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Document Preparation Profile (DPP)
Version 2.1 dated 18 August 2023

1. IDENTIFICATION

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

Safety Guide

Working ID: DS553

Proposed Title: The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste

Proposed Action: revision of a publication

The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste, 2013, GSG-3

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

Technical Officer(s): A. Guskov (NSRW/WES)

2. BACKGROUND

Radioactive waste is produced by a variety of facilities and activities, including nuclear facility commissioning, operation, and decommissioning; nuclear technology applications in medicine, industry, agriculture, research, and education; mining and milling operations; the processing of materials containing naturally occurring radionuclides; radioactive effluent discharges; and remediation of contaminated areas. This waste must be managed prior to disposal through predisposal radioactive waste management facilities and activities.

A safety case and a supporting safety assessment are essential as support to demonstrating safety in developing and operating facilities and activities for predisposal radioactive waste management. In accordance with the regulatory body's requirements, the operator prepares the safety case and the supporting safety assessment. The scope and depth of the safety case and safety assessment need to be commensurate with the complexities of the operations and the magnitude of the hazards associated with the facility and activities, and also with the current stage of facility lifetime. The process of developing these documents follows a step-by-step approach for collecting, analysing, and interpreting relevant technical data, developing design and operation plans, and developing the safety case for operational safety. The primary goal of the safety case and supporting safety assessment is to demonstrate the level of safety of the facility and activities to ensure protection provided to the public and the environment while also assuring the regulatory body that safety requirements will be met.

IAEA Safety Standards Series No. GSG-3, The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste was published in 2013, with the objective to provide regulatory bodies, operating and technical support organizations involved in the predisposal management of radioactive waste, with recommendations on how to meet the safety requirements established in IAEA Safety Standards Series No. GSR Part 5 Predisposal Management of Radioactive Waste¹ and other

¹ In revision, under ID number DS548

relevant safety requirements as appropriate, for assessing and demonstrating the safety of predisposal waste management facilities and activities.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

Several Safety Standards Series publications have been revised since 2013, and new safety standards that affect the contents of GSG-3 have been published. The recommendations on the development and review of the safety case and supporting safety assessment and how to meet the safety requirements as presented in the version of GSG-3 do not incorporate the new information, approaches, and practical experiences contained in safety requirements published after 2013. Among these publications are IAEA Safety Standards Series Nos GSR Part 1 (Rev 1), GSR Part 3, GSR Part 4 (Rev 1), GSR Part 6, and GSR Part 7. GSG-3 also need to be aligned with the other Safety Guides on predisposal management of radioactive waste published after 2013.

At the 52nd WASSC meeting in October 2021, WASSC requested the Secretariat to develop a DPP to revise GSG-3 (action under agenda item W2.22). This revision will go in parallel and in full coordination with revision of GSR Part 5 (DS548) and WS-G-6.1 (DS550) and will provide recommendations in compliance with the latest requirements on predisposal waste management.

The proposed publication will provide coherent recommendations for complying with the requirements for the safe predisposal management of radioactive waste based on the latest revisions of other IAEA safety standards in this area and operational experience.

The revised Safety Guide will elaborate more on the elements and application of a graded approach in the development and review of the safety case and supporting safety assessment for all predisposal radioactive waste management facilities and activities.

The proposed publication will incorporate recommendations on the implementation of requirements for preparedness and response to a nuclear or radiological emergency pertaining to the design and implementation of safety measures in the safety case and supporting safety assessments.

The superseded references in GSG-3 will be updated with new publications to ensure consistency and provide up-to-date information.

4. OBJECTIVE

The objective of this Safety Guide is to provide recommendations for the development and review of the safety case and supporting safety assessments for facilities and activities dealing with the predisposal management of radioactive waste.

The revised Safety Guide is intended to assist operating organizations, regulatory bodies, technical support organizations throughout the lifetime of a facility with predisposal management of radioactive waste. It is also applicable for a safety case and a supporting safety assessment for a spent fuel storage facility.

5. SCOPE

The proposed Safety Guide provides recommendations on the development and review of the safety case and supporting safety assessments prepared or conducted for a predisposal waste management facility or activity both for the case where it's a standalone facility or activity and where it's a part of

² WASSC requested three actions from the Secretariat under agenda item W2.2 of the 52nd WASSC meeting, namely, revision of GSR Part 5 and two related Safety Guides - IAEA Safety Standards Series No. WS-G-6.1, Storage of Radioactive Waste, and IAEA Safety Standards Series No. GSG-3, The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste.

another facility, such as a nuclear power plant, research reactor or critical assembly, other nuclear installation or activity resulting in generating or predisposal management of radioactive waste. It is applicable for all types of radioactive waste, spent fuel and disused sealed radiation sources.

