

International Atomic Energy Agency

Nuclear Safety Programs and Standards

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Nuclear Safety Programs

Nuclear Safety and Security Program

- **The main goal: Ensure that the overall level of safety improves and weak links are eliminated.**
- **Objectives:**
 - **Greater acceptance of conventions, codes of conduct and other instruments;**
 - **Improved security of nuclear and radioactive materials and facilities;**
 - **Acceptance of Agency safety standards and an integrated approach to their application;**
 - **Self-sustaining regional and global network of safety-related knowledge and experience.**

Nuclear Installation Safety Programs

- **Maintain safety standards current and complete, and reflect optimal levels of safety.**
 - **Introduce risk-informed considerations into the next generation of safety standards.**
- **Tailor review services to individual needs, using modular formats; include preparatory and follow-up missions.**
- **Increased use of self-assessments of application of safety standards.**
- **Address impacts of long-term operation and up-rating on safety.**

National Regulatory Infrastructure for Nuclear Installation Safety

- **Strengthen the independence, technical competence and effectiveness of regulatory bodies.**
- **Increased use of self-assessment, peer review, regulatory performance indicators and safety performance indicators.**
- **Increased effectiveness of regulatory experience exchange and use of lessons learned.**

National Regulatory Infrastructure for Nuclear Installation Safety (cont'd)

- **Enhancing regulatory performance.**
 - **Integrated regulatory review service (IRRS), quality assurance systems, self-assessment of performance, risk-informed regulation, good practices, performance indicators.**
- **Reporting and analyzing events.**
 - **Information exchange related to the Incident Reporting System.**
- **Support to the Convention on Nuclear Safety.**

Global Infrastructure and Information and Communication Networks for Nuclear Installation Safety

- **Maintain and enhance a global nuclear safety infrastructure and increase transparency in safety matters.**
- **An up-to-date set of nuclear safety standards.**
- **A consistent set of safety review services that provide for application of the standards.**
- **Nuclear safety information networks in place.**

Global Infrastructure and Information and Communication Networks for Nuclear Installation Safety

- **Safety standards for nuclear installations.**
 - **Development, review and up-date of standards.**
- **Promoting the integrated safety approach.**
 - **Integration of safety standards, safety review services and assistance in self-assessment.**
 - **Develop modular format for services.**
 - **Collect information from services for use in updating standards and planning future assistance.**

Global Infrastructure and Information and Communication Networks for Nuclear Installation Safety

- **Sustainable education and training programs in nuclear safety.**
 - Standard training materials.
 - ‘Train-the-trainers’ programs.
 - Networks of national and regional training centers.
- **Sharing information and knowledge in nuclear safety.**
 - Nuclear safety networks of national centers.

Development and Assessment of Advanced Tools for Safety Assessment

- **Reach an international consensus on advanced tools and a graded approach to safety assessment and risk-informed regulations and incorporate this in safety standards.**
- **Improve capability of Member States to use advanced tools.**
- **Make use of PSA and safety performance indicators.**

Development and Assessment of Advanced Tools for Safety Assessment

- **Use of advanced methods for long-term operation and innovative designs.**
 - **Guidance on use of advanced methods (best estimate, CFD, etc.).**
 - **Safety services and training on review of SARs, analytic support for EOPs and accident management.**
 - **Guidance for safety analysis of innovative designs.**
 - **Development of a safety guide and safety service on accident management programs.**
- **Assist in use of safety management tools.**

Design Safety and Site Evaluation

- **Improve capabilities of Member States to:**
 - **Manage long-term safety of existing nuclear facilities.**
 - **Perform self-assessment of compliance of design or up-grading measures with safety standards.**
 - **Achieve a high level of safety in design of innovative and evolutionary reactors.**
- **Enhanced safety in innovative designs.**
- **Adequate safety in evolutionary designs, up-grades and in long-term operation.**

Design Safety and Site Evaluation

- **Enhanced safety of innovative and evolutionary NPPs.**
 - Safety standards and documents relating to safety of innovative reactors; technical guidance for safe design.
 - Reviews of compliance with standards.
- **Design safety for long-term operation.**
 - A new service including aging management and other aspects of long-term operation.
- **Evaluation of external and internal hazards and site safety.**

Operational Safety

- **Enhance Member States' capabilities to manage and maintain safety in nuclear installations through application of safety standards, operational safety review services and dissemination of good practices.**
- **Enhance Member States' capabilities to perform self-assessment of their NPPs using OSART/PROSPER methods.**

Operational Safety

- **Enhancing operational safety performance.**
 - Provide OSART missions to strengthen operational safety in NPPs.
 - Maintain the OSART Missions Results Database for sharing experience and good practices.
 - Provide self-assessment training on OSART methodology and field inspection techniques.
- **Sharing of operational experience.**
 - PROSPER service to strengthen operational experience feedback.
 - Database of results.

