

Training Course on the IAEA Safety Standards Overview

SSR-2/2 (Rev. 1)

Safety of Nuclear Power Plants: Commissioning and Operation

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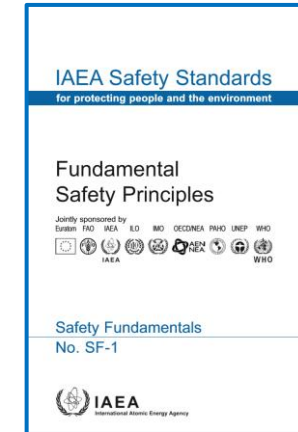
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Learning Objectives

This presentation will enable participants to understand:

- The content of SSR-2/2 (Rev.1) Safety of Nuclear Power Plants: Commissioning and Operation
- The link of SSR-2/2 (Rev.1) to Fundamental Safety Principles
- The extent of Safety Guides supporting SSR-2/2 (Rev.1)
- Purpose of Operational Safety Review Team (OSART) review missions



Safety Fundamentals: Safety Objective and Principles

Principle 1: **Responsibility for safety**

Principle 3: **Leadership and management for safety**

Principle 5: **Optimization of protection**

Principle 6: **Limitation of risks to individuals**

Principle 7: **Protection of present and future generations**

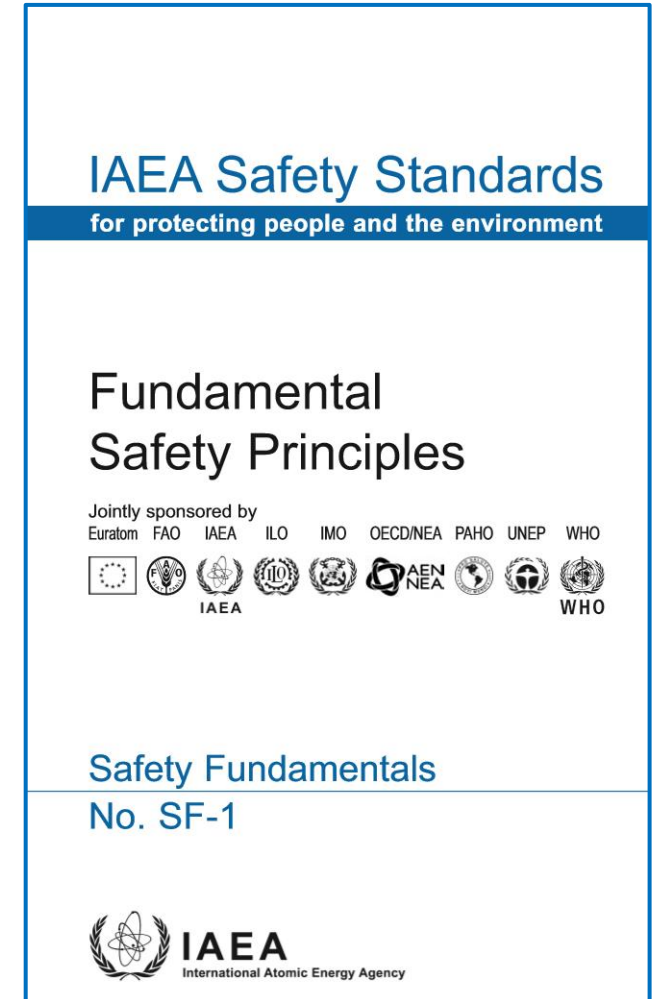
Principle 8: **Prevention of accidents**

Principle 9: **Emergency preparedness and response**

Principle 2 relates to the role of government

Principle 4 relates to justification of facilities

Principle 10 relates to existing or unregulated radiation risks



SSR-2/2 (Rev.1)

- Year of Issue - 2016
- It superseded previous version from 2011 and NS-R-2: Safety of Nuclear Power Plants: Operation issued in 2000
- Considers lessons learned from past events, including the Fukushima Daiichi accident
- Guidance on how to meet its requirements is provided in subsequent Safety Guides

