the Nuclear Safety Strategy, remain true to our original aspiration and keep our mission firmly in mind, and strictly and carefully strengthen our regulation, to comprehensively promote modernization of the nuclear safety governance system and governance capacity to safeguard nuclear and radiation safety, thereby ushering in a new era of nuclear safety.

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

Ye Min

May 19th, 2021

Contents



A Map of Nuclear Power Plants in Mainland China (as of December 31, 2020)

1 Introduction

In 2020, China's civilian nuclear facilities continued to perform well in terms of operation safety and construction quality, and no incidents or accidents at or above level 2 on the International Nuclear and Radiological Event Scale (INES) occurred in operating nuclear power plants (NPPs), research reactors, fuel cycle facilities, radioactive waste repositories and disposal facilities, and radioactive material transportation. All events related to operating and constructing nuclear facilities were handled properly. *

The quality of the radiation environment nationwide was generally good in 2020. There were no evident changes in the level of environmental ionizing radiation around nuclear facilities and in the radiation level around electromagnetic radiation emission facilities.

Rule of Law

To promote the legislation in the nuclear field, we cooperated with the legislation process of the Atomic Energy Law, and demonstrated the necessity of revising the *Law of the People's Republic of China on the Prevention and Control of Radioactive Pollution*. The preparations and revisions of nuclear and radiation safety regulations and standards were accelerated, and the revised draft of the *Regulations on the Safety and Protection of Radioisotopes and Radiation Devices* was submitted to the State Council for approval. Efforts were made to cooperate with the National Standards Commission to issue and publicize the notice on the approval of preparing the establishment of the National Nuclear Safety Standardization Technical Committee. Special training courses on nuclear and radiation safety regulations, standards, and administration according to law, were held to improve our regulatory ability in accordance with the law.

Capacity Building

The National Nuclear and Radiation Safety Technology Research and Development Base Phase II Project—the "Belt and Road" Green Development International Exchange Center

* This report does not contain relevant data of Hong Kong, Macao, and Taiwan of the People's Republic of China.

(Nuclear Safety International Exchange Center), is under preparation. The unveiling ceremony of the Changbaishan Radiation Environment Monitoring Laboratory of the Ministry of Ecology and Environment was officially launched on September 17, 2020. The construction of the South China Sea Radiation Environment Monitoring Laboratory has commenced, and construction of 500 state-controlled atmospheric radiation environment automatic monitoring stations was completed. The radiation environment monitoring system was further improved, thereby greatly enhancing the radiation monitoring capacity.

The *National Second Survey Bulletin of Pollution Sources* and the *Directory of Radiation Environment Regulation for the Development and Utilization of Mineral Resources* were officially released, the establishment of the Accompanying Radioactive Minerals Information Management System and Regulatory Platform was accelerated. The results of the national second survey of pollution sources were used in practice.

Nuclear Safety Culture Cultivation

Special training courses on nuclear safety culture were organized for regional offices and provincial ecological and environmental authorities, to encourage nuclear and radiation safety regulators to “understand their responsibilities and fulfill their duties” and enhance their awareness of the rule of law. The management system was optimized according to the law and regulations, and the *Procedures for Regulatory Inspection on Nuclear Safety Culture* was compiled. Good practices were concluded and shared on the 2020 Experience Exchange Meeting on Nuclear Safety Culture Cultivation.

Strengthening Regulations

The *Regulatory Technical Policy on Cybersecurity of NPPs* was published to guide and regulate NPP licensees’ reply on cyber attacks. The regulatory inspection procedures for the commissioning of NPPs were further improved, and 79 copies of regulatory inspection procedures for the commissioning of Hualong-1 NPP and 36 copies of procedures for the commissioning of High Temperature Gas-Cooled Reactor NPPs were released. The standard format and contents of the license application documents were continued to be optimized. *The Format and Content of Maintenance Program for NPPs, The Format and Contents of NPP Quality Assurance Program (Trial), The Format and Contents of In-service Inspection Program of NPPs,* and *The Format and Contents of Pre-Service Inspection Result Report of NPPs* were published. The risk-informed regulatory model was proactively promoted, the pilot demonstration of probabilistic safety analysis (PSA) was continued, the application and

regulatory requirements of risk monitors were studied and formulated, the development and pilot application of risk monitors were planned, and *The China NPP Equipment Reliability Data Report (2020 Edition)* was released. The pilot demonstration on maintenance effectiveness at relevant NPPS was further promoted, and *The Guidelines for the Compilation of Implementation Program of Maintenance Rules* and *The Procedures for Regulatory Inspection of Maintenance Effectiveness of NPPs* were issued. The new research reactor project was under effective regulation, and *The Regulatory Inspection Program for the 2MWt Liquid-Fueled Thorium Molten Salt Reactor (TMSR-LF) during the Construction Phase* was released. The experience feedback system of NNSA was operated effectively, and 6 independent evaluations for typical events valuable to feedback were organized. In view of the practical problems caused by human errors and water extraction safety of NPPs, a working group was organized for continuous in-depth study. The feedback reports on experiences were released to the relevant parts in a timely manner, and the overall safety status of NPPs was made public on a regular basis.

As of the end of December 2020, China had a total of 49 commercial nuclear power units in operation, 15 nuclear power units under construction, 19 civilian research reactors (including critical assemblies) in operation , and 1 civil research reactor under construction. In 2020, the NPP licensees reported a total of 20 operational events and 21 construction events, and research reactor licensees reported a total of 9 operational events. In general, the operation of nuclear power and research reactors was in sound status, and the three safety barriers maintained intact, without any radioactive incidents that impaired the safety of the public and the environment. The construction quality of the under-construction nuclear power units was also as per standards.

Three-year Campaign to Identify Potential Nuclear and Radiation Safety Hazards

To thoroughly implement General Secretary Xi Jinping's important instructions on the prevention against forest fires in Xichang City, Liangshan Prefecture, and Premier Li Keqiang's instructions and requirements, and to put into effect the State Council's planning for the three-year campaign on the special rectification of safety production, a three-year national campaign to identify potential nuclear and radiation safety risks was organized, from May 2020.

Technical Support

In 2020, the Nuclear and Radiation Safety Center (NSC) continued to provide comprehensive technical support for nuclear

and radiation safety regulation. It undertook more than 4,100 tasks, completed more than 600 review tasks, and prepared over 2,700 technical documents. To overcome the impact of the COVID-19 pandemic, the new "Internet +" safety regulation model was applied, and on-site technical support was strengthened through a combination of online video technical guidance and on-site verification. Throughout the year, NSC participated in on-site regulatory inspection and witness activities more than 460 times and provided on-site technical support more than 700 man-day. To strengthen the study and assessment of the nuclear safety conditions was strengthened, and more than 260 research reports were submitted. The "Fukushima Radioactive Water Discharge Expert Group" was set-up to conduct research, assessment and countermeasures on Fukushima radioactive water discharge. NSC steadily provided regulatory technical support to domestic new NPPs such as HTGR, Hualong-1, and Guohe-1, and conducted safety reviews for 13 NPPs under construction in an orderly manner. It strengthened the research on safety regulation methods for 4 small modular reactors and floating reactors, including the Changjiang Multi-Purpose Small Modular Reactor, the Offshore Floating Nuclear Power Platform, the ACPR50S Experimental Reactor Platform, and the Kiamusze Nuclear Heating Demonstration Project, and developed the review principles to guarantee safe application of new reactors.

In 2020, the Radiation Environment Monitoring Technology Center (RMTC) prepared *The National Radiation Environment Monitoring Plan (2020 Edition)* according to *The National Ecological Environment Monitoring Plan (2020)* issued by the Ministry of Ecology and Environment (MEE). It completed real-time and continuous monitoring of air absorption dose rates in 197 prefecture-level and above cities (increased by 77), monitoring of cumulative doses in 236 prefecture-level and above cities, aerosol monitoring in 189 prefecture-level and above cities (increased by 74), monitoring of sediments and gaseous radioiodine isotopes in 135 prefecture-level and above cities (increased by 103), monitoring of air (vapor) and precipitation in municipalities directly under the central government and provincial capitals, monitoring of surface water in major river basins and lakes (reservoirs), centralized monitoring of drinking water sources in 336 prefecture-level and above cities, monitoring of groundwater in 31 cities, monitoring of coastal seawater in 11 provinces, monitoring of soil in 337 prefecture-level and above cities, and electromagnetic radiation monitoring in municipalities directly under the central government and provincial capitals. A total of 46 key nuclear and radiation facilities under 6 categories (including nuclear power base, civil research reactor, nuclear fuel cycle facilities, waste disposal facilities, uranium mining and metallurgy facilities, as well as mining, processing and utilization facilities of

accompanying radioactive minerals (natural occurring radioactive materials, NORM) and 41 electromagnetic radiation facilities under 4 categories (including radio and television transmission system, power transmission, transformation system, transportation system and mobile communication base station) were placed under regulatory monitoring. According to the requirements of the *Notice on Publishing and Distributing the Technical Specifications for Radioactive Monitoring of Effluent from NPPs (Trial) (NNSA [2020] No. 44)*, the monitoring of radioactive effluent from NPPs was added from September 1, 2020.

International Cooperation

NNSA comprehensively participated in the "Multinational Design Evaluation Plan" and other institutional activities held by the NEA/OECD. It effectively organized and advanced the work of the "Hualong-1" working group, and successfully held the fifth and sixth meetings of the "Hualong-1" working group and the relevant sub-group meetings, achieving several results such as a consensus on relevant issues, preparation of technical reports, and participated in the EPR and VVER working group meetings under the mechanism. NNSA proactively participated in the relevant work of the IAEA, and participated in the online meetings of the Nuclear Safety Standards Committee, the annual meeting of senior regulators of the CANDU Reactor, the forum of small reactor regulators, and other meetings via video conferencing.

2 Policies, Plans, Regulations, and Standards

Nuclear Safety Policy

As part of the 2019 annual report on the state of the environment and the achievement of environmental protection targets, the documents related to nuclear and radiation safety were prepared and approved by the Standing Committee of the National People's Congress (NPC). NNSA strengthened theoretical research on the modernization of the overall national security and nuclear safety concepts, as well as nuclear safety governance system and governance capacity, and published theoretical articles in *People's Daily, Outlook Weekly, National Business Daily, China Environmental News*, and other journals. A special research on the experience feedback related to COVID-19 prevention and control, and the post-pandemic impact was organized.

Nuclear Safety Planning

The final evaluation of the implementation of the *13th Five-Year Plan for Nuclear Safety and Radioactive Pollution Prevention and Control and Long-Range Objectives through the Year 2025* was conducted, and a joint working group on the formulation of the "14th Five-Year Plan" for nuclear safety was established along with the National Development and Reform Commission, the Ministry of Finance, the National Energy Administration, and the State Administration of Science, Technology and Industry for National Defense. The proposals for the formulation of the Plan were established, special justification of planning targets and key projects were conducted. After inquiring, consulting and investigating, the *14th Five-Year Plan on Nuclear Safety and Radioactive Pollution Prevention and Control and Long-Range Objectives through the Year 2035 (Preliminary Draft) was completed.*

Formulation and Revisions of Regulations and Standards

NNSA accelerated the formulation and revision of nuclear and radiation safety regulations and standards. The Administration submitted the revised draft of the *Regulations*

on the Safety and Protection of Radioisotopes and Radiation Devices was submitted to the State Council for review. The *Rules on the Qualification of Operators of Civil Nuclear Facilities was* revised and has passed the Ministerial Council's approval. Other departmental rules and national standards were under formulation or revision such as the *Safety Rules on Commissioning and Operation of NPPs,* the *Safety Rules on Siting of NPPs,* the *Measures for Regulation of Radiation Environmental Protection in the Development and Utilization of Accompanying Radioactive Minerals,* the *Measures for Monitoring of Radiation Environment,* and the *Rules on Radiation Protection in the Environment of NPPs*. NNSA compiled and revised the supporting guides for the *Safety Rules on Design of NPPs*. NNSA released environmental standards such as the *Monitoring Method for Electromagnetic Radiation Environment of 5G Mobile Communication Base Station (on Trial)* to to fill the gap in electromagnetic radiation standard system. NNSA also gradually established the relevant standard system framework for the development and utilization of accompanying radioactive minerals.

NNSA officially published 37 regulations and standards, such as the *Rules on Safety Reporting of NPP Licensees* and the *Safety Rules on the Management System for NPPs* during the year, including 2 departmental rules, 7 nuclear safety guides, 2 national standards, 16 environmental standards, and 10 technical documents, as shown in Table 1. The National Nuclear Safety Expert Committee reviewed 32 regulations and standards, as shown in Table 2.

Figure 1. Sun Jinlong, Party Secretary of the Ministry of Ecology and Environment Holds a Special Party Group Meeting on Nuclear Safety

Table 1. List of Nuclear and Radiation Safety Regulations and Standards Issued in 2020

No.	Name	Category	Code	Release Form	Release Date
1	Rules on Nuclear Safety Reporting of NPP Licensees	Departmental rules	HAF001/02/01-2020	MEE Decree No. 13	16 November 2020
2	Safety Rules on the Management System for NPPs	Departmental rules	-	MEE Decree No.18	31 December 2020
3	Geological Disposal Facilities for Radioactive Waste	Guide	HAD401/10-2020	NNSA [2020] No. 26	19 January 2020

continued

No.	Name	Category	Code	Release Form	Release Date
4	Minimization of radioactive waste in Nuclear Technology Application Projects	Guide	HAD401/11-2020	NNSA [2020] No. 51	10 March 2020
5	Pre-Disposal Management of Radioactive Waste at Nuclear Facilities	Guide	HAD401/12-2020	NNSA [2020] No. 105	13 May 2020
6	Video Monitoring System for Physical Protection of NPPs	Guide	HAD501/08-2020	NNSA [2020] No. 154	17 July 2020
7	Designs of Reactor Coolant System and Related Systems in NPPs	Guide	HAD102/08-2020	NNSA [2020] No. 310	30 December 2020
8	Designs of Reactor Containment and Related Systems of NPPs	Guide	HAD102/06-2020	NNSA [2020] No. 311	30 December 2020
9	Designs of Reactor Core of NPPs	Guide	HAD102/07-2020	NNSA [2020] No. 312	30 December 2020
10	Limits and Monitoring Methods of Synthetic Electric Field in HVDC Transmission Project	Standard	GB 39220-2020	MEE Bulletin [2020] No. 35	17 July 2020
11	Regulations for Radiation Protection and Radiation Environment Protection in Uranium Mining and Milling	Standard	GB 23727-2020	MEE Bulletin [2020] No. 35	17 July 2020
12	Technical Guidelines for Environmental Impact Assessment-Radio and Television	Standard	HJ 1112-2020	MEE Bulletin [2020] No. 13	27 February 2020
13	Technical Requirements for Environmental Protection in Electric Power Transmission and Distribution Construction Project	Standard	HJ 1113-2020	MEE Bulletin [2020] No. 13	27 February 2020
14	Technical Specifications of Radiation Environmental Protection for other Radioactive Material's Storage and Solid Waste's Landfill (Trial)	Standard	HJ 1114-2020	MEE Bulletin [2020] No. 14	3 March 2020
15	Analysis Method for Tritium in Water	Standard	HJ 1126-2020	MEE Bulletin [2020] No. 25	9 April 2020
16	Technical Specifications on Determination of Gamma-ray Emitting Radionuclides in Environmental Samples for Emergency Monitoring	Standard	HJ 1127-2020	MEE Bulletin [2020] No. 25	9 April 2020
17	Technical Specifications for Environmental Emergency Monitoring in NPP Accidents	Standard	HJ 1128-2020	MEE Bulletin [2020] No. 32	3 June 2020

continued

No.	Name	Category	Code	Release Form	Release Date
18	Technical Specifications for Determination of γ-emitting Radionuclides in Soil by In-situ HPGe Spectrometry	Standard	HJ 1129-2020	MEE Bulletin [2020] No. 32	3 June 2020
19	Technical Guidelines for Environmental Impact Assessment—Satellite Up-link Earth Station	Standard	HJ 1135-2020	MEE Bulletin [2020] No. 45	26 October 2020
20	Monitoring Method for Electromagnetic Radiation Environment of Medium Wave Broadcasting Transmitting Station	Standard	HJ 1136-2020	MEE Bulletin [2020] No. 45	26 October 2020
21	Format and Content of Acceptance Monitoring Report of Radiation Environmental Protection for Completion of Development and Utilization Project of other Radioactive Mines	Standard	HJ 1148-2020	MEE Bulletin [2020] No. 59	3 December 2020
22	Ambient air—Determination of Gamma-ray Emitting Radionuclides in Aerosol-filter Compression / Gamma Spectrometry	Standard	HJ 1149-2020	MEE Bulletin [2020] No. 62	9 December 2020
23	Monitoring Method for Electromagnetic Radiation Environment of 5G Mobile Communication Base Station (on Trial)	Standard	HJ 1151-2020	MEE Bulletin [2020] No. 64	14 December 2020
24	Technical Specifications for Environmental Protection in Radio and Television Project for Check and Accept of Completed Project	Standard	HJ 1152-2020	MEE Bulletin [2020] No. 64	14 December 2020
25	Technical Guidelines for Environmental Impact Assessment of Electric Power Transmission and Distribution	Standard	HJ 24-2020	MEE Bulletin [2020] No. 64	14 December 2020
26	Technical Specifications for Environmental Protection in Electric Power Transmission and Distribution for Check and Accept of Completed Project	Standard	HJ 705-2020	MEE Bulletin [2020] No. 64	14 December 2020
27	Technical Specifications for Emergency Monitoring in Radiation Accidents	Standard	HJ 1155-2020	MEE Bulletin [2020] No. 76	30 December 2020

continued

No.	Name	Category	Code	Release Form	Release Date
28	Technical Specifications for Radioactive Monitoring of Effluent from NPPs (Trial)	Technical Document	-	NNSA [2020] No. 44	3 March 2020
29	Systematic Analysis of the Safety Case for Radioactive Waste Disposal	Technical Document	-	NNSA [2020] No. 51	10 March 2020
30	Guidelines on the Implementation of Maintenance Rules for NPPs	Technical Document	-	MEE NP LETTER [2020] No. 12	28 June 2020
31	Format and Content of Maintenance Program for NPPs	Technical Document	-	MEE NP LETTER [2020] No. 13	28 June 2020
32	Guidelines on Nuclear Safety Reporting of NPP Licensees	Technical Document	-	MEE Bulletin [2020] No. 58	3 December 2020
33	Guidelines on Cause Analysis of NPP Incidents (Trial)	Technical Document	-	MEE NP LETTER [2020] No. 29	3 December 2020
34	International Nuclear and Radiological Event Classification Manual	Technical Document	-	MEE NP LETTER [2020] No. 29	3 December 2020
35	Format and Contents of NPP Quality Assurance Program (Trial)	Technical Document	-	MEE NP LETTER [2020] No. 31	10 December 2020
36	Format and Contents of In-service Inspection Program for NPPs	Technical Document	-	MEE NP LETTER [2020] No. 32	14 December 2020
37	Format and Contents of Result Report of Pre-Service Inspection of NPPs	Technical Document	-	MEE NP LETTER [2020] No. 33	14 December 2020

Table 2. List of Nuclear and Radiation Safety Regulatory Standards Reviewed by the Expert Committee in 2020

No.	Name	Status	Progress	Meeting
Departmental Rules				
1	Safety Rules on the Management System for NPPs	Formulated	Draft for review and preliminary draft for approval	Second and third quarters
2	Measures for Monitoring of Radiation Environment	Formulated	Draft for review	Fourth quarter
3	Regulations on the Safety of Commissioning and Operation of Nuclear Power Plants	Revised	Draft for review	Fourth quarter

continued

No.	Name	Status	Progress	Meeting
Nuclear Safety Guides				
1	Designs of Reactor Containment and Related Systems of Nuclear Power Plants	Revised	Draft for review and preliminary draft for approval	Second and third quarters
2	Designs of Reactor Core of the Nuclear Power Plant	Revised	Draft for review and preliminary draft for approval	Second and third quarters
3	Designs of Reactor Coolant Systems and Related Systems in Nuclear Power Plants	Revised	Draft for review and preliminary draft for approval	Second and third quarters
4	Level 1 Probabilistic Safety Analysis of Nuclear Power Plants	Revised	Draft for review and preliminary draft for approval	Third and fourth quarters
5	Nuclear Power Plant Safety Analysis Determination	Revised	Draft for review and preliminary draft for approval	Third and fourth quarters
6	Safety Requirements for Low-level Radioactive Solid Waste Storage Facilities	Formulated	Draft for review	Third quarter
7	Decommissioning of Nuclear Technology Utilization Facilities	Formulated	Draft for review	Third quarter
8	Safety of the Spent Fuel Reprocessing Facilities	Formulated	Draft for review and preliminary draft for approval	Third and fourth quarters
9	Safety of Uranium Conversion and Enrichment Facilities	Formulated	Draft for review and preliminary draft for approval	Third and fourth quarters
10	Nuclear Power Plant Power System Design	Formulated	Draft for review	Fourth quarter
11	Nuclear Power Plant Instrumentation and Control System Design	Revised	Draft for review	Fourth quarter
12	Standard Format and Contents of Nuclear Fuel Cycle Front-end Facility Safety Analysis Report	Revised	Draft for review	Fourth quarter
Standards				
1	Environmental Radiation Limits for Development and Utilization of Associated Radioactive Minerals	Formulated	Draft for review	First quarter
2	Format and Contents of the Acceptance Monitoring Report Radiation Environmental Protection for Associated Radioactive Minerals Development and Utilization Projects	Formulated	Draft for review	First quarter
3	Methods for Environmental Monitoring of Electromagnetic Radiation from Medium Wave Transmission Stations	Formulated	Draft for review	First quarter

continued

No.	Name	Status	Progress	Meeting
4	Technical Specifications for Acceptance of Environmental Protection Facilities for Completed Construction Projects – Radio and Television	Formulated	Draft for review	First quarter
5	Technical Specifications for Acceptance of Environmental Protection Facilities for Completed Construction Projects –Power Transmission and Distribution Project	Revised	Draft for review	First quarter
6	Technical Guidelines for Environmental Impact Assessment- Satellite Up-link Earth Station	Formulated	Draft for review	First quarter
7	Technical Specifications on Radiation Environment Monitoring	Revised	Draft for review and preliminary draft for approval	First and second quarters
8	Determination of Gamma Radionuclides in Aerosols of Ambient Air- Compression/Gamma Spectrometry	Formulated	Draft for review and preliminary draft for approval	First and second quarters
9	Technical Specifications on the Measurement of Environmental Gamma Radiation Dose Rate	Revised	Draft for review and preliminary draft for approval	Second and third quarter
10	Methods of Electromagnetic Radiation Environmental Monitoring for 5G Mobile Communication Base Stations	Formulated	Draft for review	Second quarter
11	Standard Method for Measuring Radon in Ambient Air	Revised	Draft for review	Third quarter
12	Radioactive Environment Monitoring Requirements for Near-Surface Disposal Sites of Radioactive Solid Waste	Revised	Draft for review and preliminary draft for approval	Third and fourth quarters
13	Load Combination and Design Criteria for the Structural Analysis of Spent Fuel Transportation Containers	Formulated	Draft for review and preliminary draft for approval	Third and fourth quarters
14	Leak Test of Packages for Safe Transport of Radioactive Materials	Revised	Draft for review and preliminary draft for approval	Third and fourth quarters
15	Technical Specifications on Radiation Safety and Protection of Radioactive Logging	Formulated	Draft for review	Third quarter
16	Radiotherapy Radiation Safety and Protection Requirements	Formulated	Draft for review	Third quarter
17	Format and Contents of Nuclear and Radiation Safety Analysis Report for the Transportation of Radioactive Materials	Revised	Draft for review	Fourth quarter

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

The Articles of Association of the National Technical Committee for Nuclear Safety Standardization and the work rules of the Secretariat were drafted, and the *Preparation Plan of the National Technical Committee for Nuclear Safety Standardization* and the framework of the nuclear safety standard system were formulated and submitted to the National Standards Committee for review. NNSA cooperated with the National Standards Committee to publicized the *Notice on the Approval of the Establishment of the Six Technical Committees including the National Technical Committee for Nuclear Safety Standardization*.

3 Safety Regulation of Nuclear Power Plants

In 2020, there was no event that endangered the safety of the public and the environment in China's operating NPPs. The monitoring results indicate that for the entire year the integrity of the three physical barriers remained intact.

In 2020, the review opinions on siting for Tianwan NPP Units 7 and 8, Changjiang NPP Units 3 and 4, Sanao NPP Units 1 and 2, and Xudapu NPP Units 3 and 4 were issued; the construction permits for Sanao NPP Units 1 and 2 and the 2 MWt TMSR-LF were issued; the operating licenses for Tianwan NPP Unit 5, Fuqing NPP Units 3, 4, and 5, Sanmen NPP Units 1 and 2, Haiyang NPP Units 1 and 2 were issued; the environmental impact statements at operation stage for Tianwan NPP Unit 5 and 6, and Fuqing NPP Unit 5 and 6 were issued; the environmental impact statements at construction stage for Sanao NPP Units 1 and 2 were issued; the environmental impact statements at siting stage for Tianwan NPP Units 7 and 8, Changjiang NPP Units 3 and 4 , Sanao NPP Units 1 and 2, and Xudapu NPP Units 3 and 4 were issued.

Refer to Table 3 for the operation data of NPPs in 2020.

