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Document Preparation Profile (DPP)
Version 034 dated ~~1017 February~~ June 2022

1. IDENTIFICATION

Document Category or batch of publications to be revised in a concomitant manner

Safety Guides

Working ID: DS535

Proposed Title: Periodic safety review for nuclear power plants

Proposed Action: Revision of SSG-25

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

Technical Officer(s): Martin GAJDOS, Alexander DUCHAC (NSNI/SAS)

2. BACKGROUND

Operational nuclear power plants are generally subject to routine reviews of plant operational safety, or special safety reviews following operational events, to drive continuous safety improvements throughout their ~~operational-operating~~ lifetime. However, these routine safety reviews are focused reviews and typically do not inclusively consider changes in safety standards ~~and technological developments~~, the cumulative effects of plant ageing, plant modifications, feedback of operating experience, organizational and management issues, site related aspects ~~or and~~ developments in science and technology.

To capture the aggregate effect of these topics on plant safety, Requirement 12 of IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), Safety of Nuclear Power Plants: Commissioning and Operation calls for the periodic conduct of a comprehensive, integrated safety review, commonly referred to as a ‘periodic safety review’ (PSR), which is carried out with the established frequency and relies on a systematic and comprehensive process whereby up-to-date standards and technological developments are considered to provide assurance of the continued viability of the plant’s licensing basis, given the cumulative aspects of emerging national and international standards, evolving regulatory requirements, plant modifications and ageing, operating experience, site related aspects and technological development. PSR thus provides an effective way to obtain an overall view of actual plant safety and the quality of the safety documentation, and to determine reasonably practicable modifications of the plant to provide for compliance with applicable standards ~~with the aim of to enhancing-enhance~~ the safety of the plant by further reducing the likelihood and the potential consequences of accidents. Specifically, the assessment for the next operational period documents the following:

- The extent to which the plant conforms to current standards and practices;
- The extent to which the (updated) licensing basis will remain valid to the next operational period, or to the end of the plant’s proposed extended operating life;
- The adequacy of the arrangements that are in place to ~~maintain-ensure~~ plant safety for the next operational period;
- The reasonably practicable safety improvements to be implemented to resolve the safety issues that have been identified.

It is recognized that (in some jurisdictions) the PSR is consistently used to support decision making on periodic permission for continued operation. However, the PSR can provide [an](#) evaluation of safety factors related to [the](#) operation beyond the original planned or licensed lifetime, usually referred to as 'long term operation' (LTO). These safety factors include (among others) plant design safety, actual condition of structures, systems and components (SSCs) important to safety, ageing and equipment qualification.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

The existing Safety Guide SSG-25 provides recommendations and guidance on the conduct of a PSR for a nuclear power plant. Since it has been published in 2013, a significant enhancement of several IAEA safety standards has been made. As a result, SSG-25 does not reflect updated requirements relevant to periodic safety review of nuclear power plants that are established in the following publications:

- [SSR-1: Site Evaluation for Nuclear Installations](#);
- SSR 2/1 (Rev.1): Safety of Nuclear Power Plants: Design;
- SSR 2/2 (Rev.1): Safety of Nuclear Power Plants: Commissioning and Operation;
- [GSR Part 1 \(Rev.1\): Governmental, Legal and Regulatory Framework for Safety](#)
- GSR Part 2: Leadership and Management for Safety;
- GSR Part 3: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
- [GSR Part 4 \(Rev.1\): Safety Assessment for Facilities and Activities](#);
- [GSR Part 6: Decommissioning of Facilities](#);
- GSR Part 7: Preparedness and Response for a Nuclear or Radiological Emergency.

