Document Preparation Profile (DPP)
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1. IDENTIFICATION

Document Category **Safety Guide**

Working ID: **DS 485**

Proposed Title: **Ageing Management and Programme for Long Term Operation for Nuclear Power Plants**

Proposed Action: **Revision of document - NS-G-2.12 "Ageing Management for Nuclear Power Plants", 2009**

Review Committee(s) or Group: **NUSSC, WASSC**

Technical Officer(s): **Robert Krivanek**

2. BACKGROUND

Managing the ageing of nuclear power plants (NPPs) means ensuring that the required safety functions are available throughout the service life of the plant, taking into account changes that occur with time and use. This requires addressing both the physical ageing of structures, systems and components (SSCs), resulting in a degradation of their performance characteristics, and the gradual obsolescence of SSCs, i.e. their becoming out of date in the light of current knowledge, technology, standards, and regulations.

The IAEA Safety Guide NS-G 2.12 "Ageing Management for Nuclear Power Plants" is dedicated to ageing management activities. It was published in 2009. Since this time, many important changes occurred in IAEA Safety Standards relevant to this safety guide and they are not reflected its current version:

- SSR-2/1 "Safety of Nuclear Power Plants: Design" (published in 2012);
- SSR-2/2 "Safety of Nuclear Power Plants: Commissioning and Operation" (published in 2011) with a new Requirement 16: Programme for long term operation which is not reflected in any safety guide;
- SSG-25 "Periodic Safety Review of Nuclear Power Plants" (published in 2013) with a new Section 3 "Input from the periodic safety review in assessing long term operation or licence renewal".

In 2010, the IAEA established an extrabudgetary programme on International Generic Ageing Lessons Learned (IGALL) for NPPs with the objective to provide a technical basis and a practical guidance on managing ageing of mechanical, electrical and I&C components and civil structures important to safety. The programme has been facilitating the exchange of experience accumulated by Member States that operate NPPs with regard to the identification, establishment, and implementation of ageing management programmes. It covers pressurized water reactors, boiling water reactors, water cooled water moderated power reactors, and CANDU reactors. The outcome of the IGALL programme was consolidated in the following publications:

- Safety Reports Series No. DD1085 “International Generic Ageing Lessons Learned for Nuclear Power Plants (Proven Ageing Management Programmes and Typical Time Limited Ageing Analysis)” (published in 2014) supplemented by an IAEA web-based database;
- IAEA-TECDOC-1736 “Approaches to Ageing Management for Nuclear Power Plants – International Generic Ageing Lessons Learned (IGALL) Final Report” (published in 2014).

On top of that, some sections of this safety guide are already obsolete and do not reflect a current state-of-the-art of industry practices and research and development results and need updating. Those are for example:

- Application of ageing management to long term operation;
- Management of obsolescence;
- Review of ageing management for long term operation;
- Interfaces with other technical areas (periodic safety review).

3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

With continuous ageing of fleet of nuclear power plants, long term operation of NPP is contemplated by numerous operating organizations.
The new IAEA Safety Guide on “Ageing Management and Programme for Long Term Operation for Nuclear Power Plants” should properly address SSR-2/2 Requirement 14: Ageing management and Requirement 16: Programme for long term operation as well as SSR-2/1 Requirement 31: Ageing management. Connection with a new safety report on IGALL should be also established.
Task of „Long term structure of the IAEA Safety Standards“ that a new revision of NS-G-2.12 „…will also address the issues related to long term operation ...“ should be addressed. (Note: Task of „Long term structure of the IAEA Safety Standards“ to merge NS-G-2.12 also with NS-G-2.3 Modifications to NPP and NS-G-2.6 Maintenance, surveillance and in-service inspection in NPPs will be performed in a second step after the new NS-G-2.12 containing also LTO topics will be agreed and published.)
Current safety guide is also not reflecting the current state-of-the-art practices in areas like application of ageing management to long term operation, management of obsolescence, review of ageing management for long term operation and interfaces with other technical areas (e.g. a new Safety Guide SSG-25 Periodic safety review published in 2013).
Terminology used in the new safety guide should be harmonized with SSR 2/2 and SR on IGALL.
A new revision of this safety guide should resolve all those deficiencies.