Table 3. Operation Data of NPPs in 2020

NPP Name	Generated Energy (TWh)	Unit No.	Unified Unit No.	Rated Power (MWe)	Unit Generated Energy (TWh)	Load Factor (%)	Unit Capacity Factor (%)
Qinshan	2.682	1	CN01	330	2.682	92.53	92.20
Qinshan Phase II	21.459	1	CN04	650	5.566	97.49	99.96
		2	CN05	650	5.202	91.11	92.34
		3	CN14	660	5.067	87.40	90.43
		4	CN15	660	5.624	97.00	99.97
Qinshan Phase III	11.664	1	CN08	728	6.068	94.89	99.93
		2	CN09	728	5.596	87.50	91.04

continued

NPP Name	Generated Energy (TWh)	Unit No.	Unified Unit No.	Rated Power (MWe)	Unit Generated Energy (TWh)	Load Factor (%)	Unit Capacity Factor (%)
Fangjiashan	16.502	1	CN24	1089	7.676	80.24	89.78
		2	CN25	1089	8.826	92.27	99.96
Daya Bay	16.601	1	CN02	984	8.786	101.64	99.99
		2	CN03	984	7.815	90.41	89.21
Ling'ao	31.052	1	CN06	990	7.888	90.71	99.99
		2	CN07	990	7.321	84.18	89.17
		3	CN12	1086	8.034	84.22	90.71
		4	CN13	1086	7.809	81.86	92.77
Tianwan	35.206	1	CN10	1060	7.996	85.88	89.57
		2	CN11	1060	8.370	89.90	98.56
		3	CN45	1126	7.741	78.26	91.28
		4	CN46	1126	8.337	84.29	95.39
		5	CN53	1118	2.762	89.50	100.00
Hongyanhe	32.702	1	CN16	1119	8.441	85.89	91.09
		2	CN17	1119	8.307	84.53	90.88
		3	CN26	1119	7.433	75.63	99.78
		4	CN27	1119	8.522	86.71	92.74
Ningde	32.7525	1	CN18	1089	7.9608	83.22	91.39
		2	CN19	1089	8.6401	90.32	99.99
		3	CN34	1089	8.3592	87.39	96.73
		4	CN35	1089	7.7925	81.46	91.22
Fuqing	32.649	1	CN20	1089	8.955	93.61	99.30
		2	CN21	1089	8.378	87.59	92.02
		3	CN42	1089	7.850	82.06	89.69
		4	CN43	1089	7.174	75.00	92.47
		5	CN51	1161	0.146	-	-
Yangjiang	45.307	1	CN22	1086	8.666	90.85	98.50
		2	CN23	1086	6.955	72.91	85.96
		3	CN40	1086	7.033	73.72	85.51
		4	CN41	1086	8.492	89.02	96.18
		5	CN47	1086	7.812	81.89	92.64
		6	CN48	1086	6.349	66.56	81.82

continued

NPP Name	Generated Energy (TWh)	Unit No.	Unified Unit No.	Rated Power (MWe)	Unit Generated Energy (TWh)	Load Factor (%)	Unit Capacity Factor (%)
Taishan	23.12	1	CN32	1750	9.76	63.52	71.56
		2	CN33	1750	13.35	86.87	97.71
Changjiang	9.563	1	CN36	650	4.892	85.91	90.83
		2	CN37	650	4.671	82.04	93.07
Fangchenggang	16.83	1	CN38	1086	8.43	88.42	91.20
		2	CN39	1086	8.40	88.08	91.98
Sanmen	18.913	1	CN28	1251	9.446	85.96	88.18
		2	CN29	1251	9.467	86.15	99.99
Haiyang	19.051	1	CN30	1253	9.362	85.06	86.73
		2	CN31	1253	9.689	88.03	90.05

Note: By the end of December 2020, the Fuqing NPP Unit 5 was at the commissioning stage after the initial loading, hence, there is no relevant operation data available for statistics.

Qinshan NPP

In 2020, Qinshan NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 20th refueling overhaul of Unit 1 was started on December 14, 2020.

The nuclear safety regulatory approvals for Qinshan NPP in 2020 are shown in Table 4. The Qinshan NPP reported 1 operation event, as shown in Table 5. The occupational radiation doses at Qinshan NPP are shown in Table 6.

In 2020, the Eastern Regional Office of Nuclear and Radiation Safety Inspection (ERO) conducted inspections of the 9 operating units (including Qinshan NPP, Qinshan NPP Phase II, Qinshan NPP Phase III, and Fangjiashan NPP) in the Qinshan Nuclear Power base. In all, 1,714 man-day were taken on inspections, including 5 routine inspections (participated in 1 routine inspection organized by NNSA) and 39 special inspections. A total of 149 issues were identified and 33 regulatory requirements were imposed.

Table 4. Nuclear Safety Regulatory Approvals for Qinshan NPP in 2020

Date	Document No.	Document
2020-06-04	NNSA [2020] No. 128	Notice on Approving the Adjustment of the Windows for Some Level 2 and 3 Nuclear Pipe Supports and Brackets of Qinshan NPP Unit 1
2020-06-15	NNSA [2020] No. 130	Notice on Approving the Modification of the Radiation Zones in the Final Safety Analysis Report of Qinshan NPP Unit 1
2020-07-17	NNSA [2020] No. 155	Notice on Approving the Removal of Containment Isolation Valves for Inlet and Return Water Pipe of the Containment Ring Corridor Air-Conditioning Unit of Qinshan NPP Unit 1 and Plugging of the Corresponding Containment Penetration
2020-08-04	NNSA [2020] No. 171	Notice on Approving the Modification of Low Fuel Pressure Alarm for the Emergency Diesel Engine of Qinshan NPP Unit 1
2020-09-10	NNSA [2020] No. 200	Notice on Approving Permanent Change of the Intrusion Alarm System for the Protection Zone Perimeter of Qinshan NPP Unit 1
2020-12-14	NNSA [2020] No. 292	Notice on Approving the Replacement of 24 V Dc Power Distribution Panel and Silicon Rectifier for the Primary Circuit of Qinshan NPP Unit 1
2020-12-14	NNSA [2020] No. 293	Notice on Approving the Modification of Low Fuel Pressure Alarm for the Emergency Diesel Engine of Qinshan NPP Unit 1
2020-12-14	NNSA [2020] No. 294	Notice on Approving the Modification of Installation Mode of Class 1E Transmitter in the Reactor Building of Qinshan NPP Unit 1
2020-12-14	NNSA [2020] No. 295	Notice on Approving the Modification of the Cold-Water Undulation Tank Water Supply Valve's Power Supply to Class 1E of Qinshan NPP Unit 1
2020-07-16	NNSA Letter [2020] No. 66	Letter on the Approval of the Program of the Third Periodic Safety Evaluation of Qinshan NPP
2020-08-18	NNSA Letter [2020] No. 72	Letter on the Confirmation of the Change in Legal Representative Information in the Operating License of Qinshan NPP Unit 9

Table 5. Operational Events of Qinshan NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-08-05	Generator carbon brush failure in Unit 1 resulted in the interlocking of the protection action of the excitation system and the shutdown of the reactor	Equipment failure	0

Table 6 Occupational Radiation Doses at Qinshan NPP in 2020

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	0.031	1.810	0.113	0.042

Qinshan NPP Phase II

In 2020, the 4 units of Qinshan NPP Phase II continued to operate stably and safely, there were zero operation events, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 14th refueling overhaul of Unit 2 was completed on September 27, 2020, and the 8th refueling overhaul of Unit 3 was completed on June 13, 2020.

The nuclear safety regulatory approvals for Qinshan NPP Phase II in 2020 are shown in Table 7. The occupational radiation doses at Qinshan NPP Phase II are shown in Table 8.

Table 7 Nuclear Safety Regulatory Approvals for Qinshan NPP Phase II in 2020

Date	Document No.	Document
2020-01-03	NNSA [2020] No. 6	Notice on Approving the Revision of the Final Safety Analysis Report of Qinshan Phase II NPP
2020-02-05	NNSA [2020] No. 31	Notice on Approving the Installation of Additional Exhaust Valves and Threaded Plugs to the Cooling and Processing Systems of Reactor Refueling Pools and Spent Fuel Pools of Qinshan Phase II NPP Unit 3 and 4
2020-02-05	NNSA [2020] No. 35	Notice on Approving the Installation of An Additional Power Supply to the Core Cooling Monitoring Cabinet of Qinshan Phase II NPP Unit 3 and Unit 4
2020-02-05	NNSA [2020] No. 36	Notice on Approving the Revision of Chapter IV of the Final Safety Analysis Report of Qinshan Phase II NPP and Fangjiashan NPP
2020-05-13	NNSA [2020] No. 102	Notice on Approving the Overall Upgrade and Modification of Auxiliary Plant Power Transformer Protection Devices of Qinshan Phase II NPP Units 3 and 4
2020-08-18	NNSA Letter [2020] No. 72	Letter on Confirming the Change in the Legal Representative Information in the Operating License of Qinshan NPP Unit 9

Table 8 Occupational Radiation Doses at Qinshan NPP Phase II in 2020

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 1-4	0.163	5.438	0.628	0.029

Qinshan NPP Phase III

In 2020, the 2 units of Qinshan NPP Phase III continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 10th refueling overhaul of Unit 2 was completed on June 2, 2020.

The nuclear safety regulatory approvals for Qinshan NPP Phase III in 2020 are shown in Table 9. One operation event was reported by Qinshan NPP Phase III in 2020, as shown in Table 10. The occupational radiation doses of Qinshan NPP Phase III are shown in Table 11.

Table 9 Nuclear Safety Regulatory Approvals for Qinshan NPP Phase III in 2020

Date	Document No.	Document
2020-01-12	NNSA [2020] No. 12	Notice on Approving the Renewal of the Operation Life of Pressure Tubes of Qinshan NPP Phase III Units 1 and 2
2020-05-19	NNSA [2020] No. 109	Notice on Approving Some Amendments to the Technical Specifications of Qinshan NPP Phase III
2020-07-16	NNSA [2020] No. 153	Notice on Approving the Overall Upgrade and Modification of the Fire Detection and Alarm System of Qinshan NPP Phase III
2020-08-18	NNSA Letter [2020] No. 72	Letter on Confirming the Change in the Legal Representative Information in the Operating License of Qinshan NPP Unit 9

Table 10 Operational Events of Qinshan NPP Phase III Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-05-26	Replacement of the fuse in Unit 2 caused the signal blocking logic of the high pressure safety injection system couple loop to be bypassed, resulting in the inactivation of the high pressure safety injection equipment.	Human error	0

Table 11 Occupational Radiation Doses at Qinshan NPP Phase III in 2020

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	0.164	3.741	0.534	0.046

Fangjiashan NPP

In 2020, the 2 units of Fangjiashan NPP continued to operate stably and safely, there were zero operation events, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 5th refueling overhaul of Unit 1 was completed on November 18, 2020.

The nuclear safety regulatory approvals for Fangjiashan NPP in 2020 are shown in Table 12. The occupational radiation doses at Fangjiashan NPP are shown in Table 13.

Table 12 Nuclear Safety Regulatory Approvals for Fangjiashan NPP in 2020

Date	Document No.	Document
2020-01-03	NNSA [2020] No. 4	Notice on Approving the Revision of Chapter VI of the Final Safety Analysis Report of Fangjiashan NPP
2020-02-05	NNSA [2020] No. 32	Notice on Approving the Revision of the Final Safety Analysis Report of Fangjiashan NPP Units 1 and 2
2020-02-05	NNSA [2020] No. 36	Notice on Approving the Revision of Chapter IV of the Final Safety Analysis Report of Qinshan NPP Phase II and Fangjiashan NPP
2020-04-23	NNSA [2020] No. 90	Notice on Approving some Amendments to the Technical Specifications of Fangjiashan NPP
2020-05-22	NNSA [2020] No. 115	Notice on Approving the Installation of an Additional Power Supply Bus to the Physical Protection System of Fangjiashan NPP Units 1 and 2
2020-08-04	NNSA [2020] No. 167	Notice on Approving the Installation of an Additional Cross-pipe Line to the Cooling and Processing Systems for Refueling Pools and Spent Fuel Pools of Fangjiashan NPP Units 1 and 2
2020-10-02	NNSA [2020] No. 225	Notice on Approving the Modification and Optimization of Temperature Control Mode of the Component Cooling Water System of Fangjiashan NPP Units 1 and 2
2020-10-02	NNSA [2020] No. 229	Notice on Approving the Modification of Diesel Engine Low Voltage Relay Setting Values of Fangjiashan NPP Units 1 and 2
2020-10-13	NNSA [2020] No. 240	Notice on Approving the Capacity Expansion and Modification of the Signal Isolation Cabinet of Fangjiashan NPP Units 1 and 2
2020-08-18	NNSA Letter [2020] No. 72	Letter on Confirming the Change in the Legal Representative Information in the Operating License of Qinshan NPP Unit 9

Table 13 Operational Events of Fangjiashan NPP Reported in 2020

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	0.298	5.883	0.800	0.049

Daya Bay NPP

In 2020, the 2 units of Daya Bay NPP continued to operate stably and safely, there were zero operation events, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 21st refueling overhaul of Unit 2 was completed.

The nuclear safety regulatory approvals for Daya Bay NPP in 2020 are shown in Table 14. The occupational radiation doses at Daya Bay NPP are shown in Table 15.

In 2020, the Southern Regional Office of Nuclear and Radiation Safety Inspection (SRO) conducted inspections for the 6 operating units (including Daya Bay NPP and Ling'ao NPP) in Daya Bay Nuclear Power Base. In all, 791 man-day were taken on inspections, including 9 routine inspections, 3 non-routine inspections and special actions on identifying latent safety hazard were conducted. A total of 74 issues were identified, and 51 regulatory requirements were imposed.

Figure 2. Huang Runqiu, Minister of MEE, Inspects the Daya Bay Nuclear Power Base

Table 14 Nuclear Safety Regulatory Approvals for Daya Bay NPP in 2020

Date	Document No.	Document
2020-01-03	NNSA [2020] No. 5	Notice on Approving the Modification of the Technical Specifications of Daya Bay NPP and Ling'ao NPP
2020-04-07	NNSA [2020] No. 77	Notice on Approving the Improvements of the Backwash Nozzle Tube Drainage of the Circulating Cooling Water Filtration System of the Daya Bay NPP

continued

Date	Document No.	Document
2020-04-20	NNSA [2020] No. 88	Notice on Approving the Amendments to Some Sections of the Operational Quality Assurance Program of Daya Bay NPP and Ling'ao NPP
2020-05-28	NNSA [2020] No. 123	Notice on Approving the License Application for Renovation of Pump Import and Export Pipe of the Fire Fighter Water Supply System of Daya Bay NPP
2020-07-09	NNSA [2020] No. 146	Notice on Approving the Upgraded Maintenance Program of Daya Bay NPP and Ling'ao NPP
2020-07-20	NNSA [2020] No. 159	Notice on Approving the Overall Modifications of the Radiation and Meteorological Monitoring System of the Daya Bay Nuclear Power Base
2020-07-27	NNSA [2020] No. 162	Notice on Approving the Improvements of the Safety Injection System Dead Leg Section of the Daya Bay NPP Units 1 and 2 and Ling'ao NPP Unit 1
2020-08-18	NNSA [2020] No. 179	Notice on Approving the Revised Chemical and Radiochemical Technical Specifications of the Daya Bay NPP and Ling'ao NPP
2020-09-10	NNSA [2020] No. 205	Notice on Approving the Relays for the Feed Water Flow Control System and Rod Control System of the Daya Bay NPP and Ling'ao NPP Units 1 and 2
2020-09-21	NNSA [2020] No. 215	Letter on Approving the Digitalization Improvement of the Nuclear Instrumentation System of the Daya Bay NPP
2020-10-10	NNSA [2020] No. 237	Notice on Approving the Digitalization Improvements of the Rod Control and Rod Position Systems of the Daya Bay NPP
2020-10-17	NNSA [2020] No. 242	Notice on Approving the Digitalization Improvement of the Mitigation System for Anticipated Transients Without Scram of Daya Bay NPP and Ling'ao NPP Units 1 and 2
2020-10-19	NNSA [2020] No. 244	Notice on Approving the Application for Permission of Modification and Equipment Maintenance Related To the Auxiliary Power Supply System of the Daya Bay NPP
2020-12-11	NNSA [2020] No. 291	Notice on Approving the Revised Version of the Requirements for Periodic Testing and Regulation of Safety-related Systems and Equipment of Daya Bay NPP and Ling'ao NPP Units 1 and 2

Table 15 Occupational Radiation Doses at Daya Bay NPP in 2020

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	0.244	5.023	0.676	0.041

Ling'ao NPP

In 2020, the 4 units of Ling'ao NPP continued to operate stably and safely, there were zero operation events, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 16th refueling overhaul of Unit 2, the 9th refueling overhaul of Unit 3, and the 8th refueling overhaul of Unit 4 were completed.

The nuclear safety regulatory approvals for Ling'ao NPP in 2020 are shown in Table 16. The occupational radiation doses at Ling'ao NPP are shown in Table 17.

Table 16 Nuclear Safety Regulatory Approvals for Ling'ao NPP in 2020

Date	Document No.	Document
2020-01-27	NNSA [2020] No. 30	Notice on Approving the Improvements of the Safety Injection System Dead Leg Section of Ling'ao NPP Units 3 and 4
2020-04-03	NNSA [2020] No. 78	Notice on Approving the Installation of the Additional Emergency Diesel Generator Set of the Ling'ao NPP
2020-04-15	NNSA [2020] No. 83	Notice on Approving the Modification and Improvement of Nuclear Level Voltage and Frequency Transmitter for 6.6 kV AC Emergency Power System of Ling'ao NPP Units 3 and 4
2020-09-11	NNSA [2020] No. 207	Notice on Approving the Overall Replacement of the Chilled Water System Refrigerator in the Electrical Plant of Ling'ao NPP Units 1 and 2
2020-09-15	NNSA [2020] No. 212	Notice on Approving the Improvement of Farley-Tihange Phenomenon of the Safety Injection System Injection Pipeline of Ling'ao NPP Units 3 and 4
2020-10-17	NNSA [2020] No. 243	Notice on Approving the Minimum Metal Temperature of Primary Circuit Hydrostatic Test for the First 10-year Overhaul of Ling'ao NPP Units 3 and 4
2020-11-05	NNSA [2020] No. 255	Notice on Approving Periodic Test Requirements for Safety-related Systems and Equipment of Lingao NPP Units 3 and 4 (Version D0)
2020-12-01	NNSA [2020] No. 277	Notice on Approving the Application for Suspending the Cooling Concession of Spent Fuel Pool during the Maintenance and Treatment of BOSS Welds in the Component Cooling Water System of Ling'ao NPP Units 1, 3, and 4
2020-10-10	NNSA Letter [2020] No. 93	Notice on Approving the Function Optimization of Nuclear Instrument System Cabinets of Ling'ao NPP Units 1 and 2
2020-06-29	MEE App [2020] No. 85	Approval Reply on the Environmental Impact Lists of the Hydraulic Test Pump Diesel Generator Unit Plant Construction Project of the Ling'ao NPP (Phase II)

Note: There were 9 issues of the Ling'ao NPP and the Daya Bay NPP jointly approved. Refer to Table 14 for details.

Table 17 Occupational Radiation Doses at Ling'ao NPP in 2020

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	0.256	6.767	0.681	0.045
Units 3 and 4	0.250	4.695	0.712	0.045

Tianwan NPP

In 2020, Units 1, 2, 3, 4, and 5 of Tianwan NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 12th refueling overhaul of Unit 1, the 2nd refueling overhaul of Unit 3, and the 2nd refueling overhaul of Unit 4 were completed. The initial loading of Unit 5 was started on July 9, 2020 and it met the commercial operation condition on September 8, 2020. The hot functional test of Unit 6 was completed on December 29, 2020.

The nuclear safety regulatory approvals for Tianwan NPP in 2020 are shown in Table 18, and regulatory inspection activities are shown in Table 19. Tianwan NPP reported 1 operational event, as shown in Table 20. The occupational radiation doses at Tianwan NPP are shown in Table 21.

In 2020, the Northern Regional Office of Nuclear and Radiation Safety Inspection (NRO) conducted inspections of the 4 operating units and 2 construction units of Tianwan NPP. In all, 4,016 man-day were taken on inspections, including 8 routine inspections and 1 non-routine inspection. A total of 81 issues were identified, and 32 regulatory requirements were imposed.

Figure 3 Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, Inspects the Tianwan NPP

Table 18 Nuclear Safety Regulatory Approvals for Tianwan NPP in 2020

Date	Document No.	Document
2020-01-03	NNSA [2020] No. 7	Notice on Approving the Long Cycle Refueling Project of Tianwan NPP Units 3 and 4

continued

Date	Document No.	Document
2020-03-20	NNSA [2020] No. 54	Notice on Approving Pressure Adjustment for Primary Circuit Tightness Test of Tianwan NPP Units 1-4
2020-03-20	NNSA [2020] No. 55	Notice on Approving the Tianwan NPP Operation Quality Assurance Program (Version A1)
2020-03-20	NNSA [2020] No. 56	Notice on Approving the Maintenance Program of the Tianwan NPP Units 5 and 6 (Version B)
2020-03-23	NNSA [2020] No. 58	Notice on Approving the Change Plan of Ω Ring on Lower Pressure Shell of K2 Control Rod Drive Mechanism of Tianwan NPP Unit 5
2020-03-24	NNSA [2020] No. 61	Notice on Approving the Refueling Program (F1) of Tianwan NPP Units 3 and 4
2020-04-02	NNSA [2020] No. 72	Notice on Approving On-line Maintenance Optimization of Risk-informed Safety System of Tianwan NPP Units 3 and 4
2020-04-09	NNSA [2020] No. 79	Notice on Approving the In-service Inspection Program of Tianwan NPP Units 1 and 2 (Version F1)
2020-04-13	NNSA [2020] No. 81	Notice on Approving the Optimization Plan of Process Waste Interface Transformation of Liquid Radwaste Solidification System of Tianwan NPP Units 1 and 2
2020-05-29	NNSA [2020] No. 119	Reply on the Treatment Plan for Pipe Section Welding Defects of Low-pressure Safety Injection System of Tianwan NPP Unit 1 (Version B)
2020-06-02	NNSA [2020] No. 125	Notice on Approving the Project Quality Assurance Program (Design and Construction Stage) (Version F2) of Tianwan NPP Units 5 and 6
2020-06-15	NNSA [2020] No. 131	Notice on Approving the Loading and Refueling Program of Tianwan NPP Units 5 and 6 (Version C1)
2020-07-01	NNSA [2020] No. 137	Notice on Approving the Commissioning Program of Tianwan NPP Units 5 and 6 (Version C)
2020-07-07	NNSA [2020] No. 141	Notice on Issuing the Operating License for Tianwan NPP Unit 5
2020-08-04	NNSA [2020] No. 169	Notice on Approving the Modification of the Installation of an Additional Bypass Pipe to the Purification System of the Fuel Pool and Boron Water Storage Tank of Tianwan NPP Units 3 and 4
2020-08-06	NNSA [2020] No. 173	Notice on Approving the Installation of Additional Manual Valves in the Reactor Building Containment Annular Space and the Emergency Negative Pressure System of the Safety Building of Tianwan NPP Unit 1
2020-08-25	NNSA [2020] No. 181	Approval Reply on the Optimization of the Applied Value of Annual Radioactive Discharge From the Effluent of Tianwan NPP Units 1-4
2020-09-09	NNSA [2020] No. 197	Notice on Approving Installation of the Additional Liquid Discharge Tank of Tianwan NPP Units 1 and 2
2020-09-10	NNSA [2020] No. 201	Notice on Issuing Review Opinions on Siting of Tianwan NPP Units 7 and 8
2020-12-09	NNSA [2020] No. 288	Notice on Approving the Modification of Equipment Gates in Reactor Building of Tianwan NPP Units 3 and 4

continued

Date	Document No.	Document
2020-04-10	NNSA Letter [2020] No. 34	Reply on Approving the Tianwan NPP Nuclear Accident Emergency Plan (Version 1-2020)
2020-07-07	MEE App [2020] No. 87	Approval Reply on the Environmental Impact Statements (Operation Stage) of Tianwan NPP Units 5 and 6
2020-09-10	MEE App [2020] No. 111	Approval Reply on the Environmental Impact Statements (Siting Stage) of Tianwan NPP Units 7 and 8

Table 19 Regulatory Inspection Activities at Tianwan NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-06-08	Comprehensive inspection before the issuance of Operating License to Tianwan NPP Unit 5.	Implementation of the quality assurance program, commissioning of structures, systems and components, operation and production preparation, radiation protection, emergency preparedness, physical protection and fuel storage, radioactive waste management and environmental monitoring, fire-fighting facilities, requirements for construction permit, operating license application document and solution of review issues, implementation of nuclear safety regulatory inspection regulatory requirements in the construction stage, etc.
2020-10-14	Special safety inspection for radioactive waste accumulated in the Tianwan NPP.	Safety status of radioactive waste in the radioactive waste treatment and storage plant of nuclear power units 1-6 of the Tianwan NPP; radioactive waste management program and the relevant procedure documents; and records and retention of the information related to radioactive waste management and measurement.

Note: The inspection organized by the regional office is not included.

Table 20 Operational Events of Tianwan NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-05-15	A weld seam in the low-pressure injection system exceeded the in-service inspection standard during the 12th refueling overhaul of Unit 1.	Equipment failure	0

Table 21 Occupational Radiation Doses at Tianwan NPP in 2020

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	0.101	1.696	0.320	0.020
Units 3 and 4	0.142	2.136	0.479	0.030
Unit 5	0.006	0.754	0.013	0.005

Hongyanhe NPP

In 2020, Units 1, 2, 3, and 4 of Hongyanhe NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 6th refueling overhaul of Unit 1, the 5th refueling overhaul of Unit 2, and the 3rd refueling overhaul of Unit 4 were completed. The refueling overhauls of Units 5 and 6 progressed smoothly. The hot functional test of Unit 5 was completed on December 9, 2020, and the cold functional test of Unit 6 was completed on October 27, 2020.

The nuclear safety regulatory approvals for Hongyanhe NPP in 2020 are shown in Table 22. Hongyanhe NPP reported 1 operational event, as shown in Table 23, and reported 1 construction event, as shown in Table 24. The occupational radiation doses at Hongyanhe NPP are shown in Table 25.

In 2020, the Northeast Regional Office of Nuclear and Radiation Safety Inspection (NERO) assigned 2,120 man-day for inspections of Hongyanhe NPP, including 5 routine inspections and 8 special inspections. A total of 205 issues were identified, and 65 regulatory requirements were imposed.

