

SPESS F
Document Preparation Profile (DPP)
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(The version and date should be updated as appropriate when changes are made to the DPP.)

1. IDENTIFICATION

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

Safety Guide

Working ID: DS561

Proposed Title: Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants

Proposed Action: Revision of SSG-48

Review Committee(s) or Group: NUSSC, WASSC

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2. BACKGROUND

In recent years an increasing number of States have decided to license continued operation of nuclear power plants beyond their initial extension period, or to further extend their lifetime based on 10-year periodic safety reviews. In 2018 SSG-48 was published and has since been used for Safety Aspects of Long Term Operation (SALTO) missions, the International Generic Ageing Lessons Learned (IGALL) programme and by individual nuclear power plants (NPPs) in developing and implementing ageing management activities and preparing for long term operation (LTO). Additionally, States and regulatory bodies also use the Safety Guide to develop and improve regulations and guidance related to ageing management and LTO. As a result, these activities have generated considerable information and experience indicating areas where the Safety Guide can be further improved or supplemented.

In addition, it is expected that the subsequent LTOs being considered or implemented at NPPs would not identify significantly different approaches, but still justify the revision and adjustment of the Safety Guide, mainly in terms of managing technical and non-technical challenges such as new ageing phenomena and supply chain issues.

Several IAEA Safety Standards that have an impact on SSG-48 have been updated since 2018 or are currently in the process of being updated, such as:

- SSR-2/2 (Rev. 1) Safety of Nuclear Power Plants: Commissioning and Operation (DS532);
- SSG-25 Periodic Safety Review for Nuclear Power Plants (DS535);¹
- SSG-61 Format and Content of the Safety Analysis Report for Nuclear Power Plants (2021);
- SSG-69 Equipment Qualification for Nuclear Installations (2021);
- SSG-71 Modifications to Nuclear Power Plants (2022);

¹ By the time of drafting the new version of SSG-48 the revised versions of SSR-2/2 (DS532) and SSG-25 (DS535) will be available and so those will be considered.

- SSG-74 Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants (2023).

In addition, the following safety reports have been published that may need to be considered for the revision of SSG-48:

- SRS-82 (Rev. 2) Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL) (2024)
- SRS-106 Ageing Management and Long Term Operation of Nuclear Power Plants: Data Management, Scope Setting, Plant Programmes and Documentation (2022)
- SRS-109 Regulatory Oversight of Ageing Management and Long Term Operation Programme of Nuclear Power Plants (2022)
- SRS-121 Use of Periodic Safety Review for Long Term Operation of Nuclear Power Plants (2023)

The following nuclear energy series document will also be considered in the review:

- NR-T-3.34 Management of Ageing and Obsolescence of Instrumentation and Control Systems and Equipment in Nuclear Power Plants and Related Facilities Through Modernization (2022)

A feedback analysis report is attached to this DPP specifying the aspects for revising the Safety Guide.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

SSG-48 was published in 2018, so the typical 10-year revision period has arrived; the revision should be started in order to publish Revision 1 in 2029.

SSG-48 has been extensively used as described in Section 2 and much experience was collected for its revision. A revision to update the Safety Guide would better support the users, e.g. the operating organizations and regulatory bodies by:

- Better addressing the existing recommendations, e.g. for implementation of ageing management for active components, assessment of ageing management effectiveness, extending the recommendations in several places based on experience in its use;
- Supplementing the currently addressed topics with additional topics, e.g. preparation for a subsequent LTO, activities to be conducted in the subsequent LTO period to maintain the proper level of ageing management, coordination of ageing management on the plant level, ensuring human resources for LTO, safety aspects of supply chain management for LTO, obsolescence of regulations, codes and standards and knowledge.

The general scope of the revised publication will remain unchanged.

Details of the feedback from Member States on the need for revision are provided in the feedback analysis report in the annex.

4. OBJECTIVE

The objective is to supplement and revise the publication based on the experience from its use and to address any changes that are necessary to provide recommendations on subsequent LTO.