4. OBJECTIVE AND SCOPE

The objective of this revision is to provide sufficient guidance to implement requirements SSR-2/1 and SSR-2/2 on ageing management and long term operation, assure consistency and harmonize the document with all updated IAEA Safety Standards and safety reports in the area of ageing management and long term operation and update the content of obsolete sections of the current version of safety guide.

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

SSR-2/1 “Safety of Nuclear Power Plants: Design” provides requirements relevant to this safety guide related to design, fabrication and construction phases. Requirement 31: Ageing management is the most relevant one for this safety guide.

SSR-2/2 “Safety of Nuclear Power Plants: Commissioning and Operation” provides requirements relevant to this safety guide related to commissioning and operation.

Requirement 13: Equipment qualification, Requirement 14: Ageing management, Requirement 15: Records and reports and Requirement 16: Programme for long term operation are relevant to this safety guide.

Concerned **NS-G-2.12 "Ageing Management for Nuclear Power Plants"** provides recommendations for managing ageing of SSCs important to safety in nuclear power plants, including recommendations on key elements of effective ageing management. The Safety Guide is intended for use by operators in establishing, implementing and improving systematic ageing management programmes for nuclear power plants. The Safety Guide may be used by regulators in preparing national regulatory standards and guides, and in verifying that ageing in nuclear power plants is being effectively managed.

SSG-25 "Periodic Safety Review for Nuclear Power Plants" provides recommendations and guidance on the conduct of a PSR for an operating nuclear power plant. The Safety Guide is directed at plant operating organizations and regulatory bodies. This safety guide provides inputs for long term operation in its Section 3. The revised safety guide provides guidance connected with Safety Factors 3 – "Equipment Qualification" and 4 – "Ageing".

Safety Reports Series No. 57 "Safe Long Term Operation of Nuclear Power Plants" supports NS-G-2.12 by providing with more detail information on key technical considerations and activities to ensure safe LTO of nuclear power plants in accordance with regulatory requirements. It aims to support operating organizations in demonstrating the safety of their nuclear power plants during LTO and regulatory bodies in verifying their safety. It provides information on a step by step approach that may be taken by operating organizations and regulatory bodies considering LTO. This safety report will be updated and made compliance with a new version of NS-G-2.12 after its publication.

Safety Reports Series No. DD1085 "Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned" supports NS-G-2.12 by providing with a technical basis for development and implementation of ageing management programmes as well as performing of ageing management review during original design life time and also for long term operation. It also provides information on typical time limited ageing analyses which are revalidated for safe long term operation.

6. OVERVIEW

In **Section 1,** "Introduction, background, objective and scope" of this guide is provided.

Section 2 "Basic concepts" presents basic concepts of ageing management, obsolescence management and programme for long term operation.

Section 3 "Proactive strategy of ageing management" provides basic information on approach to ageing management during the whole nuclear power plant life cycle.

Section 4 "Relevant plant documentation and programmes" provides overview of plant activities, analysis reports and programmes relevant to ageing management and safe long term operation of nuclear power plant life cycle.

Section 5 "Management of ageing" provides detail information on management of physical ageing in operational phase of nuclear power plant life cycle.

Section 6 "Management of obsolescence" provides detail information on management of technological obsolescence (i.e. obsolescence of technology, components and spare parts) in operational phase of nuclear power plant life cycle.

Section 7 "Programme for long term operation" provides overview of ageing related activities important for safe long term operation of nuclear power plant life cycle.

Annex I. "Existing publications on ageing management" provides overview and explains structure of current IAEA publications on ageing management and long term operation.

Annex II. "Examples of contents of data collection and record keeping systems" provides overview of data required for ageing management programme and examples of relevant data.

Annex III. "Examples of significant ageing mechanisms and susceptible materials and components" provides examples of ageing mechanisms for mechanical components, electrical and I&C components and civil structures.