Scope of SSR-2/2 (Rev.1)

- Safe **commissioning** and **operation** of NPPs including maintenance and modifications
- Safe operation of NPPs up to the **removal of nuclear fuel from the plant**
- Preparation for **decommissioning**
- **Normal operation** and **anticipated operational occurrences** as well as **accident conditions** are taken into account



Overview of SSR-2/2 (Rev. 1) Requirements

1-4 Management and Organizational Structure of the Operating Organization

5-16 Management of Operational Safety

17-24 Operational Safety Programmes

25 Plant Commissioning

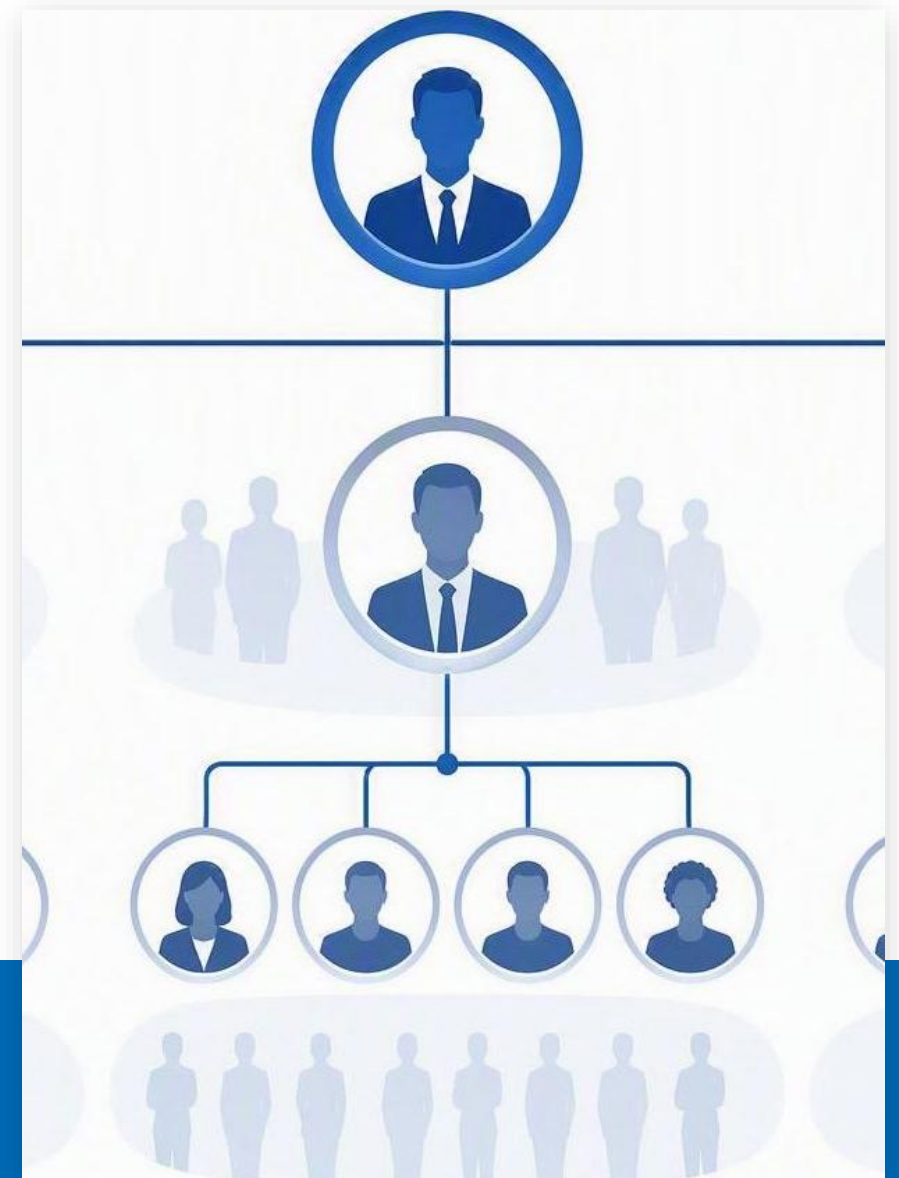
26-30 Plant Operations

31-32 Maintenance, Testing, Surveillance and Inspections

33 Preparation for Decommissioning

Management and Organizational Structure of the Operating Organization

- Responsibilities of the operating organization
- Management system
- Structure and functions of the operating organization
- Staffing of the operating organization



This section has 4 requirements

