



**The People's Republic of China**  
**National Nuclear Safety Administration**  
**2018 Annual Report**







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# 1 General Description

China's civilian nuclear facilities showed good performance on operation safety and construction quality in 2018, 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 the radioactive material transportation. The lower level events in operating and constructing nuclear facilities were handled properly.

The quality of radiation environment nationwide was generally good in 2018. The level of environmental ionizing radiation remained within the fluctuant range of environmental background, and there was no evident change in the radiation level around nuclear facilities. The overall condition of environmental electromagnetic radiation was good, and there was no evident change in the radiation level around facilities with emission of electromagnetic radiation.

## **Implementation of Nuclear Safety Law**

"Nuclear Safety Law of the People's Republic of China" (Nuclear Safety Law) came into force on January 1, 2018. The campaign of "Year of Implementation of Nuclear Safety Law" was launched to strengthen publicity on the rule of law and to improve system, to reinforce the strict regulation by law and to implement the nuclear safety responsibility.

## **Mid-term Evaluation of Nuclear Safety Planning**

The mid-term evaluation of the implementation of "the 13th Five-Year Plan and 2025 Long-term Goals on Nuclear Safety and Radioactive Pollution Prevention and Control" was conducted, including designing technical indicator systems, conducting bottom-up verification, preparing assessment reports, and promoting the implementation of planning objectives.

## Capability Building

The progress was made smoothly in the construction of the National R&D Base for Nuclear and Radiation Safety Regulation Technology. The first phase of the base construction project about 95,000 square meters has been basically completed, and a major breakthrough has been made in the project application for the base capability building. The management system has been updated, and the prescriptive and institutional regulation of nuclear and radiation safety has been continuously improved. In combination with China's regulatory practices and development needs, the "General Description" of China's nuclear and radiation safety management system was finished and 49 guidance and technical documents were formulated or revised, which promoted China's nuclear and radiation safety management system. The Ministry of Ecology and Environment (National Nuclear Safety Administration) (referred as MEE(NNSA)) also organized 4 special training courses on nuclear and radiation safety regulating procedures and systems for key personnel of nuclear and radiation safety regulation systems, to promote and to popularize the management system, and to further improve systemization, scientific, legalization, informatization and refinement of regulation work.

## Strengthening Regulation

There were 44 nuclear power units in commercial operation, and 12 nuclear power units under construction, and 19 civilian research reactors (critical assembly) in China by the end of December 2018. There were 40 licensed operating events and 11 constructing events reported by NPPs. There were 14 licensed operating events reported by research reactors. In general, NPPs in operation and research reactors were in good status, the three physical barriers were kept intact, and there were no radiological events detrimental to public and environment.

In 2018, the environmental impact statements were approved for Sanmen NPP units 1 and 2, Haiyang NPP units 1 and 2, Taipingling NPP units 1 and 2, and Ningde NPP units 5 and 6. The review opinions on siting were issued for Ningde NPP units 5 and 6 and Taipingling NPP units 1 and 2. The ratification instrument for initial fuel loading were issued for Taishan NPP unit 1, Sanmen NPP units 1 and 2, Haiyang NPP units 1 and 2, and Tianwan NPP unit 4.

The experience feedback system was working effectively, and the intensity of experience feedback was continuously strengthened. The pilot project of Probabilistic Safety Analysis (PSA) was continuously and deeply promoted, and the risk-informed regulation was actively promoted, with approving

application in the optimization of relevant NPP operation technical specifications, the revision of periodic test supervision requirements, and online maintenance. The “Guidelines for Equipment Reliability Data Collection for NPPs” was upgraded, and the “2018 China NPP Equipment Reliability Data Report” was published. MEE(NNSA) continued to carry out probabilistic safety analysis of NPPs, serious accident management and peer review on nuclear safety culture, to effectively promote the improvement of relevant work of operators. Pilot work was carried out to improve the effectiveness of maintenance of NPP and a working group of NPP maintenance rules was set up to harmonize the implementation of maintenance rules consistently. The nuclear safety regulation on activities related to operating license extension of Qinshan NPP was further standardized by issuing the “Nuclear Safety Regulatory Inspection Outline on Activities related to Operating license Extension of Qinshan NPP Unit 1”.



*Figure 1. Li Ganjie, Minister of MEE, Investigated a Nuclear Power Plant*

### Cultivation of Nuclear Safety Culture

MEE(NNSA) organized the translation of the International Atomic Energy Agency (IAEA) technical documents related to safety culture, and compiled the good practices of the international nuclear safety regulatory bodies in their development of nuclear safety culture, for better absorption of the international nuclear safety culture achievements.

MEE(NNSA) organized researches on methods for nuclear safety culture cultivation, and guided and deeply participated in cultivation and experience exchange of safety culture in the nuclear industry. MEE(NNSA) also summarized the cultivation experience of nuclear safety culture, and promoted the deep integration of the cultivation of nuclear safety culture and enterprise management, and implemented the main responsibility of enterprises.

### International Cooperation

MEE(NNSA) implemented President Xi Jinping’s initiative to “promote the national nuclear power safety regulatory system” and “implement plans to strengthen radioactive source safety actions”, and actively participated in global nuclear security mechanism, sharing nuclear safety regulatory experience and supporting China’s nuclear safety and nuclear power “going

abroad”. Liu Hua, the Vice Minister of the Ministry of Ecology and Environment and the Administrator of the National Nuclear Safety Administration, led the Chinese government delegation to attend the Sixth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and successfully completed the fulfillment tasks. MEE(NNSA) co-sponsored with the Ministry of Foreign Affairs the fifth Nuclear Energy Safety Symposium under Asia-Europe Meeting (ASEM) to give full play to the home court advantage and publicize the regulatory experience. In order to further

promote the work of the HPR1000 Working Group under Multinational Design Evaluation Programme (MDEP), two group meetings were successfully held and a technical subgroup was established. MEE(NNSA) have strengthened nuclear safety cooperation with the countries along the “Belt and Road” such as the United Arab Emirates, Pakistan, and Vietnam, and steadily promoted cooperation with developed countries producing nuclear power such as the United States of America, Russia, and France. MEE(NNSA) have always paid attention to the exchange and training of talents, as well as exploring channels for international exchanges and trainings.

# 2 Policies, Plans, Regulations and Standards

## Nuclear Safety Law

“Nuclear Safety Law of the People’s Republic of China” came into force on January 1, 2018. In this year, MEE(NNSA) took many measures to promote the implementation of Nuclear Safety Law comprehensively, including formulating the annual work plan for implementation, holding media seminars and lectures, holding training courses on nuclear and radiation safety administration by law, carrying out the special training on nuclear and radiation safety regulations, compiling learning books, carrying out knowledge contests, and promoting the implementation of Nuclear Safety Law combined with the daily regulation to enhance the ability and the level of legalization in nuclear safety regulation.

## Nuclear Safety Regulations and Standards

In order to implement the requirements of Nuclear Safety Law, MEE(NNSA) improved the system of nuclear and radiation safety regulations and standards. MEE(NNSA) prepared “the General Plan for the Revision

and Drafting of the related Regulations and Documents to Nuclear Safety Law”, and compiled “the 13th Five-Year Planning of Developing Nuclear and Radiation Safety Regulations and Standards”. MEE(NNSA) impelled the formulation and revision of the regulations and standards, and held 10 meetings of the expert committee for reviewing nuclear and radiation safety regulations and standards, on which 63 drafts were reviewed and 18 regulations and standards were issued in 2018. MEE(NNSA) reviewed the Atomic Energy Law (Draft) and gave some suggestions for consistence with the Nuclear Safety Law. MEE(NNSA) streamlined the specifications and normative documents issued by MEE(NNSA).

## Nuclear Safety Planning

“The 13th Five-Year Plan and 2025 Long-Term Goals on Nuclear Safety and Radioactive Pollution Prevention and Control” was promoted implement comprehensively. The mid-term evaluation about the Plan was conducted, with the mid-term evaluation scheme prepared and more than 100

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evaluation indexes selected. MEE(NNSA) also carried out comprehensive evaluation trainings and surveys to find the real situation, including evaluation trainings for the ecology and environment authorities and related enterprises and institutions of 31 provinces (autonomous region or municipality), and on-site verifications for more than 10 key companies in various fields. The mid-term evaluation technical report and national report were completed.

### Nuclear Safety Policy

MEE(NNSA) promoted the establishment of research project on the national nuclear safety system in the national consortium of high-class thinking tank. MEE(NNSA) regularly carried out the situation analysis of nuclear and radiation safety regulation, to provide strong support for the decision-making of nuclear and radiation safety regulation, and to ensure scientific and efficient nuclear and radiation safety regulation.

# 3 Safety Regulation on Nuclear Power Plants

In 2018, operating NPPs had no radioactive events endangering the safety of the public and the environment. The monitoring indicators over the year showed that the

integrity of the three physical barriers was in good status.

The operating data of NPPs in 2018 is shown in Table 1.

**Table 1. Operating Data of NPPs in 2018**

NPP Name	Generated Energy (TWh)	Unit No.	Uniform Unit No.	Rated Power (MWe)	Unit Generated Energy (TWh)	Unit Load Factor (%)	Unit Capacity Factor (%)
Qinshan	1.625	1	CN01	310	1.625	59.84	56.21
		1	CN04	650	5.020	88.16	87.00
Qinshan Phase II	20.867	2	CN05	650	5.657	99.35	97.66
		3	CN14	660	5.087	87.99	87.93
		4	CN15	660	5.103	88.26	88.16
Qinshan Phase III	11.256	1	CN08	728	6.190	97.07	99.98
		2	CN09	728	5.066	79.44	82.62
Fangjiashan	18.29	1	CN24	1089	9.305	97.54	99.60
		2	CN25	1089	8.985	94.18	98.08
Daya Bay	16.481	1	CN02	984	7.787	89.25	90.34
		2	CN03	984	8.695	99.72	100.87

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NPP Name	Generated Energy (TWh)	Unit No.	Uniform Unit No.	Rated Power (MWe)	Unit Generated Energy (TWh)	Unit Load Factor (%)	Unit Capacity Factor (%)
Ling'ao	32.037	1	CN06	990	7.301	87.52	84.19
		2	CN07	990	7.598	92.09	87.61
		3	CN12	1086	8.391	89.32	88.21
		4	CN13	1086	8.746	98.34	91.94
Tianwan	23.065	1	CN10	1060	7.641	82.29	90.05
		2	CN11	1060	8.285	89.23	92.50
		3	CN45	1126	6.875	83.00	98.36
		4	CN46	1126	0.264	-	-
Hongyanhe	30.157	1	CN16	1119	9.405	99.98	95.96
		2	CN17	1119	8.237	89.80	84.04
		3	CN26	1119	6.971	91.17	71.13
		4	CN27	1119	5.544	85.16	56.57
Ningde	33.757	1	CN18	1089	8.059	84.48	88.50
		2	CN19	1089	8.233	86.30	89.13
		3	CN34	1089	8.542	89.54	92.54
		4	CN35	1089	8.923	94.27	99.99
Fuqing	30.542	1	CN20	1089	8.035	84.28	87.53
		2	CN21	1089	7.839	82.02	85.47
		3	CN42	1089	7.434	78.14	87.03
		4	CN43	1089	7.213	75.60	78.37
Yangjiang	37.388	1	CN22	1086	8.190	86.09	88.23
		2	CN23	1086	9.487	99.72	99.98
		3	CN40	1086	8.427	88.58	91.61
		4	CN41	1086	7.020	73.79	82.42
		5	CN47	1086	4.264	95.05	99.60
Taishan	0.684	1	CN32	1750	0.684	94.97	96.47

## Safety Regulation on Nuclear Power Plants

continued

NPP Name	Generated Energy (TWh)	Unit No.	Uniform Unit No.	Rated Power (MWe)	Unit Generated Energy (TWh)	Unit Load Factor (%)	Unit Capacity Factor (%)
Changjiang	7.717	1	CN36	650	4.183	73.23	87.39
		2	CN37	650	3.534	61.83	73.85
Fangchenggang	16.095	1	CN38	1086	7.926	83.32	89.60
		2	CN39	1086	8.169	85.87	99.98
Sanmen	4.428	1	CN28	1251	3.015	98.60	99.98
		2	CN29	1251	1.413	83.88	-
Haiyang	3.91	1	CN30	1253	3.01	96.03	95.03
		2	CN31	1253	0.90	-	-

### Qinshan NPP

In 2018, Qinshan NPP was kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the

specified limits.

Nuclear safety regulatory approvals for Qinshan NPP in 2018 are shown in Table 2, and inspection activities for Qinshan NPP are shown in Table 3. The occupational radiation doses of Qinshan NPP are shown in Table 4.

**Table 2. Nuclear Safety Regulatory Approvals for Qinshan NPP in 2018**

Approval Date	Document No.	Document Title
01/11/2018	NNSA[2018]9	Notification of Approving the Replacement of Platinum Resistance Thermometer Installation Section in Main System Bypass of Qinshan NPP
01/11/2018	NNSA[2018]10	Notification of Approving the Modification of the Cooling Water Pipeline of Auxiliary Feed Pump of Qinshan NPP
01/11/2018	NNSA[2018]11	Notification of Approving the Modification of Adding Anti-Rejection Restraint Parts to the Voltage Stabilizer Spray Pipe of Qinshan NPP
01/23/2018	NNSA[2018]16	Notification of Approving the Addition of Seawater Thermometer to the Outlet Mother Pipe of Seawater Pump of Qinshan NPP

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Approval Date	Document No.	Document Title
01/23/2018	NNSA[2018]17	Notification Of Approving The Addition of Hydrogen and Oxygen Concentration Monitor in the Boron Recycling System Temporary Storage Box Gas Space of Qinshan NPP
01/23/2018	NNSA[2018]18	Notification of Approving the Modification of the Technical Specification of Qinshan NPP
01/25/2018	NNSA[2018]19	Notification of Approving the Modification of Electrical Penetrations of Qinshan NPP
01/25/2018	NNSA[2018]20	Notification of Approving the Modification of Fuel Underwater Transportation Channel of Qinshan NPP
01/29/2018	NNSA[2018]28	Notification of Approving the Change and Improvement of Partial Nuclear Class 2 and 3 Pipeline Supporting Hanger of Qinshan NPP
01/29/2018	NNSA[2018]29	Notification of Approving the Modification of Emergency Freezing System of Qinshan NPP
01/29/2018	NNSA[2018]30	Notification of Approving the Improvement of Fuel Transportation Channel Blind Plate Structure of Qinshan NPP
03/08/2018	NNSA[2018]65	Notification of Approving the Modification of the Main Control Room of Qinshan NPP Unit 1
03/14/2018	NNSA[2018]66	Notification of Approving the Modification of Partial Nuclear Grade Cable Bridge of Qinshan NPP
03/19/2018	NNSA[2018]69	Notification of Approving the Improvement of Chimney Exhaust Radiation Monitoring System of Qinshan NPP
03/19/2018	NNSA[2018]70	Notification of Approving the Pipeline Plugging of the Containment Air Radiation Monitoring System and the Reactor Roof Drive Mechanism Ventilation Radiation Monitoring System of Qinshan NPP
04/13/2018	NNSA[2018]98	Notification of Approving the Revision of the Final Safety Analysis Report of Qinshan NPP Unit 1
05/30/2018	NNSA[2018]150	Notification of Approving the Cancellation of Secondary Neutron Source of Qinshan NPP Unit 1
04/13/2018	NNSA Letter[2018]31	Official Letter on Approving the Commissioning Programme of the 18th Refueling Overhaul of Qinshan NPP

**Table 3. Inspection Activities for Qinshan NPP in 2018**

Start Date	Item	Main Contents of the Inspection
05/02/2018	On-site survey on the operating license extension programme of Qinshan NPP unit 1	Implementation progress on the operating license extension programme of Qinshan NPP unit 1

*Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.*

# Safety Regulation on Nuclear Power Plants

**Table 4. Occupational Radiation Doses of Qinshan NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man-Sv)	Normalized Collective Effective Dose (man-mSv/Gwh)
Unit 1	0.272	5.687	0.764	0.470

## **Qinshan NPP Phase II**

In 2018, Qinshan NPP Phase II was kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the specified limits. The 14th refueling overhaul of unit 2, the 7th refueling overhaul of unit 3

and the 6th refueling overhaul of unit 4 were completed.

Nuclear safety regulatory approvals for Qinshan NPP Phase II are shown in Table 5. One operational event occurred in Qinshan NPP Phase II, as shown in Table 6. The occupational radiation doses of Qinshan NPP Phase II are shown in Table 7.

**Table 5. Nuclear Safety Regulatory Approvals for Qinshan NPP Phase II in 2018**

Approval Date	Document No.	Document Title
02/08/2018	NNSA[2018]44	Approval Reply of the Revision of Technical Specification of Qinshan NPP Phase II Unit 1 and Unit 2
02/08/2018	NNSA[2018]45	Approval Reply on the Revision of Technical Specification of Qinshan NPP Phase II unit 3 and unit 4
03/27/2018	NNSA[2018]85	Notification of Approving the Interruption of Spent Fuel Pool Cooling for Preventive Maintenance of Partial Valves in Equipment Cooling Water System of Qinshan NPP Phase II Unit 1
07/07/2018	NNSA[2018]175	Notification of Approving the Interruption of Spent Fuel Pool Cooling for Preventive Maintenance of Cooling and treatment System in Reactor Refueling Pool and Spent Fuel Pool, and for Preventive Maintenance of Partial Valves in Equipment Cooling Water System of Qinshan NPP Phase II Unit 2
09/30/2018	NNSA[2018]264	Notification of Approving the Modification on Radiation Zone in the Final Safety Analysis Report of Qinshan NPP Phase II
12/20/2018	NNSA[2018]328	Notification of Approving the Modification of Adding Manual Isolation Valve to the Inlet Pipeline in the Front Storage Tank of Boron Recovery System of Qinshan NPP Phase II

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**Table 6. Operational Events of Qinshan NPP Phase II in 2018**

Event Date	Title	Cause	INES Level
11/07/2018	Special safety system triggered by abnormal closure of the 2nd main steam isolation valve (2VVP002VV) of unit 2	Equipment failure	0

**Table 7. Occupational Radiation Doses of Qinshan NPP Phase II in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1,2,3,4	0.295	9.730	1.149	0.055

## Qinshan NPP Phase III

In 2018, Qinshan NPP Phase III was kept in stable operation and in safety state, with no operational event occurred. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate

of containment were all within the specified limits. The 9th refueling overhaul of unit 2 was completed.

Nuclear safety regulatory approvals for Qinshan NPP Phase III are shown in Table 8. The occupational radiation doses of Qinshan NPP Phase II are shown in Table 9.

**Table 8. Nuclear Safety Regulatory Approvals for Qinshan NPP Phase III in 2018**

Approval Date	Document No.	Document Title
04/17/2018	NNSA[2018]104	Notification of Approving the Renewal Operating license of the spent fuel temporary dry storage facility of Qinshan NPP Phase III
05/04/2018	NNSA[2018]134	Notification of Approving the Revision of the Technical Specification of Qinshan NPP Phase III
05/21/2018	NNSA[2018]147	Notification of Approving the modification of the waste liquid monitoring system of Qinshan NPP Phase III
07/07/2018	NNSA[2018]173	Notification of Approving the displacement of the emergency core cooling system blasting plate downstream pipeline drain valve of Qinshan NPP Phase III unit 1

**Table 9. Occupational Radiation Doses of Qinshan NPP Phase III in 2018**

Unit	Annual Man Average Effective Dose(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1,2	0.456	6.801	0.855	0.076

# Safety Regulation on Nuclear Power Plants

## Fangjiashan NPP

In 2018, Fangjiashan NPP was kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the

specified limits.

Nuclear safety regulatory approvals for Fangjiashan NPP are shown in Table 10. There were 2 operational events occurred in Fangjiashan NPP, as shown in Table 11. The occupational radiation doses of Fangjiashan NPP are shown in Table 12.

**Table 10. Nuclear Safety Regulatory Approvals for Fangjiashan NPP in 2018**

Approval Date	Document No.	Document Title
02/08/2018	NNSA[2018]42	Notification of Approving the Clearance Levels of Steam Generator Blowdown System Spent Resin of Fangjiashan NPP Unit 1 and Unit 2
02/21/2018	NNSA[2018]57	Notification of Issuing the Operating licenses for Fangjiashan NPP Unit 1 and Unit 2
03/01/2018	NNSA[2018]62	Notification of Approving the Auxiliary Transformer Incativation in Reactor Power Operation Mode of Fangjiashan NPP Unit 1 and Unit 2
06/04/2018	NNSA[2018]158	Notification of Approving the Modification of Essential Service Water System Shellfish Catcher Backwash Pipeline of Fangjiashan NPP Unit 1 and Unit 2
09/18/2018	NNSA[2018]239	Notification of Approving the Revision of Final Safety Analysis Report Radiation Zone of Fangjiashan NPP
11/13/2018	NNSA[2018]295	Notification of Approving the Optimization of the Physical Protection System No.2 Emergency Gate Position of Fangjiashan NPP
11/13/2018	NNSA[2018]296	Notification of Approving the Modification of the Reactor Protection System Signal Quality Limiting Value of Fangjiashan NPP Unit 1 and Unit 2
12/21/2018	NNSA[2018]331	Notification of Approving the Addition of “One Point Method” for External Nuclear Measuring Instrument Mutual Calibration of Fangjiashan NPP
12/21/2018	NNSA[2018]332	Notification of Approving the Adding Bypass Water Injection Pipeline for the Cooling Water System of Fangjiashan NPP Unit 1 and Unit 2

**Table 11. Operational Events of Fangjiashan NPP in 2018**

Event Date	Title	Cause	INES Level
07/12/2018	Two cycle pumps tripping led to shutdown of unit 1	Equipment failure	0
10/21/2018	DCS layer switch port disable fault of unit 1	Equipment failure	0

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**Table 12. Occupational Radiation Doses of Fangjiashan NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man-Sv)	Normalized Collective Effective Dose (man-mSv/Gwh)
Units 1,2	0.034	0.984	0.074	0.004

## Daya Bay NPP

In 2018, Daya Bay NPP was kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the specified limits. The 19th refueling overhaul of

unit 1 was completed.

Nuclear safety regulatory approvals for Daya Bay NPP are shown in Table 13. There was 1 operational event occurred in Daya Bay NPP, as shown in Table 14. The occupational radiation doses of Daya Bay NPP are shown in Table 15.

**Table13. Nuclear Safety Regulatory Approvals for Daya Bay NPP in 2018**

Approval Date	Document No.	Document Title
03/22/2018	NNSA[2018]84	Notification of Approving the Revision of Maintenance Programme of Daya Bay NPP and Ling'ao NPP
05/07/2018	NNSA[2018]135	Notification of Approving the Revision of Chemical and Radiochemical Technical Specification of Baya Bay NPP and Ling'ao NPP
05/15/2018	NNSA[2018]142	Notification of Approving the Revision of Safety- Related System and Equipment Periodic Test Surveillance Requirements of Daya Bay NPP and Ling'ao NPP
05/21/2018	NNSA[2018]148	Notification of Approving the Modification of Spent Fuel Storage System of Daya Bay NPP
06/04/2018	NNSA[2018]159	Notification of Approving the Improvement of Face Recognition System at the Protection Zone Entrance of Daya Bay NPP and Ling'ao NPP
10/25/2018	NNSA[2018]282	Notification of Approving the Suspension of the Special Application for Spent Fuel Pools Cooling During the Optimization Period of Reactor and Spent Fuel Pools Cooling and Treatment Systems of Daya Bay NPP and Ling'ao NPP
12/26/2018	NNSA[2018]329	Notification of Approving the Revision of Safety- Related System and Equipment Periodic Test Surveillance Requirements of Daya Bay NPP and Ling'ao NPP
12/26/2018	NNSA[2018]330	Notification of Approving the Revision of Operation Technical Specification of DayaBay NPP and Ling'ao NPP

# Safety Regulation on Nuclear Power Plants

**Table 14. Operational Events of Daya Bay NPP in 2018**

Event Date	Title	Cause	INES Level
03/19/2018	Automatic shutdown of unit 2 caused by the low water level of the steam generator and the mismatch signal of steam and water	Equipment failure	0

**Table 15. Occupational Radiation Doses of Daya Bay NPP in 2018**

Unit	Annual Man Average Effective Dose(mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1,2	0.260	5.114	0.753	0.045

## Ling'ao NPP

In 2018, Ling'ao NPP was kept in stable operation and in safety state, with no operational event occurred. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the specified

limits. The 15th refueling overhaul of unit 1, the 14th refueling overhaul of unit 2 and the 8th refueling overhaul of unit 3 were completed.

Nuclear safety regulatory approvals for Daya Bay NPP are shown in Table 16. The occupational radiation doses of Daya Bay NPP are shown in Table 17.

**Table 16. Nuclear Safety Regulatory Approvals for Ling'ao NPP in 2018**

Approval Date	Document No.	Document Title
02/28/2018	NNSA[2018]59	Notification of Approving the Revision of Safety- Related System and Equipment Periodic Test Supervision Requirements for Ling'ao NPP Unit 1 and Unit 2
06/26/2018	NNSA[2018]167	Notification of Approving the Improvement of Nuclear Instrumentation System Power Range Fault Monitoring circuit for Ling'ao NPP Unit 1 and Unit 2
09/07/2018	NNSA[2018]224	Notification of Approving the Modification of Nuclear Instrument System Intermediate Range Channel Isolation Module Conversion of Ling'ao NPP Unit 3 and Unit 4

*Note: There were 7 joint approvals for Ling'ao NPP and Daya Bay NPP, as shown in table 13.*

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**Table 17. Occupational Radiation Doses of Ling'ao NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man-Sv)	Normalized Collective Effective Dose (man-mSv/Gwh)
Units 1,2	0.517	10.323	1.623	0.108
Units 3,4	0.223	5.247	0.628	0.036

## Tianwan NPP

In 2018, units 1, 2, 3 and 4 of Tianwan NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of the primary circuit pressure boundary, and the leakage rate of the containment were all within the specified limits. The 11th refueling overhaul of unit 1 began on December 7, 2018. The 10th refueling overhaul of unit 2 was completed. The commercial operating conditions of unit 3 were available on February 15, 2018, and the commercial operating conditions of unit 4 were available on December 22, 2018. On July 27, 2018, the welding and installation of the main pipe of unit 5 were completed. On May 5, 2018, the nuclear island dome hoisting of unit 6 was completed.