Annex IV. "Examples of ageing management programmes" provides examples of ageing management programmes implemented and proven in some Member States.

Annex V. "Examples of typical time limited ageing analysis" provides examples of typical time limited ageing analyses which are the matter of revalidation for safe long term operation in some Member States.

The general content of this Safety Guide could include:

1. INTRODUCTION
   Background
   Objective
   Scope
   Structure

2. BASIC CONCEPTS
   Ageing management
   Obsolescence management
   Programme for long term operation

3. AGEING MANAGEMENT STRATEGY OVER THE LIFETIME
   Design
   Fabrication and construction
   Commissioning
   Operation
   Long term operation
   Long-term shut down and decommissioning

4. RELEVANT PLANT DOCUMENTATION AND PROGRAMMES
   Safety analyses reports and other current licensing basis documents
   Configuration/modification management programme including design basis documentation
   Plant programmes relevant to ageing management and LTO

5. MANAGEMENT OF AGEING
   Organizational arrangements
   Data collection and record keeping
   Scope setting of SSCs
   Assessment for ageing management of SSCs
   Ageing management programmes

6. MANAGEMENT OF TECHNOLOGICAL OBSOLESCENCE

7. PROGRAMME FOR LONG TERM OPERATION
   Principles and approach to long term operation
   Development of programme for long term operation
   Organization
   Screening of SSCs for LTO
   Review of plant programmes for LTO
   Ageing management review
   Time limited ageing analysis
   LTO documentation
   Regulatory oversight

   REFERENCES

   ANNEX I: EXISTING PUBLICATIONS ON AGEING MANAGEMENT

   ANNEX II: EXAMPLES OF CONTENTS OF DATA COLLECTION AND RECORD KEEPING SYSTEMS

   ANNEX III: EXAMPLES OF SIGNIFICANT AGEING MECHANISMS AND SUSCEPTIBLE MATERIALS AND COMPONENTS

   ANNEX IV: EXAMPLES OF AGEING MANAGEMENT PROGRAMMES

   ANNEX V: EXAMPLES OF TYPICAL TIME LIMITED AGEING ANALYSIS

   CONTRIBUTORS TO DRAFTING AND REVIEW

   BODIES FOR THE ENDORSEMENT OF IAEA SAFETY STANDARDS

7. PRODUCTION SCHEDULE: Provisional schedule for preparation of the document, outlining realistic expected dates for *(fill the column corresponding to your proposed document and delete the other columns)*:

	A*	B*	C*
STEP 1: Preparing a DPP	DONE	DONE	DONE
STEP 2: Approval of DPP by the Coordination Committee	November 2013		
STEP 3: Approval of DPP by the relevant review Committees	July 2014		
STEP 4: Approval of DPP by the CSS	October 2014		
STEP 5: Preparing the draft	February 2015		
STEP 6: Approval of draft by the Coordination Committee	March 2015		
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	June 2015		
STEP 8: Soliciting comments by Member States	October 2015		
STEP 9: Addressing comments by Member States	February 2016		
STEP 10: Approval of the revised draft by the Coordination Committee Review in NS-SSCS	March 2016		
STEP 11: Approval by the relevant review Committees for submission to the CSS	June 2016		
STEP 12: Endorsement by the CSS	October 2016		
STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	December 2016		
STEP 14: Target publication date	March 2017		

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- *Column A for Safety Fundamentals, Safety Requirements and Safety Guides.*
- *Column B for Nuclear Security Series publications noting that for Technical Guides a fast track may be proposed and justified for approval by the NSGC at step 3. If approved, the draft will not be subject to the steps 4 to 10 and, be provided at step 11 to the NSGC to take note of it before its publication*
- *Column C for TECDOCs, safety reports and other publications*

8. RESOURCES

The Safety Guide on Ageing Management for Nuclear Power Plants is reviewed by the IAEA technical officer with support of a group of external experts.

Estimated staff—Secretariat—resources required: 10 person-weeks

Estimated Member States: 20

3 consultancy meetings: 120 person-weeks

1 technical meeting: 40 person-weeks