Figure 4. Hongyanhe NPP Units 1-6

Table 22 Nuclear Safety Regulatory Approvals for Hongyanhe NPP in 2020

Date	Document No.	Document
2020-02-05	NNSA [2020] No. 33	Notice on Approving the Modification of Regulation Requirements for Regular Test of Safety Related Systems and Equipment of Four Units of the Liaoning Hongyanhe NPP
2020-04-23	NNSA [2020] No. 91	Notice on Approving the Improvement of Shellfish Trap Filter Screen Reaming in the Important Service Water System of the Liaoning Hongyanhe NPP
2020-04-23	NNSA [2020] No. 92	Notice on Approving the Modification of the Commissioning Program of Hongyanhe NPP Units 5 and 6
2020-05-20	NNSA [2020] No. 113	Notice on Approving Omega Weld Leakage Treatment Scheme for Thermocouple Socket of Core Measurement System of Liaoning Hongyanhe NPP Unit 2
2020-07-07	NNSA [2020] No. 142	Notice on Approving the Replacement of Lubricating Oil Level Switch Spare Parts of 6.6 Kv Ac Emergency Power Supply System of the Liaoning Hongyanhe NPP

continued

Date	Document No.	Document
2020-08-04	NNSA [2020] No. 168	Notice on Approving the Loading and Start-up of Liaoning Hongyanhe NPP Units 1 and 2 Without the Secondary Neutron Source Assembly
2020-08-20	NNSA [2020] No. 180	Notice on Approving the Redundancy Improvement of Leakage Flow Channel of No. 1 Shaft Seal of Main Pump of Liaoning Hongyanhe NPP Units 1-4
2020-09-01	NNSA [2020] No. 191	Notice on Approving the In-service Inspection Program of the Liaoning Hongyanhe NPP (Version 1, Version for Approval)
2020-10-10	NNSA [2020] No. 236	Notice on Approving the Modification of Regular Test Regulation Requirements of the Liaoning Hongyanhe NPP
2020-10-12	NNSA [2020] No. 239	Notice on Approving the Revision of the Technical Specifications of Liaoning Hongyanhe NPP Units 1-4
2020-10-27	NNSA [2020] No. 251	Notice on Approving the Cleaning and Decontrol Process of Waste Resin in the Steam Generator Blowdown System of the Liaoning Hongyanhe NPP
2020-12-01	NNSA [2020] No. 275	Notice on Approving the Maintenance Program of Liaoning Hongyanhe NPP (Version 1)
2020-12-14	NNSA [2020] No. 296	Notice on Approving the Commissioning Program of the Hongyanhe NPP Units 5 and 6 (Version B)
2020-08-25	NNSA Letter [2020] No. 76	Letter on Confirming the Change in the Legal Representative Information in the Operating Licenses of Liaoning Hongyanhe NPP Units 1 and 2 and the Construction Permits of Units 5 and 6

Table 23 Operational Events of Hongyanhe NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-07-21	The CFI drum net differential pressure in Unit 4 due to the influx of jellyfish led to an automatic shutdown.	Equipment failure	0

Table 24 Construction Events of Hongyanhe NPP Reported in 2020

Occurrence Time	Event
2020-09-28	The excessive letdown line of Unit 5 was re-welded after hydrostatic test.

Table 25 Occupational Radiation Doses at Hongyanhe NPP in 2020

Unit	Annual Average Effective Dose/ Person (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1 and 2	0.384	5.438	1.076	0.064
Units 3 and 4	0.131	2.377	0.307	0.019

Ningde NPP

In 2020, Units 1, 2, 3, and 4 of Ningde NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 5th refueling overhaul of Unit 1 was completed on June 27, 2020, the 3rd refueling overhaul of Unit 4 was completed on October 26, 2020. Construction-related preparations of Units 5 and 6 were underway.

The nuclear safety regulatory approvals for Ningde NPP in 2020 are shown in Table 26. Ningde NPP reported 2 operational events, as shown in Table 27. The occupational radiation doses at Ningde NPP are shown in Table 28.

In 2020, the ERO conducted inspections of the 4 units of Ningde NPP. In all, 1,824 man-day were taken on inspections, including 1,084 daily inspections, 2 routine inspections and 24 special inspections. A total of 109 issues were identified, and 69 regulatory requirements were imposed.

Figure 5. Ningde NPP Units 1-4

Table 26 Nuclear Safety Regulatory Approvals for Ningde NPP in 2020

Date	Document No.	Document
2020-01-27	NNSA [2020] No. 34	Reply on the Optimization of the Applied Value of the Annual Radioactive Effluent of Fujian Ningde NPP Units 1-4
2020-03-23	NNSA [2020] No. 59	Notice on Approving the Change of Personnel and Goods Access Control Modes on the North Side of the Turbine Building of Ningde NPP Units 1-4
2020-04-07	NNSA [2020] No. 75	Notice on Approving the Modification of the Sump Drain Valve Control Logic of the Exhaust Drain System of the Nuclear Islands of Ningde NPP Units 1-4
2020-05-29	NNSA [2020] No. 120	Notice on Approving the Installation of the Additional Redundant Settings for the Monitoring and Control Logic of the Reflux Flow of the No. 1 Shaft Seal of Main Pump of Ningde NPP Units 1-4
2020-07-31	NNSA [2020] No. 166	Notice on Approving the Improvement of the Boundary Modification of the Main Control Room of Ningde NPP Units 1-4 and the Installation of an Additional Access Control in the Middle

continued

Date	Document No.	Document
2020-08-04	NNSA [2020] No. 170	Notice on Approving the Improvement of Logic Defects in the Simultaneous Startup of the Drum Filter Screen Medium and Low Speed Motors of the Circulating Water Filtration System of Ningde NPP Units 1-4
2020-11-26	NNSA [2020] No. 267	Notice on Approving the Installation of Additional Intrusion Detectors on the Driveway and Sidewalk at the Entrance and Exit of the Protection Zone of Ningde NPP
2020-12-09	NNSA [2020] No. 289	Notice on Approving the Improvement of the Backwashing Pipeline of Screen Cleaner of the Circulating Water Filtration System of Ningde NPP Units 1-4

Table 27 Operational Events of Ningde NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-06-20	Online error during the testing of Unit 1 caused the spent fuel cooling to not meet the requirements of the technical specifications.	Human error	0
2020-09-07	Interval of unavailability of 2JDT600DTL exceeded the maintenance period requirements stipulated in the technical specifications.	Human error	0

Table 28 Occupational Radiation Doses at Ningde NPP in 2020

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	0.207	6.534	0.562	0.034
Units 3 and 4	0.296	6.560	0.898	0.056

Fuqing NPP

In 2020, Units 1, 2, 3, and 4 of Fuqing NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 4th refueling overhaul of Unit 2 was completed on June 12, 2020, the 3rd refueling overhaul of Unit 3 was completed on February 16, 2020, and the 3rd refueling overhaul of Unit 4 was completed on October 18, 2020. Unit 5 was in the installation and commissioning stage, with overall safety and quality under control,

the operating license was acquired, and the initial loading was completed on September 4, 2020. The initial criticality was reached on October 21 and the initial connection to grid was on November 27. Unit 6 was in the installation stage and the safety and quality were under control. The outer dome was hoisted and installed on July 25, 2020, and the nuclear circuit flushing was completed on October 31.

The nuclear safety regulatory approvals for Fuqing NPP in 2020 are shown in Table 29, and the regulatory inspection activities are shown in Table 30. Two operational events but no construction event were reported by the Fuqing NPP, as shown in Table 31. The occupational radiation doses at Fuqing NPP are shown in Table 32.

In 2020, the ERO conducted inspections of the 5 operating units and 1 construction unit of Fuqing NPP. In all, 1,902 man-day were taken on inspections, including 8 routine inspections (participated in 2 routine inspections organized by NNSA) and 34 special inspections were conducted. A total of 210 issues were identified in the operating units, and 45 regulatory requirements were imposed. A total of 157 issues were identified in the construction units, and 30 regulatory requirements were imposed.

Figure 6. Fuqing NPP Units 1-6

Figure 7. Kuresi Maihesuti, Head of the Discipline Inspection and Supervision Team of the Central Commission for Discipline Inspection and the State Supervision Commission of the Ministry of Ecology and Environment, Inspects the Fuqing NPP

Table 29 Nuclear Safety Regulatory Approvals for Fuqing NPP in 2020

Date	Document No.	Document
2020-01-10	NNSA [2020] No. 11	Notice on Approving the Refueling Every 18 Months of Fujian Fuqing NPP Units 3 and 4
2020-01-23	NNSA [2020] No. 28	Notice on Approving the Refueling Program of Fujian Fuqing NPP Units 3 and 4 (Version 001)
2020-03-20	NNSA [2020] No. 57	Notice on the Issuance of Operating Licenses for Fujian Fuqing NPP Units 3 and 4

continued

Date	Document No.	Document
2020-03-23	NNSA [2020] No. 60	Notice on Approving the Design Change of the Cancellation of Zeolite Filling for Liquid Waste Treatment System of Fujian Fuqing NPP Units 5 and 6
2020-04-27	NNSA [2020] No. 95	Notice on Approving the Design Change of Outer Containment Tightness Test Method for Fujian Fuqing NPP Units 5 and 6
2020-06-08	NNSA [2020] No. 129	Notice on Approving the Maintenance Program of Fujian Fuqing NPP Units 5 and 6 (Version 001)
2020-07-01	NNSA [2020] No. 138	Notice on Approving Software Upgrade and Modification of Safety Video Display Unit (SVDU) of Fujian Fuqing NPP Units 3 and 4
2020-07-08	NNSA [2020] No. 143	Notice on Approving the Operation Quality Assurance Program of Fujian Fuqing NPP Units 5 and 6 (Version 0)
2020-07-14	NNSA [2020] No. 149	Notice on Approving the Commissioning Program of Fujian Fuqing NPP Units 5 and 6 (Version C/ 0)
2020-07-14	NNSA [2020] No. 150	Notice on Approving the Removal of the Fences in the Protection Area between Units 2 and 3 of Fujian Fuqing NPP and the Important Safety Modification of the Equipment in the Fences
2020-08-07	NNSA [2020] No. 172	Notice on Approving the In-service Inspection Program of Fujian Fuqing NPP Units 5 and 6 (Version 001)
2020-08-14	NNSA [2020] No. 176	Notice on Approving the Quality Assurance Program of Fujian Fuqing NPP Units 5 and 6 (Design and Construction Stage) (Version 4)
2020-08-18	NNSA [2020] No. 178	Notice on Approving the Loading and Refueling Program of Fujian Fuqing NPP Units 5 and 6 (Version 000)
2020-09-04	NNSA [2020] No. 194	Notice on Issuing the Operating License for Fujian Fuqing NPP Unit 5
2020-10-09	NNSA [2020] No. 219	Notice on Releasing the Control Point of the Initial Criticality of Fujian Fuqing NPP Unit 5
2020-11-23	NNSA [2020] No. 259	Notice on Approving the Commissioning Program of Fujian Fuqing NPP Units 5 and 6 (Version D/ 0)
2020-12-09	NNSA [2020] No. 287	Notice on Approving the Operation Quality Assurance Program of Fujian Fuqing NPP Units 1-4 (Version 3)
2020-12-30	NNSA [2020] No. 309	Notice on Approving the Important Safety Modification for the Installation of Additional High-Pressure Backwash Water Pump to the Drum Screen in Fujian Fuqing NPP Units 1-4
2020-04-20	NNSA Letter [2020] No. 36	Reply Letter on Agreeing to the Emergency Plan for Nuclear Accidents in Fujian Fuqing NPP (Version 1-2020)
2020-01-10	MEE App [2020] No. 2	Approval Reply on the Environmental Impact Lists of 18-month Refueling Project of Fujian Fuqing NPP Units 3 and 4

continued

Date	Document No.	Document
2020-09-04	MEE App [2020] No. 105	Approval Reply on the Environmental Impact Statements (Operation Stage) of Fujian Fuqing NPP Units 5 and 6

Table 30 Regulatory Inspection Activities at Fuqing NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-08-17	Comprehensive inspection before the issuance of the Operating License of Fujian Fuqing NPP Unit 5.	Implementation of the quality assurance program, commissioning of structures, systems and components, operation and production preparation, radiation protection, emergency preparedness, physical protection and fuel storage, radioactive waste management and environmental monitoring, fire-fighting facilities, requirements for construction permit, operating license application document and solution of review issues, and implementation of nuclear safety regulatory inspection regulatory requirements for Fujian Fuqing NPP Unit 5.
2020-09-30	Nuclear safety inspection for the control point of the initial criticality of Fujian Fuqing NPP Unit 5.	the commissioning test of Fujian Fuqing NPP Unit 5 from the initial loading to the completion of the commissioning, main debugging anomalies, changes, initial criticality preparation, commissioning after the initial criticality test, implementation of the technical specifications after the initial loading, periodic tests and implementation of the comprehensive inspection regulatory requirements before issuance of the operating license.

Note: The inspection organized by the regional office is not included.

Table 31 Operational Events of Fuqing NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-10-03	Standby logic of one fuel transfer pump of Units 3 and 4 emergency diesel generator set was not verified, resulting in the delay of the test.	Management weakness	0
2020-10-27	Safety injection was triggered during steam discharge interlock inspection and commissioning test of Unit 5.	Equipment failure	0

Table 32 Occupational Radiation Doses at Fuqing NPP in 2020

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	0.182	4.493	0.499	0.028
Units 3 and 4	0.185	4.321	0.516	0.034
Unit 5	0.002	0.095	0.003	0.018

Yangjiang NPP

In 2020, the 6 units of Yangjiang NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 4th refueling overhaul of Unit 2, the 3rd refueling overhaul of Unit 3, and the 1st refueling overhaul of Unit 6 were completed.

The nuclear safety regulatory approvals for Yangjiang NPP in 2020 are shown in Table 33. Yangjiang NPP reported 5 operational events, as shown in Table 34. The occupational radiation doses at Yangjiang NPP are shown in Table 35.

In 2020, the SRO inspected the 6 operating units of Yangjiang NPP. In all, 1,301 man-day were taken on inspections, including 7 routine inspections, 2 non-routine inspections, as well as special actions on identifying latent safety hazard. A total of 99 issues were identified, and 48 regulatory requirements were imposed.

Table 33 Nuclear Safety Regulatory Approvals for Yangjiang NPP in 2020

Date	Document No.	Document
2020-03-06	NNSA [2020] No. 48	Notice on Approving the Replacement of C-type Sealing Ring of the Pressure Vessels in the Yangjiang NPP
2020-04-02	NNSA [2020] No. 73	Notice on Approving the Restart of Yangjiang NPP Units 1 to 6
2020-05-22	NNSA [2020] No. 116	Notice on Approving the Quality Assurance Program for the Operation Stage of Yangjiang NPP (Version 12)
2020-07-03	NNSA [2020] No. 140	Notice on Approving the Transformation of Yangjiang Nuclear Power Environmental Protection Supporting Project
2020-07-20	NNSA [2020] No. 158	Notice on Approving the Second Batch of Safety Process Control Cabinet System Transformation of Yangjiang NPP Units 5 and 6
2020-09-01	NNSA [2020] No. 192	Notice on Approving the Modification of the Installed Additional Redundant Channels to the Leakage Flow Transmitter of the No. 1 Shaft Seal of the Main Pump of the Chemical and Volume Control System of the Yangjiang NPP
2020-12-11	NNSA [2020] No. 290	Notice on Approving the Replacement of Pressurizer and Steam Generator Sealing Gasket of Yangjiang NPP Units 1 to 6

Table 34 Operational Events of Yangjiang NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-02-02	Two computing servers of the KIC system of Unit 2 were unavailable and did not meet the requirements of technical specifications.	Equipment failure	0
2020-03-24	Reactor scram caused by tripping of two circulating water pumps of Unit 4.	Equipment failure	0
2020-03-25	Automatic reactor shutdown of 4 units of Yangjiang NPP due to marine biological invasion.	Equipment failure	1
2020-05-30	Internal leakage of Y8TEG024VY led to the incidental discharge of some gases from 8TEG004BA.	Equipment failure	0
2020-08-24	The filling volume of EAS001BA of Unit 4 was insufficient due to the liquid level meter malfunction and exceeded the maintenance time limit in technical specifications.	Human error	0

Table 35 Occupational Radiation Doses at Yangjiang NPP in 2020

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 1-6	0.441	12.047	1.906	0.042

Changjiang NPP

In 2020, Units 1 and 2 of Changjiang NPP continued to operate stably and safely, there were zero operation events, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 4th refueling overhaul of Unit 1 and the 3rd refueling overhaul of Unit 2 were completed.

According to the consultation and review results of the National Nuclear Safety Expert Committee in December 2019, the Safety Analysis Report of Changjiang NPP Units 3 and 4 and the Environmental Impact Statements at the Siting Stage, were approved in January 2020. On September 4, 2020, the application for the Construction Permits for Changjiang NPP Units 3 and 4 were officially accepted. On September 17, the routine nuclear safety inspection of the negative excavation of nuclear island foundation pits of Unit 3 was completed. On November 23, the review dialogue on the Preliminary Safety Analysis Report, the Environmental Impact Statements at the Construction Stage, and

the Quality Assurance Program (Design and Construction Stage) of Changjiang NPP Units 3 and 4 was organized.

The nuclear safety regulatory approvals for Changjiang NPP in 2020, are shown in Table 36. The occupational radiation doses at Changjiang NPP are shown in Table 37.

In 2020, the SRO inspected 2 operating units, 2 construction units, and a multi-purpose modular small reactor technology demonstration project of Changjiang NPP. In all, 604 man-day were taken on inspections, and 8 routine inspections and special actions on identifying latent safety hazard were conducted. A total of 97 issues were identified in the operating units, and 42 regulatory requirements were imposed. A total of 23 issues were identified in the construction units, and 7 regulatory requirements were imposed.

Figure 8. An Inspector at the Changjiang NPP Conducts Unpacking Inspection of Imported Civil Nuclear Safety Equipment

Table 36 Nuclear Safety Regulatory Approvals for Changjiang NPP in 2020

Date	Document No.	Document
2020-01-02	NNSA [2020] No. 2	Notice on Approving the Refueling Program (Version 003) of Hainan Changjiang NPP Units 1 and 2
2020-01-13	NNSA [2020] No. 18	Notice on Issuing the Review Opinions on Siting of Hainan Changjiang NPP Units 3 and 4
2020-01-19	NNSA [2020] No. 27	Notice on Approving the Subcritical Rod Calibration Test of Hainan Changjiang NPP Units 1 and 2
2020-04-28	NNSA [2020] No. 96	Notice on Approving the Waste Resin Deregulation in the Steam Generator Blowdown System of the Hainan Changjiang NPP
2020-07-31	NNSA [2020] No. 165	Notice on Approving the Quality Assurance Program of Hainan Changjiang NPP Units 1 and 2 (Operation Phase) (Version B)

continued

Date	Document No.	Document
2020-12-18	NNSA [2020] No. 299	Reply on the Optimization of the Annual Emission of Radioactive Effluent from Hainan Changjiang NPP Units 1 and 2
2020-09-24	NNSA Letter [2020] No. 91	Letter on Inquiring Opinions on Issuing Construction Permits for Hainan Changjiang NPP Units 3 and 4
2020-01-14	MEE App [2020] No. 5	Approval Reply on the Environmental Impact Statements (Siting Stage) of Hainan Changjiang NPP Units 3 and 4

Table 37 Occupational Radiation Doses at Changjiang NPP in 2020

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	0.152	2.811	0.302	0.032

Fangchenggang NPP

In 2020, Units 1 and 2 of Fangchenggang NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The 3rd refueling overhaul of Unit 1 and the 3rd refueling overhaul of Unit 2 were completed. The main equipment of the nuclear island of Unit 3 was ready for installation on July 23, 2020, the welding of the primary circuit was completed, bringing-in of the main equipment in the conventional island was completed, and the installation of pipelines were in full scope. The nuclear island of Unit 4 was at the peak stage of civil engineering construction. The internal structural construction of the reactor building (BRX) was completed, and the dome was hoisted and installed on January 24, 2021.

The nuclear safety regulatory approvals for Fangchenggang NPP in 2020 are shown in Table 38, and regulatory inspection activities are shown in Table 39. Fangchenggang NPP reported 2 construction events, as shown in Table 40, and no operational event was reported. The occupational radiation doses at Fangchenggang NPP are shown in Table 41.

In 2020, the SRO inspected 2 operating units

and 2 construction units of Fangchenggang NPP. In all, 856 man-day were taken on inspections, and 8 routine inspections and special actions on identifying latent safety hazard were conducted. A total of 61 issues were identified in the operating units, and 33 regulatory requirements were imposed. A total of 44 issues were identified in the construction units, and 34 regulatory requirements were imposed.

Figure 9. Dome Hoisting of Fangchenggang NPP Unit 4

Table 38 Nuclear Safety Regulatory Approvals for Fangchenggang NPP in 2020

Date	Document No.	Document
2020-01-02	NNSA [2020] No. 1	Notice on Approving the General Treatment Plan for Welds in the Steel Lining of Nuclear Island Containment of Fangchenggang NPP Unit 3 (Version G)
2020-01-12	NNSA [2020] No. 19	Notice on Approving the Treatment Plan for Floor Cracks in Safety Building and Fuel Building of Fangchenggang NPP Units 3 and 4 (Version B)
2020-07-01	NNSA [2020] No. 139	Notice on Approving the Changes and Optimizations of Average Temperature Control System Parameters of Guangxi Fangchenggang NPP Units 1 and 2
2020-07-07	NNSA [2020] No. 144	Notice on Approving the Quality Assurance Program at Operation Stage of Guangxi Fangchenggang NPP Units 1 and 2 (Version 1)
2020-08-17	NNSA [2020] No. 175	Notice on Approving the Quality Assurance Program for Engineering Design at the Construction Stage of Guangxi Fangchenggang NPP Units 3 and 4 (Version 4)
2020-08-17	NNSA [2020] No. 177	Notice on Approving the Defect Excavation and Repair Plan (Version B) for Further Quantitative Defects in the Welds of Steel Lining of Inner Cylinder of Nuclear Island Containment of Fangchenggang Unit 3
2020-09-30	NNSA [2020] No. 218	Notice on Approving the Transformation of the Physical Security Perimeters of Guangxi Fangchenggang NPP Units 1 and 2 to Increase the Entrance and Exit of Temporary Emergency Personnel
2020-11-05	NNSA Letter [2020] No. 108	Letter on Confirmation of the Information Change of the Legal Representative of the Operating Licenses of Guangxi Fangchenggang NPP Units 1 and 2 and the Construction Permits for Guangxi Fangchenggang NPP Units 3 and 4

Table 39 Regulatory Inspection Activities of Fangchenggang NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-07-15	Special inspection of reworked steel lining that had quality problems, of Fangchenggang NPP Unit 3.	Treatment and follow-up treatment plan for the typical defects of the inner cylinder steel lining welds of Unit 3 to be evaluated, and re-inspection and rework of steel lining welds.
2020-10-15	Verification activities for handling major nonconformities and implementation of feedback experience in the Fangchenggang NPP.	Treatment of floor cracks of Units 3 and 4 and implementation of feedback experience; and implementation of feedback experience on quality events related to the steel lining of Unit 3.

Note: The inspection organized by the regional office is not included

Table 40 Construction Events of Fangchenggang NPP Reported in 2020

Occurrence Time	Event
2020-04-26	Quality defects of cracks on the wall of additional cooling water and nuclear island fire fighter water plant of Unit 3.
2020-04-29	Seismic design of the ring crane of Units 3 and 4 did not meet the requirements of the ring crane technical specification.

Table 41 Occupational Radiation Doses at Fangchenggang NPP in 2020

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	0.301	6.361	0.775	0.046

Sanmen NPP

In 2020, Units 1 and 2 of Sanmen NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The first refueling overhaul of Unit 1 was completed on January 19, 2020.

The nuclear safety regulatory approvals for Sanmen NPP in 2020 are shown in Table 42, and regulatory inspection activities are shown in Table 43. Sanmen NPP reported 2

operational events, as shown in Table 44. The occupational radiation doses at Sanmen NPP are shown in Table 45.

In 2020, the ERO inspected 2 operating units of Sanmen NPP. In all, 1,467 man-day were taken on inspections, including 1 routine inspection (participated in 1 routine inspection organized by NNSA) and 22 special inspections. A total of 94 issues were identified, and 18 major nuclear regulatory requirements were imposed.

Figure 10. Regulatory inspector's Walkdown on the Important Buildings of the Sanmen NPP

Table 42 Nuclear Safety Regulatory Approvals for Sanmen NPP in 2020

Date	Document No.	Document
2020-02-11	NNSA [2020] No. 39	Notice on Issuing Operating Licenses for Sanmen NPP Units 1 and 2
2020-03-18	NNSA [2020] No. 53	Notice on Approving the Modification of Some Contents of the Technical Specifications of Sanmen NPP Units 1 and 2
2020-11-21	NNSA [2020] No. 258	Notice on Approving the Important Safety Modification of Permanent Scaffold Storage Rack of the 135-foot Containment Platform of Sanmen NPP Units 1 and 2
2020-12-31	NNSA [2020] No. 314	Notice on Approving the Important Safety Modification of the Change of Pressure Vessel Head Vent Pipe Support of Sanmen NPP Units 1 and 2
2020-05-13	NNSA Letter [2020] No. 41	Reply Letter on Agreeing to the Emergency Plan for Nuclear Accidents of Sanmen NPP Unit 1 and 2 (Version 1-2020)
2020-07-30	NNSA Letter [2020] No. 164	Notice on Approving the In-service Inspection Program for Sanmen NPP Units 1 and 2 (Version 6)

Table 43 Regulatory Inspection Activities at Sanmen NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-01-06	Nuclear safety inspection prior to the reactor first criticality after the first refueling overhaul of Sanmen NPP Unit 1.	Operation of the first fuel cycle of Sanmen NPP Unit 1; implementation of the first refueling overhaul of Unit 1; preparation for the first criticality of Unit 1 after the refueling overhaul; and implementation of other nuclear safety regulatory requirements.

Note: The inspection organized by the regional office is not included.

Table 44 Operational Events of Sanmen NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-04-11	The main control room emergency habitable system (engineered safety feature, ESF) actuation triggered automatically by the High-2 signal from the aerosol channel of the ventilation and radiation monitor A in the main control room of Unit 2.	Equipment failure	0
2020-05-03	Automatic reactor shutdown triggered by the low flow in the hot leg of reactor coolant loop I caused by the failure of 1B frequency converter controller A of main pump of Unit 1.	Equipment failure	0

Table 45 Occupational Radiation Doses at Sanmen NPP in 2020

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	0.049	1.100	0.077	0.004

Haiyang NPP

The Units 1 and 2 of Haiyang NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The first refueling overhauls of Units 1 and 2 were completed.

The nuclear safety regulatory approvals for Haiyang NPP in 2020 are shown in Table 46, and regulatory inspection activities are shown in Table 47. Haiyang NPP reported 2 operational events, as shown in Table 48. The occupational radiation doses at Haiyang NPP are shown in Table 49.

In 2020, the ERO inspected 2 operating units of Haiyang NPP. In all, 1,663 man-day were taken on inspections, including 2 routine inspections (participated in 2 routine inspections organized by NNSA) and 20 special inspections. A total of 244 issues were identified, and 88 regulatory requirements were imposed.

Figure 11. Full view of the Haiyang NPP

Table 46 Nuclear Safety Regulatory Approvals for Haiyang NPP in 2020

Date	Document No.	Document
2020-02-23	NNSA [2020] No. 40	Notice on Releasing the Control Point of the First Criticality of the Reactor after the First Refueling Overhaul of Haiyang NPP Unit 1
2020-02-24	NNSA [2020] No. 41	Notice on Issuing Operating Licenses for Haiyang NPP Units 1 and 2
2020-04-07	NNSA [2020] No. 74	Notice on Releasing the Control Point of the First Criticality of the Reactor after the First Refueling Overhaul of Haiyang NPP Unit 2
2020-06-16	NNSA [2020] No. 132	Notice on Approving the Revision of Operation Restrictions in the Technical Specifications of Haiyang NPP Units 1 and 2
2020-07-25	NNSA Letter [2020] No. 68	Reply Letter on agreeing to the Emergency Plan for Nuclear Accidents at Haiyang NPP Units 1 and 2 (Version 1-2020)

Table 47 Regulatory Inspection Activities at Haiyang NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-02-17	Control point inspection prior to the reactor first criticality after the first refueling overhaul of Haiyang Nuclear Power Plant Unit 1.	The first fuel cycle operation of the Unit, implementation of overhauls, implementation of maintenance activities of safety important systems and equipment, implementation of equipment changes, in-service inspection and defect treatment, as well as preparations for meeting the first criticality conditions of the Unit after refueling.
2020-03-30	Control point inspection of the reactor after the first refueling overhaul of Haiyang NPP Unit 2.	The first fuel cycle operation of the Unit, implementation of overhauls, implementation of maintenance activities of safety important systems and equipment, implementation of equipment changes, in-service inspection and defect treatment, as well as preparations for meeting the first criticality conditions of the Unit after refueling.