Nuclear safety regulatory approvals for Tianwan NPP are shown in Table 18, and inspection activities for Tianwan NPP are shown in Table 19. There were 5 operational events occurred in Tianwan NPP, as shown in Table 20, and 2 construction events as shown in table 21. The occupational radiation doses of Tianwan NPP are shown in Table 22.



*Figure 2. Liu Hua, Vice Minister of MEE, Administrator of NNSA, Investigated the Tianwan NPP.*

**Table 18. Nuclear Safety Regulatory Approvals for Tianwan NPP in 2018**

Approval Date	Document No.	Document Title
01/02/2018	NNSA[2018]2	Notification of Approving Modification and Substitution for Throttle Orifice Plate of Reactor Building Equipment Drainage System of Tianwan NPP Unit 1 and Unit 2
01/26/2018	NNSA[2018]27	Notification of Approving the Release of 90% Rated Power Control Point of Tianwan NPP Unit 3

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continued

Approval Date	Document No.	Document Title
01/31/2018	NNSA[2018]38	Notification of Approving the Optimization and Modification of Shutdown Protection Logic of Main Pump Clamp Shaft of Tianwan NPP Unit 3 and Unit 4
03/15/2018	NNSA[2018]68	Notification of Approving the Modification of Relative Check Valve of Low Pressure Safety Injection System of Tianwan NPP Unit 1 and Unit 2
03/26/2018	NNSA[2018]86	Notification of Approving the Domestic Substitution Project for Nuclear Pipeline and Branch Pipe Bearing of Tianwan NPP
04/04/2018	NNSA[2018]88	Notification of Issuing Certificates of Registration Confirmation of the Five Overseas Units for Civil Nuclear Safety Equipment Activities including Germany AEG Power Solutions Gmbh and others etc.
04/28/2018	NNSA[2018]131	Letter on Approving the “Quality Assurance Programme for Units 5 and 6 of Tianwan NPP (Design and Construction Phase)” (Version E1)
05/15/2018	NNSA[2018]143	Notification of issuing Certificates of Registration confirmation of the three Overseas Units for Civil Nuclear Safety Equipment Activities including Romania VILMAR S.A. and others etc.
05/30/2018	NNSA[2018]151	Notification of Approving the Modification of FSAR of Tianwan NPP Unit 1 and Unit 2
06/28/2018	NNSA[2018]169	Notification of Approving Adding Spent Fuel Dry Storage System for Tianwan NPP
07/07/2018	NNSA[2018]174	Notification of Approving Modification of Main Pump Power Signal Fault Interlocking Logic of Tianwan NPP Unit 3 and Unit 4
07/07/2018	NNSA[2018]176	Notification of Approving the “Quality Assurance Programme for Tianwan NPP” (Version D1)
08/30/2018	NNSA[2018]215	Notification of Issuing the “Ratification Instrument for Initial Fuel Loading of Tianwan NPP Unit 4”
09/18/2018	NNSA[2018]231	Notification of approving the Cancellation of Temporary Shutdown Measures and Rod Drop Tests at the End of Fuel Cycle Life for Tianwan NPP Unit 1 and Unit 2
09/29/2018	NNSA[2018]258	Notification of Approving the Modification of Main Pump Power Signal Fault Interlocking Logic of Tianwan NPP Unit 1 and Unit 2
09/30/2018	NNSA[2018]259	Notification of Approving the Modification of Radioactive Sewage Electric Pump of Reactor Buildings of Tianwan NPP Unit 1 and Unit 2
12/26/2018	NNSA[2018]337	Notification of Approving the Modification of Cycle and Pressure of Strength Hydraulic Tests for Tianwan NPP Units 1~4
05/30/2018	NNSA Letter[2018]43	Reply Letter on Confirming the Results of NDT Technology Capability Verification for Pre-Service and In-Service Inspections of Tianwan NPP Unit 3 and Unit 4

continued

Approval Date	Document No.	Document Title
07/31/2018	NNSA Letter[2018]62	Reply Letter on Approving the Programme of NDT Technology Capability Verification for Pre-Service and In-Service Inspections of Tianwan NPP Unit 5 and Unit 6

**Table 19. Inspection Activities for Tianwan NPP in 2018**

Start Date	Item	Main Contents of the Inspection
01/22/2018	Routine regulatory inspection on 90% rated power control point of Tianwan NPP unit 3	Completion of commissioning test and preparation for subsequent commissioning, the handling of design changes of commissioning non-conformance items, operation management, including operation technical specifications, regular tests and maintenance management and others etc., handling of operational events and experience feedback, and implementation of nuclear safety management requirements
07/18/2018	Routine regulatory inspection before the initial fuel loading of Tianwan NPP unit 4	Implementation of the quality assurance programme in the commissioning stage commissioning of nuclear safety related SSCs, production preparation, radiation protection, emergency preparedness, physical protection and fuel storage, radioactive waste management and environmental protection facilities, NPP fire protection, the implementation of the licensing conditions and the remaining issues of the review, implementation of requirements for previous nuclear safety supervision, inspection and management, other items such as fastener inspection, improvements learned from Fukushima nuclear accident, etc.

*Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.*

**Table 20. Operational Events of Tianwan NPP in 2018**

Event Date	Title	Cause	INES Level
02/28/2018	Reactor automatic shutdown triggered by low level of steam generator (AA14 Signal) of unit 3	Equipment failure	0
03/13/2018	Reactor automatic shutdown signal triggered by chuck signal of No.1 main pump of unit 2	Equipment failure	0
03/29/2018	Reactor shutdown protection triggered by low level of steam generator of unit 3	Equipment failure	0
11/22/2018	Degraded logical shutdown signal triggered by steam generator level exceeding the range of instrument of unit 3	Equipment failure	0
12/04/2018	Event of leakage of independent circuit pipeline of No.3 main pump of unit 3	Equipment failure	0

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**Table 21. Construction Events of Tianwan NPP in 2018**

Event Date	Unit no.	Title
11/15/2017	Units 3, 4	The setting values of solenoid pilot valves were inconsistent with those of spring pilot valves of main steam safety valves of unit 3 and unit 4.
08/18/2018	Unit 4	Leak water occurred in Leakage Detection System for Spent Fuel Pool Lining of unit 4

**Table 22. Occupational Radiation Doses of Tianwan NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1,2	0.162	3.074	0.581	0.037
Units 3,4	0.006	0.354	0.018	0.0025

## Hongyanhe NPP

In 2018, units 1, 2, 3 and 4 of Hongyanhe NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of the primary circuit pressure boundary, and the leakage rate of the containment were all within the specified limits.

The 3rd refueling overhaul of unit 2, the 2nd refueling overhaul of unit 3, and the 1st refueling overhaul of unit 4 were all completed. Welding of the first seam of the main pipe of unit 5 was carried out on May 11, 2018, and the same welding of the first seam of the main pipe of unit 6 was carried out on December 15, 2018. The welding work was progressing

smoothly on the whole.

Nuclear safety regulatory approvals for Hongyanhe NPP are shown in Table 23. There was 1 operating event occurred in Hongyanhe NPP, as shown in Table 24 and no constructing event occurred. The occupational radiation doses of Hongyanhe NPP are shown in Table 25.



*Figure 3. The Panorama of Hongyanhe NPP Units 1~6*

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**Table 23. Nuclear Safety Regulatory Approvals for Hongyanhe NPP in 2018**

Approval Date	Document No.	Document Title
01/30/2018	NNSA[2018]37	Notification of Approving the Item Substitution of Nuclear Level Solenoid Valves for Containment Atmospheric Monitoring System and Nuclear Island Exhaust and Drainage System of Hongyanhe NPP
02/02/2018	NNSA[2018]39	Notification of Issuing the Operating License for Hongyanhe NPP Unit 1 and Unit 2 in Liaoning Province
02/05/2018	NNSA[2018]40	Notification of Approving Adding Relevant Clauses in “Operation Technical Specifications for Hongyanhe NPP Unit 1 and Unit 2” to Establish and Operating a Scavenging Circuit of Containment Atmosphere Monitoring System to Sweep the Gas in the Reactor Building.
03/01/2018	NNSA[2018]61	Approval Reply on the Modification of Partial Content of Supervision Requirements for Regular Testing of Safety-Related Systems and Equipment of Hongyanhe NPP Unit 1 and Unit 2.
04/11/2018	NNSA[2018]94	Notification of Approving the “Supervision Requirements for Regular Tests of Safety-Related Systems and Equipment of Hongyanhe NPP Unit 3 and Unit 4 (Revised Version 4)” and the “Technical Specifications for Operation of Hongyanhe NPP Units 3 and Unit 4 (Revised Version 3)”
07/16/2018	NNSA[2018]185	Notification of Approving Implementing Extension Operation of the First Cycle of Hongyanhe NPP Unit 4.
08/14/2018	NNSA[2018]210	Notification of Approving the Improvement of Test Method for Iodine Filter of Main Control Room Air Conditioning Systems of Hongyanhe NPP in Liaoning Province
08/14/2018	NNSA[2018]211	Notification of Approving the Optimization of Middle Range Protection Setting Calibration Power Platform for Nuclear Instrument Systems of Hongyanhe NPP Units 1~4 in Liaoning Province

**Table 24. Operational Events of Hongyanhe NPP in 2018**

Event Date	Title	Cause	INES Level
02/20/2018	The core thermal power exceeded 102% FP for a short time in Hongyanhe NPP unit 1	Equipment failure	0

**Table 25. Occupational Radiation Doses of Hongyanhe NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1,2	0.345	3.207	0.614	0.036
Units 3,4	0.551	3.379	0.907	0.076

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## Ningde NPP

In 2018, 4 units of Ningde NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of the primary circuit pressure boundary, and the leakage rate of the containment were all within the specified limits.

The 4th refueling overhaul of unit 1 began on

November 20, 2018. And the 3rd refueling overhaul of unit 2 and the 2nd refueling overhaul of unit 3 were all finished.

Nuclear safety regulatory approvals for Ningde NPP are shown in Table 26. There were 2 operational events occurred in Ningde NPP, as shown in Table 27. The occupational radiation doses of Ningde NPP are shown in Table 28.

**Table 26. Nuclear Safety Regulatory Approvals for Ningde NPP in 2018**

Approval Date	Document No.	Document Title
01/12/2018	NNSA[2018]12	Notification of Approving the Version Upgrade of Quality Assurance Programme (Operation Stage) of Ningde NPP
01/25/2018	NNSA[2018]21	Notification of Approving the Modification of Operation Technical Specifications for Ningde NPP Unit 1 and Unit 2
03/15/2018	NNSA[2018]67	Notification of Approving the Modification of “the Refueling Programme for Ningde NPP Phase I Project in Fujian Province”
04/04/2018	NNSA[2018]91	Notification of Approving the Modification of “the In-Service Inspection Programme for Ningde NPP Phase I Project in Fujian Province”
04/16/2018	NNSA[2018]102	Notification of Approving of the Modification of Relevant Contents of Radiation Partition in FSARs* of Ningde NPP Unit 1, Unit 2, Unit 3 and Unit 4
05/30/2018	NNSA[2018]152	Notification of Approving the Version Upgrade of Supervision Requirements for Start-Up Physical Tests for Ningde NPP Unit 3 and Unit 4 in Fujian Province
07/25/2018	NNSA[2018]188	Notification of Approving the Modification of Supervision Requirements for Start-Up Physical Tests for Ningde NPP Unit 1 and Unit 2 in Fujian Province
09/18/2018	NNSA[2018]237	Notification of Issuing the “Review Opinions on Siting of Ningde NPP Unit 5 and Unit 6”
09/25/2018	NNSA[2018]256	Notification of Approving the Change of Installation Position of Cooling Water Flow Low Switch of No.2 Spray Pump Motor in Containment Spray System of Ningde NPP Unit 1
09/29/2018	NNSA[2018]257	Notification of Approving the Modification of Configuration Logic of Safety Logic Processor Cabinet of Essential Service Water System and Circulating Water Filtration System of Ningde NPP Unit 1 and Unit 2

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continued

Approval Date	Document No.	Document Title
10/12/2018	NNSA[2018]273	Notification of Approving Optimization of Middle Range Protection Setting Calibration of Nuclear Instrument System of Ningde NPP Unit 1 and Unit 2 For Start-Up Physical Tests
11/06/2018	NNSA[2018]294	Notification of Approving Reaming and Replacement of Shellfish Catcher Filtration Mesh of Essential Service Water System of Ningde NPP Unit 1 and Unit 2
11/30/2018	NNSA[2018]314	Notification of Approving the Chang of Adding Sewage Valves to Pressure Switch and Local Pressure Gauge Pipeline of Circulating Water Filtration System of Ningde NPP Unit 1 and Unit 2
11/30/2018	NNSA[2018]315	Notification of Approving Change of Partial Important Signal Allocation of Ventilation System and 6.6kv Distribution Panel System of Emergency Diesel Engine Workshop of Ningde NPP Unit 1 and Unit 2
09/18/2018	MEE App[2018]91	Approval Reply on Environmental impact statement (Siting Stage) for Ningde NPP Unit 5 and Unit 6

\* FSAR: Final Safety Analysis Report

**Table 27. Operational Events of Ningde NPP in 2018**

Event date	Title	Cause	INES level
04/11/2018	Reactor automatic shutdown caused by sending error feedback signal during dealing with turbine governing system faults of unit 3	Human error	0
08/10/2018	Loss of fixed bolts in pneumatic head support of some VELAN Valves	Human error	0

**Table 28. Occupational Radiation Doses of Ningde NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man-Sv)	Normalized Collective Effective Dose (man-mSv/Gwh)
Units 1,2	0.343	7.218	1.132	0.069
Units 3,4	0.109	2.072	0.317	0.018

## Fuqing NPP

In 2018, units 1, 2, 3 and 4 of Fuqing NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage

rate of the primary circuit pressure boundary, and the leakage rate of the containment were all within the specified limits.

The 3rd refueling overhaul of unit 1 and the 3rd refueling overhaul of unit 2 were

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completed. The 1st refueling overhaul of unit 3 was completed on January 14, 2018, and its 2nd refueling overhaul started on November 28, 2018. The 1st refueling overhaul of unit 4 was completed. The installation of reactor pressure vessel of unit 5 was completed and its main control room was available. Reactor building dome lifting and reactor pressure vessel installation of unit 6 were completed, and all pump cases were transported into nuclear island, and installation of conventional island of unit 6 had begun.

Nuclear safety regulatory approvals for Fuqing NPP are shown in Table 29, and inspection activities for Fuqing NPP are shown in Table 30. There were 6 operational events occurred in Fuqing NPP, as shown in Table 31 and no construction event occurred. The occupational radiation doses of Fuqing NPP are shown in Table 32.



*Figure 4. The 301 Overhaul of Fuqing NPP Unit 3*



*Figure 5. Construction Scene of Fuqing Nuclear Power Plant*

**Table 29. Nuclear Safety Regulatory Approvals for Fuqing NPP in 2018**

Approval Date	Document No.	Document Title
01/09/2018	NNSA[2018]8	Notification of Approving Releasing the 1st Criticality Control Point after the 1st Refueling Overhaul of Fuqing NPP Unit 3
01/25/2018	NNSA[2018]23	Notification of Issuing the 1st Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
02/08/2018	NNSA[2018]43	Notification of Approving Implementing 18-Month Refueling Reconstruction for Fuqing NPP Unit 1 and Unit 2
02/22/2018	NNSA[2018]56	Notification of Approving the “Programme of Refueling for Fuqing NPP Unit 1 and Unit 2 (Version 002)”
03/22/2018	NNSA[2018]83	Notification of Approving Adopting the Mutual Calibration Test Technologies of “One Point Method” Inside and Outside Reactor Nuclear Measurement for Fuqing NPP Units 1~4

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continued

Approval Date	Document No.	Document Title
04/08/2018	NNSA[2018]90	Notification of Approving the Change of Fixed Value of Partial Equipment of Radiation Monitoring System for Fuqing NPP Unit 1 and Unit 2 in Fujian Province
04/12/2018	NNSA[2018]95	Notification of Approving the Safe and Important Modification of Physical Protection Systems of Fuqing NPP Units 1~4
04/23/2018	NNSA[2018]112	Notification of Issuing the 3rd Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
05/11/2018	NNSA[2018]141	Notification of Approving the Application for Permission to Use Ring Crane in the State Of Thermal Shutdown During 1st Refueling Overhaul of Fuqing NPP Unit 4 in Fujian Province
05/21/2018	NNSA[2018]146	Notification of Issuing the 4th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
06/26/2018	NNSA[2018]168	Notification of Approving the Modification of Main Control Rooms of Fuqing NPP Unit 5 and Unit 6 in Fujian Province
07/20/2018	NNSA[2018]186	Notification of Approving Five Safety Important Modifications including Change of Narrow-Range Flow Measurement Channel in Main Water Supply System of Fuqing NPP Unit 4 in Fujian Province
07/31/2018	NNSA[2018]198	Notification of Issuing The 6th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
09/05/2018	NNSA[2018]221	Notification of Issuing the 7th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
09/18/2018	NNSA[2018]234	Notification of Approving the “Maintenance Outline Of Fuqing NPP Units 1~4 (Version 005)”
09/18/2018	NNSA[2018]235	Notification of Approving the “Operation Technical Specifications for Fuqing NPP Unit 3 and Unit 4 (Version 1.3)”
09/18/2018	NNSA[2018]236	Notification of Approving the “Regular Test Supervision Requirements for Safety-Related System and Equipment of Fuqing NPP Unit 3 and Unit 4 (Version 1.2)”
09/26/2018	NNSA[2018]247	Notification of Approving Alteration and Transformation of Mechanical Penetration Parts of Fuqing NPP Unit 1 and Unit 2 in Fujian Province
09/29/2018	NNSA[2018]253	Notification of Approving Software Upgrade and Modification of Safety Level Display Unit (SVDU) of Fuqing NPP Unit 1 and Unit 2 in Fujian Province
09/29/2018	NNSA[2018]254	Notification of Approving Software Optimization and Modification of 1E Level Digital Control System (DCS) of Fuqing NPP Unit 3 in Fujian Province
10/29/2018	NNSA[2018]286	Notification of Approving the “In-Service Inspection Programme of Fuqing Unit 3 and Unit 4 in Fujian Province (Version 000)”

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continued

Approval Date	Document No.	Document Title
10/29/2018	NNSA[2018]287	Notification of Approving the “In-Service Inspection Programme of Fuqing Unit 1 and Unit 2 in Fujian Province (Version 000)”
10/29/2018	NNSA[2018]288	Notification of Approving the “Operation Technical Specifications of Fuqing Unit 1 and Unit 2 in Fujian Province (Version D)”
11/13/2018	NNSA[2018]297	Notification of Issuing the Operating licenses for Fuqing NPP Unit 1 and Unit 2 in Fujian Province
11/26/2018	NNSA[2018]308	Notification of Issuing the 8th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
11/30/2018	NNSA[2018]312	Notification of Approving Design Change of Spent Fuel Storage Frame of Fuqing Unit 6 in Fujian Province
05/30/2018	NNSA Letter[2018]44	Letter on Approving “The Operation Quality Assurance Programme for Units 1~4 of Fuqing NPP (Version 2) in Fujian Province
11/26/2018	NNSA Letter[2018]97	Letter on Approving “The Quality Assurance Programme (Design And Construction Stage) for Fuqing NPP Unit 5 and Unit 6 in Fujian Province (Version 2)”
01/25/2018	MEE App[2018]11	Approval Reply on the Environmental impact statement ofrms of 18-Month Refueling Projects of Fuqing NPP Unit 1 and Unit 2 in Fujian Province

**Table 30. Inspection Activities for Fuqing NPP in 2018**

Start Date	Item	Main Content of inspection
01/02/2018	Regulatory inspection before the first criticality after the 1st refueling overhaul of Fuqing NPP unit 3	The operation and management of the first cycle, the overall implementation of the first refueling overhaul (including in-service inspection), and the implementation of modification for items related important and safe in the overhaul. Assessment of radiation protection work, implementation of quality assurance activities, preparations before the first criticality of the reactor after overhaul, implementation of requirements of previous nuclear safety inspections, and other issues related to nuclear safety (BOSS head treatment, fasteners issue, “Apollo pump” welding inspection and repairing issue, pipeline material replacement of SEC system, failure of fuel assemblies, etc.)

*Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.*

**Table 31. Operational Events of Fuqing NPP in 2018**

Event Date	Title	Cause	INES Level
01/02/2018	Shutdown caused by mistake closure of main feedwater isolation valve of steam generator of unit 4	Human error	0
07/17/2018	Radioactive high alarm in DVN chimney emission caused by 4RAZ012LP leakage of unit 4	Equipment failure	0

continued

Event Date	Title	Cause	INES Level
09/06/2018	Misjudgment of periodic test results of turbine-driven pump in auxiliary feedwater system and improper handling of equipment problem of unit 4	Human error	0
10/14/2018	Unexpected discharge of radioactive liquid waste into sewage treatment system during 203 overhaul	Equipment failure	0
11/05/2018	Abnormal start-up of steam-driven pump in auxiliary water supply system during signal recovery in main pump idling test of Unit 2	Human error	0
11/29/2018	Supernorm test carried out in the presence of the first group IO of unit 3	Management problem	0

**Table 32. Occupational Radiation Doses of Fuqing NPP in 2018**

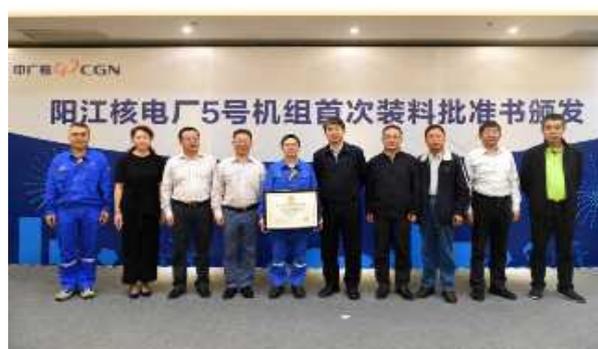
Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man-Sv)	Normalized Collective Effective Dose (man-mSv/Gwh)
Units 1,2	0.251	5.256	0.897	0.057
Units 3,4	0.282	7.816	0.871	0.059

## Yangjiang NPP

In 2018, units 1, 2, 3, 4 and 5 of Yangjiang NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the specified limits. The 3rd refueling overhaul of unit 1, the 2nd refueling overhaul of unit 3, and the 1st refueling overhaul of unit 4 were completed. The unit 5 started commercial operation on July 12, 2018 and was in power operation mode. Unit 6 was in the joint commissioning phase.

Nuclear safety regulatory approvals for

Yangjiang NPP in 2018 are shown in Table 33, and the inspection activities are shown in Table 34. There were 2 operational events occurred in Yangjiang NPP, as shown in Table 35, and no construction event occurred. The occupational radiation doses of Yangjiang NPP are shown in Table 36.



**Figure 6. Issuance of the Ratification Instrument for Initial Fuel Loading of Yangjiang NPP Unit 5**

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**Table 33. Nuclear Safety Regulatory Approvals for Yangjiang NPP in 2018**

Approval Date	Document No.	Document Title
02/05/2018	NNSA[2018]41	Notification of Approving the Temporary Isolation of System Pipelines such as Spent Fuel Pool Cooling Pipelines during the Overhaul of Yangjiang NPP Unit 4
02/10/2018	NNSA[2018]51	Notification of Approving the Addition of Restrictive Conditions in the Operational Technical Specifications of Yangjiang NPP Units 1~4
02/13/2018	NNSA[2018]54	Notification of Approving the Refueling Programme (Version 12) of Yangjiang NPP
02/14/2018	NNSA[2018]55	Notification of Issuing the Operating licenses for Yangjiang NPP Unit 1 and Unit 2
04/11/2018	NNSA[2018]96	Notification of Approving the Version Upgrade of the Supervision Requirements for Periodic Tests of Safety-Related Systems and Equipment of Yangjiang NPP Units 1~4
04/17/2018	NNSA[2018]103	Notification of Issuing the Ratification Instrument for Initial Fuel Loading of Yangjiang NPP Unit 5
04/27/2018	NNSA[2018]128	Notification of Approving the Temporary Isolation of System Pipelines such as Spent Fuel Pool Cooling Pipelines during the Overhaul of Yangjiang NPP Units 1~3
04/28/2018	NNSA[2018]130	Notification of Approving the Version Upgrade of the Supervision Requirements for Core Startup Physical Test of Yangjiang NPP Units 1~4
05/31/2018	NNSA[2018]157	Notification of Approving the Transformation of Face Recognition Access Control of Yangjiang NPP
10/18/2018	NNSA[2018]275	Notification of Releasing the Cold State Function Test Control Point of the Main System of Yangjiang NPP Unit 6
12/29/2018	NNSA[2018]343	Notification of Approving the Version Upgrade of the “Commissioning Programme of Yangjiang NPP Unit 5 and Unit 6”
12/29/2018	NNSA[2018]344	Notification of Approving the Reform of Adding Mobile Test Loads for Emergency Diesel Generator Sets of Yangjiang NPP Unit 5 and Unit 6 and Additional Diesel Generator Sets on Site
01/08/2018	NNSA Letter [2018]2	Letter on Approving the “Quality Assurance Programme (Version 10) for the Operation Phase of Yangjiang NPP”

**Table 34. Inspection Activities for Yangjiang NPP in 2018**

Start Date	Item	Main Contents of the Inspection
03/19/2018	Comprehensive nuclear safety inspection before the initial fuel loading of Yangjiang NPP unit 5	Implementation of the quality assurance programme, installation quality of structures and nuclear safety equipments, system commissioning, production preparation, radiation protection, emergency preparedness, physical protection and fuel storage, environmental protection facilities, license conditions, application documents and implementation of review issues, implementation of management requirements in previous nuclear safety supervisions and inspections, others like fasteners, BOSS head welds, post-Fukushima improvement items, etc.
05/08/2018	Nuclear safety inspection before the initial criticality of Yangjiang NPP	The implementation of commissioning activities before the initial criticality, main commissioning anomalies, design change application status, preparations before the initial criticality, implementation of technical specifications after fuel loading, implementation of periodic tests, and other nuclear safety related topics.
05/21/2018	Nuclear safety inspection on the low power control point of unit 5	Completion of critical, zero-power and low-power tests, safety-related commissioning anomalies, design change treatment status, implementation of post-critical technical specifications, implementation of periodic tests, and other nuclear safety-related issues.
10/09/2018	Annual routine nuclear safety inspection of Yangjiang NPP	Operation of quality assurance system, operation safety management (focus on inspection on unit operation, periodic test, safety management of in-service inspection and maintenance, operational events and experience feedback, treatment for design changes and non-conformities, etc.), license conditions and implementation of requirements in previous nuclear safety inspections, other nuclear safety related issues (Weilan valve bracket problem, cold source safety, nuclear pump impeller crack, BOSS head treatment, etc.)

*Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.*

**Table 35. Operational Events of Yangjiang NPP in 2018**

Event Date	Title	Cause	INES Level
03/06/2018	Y1KRT017MA secondary alarm triggered when performing the second step of hydrogen and oxygen separation of unit 1	Human error	0
06/23/2018	Y5RCV002PO unavailability time exceeded the deadline for running technical specifications	Equipment failure	0

**Table 36. Occupational Radiation Doses of Yangjiang NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1, 2	0.119	3.229	0.503	0.028
Units 3, 4	0.157	4.706	0.945	0.061
Unit 5	0.009	0.284	0.025	0.006

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### Changjiang NPP

In 2018, units 1 and 2 of Changjiang NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the specified limits. The 2nd refueling overhaul of unit 1 was completed. The 1st refueling overhaul of unit 2 was completed, and the 2nd refueling overhaul began on November 23, 2018.

Nuclear safety regulatory approvals for Changjiang NPP in 2018 are shown in Table

37, and the inspection activities are shown in Table 38. There were 3 operational events occurred in Changjiang NPP, as shown in Table 39. The occupational radiation doses of Changjiang NPP are shown in Table 40.



*Figure 7. Panorama of Changjiang NPP*

**Table 37. Nuclear Safety Regulatory Approvals for Changjiang NPP in 2018**

Approval Date	Document Number	Document Title
01/05/2018	NNSA[2018]5	Notification of Approving Two Safety Significant Changes such as the Transformation of Containment Mechanical Penetration Parts of Changjiang NPP Unit 1 in Hainan Province
01/25/2018	NNSA[2018]22	Notification of Approving the “Technical Specification for Operation (Approval Version 002) of Changjiang NPP Units 1 and 2 in Hainan Province”
04/04/2018	NNSA[2018]89	Notification of Approving the Technical Specification for Chemical and Radiochemical Chemistry (Approval Version 002) of Changjiang NPP Unit 1 and Unit 2 in Hainan Province
09/14/2018	NNSA[2018]226	Notification of Approving the Transformation of the High-risk Quality Bit Signal Changing of the Protection System of Changjiang NPP Unit 1 and Unit 2 in Hainan Province
09/29/2018	NNSA[2018]255	Notification of Approving the Franchise Application for Temporarily Suspending the Cooling of Spent Fuel Pools during the Overhaul of Changjiang NPP in Hainan Province

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**Table 38. Inspection Activities for Changjiang NPP in 2018**

Start Date	Item	Main Contents of the Inspection
09/04/2018	Annual routine nuclear safety inspection of Changjiang NPP	Operation of quality assurance system, operation safety management, preventive maintenance management of safety significant equipments, conditions for the ratification instrument for initial fuel loading and the implementation of the previous nuclear safety inspection requirements.

*Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.*

**Table 39. Operational Events of Changjiang NPP in 2018**

Event Date	Title	Cause	INES Level
01/31/2018	The first group IO which were artificially generated by false triggering of the 1LHB002JA hatch closing signal	Human error / management problem	0
04/07/2018	Trip of the circulating water pump and automatic shutdown event caused by high pressure difference of drum screen	Equipment failure	0
09/15/2018	Automatic shutdown event of the unit caused by the 1RPN024MA abnormal flashing high count rate	Equipment failure	0

**Table 40. Occupational Radiation Doses of Changjiang NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man·Sv)	Normalized Collective Effective Dose (man·mSv/Gwh)
Units 1, 2	0.221	4.335	0.549	0.071

## Fangchenggang NPP

In 2018, units 1 and 2 of Fangchenggang NPP were kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of primary circuit pressure boundary, and the leakage rate of containment were all within the specified limits. The 2nd refueling overhaul of unit 1 was completed. Unit 2 was

in the second cycle operation. The 12th layer concrete pouring and internal structure civil construction and decoration of the nuclear island shell of unit 3 were completed. The reinforcement of the 11th layer of the non-slucice area of the inner shell of the nuclear island and the construction of the internal structure of 1.2~6.5m of unit 4 was completed.

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Nuclear safety regulatory approvals for Fangchenggang NPP in 2018 are shown in Table 41, and the inspection activities are shown in Table 42. There were 2 construction events occurred in Fangchenggang NPP, as shown in Table 43, and no operational events occurred. The occupational radiation doses of Fangchenggang NPP are shown in Table 44.



*Figure 8. Construction Site of Fangchenggang NPP Unit 3 and Unit 4*

**Table 41. Nuclear Safety Regulatory Approvals for Fangchenggang NPP in 2018**

Approval Date	Document Number	Document Title
08/13/2018	NNSA[2018]203	Notification of Approving the Temporary Isolation of System Pipelines such as Spent Fuel Pool Cooling Pipelines during the Overhaul of Fangchenggang NPP Unit 1 and Unit 2
09/05/2018	NNSA[2018]218	Notification of Approving the “In-service Inspection Programme for Fangchenggang NPP (Version 2) Unit 1 and Unit 2 in Guangxi Province”
09/18/2018	NNSA[2018]232	Notification of Approving the Refueling Programme (Version 2) of Fangchenggang NPP
09/18/2018	NNSA[2018]233	Notification of Approving the “Physical Test Supervision Requirements for Guangxi Fangchenggang NPP Unit 1 and Unit 2 in Guangxi Province (Version 2)”
11/02/2018	NNSA[2018]290	Notification of Issuing the Operating licenses for Fangchenggang NPP Unit 1 and Unit 2 in Guangxi Province
04/11/2018	NNSA Letter [2018]30	Letter on Certificating the Quality Assurance Programme for Operation Phases of Fangchenggang NPP Unit 1 and Unit 2
05/17/2018	NNSA Letter [2018]42	Letter on Collecting Comments on the Issuance of the Operating licenses for Fangchenggang NPP Unit 1 and Unit 2 in Guangxi Province
09/07/2018	NNSA Letter [2018]71	Letter on Issuing the “Routine Nuclear Safety Inspection Report of Fangchenggang NPP Unit 1 and Unit 2”
10/10/2018	NNSA Letter [2018]79	Letter on Issuing the “Non-routine Nuclear Safety Inspection Report for Fangchenggang NPP Unit 3 and Unit 4”

**Table 42. Inspection Activities for Fangchenggang NPP in 2018**

Start Date	Item	Main Contents of the Inspection
08/28/2018	Annual routine nuclear safety inspection of Fangchenggang NPP unit 1 and unit 2	Operation of quality assurance system, operation safety management (inspection on unit operation, periodic test, safety management of in-service inspection and maintenance, operational events and experience feedback, design changes and handling of non-conformities, etc.), conditions for the ratification instrument for initial fuel loading and the implementation of the previous nuclear safety inspection requirements, and other nuclear safety related issues.
09/10/2018	Annual non-routine nuclear safety inspection of Fangchenggang NPP unit 3 and unit 4	Implementation of quality assurance system in nuclear island civil construction activities, quality control of concrete construction, analysis and treatment of important construction quality problems, analysis and treatment of welding construction quality problems and quality control of welding construction, etc.

*Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.*

**Table 43. Construction events of Fangchenggang NPP in 2018**

Event Date	Unit No.	Title
07/10/2018	Unit 4	Construction event of apparent quality defects of concrete layer (-5.0~-0.9m) of the containment shell of Fangchenggang NPP unit 4
10/11/2018	Unit 3	Construction event of violation of steel lining welding and non-destructive testing of Fangchenggang NPP unit 3

**Table 44. Occupational Radiation Doses of Fangchenggang NPP in 2018**

Unit	Annual Man Average Effective Dose (mSv)	Annual Maximum Individual Effective Dose (mSv)	Annual Collective Effective Dose (man-Sv)	Normalized Collective Effective Dose (man-mSv/Gwh)
Units 1, 2	0.135	3.588	0.298	0.109

## Sanmen NPP

In 2018, Sanmen NPP was kept in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of the primary circuit pressure boundary, and the leakage rate of the containment were all within the specified limits. The initial fuel

loading approval for unit 1 was issued on April 25, 2018 and its commercial operation began on September 21, 2018. The initial fuel loading approval for Unit 2 was issued on July 4, 2018 and its commercial operation began on November 5, 2018.

Nuclear safety regulatory approvals for Sanmen NPP in 2018 are shown in Table

## Safety Regulation on Nuclear Power Plants

45, and the inspection activities are shown in Table 46. There were 3 operational events occurred in Sanmen NPP, as shown in Table

47, and 2 construction events as shown in Table 48. Occupational radiation doses of Sanmen NPP are shown in Table 49.

**Table 45. Nuclear safety regulatory approvals for Sanmen NPP in 2018**

Approval Date	Document No.	Document Title
02/13/2018	NNSA[2018]53	Notification of Issuing the 2nd Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
04/23/2018	NNSA[2018]112	Notification of Issuing the 3rd Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
04/25/2018	NNSA[2018]125	Notification of Issuing the Ratification Instrument for Initial Fuel Loading of Sanmen NPP Unit 1
06/29/2018	NNSA[2018]165	Notification of Approving the Release of the Control Point of the 1st Criticality of Sanmen NPP Unit 1
07/03/2018	NNSA[2018]170	Notification of Issuing the 5th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
04/07/2018	NNSA[2018]171	Notification of Issuing the Ratification Instrument for Initial Fuel Loading of Sanmen NPP Unit 2
07/31/2018	NNSA[2018]197	Notification of Approving the Release of the Initial Criticality Control Point of Sanmen NPP Unit 2
08/09/2018	NNSA[2018]202	Notification of Approving the Release of the 90% Rated Power (Thermal) Control Point of Sanmen NPP Unit 1
09/28/2018	NNSA[2018]252	Notification of Approving the Release of the 90% Rated Power (Thermal) Control Point of Sanmen NPP Unit 2
06/11/2018	NNSA[2018]293	Notification of Approving the Modification of Some Content of Technical Specification of Sanmen Unit 1 and Unit 2
09/18/2018	NNSA[2018]73	Notification of Acceptance of Quality Assurance Programme (Operation Phase) (Vision I) of Sanmen Unit 1 and Unit 2
04/24/2018	MEE APP[2018]7	Approval Reply on Approving the Environmental Impact Statement (Operation Phase) of Sanmen Unit 1 and Unit 2

**Table 46. Inspection Activities for Sanmen NPP in 2018**

Start Date	Item	Main Contents of the Inspection
06/11/2018	Comprehensive safety inspection before the initial fuel loading of Sanmen NPP unit 2	Preparation before the initial fuel loading of Sanmen NPP unit 2
06/12/2018	Inspection on the initial criticality control point of Sanmen NPP unit 1	Preparation before the initial criticality of Sanmen NPP unit 1

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continued

Start Date	Item	Main Contents of the Inspection
07/23/2018	Inspection on the initial criticality control point of Sanmen NPP unit 2.	Preparation before the initial criticality of Sanmen NPP unit 2
08/06/2018	Inspection on the 90% rated power control point of Sanmen NPP unit 1	Preparation before leaving the 90% rated power platform of Sanmen NPP unit 1
09/25/2018	Inspection on the 90% rated power control point of Sanmen NPP unit 2	Preparation before leaving the 90% rated power platform of Sanmen NPP unit 2

**Table 47. Operational Events of Sanmen NPP in 2018**

Date	Event Description	Cause Analysis	INES Level
08/24/2018	Power loss of DC bus bar when switching to standby train of IDS A of unit 2	Human error	0
09/11/2018	Failure to verify the function of PRHR triggered shutdown during on-site supervision test due to the uncovering of PRHR triggered shutdown logic verification when the version of PMS B logic trigger test procedure for units 1 and 2 was upgraded	Human error	0
22/12/2018	Primary pump 2B inverter output ground protection triggered and caused shutdown of unit 2	Equipment failure	0

**Table 48. Construction Events of Sanmen NPP in 2018**

Date	Unit	Event Description
07/12/2018	Unit 2	PXS-V108B valve was opened accidentally by DCS controller switch problem
05/18/2018	Units 1, 2	Moment of cover nut decreasing of the support of unit 1 and unit 2

**Table 49. Occupational Radiation Doses of Sanmen NPP in 2018**

Unit	Annual Effective Dose Per Person (mSv)	Maximum Annual Individual Dose (mSv)	Annual Collective Dose (man·Sv)	Normalized Collective Dose (man·mSv/Gwh)
Units 1,2	0.005	0.246	9.037	0.002

## Haiyang NPP

In 2018, Haiyang NPP was in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of the primary

circuit pressure boundary, and the leakage rate of the containment were all within the specified limits. The initial fuel loading of unit 1 was completed on June 21, 2018 and its commercial operation began on October 22, 2018. The initial fuel loading of unit 2

## Safety Regulation on Nuclear Power Plants

was completed on August 8, 2018 and the 100% rated power platform was reached on December 2, 2018.

Nuclear safety regulatory approvals for Haiyang NPP in 2018 are shown in Table 50 and the inspection activities are shown

in Table 51. There were 2 operational events occurred, as shown in Table 52, and 1 construction event as shown Table 53.

Occupational radiation doses of Haiyang NPP are shown in Table 54.

**Table 50. Nuclear Safety Regulatory Approvals for Haiyang NPP in 2018**

Approval Date	Document No.	Document Title
05/21/2018	NNSA[2018]146	Notification of Issuing the 4th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
06/21/2018	NNSA[2018]166	Notification of Issuing the Ratification Instrument for Initial Fuel Loading of Haiyang Unit 1
07/27/2018	NNSA[2018]191	Notification of Approving the Release of the Initial Criticality Control Point of Haiyang Unit 1
07/31/2018	NNSA[2018]198	Notification of Issuing the 6th Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
08/07/2018	NNSA[2018]201	Notification of Issuing the Ratification Instrument for Initial Fuel Loading of Haiyang Unit 2
09/14/2018	NNSA[2018]225	Notification of Approving the Release of the 90% Rated Power (Thermal) Control Point of Haiyang Unit 1
09/18/2018	NNSA[2018]238	Notification of Approving the Release of the Initial Criticality Control Point of Haiyang Unit 2
11/30/2018	NNSA[2018]309	Notification of Approving the Release of the 90% Rated Power (Thermal) Control Point of Haiyang Unit 2
07/17/2018	NNSA Letter[2018]57	Notification of Issuing the Nuclear Safety Comprehensive Inspection Report before Initial Fuel Loading for Haiyang Unit 2
06/15/2018	MEE APP[2018]36	Approval Letter on Environment Impact Statement (Operation Phase) of Haiyang NPP Unit 1 and Unit 2

**Table 51. Inspection Activities for Haiyang NPP in 2018**

Start Date	Item	Main Contents of the Inspection
06/18/2018	Inspection on preparation for initial fuel loading of Haiyang NPP unit 1	Preparation before initial fuel loading of Haiyang NPP unit 1
07/02/2018	Comprehensive safety inspection before initial fuel loading of Haiyang NPP unit 2	Preparation before initial fuel loading of Haiyang NPP unit 2

continued

Start Date	Item	Main Contents of the Inspection
07/16/2018	Inspection on control point before initial criticality of Haiyang NPP unit 1.	Preparation before initial criticality of Haiyang NPP unit 1
09/03/2018	Inspection on control point before initial criticality of Haiyang NPP unit 2.	Preparation before initial criticality of Haiyang NPP unit 2

**Table 52. Operational Events of Haiyang NPP in 2018**

Date	Event Description	Cause Analysis	INES Level
08/22/2018	Trigger event of main control room emergency inhabitability system (VES) of unit 2	Human error	0
10/17/2018	S signal automatic trigger event after main feedwater loss of unit 2	Human error	0

**Table 53. Construction Events of Haiyang NPP in 2018**

Date	Unit	Event Description
06/05/2018	Units 1,2	Moment deficiency of tight nut on support of nuclear island systems of unit 1 and unit 2

**Table 54. Occupational Radiation Doses of Haiyang NPP in 2018**

Unit	Annual Effective Dose Per Person (mSv)	Maximum Annual Individual Dose (mSv)	Annual Collective Dose (man·Sv)	Normalized Collective Dose (man·mSv/Gwh)
Units 1,2	0.0033	0.232	0.008	0.002

## Taishan NPP

In 2018, unit 1 of Taishan NPP was in stable operation and in safety state. The three physical barriers were kept intact. The failure of fuel elements, the leakage rate of the primary circuit pressure boundary, and the leakage rate of the containment were all within the specified limits. Initial Fuel Loading of unit 1 began on April 10, 2018 and its commercial operation began on December 13, 2018. Unit

2 entered hot test phase on December 10, 2018.

Nuclear safety regulatory approvals for Taishan NPP in 2018 are shown in Table 55 and the inspection activities are shown in Table 56. There were 12 operational events occurred, as shown in Table 57, and 1 construction event as shown in Table 58. Occupational radiation doses of Taishan NPP are shown in Table 59.

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**Table 55. Nuclear Safety Regulatory Approvals for Taishan NPP in 2018**

Approval Date	Document No.	Document Title
04/10/2018	NNSA[2018]92	Notification of Issuing the Ratification Instrument for Initial Fuel Loading of Taishan NPP Unit 1
05/30/2018	NNSA[2018]153	Notification of Approving the Release of the Initial Criticality Control Point of Taishan Unit 1
02/24/2018	NNSA Letter[2018]14	Letter on Ratification of Commissioning Programme of Taishan NPP Unit 1 and Unit 2
03/20/2018	NNSA Letter[2018]18	Reply Letter on Ratification of Site Emergency Response Plan of Taishan NPP Unit 1 and Unit 2
04/08/2018	MEE APP[2018]4	Approval Reply on Environment Impact Statement of Taishan NPP Unit 1 and Unit 2

**Table 56. Inspection Activities for Taishan NPP in 2018**

Start Date	Item	Main Contents of the Inspection
03/25/2018	Inspection on rectification implementation of nuclear safety inspection management requirements before the initial fuel loading of Taishan NPP unit1	The implementation of the rectification of nuclear safety inspection management requirements before initial fuel loading, the treatment of deviations of safety-significant equipment and system, the preparation for operation, the specification compliance, the implementation of periodic testing, the training of personnel and exercises of fuel loading.
05/22/2018	Nuclear safety inspection before the initial criticality of Taishan NPP unit1.	The commissioning programme progress before the initial criticality, the main commissioning deviations, the application of design change, the preparation before the initial criticality, the implementation of the specification after the initial fuel loading, the implementation of periodic testing and the implementation of previous nuclear inspection requirements.
07/02/2018	Nuclear safety inspection before leaving low power platform of Taishan NPP unit1	The commissioning programme progress before leaving low power platform, the main commissioning and operational deviations, the preparation before leaving low power platform, the implementation of the specification after the initial criticality the implementation of periodic testing, the maintenance management and the implementation of previous nuclear inspection requirements.
08/06/2018	Nuclear safety inspection before leaving 60% power platform of Taishan NPP unit1	The commissioning programme progress before leaving 60% power platform, the main commissioning deviations, the preparation before leaving 60% power platform, the implementation of the specification after leaving low power platform, the implementation of periodic test, the maintenance management, the design change and modification management and the implementation of previous nuclear inspection requirements.

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continued

Start Date	Item	Main Contents of the Inspection
08/21/2018	Event independent evaluation to Taishan NPP unit 1	Root cause analysis and response measures of operational events, including the event of automatic shutdown due to SG secondary high pressure during turbine-off-reactor-on test of unit 1, the event of automatic shutdown due to SG secondary high pressure during 60% power platform linear load test, and so on.

Note: The inspections organized by Regional Office of Nuclear and Radiation Safety Inspection are not included.

**Table 57. Operational Events of Taishan NPP in 2018**

Date	Event Description	Cause Analysis	INES Level
05/30/2018	Unanticipated trigger event by ATWS signal during rod drop test of unit 1	Human error	0
06/27/2018	Automatic shutdown due to auxiliary transformer switch triggered by mistake touch of auxiliary relay (T1GPA1103XB-) of generator and transmission protection of unit 1	Human error	0
07/13/2018	Automatic shutdown due to SG water level high during main feedwater switch of unit 1	Equipment failure	0
07/26/2018	Automatic shutdown due to main/auxiliary transformer switch caused by circuit breaker failure after generator trip test of unit 1	Equipment failure	0
08/09/2018	Automatic shutdown due to SG Secondary High Pressure during Turbine-off-Reactor-on test of unit 1	Human error	0
08/17/2018	Automatic shutdown due to SG Secondary High Level during 60% power platform linear load test of unit 1	Equipment failure	0
08/29/2018	Automatic shutdown due to SG high water level during SG Water Level disturbance test on 10% power platform	Human error	0
09/20/2018	Failure to perform the mitigation measures following the operational technical specification during one train of low pressure safety injection unavailability of unit 1	Management problem	0
09/22/2018	Automatic shutdown due to one main pump blackout during the primary circuit flow test calculated by 80% power platform enthalpy balance of unit 1	Equipment failure	0
10/26/2018	Automatic shutdown due to condenser vacuum increasing after circulation pump stop of unit 1	Equipment failure	0
10/29/2018	Failure to conform with technical specification due to the fire detector in safety fire region of unit 1 wrapped	Human error	0
11/13/2018	Automatic shutdown due to SG water level low caused by APA pump flow exceeding limit during APA RB test on 100% power platform of unit 1	Equipment failure	0

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**Table 58. Construction Events of Taishan NPP in 2018**

Date	Unit	Event Description
09/04/2018	Unit 2	Fire event in the cells (2LAD) of 220V DC power system of nuclear island train 4 during construction of unit 2 without fuel

**Table 59. Occupational Radiation Doses of Taishan NPP in 2018**

Unit	Annual Effective Dose Per Person (mSv)	Maximum Annual Individual Dose (mSv)	Annual Collective Dose (man-Sv)	Normalized Collective Dose (man-mSv/Gwh)
Unit 1	0.0068	0.288	13.533	0.0040

## Huaneng Shidao Bay NPP (HTGR Demonstration Project)

In 2018, Huaneng Shidao Bay NPP (High Temperature Gas-Cooled Reactor Demonstration Project, referred as HTGR Demonstration Project) was in equipment installation and the commissioning phase. On March 30, vessel head and upper internals of first reactor were installed. On July 3, the graphite and carbon internals of second reactor were installed. Reactor pressure vessel, internals, DCS and turbine generators were delivered. The first main helium blower and SG manufacturing were finalized.

Nuclear safety regulatory approvals for HTGR Demonstration Project in 2018 are shown in Table 60 and the inspection activities are shown in Table 61. There were 3 construction events occurred, as shown in Table 62.



*Figure 9. HTGR Demonstration Project Construction Site*



*Figure 10. Tang Bo, Vice Administrator of NNSA, Director General of Department of Nuclear Power Safety Regulation of MEE, Investigated HTGR Demonstration Project*

**Table 60. Nuclear Safety Regulatory Approvals for HTGR Demonstration Project in 2018**

Approval Date	Document No.	Document Title
07/31/2018	NNSA[2018]196	Notification of Approving the Huaneng Shidao Bay NPP HTGR Demonstration Project Maintenance Programme (Version B)

continued

Approval Date	Document No.	Document Title
03/21/2018	NNSA Letter [2018]20	Letter on Ratification of Huaneng Shidao Bay NPP HTGR Demonstration Project Commissioning Programme (Version E)

**Table 61. Inspection Activities for HTGR Demonstration Project in 2018**

Start Date	Item	Main Contents of the Inspection
09/11/2018	Nuclear safety inspection to Huaneng Shidao Bay NPP HTGR Demonstration Project	Quality assurance system operation, design control, construction quality control, commission management, inspection findings action plan following up

**Table 62. Construction Events of HTGR Demonstration Project in 2018**

Date	Event Description
10/25/2018	Fuel ball stuck in main circuit pipeline of fuel handling system
11/09/2018	The fraud event of pipe size of water cooling plate of residual heat removal system
12/08/2018	Nuclear island cables over volume and mixed binding event

## Ningde NPP Unit 5 and Unit 6

On September 2018, the review opinion on siting was issued for Ningde NPP unit 5 and unit 6, and the environment impact statement (siting stage) was approved.

## Zhangzhou NPP Unit 1 and Unit 2

On November 2018, the site safety analysis review report and the environmental impact statement review report of siting stage of Zhangzhou NPP Phase I Project based on HPR1000 (“Hualong-1”) combined technology proposal were approved.

## Taipingling NPP Unit 1 and Unit 2

On December 2018, the environmental impact statement of siting stage of Taipingling NPP Phase I Project based on HPR1000 (“Hualong-1”) combined technology proposal was approved and the review opinions on siting was issued.

## San Ao NPP Unit 1 and Unit 2

In 2018, MEE(NNSA) organized technical review of the application documents for review opinions on siting of San Ao NPP Unit 1 and Unit 2 of China General Nuclear Power Group (CGN) and the environmental impact statement.

