1. IDENTIFICATION

Document category: Specific Safety Guide

Working ID: DS524

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


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 Requirements 5, 81 and 82 of SSR-2/1 (Rev. 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 requirements 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.

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 and 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.

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 Requirements 5, 81 and 82 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.

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. Although the majority of the new designs for nuclear power plants are for water cooled reactors, the scope of this Safety Guide will also cover other types of reactors; this Safety Guide is relevant to design issues associated with modifications to existing plants and their decommissioning.

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, 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, 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, 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, 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 Coolant System and Associated Systems for Nuclear Power Plants, IAEA Safety Standards Series No. NS-G-1.9, IAEA, Vienna (DS481 under publication).


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 to assist plant managers in making decisions early in the design process which influence radiation protection measures.

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.

The below Table of Contents provides information on the planned structure of the revised Safety Guide.

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4. SPECIFIC DESIGN FEATURES OF RADIATION PROTECTION IN DESIGN FOR OPERATIONAL STATES
4.1. Plant layout
4.2. Other design considerations for an effective operational radiation protection programme

5. SPECIFIC DESIGN FEATURES OF RADIATION PROTECTION IN DESIGN FOR ACCIDENT CONDITIONS
5.1. Plant layout
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6. SPECIFIC DESIGN FEATURES OF RADIATION PROTECTION IN DESIGN FOR DECOMMISSIONING
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7. DESIGN FOR RADIATION MONITORING FOR OPERATIONAL STATES AND ACCIDENT CONDITIONS AND FOR DECOMMISSIONING
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ANNEX I – EVALUATION AND MINIMISATION OF SOURCE TERM
ANNEX II – EXAMPLES OF ZONING FOR DESIGN PURPOSES

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

<table>
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<tr>
<th>STEP</th>
<th>Description</th>
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<tr>
<td>1</td>
<td>Preparing a DPP</td>
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<td>2</td>
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<td>2Q 2019</td>
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<td>3</td>
<td>Approval of DPP by the relevant review Committees</td>
<td>2Q 2019</td>
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<td>4</td>
<td>Approval of DPP by the CSS</td>
<td>4Q 2019</td>
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<td>5</td>
<td>Preparing the draft</td>
<td>2019-2020</td>
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<td>6</td>
<td>Approval of draft by the Coordination Committee</td>
<td>3Q 2020</td>
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<td>7</td>
<td>Approval by the relevant review Committees for submission to Member States for comments</td>
<td>4Q 2020</td>
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<td>8</td>
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<td>1Q 2021</td>
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<td>9</td>
<td>Addressing comments by Member States</td>
<td>2Q 2021</td>
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<td>10</td>
<td>Approval of the revised draft by the Coordination Committee Review in NSOC-SSDS (Technical Editorial review)</td>
<td>3Q 2021</td>
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<td>4Q 2021</td>
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<td>Establishment by the Publications Committee and/or Board of Governors (for SF and SR only)</td>
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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.