The Safety Guide is intended for use by operating organizations of nuclear power plants in establishing, implementing and improving systematic ageing management programmes and preparing for and implementing LTO. The Safety Guide may be used by regulatory bodies in developing and improving national regulations and guides, in verifying that ageing in nuclear power plants is being effectively managed and that preparations for LTO are done safely. The Safety Guide can also be a source of information for technical support organizations supporting the operating organizations or regulatory bodies in these areas. In addition, the Safety Guide will continue to be a strong basis of SALTO missions and related activities.

SSG-48 first of all provides recommendations that are relevant to the following requirements (taking into account interfaces with SSG-25 and SSG-69):

- SSR-2/1 (Rev. 1): Safety of Nuclear Power Plants: Design
 - Requirement 30: Qualification of items important to safety
 - Requirement 31: Ageing management
- SSR-2/2 (Rev. 1): Safety of Nuclear Power Plants: Commissioning and Operation
 - Requirement 12: Periodic safety review
 - Requirement 13: Equipment qualification
 - Requirement 14: Ageing management
 - Requirement 16: Programme for long term operation

5. SCOPE

The scope of SSG-48 covers nuclear power plants throughout their entire lifetime (including preparation for their decommissioning).

It focuses on managing physical ageing of SSCs, technological obsolescence and safety aspects of the programme for safe LTO.

The scope of the publication is planned to be changed slightly in terms of addressing obsolescence of codes and standards for subsequent LTO and knowledge management.

Environmental impact of LTO and economic assessment will be kept outside the scope of the Safety Guide.

The scope of the revision will be based on the topics listed in the feedback analysis.

Other international organizations typically do not have publications of the similar level and content as this Safety Guide; however, the following publications will be taken into account:

- European Nuclear Safety Regulator's Group (ENSREG) 1st Topical Peer Review Report “Ageing Management” October 2018, with action plan and status reports from 2021 and 2024.
- The relevant OECD NEA publications stay more on a strategic level, however, a new publication (Status Report on Long Term Operation beyond 60 Years, Working Group on Integrity and Ageing - WGIAGE), which is the result of a broad international cooperation, will be taken into account.
- Industry standards, e.g. ASME, IEC, IEEE, KTA typically contain much more detailed technical level information than the Safety Guide: the Safety Guide will not overlap with that type of content.

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

The place of the Safety Guide will not change; it will continue providing recommendations in relation to the above mentioned requirements.

The revision will take into account the above listed IAEA Safety Standards including those currently under revision. The revision will also create technical links between the safety requirements and the safety reports published since the original publication of SSG-48.

There are about 150 documents developed in the IAEA's IGALL programme, which are typically based on the current version of SSG-48 (e.g. all the ageing management programmes (AMPs) within the IGALL programme follow the structure recommended by SSG-48). It must be ensured that the revision of SSG-48 will not bring a need for a major revision of these documents for non-technical

(administrative) reasons, such as changes in the structure (attributes) of the ageing management programmes.

Nuclear Installation Safety (NSNI) Division sections will be consulted in the development, while Safety Assessment Section (SAS) and Nuclear Power Engineering Section (NPES) will be more directly involved in the drafting.

7. OVERVIEW

It is not planned to significantly change the structure of the current publication:

Section 1 will comprise an introduction.

Section 2 will cover the basic concepts of ageing management, technological obsolescence and LTO. Further recommendations on technological obsolescence on nuclear safety will be included.

Section 3 will address ageing management throughout the lifetime of the nuclear power plant (from design to decommissioning). This section is expected to be supplemented with additional recommendations, especially for the early phases of the lifetime and for subsequent LTO preparation.

Section 4 will provide recommendations on relevant plant documentation and how the plant programmes need to support ageing management. Experience from SALTO missions shows that documentation practices strongly differ in terms of ageing management among the plants. Some information from Safety Report 106 will be proposed to be raised to recommendations in order to provide better understanding for the users. The section will be checked for consistency with SSG-69.

Section 5 will provide recommendations on management of ageing including scope setting, ageing management review, ageing management programmes, time limited ageing analyses and documentation. This section will basically remain the same, extended with some experience on the use of the publication, especially lessons learned from subsequent LTOs.

Section 6 will provide recommendations on technological obsolescence management. Some safety implications of management of supply chain for LTO will be added.

Section 7 will provide recommendations on preparation and implementation of a LTO programme. Existing recommendations on implementation of activities during the LTO period will be extended.