Management and Organizational Structure of the Operating Organization (Contd..)

Key Messages

✓ Prime responsibility

Operating organization is accountable, including supplier oversight.

✓ Design integrity

Design authority is defined for the full plant lifetime.

✓ Regulatory liaison

Clear interface with regulators and relevant authorities.

✓ Event reporting

Procedure in place for notifications to the regulator.

✓ Defined organization

Safety-critical roles are specified and described.

✓ Long-term staffing

Workforce plan aligned to long-term objectives.

Question

Req. 2 Management system

Management system shall include:

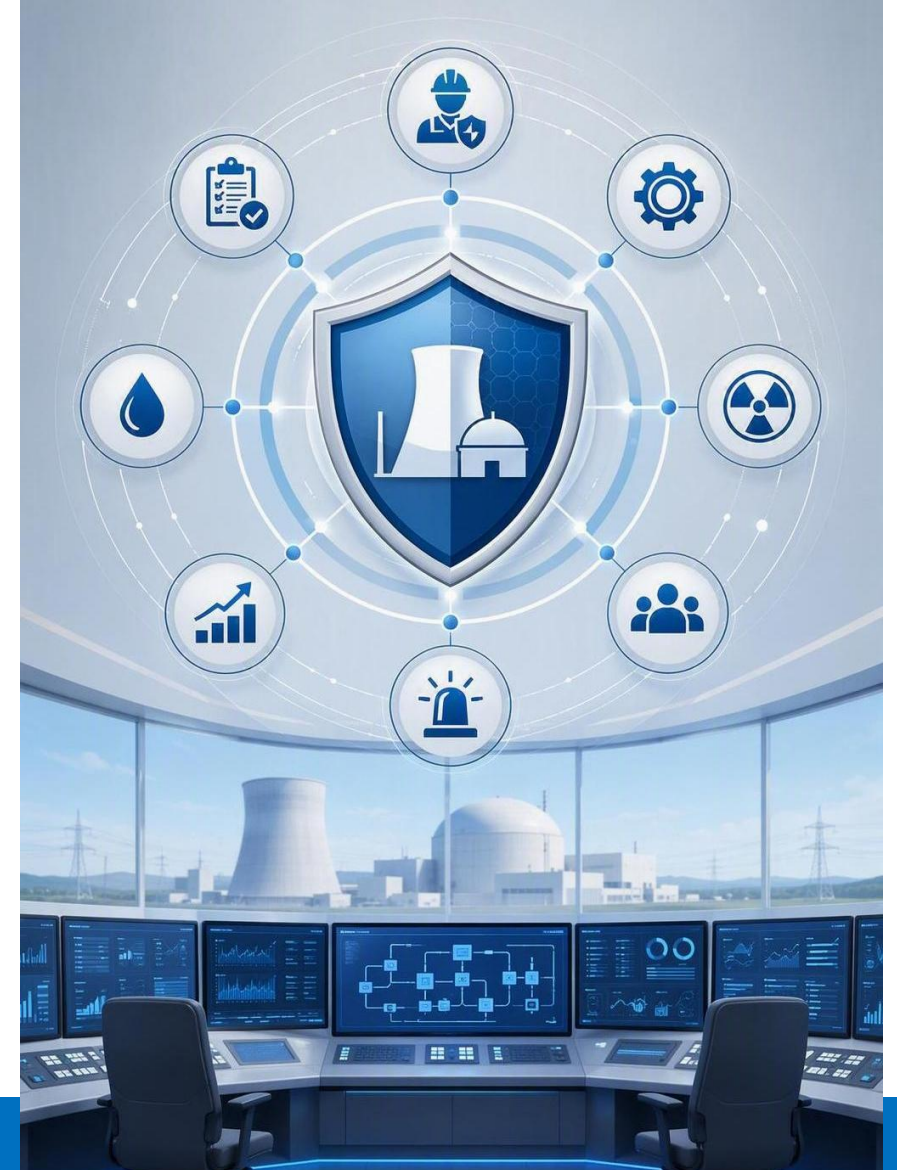
3.2 (f) Design integrity, which includes maintaining a formally designated entity that has overall responsibility for the continuing integrity of the plant design throughout its lifetime and managing the interfaces and lines of communication with the responsible designers and equipment suppliers contributing to this continuing integrity.