Several other IAEA safety standards recently published also have some relevance to periodic safety reviews. These include the following:

- [SSG-2 \(Rev.1\): Deterministic Safety Analysis \[for Nuclear Power Plants\]\(#\) \(a revision published in 2019\)](#);
- [SSG-9 \(Rev. 1\): Seismic Hazards in Site Evaluations for Nuclear Installations \(a revision published in 2022\)](#);
- SSG-48: Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants (a revision published in 2018);
- SSG-51: Human Factors Engineering in the Design of Nuclear Power Plants (new Safety Guide published in 2019);
- [SSG-61: Format and Content of the Safety Analysis Report for Nuclear Power Plants \(a revision published in 2021\)](#);
- [SSG-62: Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants \(new Safety Guide published in 2020\)](#);
- [SSG-63: Design of Fuel Handling and Storage Systems for Nuclear Power Plants \(a revision published in 2020\)](#);
- SSG-64: Protection against Internal Hazards in the Design of Nuclear Power Plants (published in 2021);
- SSG-67: Seismic Design for Nuclear Installations (a revision published in 2021);
- SSG-68: External Events Excluding Earthquakes in the Design of Nuclear Power Plants (a revision published in 2021);
- [SSG-69: Equipment Qualification for Nuclear Installations \(new Safety Guide published in 2021\)](#);

- SSG-77: Protection against Internal and External Hazards in the Operation of Nuclear Power Plants (new Safety Guide published in 2022)
- GSG-16: Leadership, Management and Culture for Safety in Radioactive Waste Management (published in 2022).

The recommendations provided in SSG-25 on the conduct of a PSR need to be updated to reflect changes made to IAEA safety standards as well as the feedback received from Member States during Technical Meetings organized in the topical area of PSR for NPPs, and the Technical Safety Review (TSR) -PSR peer-review services conducted on periodic safety reviews as well as changes made to IAEA safety standards.

4. OBJECTIVE

The purpose of this Safety Guide is to provide recommendations and guidance on the conduct of a PSR for an existing-operational nuclear power plant to determine whether they-it conforms with-to current requirements and respective recommendations provided in existing IAEA safety standards. This Safety Guide is intended for use by operating organizations, regulatory bodies and their technical support organizations, consultants and advisory bodies. This updated Safety Guide will support the implementation of the IAEA Technical Safety Review (TSR) service on the periodic safety review.

5. SCOPE

This publication will apply to operating nuclear power plants. It will revise the specific topics addressed in SSG-25 to reflect relevant changes, in particular those made to IAEA safety standards since the publication of SSG-25 in 2013.

The anticipated revisions concern namely-in particular Section 3 (Input from the periodic safety review in assessing long term operation or licence renewal), Section 5 (Safety factors in a PSR) and Section 6 (Global assessment) of the SSG-25. Regarding LTO considerations, the anticipated revisions will address in detail the interfaces between PSR and LTO (SSG-25 and SSG-48). The document will also address, as necessary, consideration of interfaces between safety, security, and safeguards according to the Requirement 8 of the SSR-2/1 (Rev. 1).

The structure of the safety guide will be revised to provide for a more logical arrangement of the information in the revised guide. Other SSG-25 sections, e.g., Sections 4, 7, 8 and 9 might be subject to revision, due to the change of their place in the new structure of the safety guide. One additional section is included to address specific considerations of PSR for NPPs in permanent shutdown or in decommissioning.

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

This publication will potentially interface with at least the following IAEA Safety Standards Series publications:

- GSR Part 1 (Rev.1): Governmental, Legal and Regulatory Framework for Safety
- GSR Part 2: Leadership and Management for Safety
- GSR Part 3: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
- GSR Part 4 (Rev. 1): Safety Assessment for Facilities and Activities
- GSR Part 5: Predisposal Management of Radioactive Waste
- GSR Part 6: Decommissioning of Facilities

