Regulatory Oversight of New Build Project

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Content Outlines

I. Organizational Structure of National Nuclear Safety Administration (NNSA)

II. Chinese Legislative Framework for Nuclear and Radiation Safety Regulation

III. The Policy Requirements for New Projects

IV. Distribution of Nuclear Power Plants in China

V. Regulation of New NPP Projects

VI. Regulation of Nuclear Safety Equipment

VII. Regulation of Personnel Qualifications
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I. Organizational Structure of National Nuclear Safety Administration (NNSA)

National Nuclear Safety Administration (NNSA)

The nuclear and radiation safety regulator of China, undertakes overall regulation and management of national nuclear safety, radiation safety and radiation environmental protection, and independently regulates national civil nuclear facilities and nuclear technologies in a centralized manner.

Department of Nuclear Power Safety Regulation:
Undertake regulation of NPPs, including administrative licensing and inspection of new projects.

6 regional offices of nuclear and radiation safety:
The affiliated agencies of the NNSA and are respectively responsible for nuclear and radiation safety inspection in their regions.

Nuclear and Radiation Safety Center:
A directly affiliated unit and the most important internal technical support organization of the NNSA. It provides a full range of regulatory technical support and guarantee for the NNSA.

Nuclear Safety and Environment Committee of Experts of MEP (NNSA):
Consulting body of the NNSA, provides independent advisory opinions on major issues.
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II. Chinese Legislative Framework for Nuclear and Radiation Safety Regulation

China has established a perfected system of national nuclear and radiation safety laws, regulations, and standards, and provides the legal basis for the regulation of new projects.

Chinese Legislative Framework for Nuclear and Radiation Safety Regulation is pyramid-shaped.

- **Laws, e.g.:** Law of the People's Republic of China on Prevention and Control of Radioactive Pollution, The Law of the People's Republic of China on Environmental Protection, etc.
- **Regulations, e.g.:** Regulations of the People's Republic of China on Safety Supervision and Management of Civil Nuclear Facilities, Regulations on Supervision and Management of Civil Nuclear Safety Equipment, etc.
- **Departmental rules, e.g.:** HAF101 “Provisions on Siting Safety of Nuclear Power Plants”, HAF102 “Provisions on Design Safety of Nuclear Power Plants”, etc.
- **Guidelines, technical documents, e.g.:** HAD102/06 “Design of Reactor Containment System in Nuclear Power Plants”, etc.
“Pyramid-shaped” Legislative Framework

Laws

Approved by the National People's Congress, promulgated by Presidential Decree, e.g.: Law of the People's Republic of China on Prevention and Control of Radioactive Pollution

Regulations by the State Council

Approved and issued by the State Council, e.g.: Regulations of the People's Republic of China on Safety Supervision and Management of Civil Nuclear Facilities

Rules for Implementation of Regulations and their Appendixes

Nuclear safety regulators

Rules for Implementation of Regulations by the State Council and their Appendixes

The administrative regulations of technical requirements of nuclear safety

Nuclear Safety Guidelines

Nuclear Safety Guidelines

Normative Documents

Nuclear Safety Guidelines, Standards, Normative Documents

Guidance documents

Mandatory requirements
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After the Fukushima nuclear accident, NNSA in conjunction with relevant ministries issued the "12th Five-Year" Plan and Prospective Targets of 2020 on Nuclear Safety and Radioactive Pollution Prevention and Control (Nuclear Safety Plan), which put forward the further policy requirements for nuclear safety regulation of new NPPs.

**Safety Goal**

- Practically eliminates the possibility of large radioactive release in design of new build projects during and after the 13th Five-Year Plan.

**Safety level**

- New NPPs should have comprehensive and effective measures to prevent and mitigate severe accidents.
- The probability of severe core damage per reactor every year shall be lower than 1/100,000, and the probability of large release of radioactive substance per reactor every year shall be lower than 1/1,000,000.
III . Policy Requirements for New Build Projects

The experience feedback and the requirements of improvement are considered in the safety design of new build projects, and the latest international safety requirements are met.

Meet *General Technical Requirements for Nuclear Power Plant Improvement Actions after Fukushima Nuclear Accident* issued by NNSA

*General Technical Requirements* includes improvement requirements in 8 factors, such as Flood Defense Capability Improvement Technical Requirements, Technical Requirements of Emergency Water-Injection and Related Equipment, and so on.