# 4 Safety Regulation on Research Reactors

In 2018, there were 19 in-service research reactors and critical assembly, in which 9 were in operation, 1 was safely closed, 4 were in long-term shutdown, and 5 were not in operation (see Table 63). According to the Reporting System for Research Reactor Operating Units, 14 operating events were reported in 2018, none of which caused

adverse consequences to the environment outside the reactor buildings (see Table 64).

In 2018, 2 review opinions on siting were issued and 2 environmental impact statements were approved. Nuclear safety regulatory approvals for research reactors are shown in Table 65.

**Table 63. Operation Status of Research Reactors in 2018**

Facility Name	Design Power	Licensee	Operating Status
101 Heavy Water Reactor (101HWR)	10MW	China Institute of Atomic Energy	Safely closed
China Experimental Fast Neutron Reactor (CEFR)	65MW	China Institute of Atomic Energy	Not in operation
China Advanced Research Reactor (CARR)	60MW	China Institute of Atomic Energy	In operation
49-2 Swimming Pool Reactor (49-2SPR)	3.5MW	China Institute of Atomic Energy	In operation
Miniature Neutron Source Reactor (MNSR)	27kW	China Institute of Atomic Energy	In operation
Miniature Reactor Zero Power Facility (CFMNSR)	—	China Institute of Atomic Energy	In operation
Zirconium Hydride Solid Critical Facility (SSZR)	—	China Institute of Atomic Energy	Long-term shutdown
DF-VI Fast Neutron Criticality Facility (DF-VI CFFR)	—	China Institute of Atomic Energy	Long-term shutdown
Criticality Safety Facility (UCF) for the Spent Fuel Reprocessing Pilot Plant	—	China Institute of Atomic Energy	Not in operation

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Facility Name	Design Power	Licensee	Operating Status
Shielding Experiment Reactor (SER)	1MW	Institute of Nuclear and New Energy Technology of Tsinghua University	Long-term shutdown
5MW Experimental Nuclear Heating Reactor (5MW-NHR)	5MW	Institute of Nuclear and New Energy Technology of Tsinghua University	Not in operation
10MW High Temperature Gas-Cooled Test Reactor (10MW-HTGR)	10MW	Institute of Nuclear and New Energy Technology of Tsinghua University	In operation
High Flux Engineering Test Reactor (HFETR)	125MW	Nuclear Power Institute of China	In operation
High Flux Engineering Test Reactor Experimental Facility (HFETR)	—	Nuclear Power Institute of China	Long-term shutdown
China Burst Reactor (CRP)	1MW	Nuclear Power Institute of China	In operation
Minjiang Test Reactor (MJTR)	5MW	Nuclear Power Institute of China	In operation
18-5 Critical Facility	—	Nuclear Power Institute of China	Not in operation
Miniature Neutron Source Reactor of Shenzhen University (MNSR)	30kW	Shenzhen University	In operation
In-Hospital Neutron Irradiator (IHNI)	30kW	Beijing Capture Technology Co., Ltd	Not in operation

continued

IV

**Table 64. Operating Events of Research Reactors in 2018**

Event Date	Facility Name	Title	Cause	INES Level
01/04/2018	HFETR	Manual shutdown because of potential risk of power loss	Human error	0
04/09/2018	CARR	Cold source device fault signal triggered shutdown	Equipment failure	0
04/20/2018	HFETR	The pool pollution during the element damage inspection outside the reactor	Equipment failure	1
05/18/2018	HFETR	Heat exchanger leakage at the test loop	Equipment failure	0
07/27/2018	HFETR	Power failure of external power supply section II	Equipment failure	0
08/27/2018	MJTR	Unplanned shutdown caused by the intermediate relay failure of 2# main pump control loop	Equipment failure	0

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continued

Event Date	Facility Name	Title	Cause	INES Level
08/28/2018	MJTR	Unplanned shutdown caused by the intermediate relay failure of 2# main pump control loop	Equipment failure	0
08/30/2018	CARR	Emergency bypass flow fluctuation triggered shutdown	Equipment failure	0
09/02/2018	HFETR	Power failure of external power supply section I	Equipment failure	0
09/25/2018	HFETR	Unplanned manual shutdown	Equipment failure	0
11/26/2018	HFETR	The flange gasket leaking at exhaust outlet pipe of heat exchanger primary side	Equipment failure	0
12/02/2018	HFETR	Power failure of external power supply section II	Equipment failure	0
12/03/2018	CARR	The shutdown triggered by the cold source device fault signal caused by the air compressor shutdown	Equipment failure	0
12/21/2018	HFETR	Unplanned manual shutdown	Equipment failure	0

**Table 65. Nuclear Safety Regulatory Approvals for Research Reactors in 2018**

Approval Date	Document No.	Document Title
07/07/2018	NNSA[2018]172	Letter on Approving the Long-Term Shutdown Plans and Management Regulations for the Shielding Experiment Reactor
07/20/2018	NNSA[2018]187	Notification of Issuing the Review Opinion on Siting of the Accelerator Driven Transmutation Research Facility
09/05/2018	NNSA[2018]219	Notification of Approving the Irradiation Experiment of the Zirconium Hydride Material in the 49-2 Swimming Pool Reactor
10/19/2018	NNSA[2018]279	Notification of Approving the Storage of Nigerian Micropiles Reactor Core in the Spent Fuel Preservation Pool of the 49-2 Swimming Pool Reactor
10/23/2018	NNSA[2018]281	Notification of Approving to Carry out Radiation Experiments for Functional Materials of the Breeder Blanket in China Advanced Research Reactor
11/26/2018	NNSA[2018]306	Notification of Approving the Postpone Application for the In-service Test of Helium Safety Valve of the 10MW High Temperature Gas-Cooled Reactor
11/30/2018	NNSA[2018]322	Notification of Issuing the Review Opinion on Siting of the 2MWt Liquid Fuel Thorium-Based Molten Salt Experimental Reactor
05/07/2018	MEE App[2018]10	Approval Reply of Environmental Impact Statement (Siting Stage) of the Accelerator Driven Transmutation Research Facility
11/26/2018	MEE App[2018]121	Approval Reply of Environmental Impact Statement (Siting stage) of the 2MWt Liquid Fuel Thorium-Based Molten Salt Experimental Reactor

## 5 Safety Regulation on Nuclear Fuel Cycle Facilities

In 2018, the in-service facilities for producing, fabricating, storing, and reprocessing nuclear fuel were maintained in safe operation, with good safety records, and the quality of facilities under construction was effectively controlled. The nuclear and radiation safety of nuclear fuel cycle facilities was controllable, and no unacceptable nuclear and radiation harm to personnel, public or environment ever happened. Main facilities are shown in Table 66.

In 2018, there were 9 environmental impact statements approved, 1 construction license and 6 operating licenses issued, and 5 nuclear safety technical modifications approved. The 2018 annual experience exchange meeting about the nuclear fuel cycle facility safety operation was held. The “Safety Requirements for Spent Fuel Reprocessing Facilities (Trial)” was issued. Inspection activities for nuclear fuel cycle facilities in 2018 are shown in Table 67.

**Table 66. Major Civilian Facilities for Producing, Fabricating, and Storing Nuclear Fuel**

Facility/Project Name	Licensee	Product Form	Current Status
Chemical Conversion Dry Fabrication Line	Jianzhong Nuclear Fuel Co., Ltd., CNNC*	UO <sub>2</sub> powder	In operation
Powder Metallurgical Fabrication Line	Jianzhong Nuclear Fuel Co., Ltd., CNNC	UO <sub>2</sub> sintered pellet	In operation
Nuclear Fuel Assembly Fabrication Line	Jianzhong Nuclear Fuel Co., Ltd., CNNC	PWR fuel elements	In operation
IDR Process Research and Equipment Production Line	Jianzhong Nuclear Fuel Co., Ltd., CNNC	UO <sub>2</sub> powder	In operation
Project of Extension and Technical Reformation of Nuclear Fuel Elements Fabrication Line	Jianzhong Nuclear Fuel Co., Ltd., CNNC	PWR nuclear fuel elements	In operation
HWR Nuclear Fuel Elements Fabrication Line	China Northern Nuclear Fuel Co., Ltd., CNNC	HWR nuclear fuel elements	In operation

## Safety Regulation on Nuclear Fuel Cycle Facilities

Facility/Project Name	Licensee	Product Form	Current Status
PWR Nuclear Fuel Elements Fabrication Line	China Northern Nuclear Fuel Co., Ltd., CNNC	PWR nuclear fuel elements	In operation
High Temperature Gas-Cooled Reactor Fuel Elements Fabrication Line	China Northern Nuclear Fuel Co., Ltd., CNNC	High temperature gas cooled reactor sphere fuel	In operation
Extension of PWR Nuclear Fuel Elements Fabrication Line	China Northern Nuclear Fuel Co., Ltd., CNNC	PWR nuclear fuel elements	In operation
AP1000 Nuclear Fuel Elements Fabrication Line	China Northern Nuclear Fuel Co., Ltd., CNNC	AP1000 nuclear fuel elements	In operation
The project of 405-1A	Shaanxi Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
Phase IV Centrifugation Project	Shaanxi Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
North Region Centrifuge Extension Project, Phase I	Shaanxi Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
North Region Centrifuge Extension Project, Phase II	Shaanxi Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
Centrifuge Project	Lanzhou Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
Domestic Centrifuge Commercial Paradigm Project	Lanzhou Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
Uranium Enrichment Project, Phase III	Lanzhou Uranium Co., Ltd., CNNC	Low enrichment UF6	In operation
Temporary Dry Storage Facility for Spent Fuel of Qinshan NPP, Phase III	Nuclear Power Operation and Management Co., Ltd., CNNC	—	In operation

\*CNNC: China National Nuclear Corporation

**Table 67. Inspection Activities for Nuclear Fuel Cycle Facilities in 2018**

Start Date	Activity Item	Main Contents of the Inspection
10/17/2018	Nuclear and Radiation Safety Inspection of Jianzhong Nuclear Fuel Co., Ltd., CNNC*	Nuclear and radiation safety
10/23/2018	Nuclear and Radiation Safety Inspection of China Northern Nuclear Fuel Co., Ltd., CNNC	Nuclear and radiation safety
11/01/2018	Nuclear and Radiation Safety Inspection of Lanzhou Uranium Co., Ltd., CNNC	Nuclear and radiation safety
12/25/2018	Nuclear and Radiation Safety Inspection of Shaanxi Uranium Co., Ltd., CNNC	Nuclear and radiation safety

\*CNNC: China National Nuclear Corporation

## 6 Radiation Environment Regulation on Exploitation and Utilization of Uranium and Naturally Occurring Radioactive Materials

VI

### Administrative Licensing

In 2018, MEE(NNSA) approved the environmental impact statements of 3 uranium mining and metallurgical construction projects

including the uranium and plutonium resource recovery project of the Hunan Monazite Comprehensive Utilization Project, as shown in Table 68.

**Table 68. Regulatory Approvals for Radiation Environment of Exploitation and Utilization of Uranium and Naturally Occurring Radioactive Materials in 2018**

Approval Date	Document No.	Document Title
07/10/2018	MEE App[2018]47	Approval Reply on the Environmental Impact Statement of the Uranium And Plutonium Resource Recovery Project of the Hunan Monazite Comprehensive Utilization Project
07/10/2018	MEE App[2018]48	Approval Reply on the Environmental Impact Statement of the Decommissioning Treatment Project of the 5000-ton Heap Leaching Industrial Test Project for the Guangshigou Uranium Deposit in Shangnan County, Shaanxi Province
09/14/2018	MEE App[2018]88	Approval Reply on the Environmental Impact Statement of the Decommissioning Treatment Project Phase I of the Mine 719 of Ganzhou Jinrui Uranium Co., Ltd., CNNC

### Regulatory Inspections

MEE(NNSA) implemented the relevant provisions of the “Law of the People’s Republic of China on Prevention and Control of Radioactive Pollution” on uranium mining and metallurgy effluent and environmental

monitoring, and organized the China Institute for Radiation Protection reviewing the effluent and environmental monitoring summary report of each uranium mining and metallurgical enterprise in 2017, and then notified the problems. In April and November of 2018, MEE(NNSA) carried out the non-routine

# Radiation Environment Regulation on Exploitation and Utilization of Uranium and Naturally Occurring Radioactive Materials

regulation and inspection to the completion and environmental protection acceptance of 2 uranium mining and metallurgical construction projects.

## Improving Regulations and Standards

MEE(NNSA) accelerated the standards formulation and revision, such as “Technical Guidelines for Environmental Impact Assessment, Uranium Mining and Metallurgy”, “Technical Guidelines for Environmental Impact Assessment, Decommissioning of Uranium Mining and Metallurgy”, “Regulations on Radiation Environmental Protection for Exploitation and Utilization of Rare Earth Mineral Resources” and “Regulations on Radiation Protection and Environmental Protection of Uranium Mining and Metallurgy”. The “Environmental Radiation Monitoring and Information Public Measures for Naturally Occurring Radioactive Materials Exploitation and Utilization Enterprises (Trial)” was issued to regulate the environmental radiation monitoring and information public of naturally occurring radioactive materials exploitation and utilization enterprises.

## Pollution Source Census of Naturally Occurring Radioactive Materials

The pollution source census of naturally occurring radioactive materials (NORM) of the second national pollution source census was

actively promoted. The “Monitoring Technical Provisions for NORM Census of the Second National Pollution Sources Census” and the “Radioactive Solid Materials and Wastes Situation of NORM relevant Enterprises” (Census Form G107) as required in the “Second National Pollution Sources Census System” were formulated. The posters for NORM census were designed, and 2 trainings for NORM census were held in Nanchang and Kunming respectively. MEE(NNSA) supervised and urged every province (autonomous regions and municipalities) to speed up the census, and conducted site instruction on the census form filling and data verification. A list of enterprises exploring or utilizing minerals associated with radionuclides exceeding 1Bq/g was initially formed. MEE(NNSA) also organized every province (autonomous regions and municipalities) to conduct technical review for the quality assurance programme of the census, regulation and inspection for the on-site monitoring quality assurance, inspection for laboratory quality assurance and data verification. The implementation of the work and the progress of the census in every province (autonomous regions and municipalities) were summarized and reported to the census office regularly.

By the end of 2018, the initial survey and detailed investigation of the NORM census were completed, and every work was carried out in an orderly way.

## 7 Safety Regulation on Radioactive Wastes

MEE(NNSA) actively promoted the construction of relevant regulations and standards for radioactive waste safety management, and performed duties on the safety regulation of radioactive waste disposal sites. MEE(NNSA) actively promoted the site selection and construction of low and medium level waste disposal sites, and promoted the treatment and disposal of the historical remaining radioactive wastes. MEE(NNSA) carried out the specific work about investigation and evaluation of present radiation environment around national nuclear bases and nuclear facilities, and carried out the research and development of charging policy for radioactive waste disposal and nuclear facilities decommissioning.

### **Safety Regulation on Construction and Operation of Radioactive Waste Disposal Sites**

In 2018, the Northwest Low-and-Intermediate

Level Waste Disposal Site accepted 10372 waste packages, and the total volume of the waste packages was 3710.26m<sup>3</sup>, with the total radioactivity of 6.05E+13Bq. By the end of 2018, the Northwest Low-and-Intermediate Level Waste Disposal Site had accepted 36408 waste packages, and the total volume of the waste packages was 17347.62m<sup>3</sup>, with the total radioactivity of 6.13E+14Bq.

In 2018, the Guangdong Beilong Low-and-Intermediate Level Waste Disposal Site accepted 252 radioactive waste packages, which were generated by Daya Bay NPP. And the total volume of the waste packages was 100.8m<sup>3</sup>, with the total radioactivity of 1.08E+10 Bq. By the end of 2018, the Guangdong Beilong Low-and-Intermediate Level Waste Disposal Site had accepted 1,904 waste packages, with the total volume of 2,392.04m<sup>3</sup>, and the total radioactivity of 7.95E+13Bq.



*Figure 11. Jiang Guang, Vice Administrator of NNSA, Director General of Department of Radiation Source Safety Regulation of MEE, Led a Team to Investigate and Research the Beishan Underground Disposal Site.*

### Treatment of Left Radioactive Wastes

MEE(NNSA) promoted the treatment and disposal of left radioactive wastes, and strengthened the safety regulation of radioactive waste. In 2018, MEE(NNSA) approved 4 environmental impact assessment documents, and carried out 2 special inspections.

### Formulation and Revision of Relevant Regulations and Standards for Radioactive Waste Management

In 2018, MEE(NNSA) revised and issued 5 national standards, which were “Low-and-Intermediate Level Radioactive Solid Wastes Near-surface Disposal Safety Regulation” (GB9132-2018), “Low-and-Intermediate Level Radioactive Solid Wastes Package Safety Standard” (GB12711-2018), “Low-and-Intermediate Level Radioactive Waste High Integrity Container -Ductile Cast Iron Container” (GB36900.1-2018), “Low-and-Intermediate Level Radioactive Waste High Integrity Container -Concrete Container” (GB36900.2-2018), “Cross linked High Density Polyethylene High Integrity Container for Low-and-Intermediate Level Radioactive Solid Waste” (GB36900.3-2018). MEE(NNSA) is pushing forward the formulation of the Radioactive Waste Disposal Facilities Monitoring and Inspection.

# 8 Safety Regulation on Radioisotopes and Irradiation Devices

Up to December 31, 2018, there were 73,070 organizations producing, selling or using radioisotopes and irradiation devices in China in total. Among them, there were 10,807 organizations producing, selling, or using radioisotopes and 62,263 organizations only producing, selling, or using irradiation devices. The number of the radioactive sources in service had increased to 142,607 (14,192 of category I, 16,697 of category II, 1,730 of category III, and 109,988 of others) and the number of irradiation devices was 181,293. The number of disused radioactive sources accepted by provincial urban radioactive waste repositories was 58,814, and the number of disused radioactive sources transferred to or accepted by the national radioactive sources centralized temporary storage, or recycled by the manufacturers was 143,101.

In 2018, there were 254 organizations producing radioisotopes (except the preparation of Positron Emission Tomography radiopharmaceuticals for self-use), selling or

using radioactive sources of category I (except medical radioactive sources of category I), selling (including installing) or using irradiation devices of category I, and owning the unsealed radioactive material workplaces of class A under the regulation of MEE(NNSA) and the radiation safety of them were all in good status.

## Improve Regulations and Standards

In order to further improve the safety management of radioisotopes and irradiation devices, it was initiated to revise the “Regulations on the Safety and Protection of Radioisotopes and Irradiation Devices”, and the draft amendment was completed and widely consulted. The National Environmental Protection Standard “Radiation Safety and Protection of Electron Accelerator Irradiation Devices” (HJ979-2018) was developed and published. Two standards were promoted to approve the reopinions by the General Group of Nuclear and Radiation Safety Regulations

## Safety Regulation on Radioisotopes and Irradiation Devices

and Standards Reviewing Committee, which were the “Format and Content of the Application Document for Radiation Safety License of Nuclear Technology Utilization Projects” and the “Radiation Safety Requirements for Source Storage Wells of Radioactive Source Producer”.

### Deepening Administration Streamlining and Power Delegating on Nuclear Technology Utilization

In order to implement the spirit of the State Council in alleviating the burden of enterprises and promoting the development of real economy, MEE(NNSA) revised the nuclear technology utilization part of the “Classification Directory of Environmental Impact Assessment for Construction Projects”, in which the environmental impact assessment for the projects of medical institutions using radioactive particle sources for implantation therapy was changed to use registration list. According to the spirit of the document “Notification of Further Exerting the Function of Regional Offices” (NNSA[2018]1), the regional offices shall be responsible for the technical examinations of the renewal of radiation safety licenses and the addition of radiation workplace items, as well as the on-site inspection before the decommissioning of nuclear technology utilization projects. MEE(NNSA) clarified the provincial replied

certificate documents for the exemption of radioisotopes and irradiation devices, and to issue the “Notification of the Exemption Certification Documents for Radioisotopes and Radiological Devices” (the fourth and fifth batches). The irradiation devices, radioactive sources or non-sealed radioactive substances in using or relevant activities after the announcement, the exemption filing certificate documents of them shall be valid nationwide, and no exemption record certificate documents shall be processed one by one.

In order to further normalize the management of radioisotope and irradiation device exemption, MEE(NNSA) published the “Notification of Regulating the Management of Radioisotope and Irradiation Device Exemption Record” (MEE Letter on Radiation [2018] 49) jointly with the General Administration of Customs. MEE(NNSA) also published the “Notification of Further Clarification on Safety Regulation Relevant Issues of Temporary Storage of Radioactive Materials Air Transport” (MEE Letter on Radiation [2018] 44) jointly with the Civil Aviation Administration of China, which clarified that the sites or warehouses established in the control area of civil airports for temporary storage of radioactive materials in the air transport cargos, are subject to civil air transport safety regulation and the ecology and environment authorities will no longer issue radiation safety licenses to airport storage units of radioactive packages.

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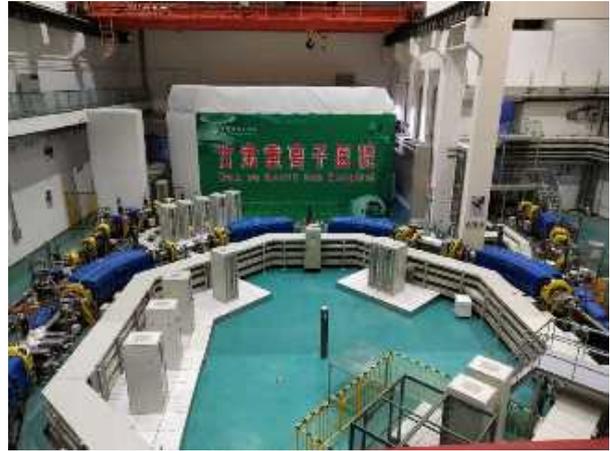
Cooperated with the Ministry of Commerce, MEE(NNSA) promoted the data docking between the national nuclear technology utilization radiation safety management system and the dual-purposes items and technology import licensing system of the Ministry of Commerce, and completed the two-way exchange of single electronic data of the radioactive isotope import approval form, licensing data and customs feedback data. MEE(NNSA) also improved the approval mode, greatly reduce the cost of enterprise regulatory approvals.

## Licensing and Regulatory Inspection

In 2018, radiation safety licenses were issued to 9 nuclear technology utilization organizations. Licenses of 75 organizations were renewed and 5 organizations were re-licensed. Licenses of 35 organizations were added new items and licenses of 54 organizations were modified. The licenses of 8 organizations were partially cancelled and the licenses of 5 organizations were cancelled (see Table 69).

MEE(NNSA) approved 4 organizations' environmental impact statements of decommissioning nuclear technology utilization projects and 9 exemption filing documents from regulation, and issued 2 decisions on ordering the correction of illegal

acts for 2 organizations(see Table 70).



*Figure 12. Gansu Heavy Ion Hospital Co., Ltd. Obtained Radiation Safety License with the First Heavy Ion Therapeutic Device Made in China*

## Review and Approval of Radioisotope Imports and Exports

There were totally 2,031 import and export applications for radioactive sources and unsealed radioactive materials (contained radio-pharmaceuticals and their raw material) approved in 2018, including 1,108 applications for imported radioactive sources and 405 applications for exported radioactive sources respectively. The total number of imported radioactive sources was 6,648, and the total number of exported radioactive sources was 1,129. The total radioactivity of imported unsealed radioactive materials was  $3.47E+16$ Bq, and the total radioactivity of exported unsealed radioactive materials was  $9.07E+16$ Bq.

## Training of Radiation Safety and Radiation Protection

Quality control and on-site oversights for the training courses of radiation safety and protection held by recommended technology supported organizations were undertaken continually to enhance the training quality. In 2018, there were 276 training courses of radiation safety and radiation protection of different levels held by China Institute of Atomic Energy, Tsinghua University, Suzhou University, Sichuan University, Nanhua University, China Institute for Radiation Protection, Radiation Monitoring Technology Center of Ministry of Ecology and Environment, Nuclear and Radiation Safety Center of Ministry of Ecology and Environment, the 8 technology supported organizations. Of which, there were 176 primary classes with 24,851 trainees, 38 intermediate classes with 3,434 trainees, and 62 retraining classes with 7,254 trainees. These courses greatly contributed to improving the quality of the radiation staff in nuclear technology utilization organizations, and to fostering their nuclear safety culture.

MEE(NNSA) continuously promoted the nuclear technology utilization radiation safety regulation to be scientific, institutionalized and refined, and normalized the radiation safety regulation and improved the regulation levels. According to “2018 Ministry of Environmental Protection Training Programme”, 2 training courses on enforcement and approval

of radiation safety in nuclear technology radiation utilization were held. More than 210 radiation safety regulation trainees from provincial ecology and environment authorities participated in the training. In order to upgrade the national nuclear technology utilization radiation safety management system, 1 training course for system administrators was held and more than 110 radiation safety regulation staffs from provincial ecology and environment authorities were trained. One national nuclear technology utilization normative document training course for preaching was held, more than 50 radiation safety regulation staffs from provincial ecology and environment authorities were trained.

## Radiation Accidents

In 2018, there were 3 radiation accidents nationwide, and all of them were ordinary accidents, with no personal injury or environmental pollution. Among them, 1 accident was the theft of 2 radioactive sources, 1 accident was the well falling of 1 radioactive source, and 1 accident was the loss of one radioactive source. All the radioactive sources involved were category IV and V radioactive sources.

## Urban Radioactive Waste Repositories

The urban radioactive waste repositories were all in normal operation in 2018. Through the

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security system upgrading and transformation project, the security and anti-terrorism capability of provincial urban radioactive waste repositories was steadily improved. The security system upgrading and modification projects of 3 urban radioactive waste repositories of Ningxia, Jilin and Tibet had

passed the final acceptance. The upgrading and modification projects of radioactive waste repositories security system of Hunan, Guizhou and Qinghai were moving forward, among which the preliminary acceptances of Guizhou and Qinghai were completed.