Note: The inspection organized by the regional office is not included.

Table 48 Operational Events of Haiyang NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-03-06	The isolation valve A at the outlet of passive containment cooling water tank outside the Unit 2 containment was erroneously opened.	Human error	0
2020-03-06	When Unit 2 was at full power, the main pump was shut down due to the failure of the main pump 1A frequency converter, resulting in low flow of the hot leg thus triggering the automatic trip of the reactor.	Equipment failure	0

Table 49 Occupational Radiation Doses at Haiyang NPP in 2020

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	0.144	3.680	0.280	0.030
Unit 2	0.199	2.944	0.325	0.034

Taishan NPP

In 2020, Units 1 and 2 of the Taishan NPP continued to operate stably and safely, and the integrity of the three physical barriers was maintained. The failure rate of fuel elements, leakage rate of primary circuit pressure boundary, and leakage rate of containment, were all within the prescribed limits. The first refueling overhaul of Unit 1 was started on June 29, 2020 and was completed on September 24.

The nuclear safety regulatory approvals for Taishan NPP in 2020 are shown in Table 50, and regulatory inspection activities are shown in Table 51. Taishan NPP reported 3 operational events, as shown in Table 52. The occupational radiation doses at Taishan NPP are shown in Table 53.

In 2020, the SRO inspected 2 operating units of Taishan NPP. In all, 595 man-day were taken on inspections, and 3 routine inspections (participated in 1 routine inspection organized by NNSA) and special actions on identifying latent safety hazard were conducted. A total of 39 issues were identified, and 23 regulatory requirements were imposed.

Table 50 Nuclear Safety Regulatory Approvals for Taishan NPP in 2020

Date	Document No.	Document
2020-02-26	NNSA [2020] No. 42	Notice on Approving the Technical Specifications on the Operations of Taishan NPP Units 1 and 2 (Version D)
2020-05-11	NNSA [2020] No. 99	Notice on Approving the Technical Specifications on Chemistry and Radiochemistry of Taishan NPP Units 1 and 2 (Version D0)
2020-05-29	NNSA [2020] No. 121	Notice on Approving the Substitution of Domestic Parts for Nuclear Island Voltage Regulating Transformers of Taishan NPP Units 1 and 2
2020-07-07	NNSA [2020] No. 145	Notice on Approving the In-service Inspection Program of Taishan NPP Units 1 and 2 (Version E3)
2020-08-26	NNSA [2020] No. 182	Notice on Approving the Regulation Requirements for Regular Tests of the Safety-related Systems and Equipment of Taishan NPP Units 1 and 2 (Version D)
2020-08-26	NNSA [2020] No. 183	Notice on Approving the Assembly and Refueling Program of Taishan NPP Units 1 and 2 (Version D)

continued

Date	Document No.	Document
2020-09-02	NNSA [2020] No. 193	Notice on Approving the Update of the Inserted Pages of the Revised Final Safety Analysis Report (Version C) for Taishan NPP Units 1 and 2
2020-09-11	NNSA [2020] No. 206	Notice on Releasing the Control Point of the First Criticality of the Reactor after the First Refueling Overhaul of Taishan NPP Unit 1
2020-09-11	NNSA [2020] No. 208	Notice on Approving the Transformation of High Radioactivity Monitoring Channel of Primary Coolant of Taishan NPP Units 1 and 2
2020-12-09	NNSA [2020] No. 286	Notice on Approving the Adjustment of Partial Radiation Zoning During Power Operation of Taishan NPP Units 1 and 2

Table 51 Regulatory Inspection Activities of Taishan NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-09-07	Control point inspection prior to the reactor first criticality after the first refueling overhaul of Taishan Nuclear Power Plant Unit 1.	Operation of the first fuel cycle of Taishan NPP Unit 1; Implementation of the first refueling overhaul of Unit 1; Maintenance activities of safety important systems and equipment, in-service inspection results of safety important systems and equipment, radiation protection, implementation of important safety modifications, and solutions for important abnormalities; Preparation for the first criticality point of the Unit after refueling overhaul; Rectification and implementation of other nuclear safety regulatory requirements.

Note: The inspection organized by the regional office is not included.

Table 52 Operational Events of Taishan NPP Reported in 2020

Occurrence Time	Event	Cause	INES Level
2020-01-06	The periodic test that produced the Group 1 Event was performed when the Group 1 Event already existed, resulting in failure to meet the requirements of the Technical Specifications in Unit 2.	Human error	0
2020-02-05	During the extended low power operation (ELPO) of Unit 2, the regulating rod was located lower than the required lower limit of the reference rod position.	Human error	0
2020-12-25	During the periodic test of the first train 10 kV diesel generator of the nuclear island of Unit 2, the diesel generator tripped and then started automatically due to excitation system failure.	Human error	0

Table 53 Occupational Radiation Doses at Taishan NPP in 2020

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	0.295	6.725	0.930	0.095
Unit 2	0.014	0.712	0.019	0.001

Huaneng Shandong Shidao Bay NPP (High Temperature Gas-Cooled Reactor NPP Demonstration Project)

In 2020, the installation of major equipment in Huaneng Shandong Shidao Bay NPP (High Temperature Gas-Cooled Reactor NPP Demonstration Project) was completed, and entered the comprehensive commissioning stage. The cold functional test of two nuclear steam supply system (NSSS) modules was completed on November 3, 2020, and the hot functional test of No. 2 NSSS module was officially started on December 15, 2020.

The nuclear safety regulatory approvals for HTGR NPP Demonstration Project in 2020 are shown in Table 54, and the regulatory inspection activities are shown in Table 55. HTGR NPP Demonstration Project reported 13 construction events, as shown in Table 56.

In 2020, the ERO inspected 1 construction unit of the HTGR NPP Demonstration Project. In all, 845 man-day were taken on inspections, and 3 routine inspections (participated in 1 routine inspection organized by NNSA) were conducted. A total of 171 issues were identified, and 110 regulatory requirements were imposed.

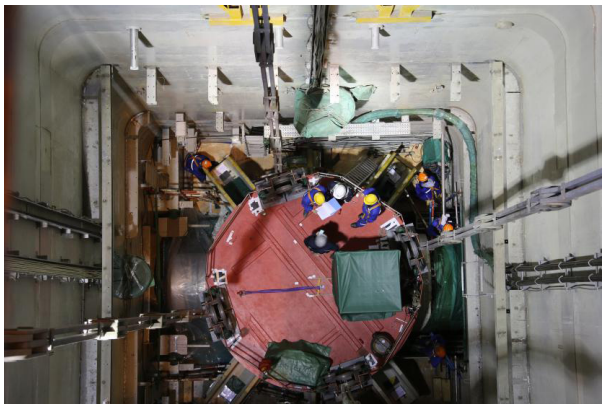


Figure 12. Three Shell Assembly of the HTGR NPP Demonstration Project (Primary Circuit Equipment such as Pressure Vessel, Hot Gas Duct, and Steam Generator are Connected)

Table 54 Nuclear Safety Regulatory Approvals for HTGR NPP Demonstration Project in 2020

Date	Document No.	Document
2020-06-02	NNSA [2020] No. 126	Notice on Approving the Change of Flow Induced Vibration Test of Steam Generator to Out-of-reactor Test for the HTGR NPP Demonstration Project
2020-09-15	NNSA [2020] No. 210	Notice on Approving the Revision of the Contents of Phase A Commissioning Guideline (Version E) of the HTGR NPP Demonstration Project
2020-09-15	NNSA [2020] No. 211	Notice on Approving the Design Change of Reactor Protection System of HTGR NPP Demonstration Project
2020-09-30	NNSA [2020] No. 217	Notice on Releasing Control Point before the Pressure Test of the Primary Circuit of the HTGR NPP Demonstration Project

continued

Date	Document No.	Document
2020-11-23	NNSA [2020] No. 249	Notice on Approving the In-Service Inspection Guideline for the HTGR NPP Demonstration Project of the Huaneng Shandong Shidao Bay NPP (Version B1 PRE)

Table 55 Regulatory Inspection Activities at HTGR NPP Demonstration Project in 2020

Start Date	Item	Main Contents of the Inspection
2020-09-22	Control point inspection before primary circuit pressure test of the HTGR NPP Demonstration Project.	Implementation of the Quality Assurance Program; Installation and handover of structures, systems and equipment; Implementation of preliminary commissioning test; Preparation for cold performance test; Solutions for construction events and experience feedback; Rectification and implementation of previous nuclear safety regulatory requirements.

Table 56 Construction Events of the HTGR NPP Demonstration Project in 2020

Occurrence Time	Event
2020-04-15	The flange bolt hole corresponding to hot gas duct section 3 was not aligned with the flange bolt hole corresponding to hot gas duct section 4 of reactor 1.
2020-05-19	Grounding of nuclear island plant and equipment was inconsistent with the specifications and drawings.
2020-06-01	Cracks were found in the locking spot welds of the connecting bolts of the hot gas duct of reactor 1.
2020-07-29	Rusting and dents were found on the inner wall of the nozzle of the helium purification circuit of steam generator 2.
2020-08-06	Throttle assembly of the No. 2 steam generator was jammed, and the thread of heat transfer tube was damaged.
2020-08-31	Control rod insertion was jammed during the pre-functional test of the control rod system of reactor 2.
2020-09-01	Dents on the outer surface of the discharge nozzle of the reactor pressure vessel.
2020-10-20	Control rod insertion was jammed during the pre-functional test of the control rod system of reactor 1.
2020-11-26	The weld of the spare nozzle BH10 of No. 2 helium fan was found not fully welded during the pre-service RT inspection.
2020-11-27	Non-destructive inspection activities beyond the scope of the license were conducted during the pre-service inspection activities by the contractor.

continued

Occurrence Time	Event
2020-12-08	Bars were displayed during the pre-service radiographic inspection of B16 weld of cooler pipe of No. 1 main helium fan.
2020-12-14	Noise was generated during primary circuit pressure test.
2020-12-17	During the pressure test of the primary circuit of reactor 1, the displacement of the anti-jump washer of the steam generator's load-bearing support exceeded the tolerance due to accidental collision, and the clearance between the anti-jump washer and the anti-jump nut exceeded the tolerance.

National Nuclear Demonstration Project

In 2020, the National Nuclear Demonstration Project was in the civil works construction and module installation stage.

The layer D concrete pouring of the external foundation of Unit 1 was completed on February 29, 2020, the nuclear island safety injection tank was introduced on August 29, layer E concrete pouring of the foundation outside the nuclear island was completed on September 6, the assembly of the steel dome of the nuclear island was started on October 8, and the pressure vessel was hoisted in place on December 25.

The hoisting (complete assembly) of CR10 (concrete reinforcement module under the containment bottom head) of Unit 2 was completed on March 30, 2020, the hoisting of CVBH (steel containment bottom head) was completed on June 15, CA20 (large structure in Zone 6 of the auxiliary building) module was hoisted in place on September 10, layer C concrete pouring of the foundation outside the nuclear island was completed on October 16, three-layer concrete pouring in the nuclear island reactor building was completed on November 14.

The nuclear safety regulatory approvals for National Nuclear Demonstration Project in 2020 are shown in Table 57, and the regulatory inspection activities are shown in Table 58. Four construction events were reported, as shown in Table 59.

In 2020, the ERO inspected 2 construction units of National Nuclear Demonstration Project. In all, 699 man-day were taken on inspections, 1 routine inspection (participated in 1 routine inspection organized by NNSA) and 1 non-routine inspection (participated in 1 non-routine inspection organized by NNSA) were conducted. A total of 128 issues were identified, and 82 regulatory requirements were imposed.

Table 57 Nuclear Safety Regulatory Approvals for National Nuclear Demonstration Project in 2020

Date	Document No.	Document
2020-06-03	NNSA [2020] No. 127	Notice on Approving the Implementation Plan for Repairing the Appearance Quality Defects of Layer D Concrete of External Foundation of Unit 1 Nuclear Island of National Nuclear Demonstration Project No. 1
2020-10-10	NNSA [2020] No. 235	Notice on Approving the Quality Assurance Program (Design and Construction Stage) (Version F) of National Nuclear Demonstration Project No. 1
2020-11-10	NNSA Letter [2020] No. 110	Reply Letter on Approving the Exemption of Post-welding Heat Treatment for Splicing Welds of the Steel Containment of Units 1 and 2 of National Nuclear Demonstration Project No. 1

Table 58 Regulatory Inspection Activities at National Nuclear Demonstration Project in 2020

Start Date	Item	Main Contents of the Inspection
2020-09-09	Non-routine nuclear safety inspections of Units 1 and 2 of No. 1 Demonstration Project.	Non-routine nuclear safety inspection of civil works construction quality management.

Note: The inspection organized by the regional office is not included.

Table 59 Construction Events of National Nuclear Demonstration Project Reported in 2020

Occurrence Time	Event
2020-03-23	Appearance quality defects of layer D concrete in the foundation (-6.25 m to -3.20 m) outside the nuclear island of Unit 1.
2020-11-06	Illegal opening of the outer packaging box of Unit 1 PH02 hydraulic spring damper.
2020-11-08	Strength data of some standard curing test blocks of layer SC1 concrete of No. 1 nuclear island were abnormal.
2020-11-16	Cracks were found on the base metal after the lifting lugs of the first ring of the steel containment cylinder of No. 1 nuclear island were removed and polished.

Zhangzhou NPP

Zhangzhou NPP Units 1 and 2 were in the civil works construction stage. The construction of Unit 2 commenced on September 5, 2020 and is currently underway in an orderly manner as per plan. The safety and quality issues were under control.

The nuclear safety regulatory approvals for Zhangzhou NPP in 2020 are shown in Table 60, and the regulatory inspection activities are shown in Table 61. One construction event was reported for Zhangzhou NPP, as shown

in Table 62.

In 2020, the ERO conducted inspections of Zhangzhou NPP. In all, 766 man-day were spent on the inspection, 1 routine inspection (participated in 1 routine inspection organized by NNSA) and 7 special inspections were conducted. A total of 251 issues were identified, and 20 regulatory requirements were imposed.

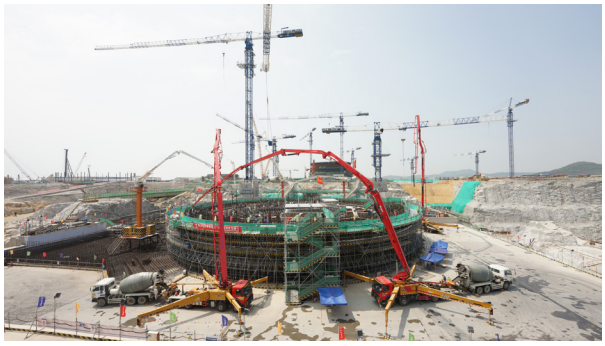


Figure 13. Concrete Pouring Site of Zhangzhou NPP Unit 2

Table 60 Nuclear Safety Regulatory Approvals for Zhangzhou NPP in 2020

Date	Document No.	Document
2020-09-03	NNSA [2020] No. 195	Notice on Releasing the Control Point for the First Tank of Concrete for Foundation Pouring of Nuclear Island of Fujian Zhangzhou NPP Unit 2

Table 61 Regulatory Inspection Activities at Zhangzhou NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-08-03	Nuclear safety inspection on the preparation before pouring the first tank of concrete for the nuclear island foundation of Fujian Zhangzhou NPP Unit 2.	Solutions for the remaining problems in the early stage of construction regulatory inspection such as negative excavation of nuclear island foundation pits; Preparation of construction management conditions such as nuclear island construction organization and construction plan; Preparation of technical conditions such as design documents and construction plans; Preparation of construction conditions before pouring the first tank of concrete for nuclear island; Implementation of quality assurance program at design and construction stages; Establishment and operation of experience feedback system.

Note: The inspection organized by the regional office is not included.

Table 62 Construction Events of Zhangzhou NPP in 2020

Occurrence Time	Event
2020-12-17	Some steel bars in the 1PX and combined 9PX pump house of Fujian Zhangzhou NPP were polluted due to seawater leakage at the cushions.

Taipingling NPP

In December 2020, Taipingling NPP was in the civil works construction and steel lining installation stage. Construction of Unit 1 commenced on December 26, 2019, and the truncated cone welding of the steel lining of reactor Building 1 (BRX) was completed on October 9. Nuclear island FCD of Unit 2 was completed on October 15, 2020, and BRX steel lining module No. 1 was lifted in place on December 29.

The nuclear safety regulatory approvals for Taipingling NPP in 2020 are shown in Table 63, and the regulatory inspection activities are shown in Table 64. No construction event was reported.

In 2020, the SRO conducted inspections of Taipingling NPP. In all, 168 man-day were taken on inspections, including 2 routine inspection and special actions on identifying latent safety hazard A total of 39 issues were identified and 14 regulatory requirements were imposed.

Figure 14. Taipingling NPP Unit 1

Figure 15. Concrete Pouring Site of Taipingling NPP Unit 1

Table 63 Nuclear Safety Regulatory Approvals for Taipingling NPP in 2020

Date	Document No.	Document
2020-10-15	NNSA [2020] No. 241	Notice on Releasing the Control Point for the First Tank of Concrete for Foundation Pouring of Nuclear Island of Guangdong Taipingling NPP Unit 2
2020-10-27	NNSA [2020] No. 250	Notice on Approving the Quality Assurance Program for Guangdong Taipingling NPP Phase I Project (Design and Construction Stage) (Version 3)

Table 64 Regulatory Inspection Activities at Taipingling NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-10-09	Nuclear safety inspection on the preparation before pouring the first tank of concrete for the nuclear island foundation of Guangdong Taipingling NPP Unit 2.	Solutions for the remaining problems in early construction regulatory inspection such as negative excavation of nuclear island foundation pits; Preparation of construction management conditions such as nuclear island construction organization and construction plan; Preparation of technical conditions such as design documents and construction plans; Preparation of construction conditions before pouring the first tank of concrete for the nuclear island; Implementation of quality assurance program in design and construction stage; Establishment and operation of experience feedback system.

San'ao NPP

In April 2020, the Environmental Impact Statements of San'ao NPP Units 1 and 2 (Siting Stage) was approved and the review opinions on siting was issued. In December 2020, the Environmental Impact Statements of San'ao NPP Unit 1 and 2 (Construction Stage) was approved and the Construction Permits for San'ao NPP Units 1 and 2 were issued.

The nuclear safety regulatory approvals for San'ao NPP in 2020 are shown in Table 65, and the regulatory inspection activities are shown in Table 66. No construction event was reported.

In 2020, the SRO conducted inspections of San'ao NPP. In all, 164 man-day were spent on the inspections, and 2 routine inspections (including 1 routine inspection organized by NNSA) were conducted. A total of 34 issues were identified and 30 regulatory requirements were imposed.

Figure 16. Issuance of Construction Permits for San'ao NPP Units 1 and 2

Figure 17. Concrete Pouring Site of San'ao NPP Unit 1

Table 65 Regulatory Approvals for San'ao NPP in 2020

Date	Document No.	Document
2020-04-13	NNSA [2020] No. 82	Notice on Issuing the Review Opinions on Siting of CGN Zhejiang San'ao NPP Phase I
2020-12-28	NNSA [2020] No. 303	Notice on Approving the Quality Assurance Program for CGN Zhejiang San'ao NPP Units 1 and 2 (Construction Stage) (Version 2)
2020-12-30	NNSA [2020] No. 313	Notice on Issuing the Construction Permits for CGN Zhejiang San'ao NPP Units 1 and 2
2020-04-13	MEE App [2020] No. 53	Approval Reply on Environmental Impact Statements (Siting Stage) of CGN Zhejiang San'ao NPP Phase I
2020-12-30	MEE App [2020] No. 151	Approval Reply on Environmental Impact Statements (Construction Stage) of CGN Zhejiang San'ao NPP Units 1 and 2

Table 66 Regulatory Inspection Activities at San'ao NPP in 2020

Start Date	Item	Main Contents of the Inspection
2020-12-21	Nuclear safety inspection before FCD of Zhejiang San'ao NPP Unit 1.	Implementation of the quality assurance program for San'ao NPP Unit 1, preparations of nuclear island construction organization, construction plan and construction scheme, on-site preparation before pouring the first tank of concrete for the nuclear island foundation, implementation of experience feedback on quality events in steel lining of Fangchenggang NPP Unit 3, and implementation of rectification requirements for on-site nuclear safety inspection, etc.

Note: The inspection organized by the regional office is not included.

4 Safety Regulation of Research Reactors

In 2020, there were 19 civil in-service research reactors (critical assemblies), among which 9 were in operation (including those in the commissioning phase), 1 was in safe closure, 4 were in long-term shutdown, and 5 were not in operation (as shown in Table 67). According to the *Reporting System for Research Reactor Licensees*, 9 operational events were reported in 2020, none of which caused adverse consequences to the environment outside the reactor buildings (as shown in Table 68). Construction of 1 civil research reactor progressed normally and there was no construction event.

The nuclear safety regulatory approvals for research reactors in 2020 are shown in Table 69, and regulatory inspection activities are shown in Table 70. The Construction Permit for the 2MWt TMSR-LF was issued.

Figure 18. Tang Bo, Deputy Administrator of the National Nuclear Safety Administration and Director of the Nuclear Power Safety Supervision Department of the Ministry of Ecology and Environment, Attends the 2020 National Experience Exchange Meeting on Safety Regulation of NPPs and Research Reactors

Figure 19. Inspectors Examine the Welding of Nuclear Equipment of the TMSR-LF

In 2020, the regional offices conducted inspections of research reactor licensees. In all, 1,627 man-day were taken on inspections, including 12 routine inspections and 1 non-routine inspection. A total of 271 issues were identified, and 49 regulatory requirements were imposed.

Table 67 Operation Status of Research Reactors in 2020

Facility	Power	Licensee	Status
101 Heavy Water Reactor (101 HWR)	10MW	CIAE	Safe closure
China Experimental Fast Neutron Reactor (CEFR)	65MW	CIAE	In operation
China Advanced Research Reactor (CARR)	60MW	CIAE	In operation
49-2 Swimming Pool Reactor (49-2SPR)	3.5MW	CIAE	In operation
Miniature Neutron Source Reactor (MNSR)	27kW	CIAE	In operation
Miniature Reactor Zero Power Facility (CFMNSR)	-	CIAE	Not in operation
Zirconium Hydride Solid Critical Facility (SSZR)	-	CIAE	Long-term shutdown
DF-VI Fast Neutron Criticality Facility (DF-VI CFFR)	-	CIAE	Long-term shutdown
Criticality Safety Facility for the Spent Fuel Reprocessing Pilot Plant (UCF)	-	CIAE	Not in operation
Shielding Experiment Reactor (SER)	1MW	Tsinghua University	Long-term shutdown
5 MW Experimental Nuclear Heating Reactor (5 MW-NHR)	5MW	Tsinghua University	Long-term shutdown
10 MW High Temperature Gas-Cooled Test Reactor (10 MW-HTGR)	10 MW	Tsinghua University	Not in operation
High Flux Engineering Test Reactor (HFETR)	125 MW	NPIC	In operation
High Flux Engineering Test Reactor Experimental Facility (HFETR)	—	NPIC	In operation
China Pulsed Reactor (CRP)	1MW	NPIC	Not in operation
Minjiang Test Reactor (MJTR)	5MW	NPIC	In operation
18-5 Critical Facility	—	NPIC	In operation
Miniature Neutron Source Reactor of Shenzhen University (MNSR)	30kW	Shenzhen University	Not in operation
In-Hospital Neutron Irradiator (IHNI)	30kW	Beijing Capture Tech Co., Ltd.	In operation

Table 68 Operational Events of Research Reactors in 2020

Occurrence Time	Facility	Event	Cause	INES Level
2020-03-23	High Flux Engineering Test Reactor (HFETR)	Leakage of degassing and pressurization system.	Equipment failure	0
2020-06-03	High Flux Engineering Test Reactor (HFETR)	Leakage of 107 water valve A.	Equipment failure	0
2020-08-07	High Flux Engineering Test Reactor (HFETR)	Lightning electromagnetic interference triggered protection signal, resulting in shutdown.	Equipment failure	0
2020-08-13	China Advanced Research Reactor (CARR)	China Advanced Research Reactor (CARR) safety rod drove the insertion of differential pressure fluctuation interlocking control rod, resulting in reactor shutdown.	Equipment failure	0
2020-08-17	High Flux Engineering Test Reactor (HFETR)	Instantaneous power loss of section I of external power supply caused by lightning.	Equipment failure	0
2020-08-30	High Flux Engineering Test Reactor (HFETR)	Reactor shutdown triggered by voltage fluctuation of section I of external power supply.	Equipment failure	0
2020-09-04	China Experimental Fast Neutron Reactor (CEFR)	China Experimental Fast Neutron Reactor (CEFR) irradiation assembly slipped into the conversion barrel while outside the reactor.	Equipment failure	0
2020-10-12	China Advanced Research Reactor (CARR)	China Advanced Research Reactor (CARR) water cooling pump A motor failure triggered safety shutdown.	Equipment failure	0
2020-10-18	China Experimental Fast Neutron Reactor (CEFR)	The gripper of the transfer machine in the transfer room of China Experimental Fast Neutron Reactor (CEFR) got stuck.	Equipment failure	0

Table 69 Regulatory Approvals for Research Reactors in 2020

Date	Document No.	Document
2020-01-08	NNSA [2020] No. 10	Notice on Approving the Quality Assurance Program (Operation Phase) for 10 MW High Temperature Gas Cooled Test Reactor (Version D) and the Quality Assurance Program (Operation Phase) for 5 MW Low Temperature Nuclear Heating Test Reactor (Version I)
2020-01-13	NNSA [2020] No. 20	Notice on the Issuance of the Construction Permit for the 2MWt TMSR-LF
2020-03-11	NNSA [2020] No. 52	Notice on Approving the Modification of the Top of 49-2 Swimming Pool Reactor of China Academy of Atomic Energy
2020-04-15	NNSA [2020] No. 84	Notice on Approving the Optimization of Annual Emission of Radioactive Airborne Effluent by China Experimental Fast Neutron Reactor (CEFR)

continued

Date	Document No.	Document
2020-06-02	NNSA [2020] No. 124	Notice on Approving the Transformation of DC Power Distribution and Emergency Power Supply System of 49-2 Swimming Pool Reactor of China Academy of Atomic Energy
2020-06-16	NNSA [2020] No. 133	Notice on Approving High-power Operation of China Experimental Fast Neutron Reactor (CEFR)
2020-07-17	NNSA [2020] No. 157	Notice on Approving Long-term Shutdown of Zirconium Hydride Solid State Critical Unit and DF-VI Fast Neutron Critical Unit
2020-07-17	NNSA [2020] No. 156	Notice on Approving the Addition of a New Startup Auxiliary Device by China Advanced Research Reactor (CARR)
2020-10-10	NNSA [2020] No. 238	Notice on Approving China Experimental Fast Neutron Reactor (CEFR) to Conduct Irradiation Test Experiments such as Neptunium-containing Experimental Components
2020-04-08	NNSA Letter [2020] No. 33	Reply Letter on the Adjustment of Sealing Test Time in the CARR Operation Hall
2020-09-03	NNSA Letter [2020] No. 85	Letter on Confirming the Change of Safety License Information of Nuclear Facilities such as China Experimental Fast Neutron Reactor (CEFR)
2020-11-04	NNSA Letter [2020] No. 103	Letter on Confirming the Change of Nuclear Facility Safety License Information of China Nuclear Power Research and Design Institute

Table 70 Regulatory Inspection Activities of the Research Reactor in 2020

Start Date	Item	Main Contents of the Inspection
2020-01-13	High power operation preparation inspection of the China Experimental Fast Neutron Reactor (CEFR).	Organization, training, system equipment status and procedure documents for high power operation of China Experimental Fast Neutron Reactor (CEFR).