8. PRODUCTION SCHEDULE:

Provisional schedule for preparation of the publication, outlining realistic expected dates for each step
(fill the column corresponding to your proposed publication and delete the other columns):

STEP 1: Preparing a DPP	DONE
STEP 2: Internal review of the DPP (Approval by the Coordination Committee)	Q2 2025
STEP 3: Review of the DPP by the review Committee(s) (Approval by review Committee(s))	Q2 2025
STEP 4: Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP	Q4 2025
STEP 5: Preparing the draft publication	Q4 2026
STEP 6: First internal review of the draft publication (Approval by the Coordination Committee)	Q1 2027
STEP 7: First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments)	Q2 2027
STEP 8: Soliciting comments by Member States	Q1 2028
STEP 9: Addressing comments by Member States	Q1 2028

STEP 10: Second internal review of the draft publication (Approval by the Coordination Committee)	Q2 2028
STEP 11: Second review of the draft publication by the review Committee(s) (Approval of the draft)	Q4 2028
STEP 12: (For Safety Standards) Editing of the draft publication in MTCD and endorsement of the draft publication by the CSS	Q2 2029
STEP 13: Approval by the Board of Governors (for SF and SR only)	-
STEP 14: Target publication date	Q4 2029

The schedule is in line with the NSNI Operational Safety Section's long term plan on the development and revision of IAEA Safety Standards. The publication of the revision in the plan is expected in 2029.

9. RESOURCES

Estimated resources involved by the Secretariat (person-weeks) and the Member States (number and type of meetings)

- Estimated Secretariat staff resources: 16 person-weeks in 4 years
- Estimated Member States: 20 person weeks
- 3 consultancy meetings: 60 person-weeks
- 1 technical meeting: 40 person-weeks

ANNEX

Feedback analysis report

The following resources were used to identify the need for the revision and for listing the topics along which the publication should be reviewed:

- SALTO missions: the publication was used as the main basis for the Safety Aspects of Long Term Operation peer review missions. Altogether 38 different types of SALTO missions (full, pre-SALTO, expert mission and follow-up) were conducted using this Safety Guide. The experience with use of the Safety Guide was systematically collected: one of the feedback questions the reviewers are asked to answer after the missions addresses the need of revision of IAEA Safety Standards.
- IGALL programme: the programme includes more than 200 experts worldwide (each MS operating nuclear power plant participates in the programme). The meetings and work during the programme were used to collect experience with the use of SSG-48. The programme's steering committee members were requested at the end of 2024 to specifically send proposals on the need of a revision of SSG-48.
- During the development of informational publications listed in Section 2, several areas were addressed which are not, or not sufficiently, discussed in SSG-48. Those areas are identified and will be addressed in the revision of SSG-48.
- Several technical meetings were organized which were not directly addressing but were related to SSG-48: on SALTO missions, on the IGALL programme, on the development of informational publications. As a by-product of those meetings, proposals were systematically collected on the need for a revision of SSG-48.

Based on the above resources a draft list of review aspects was developed and sent to the ‘ageing management and long term operation community’ (>300 experts) to ask their opinion. Altogether 36 expert comments were received from 16 Member States. Ten agreed with the aspects, while 26 experts proposed some modifications and additional aspects. Based on the above sources and opinions the following topics, which are missing or not detailed in the current SSG-48, were identified as revision aspects for SSG-48 (these aspects will be considered and discussed during the revision process, but not necessarily all will be used):