**Table 69. List of Approved Radiation Safety Licenses in 2018**

No.	Organization	Type
1	National Institute of Metrology, China	Renewal
2	Nuclear Physics and Chemistry Institute, China Academy of Engineering Physics	Renewal, Partial cancellation
3	Southwestern Institute of Physics, CNNC	Renewal, Partial cancellation
4	China Institute of Atomic Energy	addition
5	Gansu Tianchen Radiation Technology Co., Ltd.	Renewal
6	Dalian Institute of Chemical Physics, Chinese Academy of Sciences	Addition
7	Institute of Nuclear and New Energy Technology of Tsinghua University	Renewal
8	Liaoning Cobalt Radioactive Source Irradiation Device Center	Renewal
9	Radiation Environment Monitoring Station of Xinjiang Uygur Autonomous Region	Renewal
10	The Xinjiang Technical Institute of Physicals and Chemistry, Chinese Academy of Sciences	Renewal
11	Shaanxi Fangyuan Co., Ltd.	Addition, Modification
12	Elekta (Shanghai) Medical Instrument Co., Ltd.	Modification
13	Jilin Ceyuan Biotechnology Co., Ltd.	Addition
14	Shanghai Jixing Irradiation Technology Development Co., Ltd.	Renewal, Modification
15	Shanghai Institute of Applied Physics (Zhangjiang), Chinese Academy of Sciences	Renewal, Addition
16	Chengdu Zhongjin Irradiation Incorporated Company	Renewal, Modification
17	Shenzhen Zhonghe Headway Bio-Sci & Tech Co., Ltd.	Addition
18	Beijing Shuangyuan Radioisotope Technology Co., Ltd.	Modification
19	Institute of Isotope research, Co., Ltd., Henan Academy of Sciences	Modification

## Safety Regulation on Radioisotopes and Irradiation Devices

continued

No.	Organization	Type
20	Shandong Quangang Radiation Technology Co., Ltd.	Addition, Modification
21	Suzhou University	Fresh application, Addition
22	Shenzhen Laerwen Bioengineering Technology Co., Ltd.	Modification
23	Peking University	Addition, Modification, Partial cancellation
24	Wuhan Zhongjin Irradiation Incorporated Company	Renewal, Modification
25	National Institute of Metrology, China	Addition
26	Guangzhou Furui High Energy Co., Ltd.	Renewal
27	Institute of Agricultural Products Processing and Nuclear Agricultural Technology, Hubei Academy of Agricultural Sciences	Renewal
28	Guizhou Academy of Agricultural Sciences	Renewal
29	Xi'an Branch of Guangdong Siai Pharmaceutical Co., Ltd.	Renewal
30	Tongfu (Changchun) CNNC Radiation Technology Co., Ltd.	Modification
31	Nuclear Power Institute of China	Renewal, Addition, Partial cancellation
32	Senke (Beijing) Pharmaceutical Technology Co., Ltd.	Addition, Partial cancellation
33	China Isotope & Radiation Corporation	Addition
34	Shenzhen Laerwen Bioengineering Technology Co., Ltd.	Renewal
35	Guangdong Andike Positron Electronic Technology Co., Ltd.	Modification
36	Shenyang Branch of Nanjing Jiangyuan Andike Positron Electronic Technology Co., Ltd.	Renewal
37	Radiation Environment Monitoring Station of Fujian Province	Modification
38	East China University of Science and Technology	Addition
39	Wuhan High Tech Atomic Pharmaceutical Co., Ltd.	Modification
40	272 Uranium Industry Co., Ltd., CNNC	Modification
41	Gansu Heavy Ion Hospital Co., Ltd.	Fresh application
42	Hefei HTA Co., Ltd.	Fresh application
43	Chengdu New Radiomedicine Technology Co., Ltd.	Fresh application
44	Guangzhou Atom High-Tech Isotope Pharmaceutical Co., Ltd.	Modification

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continued

No.	Organization	Type
45	Institute of High Energy Physics, China Academy Sciences	Addition, Partial cancellation
46	Suzhou CNNC Huadong Radiation Co., Ltd.	Renewal
47	Changzhou Second Electronic Instrument Co., Ltd.	Renewal
48	Anhui Union Radiation Chemical., Ltd.	Renewal
49	Institute of Modern Physics, Chinese Academy Sciences	Renewal, Modification
50	Shenzhen OUR New Medical Technologies Development Co., Ltd.	Modification
51	Zhejiang Radiation Environment Monitoring Station	Renewal
52	Shanghai Changhu New Material Co., Ltd.	Renewal
53	Yantai East Radiation Application Co., Ltd.	Renewal
54	Shanghai Institute of Applied Physics, Chinese Academy of Sciences	Renewal
55	Shandong Radiation Environment Monitoring Station	Renewal
56	Anhui Huajing New Material Co., Ltd.	Renewal
57	Hefei NIPRO Medical Instrument Co., Ltd.	Renewal
58	Shanghai Institute of Measurement and Testing Technology	Renewal
59	Tongxing (Beijing) Nuclear Technology Co., Ltd., CNNC	Renewal
60	Hefei Polymeric Radiation Technology Co., Ltd.	Renewal
61	Hefei Institutes of Physical Science, Chinese Academy of Sciences	Renewal
62	Institute of Isotope, Henan Academy of Sciences	Renewal
63	Shanghai Proton Heavy Ion Hospital Co., Ltd.	Renewal
64	Huashan Hospital Affiliated to Fudan University	Addition
65	Guizhou Radiation Environment Monitoring Station	Modification, Partial cancellation
66	Jining Radiation Co., Ltd.	Renewal
67	Zibo Liyuan High-Tech Radiation Technology Co., Ltd.	Renewal
68	Nanjing Xiyue Radiation Technology Co., Ltd.	Renewal
69	Jiangsu Huayi Technology Co., Ltd.	Renewal
70	Xinghua Meiquan Technology Co., Ltd.	Renewal
71	Fuzhou Branch of Nanjing Jiangyuan Andike Positron Electronic Technology Co., Ltd.	Renewal

## Safety Regulation on Radioisotopes and Irradiation Devices

continued

No.	Organization	Type
72	Beijing Iba-asiapacific Technology Co., Ltd.	Fresh application
73	Zhengzhou Atom High-Tech Co., Ltd.	Renewal
74	Sichuan HTA Co., Ltd.	Addition
75	Yunnan Radiation Environment Monitoring Station	Modification
76	Suzhou CNNC Huadong Radiation Co., Ltd.	Modification
77	Chengdu Gaotong Radioisotope Co., Ltd., CNNC	Renewal, Addition, Modification, Partial cancellation
78	Radiation Technology Pilot Research Base of Shanghai Institute of Atomic Nuclear Research	Modification
79	Shenzhen Haibo Technology Co., Ltd.	Addition
80	Guangdong Junqi Pharmaceutical Technology Co., Ltd.	Renewal, Addition
81	Shanghai Xinke Pharmaceutical Co., Ltd.	Addition
82	Suzhou Branch of Shanghai Xinke Pharmaceutical Co., Ltd.	Addition
83	Beijing North Institute of Biotechnology Co., Ltd.	Addition
84	Hebei Radiation Environment Monitoring Station	Modification
85	Shanxi Radiation Environment Monitoring Station	Modification
86	Dalian Radiation Technology Co., Ltd., CNNC	Modification
87	China Isotope (Changchun) & Radiation Corporation	Modification
88	Siemens Healthcare GmbH	Modification
89	Lanzhou Kejin Taiji Corporation, Ltd	Modification
90	Guangdong Junqi Pharmaceutical Technology Co., Ltd.	Addition
91	University of Science and Technology of China	Addition
92	Nanjing University of Aeronautics and Astronautics	Addition
93	Zibo Wanjie Cancer Hospital	Modification
94	Liaocheng Branch of Nanjing Jiangyuan Andike Positron Electronic Technology Co., Ltd.	Modification
95	Jiangsu Huayi Technology Co., Ltd.	Modification
96	Beijing Sanqiang Nuclear Power and Radiation Engineering Technology Co., Ltd.	Modification
97	Zhejiang Academy of Agricultural Science	Renewal

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continued

No.	Organization	Type
98	Xuzhou High Tech Atomic Pharmaceutical Co., Ltd.	Fresh application
99	Taizhou Radiation Technology Co., Ltd., CNNC	Fresh application
100	Zhejiang Hengdian High Tech Atomic Pharmaceutical Co., Ltd.	Modification
101	Institute of Biotechnology and Nuclear Technology, Sichuan Academy of Agricultural Sciences	Modification
102	Shanghai Kexing Atomic Pharmaceutical Co., Ltd.	Addition
103	Anhui Radiation Environment Monitoring Station	Fresh application
104	Lanzhou Vet Radiation Co., Ltd.	Renewal
105	Corn Research Institute of Heilongjiang Academy of Agricultural Sciences	Renewal, Modification
106	China Nuclear Energy Industry Company	Addition
107	Wuhan Branch of Nanjing Jiangyuan Andike Positron Electronic Technology Co., Ltd.	Renewal
108	Tianjin Jinpengyuan Radiation Technology Co., Ltd.	Modification
109	Jinan High Tech Atomic Pharmaceutical Co., Ltd.	Fresh application
110	Beijing Beike Radiation Technology and Trade Co., Ltd.	Addition
111	National Institute for Radiation Protection, China CDC	Renewal, Modification
112	Shanghai Proton Heavy Ion Hospital Co., Ltd.	Addition
113	Chongqing Atom High-Tech Co., Ltd.	Renewal
114	Guangxi Guilin Zhenghan Radiation Center Co., Ltd.	Renewal, Modification
115	272 Uranium Industry Co., Ltd., CNNC	Renewal
116	Masep Medical Science & Technology Development (Shenzhen) Co., Ltd.	Renewal
117	Guangdong Cyclotron Pharmaceutical Technology Co., Ltd.	Addition
118	Hunan Institute of Nuclear Agriculture and Space Breeding	Renewal
119	Nanning Yuanzi Gaotong Pharmaceutical Co., Ltd.	Fresh application
120	Hebei Andike Positron Electronic Technology Co., Ltd.	Fresh application
121	China Nuclear Energy Industry Company Co., Ltd.	Renewal, Addition
122	Beijing Urban Radioactive Waste Management Center	Renewal, Modification
123	CGNPC Uranium Resources Co., Ltd.	Renewal, Modification
124	Beijing Normal University	Renewal

## Safety Regulation on Radioisotopes and Irradiation Devices

continued

No.	Organization	Type
125	Sichuan Institute of Atomic Energy	Renewal
126	Institute of Beijing Measurement and Testing Sciences	Renewal
127	Siemens Healthcare GmbH	Renewal
128	Institute of Heilongjiang Science and Technology Physics	Renewal
129	Guangxi Zhuang Autonomous Region Radiation Environmental Monitoring Station	Renewal, Modification
130	Shandong Feida Group Radiation Sterilization Co., Ltd.	Renewal
131	Dalian Fuan Radiation New Technology Co., Ltd.	Renewal
132	China Institute for Radiation Protection	Addition
133	Shanxi Huakang Pharmaceutical Co., Ltd.	Renewal
134	Siemens Healthcare GmbH	Addition
135	Nanjing University of Aeronautics and Astronautics	Renewal
136	Nuclear Power Institute of China	Renewal
137	Shanghai Shilong Technology Co., Ltd.	Renewal
138	Jiangxi Radiation Environmental Monitoring Station	Renewal
139	Qinghai Radiation Environmental Monitoring Station	Renewal, Modification
140	Yanjiao Branch of Nanjing Jiangyuan Andike Positron Electronic Technology Co., Ltd	Addition
141	Jiangsu Nuclear and Radiation Safety Monitoring and Management Center	Modification
142	Shanghai Jiangyuan Andike Positron Pharmaceutical Co., Ltd.	Modification
143	Shanghai Xinke Pharmaceutical Co., Ltd.	Modification
144	Elekta (Shanghai) Medical Instrument Co., Ltd.	Renewal, Modification
145	Shaanxi Radioactive Waste Repository and Management Center	Fresh application
146	Beijing BINE Hi-Tech Co., Ltd.	Modification
147	Nuclear and Radiation Safety Center of Ningxia Hui Autonomous Region	Modification
148	The 404 Co., Ltd., CNNC	Modification
149	Xinjiang Institute of Physical and Chemical Technology, Chinese Academy of Sciences	Modification
150	Kunming Longhui Sterilization Technology Development Co., Ltd.	Renewal
151	Guangdong Andike Positron Electronic Technology Co., Ltd.	Fresh application

continued

No.	Organization	Type
152	Liaoning Province Nuclear Safety Agency	Modification
153	Xi'an Eti Medical Technology Co., Ltd.	Renewal
154	Xiian Jiangyuan Andike Positron Electronic Technology Co., Ltd.	Addition
155	Beijing SanQiangHeLi Radiation Engineering Technology Co., Ltd.	Renewal, Modification
156	Tianjin Jiuding Medical Bioengineering Co., Ltd.	Fresh application
157	Tianjin Institute of Technical Physics	Cancellation
158	China National AERO-Technology GuangZhou Company Limited	Cancellation
159	Institute of Agricultural Products Processing, Anhui Academy of Agricultural Sciences	Cancellation
160	Institute of Atomic Energy Applications, Shandong Academy of Agricultural Sciences	Cancellation
161	Shanghai Hexin Radiation Workshop	Cancellation

**Table 70. Environmental Protection Approvals and Acceptance Surveys in the Field of Safety Regulation on Radioisotopes and Irradiation Devices in 2018**

Approval Date	Document No.	Document Title
06/08/2018	MEE App[2018]26	Approval Reply on the Environmental Impact List of the Decommissioning Project of Beijing Normal University Radioactivity Laboratory (Room 126 and 127 of Radiochemical Building)
07/20/2018	MEE App[2018]54	Approval Reply on the Environmental Impact List of the Decommissioning Project of Cobalt Source Irradiation Device of Changchun Institute of Applied Chemistry, Chinese Academy of Sciences.
12/14/2018	MEE APP[2018]139	Approval Reply on the Environmental Impact List of the Decommissioning Project of Irradiation Device of Lanzhou Lvyuan Radiation Co., Ltd
12/14/2018	MEE APP[2018]140	Approval Reply on the Environmental Impact List of the Decommissioning Project of Irradiation Device of Institute of Atomic Energy Utilization, Chinese Academy of Agricultural Sciences
08/20/2018	MEE Regulation[2018]60	Decision on Ordering the Correction of Illegal Acts for Wuhan Yiyang Technology Co., Ltd.
09/14/2018	MEE Regulation[2018]71	Decision on Ordering the Correction of Illegal Acts for Hefei Juhe Radiation Technology Co., Ltd.

## Safety Regulation on Radioisotopes and Irradiation Devices

continued

Approval Date	Document No.	Document Title
02/05/2018	MEE Letter on Radiation[2018]176	Reply Letter on Exempting the Nickel-63 Radioactive Sources in Scion 436-GC and 456-GC Gas Chromatograph of Shanghai Tianmei Scientific Instrument Co., Ltd.
03/22/2018	MEE Letter on Radiation[2018]3	Reply Letter on Exempting the Nickel-63 Radioactive Source in Tracer Gas Quantitative Leak Detector of Dihe Technology (Shanghai) Co., Ltd.
06/08/2018	MEE Letter on Radiation[2018]463	Reply Letter on Exempting the Nickel-63 Radioactive Source in GC-6890 Gas Chromatograph of Tengzhou Tenghai Analytical Instrument Co., Ltd.
07/10/2018	MEE Letter on Radiation [2018]634	Reply Letter on Exempting the Nickel-63 Radioactive Source in the A91 Gas Chromatograph of Changzhou Panna Instrument Co., Ltd.
08/15/2018	MEE Letter on Radiation[2018]839	Reply Letter on Exempting the Nickel-63 Radioactive Source in XJ-BT100 and XJ-BT100-II/III/IV Portable Explosive Drug Chemicals Toxicant Detector of Shenzhen Xinyuan Tong Electronics Co., Ltd.
09/05/2018	MEE Letter on Radiation[2018]945	Reply Letter on Exempting the Nickel-63 Radioactive Source in ITEMISER 3 ENHANCED (IT3E) and MOBILE TRACE (MT) Ion Capture Drift Mass Spectrometer of Zhonghaizhi (Beijing) Technology Co., Ltd.
09/18/2018	MEE Letter on Radiation[2018]1010	Reply Letter on Exempting the Nickel-63 Radioactive Source in 8860 and 8890 Gas Chromatograph of Agilent Technologies (Shanghai), Inc.
10/31/2018	MEE Letter on Radiation[2018]1218	Reply Letter on Exempting the Nickel-63 Radioactive Source in YL6500GC Gas Chromatograph of Jingdian Technology Co., Ltd.
11/30/2018	MEE Letter on Radiation[2018]1411	Reply Letter on the Agreement about Delayed Operation of 105 Irradiation Device in Shanghai Institute of Applied Physics, Chinese Academy of Sciences
11/30/2018	MEE Letter on Radiation[2018]1412	Reply Letter on Exempting the Nickel-63 Radioactive Source in Clarus590 and Clarus690 Gas Chromatograph of PerkinElmer

# 9 Nuclear Material Control and Physical Protection for Nuclear Facility

In 2018, 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, MEE(NNSA) executed its responsibilities for regulatory inspections and technical reviews on nuclear material control and physical protection of nuclear facilities, and responsibilities for nuclear material license verification. MEE(NNSA) continuously enhanced the development of related regulations, standards and guides, and issued nuclear safety guideline “Physical Protection on Nuclear Facilities”.

## Nuclear Material License Verification and Approval

MEE(NNSA) carried out the technical reviews

and site inspections on the nuclear material application documents of Guohe Uranium Industry Development Co., Ltd., Huaneng Shandong Shidaowan Nuclear Power Co., Ltd., Xi’an Guanneng Neutron Detection Technology Co., Ltd., China Ruihua Atomic Energy Technology Co., Ltd., and Hefei Institutes of Physical Science, Chinese Academy of Sciences, and reviewed the evaluation comments of Nuclear Material Control Office of China Atomic Energy Authority (CAEA), and completed the approval procedure.

## Reviews and Inspections on Physical Protection of Nuclear Facilities

MEE(NNSA) organized the reviews on the upgrading and transformation projects of the physical protection systems of Fangjiashan NPP and Fuqing NPP.

## 10 Safety Regulation on Transportation of Radioactive Materials

In 2018, the transportation activities of radioactive materials were safely implemented without occurrence of nuclear and radiation accidents or incidents. To improve the regulatory regulation system, the “Regulations for the Safe Transport of Radioactive Materials” (GB1806) was revised, and the “Outline on Safety Supervision and Inspection of Radioactive Material Transport” and the “Outline on Safety Assessment of Radioactive Material Transport” were compiled. The developments of domestic new fuel assemblies and spent fuel transport container for NPPs were promoted, and the transport for categories II and III radioactive materials, especially for radiopharmaceuticals were standardized.

In 2018, 3 certificates of approval for the design of transport Container for category I radioactive materials and 3 licenses (including 1 change) for the manufacture of transport containers for category I radioactive materials were issued. Eight transport containers designed and manufactured abroad for category I radioactive materials were approved for use in China. Three special forms of radioactive material design were approved. And 22 nuclear and radiation safety analysis reports for the transportation of radioactive materials were approval replied.

In 2018, regulatory approvals in the field of safety regulation on radioactive material transportation are shown in Table 71, and inspection activities are shown in Table 72.

**Table 71. Regulatory Approvals in the Field of Safety Regulation on Radioactive Material Transportation in 2018**

Approval Date	Document No.	Document Title
01/05/2018	NNSA[2018]6	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Imported Cobalt-60 Materials (R7008 Container)

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continued

Approval Date	Document No.	Document Title
01/17/2018	NNSA[2018]15	Notification of Approving the Change of Permit Scope for Manufacturing Radioactive Material Transport Container of Xi'an Nuclear Equipment Co., Ltd.
04/11/2018	NNSA[2018]93	Notification of Approving the Use of F147 Transport Container in the People's Republic of China
04/13/2018	NNSA[2018]97	Notification of Issuing Approval for the Use of ENUN 24P Spent Fuel Transport Container
04/13/2018	NNSA[2018]99	Notification of Issuing Approval for the Design of Special Forms of Radioactive Material for CN-101C Type Cobalt-60 Sealed Radioactive Source
04/13/2018	NNSA[2018]100	Notification of Issuing Approval for the Design of Special Forms of Radioactive Material for CN-101D Type Cobalt-60 Sealed Radioactive Source
04/13/2018	NNSA[2018]101	Notification of Issuing Approval for the Design of Special Forms of Radioactive Material for CN-101E Type Cobalt-60 Sealed Radioactive Source
04/23/2018	NNSA[2018]106	Notification of Issuing Manufacturing License for Transport Container of Radioactive Material of CNNC Jiahua Equipment Manufacturing Co., Ltd.
04/23/2018	NNSA[2018]108	Notification of Issuing Manufacturing License for Transport Container of Radioactive Material of Nantong Zhongji Energy Equipment Co., Ltd..
04/23/2018	NNSA[2018]114	Notification of Approving the Use Limits and Condition Changes for the NAC-STC Spent Fuel Transport Container
05/11/2018	NNSA[2018]138	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transport of RSL2089 Cobalt-60 Radioactive Source
05/11/2018	NNSA[2018]139	Notification of Approving the Increase of the Number of the F-127 Transport Container Used in the People's Republic of China
05/21/2018	NNSA[2018]149	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transport of Cobalt-60 Radioactive Source
05/31/2018	NNSA[2018]155	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transport of Cobalt-60 Industrial Source (IRS-I Container)
05/31/2018	NNSA[2018]156	Notification of Approving the Validity Extension for the Design of ZHQY-QG-001 Transportation Container
06/15/2018	NNSA[2018]161	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Spent Fuel Transportation in Daya Bay and Ling'ao NPPs (Version 2)
07/11/2018	NNSA[2018]181	Notification of Issuing the Design Approval of SY-I Transport Container

## Safety Regulation on Transportation of Radioactive Materials

continued

Approval Date	Document No.	Document Title
07/11/2018	NNSA[2018]182	Notification of Approving the Extension of the Validity Period of the Nuclear and Radiation Safety Analysis Report for the Transportation of UO <sub>2</sub> Pellets from Kazakhstan
07/11/2018	NNSA[2018]183	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Qinshan Cobalt-60 Bar Bundle Module Transportation
07/11/2018	NNSA[2018]184	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Domestic Highway Transportation of Low-enriched Uranium New Fuel of Microreactor
08/13/2018	NNSA[2018]207	Notification of Approving the Extension of the Validity Period of the Nuclear and Radiation Safety Analysis Report for the Transportation of Industrial Cobalt-60 Radioactive Source (R7008 Container)
08/13/2018	NNSA[2018]208	Notification of Approving Extension of the Validity Period of the Nuclear and Radiation Safety Analysis Report for the Transportation of Industrial Cobalt-60 Radioactive Source (F-168 Container)
08/21/2018	NNSA[2018]213	Notification of Approving the Extension of the Validity Period of TK-C5-M Transport Container for Use in the People's Republic of China
08/22/2018	NNSA[2018]214	Notification of Approving the Extension of the Validity Period of TYK-39M1 Transport Container for Use in the People's Republic of China
09/14/2018	NNSA[2018]227	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Transport of Cobalt-60 Radioactive Source (F147 Container)
09/14/2018	NNSA[2018]229	Notification of Approving the nuclear and radiation safety analysis Report for the transport of Cobalt-60 radioactive Source
09/14/2018	NNSA[2018]230	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Transportation of 300 MW Fuel Assemblies (2018-2023)
09/25/2018	NNSA[2018]246	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Domestic Road Transportation of Heat Source Type C Package
10/10/2018	NNSA[2018]271	Notification of Approving the Change of the Limit Value of the Approval for the Use of TK-C57 New Fuel Transport Container of China Institute of Atomic Energy
10/12/2018	NNSA[2018]274	Notification of Approving Nuclear and Radiation Safety Analysis Report (Supplementary Report of Programme Change) for Fuel Assembly Transportation of Tianwan Nuclear Power Station (Russian Supply)
10/18/2018	NNSA[2018]276	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Domestic Road Transportation of Fuel Assembly Samples
10/22/2018	NNSA[2018]283	Notification of Approving the Extension of the Validity Period of the Nuclear and Radiation Safety Analysis Report for Transportation of Tianwan TVS-2M Fuel Assembly

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Approval Date	Document No.	Document Title
11/06/2018	NNSA[2018]291	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Domestic Road Transportation of Medical Co-60 Radioactive Source
11/13/2018	NNSA[2018]298	Notification of Approving the Nuclear and Radiation Safety Analysis Report for Domestic Highway Transportation of High-enriched Uranium Microreactor's Materials
11/30/2018	NNSA[2018]316	Notification of Approving Change of RY-IA Design Approval for Transportation Container
12/24/2018	NNSA[2018]333	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Disused Cobalt-60 Source (F-168/F-168-X Container)
12/24/2018	NNSA[2018]334	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Disused Cobalt-60 Source (FCTC10 Container)
12/24/2018	NNSA[2018]335	Notification of Approving the Nuclear and Radiation Safety Analysis Report for the Transportation of Disused Cobalt-60 Source (GY-20 Container)
11/13/2018	NNSA Letter[2018]93	Notification of Approving the Extension of the Validity Period of the Approval for Us FCC4-V1 New Fuel Transport Container of Taishan Nuclear Power Joint Venture Co. Ltd.

