

1. IDENTIFICATION

Document Category **Specific Safety Guide**

Working ID: **DS525**

Proposed Title: **Chemistry Programme for Water Cooled Nuclear Power Plants**

Proposed Action: **Revision of IAEA Safety Standards Series No. SSG-13,
Chemistry Programme for Water Cooled Nuclear Power Plants.**

Review Committee(s): **NUSSC, RASSC, WASSC**

Technical Officer(s): **Kari MAEKELAE (NSNI/OSS)**

2. BACKGROUND

Requirement 29 of IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), Safety of Nuclear Power Plants: Commissioning and Operation, states:

“The operating organization shall establish and implement a chemistry programme to provide the necessary support for chemistry and radiochemistry.”

The Specific Safety Guide SSG-13 is relevant to all types of nuclear power plants (NPPs) with water cooled reactors, and it gives guidance how the ~~water~~-chemistry programme should be planned and implemented to ensure the safe operation of a nuclear power plant. A comprehensive programme minimizes the amount of aggressive ionic impurities in the water and hence mitigates degradation of plant ~~systems~~, structures, ~~systems~~ and components (SSCs). In addition, a properly implemented programme results in reduced radiation doses to plant personnel, reduces the generation of solid radioactive waste and helps keep radioactive discharges to the environment within the authorized limits established by the regulatory body.

SSG-13 provides recommendations to Member States on how to keep the chemistry programme at their nuclear power plants up-to-date and to identify opportunities to further improve performance in plant chemistry.

3. JUSTIFICATION FOR THE REVISION OF THE DOCUMENT

The current version of SSG-13 was published in January 2011. Since then, a significant amount of additional operating experience in Member States has been gained, and the nuclear industry has identified new challenges in the plant chemistry area. In addition, role of chemistry during the accident and post-accident situations should be updated based on the lessons learned from the Fukushima-Daiichi NPP accident.

IAEA review missions such as OSART (Operational Safety Review Team) continue to identify areas where operational safety performance at a nuclear power plants needs to be improved in accordance with IAEA safety standards. These findings represent opportunities to improve the safety and reliability of NPPs as well as to update the existing Specific Safety Guide on the chemistry programme for water cooled NPPs.

Therefore, it is necessary to revise the Specific Safety Guide so that it reflects the current understanding of the expectations set for chemistry and radiochemistry programmes.

The proposed revision of the Specific Safety Guide will:

- Address new practices and technologies in the preservation of plant systems during extended outages (including long-term shutdown with intended restart), delayed construction programmes or modernisation and refurbishment projects for long term operation as well as during the post-operational phase prior to decommissioning;
- Give guidance to ensure that applied chemistry programme maintain SSCs in proper conditions until the plant is fully operational. During construction and commissioning periods structures, systems and components (SSC) are installed in a progressive manner. ~~The updated Specific Safety Guide will give guidance to ensure that applied water chemistry programme maintain SSCs in proper conditions until the plant is fully operational;~~
- Revise the guidance related to the quality control for measurement of chemistry parameters and data e.g. through analytical accreditation or quality control programmes at the point of operational delivery;
- Update the current guidance on accident and post-accident sampling systems and to recommend if possible which chemistry parameters to be followed and chemistry actions to be taken during accident and post-accident conditions;
- To update the ~~water~~ chemistry requirements in all relevant technologies within the scope of the document. Some significant improvements have been introduced and applied in the area of NPP chemistry since the publication of the current version of the SSG-13. To identify more clearly what chemistry parameters are important to safety and which parameters for other reasons such as long-term operation or occupational radiation protection.
- Increase the level of detailed guidance for chemistry control of auxiliary systems and associated systems of the reactor coolant system;
- Align SSG-13 with other relevant, recently revised Safety Standards and remove duplication of contents if necessary;
- Incorporate feedback from the users of SSG-13.