5 Safety Regulation on Nuclear Fuel Cycle Facilities

In 2020, the in-service facilities for producing, fabricating, storing, and reprocessing nuclear fuels continued to be operated safely and maintained a good safety record, and the quality of facilities under-construction was effectively controlled. The nuclear and radiation safety of nuclear fuel cycle facilities was under control, and no unacceptable nuclear and radiation events harmful to workers, public, or the environment occurred. The details of the main facilities are shown in Table 71.

In 2020, there were 5 environmental impact statements approved, 1 operating license issued, and 3 nuclear safety technical modifications approved. The regulatory inspection on latent safety hazards of the relevant nuclear facilities were organized; the formulation of the regulations and standards in the field of spent fuel reprocessing was accelerated, the compilation of the *Safety of the Spent Fuel Reprocessing Facilities* was compilation, and research on key technologies for effluent and environmental monitoring of the reprocessing plants and safety review of reprocessing facilities were conducted. The experience feedback of operation events was strengthened, and the *Notice on Strengthening the Operation Experience Feedback of Civil Nuclear Fuel Cycle Facilities* was issued.

In 2020, the regional offices conducted inspections of nuclear fuel cycle facility licensees. In all, 1,706 man-day were taken on inspections, with 14 routine inspections and 3 non-routine inspections. A total of 203 issues were identified, and 141 regulatory requirements were imposed.

Table 71 Major Civilian Facilities in China for Producing, Fabricating, and Storing Nuclear Fuel

Facility / Project	Licensee	Major Product Form	Status
Dry Fabrication Line for Chemical Conversion	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO_2 power	In operation

continued

Facility / Project	Licensee	Major Product Form	Status
Powder Metallurgical Fabrication Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO_2 pellet	In operation
Nuclear Fuel Assembly Fabrication Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	PWR nuclear fuel elements	In operation
IDR Process Research and Equipment Production Line	CNNC Jianzhong Nuclear Fuel Co., Ltd.	UO_2 power	In operation
Nuclear Fuel Element Fabrication Line Extension and Technical Reformation Project	CNNC Jianzhong Nuclear Fuel Co., Ltd.	PWR nuclear fuel elements	In operation
HWR Nuclear Fuel Element Fabrication Line	China North Nuclear Fuel Co., Ltd.	HWR Nuclear Fuel Elements	In operation
PWR Nuclear Fuel Element Fabrication Line	China North Nuclear Fuel Co., Ltd.	PWR nuclear fuel elements	In operation
Reactor Fuel Element Fabrication Line for HTGR NPP Demonstration Project	China North Nuclear Fuel Co., Ltd.	High temperature gas cooled reactor spheric fuel	In operation
PWR Nuclear Fuel Element Fabrication Line Extension	China North Nuclear Fuel Co., Ltd.	PWR Nuclear Fuel Element	In operation
AP1000 Nuclear Fuel Element Fabrication Line	China North Nuclear Fuel Co., Ltd.	AP1000 Fuel Element	In operation
405-1A Project	CNNC Shaanxi Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
Phase IV Centrifugation Project	CNNC Shaanxi Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
North Region Centrifuge Extension Project, Phase I	CNNC Shaanxi Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
North Region Centrifuge Extension Project, Phase II	CNNC Shaanxi Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
Centrifuge Project	CNNC Lanzhou Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
Domestic Centrifuge Commercial Paradigm Project	CNNC Lanzhou Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
Uranium Enrichment Project, Phase III	CNNC Lanzhou Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
Uranium Enrichment Project, Phase IV	CNNC Lanzhou Uranium Enrichment Co., Ltd.	Low Enrichment UF_6	In operation
Temporary Dry Storage Facility for Spent Fuel of Qinshan NPP, Phase III	CNNC Nuclear Power Operation Management Co., Ltd.	—	In operation

6 Radiation Environment Regulation of Uranium and Accompanying Radioactive Minerals

Regulatory Approval

In 2020, NNSA conducted the environmental impact assessments (EIA) of 10 uranium mining and milling construction projects or decommissioning projects, such as the in-situ leaching and uranium mining test and research of Chuangqian Plot III of Qianjiadian uranium deposit in Tongliao city (see Table 72).

Table 72 Regulatory Approvals for Environmental Inspections of Uranium Mining and Milling Radiation in 2020

Date	Document No.	Document
2020-04-27	MEE App [2020] No. 57	Approval Reply to the Environmental Impact Statements on the Experimental Study of the In-situ Leaching and Uranium Mining Test and Research of Chuangqian Plot Iii of Qianjiadian Uranium Deposit in Tongliao City
2020-05-23	MEE App [2020] No. 71	Approval Reply to the Environmental Impact Lists of Engineering Research on High Flux Uranium Extraction Device for In-situ Leaching Mine
2020-05-23	MEE App [2020] No. 72	Approval Reply to the Environmental Impact Lists of Uranium Resource Investigation, Evaluation, and Exploration Project in Erlian Basin, Inner Mongolia
2020-05-23	MEE App [2020] No. 73	Approval Reply to the Environmental Impact Lists of Uranium Resource Investigation, Evaluation, and Exploration Project in the North of Ordos Basin
2020-07-23	MEE App [2020] No. 90	Approval Reply to the Environmental Impact Lists of 5 Projects Including Investigation, Evaluation, and Exploration of Uranium Resources in Ore Concentration Area, Xiazhuang County, Guangdong Province

continued

Date	Document No.	Document
2020-07-23	MEE App [2020] No. 91	Approval Reply to the Environmental Impact Lists of 6 Projects Including Investigation, Evaluation, and Exploration of Uranium Resources in Miaoershan Area, Guangxi
2020-07-23	MEE App [2020] No. 92	Approval Reply to the Environmental Impact Lists of 8 Projects Including Investigation, Evaluation, and Exploration of Uranium Resources in Yili Basin, Xinjiang
2020-08-20	MEE App [2020] No. 100	Approval Reply to the Environmental Impact Lists of 4 Projects Including the Investigation and Evaluation of Uranium Resources in Hailar Basin, Inner Mongolia
2020-09-03	MEE App [2020] No. 109	Approval Reply to the Environmental Impact Statements of In-situ Leaching and Uranium Mining Project in the Chuangqian Plot Iv of Qianjiadian Uranium Deposit
2020-11-26	MEE App [2020] No. 145	Approval Reply to Environmental Impact Statements of Decommissioning Treatment Project of 753 Mine of Cnnc North Uranium Industry Co., Ltd.

Regulatory Inspections

The 3-year regulatory inspection Plan was prepared according to the requirements of the *Notice on the Investigation and Elimination of Nuclear and Radiation Safety Hazards (MEE [2020] 215)*. Regional offices conducted radiation safety inspections of uranium mining and milling facilities around the country, organized the technical reviews of the 2019 annual report on the effluent and environmental monitoring of China Uranium Industry Co., Ltd. and Liaoning Shougang Ferroboron Co., Ltd., the review comments were issued and urged the enterprise to make rectifications. The directory of accompanying radioactive minerals enterprises are erected in all provinces and the self monitoring and information disclosure was examined.

Figure 20. An Inspector Inspects the Xinjiang Zhonghe Tianshan Uranium Industry Co., Ltd.

In 2020, the six regional offices took 322 man-day on inspections in total for uranium mining and milling facilities, including 41 routine inspections and 2 non-routine inspections. A total of 19 latent safety issues and 49 issues were identified, and 114 regulatory requirements were imposed.

7 Safety Regulation on Radioactive Waste

NNSA proactively promoted the development of relevant regulations and standards for radioactive waste safety management and improved the regulatory system of radioactive waste safety management. NNSA proactively promoted the selection of sites for disposal of radioactive waste, strengthened the safety regulation of radioactive waste, and advanced the treatment and disposal of the historical legacy radioactive waste.

Regulatory Approval

In 2020, the construction permit for radioactive waste treatment and storage facilities was issued to three licensees including China Nuclear Xinnuo Environmental Protection Co., Ltd; and the radioactive waste treatment and disposal license was issued to CNNC Sichuan Environmental Protection Engineering Co., Ltd.

In 2020, the EIA for the construction of Beishan underground laboratory, the EIA for the construction of two very low-level waste landfills and the EIA for the siting stage of Longhe near-surface disposal site were approved.

Operation and Safety Regulation of Radioactive Waste Disposal Sites

In 2020, the Northwest Disposal Site accepted a total of 8,013 packages of low-and-intermediate level radioactive waste, with a total volume of 3,625.72 m^3, and gross radioactivity of 1.41E+13Bq. As of the end of 2020, the Northwest Disposal Site had accepted a total of 64,979 packages of low-and intermediate level radioactive waste, with the total volume of 26,048.19 m^3, and gross radioactivity of 6.36E+14Bq.

In 2020, the Beilong Disposal Site did not accept any waste. The Beilong Disposal Site accepted a total of 2,240 packages of radioactive waste, with a total volume of 2,526.44 m^3, and gross radioactivity of 7.95E+13Bq.

According to the requirements of the operating license, the Northwest Disposal Site and Beilong Disposal Site are undergoing regular safety evaluation.

In 2020, the regional offices conducted inspections of radioactive waste disposal sites. In all, 513 man-day were taken on inspections, including 5 routine inspections, 1 non-routine inspection, and 5 special inspections. A total of 15 issues were identified, and 15 regulatory requirements were imposed.

Treatment of Legacy Radioactive Waste

NNSA strengthened the safety regulation of radioactive waste and advanced the treatment and disposal of legacy radioactive waste. In 2020, NNSA approved 11 environmental impact assessment documents and carried out 4 special inspections.

Figure 21. Jiang Guang, Vice Administrator of NNSA and Director General of Department of Radiation Source Safety Regulation of MEE, conducts a Special Safety Inspection of Radioactive Waste accumulated in the Daya Bay NPP

8 Safety Regulation of Radioisotopes and Irradiation Devices

By the end of December 31, 2020, there were 80,414 organizations that produce, sell, or use radioisotopes and irradiation devices in China. Among them, 9,755 organizations only produce sell, or use radioisotopes, and 70,659 organizations only produce, sell, or use irradiation devices. The number of radioactive sources in use is 149,452 (including 15,325 category I, 17,253 category II, 1,833 category III, and 115,041 other sources), and the number of various irradiation devices is 205,280. The number of disused radioactive sources accepted by provincial, regional, and municipal radioactive waste storage facilities is 56,561, and the number of disused radioactive sources transferred to or accepted by the national radioactive source centralized storage facility or recycled by the manufacturers is 146,648. In addition, the preparation for the disposal of more than 18,000 radioactive sources was completed.

In 2020, there were 263 organizations produce radioisotopes (except the preparation of Positron Emission Tomography (PET) radiopharmaceuticals for self-use), sell or use category I radioactive sources (excluding category I medical radioactive sources), sell (including installation) or use category I irradiation devices and own unsealed class-A radioactive material workplaces regulated by NNSA. All these organizations maintained a good radiation safety record.

Assistance in prevention against and control of the epidemic and resumptions of work and production

On February 1, 2020, the Ministry of Ecology and Environment (National Nuclear Safety Administration) issued the *Notice on Guaranteeing Radiation Safety REGULATION and Control of Medical Institutions in the Prevention against and Control of COVID-19 (EOR [2020] 51)*, which exempted the requirements for the radiology safety permits for emergency use of imaging equipment, and extended the time limit for the submissions of annual reports by medical institutions, to support medical institutions to comprehensively respond to the epidemic. During the period of epidemic prevention and control, more than 1,000 imaging equipment

were put into use nationwide after the exemption from licensing procedures were approved.

NNSA gave full play to its advantages to gain access to more information, and proactively coordinated and promoted radiation sterilization enterprises to participate in the production of epidemic prevention materials, playing a positive role in increasing the production capacity of epidemic prevention materials.

NNSA provided key support to the relevant work in Hubei province, which was seriously affected by the COVID-19, and coordinated with the organizaitons produce, sell and transport radioactive sources to promptly transport a batch of radioactive sources that were emergently required in Wuhan City, to alleviate the critical shortage of medical radioactive sources in Hubei province. NNSA also supported and accelerated the construction of new urban radioactive waste storage facility in Hubei province.

In addition, NNSA proactively adopted the "Internet +" mode for online examination and regulatory inspection of licensing and adopted the "exemption first, early approval and post-regulation" mode for some projects of relatively low radiation safety risks, to guarantee epidemic prevention and control and project approval at the same time, helping enterprises to resume their work and production.

Comprehensive Administration Streamlining and Power Delegation on Nuclear Technology Utilization

Since 2020, the reform on radiation safety training for the use of nuclear technology has been officially started, and a unified radiation safety training and assessment platform has been established. The radiation safety training assessment has changed from "recognized training institutions and paid offline training and examination" to "free-of-charge online self-learning and on-site online examination". The training and assessment platform is being extensively promoted, creation of the WeChat official account on radiation safety training has been completed, increased support is being provided in terms of information dissemination, registration study, registration and examination for radiation workers, and all provinces are being required to increase the number of examinations and improve the efficiency of regulation services according to the feedback in all aspects. As of December 31, 2020, 31 provinces (autonomous regions and municipalities directly under NNSA of the central government) organized 3,280 exams. A total of 191,386 applications were received and 156,039 applicants attended the exams, with 76,412 passing the exam.

NNSA further promoted the transformation from "release, management and services" reform to digitization. The National Nuclear

Technology Utilization Radiation Safety Management System possessed the functions of approval, archiving, regulation, and inspection, as well as real-time monitoring of high-risk sources, etc. "One-stop online approval" was implemented for radioisotope import and export approvals. Nuclear technology utilization enterprises no longer need to submit paper materials for any process, and only online application is required. The average time for approval has been shortened to almost half.

On November 3, 2020, NNSA issued the *Classified Management Directory of Environmental Impact Assessment of Construction Projects (2021 Version)*, optimized the approval procedures for some decommissioned projects using nuclear technology, and simplified the environmental impact assessment documents required for polluted water well gamma irradiation devices of decommissioned projects from the preparation report to the registration form, further reducing the workload of relevant entities.

The archiving exemption supporting documents for radioisotopes and irradiation devices approved by provinces were summarized, and the *Announcement on the Archiving Exemption Supporting Documents of Radioisotopes and Irradiation Devices (7th Batch)* and the *Announcement on the Archiving Exemption Supporting Documents of Radioisotopes and Irradiation Devices (8th Batch)* were issued. The archiving exemption supporting documents for irradiation devices and the activities listed in the announcement and documents for the radioactive sources or unsealed radioactive materials used in such activities, are valid nation-wide, and archiving exemption will no longer be applied individually.

Regulatory Approval and Inspection

In 2020, radiation safety licenses were issued to 16 nuclear technology utilization organizations. Licenses of 30 organizations were renewed, new items were added to the licenses of 41 organizations, and licenses of 45 organizations were modified. Four licensees' activities were partially restricted (see Table 73).

The licenses of 5 nuclear technology utilization organizations were cancelled. Responses were provided for the environmental impact assessments of 2 decommissioned nuclear technology utilization projects as well as for 4 conditional exemption letters (see Table 74).

In 2020, the regional offices conducted inspections of nuclear technology utilization organizations. In all, 1,299 man-day were taken on inspections, including 305 routine inspections, 33 non-routine inspections, and 37 special inspections. A total of 938

issues were identified, and 1,102 regulatory requirements were imposed.

Figure 22. Inspectors conduct On-site Inspection of Radioactive Source Transfer by the CNNC Tongfu (Changchun)

Review and Approval of Radioisotope Imports and Exports

There were totally 2,373 import and export applications for radioactive sources and unsealed radioactive materials (containing radiopharmaceuticals and their raw materials) approved in 2020, including 1,232 applications for imported and exported radioactive sources and 667 applications for exported radioactive sources. The total number of imported radioactive sources was 6,350, and the total number of exported radioactive sources was 1,306. The gross radioactivity of imported unsealed radioactive materials was 1.81E+16Bq, and the gross radioactivity of exported unsealed radioactive materials was 4.63E+16Bq.

Training on Radiation Safety Protection and Law Enforcement

NNSA continued to promote scientific, institutionalized, and refined regulation of radiation safety of nuclear technology, standardized the regulation of radiation safety at all levels across the country, and improved the regulation levels. According to the *Training Plan of the Ministry of Ecology and Environment 2020*, four training courses for inspectors were held, during which, more than 200 local inspectors has been trained. Under the background of epidemic prevention and control, innovative training forms were adopted. In June and July, the “National Nuclear Technology Utilization Radiation Safety Management System Administrator Training Course” and the first national nuclear technology utilization supervisor training course were held in the form of online videos, with higher training efficiency, lower cost, and more participants. This provided a good experience for holding similar training in the future. In October and November, the second and third offline training courses for national nuclear technology utilization inspectors were held respectively, both of which achieved the expected training results.

Radiation Accidents

In 2020, there were 5 radiation accidents in all provinces, autonomous regions and municipalities, and all of them were ordinary

accidents. Among them, 4 accidents involved the loss of 6 radioactive sources, and 1 involved an over-dose exposure to the staff.

Developing Real-time Monitoring Capacity for High-Risk Mobile Radioactive Sources

The development of real-time monitoring capacity for high-risk mobile radioactive sources was vigorously promoted. *The Data Collection Rules for Online Monitoring Platform for High-Risk Mobile Radioactive Sources* was issued to all provinces to advance the orderly sharing of monitoring data among provinces. In 2020, all provincial level independently built platforms were connected to the national platform, enabling the collection of monitoring data of provincial high-risk sources by the national platform. The data integration between the national platform and the provincial platform was realized, and the "one-network" for real-time monitoring of national high-risk mobile radioactive sources has been established.

Urban Radioactive Waste Storage Facility

In 2020, 31 provincial-level urban radioactive waste storage facilities in China implemented safety upgrade and transformation in accordance with the nuclear safety guide *Requirements for Safety Protection System of Urban Radioactive Waste Storage Facilities*, and the MEE and regional offices conducted on-site inspections, which met the standards. In 2020, all provinces received and stored a total of 5,462 disused radioactive sources, and Guangdong and Liaoning provinces cleared and transported 8,081 radioactive sources to the national centralized waste radioactive source storage facility.

Table 73 List of Approved Radiation Safety Licenses in 2020

No.	Organization	Type
1	Chongqing Dongcheng ADM Pharmaceutical Co., Ltd.	New application
2	China National Uranium Co., Ltd.	New application
3	ENN Science & Technology Development Co., Ltd.	New application
4	Liaoning Branch of Nanjing Jiangyuan AMS Positron Research and Development Co., Ltd.	New application
5	Zhejiang Yonghe Pharmaceutical Technology Co., Ltd.	New application
6	Hefei CAS Ion Medical and Technical Devices Co., Ltd.	Re-application
7	Nanchang HTA Pharmaceutical Co., Ltd.	New application
8	Tianjin Huayi Paite Technology Co., Ltd.	New application

continued

No.	Organization	Type
9	Sichuan Gaotong Pharmaceutical Co., Ltd.	New application
10	Qingdao ADM Positron Technology Co., Ltd.	New application
11	Chongqing Hengde Irradiation Technology Co., Ltd.	New application
12	Our United Corp.	New application and change
13	Hunan Huixuan Medical Technology Co., Ltd.	New application
14	Varian Medical Systems Trading (Beijing) Co., Ltd.	Re-application
15	Radiation Environment Regulation Station of the Tibet Autonomous Region	Renewal
16	Nanning Atom Gaotong Pharmaceutical Co., Ltd.	Addition
17	Chengdu Nuclear Power Research and Design Engineering Co., Ltd.	Renewal, change, and addition
18	SDIC Zheda (Hainan) Green Energy Technology Co., Ltd.	Addition
19	China Institute of Atomic Energy	Renewal, change, and partial modification
20	Zhonghe Tongxing (Beijing) Nuclear Technology Co., Ltd.	Renewal and change
21	Zhengzhou Niukelai Biotechnology Co., Ltd.	Change
22	Hangzhou HTA Pharmaceutical Co., Ltd.	Change
23	Sichuan Radiation Environment Management and Monitoring Center Station	Renewal
24	Lanzhou Kejin Taiji Co., Ltd.	Renewal
25	Hefei HTA Pharmaceutical Co., Ltd.	Addition
26	Qingyuan Environmental Technology Engineering Co., Ltd., CNNC	Change
27	Xi'an Jiangyuan AMS Positron Technology Co., Ltd.	Addition
28	Qingdao Atom Gaotong Pharmaceutical Co., Ltd.	New application and addition
29	Chengdu Gaotong Isotope Co., Ltd., CNNC	Addition
30	Chongqing Jian'an Instrument Co., Ltd.	Addition and renewal
31	Shinva Medical Instrument Co., Ltd.	Addition and change
32	Zhejiang Hengdian Atomic Hi Tech Pharmaceutical Co., Ltd.	Change
33	China Institute for Radiation Protection	Addition and change
34	Beijing Purevalley Biotechnology Co., Ltd.	Addition
35	The 719th Research Institute of China State Shipbuilding Co., Ltd.	Addition and change
36	Taiyuan HTA Pharmaceutical Co., Ltd.	Change
37	CNNC Hainan Haiyuan Development Co., Ltd.	Change
38	Chongqing HTA Pharmaceutical Co., Ltd.	Change

continued

No.	Organization	Type
39	Jilin Zhonghe Irradiation Technology Co., Ltd.	Change
40	Longyao Hefuyuan Technology Development Co., Ltd.	Addition
41	Seeds Biological Pharmacy (Tianjin) Ltd.	Addition
42	Chengdu New Radiomedicine Technology Co., Ltd.	Addition
43	Nanjing University of Aeronautics and Astronautics	Addition and change
44	Fujian Radiation Environment Regulation Station	Change
45	Zhejiang Academy of Agricultural Sciences	Change
46	Shanghai Gamma Star Technology Development Co., Ltd.	Addition and change
47	The 404 Co., Ltd., CNNC	Change
48	Beijing Senke Pharmaceutical Co., Ltd.	Addition
49	Chengdu Gaotong Isotope Co., Ltd.,CNNC	Change
50	Fuzhou Jiayi Medicine Co., Ltd.	Renewal
51	Syncor (Nanjing) Pharmaceutical Technology Co., Ltd.	Renewal and addition
52	Shanghai Atom Kexing Pharmaceutical Co., Ltd.	Renewal
53	Zhejiang ADM Positron Technology Co., Ltd.	Renewal
54	East China University of Science and Technology	Renewal
55	Guangzhou Chuangyi Biotechnology Co., Ltd.	Addition, renewal, and partial cancellation
56	Dongguan Sub-Branch, Institute of High Energy Physics Chinese Academy of Sciences	Renewal and addition
57	Guangdong Junqi Pharmaceutical Technology Co., Ltd.	Addition
58	Sichuan Atomic Gaotong Pharmaceutical Co., Ltd.	Renewal
59	Shanghai JPY Ion-Tech. Co., Ltd.	Renewal
60	Elekta (Shanghai) Medical Instrument Co., Ltd.	Addition
61	Institute of Modern Physics, Chinese Academy of Sciences	Addition
62	Shandong Feida Group Irradiation and Sterilization Co., Ltd.	Change
63	Huazhong University of Science and Technology	Renewal and change
64	Guangzhou Atomic High-Tech Radiopharmaceutical Co., Ltd.	Addition and change
65	Shaanxi Radioactive Waste Storage Facility Collection and Storage Management Center	Change
66	Tianjin HTA Isotope Pharmaceutical Co., Ltd.	Addition and renewal
67	Zibo Wanjie Cancer Hospital	Addition and change
68	Gansu Heavy Ion Hospital Co., Ltd.	Partial change
69	Zhejiang Jiaxiang Irradiation Technology Co., Ltd.	Renewal and change

continued

No.	Organization	Type
70	Shanghai Radiation Environment Regulation Station	Renewal
71	J Nuclear and Radiation Safety Center of Jiangsu	Renewal
72	Zhejiang Radiation Environment Monitoring Station	Change
73	Nuclear and Radiation Safety Center of Ningxia Hui	Renewal
74	Guangdong ADM Positron Technology Co., Ltd.	Addition
75	China Nuclear (Taizhou) Irradiation Technology Co., Ltd.	Change
76	Yanjiao Branch of Nanjing Jiangyuan AMS Positron Research and Development Co., Ltd.	Addition
77	China Isotope & Radiation Corporation	Addition
78	Shijiazhuang HTA Pharmaceutical Co., Ltd.	Addition
79	Southwestern Institute of Physics	Change
80	Nuclear Power Institute of China	Addition and change
81	Beijing Beike Radioisotope Science & Trade Co., Ltd.	Renewal
82	Wuhan HTA Pharmaceutical Co., Ltd.	Addition
83	Guangdong Huixuan Pharmaceutical Technology Co., Ltd.	Addition
84	Sichuan HTA Pharmaceutical Co., Ltd.	Addition
85	Jinan HTA Pharmaceutical Co., Ltd.	Addition
86	Dalian China Nuclear Radiation Technology Co., Ltd.	Renewal
87	Guizhou Radiation Environment Regulation Station	Change
88	Peking University	Addition
89	Seeds Pharmaceuticals Research Institute (Tianjin) Ltd.	New application
90	Hefei Institute of Physical Science, Chinese Academy of Sciences	Addition and change
91	CIRC Radiation Technology (Changchun) Co., Ltd.	Renewal
92	Nuclear and Radiation Safety Center of Shanxi Province	Change
93	CNNC Bine (Beijing) High-Tech Co., Ltd.	Renewal and change
94	Beijing HTA Jinhui Radiation Technology Application LLC	Renewal
95	Beijing SanqiangHeLi Radiation Engineering Technology Co., Ltd.	Renewal
96	CIRC Radiation Technology (Sichuan) Co., Ltd.	Renewal and change
97	Liaoning National Nuclear Safety Administration	Change
98	Shanxi Reedsheng Technology Co., Ltd.	Renewal
99	Luohe Longxiang Radiation Technology Co., Ltd.	Renewal
100	Hainan Radiation Environment Monitoring Station	Change
101	Hunan Radiation Environment Regulation Station	Change
102	Shenzhen Zhonghe Headway Bio-Sci & Tech Co., Ltd.	Change

continued

No.	Organization	Type
103	Suzhou CNNC Huadong Radiation Co., Ltd.	Change and partial cancellation
104	Jiangxi Radiation Environment Regulation Station	Change
105	Shanghai Advanced Research Institute, Chinese Academy of Sciences	Addition
106	Institute of High Energy Physics, Chinese Academy of Sciences	Addition
107	Tianjin Eco-Environment Monitoring Center	Change
108	Nuclear and Radiation Monitoring Center of the Inner Mongolia Autonomous Region	Change
109	Beijing Zhibo Bio-Medical Tech.	Change