**Table 72. Inspection Activities in the Field of Safety Regulation on Radioactive Material Transportation in 2018**

Start Date	Activity	Main Contents of the Inspection
05/14/2018	Witness on Hydraulic Pressure Test of XN740 Transport Container for Uranium Hexafluoride of CNNC Xinneng Nuclear Engineering Co., Ltd.	Container Witness
07/09/2018	Supervision on Manufactur of NAC-STC Transport Container for Spent Fuel of CGN Uranium Industry Development Co., Ltd. (Hitachi Corporation, Japan)	Container Manufacturing Supervision
08/21/2018	Witness on Drop Test of XN740 Transport Container for Uranium Hexafluoride of CNNC Xinneng Nuclear Engineering Co., Ltd.	Container Witness
09/04/2018	Heat Resistance Tests of XN740 Transport Container for Uranium Hexafluoride of CNNC Xinneng Nuclear Engineering Co., Ltd.	Container Witness
09/27/2018	Regulatory Inspection on Radioactive Material Transportation of Zhongjin Irradiation Co., Ltd.	Transportation Safety Inspection

## Safety Regulation on Transportation of Radioactive Materials

continued

Start Date	Activity	Main Contents of the Inspection
10/10/2018	Regulatory Inspection on Radioactive Material Transportation of CNNC Tongxing (Beijing) Nuclear Technology Co., Ltd.	Transportation Safety Inspection
10/17/2018	Nuclear and Radiation Safety Regulatory Inspection on Nuclear Fuel Assemblies Transportation of CNNC Jianzhong Nuclear Fuel Components Co., Ltd.	Transportation Safety Inspection
11/01/2018	On-site Inspection of Proof Condition for Manufacturing License of XN3000 Transport Container for Uranium Hexafluoride of Lanzhou Uranium Enrichment Co., Ltd. CNNC	Container Manufacturing Supervision
12/14/2018	On-site Inspection on Radioactive Material Transportation Activities of Qingyuan Environmental Technology Engineering Co., Ltd. CNNC	Transportation Safety Inspection
12/29/2018	On-site Inspection on Design and Manufacture of Transport Container for Category II Radioactive Material of Jinke Petroleum Equipment Co., Ltd. in Renqiu City	Container Recording Supervision

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## 11 Regulation on Civilian Nuclear Safety Equipment

### Regulatory Approvals

In 2018, MEE(NNSA) received and reviewed 87 organizations' fresh applications for the civilian nuclear safety equipment license, and approved 120 applications, including 16 applications for fresh license (see Table 73), 39 applications for renewal (see Table 74), and 65 applications for change (see Table 75). By the end of 2018, 205 licenses were issued for the design, manufacture, installation, and

NDT of nuclear safety equipment.

In 2018, 53 applications for registration of civilian nuclear safety equipment import were received and reviewed, of which 30 were approved (see Table 76). By the end of 2018, the total number of foreign organizations holding registration confirmations for design, manufacture or NDT of nuclear safety equipment was 190.

**Table 73. Issuance of Fresh License for Civilian Nuclear Safety Equipment in 2018**

Approval Date	Document No.	Document Title
01/30/2018	NNSA[2018]34	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment of Sichuan Huitong Energy Equipment Manufacture Co., Ltd.
01/30/2018	NNSA[2018]35	Notification of Issuing the Installation License for Civilian Nuclear Safety Equipment of Nuclear Power Engineering Company of China Electric Construction Group
01/30/2018	NNSA[2018]36	Notification of Issuing the Design License for Civilian Nuclear Safety Equipment of Wuxi Branch of the 703 Research Institute of China Shipbuilding Industry Group Corporation
04/23/2018	NNSA[2018]105	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment of China Energy Engineering Group Zhejiang Thermal Power Construction Co., Ltd.
04/23/2018	NNSA[2018]107	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Nantong CIMC Energy Equipment Co., Ltd.

## Regulation on Civilian Nuclear Safety Equipment

continued

Approval Date	Document No.	Document Title
04/23/2018	NNSA[2018]109	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Baoji Titanium Industry Co., Ltd.
04/23/2018	NNSA[2018]34	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Ningxia Orient Tantalum Industry Co. Ltd.
05/11/2018	NNSA[2018]137	Notification of Issuing the Design and Manufacture License for Civilian Nuclear Safety Equipment to Shenzhen Woer Heat-shrinkable Material Co. Ltd.
09/27/2018	NNSA[2018]248	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Taishan Ping'an Hardware Goods Co., Ltd.
09/30/2018	NNSA[2018]261	Notification of Issuing the Design and Manufacture License for Civilian Nuclear Safety Equipment to Henan Senyuan Electric Co., Ltd.
09/30/2018	NNSA[2018]269	Notification of Issuing the Design License for Civilian Nuclear Safety Equipment to Xi'an Shaanxi Diesel Engine Heavy Industry Nuclear Emergency Equipment Co., Ltd.
09/30/2018	NNSA[2018]270	Notification of Issuing the Design and Manufacture Licenses for Civilian Nuclear Safety Equipment to Chongqing Materials Research Institute Co., Ltd.
10/19/2018	NNSA[2018]278	Notification of Issuing the Design and Manufacture License for Civilian Nuclear Safety Equipment to Shenzhen Aotexun Electric Power Equipment Co., Ltd.
11/30/2018	NNSA[2018]317	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Hangzhou Boiler Group Co., Ltd.
11/30/2018	NNSA[2018]318	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Wuxi Chemical Equipment Co., Ltd.
11/30/2018	NNSA[2018]319	Notification of Issuing the Manufacture License for Civilian Nuclear Safety Equipment to Sichuan Chuanguo Boiler Co., Ltd.

**Table 74. Approvals of License Renewal for Civilian Nuclear Safety Equipment in 2018**

Approval Date	Document No.	Document Title
01/29/2018	NNSA[2018]31	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Xingyang Pipe Fittings Co., Ltd.
01/29/2018	NNSA[2018]32	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Huayang Pipe & Fittings Co., Ltd.
02/09/2018	NNSA[2018]46	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Shanghai Electric Nuclear Power Equipment Co., Ltd.

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Approval Date	Document No.	Document Title
02/09/2018	NNSA[2018]47	Notification of Approving Renewal of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Hunan XCEC Changsha Pump Works Co., Ltd.
02/09/2018	NNSA[2018]48	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Dongfang Areva Nuclear Pump Co., Ltd.
02/09/2018	NNSA[2018]49	Notification of Approving Renewal of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Emerson Automation Fluid Control (Shanghai) Co., Ltd.
02/28/2018	NNSA[2018]60	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Dongfang Electric Corporation Dongfang Boiler Co., Ltd.
03/06/2018	NNSA[2018]64	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Sichuan Sanzhou SCMP Nuclear Equipment Manufacture Incorporation
03/21/2018	NNSA[2018]74	Notification of Approving Renewal of the Installation License for Civilian Nuclear Safety Equipment of China Energy Engineering Group Zhejiang Thermal Power Construction Co., Ltd.
03/21/2018	NNSA[2018]75	Notification of Approving Renewal of the Installation License for Civilian Nuclear Safety Equipment of China Nuclear Industry Fifth Construction Co., Ltd.
03/21/2018	NNSA[2018]76	Notification of Approving Renewal of the Installation License for Civilian Nuclear Safety Equipment of China Energy Engineering Group Guangdong Thermal Power Construction Co., Ltd.
03/21/2018	NNSA[2018]77	Notification of Approving Renewal of the Design License for Civilian Nuclear Safety Equipment of Nuclear Power Institute of China
03/21/2018	NNSA[2018]78	Notification of Approving Renewal of the Design License for Civilian Nuclear Safety Equipment of China Nuclear Power Engineering Co., Ltd.
03/21/2018	NNSA[2018]79	Notification of Approving Renewal of the Design License for Civilian Nuclear Safety Equipment of Shanghai Nuclear Power Engineering and Design Institute Co., Ltd.
03/21/2018	NNSA[2018]80	Notification of Approving Renewal of the Design License for Civilian Nuclear Safety Equipment of Shenzhen CGNP Engineering Design Co., Ltd.
03/21/2018	NNSA[2018]81	Notification of Approving Renewal of the Design License for Civilian Nuclear Safety Equipment of Institute of Nuclear and New Energy Technology of Tsinghua University
03/21/2018	NNSA[2018]82	Notification of Approving Renewal of the Design License for Civilian Nuclear Safety Equipment of China Institute of Atomic Energy

## Regulation on Civilian Nuclear Safety Equipment

continued

Approval Date	Document No.	Document Title
04/23/2018	NNSA[2018]111	Notification of Approving Renewal of the Design License and Manufacture License, and Activity Scope Change of the License for Civilian Nuclear Safety Equipment of Shanghai Valve Factory Co., Ltd.
04/23/2018	NNSA[2018]116	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Wuhan Heavy Machinery Casting and Forging Co., Ltd.
04/23/2018	NNSA[2018]117	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Xinhengji Special Equipment Co., Ltd.
04/23/2018	NNSA[2018]118	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Changshu Huaxin Special Steel Co., Ltd.
04/23/2018	NNSA[2018]119	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Shandong Hongda Technology Group Co., Ltd.
04/23/2018	NNSA[2018]124	Notification of Approving Renewal of the Manufacture License and Activity Scope Change of the License for Civilian Nuclear Safety Equipment of Anshan Electromagnetic Valve Co., Ltd.
05/15/2018	NNSA[2018]144	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Hengyang Valin Steel Tube Co., Ltd.
05/15/2018	NNSA[2018]145	Notification of Approving Renewal of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Harbin Electric Corporation Jiamusi Electric Machine Co., Ltd.
07/11/2018	NNSA[2018]178	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Wujin Stainless Steel Pipe Group Co., Ltd.
07/11/2018	NNSA[2018] 179	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Zhejiang Zhongda Special Steel Co., Ltd.
07/31/2018	NNSA[2018]200	Notification of Approving Renewal of the Installation License for Civilian Nuclear Safety Equipment of China Nuclear Industry 23 Construction Co., Ltd.
08/21/2018	NNSA[2018]212	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Wuxi Huaertai Machinery Manufacturing Co., Ltd.
09/21/2018	NNSA[2018]243	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Sichuan Kexin Mechanical and Electrical Equipment Co., Ltd.
09/21/2018	NNSA[2018]244	Notification of Approving Renewal of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Anhui A-Line Electric Pumps Co., Ltd.

continued

Approval Date	Document No.	Document Title
09/21/2018	NNSA[2018]31	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Qingdao Lanshi Heavy Machinery Co., Ltd.
09/30/2018	NNSA[2018]266	Notification of Approving Renewal of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Changchun Kinwa High Technology Co., Ltd.
10/19/2018	NNSA[2018]277	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Wuxi Xinfeng Pipe-fittings Co., Ltd.
11/26/2018	NNSA[2018]300	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Runyang Pipe Fitting Co., Ltd.
11/26/2018	NNSA[2018]301	Notification of Approving Renewal of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Haishi Pump Manufacturing Co., Ltd.
11/26/2018	NNSA[2018]302	Notification of Approving Renewal of the Manufacture License and Activity Scope Change of the License for Civilian Nuclear Safety Equipment of Yangzhou Shuguang Cable Co., Ltd.
11/26/2018	NNSA[2018]303	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Sichuan Huadu Nuclear Equipment Manufacture Co., Ltd.
11/26/2018	NNSA[2018]304	Notification of Approving Renewal of the Manufacture License for Civilian Nuclear Safety Equipment of Shandong Beichen Mechanical and Electrical Equipment Co., Ltd.

**Table 75. Approvals of License Change for Civilian Nuclear Safety Equipment in 2018**

Approval Date	Document No.	Document Title
01/25/2018	NNSA[2018]25	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Dalian Dagao Valve Co., Ltd.
01/25/2018	NNSA[2018]26	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Shentong Valve Co., Ltd.
01/29/2018	NNSA[2018]33	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of Shanghai Electric Recasting Forging Co., Ltd.
04/23/2018	NNSA[2018]120	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Electric Power Equipment Co., Ltd. by Adding Pipeline Straight Pipe Varieties

## Regulation on Civilian Nuclear Safety Equipment

continued

Approval Date	Document No.	Document Title
04/23/2018	NNSA[2018]121	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Shanghai Apollo Machinery Co., Ltd. By Adding Centrifugal Pumps
04/23/2018	NNSA[2018]122	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of Nuclear Power Institute of China by Adding Multi-purpose Small Reactor DC SG
04/24/2018	NNSA[2018]123	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of China First Heavy Industries Co., Ltd. by Adding High Temperature Gas-cooled Reactor Internal Components
04/27/2018	NNSA[2018]126	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Changchun Kinwa High Technology Co., Ltd.
04/27/2018	NNSA[2018]127	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Shangshang Cable Group Co., Ltd.
05/11/2018	NNSA[2018]140	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of CNNC Sufa Technology Industry Co., Ltd. by Adding Explosion Valves
05/30/2018	NNSA[2018]154	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Huaguang Cable and Electrical Equipment Co., Ltd.
09/05/2018	NNSA[2018]220	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of Sichuan Sanzhou SCMP Nuclear Equipment Manufacture Incorporation by Adding Forged Pipe Fittings
09/27/2018	NNSA[2018]249	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of CITIC Heavy Industry Machinery Co., Ltd. by Adding Supporting Forgings
09/27/2018	NNSA[2018]251	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of Jiangsu Wujin Stainless Steel Group Co., Ltd. by Adding Seamless Straight Pipes of Nuclear Safety Lever 1 and Welded Straight Pipes of Nuclear Safety Lever 2 and Lever 3
09/30/2018	NNSA[2018]260	Notification of Approving Activity Scope Change of the Manufacture License for Civilian Nuclear Safety Equipment of CGN Research Institute Co., Ltd.
09/30/2018	NNSA[2018]262	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Sichuan Star Cable Co., Ltd.
09/30/2018	NNSA[2018]263	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of CSIC Special Equipment Co., Ltd.

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continued

Approval Date	Document No.	Document Title
09/30/2018	NNSA[2018]265	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Chuan Kai Electric Co., Ltd.
09/30/2018	NNSA[2018]268	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Anhui Cable Co., Ltd.
10/08/2018	NNSA[2018]267	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Beijing Guangli Nuclear System Engineering Co., Ltd.
10/31/2018	NNSA[2018]289	Notification of Approving Activity Scope Change of the Design License for Civilian Nuclear Safety Equipment of Shaanxi Diesel Engine Heavy Industry Co., Ltd.
11/26/2018	NNSA[2018]305	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Shanghai EHO Valve Co., Ltd.
11/30/2018	NNSA[2018]320	Notification of Approving Activity Scope Change of the Design License for Civilian Nuclear Safety Equipment of Nuclear Power Institute of China
12/29/2018	NNSA [2018]341	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Guangdong ZhengChao Electric Co., Ltd.
01/11/2018	NNSA Letter [2018]5	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of China Erzhong Group (Deyang) Heavy Industries Co., Ltd. and other 3 Enterprises
01/17/2018	NNSA Letter [2018]6	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Shanghai First Machine Tool Works Co., Ltd. and another Enterprise, and Information Change of the Registration Confirmations of Swiss AB Sandvik Materials Technology and another Foreign Enterprise
03/21/2018	NNSA Letter [2018]19	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Shanghai East Heavy Machinery Co., Ltd. and another Enterprise, and Information Change of the Registration Confirmations of French NEW NP SAS and another Foreign Enterprise
04/03/2018	NNSA Letter [2018]27	Notification of Approving Information Change of the Registration Confirmations for Civilian Nuclear Safety Equipment of German FRAMATOME GmbH and American Fisher Controls International LLC.
05/11/2018	NNSA Letter [2018]38	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Wuxi Flange Forging Co., Ltd and other 5 Enterprises, and Information Change of the Registration Confirmations of Thermo Gamma-Metrics LLC and other 3 Foreign Enterprises

## Regulation on Civilian Nuclear Safety Equipment

continued

Approval Date	Document No.	Document Title
05/11/2018	NNSA Letter [2018]39	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Dalian Dagao Valve Co., Ltd and other 2 Enterprises
06/26/2018	NNSA Letter [2018]48	Notification of Approving Design Capability Characteristic Parameters Change of the License for Civilian Nuclear Safety Equipment of Dongfang Electric Co., Ltd.
06/26/2018	NNSA Letter [2018]49	Notification of Approving Design and Manufacture Capability Characteristic Parameters Change of the License for Civilian Nuclear Safety Equipment of Emerson Automation Fluid Control (Shanghai) Co., Ltd.
06/28/2018	NNSA Letter [2018]52	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of China First Heavy Industries Co., Ltd and other 6 Enterprises, and Information Change of the Registration Confirmations of Mitsubishi Electric Corporation and another Foreign Enterprise
06/28/2018	NNSA Letter [2018]53	Notification of Approving Resumption of the Manufacture for Civilian Nuclear Safety Equipment of Guizhou Hangtian Xinli Forging & Casting Co., Ltd.
07/07/2018	NNSA Letter [2018]55	Notification of Approving Design and Manufacture Capability Characteristic Parameters Change of the License for Civilian Nuclear Safety Equipment of Dalian Dagao Valve Co., Ltd.
07/17/2018	NNSA Letter [2018]58	Notification of Approving Design and Manufacture Capability Characteristic Parameters Change of the License for Civilian Nuclear Safety Equipment of Shijiazhuang No.1 Valve Factory Co., Ltd.
09/05/2018	NNSA Letter [2018]69	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Shanghai Electric Machine Factory Co., Ltd. of Shanghai Electric Group and other 7 Enterprises, and Information Change of the Registration Confirmations of VELAN S.A.S and another Foreign Enterprise
09/21/2018	NNSA Letter [2018]77	Notification of Approving Major Subcontracting Projects Change of the Manufacture License for Civilian Nuclear Safety Equipment of Shanghai Kaiquan Pump (Group) Co., Ltd.
09/27/2018	NNSA Letter [2018]78	Notification of Approving Activity Scope Change of the Design License for Civilian Nuclear Safety Equipment of Wuxi Flange Forging Co., Ltd.
09/30/2018	NNSA Letter [2018]80	Notification of Approving Major Procurement Items Change of the Manufacture License for Civilian Nuclear Safety Equipment of Harbin Electric Power Equipment Co., Ltd.
09/30/2018	NNSA Letter [2018]81	Approval Reply Letter on Approving the Subcontract of Check Valve Opening Test for Units 5 and 6 of Hongyanhe NPP of CSIC Special Equipment Co., Ltd.

continued

Approval Date	Document No.	Document Title
10/19/2018	NNSA Letter [2018]82	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Fangda Carbon New Material Technology Co., Ltd. and other 6 Enterprises
10/29/2018	NNSA Letter [2018]85	Notification of Approving Activity Scope Change of the Design and Manufacture License for Civilian Nuclear Safety Equipment of Shanghai Power Equipment Research Institute Co., Ltd.
11/26/2018	NNSA Letter [2018]95	Notification of Approving Major Subcontracting Projects Change of the Manufacture License for Civilian Nuclear Safety Equipment of Lisega Pipeline Bearer Technology (Shanghai) Co., Ltd.
11/26/2018	NNSA Letter [2018]96	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of Chuan Kai Electric Co., Ltd. and other 6 Enterprises
12/29/2018	NNSA Letter [2018]108	Notification of Approving Design and Manufacture Capability Characteristic Parameters Change of the License for Civilian Nuclear Safety Equipment of Shanghai Guanghua Instrument Co., Ltd.
12/29/2018	NNSA Letter [2018]109	Reply Letter on Approving the Manufacture Activity of Nuclear Safety Class 3 Valve Products and Prototypes for High Temperature Gas-cooled Reactor Demonstration Project of Suzhou Neway Valve Co., Ltd. And other 2 Enterprises
12/29/2018	NNSA Letter [2018]110	Notification of Approving Major Subcontracting Projects Change of the Manufacture License for Civilian Nuclear Safety Equipment of Nanjing Duple Metal Equipment Engineering Co., Ltd.
12/29/2018	NNSA Letter [2018]111	Notification of Approving Information Change of the Licenses for Civilian Nuclear Safety Equipment of CNNC Sufa Technology Industry Co., Ltd. and other 5 Enterprises

**Table 76. Approvals of Registration Confirmations for Civilian Nuclear Safety Equipment Activities of Foreign Enterprises in 2018**

Approval Date	Document No.	Document Title
02/24/2018	NNSA[2018]58	Notification of Issuing the Registration Confirmations for Civilian Nuclear Safety Equipment of Foreign Enterprise to German Benning Elektrotechnik und Elektronik GmbH & Co. KG and other 7 Enterprises
04/04/2018	NNSA[2018]88	Notification of Issuing the Registration Confirmations for Civilian Nuclear Safety Equipment of Foreign Enterprise to German AEG Power Solutions GmbH and other 4 Enterprises
05/15/2018	NNSA[2018]143	Notification of Issuing the Registration Confirmations for Civilian Nuclear Safety Equipment of Foreign Enterprise to Romanian VILMAR S.A. and other 2 Enterprises

# Regulation on Civilian Nuclear Safety Equipment

continued

Approval Date	Document No.	Document Title
08/13/2018	NNSA[2018]205	Notification of Issuing the Registration Confirmations for Civilian Nuclear Safety Equipment of Foreign Enterprise to German Schroeder Valves GmbH & Co.KG and other 3 Enterprises
10/19/2018	NNSA[2018]280	Notification of Issuing the Registration Confirmations for Civilian Nuclear Safety Equipment of Foreign Enterprise to Russian EZAN and other 11 Enterprises
12/29/2018	NNSA[2018]340	Notification of Issuing the Registration Confirmations for Civilian Nuclear Safety Equipment of Foreign Enterprise to German KROHNE Messtechnik GmbH and other 4 Enterprises

## Safety Inspections on Imported Equipment

In 2018, MEE(NNSA) took regulatory inspections on the imported nuclear safety equipment in accordance with law, and further standardized and optimized the work process of the safety inspection. There were 527 batches of regulatory inspection application documents (including customs and opening package inspection) submitted by safety inspection declaration enterprises, including 303 batches of mechanical equipment and 224 batches of electrical equipment. In which, 479 batches were signed for releasing, 48 batches were denied, and 73 batches were witnessed.

## Regulatory Inspection on Civilian Nuclear Safety Equipment

In 2018, according to the regulatory inspection programme and plan, MEE(NNSA) took 50 comprehensive inspections (see Table 77) and 7 special inspections (see Table 78) of domestic enterprises, and 1 special inspection of foreign enterprise (see Table 79). MEE(NNSA) timely raised correction requirements for discovered problems in these inspections, and organized experts to review and perform special inspections on major non-conformities affecting nuclear safety. In 2018, the quality of design, manufacture, installation, and non-destructive test of civilian nuclear safety equipment was basically under control.

**Table 77. Comprehensive Inspections on Civilian Nuclear Safety Equipment of Domestic Enterprises in 2018**

Start Date	Inspected Enterprise
10/19/2018	Anhui Line Electric Pump Co., Ltd.
10/19/2018	Hengyang Valin Steel Tube Co., Ltd.

Start Date	Inspected Enterprise
03/12/2018	Shanghai First Machine Tool Factory Co., Ltd.
03/13/2018	Harbin Boiler Company Limited
03/13/2018	Wuxi Xinfeng Pipe-fittings Co., Ltd.
03/19/2018	Zhejiang Sanfang Control Valve Co., Ltd.
03/27/2018	Dongfang Electric (Guangzhou) Heavy Machinery Co., Ltd.
03/27/2018	Jiangsu Haishi Pump Manufacturing Co., Ltd.
03/27/2018	Yangzhou Electric Power Equipment Manufacture Factory Co., Ltd.
03/27/2018	Yangzhou Shuguang Cable Co., Ltd.
04/10/2018	Wuxi Flange Forging Co., Ltd.
04/20/2018	Shanghai Nuclear Engineering Research and Design Institute Co., Ltd.
04/23/2018	Shanghai Electric Nuclear Power Equipment Co., Ltd.
04/23/2018	Shanghai Lianggong Valve Factory Co., Ltd.
04/23/2018	Changzhou Bayi Cable Co., Ltd.
04/23/2018	Nuclear Power Institute of China
04/24/2018	Shanghai Electric-KSB Nuclear Pumps & Valves Co., Ltd.
04/24/2018	Yantai Taihaimanur Nuclear Power Equipment Co., Ltd.
05/14/2018	CSIC Special Equipment Co., Ltd.
05/28/2018	Sunten Electric Equipment Co., Ltd.
05/31/2018	Shenzhen CGNP Engineering Design Co., Ltd.
06/05/2018	Lanzhou LS Heat Exchange Equipment Co., Ltd.
06/12/2018	Dalian Baoyuan Nuclear Equipment Co., Ltd.
06/19/2018	China Nuclear Power Operation Technology Co., Ltd.
06/19/2018	TBEA Shenyang Transformer Group Co., Ltd.
06/25/2018	Sichuan Huadu Nuclear Equipment Manufacturing Co., Ltd.
06/25/2018	Shanghai Foxboro Co., Ltd.
06/25/2018	Hoppecke Power System (Wuhan) Co., Ltd.
07/02/2018	Dongfang Boiler Group Co., Ltd. of Dongfang Electric Group
07/02/2018	Nantong Kunlun Air Conditioning Co., Ltd.

## Regulation on Civilian Nuclear Safety Equipment

continued

Start Date	Inspected Enterprise
07/10/2018	China Nuclear Industry Fifth Construction Co., Ltd. CNNC
07/16/2018	China General Nuclear Inspection Technology Co., Ltd.
07/24/2018	Nantong Dart-Pollrich Fan Co., Ltd.
07/24/2018	Anhui Yingliu Group Huoshan Foundry Co., Ltd.
08/06/2018	Schneider Electric (Xiamen) Switchgear Co., Ltd.
08/21/2018	Harbin Electric Power Equipment Co., Ltd.
08/27/2018	Harbin Electric Power Group (Qinhuangdao) Heavy Equipment Co., Ltd.
08/27/2018	The 718 Research Institute of China Shipbuilding Industry Corporation
09/04/2018	BaoSteel Special Steel Co., Ltd.
09/11/2018	China First Heavy Machinery Co., Ltd.
09/11/2018	Nanfeng Ventilator Co., Ltd.
09/17/2018	Nuclear Power Institute of China
09/25/2018	Dalian Dagao Valve Co., Ltd.
10/22/2018	China Nuclear Power Engineering Co., Ltd.
10/24/2018	Nanjing Duple Metal Equipment Engineering Co., Ltd.
11/05/2018	Shanghai Yuzhang Electric Complete Equipment Co., Ltd.
11/20/2018	Shanghai Electric Recasting Forging Co., Ltd.
11/21/2018	Dalian Shipbuilding Heavy Industry Group Co., Ltd.
12/03/2018	State Nuclear Power Automation System Engineering Co., Ltd.
12/14/2018	Nuclear Industry Engineering Research Design Co., Ltd.