How do you understand the purpose of “design authority”?



Management of Operational Safety

- Safety policy
- Operational limits and conditions
- Qualification and training of personnel
- Performance of safety related activities
- Monitoring and review of safety performance
- Control of plant configuration
- Management of modifications
- Periodic safety review
- Equipment qualification
- Ageing management
- Records and reports
- Programme for long term operation



This section has 12 requirements

Management of Operational Safety (Contd..)

Key Messages

✓ **Safety priority**

Policy prioritizes safety, periodic reviews and continuous improvement.

✓ **Limits & conditions**

OLCs align with the safety analysis report; surveillance verifies compliance.

✓ **Personnel training**

Systematic training before safety duties, including experience and simulator use.

✓ **Controlled activities**

Written procedures maintain margins; experiments require review and justification.

✓ **Audit & review**

Self-assessment, indicators and corrective actions improve safety performance.

Management of Operational Safety (Contd..)

Key Messages

✓ **Configuration control**

Plant changes from work, repair, refurbishment and ageing are managed.

✓ **Modification control**

Temporary changes are limited; training supports safe implementation.

✓ **Safety reviews**

Periodic reviews are reported; PSA complements deterministic assessment.

✓ **Equipment qualification**

Scope and process for qualification are established.

✓ **Ageing management**

A systematic ageing management approach is in place.

✓ **Records & LTO**

Records, reports and long-term operation programme are controlled.

Question



Req. 10 Control of plant configuration

The operating organization shall establish and implement **a system** for plant configuration management to ensure **consistency between design requirements, physical configuration and plant documentation.**

What are the challenges related to this requirement?

Operational Safety Programmes

- Consideration of nuclear security in safety programmes
- Emergency preparedness
- Accident management programme
- Radiation protection
- Management of radioactive waste
- Fire safety
- Non-radiation-related safety
- Feedback of operating experience



This section has 8 requirements

Operational Safety Programmes (contd..)

Key Messages

✓ **Safety + security**

Measures are complementary and do not compromise one another.

✓ **Emergency readiness**

Plan, response structure, off-site coordination and exercises are validated.

✓ **Accident management**

Procedures, equipment and contingency measures prevent or mitigate accidents.

✓ **Training & measures**

Multi-unit, technical and administrative measures are supported by training.

✓ **Radiation protection**

Doses remain below authorized limits and ALARA; exposure is assessed.

Operational Safety Programmes (Contd..)

Key Messages

✓ **Radioactive waste**

Waste is characterized, processed, stored/disposed and discharges reported.

✓ **Fire safety**

Prevention, detection, extinguishing and fire hazard analysis are addressed.

✓ **Non-radiation hazards**

Hazards are kept as low as reasonably achievable.

✓ **Operating experience**

Events are investigated; lessons inform training and corrective actions.