Safety of Research Reactors and Fuel Cycle Facilities

- **Enhance safety of research reactors through:**
 - **Applying the Code of Conduct on the Safety of Research Reactors;**
 - **Developing safety standards;**
 - **Conducting integrated safety assessment missions.**
- **Enhance safety of fuel cycle installations through:**
 - **Adoption of safety standards and related publications;**
 - **Implementing safety services.**

Safety of Research Reactors and Fuel Cycle Facilities

- **Enhancing safety of research reactors.**
 - Application of the Code of Conduct;
 - Development and up-dating of safety standards;
 - Up-dated version of the IRSRR;
 - INSARR reviews and other missions;
 - CRP on radionuclide transport and source term.
- **Monitoring and safety enhancement of research reactors under agreement.**

Safety of Research Reactors and Fuel Cycle Facilities

- **Develop standards for fuel cycle installations:**
 - Spent fuel reprocessing;
 - Conversion and enrichment;
 - Mining, milling and refining;
 - Isotope production facilities.
- **Provide safety review services and training.**

Nuclear Installation Safety Review Services

- **Integrated Regulatory Review Service (IRRS);**
- **Operational Safety Review Team (OSART);**
- **Peer Review of Operational Safety Performance Experience (PROSPER);**
- **Safety Culture Enhancement Programme (SCEP);**
- **Safety Culture Assessment Review Team (SCART);**
- **International Probabilistic Safety Assessment Review Team (IPSART);**
- **Review of Accident Management Programs (RAMP);**
- **Integrated Safety Assessment of Research Reactors (INSARR).**

Nuclear Safety Standards

IAEA Safety Publications

- **Safety Standards Series**
- **Safety Series – Superseded by SSS**
- **Safety Report Series**
- **INSAG Reports**
- **Technical Report Series**
- **IAEA Technical Documents (TECDOCs)**
- **IAEA Services Series**
- **Accident Response**

Categories of Safety Standards

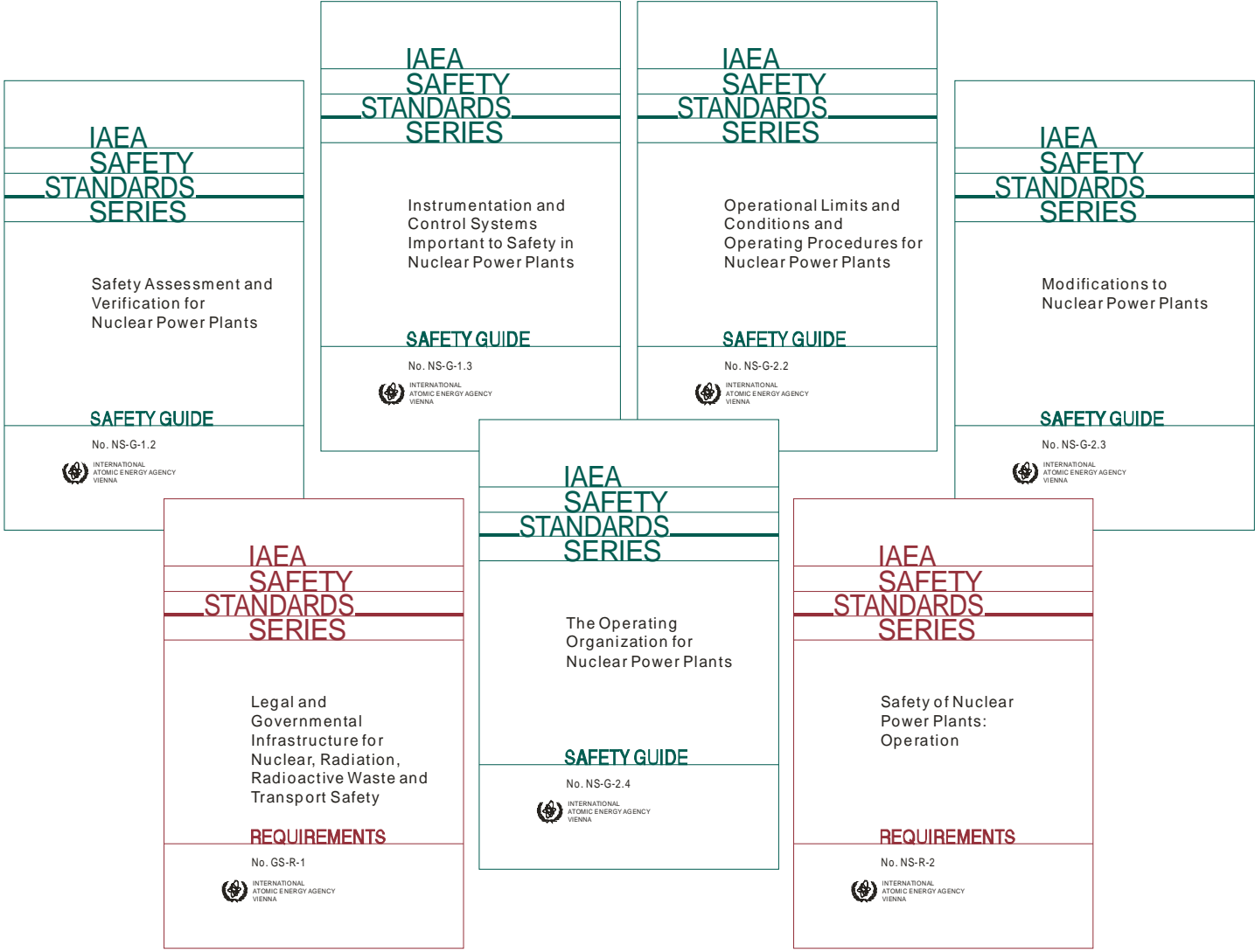
- **Safety Fundamentals (F)**
 - Basic objectives, concepts, and principles of safety and protection.
- **Safety Requirements (R)**
 - Requirements that must be fulfilled to ensure safety for particular activities or applications.
- **Safety Guides (G)**
 - Recommended actions, conditions, or procedures for complying with safety requirements.