**Table 78. Special Inspections on Civilian Nuclear Safety Equipment of Domestic Enterprises in 2018**

Start Date	Inspected Enterprise
01/12/2018	Shanghai Apollo Machinery Co., Ltd.
05/02/2018	Shandong Beichen Mechanical and Electrical Equipment
06/20/2018	Pangang Group Chengdu Iron and Vanadium Co., Ltd.
07/09/2018	Shanghai Nuclear Power Engineering and Design Institute Co., Ltd.
07/24/2018	Xi'an Nuclear Equipment Co., Ltd.

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continued

Start Date	Inspected Enterprise
10/30/2018	Harbin Electric Corporation Jiamusi Electric Machine Co.,Ltd.
12/06/2018	Shenzhen CGNP Engineering Design Co., Ltd.

**Table 79. Regulatory Inspections on Civilian Nuclear Safety Equipment of Foreign Enterprises in 2018**

Started Date	Inspected Enterprise	Inspection Type
06/05/2018	Swiss Gutor Electronic LLC	Special inspection

# 12 Regulation on Electromagnetic Radiation Environment

### Administrative License

In 2018, the environmental impact statements of 10 electromagnetic radiation construction projects including  $\pm 800$  kV UHV DC transmission project in northern Shaanxi-Hubei were reviewed and approved (see Table 80).

### Improving the Regulations and Standards

In September 2018, the Ministry of Ecology and Environment issued the “Measurement Method for Electromagnetic Radiation Environment of Mobile Communication Base Stations” (HJ972-2018) as No.44 announcement of 2018, which would be implemented since January 1, 2019. MEE(NNSA) organized the formulation and revision of the standards, and there were 3 standards passed the review of the professional group of the Nuclear and Radiation Safety Regulations and Standards Review Conference, including the “Technical Guidelines for Environmental Impact Assessment, Radio and Television”,

“Environmental Protection Rules for Power Transmission and Transformation Construction Projects”, and “Technical Guidelines for Environmental Impact Assessment, Transmission and Transformation”. Another standard, the “Synthetic Electric Field Limits and Monitoring Methods for HVDC Projects” was under formulation.

### Handling Petition Complaints

There were 33 administrative disputes handled properly, including 10 applications for government information publication, 9 petition complaints, 4 administrative reconsiderations, 3 administrative litigations, 5 minister mailbox responses, 1 application for inspection on the administrative enforcement and 1 application for national compensation.

### Organizing Electromagnetic Environment Monitoring Trainings

In April and June 2018, there were 2 trainings

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on electromagnetic environment regulation held in Nanjing and Hengyang respectively. About 160 participants of the ecology and environment authorities from Beijing, Tianjin, Hebei, Inner Mongolia, Shanxi, Liaoning, Jilin, Heilongjiang, Shaanxi, and Gansu provinces (autonomous region or municipality) attended the trainings.

## Adjust the Categories of Environmental Impact Assessment

In order to implement the State Council's

reform spirit to Streamline Administration, Delegate Powers, and Improve Regulation and Services, the categories of environmental impact assessments for electromagnetic radiation construction projects such as radio and television projects were adjusted, and the division principle were adjusted from the transmission power and the number of devices to whether or not environmental sensitive areas were involved. The adjusted contents were approved on the Minister's working meeting in April, 2018, and planned to be issued as the No.1 announcement of MEE in 2019.

**Table 80. Administrative Approval Items in the Field of Electromagnetic Environmental Regulation in 2018**

Approval Date	Document No.	Document Title
01/12/2018	MEE App [2018]7	Approval Reply on the Environmental impact statement on the $\pm 800$ kV UHV DC Power Transmission Project in Northern Shaanxi-Hubei
01/12/2018	MEE App [2018]12	Approval Reply on the Environmental impact statement on the 500 kV Power Transmission and Transformation Project for Beijing East UHV Station
04/04/2018	MEE App [2018]3	Approval Reply on the Environmental impact statement on the Change of DC Power Transmission Project For Power Transmission From Jinsha River Midstream Power Station to Guangxi Province in Yunnan Province
04/23/2018	MEE App [2018]6	Approval Reply on the Environmental impact statement on the Ground Application System Engineering of the Zhongxing 18 Satellite Project
05/21/2018	MEE App [2018]19	Approval Reply on the Environmental impact statement on the Weifang City - Linyi City - Zaozhuang City - Heze City - Shijiazhuang City UHV AC project
06/28/2018	MEE App [2018]43	Approval Reply on the Environmental impact statement on Power Transmission from Wudongde Power Station to Guangdong Guangxi (Kunliulong DC) Power Transmission Project (UHV Multi-terminal DC Demonstration Project)
07/31/2018	MEE App [2018]59	Approval Reply on the Environmental impact statement on the Mengxi - Jinzhong City UHV AC project
11/26/2018	MEE App [2018]119	Approval Reply on the Environmental impact statement on Beijing East - Tongzhou 500 kV Power Transmission and Transformation Project
11/26/2018	MEE App [2018]120	Approval Reply on the Environmental impact statement on Qinghai Province - Henan Province $\pm 800$ kV UHV DC Power Transmission Project
12/07/2018	MEE App [2018]135	Approval Reply on the Environmental impact statement on the Change of 750 kV East of Lanzhou City - Tianshui City - Baoji City Power Transmission and Transformation Project

# 13 Radiation Environmental Monitoring

The project organization and management were strengthened, and the monitoring capability building was vigorously promoted. There were 96 radiation environmental air automatic monitoring stations newly built and 110 stations under construction. Four provinces including Jilin Province, Hubei Province, Hunan Province and Shanxi Province successfully passed the radiation environmental monitoring capability assessment. Except Tibet, the radiation environmental monitoring capabilities of other provincial radiation environmental monitoring agencies were all up to standard. MEE(NNSA) strengthened the operational management of the national control network, formulated and revised technical standards such as the “Technical Specifications for the Operation of Radiation Environmental Air Automatic Monitoring Stations”. MEE(NNSA) improved the notification mechanism for data reporting. The real-time data acquisition rate of the automatic station was stable at over 98%, and the data acquisition rate of sampling analysis increased from 86% to 91%. MEE(NNSA) strengthened the regulatory monitoring of nuclear facilities, and completed the final

acceptance of the monitoring system of Hongyanhe NPP, Haiyang NPP, and Sanmen NPP. MEE(NNSA) also implemented the background investigation of Xiong’an New District and the Northeast Border Area, and studied and standardized the supervised monitoring of nuclear facility effluents, and organized and conducted marine radioactivity monitoring survey.

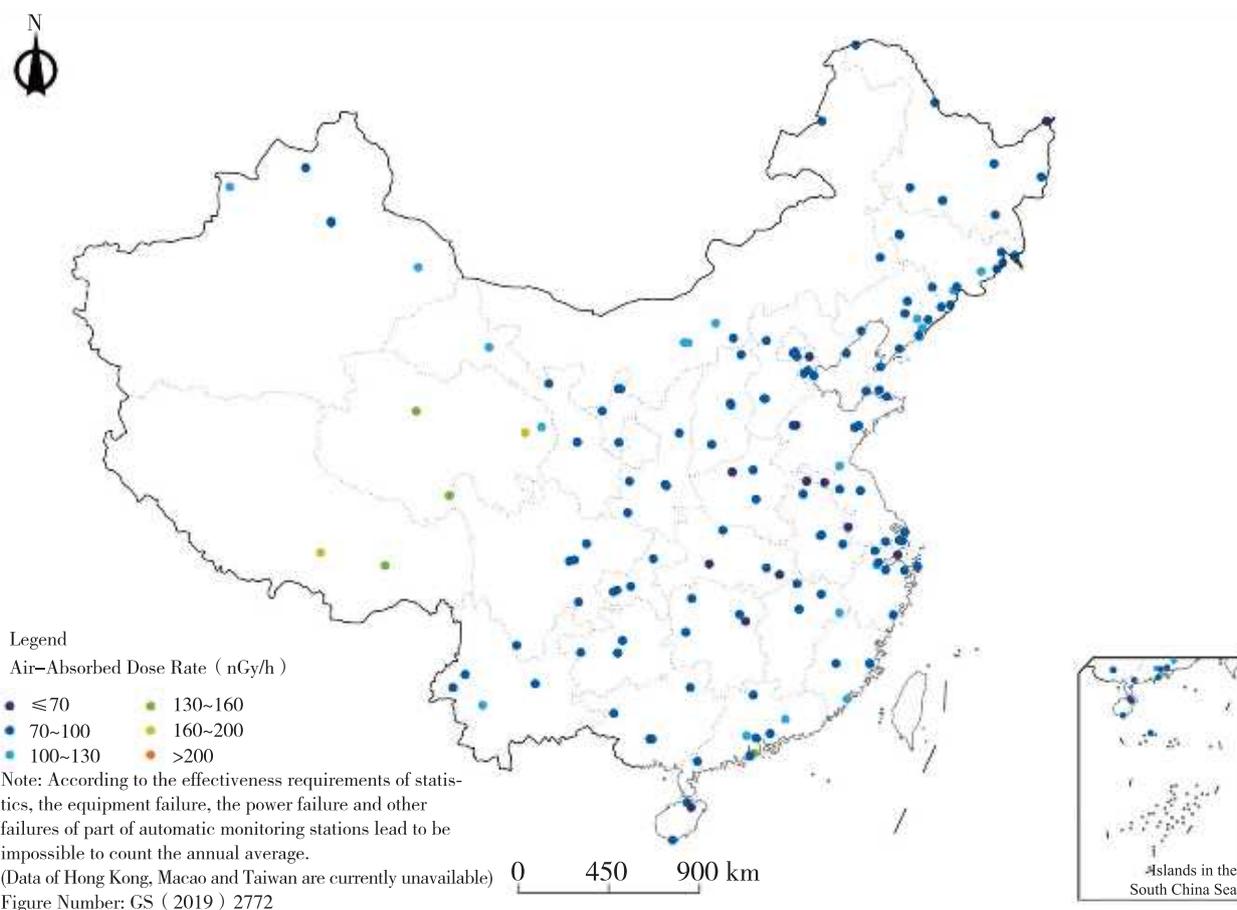
## Ionizing Radiation Environmental Monitoring

In 2018, the nationwide environmental ionizing radiation level was within the range of background fluctuations. The real-time continuous air absorbed dose rate (see Figure 13) and the cumulative dose were in background fluctuation ranges. The activity concentrations of natural radionuclides in the air were at the background level, and no abnormality of the activity concentrations of artificial radionuclides was observed. The activity concentrations of natural radionuclides in the seven major river basins including the Yangtze River, the Yellow River, the Pearl River, the Songhua River,

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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 abnormality of activity concentrations of artificial radionuclides was observed. The activity concentrations of gross  $\alpha$  and gross  $\beta$  in urban centralized drinking water source and underground drinking water were lower than the guidance value specified in the “Standards for Drinking Water Quality” (GB 5749-2006). The activity concentrations of

natural radionuclides in seawater and marine life in coastal waters were at the background level, and no abnormality of the activity concentrations of artificial radionuclides was observed, of which the activity concentrations of artificial radionuclides in seawater (see Figure 14) were significantly lower than the limits specified in the “Sea Water Quality Standard” (GB 3097-1997). The activity concentrations of natural radionuclides in the soil were at the background level, and no abnormality of the activity concentrations of artificial radionuclides was observed.



**Figure 13. Distribution Map of Nationwide Real-Time Continuous Air-Absorbed Dose Rate Monitored by the National Radiation Environmental Automatic Monitoring Stations in 2018**

# Radiation Environmental Monitoring



Figure 14.  $^{90}\text{Sr}$  and  $^{137}\text{Cs}$  Activity Concentrations in Offshore Marine Areas of China in 2018

## Ionizing Radiation Environmental Monitoring around Nuclear Power Bases in Operation

In 2018, the real-time continuous air absorbed dose rate around operating nuclear power bases did not detect anomalies caused by the operation of NPPs. There were no abnormalities in the activity concentrations of artificial radionuclides in the air, water, soil, biological and other environmental media around the Hongyanhe Nuclear Power Base, Ningde Nuclear Power Base, Fuqing Nuclear Power Base, Taishan Nuclear Power Base and Changjiang Nuclear Power Base. The activity concentration of tritium in some environmental media around Tianwan Nuclear Power Base, Qinshan Nuclear Power Base, Daya Bay Nuclear Power Base, Yangjiang Nuclear Power Base and Fangchenggang Nuclear Power Base had increased compared with the background level before the operation of NPPs. The results of the assessment indicated that the radiation doses to the public caused by the operation of the above-mentioned NPPs were all lower than the limits set by the state.

## Ionizing Radiation Environmental Monitoring around Civil Research Reactors

In 2018, the ambient  $\gamma$ -radiation air absorbed dose rate around civil research reactors of Tsinghua University and Shenzhen University

and other civil research reactor operators, and the concentration of artificial radionuclides in aerosols, sediments, water and soil were not abnormal. Trace amounts of artificial radionuclides Cobalt-60 and Iodine-131 were detected in some environmental media around the production research area of the China Institute of Atomic Energy and the China Nuclear Power Research and Design Institute. The assessment results showed that the radiation doses to the public caused by above-mentioned civil research reactors were far below the national limits.

## Ionizing Radiation Environmental Monitoring around Nuclear Fuel Cycle Facilities and Waste Disposal Facilities

In 2018, the ambient environmental  $\gamma$ -radiation air absorption dose rates around nuclear fuel cycle facility operators including Lanzhou Uranium Co., Ltd., CNNC, and Shaanxi Uranium Co., Ltd., CNNC, and China Northern Nuclear Fuel Co., Ltd., CNNC, and Jianzhong Nuclear Fuel Co., Ltd., CNNC, and The 404 Co., Ltd., CNNC, as well as those around the Northwest Low-and-Medium Level Solid Radioactive Waste Disposal Site, and Guangdong Beilong Low-and-Medium Level Solid Radioactive Waste Disposal Site, were within the fluctuation of local natural background level, and the radionuclide activity concentration associated with the

above-mentioned corporate activities in the environmental medium was not abnormal.

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

In 2018, the quality of the radiation environment around uranium mining and milling facilities was generally stable. The ambient environmental  $\gamma$ -radiation air absorption dose rates, air radon activity concentration, total uranium and gross  $\alpha$  concentration in aerosols, and total uranium and radium-226 concentrations in surface water and soil were within the range of historical fluctuations. The concentrations of total uranium, lead-210, polonium-210 and radium-226 in the surrounding drinking water are lower than the corresponding limits of the “Regulations for Radiation and Environmental Protection in Uranium Mining and Milling” (GB 23727-2009).

### **Electromagnetic Radiation Environmental Monitoring**

In 2018, the environmental electromagnetic radiation level of municipalities and provincial capitals was far below the public exposure control limits specified in the “Controlling Limits for Electromagnetic Environmental” (GB 8702-2014). The electromagnetic radiation level of the electromagnetic environment sensitive target around the monitored broadcast and television transmitting facilities and the antenna of mobile communication base stations, and the power frequency electric field strength and the magnetic induction intensity of the electromagnetic environment sensitive target around the transmission line and the substation were all lower than the public exposure control limits specified in the “Controlling Limits for Electromagnetic Environmental” (GB 8702-2014).

# 14 Emergency Management of Nuclear and Radiation Accidents

In 2018, MEE(NNSA) effectively enhanced the regulation of the civilian nuclear facilities emergency preparedness through review and reexamination of the on-site emergency response plans, supervision and evaluation of the conditions of the routine emergency preparation and the on-site comprehensive emergency exercises in accordance with the regulations. MEE(NNSA) continually strengthened its emergency preparation and emergency response capability, and satisfactorily accomplished several nuclear and radiation emergency response tasks.

## Regulation on Nuclear Facility Emergency Preparation

MEE(NNSA) completed the special inspection on the on-site nuclear accident emergency preparedness and supervision and evaluation on the comprehensive emergency exercise before the initial fuel loading of Taishan NPP, systematized the findings in the special inspection and evaluation, and put forward

nuclear safety regulatory requirements. MEE(NNSA) completed supervisions and evaluations on the comprehensive emergency exercises of 9 nuclear power bases such as Yangjiang, Hongyanhe, Tianwan, Haiyang, Sanmen, Daya Bay, Ningde, Qinshan and Fuqing and other nuclear facility operators such as China Institute of Atomic Energy, and The 404Co., Ltd., CNNC, and Jianzhong Nuclear Fuel Co., Ltd., CNNC, and 272 Uranium Industry Co., Ltd., CNNC.

## Approval of Emergency Plans

MEE(NNSA) reviewed and approved on-site emergency plans of the civilian nuclear facilities such as Daya Bay NPP, Yangjiang NPP, Taishan NPP, Jianzhong Nuclear Fuel Co., Ltd., CNNC, and The 404 Co., Ltd., CNNC, and Lanzhou Uranium Enrichment Co., Ltd., CNNC, and Honghua Project (Phase II), and China Northern Nuclear Fuel Co., Ltd., CNNC.

# Emergency Management of Nuclear and Radiation Accidents

## Nuclear and Radiation Emergency Preparedness, Counter-Terrorism and Security

MEE(NNSA) successfully completed the nuclear and radiation emergency preparedness tasks for major events including the 2018 Shanghai Cooperation Organization Summit in Qingdao and the First China International Import Expo.

## Guiding Provincial Ecology and Environment Authorities to Enhance Radiation Accident Emergency Exercises

MEE(NNSA) coordinated and guided the regional offices supervising the 6 Provincial Ecology and Environment Authorities of Zhejiang, Hunan, Liaoning, Ningxia, Sichuan and Tianjin Provinces ( Autonomous Region or Municipality) to carry out comprehensive radiation accident emergency exercises. Through the exercises, the local governments' attentions to radiation accident emergency work were enhanced, and the main responsibilities of the local governments for radiation emergency work were implemented,

with the emergency teams trained, the emergency plans and facilities examined, the emergency response and handling capabilities improved, and the radiation safety regulation further promoted. Meanwhile, through site and video evaluation, the emergency experience exchange between provinces (autonomous region or municipality) was strengthened, with reaching the effects of “replacing training with exercises, point to area, exemplary demonstration and mutual learning”.

## Effectively Maintaining the Emergency Response Capability

MEE(NNSA) continued to carry out sound work on nuclear and radiation accident emergency response. A 24-hour on duty emergency system was implemented, in order to ensure the effective operation and smooth communication of the nuclear and radiation emergency response system. The system of nuclear and radiation emergency decision-making supporting and command dispatching and the emergency monitoring dispatching platform were integrated. Emergency training for nuclear and radiation safety regulation system of MEE was carried out scientifically.

## 15 Personnel Qualification

Implementing the requirements of the “Nuclear Safety Law of the People’s Republic of China”, implementing the State Council’s reform spirit to Streamline Administration, Delegate Power, Strengthen Regulation and Improve Service, MEE(NNSA) organized the formulation and revision of the regulations for the qualification of nuclear facility operators and nuclear safety equipment welding and non-destructive testing (NDT) personnel, clarifying regulatory responsibilities, simplifying the approval process, strengthening regulation both during and after projects, reinforcing the main responsibility of the enterprise, and further promoting the optimization and reform of the qualification management of nuclear safety special personnel. MEE(NNSA) organized the experience feedback on operational events related to NPP operating personnel, promoting risk-informed regulation. The qualification certificates of 3 NDT personnel and 1 welder of China Energy Construction Group Guangdong Thermal Power Engineering Co., Ltd. were revoked according to law, and strict regulation was further strengthened. The cultivation of

nuclear safety culture was promoted to achieve practical results by strengthening the research on the cultivation of nuclear safety culture and learning from the achievements of international nuclear safety culture. To optimize the business training system, MEE(NNSA) improved the top-level design of nuclear and radiation safety regulation business training, and strengthened the basic capacity building of business training, with the 2018 annual business training plan issued.

### Qualification Management of Civilian Nuclear Facility Reactor Operators

In 2018, 4 Civilian Nuclear Facility Reactor Operator Qualification Approval Committee Meetings were held and 12 batches of civilian nuclear facility operator licenses were issued (see Table 81) to 1,399 operators in total, including 1,289 NPP operators and 110 civilian research reactor operators.

Up to December 2018, there were 2,616 people holding NPP operator licenses (see

Table 82), including 1,403 senior operator licenses and 1,213 operator licenses, and 283 people holding research reactor operator

licenses (see table 83), including 161 senior operator licenses and 122 operator licenses.

**Table 81. Regulatory Approvals on Civilian Nuclear Facility Reactor Operator License in 2018**

Approval Date	Document No.	Document Title
01/25/2018	NNSA[2018]23	Notification of Issuing the First Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
02/13/2018	NNSA[2018]53	Notification of Issuing the Second Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
04/23/2018	NNSA[2018]112	Notification of Issuing the Third Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
05/21/2018	NNSA[2018]146	Notification of Issuing the Fourth Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
07/03/2018	NNSA[2018]170	Notification of Issuing the Fifth Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
07/31/2018	NNSA[2018]198	Notification of Issuing the Sixth Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
09/05/2018	NNSA[2018]221	Notification of Issuing the Seventh Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
11/26/2018	NNSA[2018]308	Notification of Issuing the Eighth Batch of Civilian Nuclear Facility Reactor Operator Licenses (NPP) in 2018
01/25/2018	NNSA[2018]24	Notification of Issuing the First Batch of Civilian Nuclear Facility Reactor Operator Licenses (Nuclear Research Reactor) in 2018
04/23/2018	NNSA[2018]113	Notification of Issuing the Second Batch of Civilian Nuclear Facility Reactor Operator Licenses (Nuclear Research Reactor) in 2018
07/31/2018	NNSA[2018]199	Notification of Issuing the Third Batch of Civilian Nuclear Facility Reactor Operator Licenses (Nuclear Research Reactor) in 2018
10/10/2018	NNSA[2018]272	Notification of Issuing the Fourth Batch of Civilian Nuclear Facility Reactor Operator Licenses (Nuclear Research Reactor) in 2018

**Table 82. Statistics of NPP Operator Licenses**

Licensee	Nuclear Facility	Senior Reactor Operators	Reactor Operators	Subtotal
Nuclear Power Operation Management Co., Ltd., CNNC	Qinshan NPP	39	24	63
	Qinshan NPP Phase II Unit 1 and Unit 2	63	30	93
	Qinshan NPP Phase II Unit 3 and Unit 4	66	30	96
	Qinshan NPP Phase III Unit 1 and Unit 2	64	48	112
	Fangjiashan NPP Unit 1 and Unit 2	54	44	98
Daya Bay Nuclear Power Operation and Management Co., Ltd.	Daya Bay NPP Unit 1 and Unit 2	79	35	114
	Ling'ao NPP Unit 1 and Unit 2	77	43	120
	Ling'ao NPP Unit 3 and Unit 4	82	30	112
Jiangsu Nuclear Power Co., Ltd.	Tianwan NPP Unit 1 and Unit 2	60	68	128
	Tianwan NPP Unit 3 and Unit 4	57	38	95
Fujian Ningde Nuclear Power Co., Ltd.	Ningde NPP Unit 1 and Unit 2	66	38	104
	Ningde NPP Unit 3 and Unit 4	49	41	90
Liaoning Hongyanhe Nuclear Power Co., Ltd.	Hongyanhe NPP Unit 1 and Unit 2	79	48	127
	Hongyanhe NPP Unit 3 and Unit 4	68	63	131
Yangjiang Nuclear Power Co., Ltd.	Yangjiang NPP Unit 1 and Unit 2	55	43	98
	Yangjiang NPP Unit 3 and Unit 4	72	34	106
	Yangjiang NPP Unit 5 and Unit 6	33	27	60
Fujian Fuqing Nuclear Power Co., Ltd.	Fuqing NPP Unit 1 and Unit 2	51	62	113
	Fuqing NPP Unit 3 and Unit 4	45	61	106
Guangxi Fangchenggang Nuclear Power Co., Ltd.	Fangchenggang NPP Unit 1 and Unit 2	73	65	138
Hainan Nuclear Power Co., Ltd.	Changjiang NPP Unit 1 and Unit 2	45	68	113
Sanmen Nuclear Power Co., Ltd.	Sanmen NPP Unit 1 and Unit 2	42	80	122
Shandong Nuclear Power Co., Ltd.	Haiyang NPP Unit 1 and Unit 2	42	125	167
Taishan Nuclear Power Joint Venture Co. Ltd.	Taishan NPP Unit 1 and Unit 2	42	68	110
<b>Total</b>		<b>1403</b>	<b>1213</b>	<b>2616</b>

**Table83. Statistics of Civilian Research Reactor Operator Licenses**

Licensee	Nuclear Facility	Senior Reactor Operators	Reactor Operators	Subtotal
China Institute of Atomic Energy	49-2 Swimming Pool Reactor	4	8	12
	DF-VI Fast Neutron Criticality Facility	1	3	4
	Reprocessing Pilot Plant Uranium Solution Criticality Facility	5	3	8
	Miniature Reactor Zero Power Facility	5	3	8
	China Experimental Fast Neutron Reactor	41	18	59
	China Advanced Research Reactor	5	18	23
	Miniature Reactor Zero Power Facility	15	7	22
Nuclear Power Institute of China	High Flux Engineering Test Reactor	24	17	41
	Minjiang Test Reactor	10	11	21
	China Burst Reactor	6	4	10
	High Flux Engineering Test Reactor	5	2	7
	18-5 Critical Facility	8	3	11
Institute of Nuclear and New Energy Technology of Tsinghua University	5MW Experimental Low Temperature Nuclear Heating Reactor	17	7	24
	10MW High Temperature Gas-Cooled Test Reactor	14	13	27
	Shielding Experimental Reactor	1	2	3
Shenzhen University	Shenzhen Miniature Reactor	0	3	3
<b>Total</b>		<b>161</b>	<b>122</b>	<b>283</b>

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

In 2018, 2 batches of civilian nuclear safety equipment Non-destructive Testing (NDT) personnel examination plans were published.