1. General review of the publication and the core ageing management topics (scope setting, ageing management review, AMPs, time limited ageing analyses - TLAAs);
2. Experience from subsequent LTO preparations;
 - How to handle if regulatory requirements are not sufficiently detailed;
 - Knowledge transfer of experts between LTO and subsequent LTO;
 - Long term (investment) strategy for safety improvements;
 - Timely decision making;
 - Disappearing service providers;
 - Disappearing (or obsolescence of) standard basis, including the resulting obsolescence of technical specifications;
 - Lack of sufficient qualified suppliers: lack of competition and its potential impact on safety.
3. Ageing management in the early phase of operation, during design, construction, commissioning: SSG-48 provides limited recommendations, but the safety report under development contains already useful information:
 - Extend details on expectation for TLAAs and scope setting in early design-phase;
 - Include more guidance on material selection criteria (e.g. corrosion and radiation resistance) and effective methods for establishing baseline degradation data.
4. Recommendations on how to better integrate human resources strategy, knowledge management and competence management aspects into the LTO programme especially considering the increased need for qualified and experienced staff for performing design upgrades and modifications for LTO and how HR strategy should be extended to LTO;
5. Review Areas for Enhancement in the 2025 OECD NEA “Status Report on LTO Beyond 60 Years”;
6. Include the concept of plant level ageing management that is already addressed in SRS-82 (Rev.2);
7. Discuss ageing management of active components in more detail and provide recommendations on its implementation/integration in the plant-level ageing management programme;
8. Extend the recommendations on ageing management effectiveness assessment;
9. Extend the recommendations on the role of SSC’s current condition in ageing management;
10. Extend the recommendations on ageing management review, based on Member States experience including conditions assessment (currently not explained), self-assessment of AMP effectiveness, peer review of relevant programmes, using sampling as a graded approach in AMR. Correct Fig. 4 where ageing management review is only one box.
11. Explain the various types of AMPs and better describe their interactions/cooperation (e.g. component, commodity group, degradation mechanism specific, inspection method-oriented AMPs);
12. Include and discuss the operating experience feedback programme as a plant programme supporting ageing management.

13. Recommendations on how the operating organization can provide better oversight over the supply chain for in scope components to support LTO;
14. More recommendations for when LTO is based on a periodic safety review (PSR) (further harmonization with new revision of SSG-25) using the information contained in SRS-121.
15. More recommendations for when LTO is not based on PSR.
16. More recommendations on ageing management in the decommissioning phase and how to prepare for implementing ageing management in the decommissioning phase including preparation activities in the permanent shutdown period leading to decommissioning;
17. Revision to fully align with SSG-69 (equipment qualification);
18. Extend the recommendations on technological obsolescence and its relationship with the ageing management review;
19. Revision to check agreement with other new Safety Guides:
 - SSG-71 Modifications to Nuclear Power Plants;
 - SSG-72 The Operating Organization for Nuclear Power Plants;
 - SSG-74 Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants
 - SSG-75 Recruitment, Qualification and Training of Personnel for Nuclear Power Plants;
20. Most frequent areas of SALTO findings, where recommendations may need to be extended (and not listed above);
21. More recommendations on synergies with equipment reliability process/reliability centered maintenance and other maintenance strategies;
22. Recognition of use of risk informed in-service inspection approaches;
23. Include recommendations on the use of digitalized processes to support implementation of plant programmes in support of ageing management including advanced data analysis methods and AI tools, expert systems (as a minimum, recommendations on the verification and validation of such tools) to support proactive identification of ageing issues;
24. Extend the existing recommendations in paras 7.39-40 of SSG-48 on regulatory review of LTO (concerning clear schedule of the process) and 7.41 on tracking the implementation of the LTO programme;
25. Interpretation of recommendations on ‘preconditions’ with regard to subsequent LTO;
26. More recommendations on the use of operating experience and the results of R&D in ageing management, and on how a generic corrective action programme can support ageing management;
27. Provide recommendations on a check of changes/modifications on their contribution to or necessity for the improvement of nuclear safety taking into account NR-T-3.34;
28. Figures are proposed to be included to illustrate the relations between:
 - plant programmes and ageing management;
 - ageing management, LTO and plant life management;
29. Recommendations on development of an ageing management database to systematically collect and manage ageing related information throughout the lifetime of the plant.
30. More recommendations on ageing management of spare parts during normal operation / delayed construction and decommissioning phases.
31. Recommendations on how to evaluate/prepare for changes of environmental stressors due to climate change.

32. More recommendations on replacement and refurbishment as ageing management actions taking into account NR-T-3.34.
33. Clarify the use of the term 'intended function'.
34. Clarify scope setting criteria (swap order of items c and b and update Fig. 3);
35. It should be clarified that scope setting for ageing management is equivalent to scope setting for LTO, and no additional recommendations are needed in Section 7.
36. Provide more guidance on equipment specification in order to avoid unexpected/rapid ageing due to inadequate specification.