The Safety Standard Series

- **General Safety (GS)**
 - Safety Fundamentals
 - Legal and Governmental Infrastructure
 - Emergency Preparedness and Response
 - Management Systems
- **Nuclear Safety (NS)**
 - Design of NPPs
 - Operation of NPPs
 - Site Evaluation
 - Research Reactors
 - Fuel Cycle Facilities

The Safety Standard Series

- **Radiation Safety (RS)**
- **Radioactive Waste Safety (WS)**
 - Infrastructure
 - Pre-disposal
 - Disposal
 - Rehabilitation
- **Transport Safety (TS)**



Safety Fundamentals

- **DS298: Principles of Nuclear, Radiation, Radioactive Waste and Transport Safety.**

Superseded Fundamentals Documents:

- **SS No. 110: The Safety of Nuclear Installations (1993).**
- **SS No. 111-F: The Principles of Radioactive Waste Management (1993).**
- **SS No. 120: Radiation Protection and the Safety of Radioactive Sources (1996).**

Thematic Safety Standards

Legal and Governmental Infrastructure

- **GS-R-1: Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste, and Transport Safety (2000).**
 - **GS-G-1.1: Organization and Staffing of the Regulatory Body for Nuclear Facilities (2002).**
 - **GS-G-1.2: Review and Assessment of Nuclear Facilities by the Regulatory Body (2002).**
 - **GS-G-1.3: Regulatory Inspection of Nuclear Facilities and Enforcement by the Regulatory Body (2002).**
 - **GS-G-1.4: Documentation for Use in Regulating Nuclear Facilities (2002).**
 - **GS-G-1.5: Regulatory Control of Radiation Sources (2004).**

Thematic Safety Standards

Emergency Preparedness and Response

- **GS-R-2: Preparedness and Response for a Nuclear or Radiological Emergency (2002).**
 - **GS-G-2.1: Arrangements for Preparedness for a Nuclear or Radiological Emergency (2006).**
 - **Safety Series 109: Intervention Criteria in a Nuclear or Radiation Emergency (1994).**

Thematic Safety Standards

Management Systems

- **The Management System integrates safety, health, environmental, security, quality and economic objectives into one coherent system. Guidance is available in:**
 - **GS-R-3: Management System for Facilities and Activities (2006) (Supersedes 50-C-Q);**
 - **GS-G-3.1: Application of the Management System for Facilities and Activities (2006) (Supersedes 50-SG-Q1 through Q7);**
 - **DS349: Management Systems for Nuclear Facilities (to supersede 50-SG-Q8 through Q14).**
- **These documents replace:**
 - **50-C/SG-Q: Quality Assurance for Safety in Nuclear Power Plants and other Nuclear Installations: Code and Safety Guides Q1-Q14 (1996).**

Thematic Safety Standards

Assessment and Verification

- **DS348: Safety Assessment and Verification**
 - **GS-G-4.1: Format and Content of the Safety Analysis Report for Nuclear Power Plants (2004).**

Site Evaluation

- **NS-R-3: Site Evaluation for Nuclear Installations.**
 - **NS-G-3.1: External Human Induced Events in Site Evaluation for Nuclear Power Plants (2002).**
 - **NS-G-3.2: Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants (2002).**

Thematic Safety Standards

Site Evaluation (cont'd.)