MEE(NNSA) organized 5 NDT personnel examination centers to hold 100 batches examinations, and issued 8 batches of civilian nuclear safety equipment NDT personnel qualification certificates (see Table 84), approving 1,877 people and 2,437 items. Up to December 2018, a total of 6,194 people held 13,329 civilian nuclear safety equipment

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NDT qualification certificates, including 300 advanced (level III) certificates, 11,123 intermediate (level II) certificates, and 1,906 primary (level I) certificates.

According to the regulatory inspection programme and work plan, MEE(NNSA)

carried out 3 comprehensive inspections and 9 on-site witness inspections to the 5 civilian nuclear safety equipment NDT personnel examination centers and timely put forward rectification requirements for the problems found in the regulatory inspections.

**Table84. Regulatory Approvals on Civilian Nuclear Safety Equipment NDT Personnel Qualification in 2018**

Approval Date	Document No.	Document Title
05/04/2018	NNSA [2018]133	Notification of Issuing the First Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
06/15/2018	NNSA [2018]163	Notification of Issuing the Second Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
07/27/2018	NNSA [2018]192	Notification of Issuing the Third Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
08/24/2018	NNSA [2018]216	Notification of Issuing the Fourth Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
09/19/2018	NNSA [2018]240	Notification of Issuing the Fifth Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
10/29/2018	NNSA [2018]284	Notification of Issuing the Sixth Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
11/29/2018	NNSA [2018]311	Notification of Issuing the Seventh Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018
12/27/2018	NNSA [2018]338	Notification of Issuing the Eighth Batch of Certificates for Non-destructive Testing Personnel of Civilian Nuclear Safety Equipment in 2018

## Qualification Management of Welder and Welding Operators of Civilian Nuclear Safety Equipment

In 2018, MEE(NNSA) issued 2 batches of examination plans for welder and welding operators of civilian nuclear safety equipment, and organized 15 civilian nuclear safety

equipment welder and welding operator examination centers to hold 17 basic theoretical knowledge examinations and 153 item examinations. Ten batches of civilian nuclear safety equipment welder and welding operator qualification certificates (see table 85) were issued throughout the year, with 2,979 persons and 8,094 items approved. As of December 2018, a total of 9,669 people

held 23,304 welder and welding operator qualification certificates of civilian nuclear safety equipment.

According to the regulatory inspection programme and work plan, MEE(NNSA) carried out 3 comprehensive inspections

and 18 on-site witness inspections to the 15 civilian nuclear safety equipment welder and welding operator examination centers and timely put forward rectification requirements for the problems found in the regulatory inspections.

**Table85. Regulatory Approvals on Civilian Nuclear Safety Equipment Welder and Welding Operator Qualification in 2018**

Approval Date	Document No.	Document Title
02/09/2018	NNSA [2018]50	Notification of Issuing the First Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
03/29/2018	NNSA [2018]87	Notification of Issuing the Second Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
05/04/2018	NNSA [2018]132	Notification of Issuing the Third Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
06/15/2018	NNSA [2018]164	Notification of Issuing the Fourth Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
07/27/2018	NNSA [2018]193	Notification of Issuing the Fifth Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
08/24/2018	NNSA [2018]217	Notification of Issuing the Sixth Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
09/19/2018	NNSA [2018]241	Notification of Issuing the Seventh Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
10/29/2018	NNSA [2018]285	Notification of Issuing the Eighth Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
11/29/2018	NNSA [2018]310	Notification of Issuing the Ninth Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018
12/27/2018	NNSA [2018]339	Notification of Issuing the Tenth Batch of Certificates for Welders and Welding Operators of Civilian Nuclear Safety Equipment in 2018

### The Qualification Management of Registered Nuclear Safety Engineer

In 2018, a total of 1,825 applicants applied

for the National Unified Examination for Registered Nuclear Safety Engineer Qualification, 1,174 applicants actually took the examination and 251 applicants obtained the Registered Nuclear Safety Engineer

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Qualification. In the whole year, MEE(NNSA) completed 3 batches of the registration of nuclear safety engineers (see table 86), and approved 547 applications, including 281 new registrations, 264 renewals of registration and 2 changes of registration field.

By the end of December 2018, a total of 4,293 people nationwide had obtained the certificates of the Registered Nuclear Safety Engineer Qualification, and 2,137 registered

nuclear safety engineers were working in 246 units. A total of 948 persons were trained in 10 training courses on nuclear safety, including 203 persons who attended 2 trainings on nuclear quality assurance and nuclear safety culture, 311 persons who attended 3 radiation protection trainings, 250 persons who attended 3 trainings on nuclear emergency and nuclear security, and 184 persons who attended 2 trainings on nuclear safety law.

**Table86. Regulatory Approvals on Registered Nuclear Safety Engineer Qualification in 2018**

Approval Date	Document No.	Document Title
03/06/2018	NNSA [2018]63	Notification of Publishing the List of Persons Approved for Registration and Renewal of Registration of the First Batch of Registered Nuclear Safety Engineers in 2018
08/13/2018	NNSA [2018]204	Notification of Publishing the List of Persons Approved for Registration, Renewal of Registration and Change of Registration Field of the Second Batch of Registered Nuclear Safety Engineers in 2018
11/26/2018	NNSA [2018]307	Notification of Publishing the List of Persons Approved for Registration and Renewal of Registration of the Third Batch of Registered Nuclear Safety Engineers in 2018

## Nuclear and Radiation Safety Regulatory Inspection Personnel Training

The business training of the regulatory system was optimized, through further developing the comprehensive technical support role of the Nuclear and Radiation Safety Center, improving the top-level design, and strengthening resource integration. MEE(NNSA) organized to record the video training materials of the business training

course and opened the training information module of the National Nuclear Safety Administration Knowledge Management System to improve the information level of training and strengthen the basic capacity building of training.

In 2018, one batch of NNSA Nuclear Safety Primary Training Class and one batch of Nuclear Power Training Class (Nuclear and Radiation Safety Intermediate Training Class) were held, with 63 participants. Up

## Personnel Qualification

to December 2018, MEE(NNSA) had held 9 batches of NNSA Nuclear Safety Primary Training Classes, with 461 participants obtaining certificates of completion; 10 batches of Nuclear Power Training Classes (Nuclear and Radiation Safety Intermediate Training Classes), with 313 participants obtaining certificates of completion; and 9 batches of Provincial Radiation Safety

Regulatory Personnel Training Classes, with 306 participants obtaining certificates of completion. MEE(NNSA) had held jointly with Tsinghua University 6 batches of postgraduate classes for Master Degree of Engineering on radiation protection and environmental protection in the field of nuclear energy and nuclear technology engineering, and there had been 162 students in total.

# 16 International Cooperation

## Implementing Leaders' Propose to Participate in Global Nuclear Governance

In January 2018, Liu Hua, Vice Minister of MEE and Director-General of NNSA, attended the unveiling ceremony of the world's first EPR reactor project in Taishan, which were jointly unveiled by the heads of state of China and France. In March 2018, the 5th Asia-Europe Meeting (ASEM) Seminar on Nuclear Safety was co-sponsored by MEE(NNSA) and the Ministry of Foreign Affairs of China, Liu Hua attended the meeting and delivered a speech, and more than 200 people from 20 Asian and European member countries attended the meeting. MEE(NNSA) also participated in many other important mechanisms such as the Third China-United States Nuclear Security Dialogue and the Global Initiative to Combat Nuclear Terrorism (GICNT) Meeting, and organized the meetings and activities of the Fifth Working Group under the framework of Peaceful Uses of Nuclear Technology (PUNT) between China and the United States, which actively publicized and promoted China's nuclear safety regulatory

system and achievements on radiation source safety regulation.

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

MEE(NNSA) actively fulfilled the obligations of international conventions. In May 2018, Liu Hua, Vice Minister of MEE and Director-General of NNSA, led a Chinese government delegation to attend the Sixth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention), 7 practices of China were recognized as good practices and worth promoting in international counterparts. International Atomic Energy Agency Joint Convention Newsletter reported in particular on the "three-in-one talent training model for enterprises, universities and research institutes" in China. A new National

Report Editorial Committee of “the Convention on Nuclear Safety” was set up and actively preparing for the next round of review.



*Figure 16. Liu Hua, Vice Minister of MEE and Director-General of NNSA, Led a Chinese Government Delegation to Attend the Sixth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.*

### Nuclear Safety and Nuclear Power “Going Abroad”

Jointly with Ministry of Finance, MEE(NNSA) reported the progress of the HPR1000 Working Group to the State Council. MEE(NNSA) hosted the 33rd Meeting of Steering Technical Committee (STC) of Multinational Design Evaluation Programme (MDEP), and successfully convened 2 meetings of the HPR1000 Working Group, on which a technical sub-group was set up to share regulatory experience with international counterparts and enhance the confidence of the international community. In October 2018, Liu Hua, Vice Minister of MEE and Director-General of NNSA, chaired the 2nd meeting of China-U.K. Steering Committee

on Nuclear Safety Cooperation, which strongly promoted the cooperation of China with the other key parties within the group. MEE(NNSA) proposed MDEP to publish comprehensive technical reports to promote the unification of regulatory consensus. It laid the foundation for the international recognition of the achievements of our working group. In 2018, 85 nuclear and radiation safety regulations and guidelines of China were translated into English, and a series of “going abroad” training materials were compiled and published. The important information on international nuclear safety were collected and compiled in time, and 18 issues of the “Global Nuclear Safety Information Briefing” were published.

### Deepening Bilateral and Regional Cooperation and Striving for Practical Results

The cooperation with the countries along the “Belt and Road” on nuclear safety were strengthened. A Memorandum of Understanding (MOU) on Nuclear Safety Cooperation with the United Arab Emirates was signed. The first China-Czech Meeting on Nuclear Safety Cooperation and the first China-Vietnamese Meeting on Nuclear Safety Cooperation were held. The 10th China-Pakistani Steering Committee Meeting on Nuclear Safety Cooperation was held in Pakistan. And regulators from British, Pakistani and Czech were received

to China for exchange of experience. The implementations of the agreements were firmly promoted. All of these activities played an important role in promoting China's nuclear safety regulatory system to the World.

The cooperation with the developed countries producing nuclear power was steadily promoted. The nuclear safety cooperation agreement with the United States was renewed and the activities under the framework of the Peaceful Uses of Nuclear Technology between China and the United States were actively participated in. MEE(NNSA) attended the sub-committee on nuclear issues of the Regular Meeting between Chinese and Russian Prime Ministers, and hosted the 3rd China-German Nuclear Safety Dialogue. There were 30 people organized to attend 15-day training courses in the United States and Italy respectively, and one person recommended to participate in 3-month exchange visit to the Ministry of Education, Culture, Sports, Science and Technology of Japan. Three American supervisors were invited to visit China for exchanges, and three Chinese supervisors were selected to visit France for exchanges.

MEE(NNSA) continuously maintained the regional stability and promoted important scientific and technological cooperation. The mechanism of regional nuclear safety cooperation between China-Japan-ROK was

maintained, and the senior officials' meeting on nuclear safety between China-Japan-ROK was attended. MEE(NNSA) continuously tracked DPRK nuclear issue and Fukushima accident. The second phase of China-EU nuclear safety cooperation project was implemented effectively, and achieved the expected results through close exchanges and interaction between technicians of both sides. The third phase of China-EU nuclear safety cooperation was launched smoothly and a new win-win situation was formed.

### Consolidating Multilateral Cooperation and Maintaining and Improving China's Influences

On cooperation with IAEA, MEE(NNSA) attended the IAEA General Conference and the Senior Regulators' Meeting, completed the general election of members of the Safety Standards Committee and its sub-committees, participated in various important mechanisms such as the Global and Asian Nuclear Safety and Security Network (GNSSN) and the Regulatory Cooperation Forum (RCF). China was playing an active role in IAEA safety standards formulation, capacity-building and technology fields. A total of 50 people attended 28 times of IAEA's activities in 2018. To implement the national policy of promoting outstanding talents to work in international organizations, two persons were recommended to work in IAEA for one year.

## International Cooperation

On cooperation with the OECD Nuclear Energy Agency (NEA), MEE(NNSA) received two visits from the Director-General of the OECD NEA, attended the Policy Group Meeting of MDEP, completed the replacement of members of the Committee on Nuclear Regulatory Activities (CNRA) and the

Committee on the Safety of Nuclear Facilities (CSNI), hosted AP1000 and EPR Working Group meetings, and participated deeply in the activities of the other working groups. A total of 41 people attended activities of NEA and MDEP for 15 times in 2018.

## 17 Memorabilia

On January 1, 2018, “the Nuclear Safety Law of People’s Republic of China” officially came into force.

On January 9, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, attended the opening ceremony for unit 1 of Taishan NPP, Guangdong Province, as the first EPR nuclear reactor in the world.

On January 10, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Fontana, the CEO of AREVA, in Beijing. China and France exchanged opinions on topics of common concern such as nuclear safety.

On February 2, 2018, the operating licenses for Hongyanhe NPP unit 1 and unit 2 in Liaoning Province were issued.

On February 5, 2018, Tang Bo, the Vice Administrator of NNSA, the Director General of the Nuclear Power Safety Regulation Department, MEE, met the delegation led by Dr. Cayce McCarthy, Vice-President of Research & Development, Canadian Nuclear

Laboratories, in Beijing.

On February 14, 2018, the operating licenses for Yangjiang NPP unit 1 and unit 2 were issued.

On February 24, 2018, the operating licenses for Fangjishan NPP unit 1 and unit 2 were issued.

On February 26, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. William D. Magwood, the Director-General of the OECD NEA. Both sides exchanged opinions on topics of common concern, such as nuclear safety cooperation.

In February, 2018, the special team for Long’an Programme was initiated. The team carried out a survey on reprocessing status and regulation countermeasures from April to October.

On March 9, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, met the delegation led

by Mr. Khaled Toukan, Chairman of Jordan Atomic Energy Commission, in Beijing.

From March 12 to 17, 2018, Zhou Shirong, the Deputy Director-General of Nuclear Power Safety Regulation Department, MEE, led the delegation to the United States for the U.S. Nuclear Regulatory Commission's (NRC) 30th Annual Regulatory Information Conference (RIC).

From March 26 to 27, 2018, the first meeting of HPR1000 Working Group of MDEP was held. Hao Xiaofeng, the Deputy Director-General of Nuclear Power Safety Regulation Department, MEE, was elected as the chairman of the Group.

On March 27, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Zaheer Ayub Baig, the Chairman of Pakistan Nuclear Regulatory Authority. They exchanged opinions on topics of common concern, such as nuclear safety regulation cooperation between China-Pakistan.

On March 27, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Juan Carlos Lentijo, the Deputy Director-General of IAEA. They exchanged opinions on topics of common concern such as nuclear safety.

On March 28, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, attended the opening ceremony of the 5th ASEM

Seminar on Nuclear Safety in Beijing and made remarks.

On March 29, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Pham Cong Tac, the Vice Minister, Ministry of Science and Technology of Vietnam. They exchanged opinions on topics of common concern, such as China- Vietnam cooperation on nuclear safety regulation.

On April 9, 2018, the ratification instrument for initial fuel loading of Taishan NPP unit 1 was issued.

From April 10 to 14, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, went to Daya Bay NPP, Taishan NPP, and Yangjiang NPP to carry out surveys on operation safety regulation improvement for NPPs.

On April 17, 2018, the ratification instrument for initial fuel loading of Yangjiang NPP unit 5 was issued.

On April 25, 2018, the ratification instrument for initial fuel loading of Sammen NPP unit 1 was issued.

From April 23 to 27, 2018, Hao Xiaofeng, the Deputy Director-General of Nuclear Power Safety Regulation Department, MEE, attended the 33rd Meeting of Steering Technical Committee (STC) of MDEP in Shenzhen.

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On May 9, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Department of Nuclear Power Safety Regulation of MEE, attended the kick-off meeting of 8th implementation cycle of “Convention on Nuclear Safety” in Beijing.

On May 9, 2018, Jiang Guang, the Vice Administrator of NNSA, Director-General of Department of Radiation Source Safety Regulation, MEE, met the delegation led by Dr. Kisolo Akisophel, the Chairman of Uganda Atomic Energy Commission.

On May 11, 2018, Li Ganjie, the Minister of MEE, went to Tianwan NPP to survey on nuclear safety management status.

On May 11, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Wolfgang Cloosters, the Director-General of Nuclear Facilities, Radiological Protection, Nuclear Fuel Cycle Safety Management Department, German Federal Minister of Environment, Nature Conservation and Nuclear Safety. They exchanged opinions on topics of common concern, such as China-German nuclear safety regulation.

From May 21 to 23, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, led the delegation to attend the Sixth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive

Waste Management, on which he reported China’s performance and answered questions from parties.

From May 22 to 23, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, led the delegation to attend the 12th Meeting of Policy Group of MDEP in Vienna, Austria.

On May 22, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Hamad Ali Al Kaabi, the Deputy Chairman of Nuclear Regulation Authority of United Arab Emirates, and signed the MOU of China-UAE cooperation in nuclear safety in Vienna, Austria.

On May 23, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Juan Carlos Lentijo, the Deputy Director-General of IAEA, in Vienna, Austria. They exchanged opinions on topics of common concern, such as the implementation of the Convention.

On May 23, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Franck Chevet, the Chairman of the French Nuclear Safety Authority, in Vienna, Austria. They exchanged opinions on topics of common concern, such as nuclear safety cooperation between China-French.

On May 25, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, attended the China-Czech Nuclear Safety

Regulation Cooperation Meeting in Prague, Czech Republic. They exchanged opinions on topics of common concern, such as China-Czech nuclear safety cooperation, and set the focus of future cooperation.

From June 3 to 9, 2018, Li Jigen, the Chief Engineer of Nuclear and Radiation Safety Center, MEE, went to Japan for China-Japan nuclear power industry seminar.

From June 5 to 9, 2018, Liu Lu, the Deputy Director-General of North China Regional Office of Nuclear and Radiation Safety Inspection, NNSA, led the delegation to Switzerland to inspect design and production activities for the uninterrupted power supply equipment by the Gutor Electronic LLC for Fuqing NPP unit 5 and unit 6.

On June 21, 2018, the ratification instrument for initial fuel loading of Haiyang NPP unit 1 was issued.

From June 25 to July 1, 2018, Zhou Qifu, the Deputy Director-General of North-Western China Regional Office of Nuclear and Radiation Safety Inspection, NNSA, attended a technical meeting on international programmes for decommissioning of small devices in Vienna, Austria.

From July 2 to 6, 2018, Kang Yufeng, the Deputy Director-General of Department of Radiation Source Safety Regulation, MEE, attended the special training of nuclear waste

management, China-Italy cooperation in environmental management and sustainable development training programme (session II) in Beijing.

On July 4, 2018, the ratification instrument for initial fuel loading of Sanmen NPP unit 2 was issued.

On July 5, 2018, the “Environmental Radiation Monitoring and Information Public Measures of Naturally Occurring Radioactive Materials Exploitation and Utilization Enterprises (Trial)” (National Environmental Regulations on Radiation [2018]1) was issued. It will come into force on January 1, 2019.

On July 7, 2018, the radiation safety license was issued to Gansu Heavy Ion Hospital, Co., Ltd., which was the first organization utilizing domestic heavy ion accelerator treatment equipment.

On July 11, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, met Mr. Nguyen Tuan Khai, the Chairman of Vietnam Nuclear Safety Agency. They exchanged opinions on topics of common concern, such as China-Vietnam cooperation in nuclear safety.

From July 11 to 14, 2018, Guo Chengzhan, the Vice Administrator of NNSA, Director-General of Department of Nuclear Facility Safety Regulation, MEE, hosted the first China-Vietnam nuclear safety cooperation

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seminar in Beijing.

On July 20, 2018, the review opinion on siting for accelerator driven transmutation research device was issued.

On August 7, 2018, the ratification instrument for initial fuel loading of Haiyang NPP unit 2 was issued.

On August 23, 2018, the ratification instrument for the initial fuel loading of Tianwan NPP unit 4 was issued.

On August 29, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, attended the coordination meeting of the Regular Meetings Commission between Chinese and Russian Prime Ministers in Beijing.

On September 9, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, attended the 22th meeting of nuclear issue subcommittee of Regular Meetings Commission between Chinese and Russian Prime Ministers in Beijing.

From September 10 to 14, 2018, Guo Chengzhan, the Vice Administrator of NNSA, Director-General of Department of Nuclear Facility Safety Regulation, MEE, led the delegation to the United States for on-site inspection of registered foreign enterprises of

civilian nuclear safety equipment.

From September 10 to 14, 2018, Kang Yufeng, the Deputy Director-General of Department of Radiation Source Safety Regulation, MEE, led the delegation to Finland for the regulation seminar on deep geological disposal.

From September 16 to 18, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, led the delegation to Pakistan for the 10th China-Pakistan Steering Committee Meeting on Nuclear Safety Cooperation.

On September 18, 2018, the review opinions on siting for Ningde NPP unit 5 and unit 6 were issued.

On September 18, 2018, Hao Xiaofeng, the Deputy Director-General of Nuclear Power Safety Regulation Department, MEE, attended the China-U.K. special seminar on NPP security in Beijing.

From September 18 to 22, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, led the delegation to Austria for the IAEA 62th General Conference and nuclear safety senior regulator meeting.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation

Department, MEE, met Ms. Svinicki, the Chairman of U.S. NRC, in Vienna, Austria.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, met Mr. Mark Foy, the Chief Nuclear Inspector of Office of Nuclear Regulation of U.K., in Vienna, Austria.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, met Ms. Rumina Velshi, the Chairman of the Canadian Nuclear Safety Commission, in Vienna, Austria.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, met Saeed Al Amoudi, the delegation head of King Abdullah City for Atomic and Renewable Energy (KA-CARE), Kingdom of Saudi-Arabia, in Vienna, Austria.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, met Gino Moonsamy, the delegation head of South African National Nuclear Safety Regulator Agency, in Vienna, Austria.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation

Department, MEE, met Mr. Peter, the Deputy Chairman of Nuclear Safety Agency of Czech Republic (SÚJB), in Vienna, Austria.

On September 20, 2018, Tang Bo, the Vice Administrator of NNSA, the Director-General of Nuclear Power Safety Regulation Department, MEE, met Nestor Masriera, the Chairman of Argentina Nuclear Safety Agency, in Vienna, Austria.

From September 23 to 30, Hao Xiaofeng, the Deputy Director-General of Nuclear Power Safety Regulation Department, MEE, led the delegation to France for the 2nd meeting of HPR1000 Working Group of Multinational Design Evaluation Programme (MDEP).

From October 10 to 11, the national radiation safety regulation working meeting was successfully held in Beijing. Experience, issues and solutions on radiation safety regulation were discussed on the meeting. Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, attended the meeting, and took part in discussion with important remarks.

From October 14 to 20, Chai Guohan, the Deputy Director-General of Nuclear and Radiation Safety Center, led the delegation to Belgium for the IAEA International Conference on Challenges Faced by Technical and Scientific Support Organizations (TSOs) in Enhancing Nuclear Safety and Security:

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Ensuring Effective and Sustainable Expertise.

On October 24, 2018, Liu Hua, the Vice Minister of MEE, the Administrator of NNSA, attended the China-U.K. Steering Committee Meeting on Nuclear Safety Cooperation and gave remarks in Beijing. Topics such as enhancing China-U.K. nuclear safety regulation cooperation, and safety review of HPR1000 were discussed on the meeting.

On October 29, 2018, Jiang Guang, the Vice Administrator of NNSA, Director-General of Department of Radiation Source Safety Regulation, MEE, met Miroslav Pinak, the Head of Radiation Safety and Monitoring Section, Division of Radiation, Transport and Waste Safety, Department of Nuclear Safety and Security, IAEA, in Beijing.

On November 2, 2018, the operating licenses for Fangchenggang NPP unit 1 and unit 2 were issued.

On November 13, 2018, the operating licenses for Fuqing NPP unit 1 and unit 2 were issued.

From November 13 to 24, 2018, Yu Jun, the Director-General of East China Regional Office of Nuclear and Radiation Safety Inspection, NNSA, went to Austria to attend the 44th meeting of IAEA CSS and the first planning committee meeting for the International Conference on Effective Nuclear Regulatory Systems in 2019.

On November 14, 2018, Kang Yufeng, the Deputy Director-General of Department of Radiation Source Safety Regulation, MEE, met Mats Persson, the Director-General of Sweden Radiation Safety Authority, in Beijing.

From November 19 to 23, 2018, Chai Jianshe, the Deputy Director-General of Nuclear and Radiation Safety Center, MEE, led the delegation to exchange safety regulatory experience on imported nuclear safety equipment and implement on-site inspection of foreign enterprises.

From November 26 to 30, 2018, Zhao Yongming, the Deputy Director-General of Department of Nuclear Facility Safety Regulation, MEE, led the delegation to Republic of Korea for the 11th Top Regulators' Meeting on Nuclear Safety among China-Japan-ROK and the 6th Top Regulators' seminar.

From November 29 to 30, 2018, Kang Yufeng, the Deputy Director-General of Department of Radiation Source Safety Regulation, MEE, chaired the 3rd China-German nuclear safety dialogue meeting in Beijing.

On December 5, 2018, the MEE(NNSA), jointly with Civil Aviation Administration of China, issued the "Notification of Further Clarification on Safety Regulation Relevant Issues of Temporary Storage of Radioactive Materials Air Transport".

From December 9 to 15, 2018, Chai Guohan, the Deputy Director-General of Nuclear and Radiation Safety Center, led the delegation to the U.K. for scientific visit for regulation technological requirements and review principles on nuclear facility decommissioning and environmental remediation.

On December 18, 2018, “Safety Requirements for Spent Fuel Decommissioning Treatment Facilities (trial)” was issued.

On December 19, 2018, the review opinion on siting for Taipingling NPP Phase I in Guangdong Province operated by CGNPC was issued.

On December 24, 2018, the MEE(NNSA), jointly with the General Administration of Customs, issued the “Notification of Regulating the Management of Radioisotope and Irradiation Device Exemption Record”.





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