Meet the IAEA latest safety requirement document of No. SSR-2/1(Rev.1)

NNSA is updating the regulation document of HAF102-2004 Provisions on Design Safety of Nuclear Power Plants referring to the IAEA document of No.SSR-2/1(Rev.1) and considering the latest safety requirements.
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IV. Distribution of NPPs in China

1. Units in operation: 27
2. Units under construction: 25
3. Units to be constructed: ~20
The Distribution of NPPs in China

- **27 Units in operation**
- **25 Units under construction**

- **Units in operation**
- **Units under construction**
- **Units to be constructed**

Locations and names of NPPs:
- **红沿河核电厂**
- **海阳核电厂**
- **石岛湾核电厂**
- **田湾核电站**
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V. Regulation of New NPP Projects

1. General Introduction
   Different stages of Regulation

2. Siting
   Review of Siting and Environmental Impact Assessment (EIA) Report

3. Application for Construction Permit
   Review of PSAR

4. Construction
   Review and Inspection

5. Application for First Fuel Loading Permit
   Review of FSAR

6. Application for Operation License
1. General Introduction

According to relevant regulations, China adopts a safety licensing system for nuclear installations.

NNSA regulatory actions over the new NPPs items include safety review and inspection.

- The NNSA is responsible for the enactment, approval and granting of safety licenses.
- The NNSA or its regional offices may assign regional inspection groups (inspectors) to the manufacturing, construction and operation sites of nuclear installations.

- The licenses include: Review Comment on Siting, Construction Permit, First Fuel Loading Permit, Operation License, etc.
- The main inspections: Daily Inspection, Routine Inspection and Non-routine Inspection
Stage Division for Regulation of New NPPs Items

1. Application for Construction Permit (PSAR)
2. Application for First Fuel Loading Permit (FSAR)
3. Construction
4. Application for Operation License
5. Commercial Operation

Note: The regulations of decommissioning are does not fall into the scope of new NPPs regulation. However, requirements are included in the safety review for NPP design which aim to facilitate decommissioning, and the design details convenient for decommissioning are compiled as an independent chapter (chapter 20 in SAR) in the PSAR and FSAR.
2. Siting

The regulation for new NPPs start from the siting stage. NNSA must determine the suitability of the NPP and the selected site from the safety perspective, including two aspects of review:

- Site Safety Analysis Report (Siting Phase)
- Siting and Environmental Impact Report (Siting Phase)

The Review Comments on Siting will be issued by NNSA after reviewing the reports above.
Inspection: site survey.
3. Application for Construction Permit (PSAR)

License review
Technical review of supporting documents for CP including:
- Preliminary safety analysis report (PSAR)
- Environment Impact Assessment Report (during construction)
- Quality Assurance Program (during design and construction)

Supervisory inspection
On-site inspection, routine and non-routine inspection by NNSA and regional offices:
- Daily inspection
- Routine inspection of control points (e.g. foundation subsoil in foundation ditch, first concrete casting)
- Non-routine inspection or special inspection
NNSA issue construction permit to new build NPP project

Review and Approval of Construction Permit

Review 3 reports including PSAR:
preparation of PSER and review comments

Inspections performed by NNSA and regional offices:
On-site inspection/routine inspection/non-routine inspection

Examined by Nuclear Safety and Environment Advisory Committee:
Deliberate the process of review and inspection

Internal approval process of NNSA:
Meetings of DGs/Administrator s/ Ministers
Process Schematic for Various Administrative Examination and Approval Of NNSA

Ministry of Environmental Protection (NNSA)

Acceptance of application / format examination / reply / announcement

Clarifying review organization assigning missions and establishing project team

Review organization A
- Technical review of written document / technical inspection on site

Review organization B (for important projects)
- Technical review of written document / technical inspection on site

Questionnaire / reply, review dialogue, and supplement for documentation

For important technical matters of review, the regulated organizations being reviewed is required to carry out special studies, organize experts for consulting and deliberation, and perform independent computation or demonstration tests

Administrative approval and deliberation of Category A
- Deliberation in Administrator’s office meeting
- Deliberation in Administrator’s office meeting / Minister's topical meeting
- Deliberation of ministerial standing committee

Administrative approval and deliberation of Category B
- Deliberation in DG’s affairs meeting
- Minister's topical meeting

Administrative approval and deliberation of Category C
- Deliberation in DG’s affairs meeting
- Deliberation in Administrator’s office meeting

Administrative approval and deliberation of Category D
- Deliberation in DG’s affairs meeting

Approval / review of document issuance, announcement and updating, sorting and filing of relevant document recording

Applicants for matters to be licensed

Submitting applications / relevant documents
Flowchart of Safety Inspection Process

Nuclear and Radiation Safety Inspection Program and Implementation Procedures

Annual Plan for Nuclear and Radiation Safety Inspection (Regional offices and Headquarter)

Single Inspection Plan

Preparation and on-site Implementation

Preparation and Issuance of Inspection Report

Problems Tracking and Verification

Investigation of and Response to Safety Incidents

Law Enforcement (when necessary)

Collection, Sorting and Filing of Inspection Documents
SAR including PSAR and FSAR, which overall describes the safety design of NPPS

Format and content of SAR are based on USNRC RG 1.70 (1978) and SRP

Added section 18 “Human factors engineering”, section 19 “PSA and severe accident” and section 20 “Decommissioning”

NNSA perform the technical review for SAR and develop SER and give independent and objective evaluation of NPP’s safety design.
4. Construction

**Review and Approval**

Technical review of detail design and construction including:

- Modification of document approved or agreed by NNSA
- Important issue unsolved and CP conditions during the PSAR review.
- Safety important design changes
- Construction events report
- Major non-conformances and special permit application...