- **NS-G-3.3: Evaluation of Seismic Hazard for Nuclear Power Plants (2002).**
- **NS-G-3.4: Meteorological Events in Site Evaluation for Nuclear Power Plants (2003).**
- **NS-G-3.5: Flood Hazard for Nuclear Power Plants on Coastal and River Sites (2003).**
- **NS-G-3.6: Geotechnical Aspects of Nuclear Power Plant Site Evaluation and Foundations (2004).**

Facility Specific Safety Standards

Nuclear Power Plant: Design

- **NS-R-1: Safety of Nuclear Power Plants: Design (2000).**
 - **NS-G-1.1: Software for Computer Based Systems Important to Safety in Nuclear Power Plants (2000).**
 - **NS-G-1.2: Safety Assessment and Verification for Nuclear Power Plants (2001).**
 - **NS-G-1.3: Instrumentation and Control Systems Important to Safety in Nuclear Power Plants (2002).**
 - **NS-G-1.4: Design of Fuel Handling and Storage Systems in Nuclear Power Plants (2002).**
 - **NS-G-1.5: External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2003).**
 - **NS-G-1.6: Seismic Design and Qualification for Nuclear Power Plants (2003).**

Facility Specific Safety Standards

Nuclear Power Plant: Design

- **NS-G-1.7: Protection Against Internal Fires and Explosions in the Design of NPPs (2004).**
- **NS-G-1.8: Design of Emergency Power Systems for Nuclear Power Plants (2004).**
- **NS-G-1.9: Design of the Reactor Coolant Systems and Associated Systems in NPPs (2004).**
- **NS-G-1.10: Design of Reactor Containment Systems for Nuclear Power Plants (2004).**
- **NS-G-1.11: Protection Against Internal Hazards other than Fire and Explosions (2004).**
- **NS-G-1.12: Design of the Reactor Core for NPPs (2005).**
- **NS-G-1.13: Radiation Protection Aspects of Design for Nuclear Power Plants (2005).**

Facility Specific Safety Standards

Nuclear Power Plant: Operation

- **NS-R-2: Safety of Nuclear Power Plants: Operation (2000).**
 - **NS-G-2.1: Fire Safety in Operation of Nuclear Power Plants (2000).**
 - **NS-G-2.2: Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (2000).**
 - **NS-G-2.3: Modifications to Nuclear Power Plants (2001).**
 - **NS-G-2.4: The Operating Organization for Nuclear Power Plants (2001).**
 - **NS-G-2.5: Core Management and Fuel Handling for Nuclear Power Plants (2002).**

Facility Specific Safety Standards

Nuclear Power Plant: Operation

- **NS-G-2.6: Maintenance, Surveillance and In-Service Inspection in Nuclear Power Plants (2002).**
- **NS-G-2.7: Radiation Protection and Radioactive Waste Management in the Operation of NPPs (2002).**
- **NS-G-2.8: Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2002).**
- **NS-G-2.9: Commissioning of NPPs (2003).**
- **NS-G-2.10: Periodic Safety Reviews of NPPs (2003).**
- **NS-G-2.11: A System for Feedback of Experience from Events in Nuclear Installations (2005).**
- **DS347: Conduct of Operations at Nuclear Power Plants.**

Facility Specific Safety Standards Research Reactors

- **NS-R-4: Safety of Research Reactors (2005).**
 - **35-G1: Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report (1994). Update and revision is DS396.**
 - **35-G2: Safety in the Utilization and Modification of Research Reactors (1994). Update and revision is DS397.**
 - **NS-G-4.1: Commissioning of Research Reactors (2006).**
 - **NS-G-4.2: Maintenance, Periodic Testing and Inspections of Research Reactors (2006).**

Facility Specific Safety Standards Research Reactors

- **Safety Guides under preparation:**
 - **DS261: Operating Procedures and Operational Limits and Conditions for Research Reactors (to be merged with DS396).**
 - **DS325: The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors (title may be changed).**
 - **DS350: Core Management and Fuel Handling for Research Reactors.**

Facility Specific Safety Standards Research Reactors

- **Safety Guides under preparation:**
 - **DS340: Radiation Protection and Waste Management in the Design and Operation of Research Reactors (will be merged with WS-G-2.1, Decommissioning of Nuclear Power Plants and Research Reactors).**
 - **Guidance on graded approach will be incorporated into the various guides, rather than being published as a separate document.**