✓ **Support liaison**

Links with manufacturers, researchers and designers are maintained.

Question



Req. 22 Fire safety

The operating organization shall be responsible for ensuring that appropriate procedures, equipment and staff are in place **for effectively coordinating and cooperating with all firefighting services involved**. Periodic joint fire drills and exercises shall be conducted to assess the effectiveness of the fire response capability.

How is fire safety related to nuclear safety?

Plant Commissioning

- Commissioning programme



This section has 1 requirement

Plant Commissioning (contd..)

Key Messages

✓ **Commissioning scope**

Programme covers plant conditions, stages, objectives and acceptance criteria.

✓ **Safe operation**

Demonstrates operation within limits and validates procedures.

✓ **Fuel loading**

Authorized only after pre-operational tests are accepted by operator and regulator.

✓ **Interfaces**

Communication, authorities and responsibilities are clearly specified.

✓ **Non-conformances**

A process is established to address deviations and issues.

Question



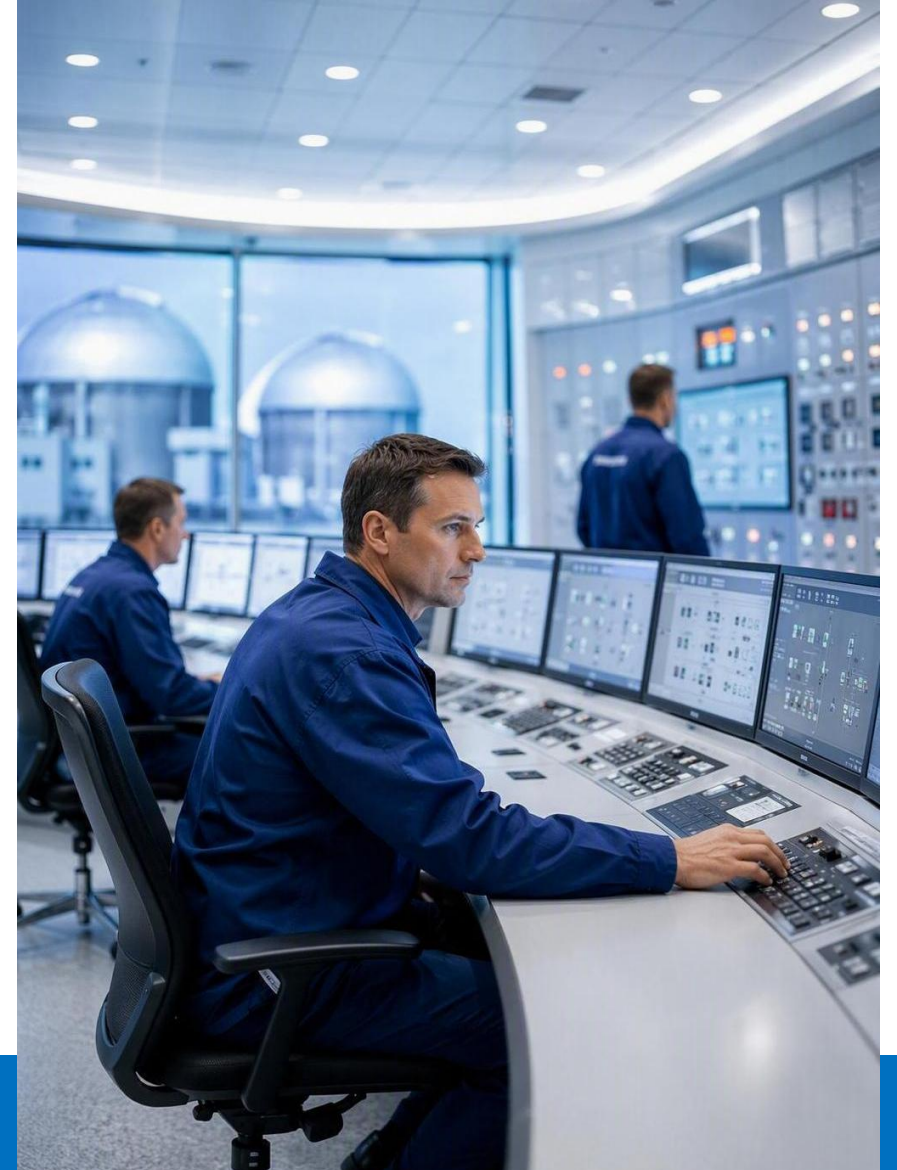
Req. 25 Commissioning programme

The operating organization shall be responsible **for ensuring that construction activities are of appropriate quality** and that completion data on commissioning activities and comprehensive baseline data, documentation or information are provided.

Why is commissioning phase so complex and challenging for coordination?

Plant Operations

- Operating procedures
- Operation control rooms and control equipment
- Material conditions and housekeeping