4. OBJECTIVE

The objective of the revised SSG-13 is to provide Member States with updated and, in some areas, more detailed ~~water~~ chemistry guidance for the safe operation of water-cooled nuclear power plants. The updated document will provide recommendations which mitigate degradation of SSCs, improve quality control of chemistry laboratory activities, reduce the generation of radioactive waste and contribute to maintaining radiation doses as low as reasonably achievable. The revised publication will also update the current practices of chemistry measurements during accidents and the current expectations of post-accident sampling systems.

5. SCOPE

This revised Specific Safety Guide will give Member States updated recommendations and guidance for ~~water~~ chemistry programmes needed to ensure that SSCs important to safety and other SSCs whose failure may prevent SSC important to safety from fulfilling their intended functions operate reliably throughout the original design life time and a potential life extension period. In addition, other SSCs that are credited in the safety analyses should be covered by NPPs ~~water~~ chemistry program.

The revised guide will cover all areas important to the chemistry programme of water cooled NPPs during construction, commissioning, operation and preparation for decommissioning.

Like the current version, the revised document will not give detailed technical advice on particular chemistry regimes. If necessary, the recommendations on chemistry and radiochemistry programmes will be modified to ensure compliance with the appropriate plant operational limits and conditions.

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

The revised Specific Safety Guide will interface with the following IAEA Safety Standards (the list is not intended to be final or exhaustive):

- Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1), IAEA, Vienna (2016);
- Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016);
- 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);
- Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants (DS497e, revision of NS-G-2.6);
- Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants (DS497a, revision of NS-G-2.2);
- Occupational Radiation Protection, IAEA Safety Standards Series No. GSG-7, IAEA, Vienna (2018);
- Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, IAEA Safety Standards Series No. SSG-40, IAEA, Vienna (2016);
- Accident Management Programmes for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-54, IAEA, Vienna (2019);
- Conduct of Operation (DS497, revision of NS-G-2.4)
- Recruitment, Qualification and Training (DS497, revision of NS-G-2.8)
- The Operating Organization (DS497, revision of NS-G-2.14)
- Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants (DS481, revision of NS-G-1.9);
- Design of Fuel Handling and Storage Systems for Nuclear Power Plants (DS487, revision of NS-G-1.4);

- Design of Auxiliary Systems and Supporting Systems for Nuclear Power Plants (DS440);
- Radiation Protection Aspects of Design for Nuclear Power Plants (DS524, revision of NS-G-1.13).

7. OVERVIEW

The structure of the revised Specific Safety Guide will remain essentially unchanged. The planned updates will not affect the titles of the individual sections as specified in the current version of SSG-13:

Section 1: Introduction

Section 2: Functions, responsibilities and interfaces

Section 3: Chemistry programme

Section 4: Chemistry control

Section 5: Chemistry aspects of radiation exposure optimization

Section 6: Chemistry surveillance

Section 7: Management of chemistry data

Section 8: Training and qualification

Section 9: Quality control of chemicals and other substances

Annex: “New Practices and New Technologies Associated with the Chemistry Program to Enhance Safety.”

However, there may be a need to include new subsections to address the gaps identified in Section 3 of this DPP.

8. PRODUCTION SCHEDULE

STEP 1: Preparing a DPP	Q3 2019
STEP 2: Approval of DPP by the Coordination Committee	Q4 2019
STEP 3: Approval of DPP by the relevant review Committees	Q2 2020
STEP 4: Approval of DPP by the CSS	Q4 2020
STEP 5: Preparing the draft	Q1 2021
STEP 6: Approval of draft by the Coordination Committee	Q2 2021
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	Q2 2021
STEP 8: Soliciting comments by Member States	Q3 2021
STEP 9: Addressing comments by Member States	Q4 2021
STEP 10: Approval of the revised draft by the Coordination Committee Review in NS-SSCS	Q1 2022
STEP 11: Approval by the relevant review Committees	Q2 2022
STEP 12: Endorsement by the CSS	Q4 2022
STEP 13: Establishment by the Publications Committee	Q1 2023
STEP 14: Target publication date	Q2 2023

9. RESOURCES

1 P Staff: 15 staff weeks
Consultancy meetings: 2 CS
2 HBAs