**Supervisory inspection**

On-site inspection of construction and installation by NNSA and regional offices:

- Routine inspection of construction
- Supervision of construction regarding Important design changes, major non-conformances and quality issues
- Non-routine inspection and special inspection
5. Application for first fuel loading permit (FSAR)

License review
Approval of first fuel loading application is based on technical review of 13 supporting documents

- 6 reports should be in advance so that the NNSA has enough time for review, they include FSAR/Environment impact assessment report (during operation)/Commissioning Program, and have enough time for review.

- 7 reports including Construction Progress Report/Maintenance program and operator qualification report should be submitted.

Supervisory inspection
On-site inspection/routine and non-routine inspection/special inspection during construction, installation and commissioning.

- On-site inspection, routine inspection of selected control points during cold/hot function tests.

- Non-routine inspection, special inspection and environment protection related inspection, E.g. Inspections are performed to check if the design, construction and operation of waste facilities were completed at the same time with those of the main parts of installation.
Review and Approval of first fuel loading permit

Review 13 reports including FSAR:
preparation of PSER and review comments

Supervisory Inspection:
On-site inspection routine and non-routine inspection, special inspection. Such as waste facilities inspection

Examined by Nuclear Safety and Environment Expert Committee:
Examination of the process of review and inspection

Internal approval process of NNSA:
Meetings of DGs/Administrators/Ministers

NNSA issue first fuel loading permit to new build NPP project
6. Application for operation license

License permit
Final phase of the technical review for new build NPP project, after which the NPP will transfer to operation.

- 6 reports should be reviewed, including FSAR (revised edition), Report on Commissioning and Pre-operation after Fuel Loading of Nuclear Facilities, Quality Assurance Program (during operating)
- Approval Letter for Environmental Impact Report on Nuclear Facilities and documents related to environmental protection acceptance

Supervisory inspection
Inspections should be conducted at the selected control points during fuel loading, criticality, tests and pre-operation.

- On-site inspection
  - Routine and non-routine inspection/special inspections of control points during fuel loading/Criticality, power ascension (e.g., 10%FP, 90%FP)
Review and approval of operation license

Review 4 reports including FSAR (revised edition):
Preparation of review comments

supervisory inspection:
Routine inspection and other inspection of control points at fuel loading, criticality, power ascension (e.g. 10%FP, 90%FP)

Examined by Nuclear Safety and Environment Expert Committee:
Examination of the process of review and inspection

Internal approval process of NNSA:
Meetings of DGs/Administrators/Ministers

NNSA issue operation license to the new build NPP project
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VI. Regulatory of nuclear safety equipment

The Regulation of nuclear safety equipment is another important part of NNSA’s regulatory activities. The Department of Nuclear Facility Safety Regulation, Northern Regional Office and Nuclear and Radiation Safety Center carry out regulatory activities together in the following 3 aspects:

01 Review and license: A licensing system is adopted for the regulation of corporations/organizations responsible for the design, manufacturing, installation and non-destructive testing of civil nuclear safety equipment. As for overseas corporations, NNSA adopts a registration system.

02 Supervisory inspection: nuclear safety equipment routine and non-routine nuclear safety inspections for nuclear safety equipment of licensees and overseas registered corporations. Resident inspectors are sent in case of important nuclear safety equipment.

03 Safety examination: conducting safety examination of imported civil nuclear safety equipment.
Review and license of nuclear safety equipment

Review of License Applicants

- qualification of legal person;
- work performance related or similar to activities to be performed;
- professional technical personnel adapted to activities to be performed and qualified after examination;
- workplaces, facilities and equipment adapted to activities to be performed.

Review of Registered (foreign)Corporations

- Compliance with relevant laws, regulations and provisions;
- Possession of licenses/qualifications required by nuclear safety regulatory body in home country.
Daily inspections, routine and non-routine inspections and resident inspections pay special attention to:

- Fulfillment of license conditions, Personnel Qualification
- Implementation of quality assurance program, Compliance of relevant technical documents
- Design, manufacture, Installation of nuclear safety equipment, Implementation, acceptance and evaluation of non-destructive test
- Investigation and solution for significant quality problems, implementation of modification requirements
Activities conducted by the NNSA and its subsidiary safety inspection agencies for imported civil nuclear safety equipment:

- Examination at customs checkpoint
- Checking of Declaration document
- Witness inspection
- Witness inspection of safety performance
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VII. Qualification management

NPP operators: operators, senior operators

Welders of nuclear safety equipment and personnel for non-destructive test

Qualification of professional technicians holding key positions in nuclear safety

Nuclear Safety Inspector

The NNSA is responsible for implementing qualification management of employees of new build projects.
Any questions or comments
Thank for your patience!