- Chemistry programme
- Core management and fuel handling



This section has 5 requirements

Plant Operations (contd..)

Key Messages

✓ **Operating procedures**

Cover normal operation, anticipated occurrences and accident conditions.

✓ **Control rooms**

Main/local rooms are kept ready, with clear communication and prioritized alarms.

✓ **Housekeeping**

High material condition, foreign object exclusion and equipment labelling.

Plant Operations (contd..)

Key Messages

✓ **Chemistry controls**

Monitoring, lab analysis and chemical use are managed during operation.

✓ **Fuel lifecycle**

Procurement through testing follows specifications and procedures.

✓ **Core management**

Safe reactivity and core monitoring programmes are established.

✓ **Fuel integrity**

Radiochemistry data are monitored systematically.

✓ **Fuel transport**

Packaging, handling and transport follow applicable regulations.

Maintenance, Testing, Surveillance and Inspections

- Maintenance, testing, surveillance and inspection programmes
- Outage management



This section has 2 requirements

Maintenance, Testing, Surveillance and Inspections (contd..)

Key Messages

✓ **Maintenance programmes**

Predictive, preventive and corrective maintenance use approved procedures.

✓ **Work planning**

Frequencies, records, analysis and coordination are controlled.

✓ **Materials control**

Spare parts and components are procured, stored and issued under controls.

✓ **Outage management**

Configuration is maintained within limits; group interfaces are defined.

✓ **Optimization**

Radiation, non-radiation, waste and chemical hazards are optimized.