- GSR Part 7: Preparedness and Response for a Nuclear or Radiological Emergency
- SSR-1: Site Evaluation for Nuclear Installations
- SSR-2/1 (Rev.1): Safety of Nuclear Power Plants: Design
- SSR-2/2 (Rev. 1): Safety of Nuclear Power Plants: Commissioning and Operation
- GSG-3: The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste
- GSG-16: Leadership, Management and Culture for Safety in Radioactive Waste Management
- NS-G-2.13: Evaluation of Seismic Safety for Existing Nuclear Installations
- SSG-2 (Rev.1): Deterministic Safety Analysis for Nuclear Power Plants
- SSG-3: Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants
- SSG-4: Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants
- SSG-9 (Rev. 1): Seismic Hazards in Site Evaluations for Nuclear Installations
- SSG-15: Storage of Spent Nuclear Fuel
- SSG-18: Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations
- SSG-21: Volcanic Hazards in Site Evaluation for Nuclear Installations
- SSG-30: Safety Classification of Structures, Systems and Components in Nuclear Power Plants
- SSG-34: Design of Electrical Power Systems for Nuclear Power Plants
- SSG-39: Design of Instrumentation and Control Systems for Nuclear Power Plants
- SSG-48: Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants
- SSG-51: Human Factors Engineering in the Design of Nuclear Power Plants
- SSG-52: Design of the Reactor Core for Nuclear Power Plants
- SSG-53: Design of the Reactor Containment and Associated Systems for Nuclear Power Plants
- SSG-54: Accident Management Programmes for Nuclear Power Plants
- SSG-56: Design of Reactor Coolant System and Associated Systems for Nuclear Power Plants
- SSG-61: Format and Content of the Safety Analysis Report for Nuclear Power Plants
- SSG-62: Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants
- SSG-63: Design of Fuel Handling and Storage Systems for Nuclear Power Plants
- SSG-64: Protection against Internal Hazards in the Design of Nuclear Power Plants
- SSG-67: Seismic Design for Nuclear Installations
- SSG-68: External Events Excluding Earthquakes in the Design of Nuclear Power Plants
- SSG-69: Equipment Qualification for Nuclear Installations
- SSG-77: Protection against Internal and External Hazards in the Operation of Nuclear Power Plants
- DS497A: Operational Limits and Conditions
- DS497B: Modifications of Nuclear Power Plants
- DS497C: The Operating Organization of Nuclear Power Plants
- DS497D: Core Management and Fuel Handling for Nuclear Power Plants
- DS497E: Maintenance, Surveillance and in-service Inspection for Nuclear Power Plants

- DS497F: Recruitment, Qualification and Training of Personnel for Nuclear Power Plants
- ~~DS497G: Conduct of Operation at Nuclear Power Plants~~
- ~~DS503: Protection against Internal and External Hazards in the Operation of Nuclear Power Plants~~

7. OVERVIEW

The proposed publication will include the following contents:

1. INTRODUCTION
 - Background
 - Objective
 - Scope
 - Structure
2. RATIONALE, OBJECTIVE AND GENERAL RECOMMENDATIONS FOR PERIODIC SAFETY REVIEW
3. ROLES AND RESPONSIBILITIES DURING PERIODIC SAFETY REVIEW
4. THE REVIEW PROCESS OF PERIODIC SAFETY REVIEW
5. ACTIVITIES FOLLOWING PERIODIC SAFETY REVIEW
6. SCOPE, REVIEW STRATEGY AND GENERAL METHODOLOGY FOR PERIODIC SAFETY REVIEW
7. SAFETY FACTORS IN A PERIODIC SAFETY REVIEW
 - Safety factors relating to the plant
 - Safety factors relating to safety analysis
 - Safety factors relating to performance and feedback of experience
 - Safety factors relating to management
 - Safety factor relating to environment
8. GLOBAL ASSESSMENT IN THE PERIODIC SAFETY REVIEW
 - Methodology for global assessment
 - Principles for ranking results from periodic safety review, including categorization of deviations identified
 - Identification, Development and justification of safety improvements for the next PSR period
9. INPUT FROM THE PERIODIC SAFETY REVIEW IN ASSESSING LONG TERM OPERATION
 - Plant programmes to support the safety factors relating to plant design, the actual condition of SSCs important to safety, equipment qualification and ageing, status of SSCs with respect to their obsolescence, site characteristics and operating experience
 - A management system that addresses quality management and configuration management for continued LTO
 - Safety analyses involving time limiting assumptions relating to the proposed lifetime
 - Programmes for promoting safety culture and the knowledge management focused on the pursuit of excellence in all aspects of safety management and human factors for continued LTO
 - Identification, Development, and justification of safety improvements for long term operation
 - Specific aspects of periodic safety review in support of assessment of long term operation
10. PERIODIC SAFETY REVIEW OF NPPs IN PERMANENT SHUTDOWN OR IN DECOMMISSIONING

Specific aspects of periodic safety review for NPPs in permanent shutdown or in decommissioning

Scope of the periodic safety review for NPPs in permanent shutdown or in decommissioning