Table 74 Other Environmental Protection Approval and Punishment Documents in the field of Safety Regulation of Radioisotopes and Irradiation Devices in 2020

Date	Document No.	Document
2020-01-17	MEE App [2020] No. 13	Approval Reply on the Environmental Impact Lists of the Irradiation Device Decommissioning Project of Shanghai Changhu New Materials Co., Ltd.
2020-11-24	MEE App [2020] No. 142	Approval Reply on the Environmental Impact Lists of the 60,000 Curie Cobalt-60 Irradiation Device Decommissioning Project of Guizhou Academy of Agricultural Sciences
2020-06-01	NNSA Letter [2020] No. 52	Notice on Approving the Change of the Information of Radioactive Solid Waste Storage License of 16 Organizations including Tianjin Ecological Environment Monitoring Center
2020-01-07	MEE RL [2020] No. 11	Letter on the Issuance of Radiation Safety License in 2019
2020-01-10	MEE RL [2020] No. 20	Reply Letter on Approving the Cancellation of Radiation Safety License of Tonghua Dongfang Irradiation Disinfection Co., Ltd.
2020-01-15	MEE RL [2020] No. 32	Letter on Approving the Cancellation of Radiation Safety License of Institute of Atomic Energy Utilization, Chinese Academy of Agricultural Sciences
2020-02-01	MEE RL [2020] No. 51	Notice on COVID-19 Infection Prevention and Control of Radiation Safety Regulation Services by Chinese Medicine Institutions
2020-03-05	MEE RL [2020] No. 96	Reply Letter on the Exemption of Nickel-63 Radioactive Source in PH700 Ⅱ, PH700 Ⅲ, PH700 Ⅳ, and PH700 Ⅴ Explosion-drug-chemicals Portable Detector of Shenzhen Peihong Electronics Co., Ltd.
2020-04-11	MEE RL [2020] No. 167	Letter on Approving the Cancellation of Radiation Safety License of China Atomic Energy Industry Guangzhou Co., Ltd.
2020-07-10	MEE RL [2020] No. 371	Letter on Approving the Cancellation of Radiation Safety License of Lanzhou Lvyuan Irradiation Co., Ltd.

continued

Date	Document No.	Document
2020-07-25	MEE RL [2020] No. 397	Letter on the Cancellation of Radiation Safety License of Shanghai Changhu New Material Co., Ltd.
2020-08-19	MEE RL [2020] No. 439	Reply Letter on Exemption Management of Nickel-63 Radioactive Source in GC-7820 Gas Chromatograph of Shandong Huifen Instrument Co., Ltd.
2020-09-10	MEE RL [2020] No. 477	Letter on the Notification of Problems Found in the Review of Environmental Assessment Documents of Nuclear and Radiation Projects in the First Half of 2020 and Suggestions for Solution
2020-10-10	MEE RL [2020] No. 527	Reply Letter on Exemption for the Approval of the Change of Enterprise Title of Shanghai Sinmax Sensor Technology Co., Ltd.
2020-11-03	MEE RL [2020] No. 583	Reply Letter on Exemption Management of Nickel-63 Radioactive Source in EI-HE800 Portable Explosive Drug Detector of Shanghai Yingmanni Safety Equipment Co., Ltd.
2020-12-11	MEE RL [2020] No. 686	Reply Letter on Exemption Management of Nickel-63 Radioactive Sources in GC9790-Plus and GC9720-Plus Gas Chromatographs of Zhejiang Fuli Analytical Instrument Co., Ltd.

Re-check of Environmental Assessment Documents

According to the *Measures for the Regulation of the Preparation of Environmental Impact Statements (Lists) of Construction Projects* and the relevant requirements for the normalization reviews of 69 environmental impact statements (lists) NNSA organized the technical re-check of environmental impact statements (lists) in the field of nuclear technology utilization submitted by 11 provinces (cities) including Hunan, Beijing, Liaoning, Gansu, Shandong, Yunnan, Heilongjiang, Shanghai, Tianjin, Qinghai, and Hainan, publicly announced the problems found, criticized and deducted scores of honesty for the construction enterprises and the enterprises and personnel that prepared the environmental assessment documents, and announced the criticism to the relevant technical assessment enterprises and approval authorities.

9 Nuclear Material Control and Physical Protection of Nuclear Facilities

In 2020, according to the *Nuclear Safety Law of the People's Republic of China,* the *Law of the People's Republic of China on Prevention and Control of Radioactive Pollution,* the *Safety Regulation on Civilian Nuclear Facilities,* the *Regulation on Nuclear Material Control*, and other relevant laws and regulations, NNSA executed its responsibilities for regulatory inspections and technical reviews on nuclear material control and physical protection of nuclear facilities, and the responsibilities for nuclear material license verification. The *Video Monitoring System for Physical Protection of NPPs (HAD501/ 08)* was also issued.

Nuclear Material License Verification and Approval

Technical reviews and onsite inspections of the nuclear material license application documents of Guangdong Lufeng Nuclear Power Co., Ltd., Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou University, and China National Uranium Co., Ltd., were conducted. The verification procedures were completed.

10 Safety Regulation on Transportation of Radioactive Materials

In 2020, the transportation activities of radioactive materials were safely implemented without the occurrence of any nuclear and radiation accidents or incidents in China. To improve the regulatory system, the *Format and Contents of Nuclear and Radiation Safety Analysis Report for the Transportation of Radioactive Materials,* the Safety Guides for *the Format and Contents of Safety Analysis Report for Road Sea and Railway Combination Transportation of Spent Fuel,* the *Leak Test of Packages for Safe Transport of Radioactive Materials,* and the *Load Combination and Design Criteria for the Structural Analysis of Spent Fuel Transportation Containers* were prepared. The responsibilities for the transportation for categories II and III radioactive materials were fulfilled, and the transport containers for category II radioactive materials were archived.

In 2020, 3 certificates of approval for the design of transport containers for category I radioactive materials (including 2 changes and renewals) were issued. Eight transport containers designed and manufactured abroad for category I radioactive materials (including 3 renewals) were approved for use in China. Twenty-four nuclear and radiation safety analysis reports for the transportation of radioactive materials (including 13 changes and renewals) were approved.

The regulatory approvals in the field of safety regulation on radioactive material transportation in 2020 are shown in Table 75, and regulatory inspection activities are shown in Table 76.

In 2020, the regional offices conducted 18 regulatory inspections for transportation of radioactive materials. Three issues were identified, and 3 regulatory requirements were imposed.

Table 75 Major Regulatory Approvals for Radioactive Material Transportation in 2020

Date	Document No.	Document
2020-01-07	NNSA [2020] No. 8	Notice on Issuing the Approval for the Use of Two NAC-STC Spent Fuel Transport Containers to the CGN Uranium Resources Co., Ltd.
2020-01-07	NNSA [2020] No. 9	Notice on Issuing the Approval for the Use of Three NAC-STC Spent Fuel Transportation Containers to Qingyuan Environmental Technology Engineering Co., Ltd., CNNC
2020-01-12	NNSA [2020] No. 13	Notice on Approving the Nuclear and Radiation Safety Analysis Report for AFA3G Fuel Assembly Transportation to Tianwan NPP
2020-01-12	NNSA [2020] No. 17	Notice on Approving the Nuclear and Radiation Safety Analysis Report for Fuel Assembly Transportation to Tianwan NPP Units 5 and 6 of China North Nuclear Fuel Co., Ltd.
2020-01-17	NNSA [2020] No. 23	Notice on Approving the Extension of the Valid Period of Nuclear and Radiation Safety Analysis Report for Road Transportation of Fuel Assemblies to the Fangchenggang NPP
2020-02-04	NNSA [2020] No. 29	Notice on Approving the Nuclear and Radiation Safety Analysis Report for Class I Radioactive Source Transportation to Qingyuan Environmental Technology Engineering Co., Ltd., CNNC
2020-02-04	NNSA [2020] No. 38	Notice on Extending the Valid Period of the Approval for the Design of GY-20 and GY-40 Cobalt-60 Transport Containers
2020-03-05	NNSA [2020] No. 45	Notice on Approving the Extension of the Valid Period of Using F-127 Transport Containers of Nordion (Canada) Inc within the Territory of the People's Republic of China
2020-03-05	NNSA [2020] No. 46	Notice on Approving the Change of the Design Approval of CNSC Spent Fuel Transport Container
2020-03-10	NNSA [2020] No. 50	Notice on Approving the Nuclear and Radiation Safety Analysis Report for N36 Characterized Spent Fuel Transportation
2020-04-20	NNSA [2020] No. 85	Notice on Approving the Renewal of Nuclear and Radiation Safety Analysis Report for Fuel Assembly Transportation to Hainan Changjiang NPP
2020-04-20	NNSA [2020] No. 86	Notice on Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Cobalt-60 Source (F-168/F-168-X Container) to Tongxing (Beijing) Nuclear Technology Co., Ltd., CNNC
2020-04-20	NNSA [2020] No. 87	Notice on Approving the Nuclear and Radiation Safety Analysis Report of Co-60 Radioactive Source Road Transportation to Beijing Beike Radioisotope Science and Trade Co., Ltd.
2020-04-23	NNSA [2020] No. 89	Notice on Approving the Renewal of the Use Approval of NAC-STC Spent Fuel Transport Container to Qingyuan Environmental Technology Engineering Co., Ltd., CNNC
2020-04-23	NNSA [2020] No. 94	Notice on the Renewal of the Valid Period of the Approval for the Use of TK-C5-M New Fuel Transport Container to Jiangsu Nuclear Power Co., Ltd.
2020-05-13	NNSA [2020] No. 104	Notice on the Change of the Approval of Nuclear and Radiation Safety Analysis Report for Nordian γ Knife Cobalt Source Transportation

continued

Date	Document No.	Document
2020-05-13	NNSA [2020] No. 106	Notice on the Change of the Ratification of Nuclear and Radiation Safety Analysis Report of Leksell, Sweden γ Knife Cobalt Source Transportation
2020-05-21	NNSA [2020] No. 114	Notice on Approving the Change of Nuclear and Radiation Safety Analysis Report for Cobalt Regulating Rod Bundle Transportation of CANDU Reactor to Qinshan Phase III Nuclear Power Co., Ltd
2020-05-25	NNSA [2020] No. 117	Notice on Approving the Adjustment of the transportation plan of the Nuclear and Radiation Safety Analysis Report for Fuel Assembly Transportation to China North Nuclear Fuel Co., Ltd. Tianwan Units 5 and 6
2020-05-25	NNSA [2020] No. 118	Notice on Approving the Renewal of Nuclear and Radiation Safety Analysis Report for Transportation of Cobalt-60 Radioactive Source SY-I (A) Container to Beijing CIAE-RIAR Radioisotope Technology Co., Ltd.
2020-06-28	NNSA [2020] No. 136	Notice on Approving the Renewal of Nuclear and Radiation Safety Analysis Report for Cobalt Source (FCTC10 Container) Transportation to Tongxing (Beijing) Nuclear Technology Co., Ltd., CNNC
2020-07-16	NNSA [2020] No. 151	Notice on Approving the Change of Nuclear and Radiation Safety Analysis Report on Sanmen Nuclear Fuel Assembly Transportation to China North Nuclear Fuel Co., Ltd.
2020-07-16	NNSA [2020] No. 152	Notice on Approving the Renewal of Nuclear and Radiation Safety Analysis Report for Railway Transportation of UF6 Products Imported and Exported by China Nuclear Energy Industry Co., Ltd.
2020-07-23	NNSA [2020] No. 160	Notice on Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Class I Radioactive Substances to Urban Radioactive Waste Storage Facility of Liaoning Province
2020-07-23	NNSA [2020] No. 161	Notice on Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Class I Radioactive Substances to Urban Radioactive Waste Storage Facility of Hubei Province
2020-10-23	NNSA [2020] No. 246	Notice on Issuing the Approval for the Use of Four NAC-STC Spent Fuel Transport Containers to CGN Uranium Resources Co., Ltd.
2020-10-23	NNSA [2020] No. 247	Notice on Approving the Nuclear and Radiation Safety Analysis Report (Supplementary Report for Change) for Highway Transportation of New Fuel Assemblies to Yibin-Hongyanhe NNP
2020-11-24	NNSA [2020] No. 264	Notice on Approving the 3977A Transport Container for Use in the Territory of the People's Republic of China
2020-11-26	NNSA [2020] No. 268	Notice on Issuing the Design Approval of ANT-12A New Fuel Transportation Container to China Nuclear Power Technology Research Institute Co., Ltd.
2020-11-26	NNSA [2020] No. 269	Notice on Approving the Nuclear and Radiation Safety Analysis Report for Highway Transportation of Iodine-131 and Molybdenum-99 Radioactive Raw Materials (Domestic) to HTA. Co., Ltd.

continued

Date	Document No.	Document
2020-11-28	NNSA [2020] No. 272	Notice on Approving the BEATRICE Transport Containers and JANE Transport Containers for Use within the Territory of the People's Republic of China
2020-12-07	NNSA [2020] No. 282	Notice on Approving the Nuclear and Radiation Safety Analysis Report of the Transportation of Cobalt-60 Radioactive Source (GY-20 Container) from Lanzhou to Dalian, to Dalian China Nuclear Radiation Technology Co., Ltd
2020-12-07	NNSA [2020] No. 283	Notice on Approving the Nuclear and Radiation Safety Analysis Report (Supplementary Report for Change) for New Fuel Assembly Transportation to Yibin Hainan Changjiang NPP
2020-12-07	NNSA [2020] No. 284	Notice on Approving the Nuclear and Radiation Safety Analysis Report (Supplementary Report for Change) for New Fuel Assembly Transportation to Yibin Daya Bay NPP, Ling'ao NPP, and Yangjiang NPP
2020-12-07	NNSA [2020] No. 285	Notice on Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Cobalt-60 Radioactive Source (GY-20 Container) to Zhongjin Irradiation Incorporated Co.
2020-01-27	NNSA Letter [2020] No. 12	Reply Letter on Approving the Change of the Designated Representative of the Nuclear and Radiation Safety Analysis Report for the Transportation of 8 Class I Radioactive Substances to Chengdu Gaotong Isotope Co., Ltd., CNNC
2020-03-30	NNSA Letter [2020] No. 31	Reply Letter on Approving the Change of the Address of ENUN 24P Spent Fuel Transport Container to CGN Uranium Resources Co., Ltd.
2020-04-20	NNSA Letter [2020] No. 37	Reply Letter on Approving the Change of the Legal Representative Information in the Design Approval of Radioactive Goods Transport Container to China Nuclear Power Engineering Co., Ltd.
2020-06-28	NNSA Letter [2020] No. 57	Reply Letter on Approving the Change of the Information of the Design License for Class I Radioactive Goods Transport Container to Nuclear Power Institute of China
2020-07-16	NNSA Letter [2020] No. 65	Reply Letter on Approving the Change of the Legal Representative Information in the Design Approval of Radioactive Goods Transport Container to China Nuclear Power Engineering Co., Ltd.

Table 76 Regulatory Inspection Activities of Radioactive Material Transportation in 2020

Start Date	Item	Main Contents of the Inspection
2020-05-20	Investigation of imported B-type package transportation of HTA. Co., Ltd.	Transportation safety inspection
2020-08-24	Witness of shielding test of GYR transport container of Nuclear Power Institute of China.	Vessel test witness

continued

Start Date	Item	Main Contents of the Inspection
2020-09-09	Regulatory inspection on design of ANT-12A new fuel transportation container of China Nuclear Power Technology Research Institute Co., Ltd.	Vessel design inspection
2020-10-10	Witness of design verification test of well logging source transport container of Bazhou Dapu Petroleum Technology Service Co., Ltd. (Atomic Energy Institute).	Vessel test witness
2020-10-21	Witness of design verification test of LC-C-200 and LC-C-300 neutron source transport containers for oil logging of Hebei Jinke Petroleum Equipment Co., Ltd.	Vessel test witness
2020-11-09	Regulatory inspection on design of Class II radioactive material transport container of Beijing Shucheng Science and Technology Development Co., Ltd.	Vessel design inspection
2020-11-10	Regulatory inspection on manufacture of Class II radioactive goods transport containers of Beijing Tuoyuan Instrument Components Factory	Vessel manufacturing inspection
2020-11-11	Regulatory inspection on manufacturing of Class II radioactive goods transport containers of Sichuan Kexin Mechanical and Electrical Equipment Co., Ltd.	Vessel manufacturing inspection
2020-11-18	Design and shielding test of neutron source container of Beijing Shucheng Science and Technology Development Co., Ltd.	Vessel design inspection
2020-11-23	Witness of design and test of Class II radioactive goods transportation container of HTA. Co., Ltd.	Vessel test witness
2020-11-24	Regulatory inspection on design of QY4U013 uranium compound powder transport container of The Seventh Research and Design Engineering Corporation of CNNC	Vessel design inspection
2020-11-25	Witness of design and test of Class II radioactive goods transportation container of HTA. Co., Ltd.	Vessel test witness
2020-11-26	Regulatory inspection on verification of neutron source container of North China Sub-Branch, CNPC Logging	Vessel design inspection
2020-11-30	Regulatory inspection on design activities of China Institute of Atomic Energy	Vessel design inspection
2020-12-02	Witness of neutron source vessel design and test of Zhengzhou Boerdeng Protective Equipment Co., Ltd. (Atomic Energy Institute).	Vessel test witness
2020-12-08	Regulatory inspection of Class II radioactive material transport container (logging source container) of Changqing Sub-Branch of CNPC Logging Co., Ltd.	Vessel design inspection
2020-12-14	Regulatory inspection on the design and manufacture of Class II radioactive goods transport containers of Baoji Sifu Petroleum Machinery Co., Ltd.	Vessel design and manufacturing and inspection
2020-12-24	Witness of design verification test of BRD-ZYG102 neutron source transport container for oil logging of Zhengzhou Boerdeng Equipment Articles Co., Ltd. (Atomic Energy Institute).	Vessel test witness

11 Regulation on Civilian Nuclear Safety Equipment

Regulatory Approvals

In 2020, NNSA received and reviewed a total of 120 organizations' new applications for civilian nuclear safety equipment licenses, and approved 132 organizations' applications, including 13 organizations' new applications for licenses (see Table 77), 31 organizations' applications for renewal (see Table 78), and 88 organizations' applications for change (see Table 79). As of the end of 2020, a total of 216 organizations were licensed for the design, manufacture, installation, and NDT of nuclear safety equipment.

In 2020, 38 organizations' applications for registration of civilian nuclear safety equipment import were received and reviewed, of which 28 applications were approved (see Table 80). As of the end of 2020, the total number of foreign organizations holding registration confirmations for design, manufacture, or NDT of nuclear safety equipment was 179.

Table 77 Issuance of New Licenses for Civilian Nuclear Safety Equipment in 2020

Date	Document No.	Document
2020-03-06	NNSA [2020] No. 047	Notice on Issuing the Design and Manufacturing License of Civil Nuclear Safety Equipment to Siemens Factory Automation Engineering Co., Ltd.
2020-03-09	NNSA [2020] No. 049	Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Suzhou High and Medium Pressure Valve Factory
2020-05-13	NNSA [2020] No. 101	Notice on Issuing Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Dalicheng Electric Co., Ltd.
2020-05-13	NNSA [2020] No. 103	Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Gaona Aero Material Co., Ltd.

continued

Date	Document No.	Document
2020-08-31	NNSA [2020] No. 190	Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Baowu Special Metallurgy Co., Ltd.
2020-09-09	NNSA [2020] No. 199	Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Zhejiang Innuovo Machinery Co., Ltd.
2020-09-10	NNSA [2020] No. 203	Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Neway Industrial Materials (Suzhou) Co., Ltd.
2020-09-10	NNSA [2020] No. 204	Notice on Issuing the Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Wanheng Casting Industry Co., Ltd.
2020-09-15	NNSA [2020] No. 214	Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Huakan Nuclear Power Equipment Technology Co., Ltd.
2020-10-07	NNSA [2020] No. 234	Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Jiangsu Dunan Environmental Control System Co., Ltd.
2020-11-28	NNSA [2020] No. 271	Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Siait Cable Group Co., Ltd.
2020-11-28	NNSA [2020] No. 273	Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Atomhorizon Electric (Jinan) Corp., Ltd
2020-12-01	NNSA [2020] No. 279	Notice on Issuing the Design and Manufacturing License for Civil Nuclear Safety Equipment to Wuzhong Instrument Co., Ltd.

Table 78 Approvals of License Renewal for Civilian Nuclear Safety Equipment in 2020

Date	Document No.	Document
2020-01-02	NNSA [2020] No. 003	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Zhejiang Jiuli Special Material Technology Co., Ltd. and the Chang of the Scope of Licensed Activities
2020-01-27	NNSA [2020] No. 037	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Nantong Kunlun Air Conditioner Co., Ltd.
2020-03-26	NNSA [2020] No. 062	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Jiangsu Power Equipment Co., Ltd.
2020-03-27	NNSA [2020] No. 063	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Nuclear Power Institute of China
2020-03-27	NNSA [2020] No. 064	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Shenyang Northeast Battery Co., Ltd.

continued

Date	Document No.	Document
2020-03-27	NNSA [2020] No. 065	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Chongqing Chuanyi Automation Co., Ltd.
2020-03-27	NNSA [2020] No. 066	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Shenyang Kejin Special Material Co., Ltd.
2020-03-27	NNSA [2020] No. 067	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Shanghai Foxboro Co., Ltd
2020-03-27	NNSA [2020] No. 068	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Shanghai Electric Group Shanghai Electric Machinery Co., Ltd.
2020-03-27	NNSA [2020] No. 069	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Shanghai Guanghua Instrument Co., Ltd.
2020-03-27	NNSA [2020] No. 070	Notice on Approving the Renewal of the Manufacturing License for Civil Nuclear Safety Equipment of Jiangsu Yinhuan Precision Steel Pipe Co., Ltd.
2020-03-30	NNSA [2020] No. 071	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Wolong Electric Nanyang Explosion Proof Group Co., Ltd
2020-09-15	NNSA [2020] No. 209	Notice on Approving the Renewal of Civil Nuclear Safety Equipment Installation License of China Energy Engineering Group Jiangsu No. 3 Electric Power Construction Co., Ltd.
2020-09-15	NNSA [2020] No. 213	Notice on Approving the Renewal of Civil Nuclear Safety Equipment Design License of Harbin Electric Co., Ltd.
2020-10-03	NNSA [2020] No. 220	Notice on Approving the Renewal of the Manufacturing License of Civil Nuclear Safety Equipment of Dongfang (Guangzhou) Heavy Machinery Co., Ltd.
2020-10-03	NNSA [2020] No. 221	Notice on Approving the Renewal of Civil Nuclear Safety Equipment Manufacturing License of Harbin Electric Power Equipment Co., Ltd.
2020-10-03	NNSA [2020] No. 222	Notice on Approving the Renewal of Civil Nuclear Safety Equipment Design License of Nuclear Industry Engineering Research and Design Co., Ltd.
2020-10-04	NNSA [2020] No. 223	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Chongqing Pump Industry Co., Ltd.
2020-10-04	NNSA [2020] No. 224	Notice on Approving the Renewal of the Manufacturing License of Civil Nuclear Safety Equipment of Baoyin Special Steel Tube Co., Ltd.
2020-10-02	NNSA [2020] No. 226	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Sunway Co., Ltd.

continued

Date	Document No.	Document
2020-10-03	NNSA [2020] No. 227	Notice on Approving the Renewal of the Manufacturing License of Civil Nuclear Safety Equipment of Harbin Electric Group (Qinhuangdao) Heavy Equipment Co., Ltd.
2020-10-03	NNSA [2020] No. 228	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Manufacturing License of Shandong Nuclear Power Equipment Manufacturing Co., Ltd.
2020-10-04	NNSA [2020] No. 230	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Guangdong Zhengchao Electric Co., Ltd.
2020-10-04	NNSA [2020] No. 231	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of The 719th Research Institute of China State Shipbuilding Co., Ltd.
2020-10-03	NNSA [2020] No. 232	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of China Techenergy Co., Ltd.
2020-10-04	NNSA [2020] No. 233	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Hoppecke Power System (Wuhan) Co., Ltd.
2020-10-28	NNSA [2020] No. 252	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Wujiang Dongwu Machinery Co., Ltd.
2020-12-23	NNSA [2020] No. 301	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Hudong Heavy Machinery Co., Ltd.
2020-12-28	NNSA [2020] No. 305	Notice on Approving the Renewal of the Manufacturing License of Civil Nuclear Safety Equipment of Vallourec Nuclear Tubes (Guangzhou) Co., Ltd.
2020-12-28	NNSA [2020] No. 306	Notice on Approving the Renewal of the Civil Nuclear Safety Equipment Design and Manufacturing License of Zhejiang Shuangyang Fan Co., Ltd.
2020-12-28	NNSA [2020] No. 307	Notice on Approving the Renewal of Civil Nuclear Safety Equipment Manufacturing License of Bohai Shipyard Group Co., Ltd.

