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1. IDENTIFICATION

Document category: Specific Safety Guide

Working ID: DS524

Proposed Title: Radiation Protection Aspects of Design for Nuclear Power Plants

Proposed Action: Revision of Safety Guide NS-G-1.13 Radiation Protection Aspects of Design for Nuclear Power Plants, 2005

Review Committee(s) or Group: NUSSC, RASSC, WASSC, EPReSC, NSGC

Technical Officer: TOTH Csilla, SAS

2. BACKGROUND

The Safety Guide NS-G-1.13 on “Radiation Protection Aspects of Design for Nuclear Power Plants” was published in 2005. This Safety Guide provides recommendations on how to satisfy the requirements established in the Safety Requirements publication NS-R-1 on the Safety of Nuclear Power Plants: Design, issued in 2000. It addresses the provisions that should be made in the design of nuclear power plants in order to protect site personnel (workers), the public and the environment against radiological hazards for operational states and accident conditions, including for the decommissioning stage.

3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

The IAEA Safety Standards for the design of NPPs have been revised in the last ten years. The Specific Safety Requirements publication on the Safety of Nuclear Power Plants: Design was revised and the most recent version SSR-2/1 (Rev.1) was published in 2016. The Generic Safety Requirements GSR Part 4, Safety Assessment for Facilities and Activities was published in 2009 and the most recent version GSR Part 4 (Rev.1) was published in 2016. This revision of NS-G-1.13 will provide recommendations to meet the revised requirements, in particular it will provide recommendations on meeting Requirement 5, 81 and 82 of SSR-2/1 (Rev. 1). [Sweden 1]

In addition, the revision is needed to address the concepts of optimization of protection and safety and application of dose limits into design based on relevant requirements set out in GSR Part 3 Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards (2014).

The relevant requirement of GSR Part 2 Leadership and Management for Safety, (2016) and. GSR Part 7 Preparedness and Response for a Nuclear or Radiological Emergency (2015) will be also taken into consideration. [USA2, SA 2]

The revision will incorporate experience of Member States on the application of safety standards and operating experience and feedback from the accident at the Fukushima Daiichi NPP.

Since the publication of NS-G-1.13, experience has been gained from design assessment activities and improvements have been introduced to plant designs for new NPPs and modifications to existing NPPs

in different areas that affect radiation protection of workers and members of public such as outages, maintenance, communication technologies, automation and management of plant operations. This revision will take into account these improvements and will include the latest information about contemporary technical and management solutions implemented in the latest designs and modifications of NPPs regarding radiation protection. [\[UK 2\]](#)

4. OBJECTIVE

The revised Safety Guide will be primarily intended to provide recommendations on radiation protection aspects in the design of new nuclear power plants. In particular it will provide recommendations on meeting Requirement 5 of SSR-2/1 (Rev. 1).

For nuclear power plants designed according to earlier standards, it is expected that in the safety assessments of such designs a comparison will be made with the current standards (for example as part of the safety reassessment of the plant), to determine whether the radiation protection measures and arrangements of the plant could be further enhanced by means of reasonably practicable safety improvements. (see para. 1.3 of SSR-2/1 (Rev. 1)) [consistent with member states' regulations. \[USA 1\]](#)

The revised Safety Guide is intended for use by designers, operating organizations, regulatory bodies and technical support organizations who are involved in planning, managing and carrying out the design of new nuclear power plants and design modification of operating nuclear plants. The terms used in the revised Safety Guide will be used as defined and explained in the IAEA Safety Glossary, 2018 Edition.

5. SCOPE

This Safety Guide will describe the measures to be taken in design of nuclear power plants for the radiation protection of workers and the public, and for protection of the environment, for all operational states [including commissioning](#) and accident conditions, including for the decommissioning stage; [\[UK 3\]](#)

Although the majority of the new designs for nuclear power plants are for water cooled reactors, [the scope of](#) this Safety Guide ~~may~~ [will](#) also ~~cover~~ [be relevant to](#) other types of ~~commercial~~ reactors; this Safety Guide is relevant to design issues associated with modifications to existing plants and their decommissioning. [\[Japan 1\]](#)

6. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

The scope of this Safety Guide includes radiation protection and monitoring, therefore the Radiation Safety and Monitoring Section will be consulted as part of the drafting process.

This revision will interface with at least the following IAEA Safety Standards and other publications:

INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1 (Rev. 1), IAEA, Vienna (2016).

INTERNATIONAL ATOMIC ENERGY AGENCY, IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection, 2016 Revision, IAEA, Vienna (in preparation).

[INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation and IAEA Safety Standards Series No. SSR-2/2 \(Rev. 1\), IAEA, Vienna \(2016\).](#)

INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).

EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).

INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 4 (Rev. 1), IAEA, Vienna (2016).

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015).

INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).

INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Nuclear Installations, IAEA Safety Standards Series No. GS-G-3.5, IAEA, Vienna (2009).

INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13, IAEA, Vienna (2011).

INTERNATIONAL ATOMIC ENERGY AGENCY, Protection against Internal Fires and Explosions in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.7, IAEA, Vienna (2004). (A revision of this publication is in preparation, DS494.)

INTERNATIONAL ATOMIC ENERGY AGENCY, Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.11, IAEA, Vienna (2004). (A revision of this publication is in preparation, DS494.)

INTERNATIONAL ATOMIC ENERGY AGENCY, External Events Excluding Earthquakes in the Design of Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.5, IAEA, Vienna (2003). (A revision of this publication is in preparation, DS498.)

INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Existing Nuclear Installations, IAEA Safety Standards Series No. NS-G-2.13, IAEA, Vienna (2009).

INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Design and Qualification for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.6, IAEA, Vienna (2003). (A revision of this publication is in preparation, DS490.)

INTERNATIONAL ATOMIC ENERGY AGENCY, Seismic Hazards in Site Evaluation for Nuclear Installations, IAEA Safety Standards Series No. SSG-9, IAEA, Vienna (2010). (A revision of this publication is in preparation, DS507.)

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Electrical Power Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-34, IAEA, Vienna (2016).

INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Classification of Structures, Systems and Components in Nuclear Power Plants, IAEA Safety Standards Series No. SSG-30, IAEA, Vienna (2014).

INTERNATIONAL ATOMIC ENERGY AGENCY, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.2, IAEA, Vienna (2000). (A revision of this publication is in preparation, DS497.)

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of the Reactor Core for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.12-DS488, IAEA, Vienna (~~in preparation~~DS488, under publication).

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Design of Fuel Handling and Storage Systems for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.4, IAEA, Vienna (2003). (~~A revision of this publication is in preparation,~~ DS487, under publication-)

INTERNATIONAL ATOMIC ENERGY AGENCY, Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-48, IAEA, Vienna (2018).

INTERNATIONAL ATOMIC ENERGY AGENCY, Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-2.6, IAEA, Vienna (2002). (A revision of this publication is in preparation, DS497.)

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of the Reactor Containment and Associated Systems for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.10-DS482, IAEA, Vienna (DS482 under publication~~in preparation~~).

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.9, IAEA, Vienna (DS481 under publication). [Japan]

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants, IAEA Safety Standards Series, (DS440 under publication).

INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Instrumentation and Control Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-39, IAEA, Vienna (2016).

INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Occupational Radiation Protection, IAEA Safety Standards Series No. GSG-7, IAEA, Vienna (2018).

INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS ENVIRONMENT PROGRAMME, Radiation Protection of the Public and the Environment, IAEA Safety Standards Series No. GSG-8, IAEA, Vienna (2018).

INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS ENVIRONMENT PROGRAMME, Regulatory Control of Radioactive Discharges to the Environment, IAEA Safety Standards Series No. GSG-9, IAEA, Vienna (2018).

INTERNATIONAL ATOMIC ENERGY AGENCY, UNITED NATIONS ENVIRONMENT PROGRAMME, Prospective Radiological Environmental Impact Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSG-10, IAEA, Vienna (2018).

INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-47, IAEA, Vienna (2018) [Germany 1]

INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna. (2014) [Germany 2, PAK 1]

INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSR Part 5, IAEA, Vienna (2009). [PAK 1]

INTERNATIONAL ATOMIC ENERGY AGENCY, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011). [SA 1]

INTERNATIONAL ATOMIC ENERGY AGENCY, Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007). [SA 1]

INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, IAEA Safety Standards Series No. SSG-40, IAEA, Vienna (2016).

7. OVERVIEW

The content will be updated based on latest Safety Standards and recent experience in plants in operation or decommissioning and lessons learned from the Fukushima Daiichi NPP accident.

The revised version will also add recommendations relevant to higher dose tasks performed during outages and maintenance activities (as stated in GSG-7 ~~and by taking into account the itinerant workers~~) and to assist plant managers in making decisions early in the design process which influence radiation protection measures. [\[Japan2\]](#)

The revision will also provide additional recommendations in different areas such as radiation protection design aspects for contemporary communication technologies, automation, radiation protection programmes relates to all phases of a practice or to the lifetime and design impact on management of plant operations (e.g. design for load following operation). This Safety Guide also addresses radiation protection aspects of the handling, interim storage and treatment of radioactive waste in NPPs.

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ANNEX I – EVALUATION AND MINIMISATION OF SOURCE TERM

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8. PRODUCTION SCHEDULE: Provisional schedule for preparation of the document, outlining realistic expected dates for each step:

	A*
STEP 1: Preparing a DPP	DONE
STEP 2: Approval of DPP by the Coordination Committee	2Q 2019
STEP 3: Approval of DPP by the relevant review Committees	2Q 2019
STEP 4: Approval of DPP by the CSS	4Q 2019
STEP 5: Preparing the draft	2019-2020
STEP 6: Approval of draft by the Coordination Committee	3Q 2020
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	4Q 2020
STEP 8: Soliciting comments by Member States	1Q 2021
STEP 9: Addressing comments by Member States	2Q 2021
STEP 10: Approval of the revised draft by the Coordination Committee Review in NSOC-SSDS (Technical Editorial review)	3Q 2021
STEP 11: Approval by the relevant review Committees for submission to the CSS	4Q 2021
STEP 12: - Submission to the CSS - Submission in parallel and approval by the Publications Committee - MTCD Editing - Endorsement of the edited version by the CSS	2Q 2022

STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	N/A
STEP 14: Target publication date	3Q 2022

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- *Column A for Safety Fundamentals, Safety Requirements and Safety Guides.*
- *Column B for Nuclear Security Series publications*
- *Column C for TECDOCs, safety reports and other publications*

9. RESOURCES

It is estimated that development of the revised Safety Guide would involve approximately 30 weeks of effort by Member State experts. This is based upon assuming 3 one-week consultant meetings.

Secretariat resources involved are estimated at 10 weeks of effort by Agency staff.