A management system and configuration management for NPPs in permanent shutdown or decommissioning

Safety analyses in support of NPP decommissioning

Identification, development, and justification of retrofits necessary for undergoing dismantling activities

A process for integrating human factors engineering to reflect tasks conducted as part of decommissioning operation and by different entities and suppliers

Appendix I INTERFACES ~~BETWEEN-AMONG~~ SAFETY FACTORS

Appendix II DOCUMENTATION OF THE PSR

REFERENCES

DEFINITIONS

CONTRIBUTORS TO DRAFTING AND REVIEW

Annex I TYPICAL INPUTS, OUTPUTS AND RELEVANT PUBLICATIONS FOR THE REVIEW OF SAFETY FACTORS

Annex II IMPLEMENTATION OF THE PSR SAFETY IMPROVEMENTS PLAN-

DEFINITIONS

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

	A*	B*	C*
STEP 1: Preparing a DPP	DONE	DONE	DONE
STEP 2: Internal review of the DPP (Approval by the Coordination Committee)	March 2022		
STEP 3: Review of the DPP by the review Committee(s) (Approval by review Committee(s))	June 2022		
STEP 4: Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP	November 2022		
STEP 5: Preparing the draft publication	April 2023		
STEP 6: First internal review of the draft publication (Approval by the Coordination Committee)	April 2023		
STEP 7: First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments)	June 2023		
STEP 8: Soliciting comments by Member States	December 2023		
STEP 9: Addressing comments by Member States	June <u>January</u> 2024		
STEP 10: Second internal review of the draft publication (Approval by the Coordination Committee)	April <u>August</u> 2024		
STEP 11: Second review of the draft publication by the review Committee(s) (Approval of the draft)	November 2024		
STEP 12: (For Safety Standards) Editing of the draft publication in MTCDD and endorsement of the draft publication by the CSS (For nuclear security guidance) DDG's decision on whether additional consultation is needed, establishment by the Publications Committee and editing	April 2025		

STEP 13: Approval by the Board of Governors (for SF and SR only)			
STEP 14: Target publication date	December 2025		

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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 the development of the document would involve approximately 24 person-weeks of effort by Member States' experts. This is based upon assuming 3 one-week consultancy meetings involving no more than 7 experts, ~~a one-week technical meeting to facilitate Member States review~~, and an average of one week of work for preparation, when expert is participating in a meeting.

Secretariat resources involved are estimated at 12 person-weeks of effort by Agency staff plus support for experts' travel and honoraria for experts whose effort is not otherwise funded.

ANNEX

(For a revision of a publication, or an addendum to a publication, or for revision by batch, attach the gap and feedback analysis report. For a new publication attach the gap analysis report.)

- FEEDBACK AND GAP ANALYSIS REPORT

The IAEA Safety Standards provide guidance in the field of periodic safety reviews for nuclear power plants through the specific safety guide SSG-25. This safety guide provides recommendations on how to address the Requirement 12 of IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), *Safety of Nuclear Power Plants: Commissioning and Operation*.

A revision of the SGG-25 is proposed as it would respond to the following needs and objectives:

1) Update and alignment of the information with the IAEA Safety Standards published recently

After the accident at the TEPCO's Fukushima Daiichi NPPs, the IAEA Action Plan on Nuclear Safety (GOV/2011/59-GC(55)/14) included an action to "Review and strengthen IAEA Safety Standards and improve their implementation". The Secretariat carried out a first review on the basis of the lessons from the information that was available up to September 2011.

This work on the lessons learned led to the decision to revise, through several addenda, e.g., GSR Part 1, NS-R-3, SSR-2/1, SSR-2/2, or GSR Part 4. These revised Safety Requirements were published several years after the publications of the SSG-25 and relevant aspects should be incorporated in this Safety Guide, mainly to align the scope of the PSR outlined in individual safety factors

In addition, other IAEA Safety Requirements, e.g., GSR Part 2, GSR Part 3 or GSR Part 7 were published after the publication of the SSG-25 and are not fully reflected in the current revision of the safety guide, specifically in the scope of the PSR assessment as outlined in individual safety factors.