Table 79 Approvals of License Change for Civilian Nuclear Safety Equipment in 2020

Date	Document No.	Document
2020-01-12	NNSA [2020] No. 015	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Chongqing Chuanyi Automation Co., Ltd.
2020-01-12	NNSA [2020] No. 016	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Changzhou Bayi Cable Co., Ltd.

continued

Date	Document No.	Document
2020-01-17	NNSA [2020] No. 024	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for China Nuclear Industry 23 Construction Co., Ltd.
2020-01-17	NNSA [2020] No. 025	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Wuhan Heavy Industry Casting and Forging Co., Ltd.
2020-05-18	NNSA [2020] No. 112	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shanghai Electric Ksb Nuclear Pumps & Valves Co., Ltd.
2020-08-27	NNSA [2020] No. 184	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for CNNC Xi'An Nuclear Instrument Co., Ltd.
2020-08-27	NNSA [2020] No. 185	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
2020-08-27	NNSA [2020] No. 186	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Installation License for POWERCHINA Nuclear Engineering Co., Ltd.
2020-08-27	NNSA [2020] No. 188	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shandong Hualing Cable Co., Ltd.
2020-08-27	NNSA [2020] No. 189	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for China Nuclear Power Technology Research Institute Co., Ltd.
2020-09-08	NNSA [2020] No. 196	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for China Nuclear Industry 23 Construction Co., Ltd.
2020-09-22	NNSA [2020] No. 216	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Zhejiang Sanfang Control Valve Co., Ltd.
2020-11-21	NNSA [2020] No. 260	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for China Nuclear Industry 23 Construction Co., Ltd.
2020-11-24	NNSA [2020] No. 261	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Zhejiang Jiuli Hi-Tech Metals Co., Ltd.
2020-11-24	NNSA [2020] No. 262	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Suzhou Hailu Heavy Industry Co., Ltd.
2020-11-24	NNSA [2020] No. 263	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Dalian Dagao Valve Co., Ltd.

continued

Date	Document No.	Document
2020-11-24	NNSA [2020] No. 266	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Dongfang Electric (Guangzhou) Heavy Machinery Co., Ltd.
2020-11-28	NNSA [2020] No. 274	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for China Nuclear Power Technology Research Institute Co., Ltd.
2020-12-01	NNSA [2020] No. 276	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Yantai Taihai Manuer Nuclear Power Equipment Co., Ltd.
2020-12-01	NNSA [2020] No. 278	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design License for Dongfang Electric Co., Ltd.
2020-01-12	NNSA Letter [2020] No. 006	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for ABB Xiamen Switchgear Co., Ltd.
2020-01-19	NNSA Letter [2020] No. 007	Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 8 Enterprises such as China First Heavy Industries (Group) Co., Ltd. and Registration Confirmation of 3 Overseas Enterprises such as Westinghouse Electric Company, Llc
2020-02-27	NNSA Letter [2020] No. 016	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Lisega Pipeline Support Technology (Shanghai) Co., Ltd.
2020-03-27	NNSA Letter [2020] No. 028	Notice on Approving the Change of Civil Nuclear Safety Equipment License of 9 Enterprises such as China Nuclear Power Engineering Co., Ltd. and the Registration Confirmation of Overseas Enterprises such as Russian Joint Stock Company “Atommashexport”
2020-03-30	NNSA Letter [2020] No. 029	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Dalian Dagao Valve Co., Ltd,
2020-03-31	NNSA Letter [2020] No. 032	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Yangzhou Huayu Fittings Co., Ltd.
2020-05-19	NNSA Letter [2020] No. 046	Notice on Approving the Change of Civil Nuclear Safety Equipment Licenses of 10 Enterprises such as China First Heavy Industries Co., Ltd. and 5 Overseas Enterprises such as Candu Energy Inc. of Canada
2020-05-29	NNSA Letter [2020] No. 050	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shanghai Lianggong Valve Co., Ltd.
2020-07-09	NNSA Letter [2020] No. 062	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Shanghai Xinmin Heavy forging Co., Ltd.

continued

Date	Document No.	Document
2020-07-25	NNSA Letter [2020] No. 069	Notice on Approving the Change of the Characteristic Parameters of its Design and Manufacturing Capacity of Civil Nuclear Safety Equipment for SUFA Technology Industry Co., Ltd., CNNC
2020-08-21	NNSA Letter [2020] No. 074	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Shanghai Electric Shmp Casting and forging Co., Ltd.
2020-08-21	NNSA Letter [2020] No. 075	Notice on Approving the Change of Civil Nuclear Safety Equipment License of 9 Enterprises such as China Nuclear Power Engineering Co., Ltd. and Registration Confirmation of 3 Overseas Enterprises such as Japan's OKANA VALVE MFG Co., Ltd.
2020-08-27	NNSA Letter [2020] No. 078	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shanghai Electric Machinery Co., Ltd.
2020-08-27	NNSA Letter [2020] No. 080	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Sunte Electric Equipment Co., Ltd.
2020-08-27	NNSA Letter [2020] No. 081	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Jiangsu Shangshang Cable Group Co., Ltd.
2020-10-23	NNSA Letter [2020] No. 096	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Manufacturing License for Baoding Tianwei Baobian Electric Co., Ltd.
2020-10-28	NNSA Letter [2020] No. 099	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Shanghai Apollo Machinery Co., Ltd.
2020-10-28	NNSA Letter [2020] No. 100	Notice on Approving the Changes of the Information of Civil Nuclear Safety Equipment Licenses of 6 Enterprises Including China Nuclear Power Operation Technology Co., Ltd.
2020-11-24	NNSA Letter [2020] No. 117	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Zhejiang Shangfeng Special Bl Ower Industry Co., Ltd.
2020-11-28	NNSA Letter [2020] No. 122	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for Hoppecke Power System (Wuhan) Co., Ltd.
2020-11-28	NNSA Letter [2020] No. 123	Notice on Approving the Change of the Scope of Activities of Civil Nuclear Safety Equipment Design and Manufacturing License for ABB Xiamen Low Voltage Equipment Co., Ltd.
2020-12-03	NNSA Letter [2020] No. 124	Notice on Approving the Changes of the Information of Civil Nuclear Safety Equipment Licenses of 8 Enterprises Including Shandong Nuclear Power Equipment Co., Ltd.
2020-12-23	NNSA Letter [2020] No. 132	Notice on Approving the Change of the Scope of Activities of its Civil Nuclear Safety Equipment Non-Destructive Testing License for China Nuclear Power Operation Technology Co., Ltd.

Table 80 Issuance of Registration Confirmation for Civil Nuclear Safety Equipment Activities to Foreign Enterprises in 2020

Date	Document No.	Document
2020-01-12	NNSA [2020] No. 14	Notice on Issuing the Registration Confirmations to 10 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Thorburn Flex Inc. of Canada
2020-02-27	NNSA [2020] No. 43	Notice on Issuing the Registration Confirmations to 3 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including RINGO VALVULAS S.L. of Spain
2020-04-04	NNSA [2020] No. 76	Notice on Issuing the Registration Confirmations to 5 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including JSC OKB “GIDROPRESS” of Russia
2020-08-27	NNSA [2020] No. 187	Notice on Issuing the Registration Confirmations to Overseas Enterprise Specializing in Civil Nuclear Safety Equipment Activities, such as MSA, A.S of the Czech Republic
2020-10-23	NNSA [2020] No. 248	Notice on Issuing the Registration Confirmations to 4 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including Aruna Alloy Steels Pvt. Ltd. of India
2020-11-26	NNSA [2020] No. 270	Notice on Issuing the Registration Confirmations to 5 Overseas Enterprises Specializing in Civil Nuclear Safety Equipment Activities, including JSC “Pervouralsky Pipe Plant” of Russia

Safety Inspections of Imported Equipment

NNSA conducted regulatory inspections of imported civil nuclear safety equipment in accordance with law, and further standardized and optimized the safety inspection process. There were 321 batches of regulatory inspection application documents (including customs and opening package inspection) submitted by applicants, including 137 for mechanical equipment, 142 for electrical equipment, and 42 for combined mechanical and electrical equipment. Among which, 283 were released, 39 were rejected, and 50 were opened for inspections.

Regulatory Inspection

NNSA conducted 31 comprehensive inspections (see Table 81), 11 special inspections (see Table 82) of domestic enterprises, and 4 nuclear safety inspections of foreign enterprises (see Table 83) according to the regulatory inspection program and plan, 221 issues were identified and 152 regulatory requirements were imposed. NNSA promptly raised correction requirements for the problems discovered in these inspections, and organized experts to review and perform special inspections on major non-conformance that affect nuclear safety. In 2020, the quality of design, manufacture, installation, and non-destructive testing of civilian nuclear safety equipment is under control.

Table 81 Comprehensive Inspection on Civilian Nuclear Safety Equipment of Domestic Enterprises in 2020

Start Date	Inspected Enterprise
2020-01-08	Dongfang Famatome Nuclear Pump Co., Ltd.
2020-06-15	CGN Inspection Technology Co., Ltd.
2020-07-27	Shanghai No.1 Machine Tool Works Co., Ltd.
2020-08-04	Zhejiang Shuangyang Fan Co., Ltd
2020-08-18	Xi'an United Pressure Vessel Co., Ltd.
2020-08-19	Xi'an Nuclear Equipment Co., Ltd.
2020-08-24	Jiamusi Electric Machine Co., Ltd.
2020-08-25	Dongfang Electric Corporation, Dongfang Turbine Co., Ltd.
2020-08-31	Dongfang Electric (Wuhan) Nuclear Equipment Co., Ltd.
2020-08-31	China Nuclear Control System Engineering Co., Ltd.
2020-09-07	Shanghai Nuclear Engineering Research & Design Institute Co., Ltd.
2020-09-07	Yuancheng Cable Co., Ltd.
2020-09-07	Wuxi Branch of 703 Research Institute of China Shipbuilding Industry Corporation
2020-09-08	Suzhou Hailu Heavy Industry Co., Ltd.
2020-09-15	Harbin Electric Group (Qinhuangdao) Heavy Equipment Co., Ltd.
2020-09-15	CITIC Heavy Industries Co., Ltd.
2020-09-21	AVIC-TECH (Xiamen) Electric Power Technology Co., Ltd.
2020-09-22	Siping Juyuan Hanyang Plate Heat Exchanger Co., Ltd.
2020-09-22	Shenyang Blower Works Group Nuclear Power Pump Co., Ltd.
2020-10-13	Dalian Hermetic Pumpen Industry Co., Ltd.
2020-10-19	Hudong Heavy Machinery Co., Ltd.
2020-10-20	Guizhou Aerospace Xinli Forging & Castomg Co., Ltd.
2020-10-26	Chongqing Materials Research Institute Co., Ltd.
2020-10-28	HE Harbin Power Plant Valve Co., Ltd.
2020-11-02	Xiamen Huadian Switchgear Co., Ltd.
2020-11-04	China Nuclear Power Operation Technology Co., Ltd.
2020-11-09	State Nuclear Power Automation System Engineering Co., Ltd.
2020-11-11	Pangang Group Chengdu Steel & Vanadium Co., Ltd.
2020-11-17	Shenzhen Woer Heat-shrinkable Material Co., Ltd.
2020-11-25	Shenyang Shengshi Hich & Medium Pressure Valve Co., Ltd.
2020-12-16	Inner Mongolia North Heavy Industries Group. Ltd.

Table 82 Special Inspection of Civilian Nuclear Safety Equipment of Domestic Enterprises in 2020

Start Date	Inspected Enterprise
2020-05-07	Shanghai Institute of Applied Physics, Chinese Academy of Sciences
2020-06-10	China Nuclear Power Operation Technology Co., Ltd.
2020-07-07	State Nuclear Power Plant Service Company
2020-07-14	Nuclear Power Institute of China
2020-08-25	Jiangsu Haishi Pumps Manufacturing Co., Ltd.
2020-09-01	China Nuclear Power Design Co., Ltd. (Shenzhen)
2020-09-21	China Nuclear Power Engineering Co., Ltd.
2020-09-23	State Nuclear Power Automation System Engineering Co., Ltd.
2020-10-13	Nuclear Power Institute of China
2020-11-23	The 719th Research Institute of China State Shipbuilding Co., Ltd,
2020-12-07	China Nuclear Power Engineering Co., Ltd.

Table 83 Regulatory Inspection of Civilian Nuclear Safety Equipment of Foreign Enterprises in 2020

Start Date	Inspected Enterprise	Inspection Type
2020-10-26	Nuclear Power Machinery Manufacturing Process Engineering Co., Ltd. (AEM-T) of Russia	Nuclear safety inspection
2020-11-09	Hydraulic Press Design Institute (JSC OKB “GIDROPRESS”) of Russia	Nuclear safety inspection
2020-11-09	VELAN S. A. S	Nuclear safety inspection
2020-12-14	Bernard Controls of France	Nuclear safety inspection

12 Regulation of Electromagnetic Radiation Environment

Regulatory Approval and Inspection

In 2020, EIA approval procedures for 10 construction projects with electromagnetic radiation, such as Zhumadian-Wuhan 1000 kV high-voltage AC power transmission and transformation project, were conducted by NNSA (see Table 84). NNSA required the State Grid Corporation of China to select one UHV AC and one DC power transmission and transformation construction project for post-environmental impact assessment, and organized the random inspection on the completion self-acceptance of environmental protection of the power transmission and transformation construction project of China Southern Power Grid Company Limited.

Table 84 Regulatory Approvals in the Field of Electromagnetic Radiation Environment in 2020

Date	Document No.	Document
2020-01-14	MEE App [2020] No. 10	Approval Reply on the Environmental Impact Statements Submitted by the National Nuclear Emergency Assistance Team Construction Project (Module I)
2020-01-27	MEE App [2020] No. 22	Approval Reply on the Environmental Impact Statements of Zhumadian-Wuhan 1000 Kv High-Voltage AC Power Transmission and Transformation Project
2020-05-08	MEE App [2020] No. 64	Approval Reply on the Environmental Impact Statements of the Changes in the Northwest Yunnan Guangdong UHVDC Transmission Project
2020-07-23	MEE App [2020] No. 94	Approval Reply on the Environmental Impact Statements of Wuhu Phase III-Huifengshan Mountain 500 kV Double-Line Capacity Expansion and Reconstruction Project
2020-09-03	MEE App [2020] No. 106	Approval Reply on the Environmental Impact Statements of Nanyang-Jingmen-Changsha 1000 kV High-Voltage AC Power Transmission and Transformation Project

continued

Date	Document No.	Document
2020-09-15	MEE App [2020] No. 116	Approval Reply on the Changes in the Environmental Impact Statements Submitted by the National Nuclear Emergency Assistance Team Construction Project (Module I)
2020-09-28	MEE App [2020] No. 127	Approval Reply on the Environmental Impact Statements of the 500 Kv Taihang Xuzhou Line Reconstruction Project of Shanghai Tonghua Railway
2020-10-21	MEE App [2020] No. 131	Approval Reply on the Environmental Impact Statements of Jiangsu Xuyi-Qiuteng 500kV Line Project
2020-11-02	MEE App [2020] No. 135	Approval Reply on the Environmental Impact Statements of Baihetan Beach-Jiangsu ± 800 kV HVDC Transmission Project
2020-11-26	MEE App [2020] No. 144	Approval Reply on Environmental Impact Lists of Huludao Ship Traffic Management System Project

Re-check of Environmental Assessment Documents

Technical review of environmental assessment documents on nuclear and radiation construction projects were standardized. NNSA organized technical re-check of the environmental impact assessment documents on nuclear and radiation construction projects approved by the competent ecological environment authorities at all levels in 11 provinces (cities) including Hunan, Beijing, Liaoning, Gansu, Shandong, Yunnan, Heilongjiang, Shanghai, Tianjin, Qinghai, and Hainan, and sampled 61 environmental impact assessment documents on electromagnetic radiation construction projects.

13 Radiation Environmental Monitoring

NNSA vigorously promoted the construction of automatic radiation environment monitoring stations, completed the construction and acceptance of 244 automatic stations from 2018 to 2019 on schedule, and successfully achieved the goal of "500 State-Controlled Automatic Radiation Environment Monitoring Stations" for nuclear safety required under the "13th five-year plan". It continued to strengthen the operation and management of the national radiation environment monitoring network, publishing the operation and management measures for automatic stations, guiding ecological environment authorities of all provinces (regional- and municipal-level) to overcome the impact of the epidemic, earnestly met the operation and maintenance regulatory requirements, and stabilized the acquisition rate of real-time monitoring data and laboratory analysis data at 97%. It strengthened the supervisory monitoring of effluents from nuclear facilities, published the technical specifications for radioactive monitoring of effluent from NPPs, and continued to promote the construction of supervisory monitoring systems for Xudapu NPP, Zhangzhou NPP, and other NPPs. It improved the marine radiation environment monitoring system, conducted exchange and comparison of marine radiation monitoring technologies, summarized relevant monitoring technical standards, prepared technical standard system reports, proactively promoted the construction of the radiation environment monitoring laboratory in the South China Sea, and completed laboratory construction tasks on schedule. It strengthened the quality management of radiation environment monitoring, reported the quality assessment results of national radiation environment monitoring in 2020, and advanced the construction of Jinping Very Low Radiation Background Laboratory. It accelerated the formulation and revision of regulations and standards for radiation environment monitoring, completed the preparation and review of the drafts of departmental rules and regulations such as the *Measures for Monitoring of Radiation Environment*; issued 6 standards such as the *Technical Specifications for Environmental Emergency Monitoring in NPP Accidents*, and completed the technical reviews of 3 standards such as the *General Rule of Quality Assurance for Ionizing Radiation Monitoring.*

Ionizing Radiation Environmental Monitoring

In 2020, the nationwide environmental ionizing radiation level was within the range of background fluctuations. The real-time continuous air-absorbed dose rate and the cumulative dose were within the range of background fluctuation. The activity concentrations of natural radionuclides in the air were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of natural occurring radionuclides in the seven major river basins including the Yangtze River, the Yellow River, the Pearl River, the Songhua River, the Huaihe River, the Haihe River, and the Liaohe River, the rivers in the Zhejiang-Fujian basin, the northwestern rivers, the southwestern rivers, and the key lakes (reservoirs) were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of gross α and gross β in urban centralized drinking water source and underground drinking water were lower than the guidance values specified in the *Standards for Drinking Water Quality (GB5749-2006)*. The activity concentrations of natural occurring radionuclides in seawater and marine life in coastal waters were at the background level, and no abnormal activity concentration of artificial radionuclides was detected. The activity concentrations of artificial radionuclides in seawater were significantly lower than the limits specified in the *Sea Water Quality Standard (GB3097-1997)*. The activity concentrations of natural occurring radionuclides in the soil were at the background level, and no abnormal activity concentration of artificial radionuclides was detected.

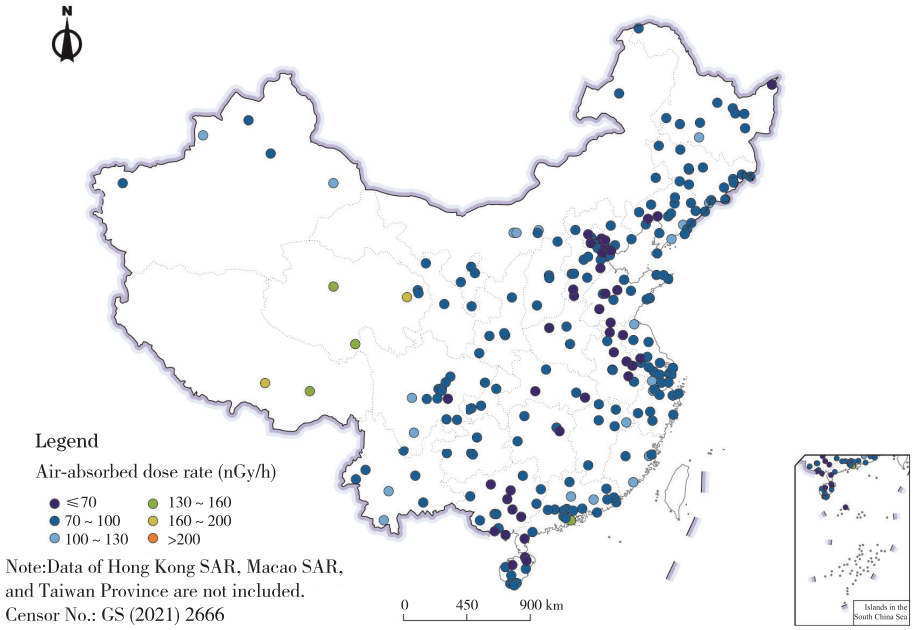


Figure 23. Distribution of Real-time Continuous Air-absorbed Dose Rate by National Automatic Radiation Environment Monitoring Stations in 2020

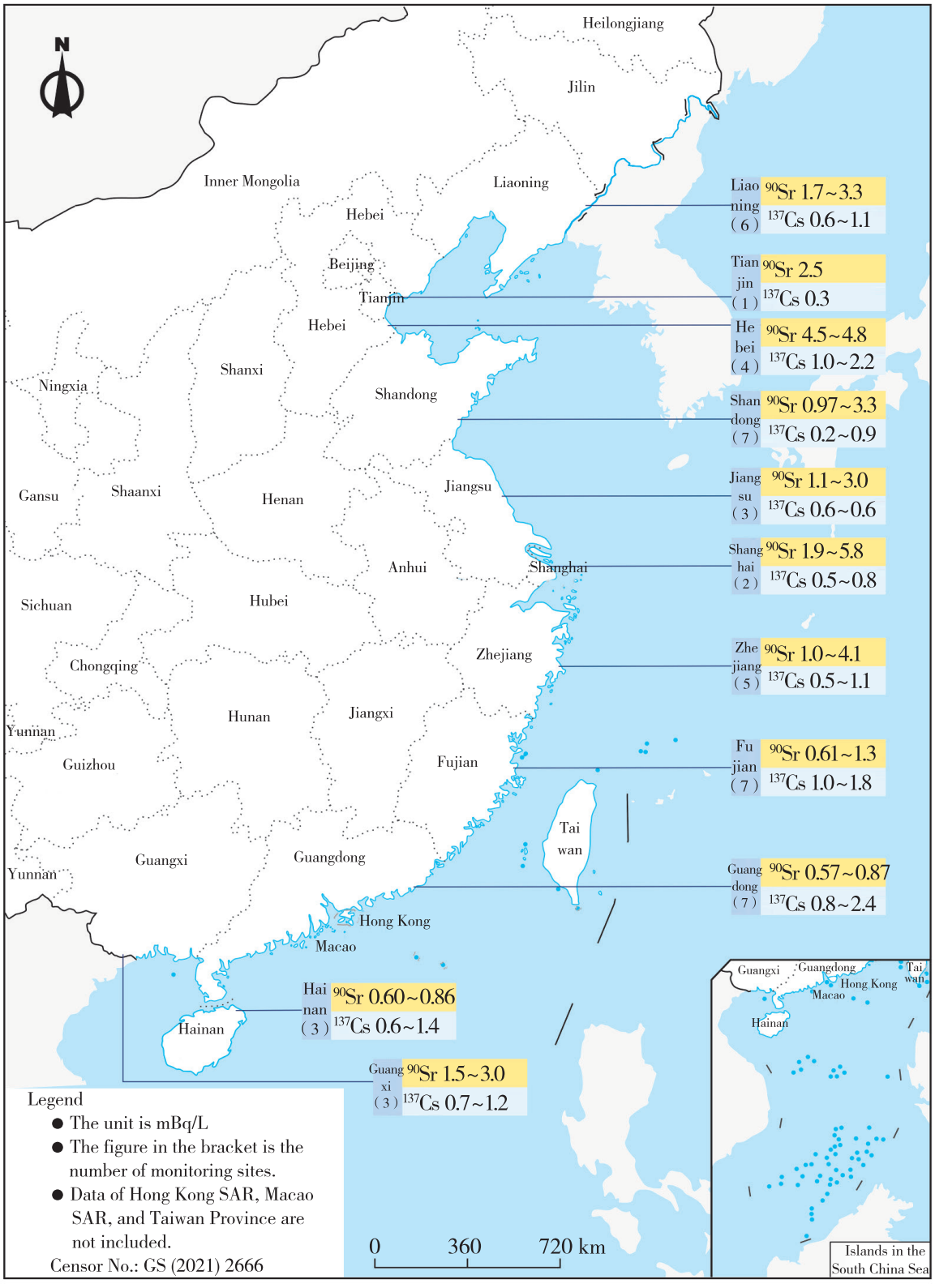


Figure 24. Distributions of 90Sr and 137Cs Activity Concentrations in Offshore Marine Area of China in 2020

Ionizing Radiation Environmental Monitoring Around Operational Nuclear Power Bases

The real-time continuous air-absorbed dose rate around operational nuclear power bases did not indicate anomalies caused by the operation of NPPs. No abnormal activity concentration of artificial radionuclides was detected in the air, water, soil, biological, and other environmental media around the Sanmen Nuclear Power Base, Haiyang Nuclear Power Base, Yangjiang Nuclear Power Base, Taishan Nuclear Power Base, Fangchenggang Nuclear Power Base and Changjiang Nuclear Power Base. The activity concentration of tritium increased slightly compared with the background level prior to the operation of NPPs in some environmental media around Hongyanhe Nuclear Power Base, Tianwan Nuclear Power Base, Qinshan Nuclear Power Base, Ningde Nuclear Power Base, Fuqing Nuclear Power Base, and Daya Bay Nuclear Power Base. The assessment results indicate that the radiation dose exposure to the public caused by the operation of the abovementioned NPPs were far lower than the national limits.

Ionizing Radiation Around Civil Research Reactors

The ambient γ-radiation air absorbed dose rate around civil research reactors of the Institute of Nuclear Energy and New Energy Technology, Tsinghua University, Shenzhen University, and other civil research reactor facilities, and no abnormal activity concentration of artificial radionuclides was detected in air, water, soil, biological, and other environmental media. The activity concentrations of strontium-90, iodine-131, and other radionuclides in some environmental media around the scientific research and production site of China Academy of Atomic Energy and the activity concentrations of radionuclides cobalt-60 and iodine-131 in some environmental media around the production research area of the NPIC, slightly increased compared with the background level. The assessment results revealed that the radiation dose exposure to the public caused by the above-mentioned civil research reactors and production research area were far below the national limits.

Ionizing Radiation Environmental Monitoring Around Nuclear Fuel Cycle Facilities and Waste Disposal Facilities

The ambient γ-radiation air-absorbed dose rates of nuclear fuel cycle facilities operated by CNNC Lanzhou Uranium Enrichment Co., Ltd., CNNC Shaanxi Uranium Enrichment Co., Ltd., China North Nuclear Fuel Co., Ltd., CNNC Jianzhong Nuclear Fuel Co., Ltd., CNNC 272 Uranium Co., Ltd., and The 404

Co., Ltd., CNNC as well as the Northwest Low and Intermediate-Level Solid Waste Disposal Site and Beilong Low and Intermediate-Level Solid Waste Disposal Site were within the range of local natural background fluctuation, and no abnormal activity concentration of radionuclides related to the activities of the above-mentioned enterprises in the environmental media was detected.