Question



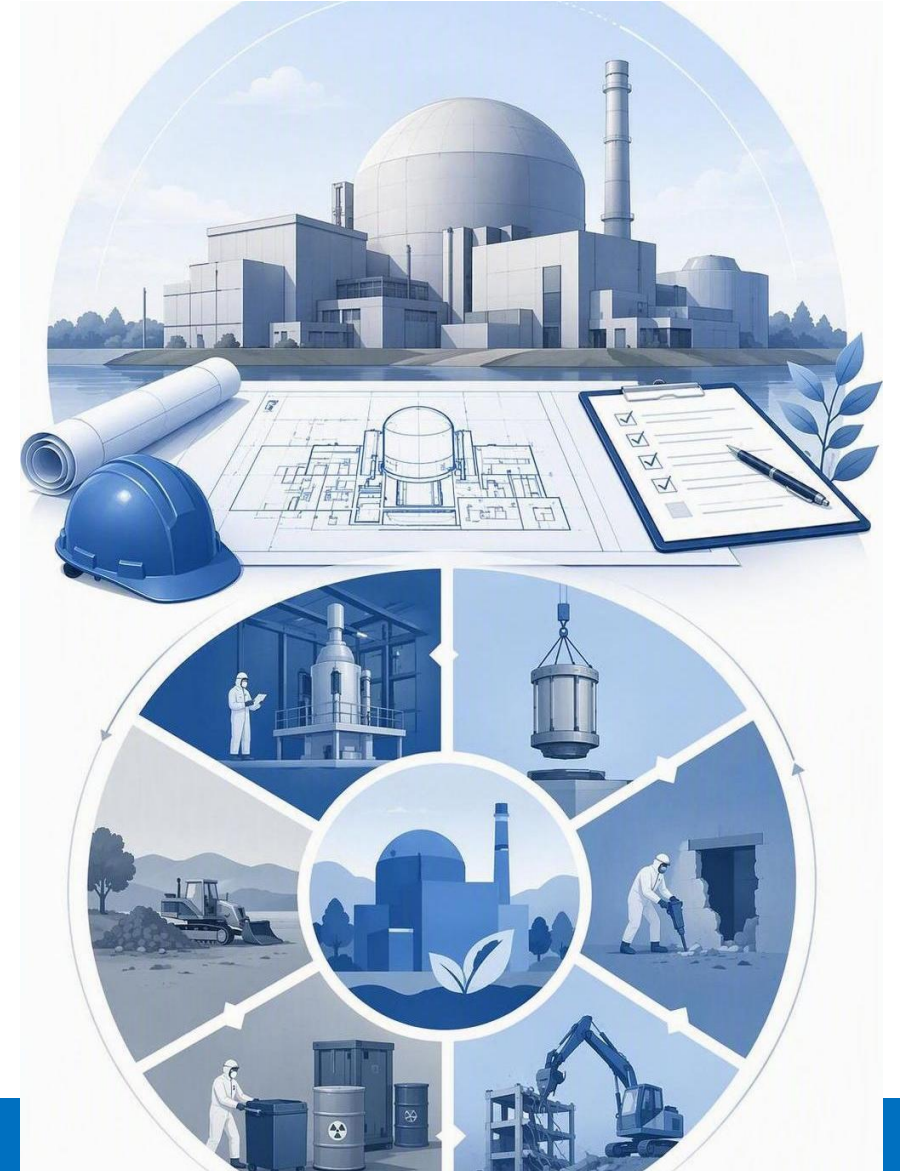
Req. 32 Outage management

Optimization of **radiation protection**, optimizing of **non-radiation-related safety, waste** reduction and control of **chemical hazards** shall be essential elements of outage programmes and planning...

Why is this optimization particularly important during outages?

Preparation for Decommissioning

- Preparation for decommissioning



This section has 1 requirement

Preparation for Decommissioning (contd..)

Key Messages

✓ **Decommissioning plan**

Prepared and kept up to date throughout the plant lifetime.

✓ **Human resources**

Programme supports decommissioning capability and readiness.

✓ **Multi-unit support**

Common systems remain available to support safe operation of all units.

Question



Req. 33 Preparation for decommissioning

In the preparatory period for decommissioning, a high level of operational safety shall be maintained **until the nuclear fuel has been removed** from the plant.

Why is this linked to removal of nuclear fuel?

Safety Guides for Commissioning and Operation of NPPs

Selected guides grouped by how they help implement SSR-2/2 in practice.