2) Incorporation of the feedback received from Member States

The guidance provided in the SSG-25 on periodic safety reviews been produced approximately ten years ago and need to be revised to take into account updated good practices and practical experience from conducting periodic safety reviews in Member States, as well as their feedback from practical use of the safety guide.

The feedback received from Member States during technical meetings and workshops organized by the IAEA on the topic of periodic safety reviews for nuclear power plants call for updated or extended guidance in the following areas:

- Scope and content of the PSR for LTO justification, alignment with SSG-48.
- Interfaces between safety factors and their correlation matrix.
- Global assessment and prioritization of PSR findings.

3) Incorporation of the feedback from Technical Safety Review conducted at the request of Member States

The IAEA has conducted several Technical Safety Reviews on periodic safety reviews for NPPs in recent years. These peer-reviews were reviewing PSR documentation prepared by operating organization during the typical PSR period, as well of the PSR documentation developed in support of the LTO justification.

The feedback from these peer-reviews is aligned with Member States’ feedback received in IAEA events. Specifically, the IAEA noted the misalignment and gaps in the scope of safety factors as outlined in SSG-25 with more recent IAEA Safety Requirement documents, specifically GSR Part 7, SSR-1, or SSR-2/1 (Rev. 1) and SSR-2/2 (Rev .1).

4) Update of the internal structure of the safety guide

The update of the internal structure of the safety guide is proposed to improve the logical placement of the information. The revised safety guide will be structured to address three topical areas:

- General considerations, framework and conduct of the PSR.
- PSR scope and methodology.
- Specific applications of PSR (LTO, decommissioning).

5) Main revisions proposed to the safety guide

The following table presents the main revisions to the SSG-25 expected at the Section level. These revisions were identified utilizing comparisons with recently published IAEA Safety Standards and addressing Member States’ feedback as well as feedback from the Technical Safety Review conducted on the PSR for NPPs.

<u>SSG-25: Periodic Safety Review for Nuclear Power Plants</u>	
<u>Section</u>	<u>Main Revisions</u>

<u>1</u>	<u>Standardize background, objective, and scope. Align discussions and information to reflect the update structure of the safety guide. Reflect explicitly the considerations of LTO or application to NPPs in decommissioning.</u>
<u>2</u>	<u>Revise to reflect current requirements in SSG-2/2 (Rev. 1), update as necessary to align with SSG-48 and address, as necessary, considerations of safety interface with security and safeguards.</u>
<u>3</u>	<u>Revise and align with SSG-48 and include relevant good practices from PSR use to support LTO justification in Member States.</u>
<u>4</u>	<u>Review and align, as necessary, with the updated guidance in other Sections of the revised safety guide.</u>
<u>5</u>	<u>Revise and align with applicable requirements from GSR Part 2, GSR Part 3, GSR Part 4 (Rev. 1), GSR Part 5, GSR Part 6, GSR Part 7, SSR-1, SSR-2/1 (Rev. 1) and SSR-2/2 (Rev. 1), and with relevant safety guides published recently. Revise the content of individual safety factors to avoid unnecessary overlap.</u>
<u>6</u>	<u>Review and extend the guidance on performing Global Assessment, prioritizing PSR findings and identification, development an implementation of safety improvements.</u>
<u>7</u>	<u>Review and update utilizing Member States' experience and feedback received during IAEA workshops and technical meetings in the topical area.</u>
<u>8</u>	<u>Review and update utilizing Member States' experience and feedback received during IAEA workshops and technical meetings in the topical area.</u>
<u>9</u>	<u>Review and update utilizing Member States' experience and feedback received during IAEA workshops and technical meetings in the topical area.</u>
<u>New Section Proposed</u>	<u>New Section will be introduced to address specific aspects of the PSR for NPPs in permanent shutdown of decommissioning.</u>
<u>Appendix I</u>	<u>Review and update to reflect the changes introduced in the revised Section 5.</u>
<u>Appendix II</u>	<u>Review and update utilizing Member States' experience and feedback received during IAEA workshops and technical meetings in the topical area.</u>
<u>Annex</u>	<u>Review and update to reflect the changes introduced in the revised Section 5 and updated list of applicable IAEA Safety Standards and technical documents.</u>
<u>New Annex Proposed</u>	<u>Implementation of the PSR Safety Improvements Plan</u>