Ionizing Radiation Environmental Monitoring Around Uranium Mining and Metallurgy Facilities

The quality of the radiation environments around uranium mining and metallurgy facilities was generally stable. The ambient environmental γ-radiation air-absorbed dose rates, air radon activity concentration, total uranium and gross α concentration in aerosols, and total uranium, lead-210, polonium-210, and radium-226 in the surface water and underground drinking water, total uranium and radium-226 concentrations in soil, were within the range of fluctuation ranges over the years.

Electromagnetic Radiation

In 2020, the environmental electromagnetic radiation levels at the state control points for electromagnetic radiation environment monitoring in 31 provinces (autonomous regions and municipalities), and the electromagnetic radiation levels at the electromagnetic environment sensitive targets around the monitored broadcast and television transmitting facilities, power transmission and transformation facilities, and mobile communication bases were all lower than the public exposure control limits specified in the *Controlling Limits for Electromagnetic Environment (GB 8702-2014)*.

14 Emergency Management of Nuclear and Radiation Accidents

In 2020, NNSA reviewed and rechecked the emergency plans of civil nuclear facilities in accordance with the law, and supervised, inspected, and evaluated daily emergency preparedness of nuclear facilities and comprehensive on-site emergency exercises, and effectively strengthened the regulation of emergency preparedness of nuclear facilities. NNSA continually strengthened its emergency preparedness and emergency response capability, and satisfactorily accomplished several nuclear and radiation emergency response tasks.

Regulation of Nuclear Facility Emergency Preparedness

NNSA completed special emergency inspections of 10 nuclear power bases, i.e., Qinshan, Ningde, Fuqing, Sanmen, Haiyang, Daya Bay, Yangjiang, Taishan, Fanggangcheng, and Changjiang; and completed regulation and evaluation of the comprehensive emergency exercises of 9 nuclear power bases and nuclear facility licensees such as Tianwan, Fuqing, Yangjiang, Daya Bay, Qinshan, China North Nuclear Fuel Co., Ltd., Institute of Nuclear Energy and New Energy Technology, Tsinghua University, The 404 Co., Ltd., CNNC and CNNC 272 Uranium Co., Ltd. NNSA systematically summarized the problems found during the special inspections and evaluation, and proposed nuclear safety regulatory requirements.

Approval of On-Site Emergency Plans

NNSA reviewed and approved on-site emergency plans of civilian nuclear facilities such as Changjiang NPP, Haiyang NPP, Tianwan NPP, Fuqing NPP, Sanmen NPP, Institute of Nuclear Energy and New Energy Technology, Tsinghua University, and China North Nuclear Fuel Co., Ltd.

Nuclear and Radiation Emergency Preparedness, Counterterrorism and Security

NNSA successfully fulfilled tasks of nuclear

and radiation emergency security standby for National Day Celebration, the Fifth Plenary Session of the 19th CPC Central Committee and the 3rd China International Import Expo, and other major activities.

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

NNSA coordinated and guided 6 Provincial Ecological Environment Authorities in Inner Mongolia Autonomous Region, Tibet Autonomous Region, Gansu, Fujian, Liaoning, and Guangdong to conduct comprehensive radiation accident emergency exercises. Through the exercises, the impetus placed by the local governments on radiation accident emergency was enhanced, and the main responsibilities of the local governments in radiation emergency were implemented. The emergency teams were comprehensively trained, the emergency plans and facilities were examined, the emergency response and handling capabilities were improved, and the radiation safety regulation was further promoted. At the same time, through onsite and video evaluations, the emergency experience exchanges between provinces were strengthened, and the effect of "replacing training with exercises, from one point to the whole area, exemplary demonstration, and mutual learning" was ensured.

Figure 25. Guo Chengzhan, Vice Administrator of NNSA and Director General of Department of Nuclear Facility Safety Regulation of MEE, Participates in and Guides the Special Emergency Exercises on Radiation Accidents in Liaoning Province

Effectively Maintain Emergency Response Capability

NNSA published the new version of the emergency plan and implementation plan for nuclear and radiation accidents of the Ministry of Ecology and Environment (National Nuclear Safety Administration) and continued to make sound preparations for nuclear and radiation accident emergency response. A 24-hour on-duty emergency system was implemented, to ensure the effective operation of the nuclear and radiation emergency response system. NNSA scientifically provided training on the emergency plan and implementation plan and conducted comprehensive emergency drills related to nuclear accidents along with Daya Bay Nuclear Power Base.

15 Personnel Qualification

In 2020, the *Rules on the Qualification of Operators of Civil Nuclear Facilities* were prepared and reviewed by the Ministerial Council, indicating that important achievements were made in the qualification management reform of operators of nuclear facilities. Two departmental rules—the *Rules on the Qualification Management of Civil Nuclear Safety Equipment Welding Personnel* and the *Rules on the Qualification Management of Civil Nuclear Safety Equipment Nondestructive Testing Personnel*, were implemented steadily; preparations and revisions of the relevant procedure documents were completed, examination resources were integrated; examination contents were optimized and examinations were organized to the best extent, and the services to the enterprise were strengthened. *The Nuclear and Radiation Safety Regulation Professional Training Program (Trial)* and the *Professional Training Plan of the National Nuclear Safety Administration in 2020* were published to improve the top-level design of the training system, to strengthen the planning of training, and to standardize management and improve efficiency. The personnel qualification permits were licensed according to law, and the qualification management measures in special epidemic periods were formulated, to achieve the overall goal of “six stabilities and six guarantees”.

Qualification Management of Civilian Nuclear Facility Reactor Operators

In 2020, 4 Civilian Nuclear Facility Reactor Operator Qualification Approval Committee Meetings were held, and civilian nuclear facility operator licenses were issued in 5 batches (see Table 85) by NNSA to 1,775 operators in total, including 1,697 NPP operators and 78 civilian research reactor operators.

As of December 2020, there were 2,874 people in total holding NPP operator licenses (see Table 86), including 1,791 people holding senior operator licenses, and 1,083 holding operator licenses. There were also 282 people holding research reactor operator licenses (see Table 87), including 143 people holding senior operator licenses and 139 holding operator licenses.

Table 85 Regulatory Approvals for Civilian Nuclear Facility Reactor Operator License in 2020

Date	Document
2020-04-14	Notice on the Issuance of the Licenses for the First Batch of Nuclear Reactor Operators of Civil Nuclear Facilities (NPPs) in 2020
2020-05-14	Notice on the Issuance of the Licenses for the First Batch of Nuclear Reactor Operators of Civil Nuclear Facilities (Research Reactors) in 2020
2020-05-14	Notice on the Issuance of the Licenses for the Second Batch of Nuclear Reactor Operators Of Civil Nuclear Facilities (NPPs) in 2020
2020-08-09	Notice on the Issuance of the Licenses for the Third Batch of Nuclear Reactor Operators of Civil Nuclear Facilities in 2020
2020-11-05	Notice on the Issuance of the Licenses for the Fourth Batch of Nuclear Reactor Operators of Civil Nuclear Facilities in 2020

Table 86 Statistics on NPP Operator License

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
CNNC Nuclear Power Operation Management Co., Ltd.	Qinshan NPP	42	17	59
	Qinshan NPP Phase II Unit 1 and Unit 2	61	35	96
	Qinshan NPP Phase II Unit 3 and Unit 4	67	33	100
	Qinshan NPP Phase III Unit 1 and Unit 2	72	49	121
	Fangjiashan NPP Unit 1 and Unit 2	68	33	101
Daya Bay Nuclear Power Operation and Management Co., Ltd.	Daya Bay NPP	82	27	109
	Ling'ao NPP Unit 1 and Unit 2	77	33	110
	Ling'ao NPP Unit 3 and Unit 4	74	26	100
Jiangsu Nuclear Power Co., Ltd.	Tianwan NPP Unit 1 and Unit 2	67	80	147
	Tianwan NPP Unit 3 and Unit 4	62	35	97
	Tianwan NPP Unit 5 and Unit 6	39	54	93
Fujian Ningde Nuclear Power Co., Ltd.	Ningde NPP Unit 1 and Unit 2	77	40	117
	Ningde NPP Unit 3 and Unit 4	61	41	102
Liaoning Hongyanhe Nuclear Power Co., Ltd.	Hongyanhe NPP Unit 1 and Unit 2	82	31	113
	Hongyanhe NPP Unit 3 and Unit 4	71	30	101
	Hongyanhe NPP Unit 5 and Unit 6	41	18	59
Yangjiang Nuclear Power Co., Ltd.	Yangjiang NPP Unit 1 and Unit 2	77	25	102
	Yangjiang NPP Unit 3 and Unit 4	85	26	111
	Yangjiang NPP Unit 5 and Unit 6	48	26	74

continued

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
Fujian Fuqing Nuclear Power Co., Ltd.	Fuqing NPP Unit 1 and Unit 2	58	56	114
	Fuqing NPP Unit 3 and Unit 4	55	66	121
	Fuqing NPP Unit 5 and Unit 6	59	74	133
Guangxi Fangchenggang Nuclear Power Co., Ltd.	Fangchenggang NPP Unit 1 and Unit 2	96	35	131
Hainan Nuclear Power Co., Ltd.	Changjiang NPP Unit 1 and Unit 2	54	57	111
Sanmen Nuclear Power Co., Ltd.	Sanmen NPP Unit 1 and Unit 2	83	41	124
Shandong Nuclear Power Co., Ltd.	Haiyang NPP Unit 1 and Unit 2	61	57	118
Taishan Nuclear Power Joint Venture Co. Ltd.	Taishan NPP Unit 1 and Unit 2	72	38	110
Total		1791	1083	2874

Table 87 Statistics on Civilian Research Reactor Operator Licenses

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
CIAE	49-2 Swimming Pool Reactor (49-2SPR)	10	9	19
	DF-VI Fast Neutron Criticality Facility (DF-VI CFFR)	0	0	0
	Criticality Safety Facility for the Spent Fuel Reprocessing Pilot Plant (UCF)	6	19	25
	Miniature Neutron Source Reactor (MNSR)	3	4	7
	China Experimental Fast Neutron Reactor (CEFR)	22	28	50
	China Advanced Research Reactor (CARR)	12	5	17
	Miniature Reactor Zero Power Facility (CFMNSR)	3	4	7
NPIC	High Flux Engineering Test Reactor (HFETR)	23	26	49
	Minjiang Test Reactor (MJTR)	7	11	18
	China Pulsed Reactor (CRP)	7	3	10
	High Flux Engineering Test Reactor Experimental Facility (HFETR)	5	3	8
	18-5 Critical Assembly	7	3	10

continued

Licensee	Nuclear Facility	Senior Operators	Operators	Subtotal
Institute of Nuclear Energy and New Energy Technology, Tsinghua University	5MW Experimental Nuclear Heating Reactor (5MW-NHR)	14	11	25
	10MW High Temperature Gas-Cooled Test Reactor (10 MW-HTGR)	23	7	30
	Shielding Experimental Reactor (SER)	1	2	3
Shenzhen University	Miniature Neutron Source Reactor of Shenzhen University (MNSR)	0	3	3
Beijing Capture Tech Co., Ltd.	In-Hospital Neutron Irradiator (IHNI)	0	1	1
Total		143	139	282

Qualification Management of Civilian Nuclear Safety Equipment Non-destructive Testing Personnel

In 2020, 2 batches of civilian nuclear safety equipment non-destructive testing (NDT) personnel examination plans were published. NNSA organized 5 NDT personnel examination centers to hold 19 batches of examinations and issued civilian nuclear safety equipment NDT personnel qualification certificates in 3 batches (see Table 88), approving a total of 1,085 people and 1,152 certificates.

As of December 2020, a total of 7,308 people held 14,726 civilian nuclear safety equipment NDT qualification certificates, including 498 advanced (level III) certificates, 12,093 intermediate (level II) certificates, and 2,135 primary (level I) certificates.

Table 88 Regulatory Approvals for Civilian Nuclear Safety Equipment NDT Personnel Qualification in 2020

Date	Document
2020-03-18	Notice on Issuing the First Batch of Certificates for Civilian Nuclear Safety Equipment Non-destructive Testing Personnel in 2020
2020-11-04	Notice on Issuing the Second Batch of Certificates for Civilian Nuclear Safety Equipment Non-destructive Testing Personnel in 2020
2020-12-24	Notice on Issuing the Third Batch of Certificates for Civilian Nuclear Safety Equipment Non-destructive Testing Personnel in 2020

Qualification Management of Nuclear Safety Equipment Welders and Welding Operators

In 2020, NNSA issued 2 examination plans for civilian nuclear safety equipment welders and welding operators and arranged 13 civilian nuclear safety equipment welder and welding operator examination centers to hold 21 welding operator examination examinations. One batch of civilian nuclear safety equipment welder and welding operator qualification certificates was issued throughout the year, a total of 1,088 persons and 2,180 certificates were approved. Two batches of civilian nuclear safety equipment welder qualification certificates were issued throughout the year, a total of 420 persons and 530 certificates were approved (see Table 89).

As of December 2020, a total of 10,846 people held 23,869 civilian nuclear safety equipment welder and welding operator qualification certificates, and a total of 420 people held 530 civilian nuclear safety equipment welder qualification certificates.

Table 89 Regulatory Approvals for Civilian Nuclear Safety Equipment Welder and Welding Operator Qualification in 2020

Date	Document
2020-03-18	Notice on Issuing the First Batch of Certificates for Civilian Nuclear Safety Equipment Welders and Welding Operators in 2020
2020-11-04	Notice on Issuing the Second Batch of Certificates for Civilian Nuclear Safety Equipment Welders and Welding Operators in 2020
2020-12-24	Notice on Issuing the Third Batch of Certificates for Civilian Nuclear Safety Equipment Welders and Welding Operators in 2020

Qualification Management of Registered Nuclear Safety Engineer

In 2020, a total of 893 applicants applied for the National Unified Examination for Registered Nuclear Safety Engineer Qualification, 678 applicants took the examinations, and 170 applicants obtained the Registered Nuclear Safety Engineer Qualification. In the whole year, NNSA conducted 4 batches of registration of nuclear safety engineers (see Table 90), and approved 567 applications, including 276 new registrations, 289 renewals, and 2 with changed registered organizations.

By the end of December 2020, a total of 4,640 applicants nationwide had obtained the certificates of the Registered Nuclear Safety Engineer Qualification, and 1,915 registered nuclear safety engineers were working in 232 organizations.

Table 90 Regulatory Approvals for Registered Nuclear Safety Engineer Qualification in 2020

Date	Document
2020-04-03	Notice on Publishing the List of Persons Approved for Registration and Renewal of Registration in the First Batch of Registered Nuclear Safety Engineers in 2020
2020-07-10	Notice on Publishing the List of Persons Approved for Registration and Renewal of Registration in the Second Batch of Registered Nuclear Safety Engineers in 2020
2020-09-28	Notice on Publishing the List of Persons Approved for Registration and Renewal of Registration in the Third Batch of Registered Nuclear Safety Engineers in 2020
2020-11-28	Notice on Publishing the List of Persons Approved for Registration, Renewal of Registration and Registered Address Change in the Fourth Batch of Registered Nuclear Safety Engineers in 2020

Nuclear and Radiation Safety Regulatory Inspection Personnel Training

NNSA prepared and released the *Nuclear and Radiation Safety regulation Professional Training Program (Trial)*, improved the professional training structure, optimized the training curriculum, and further standardized the nuclear safety regulation professional training. It prepared and released the *Professional Training Plan of the National Nuclear Safety Administration in 2020* and strengthened the training on organization and planning.

In 2020, the Nuclear and Radiation Safety Center organized the first primary nuclear safety professional training course, with 36 trainees. By December 2020, the National Nuclear Safety Administration held a total of 10 primary nuclear safety Professional Training courses, with a total of 497 people participating in the training and obtaining the completion certificates.

16 International Cooperation

Continue to promote multilateral cooperation

Cooperation with the IAEA. Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, was successfully elected as Deputy Director General of the IAEA.

In September, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the video conference of senior nuclear safety regulatory officials of the IAEA, to share China's measures and experience in nuclear and radiation safety controls during the pandemic.

NNSA assigned its personnel to participate in the preparations and revisions of the important mechanisms, regulations, and standards of the IAEA, including those for the Safety Standards Committee Meeting, Nuclear Safety Standards Committee Meeting, Steering Committee Meeting of Global Nuclear Safety and Security Network, Steering Committee Meeting of Regulatory Cooperation Forum, and the IAEA's lecture on nuclear safety regulations and standards. The recommended personnel continued to serve as members of the Safety Standards Committee of the IAEA, members of the Steering Committee of the Global Nuclear Safety and Security Network, and liaison officers of the Irradiation Safety Information Management System. NNSA organized the application for technical cooperation projects of the IAEA from 2022 to 2023. NNSA organized and participated in various institutional meetings and activities of the IAEA.

Figure 26. Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, Attends the Video Conference of Senior Nuclear Safety Regulatory Officials of the IAEA

Cooperation with the OECD-Nuclear Energy Agency. In October, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, led a delegation to attend the 14th Policy Group Video Conference on the Multinational Design Evaluation Programme (MDEP) of NPPs, listened to the work reports concerning the Multinational Design Evaluation Programme and its working groups in the previous year, and discussed the future development of the Multinational Design Evaluation Programme and the 5th conference of the Multinational Design Evaluation Programme.

NNSA advanced the preparation of the 5th conference of the Multinational Design Evaluation Programme of NPPs in an orderly manner, organized and participated in the meetings of the Technical Steering Committee regarding the Multinational Design Evaluation Programme (MDEP), Hualong-1 Working Group, VVER Working Group, EPR Working Group and its Expert Sub-Groups, and took part in the main activities regarding the Multinational Design Evaluation Programme (MDEP) at multiple levels.

Obligations for Fulfilling International Conventions

In February, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the 8th round of domestic video report meeting on fulfillment of the *Convention on Nuclear Safety*.

The 8th round work on fulfillment of the *Convention on Nuclear Safety* was conducted in an orderly manner. NNSA followed up the information of the Secretariat of the Convention and parties to the Convention, shared China's opinions to the Agency in a timely manner and prepared for the negotiations of the open-ended working group.

The 7th round of the *Joint Convention on the Safety Managements of Spent Fuel and Radioactive Waste Management* was conducted in an orderly manner, and the national report was submitted to the IAEA after approval by the State Council. NNSA designated its personnel to participate in the Organizational Meeting of the 7th Review Conference of the parties to the Joint Convention and the handover meeting of the Review Conference Officials. Two Chinese officials served as officials of the 7th Review Conference of the Joint Convention.

Continue to Consolidate Bilateral Cooperation

In November, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, held discussions with Christer Viktorsson, Director General of the FANR, via video conference. Both parties exchanged opinions on the latest progress of nuclear

safety regulation, nuclear and radiation safety regulatory system, and nuclear safety regulation cooperation.

NNSA steadily promoted nuclear safety cooperation with nuclear energy developed countries. NNSA attended the 24th video conference of the Sub-Committee of the Regular Conference of Sino-Russian Prime Ministers on Nuclear Issues, the meeting of the 5th Working Group on the Peaceful Uses of Nuclear Energy between China and the United States, the Sino-British Nuclear Safety Technology Seminar, and other meetings.

NNSA strengthened nuclear safety cooperation with the "One Belt and One Road" countries. NNSA organized the China-United Arab Emirates (UAE) Nuclear Safety regulation Seminar in Beijing, renewed the bilateral agreement with the Pakistan Nuclear Regulatory Authority, and sent personnel to attend the 2nd meeting of the China-Thailand Joint Committee on Peaceful Use of Nuclear Energy.

NNSA maintained nuclear safety cooperation with neighboring countries. NNSA attended the online information exchange meeting on nuclear safety regulation of China, Japan, and South Korea, and exchanged the latest progress in nuclear safety and radioactive water discharge of Fukushima NPP. One person from NNSA was awarded the grant from the Nuclear Research Scholar Program of the Ministry of Education, Culture, Science and Technology of Japan.

Properly Respond to the Impact of the Pandemic

Provide foreign assistance and show a friendly image. At the beginning of the global pandemic, NNSA greeted and discussed with the main heads of nuclear safety regulatory authorities of the United States, France, Spain, Italy, the United Kingdom and other countries, as well as the director generals of the Nuclear Energy Agency of the OECD, and the relevant heads of the IAEA, so as to understand the nuclear safety regulation during the pandemic in various countries, and to provide assistance to some countries with epidemic prevention materials, winning accolades from international peers.

Track up to date information of the pandemic and share the experience in pandemic regulation. NNSA tracked the dynamic information on the pandemic in the field of nuclear and radiation safety of international organizations, such as the IAEA and the Nuclear Energy Agency of the OECD, maintained good contact and communication with nuclear safety regulatory authorities of the United States, France, Russia, the United Kingdom, Pakistan, Japan, South Korea, and Germany, proactively shared epidemic response measures and good experience with international peers through video conferences, and paid attention to analyze and properly respond to the influences of the pandemic.

17 Milestones

On January 3, 2020, the Review Opinions on Siting of Changjiang NPP Units 3 and 4 were issued.

From January 7 to 8, 2020, the annual senior officer communication meeting was held with China Nuclear Power Group, China Guangdong Nuclear Power Group, and China Power Investment Group.

From January 9 to 10, 2020, the Summary Meeting of Nuclear and Radiation Safety regulation 2019 was held.

On January 13, 2020, the Construction Permit for the 2MWt TMSR-LF was issued.

On February 11, 2020, the Operating Licenses for Sanmen NPP Units 1 and 2 were issued.

From February 12 to 13, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, visited the Nuclear and Radiation Safety Center to investigate and inspect the COVID-19 prevention and control measures, and conducted a video conference with all regional offices to understand COVID-19 prevention and control responses, and nuclear safety regulation.

On February 24, 2020, the Operating Licenses for Haiyang NPP Units 1 and 2 were issued.

On March 20, 2020, the Operating Licenses for Fuqing NPP Units 3 and 4 were issued.

On April 13, 2020, the Review Opinions on Siting of San'ao NPP Units 1 and 2 were issued.

On June 18, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the General Meeting of the Council of China Association for the Promotion of Environmental Culture on Change the Term of Office.

On July 3, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, presided over a symposium

on the centralized preparation of the 14th Five-Year Plan for nuclear safety.

On July 7, 2020, the Operating License for Tianwan NPP Unit 5 was issued.

on July 10, 2020, the Summary Meeting of Nuclear and Radiation Safety Regulation and special Party lesson activities in the first half of 2020 were organized.

From July 26 to 29, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, led the pre-fueling safety inspection of Fuqing NPP Unit 5 and Nuclear Safety Investigation of Hualong-1 Project in Fujian Province.

On August 14, 2020, the Review Opinions on Siting of Xudapu NPP Units 3 and 4 were issued.

On September 4, 2020, the Operating License for Fuqing NPP Unit 5 was issued.

On September 10, 2020, the Review Opinions on Siting of Tianwan NPP Units 7 and 8 were issued.

On September 24, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the video conference of Senior Nuclear Safety Regulatory Officials of the IAEA to share China's nuclear and radiation safety regulatory measures for the pandemic with other countries.

On October 9, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the agreement signing ceremony between the Nuclear and Radiation Safety Center and Hualong International in Beijing.

On October 12, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the opening ceremony of the 16th China International Nuclear Industry Exhibition.

From October 19 to 21, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, participated in the 2020 National Radiation Safety Regulation Conference and investigated the CNNC Gansu Nuclear Technology Industrial Park in Gansu Province.

On October 22, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the video conference of the Multinational Design Evaluation Mechanism Policy Group of NPPs (MDEP) convened by the Nuclear Energy Agency of the OECD. At the conference, MDEP and its working groups reported the

progress of the previous year, and the future development of MDEP and its 5th mechanism conference were discussed.

On October 23, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, participated in the nuclear accident emergency linkage exercise of the Ministry of Ecology and Environment (National Nuclear Safety Administration).

From October 26 to 30, 2020, the video regulatory inspection of the manufacturing activities of reactor pressure vessels of Tianwan NPP Units 7 and 8 of Russian Nuclear Power Machinery Manufacturing Process Engineering Co., Ltd. were conducted.

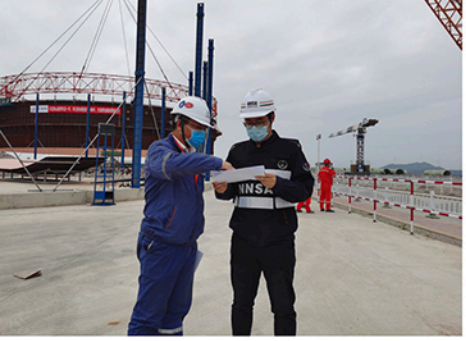
From October 27 to 29, 2020, the 2020 National Experience Exchange Meeting on Safety Regulation of NPPs and Research Reactors was organized.

On November 4, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, held discussions with Christer Viktorsson, Director General of the FANR, via video conference. Both parties exchanged their opinions on the latest progress of nuclear safety regulation, nuclear and radiation safety regulatory system, and nuclear safety regulation cooperation.

From November 17 to 19, 2020, NNSA participated in the 48th meeting of the Safety Standards Committee of the IAEA.

From December 15 to 16, 2020, Liu Hua, Vice Minister of the Ministry of Ecology and Environment and Administrator of the National Nuclear Safety Administration, attended the 2020 meeting of the National Nuclear Safety Expert Committee.

On December 30, 2020, the Construction Permits for San'ao NPP Units 1 and 2 were issued.




NSC

National Nuclear Safety Administration

Address: No. 12, East Chang 'an Street, Dongcheng District, Beijing Postcode: 100006

Tel: (010) 65646114 Fax: (010) 65646901

Northern Regional Office of the Nuclear and Radiation Safety Inspection

Address: No. 54, South Honglian Village, Haidian District, Beijing **Telephone:** (010) 82212600

Eastern Regional Office of the Nuclear and Radiation Safety Inspection

Address: Floor 5, Building 1, No. 396, Guilin Road, Xuhui District, Shanghai **Telephone:** (021) 60740666

Southern Regional Office of the Nuclear and Radiation Safety Inspection

Address: Floor 21 C, Olympic Building, Shangbao Road, Futian District, Shenzhen **Telephone:** (0755) 83521247

Southwest Regional Office of the Nuclear and Radiation Safety Inspection

Address: No. 1308, Section 1, Chenglong Avenue, Jinjiang District, Chengdu **Telephone:** (028) 82337600

Northwest Regional Office of the Nuclear and Radiation Safety Inspection

Address: Floor 5, Environmental Protection Technology Building, No. 225, Yan'er Bay, Lanzhou **Telephone:** (0931) 8682816

Northeast Regional Office of the Nuclear and Radiation Safety Inspection

Address: No. 127, Nanshan Road, Zhongshan District, Dalian **Telephone:** (0411) 82697501

Nuclear and Radiation Safety Center

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

Radiation Environment Monitoring Technology Center

Address: No. 306, Wenyi Road, Hangzhou **Telephone:** (0571) 28869209