Red = under revision

1 Control the plant

Operating basis and conduct

SSG-70 — OLCs & procedures

SSG-72 — Operating organization

SSG-76 — Conduct of operations

SSG-73 — Core & fuel handling

SSG-13 — Chemistry programme

2 Maintain capability

People, programmes, configuration

SSG-74 — Maintenance & testing

SSG-48 — Ageing & LTO

SSG-75 — Personnel training

SSG-71 — Modifications to NPPs

SSG-40 — Waste management

3 Review, learn, transition

Hazards, reviews and feedback

SSG-77 — Internal/external hazards

SSG-89 — Seismic safety

SSG-54 — Accident management

SSG-50 — Operating experience

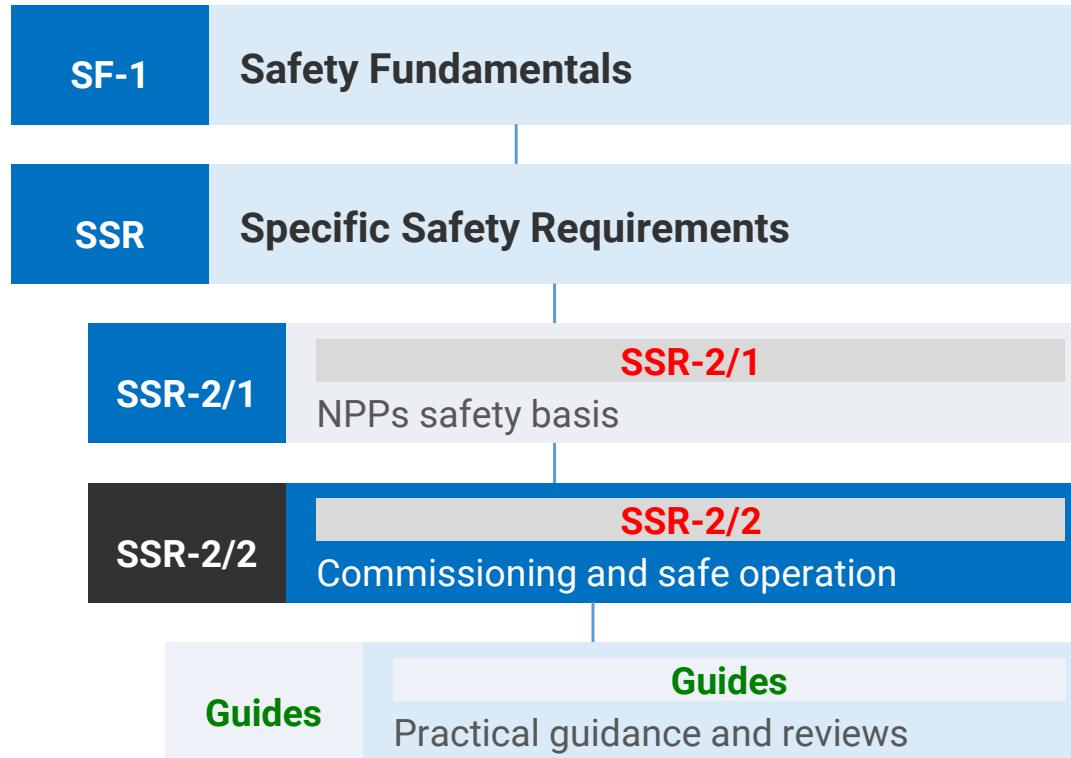
SSG-25 — Periodic safety review

SSG-28 — Commissioning

Takeaway: Safety Guides are the practical layer that turns SSR-2/2 requirements into programmes, reviews and feedback loops.

SSR-2/2: where it fits in the safety framework

It translates the high-level safety objective into expectations for safe commissioning and operation.



Main meaning

SSR-2/2 defines the requirements for safe commissioning and operation of NPPs.

- 1 Accountability**
The operating organization remains responsible for safety.
- 2 Control**
Operational limits, procedures and maintenance preserve design intent.
- 3 Improvement**
Reviews, feedback and preparedness keep safety current.

SSR-2/2 (Rev.1): **Key messages to remember**

Safe operation is a managed, reviewed and continuously improved set of behaviours.

Safety in operation **means making safety** **visible**

in daily decisions, controlled plant status, competent people and documented evidence.



✓ **Operator owns safety**

Prime responsibility stays with the operating organization.

✓ **Management system is key**

Leadership, culture and interfaces shape safe performance.

✓ **Programmes maintain safety**

OLCs, maintenance, training and configuration control keep barriers reliable.

✓ **Prepare before you need it**

Emergency arrangements and decommissioning readiness are part of safe operation.

Remember: requirements work only when they shape daily decisions.



Thank you!

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