Facilities or activities that deal with radioactive material might have impacts of both a radiological and non-radiological nature, but the focus of this Safety Guide is on the radiological impacts. However, the radiological consequences of non-radiological events or hazards, such as fire, are addressed. Furthermore, although the assessment of non-radiological hazards is outside the scope of this Safety Guide, it is important that due consideration be given to such hazards, as required in national legislation.

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

The proposed publication will interface at least with the following IAEA safety standards and other IAEA publications (this is not, and cannot be, regarded as an exhaustive list):

- EUROPEAN ATOMIC ENERGY COMMUNITY, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1, IAEA, Vienna (2006).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), IAEA, Vienna (2016).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).
- EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 4 (Rev. 1), IAEA, Vienna (2016).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSR Part 5, IAEA, Vienna (2009). (Under revision, DS548)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2014).
- FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, UNITED NATIONS OFFICE FOR THE

COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015).

- INTERNATIONAL ATOMIC ENERGY AGENCY, Storage of Spent Nuclear Fuel, IAEA Safety Standards Series No. SSG-15 (Rev. 1), IAEA, Vienna (2020).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Deterministic Safety Analysis for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-2 (Rev. 1), IAEA, Vienna (2019).
- INTERNATIONAL ATOMIC ENERGY AGENCY, The Safety Case and Safety Assessment for the Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSG-23, IAEA, Vienna (2012).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Classification of Radioactive Waste, IAEA Safety Standards Series No. GSG-1, IAEA, Vienna (2009).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-5, IAEA, Vienna (2011).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSR-4, IAEA, Vienna (2017).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material, 2018 Edition, IAEA Safety Standards Series No. SSR-6 (Rev. 1), IAEA, Vienna (2018). (Under revision, DS543)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, IAEA Safety Standards Series No. SSG-40, IAEA, Vienna (2016).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-41, IAEA, Vienna (2016).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education, IAEA Safety Standards Series No. SSG-45, IAEA, Vienna (2019).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-47, IAEA, Vienna (2018).
- INTERNATIONAL ATOMIC ENERGY AGENCY, 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).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Medical, Industrial and Research Facilities, IAEA Safety Standards Series No. SSG-49, IAEA, Vienna (2019).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Regulatory Control of Radioactive Discharges to the Environment, IAEA Safety Standards Series No. GSG-9, IAEA, Vienna (2018)

- INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev 1), IAEA, Vienna (2016). (Under revision, DS532)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Release of Sites from Regulatory Control on Termination of Practices, IAEA Safety Standards Series No. WS-G-5.1, Vienna (2006).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006). (Under revision, DS513)
- INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for the Processing, Handling and Storage of Radioactive Waste, IAEA Safety Standards Series No. GS-G-3.3, IAEA, Vienna (2008).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Review and Assessment of Nuclear Facilities by the Regulatory Body, IAEA Safety Standards Series No. GS-G-1.2, IAEA, Vienna (2002).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership, Management and Culture for Safety in Radioactive Waste Management, IAEA Safety Standards Series No. GSG-16, IAEA, Vienna (2022).
- DS526, National Policies and Strategies for the Safety of Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (new Safety Guide).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Radioactive Waste Management Objectives, IAEA Nuclear Energy Series No. NW-O, IAEA, Vienna (2011).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Options for Management of Spent Fuel and Radioactive Waste for Countries Developing New Nuclear Power Programmes, IAEA Nuclear Energy Series No. NW-T-1.24 (Rev. 1), IAEA, Vienna (2018).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Selection of Technical Solutions for the Management of Radioactive Waste, IAEA-TECDOC-1817, IAEA, Vienna (2017).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Categorizing Operational Radioactive Wastes, IAEA-TECDOC-1538, IAEA, Vienna (2007).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Methodology for Safety Assessment Applied to Predisposal Waste Management: *Report of the Results of the International Project on Safety Assessment Driving Radioactive Waste Management Solutions (SADRWMS) (2004–2010)*, IAEA-TECDOC-1777, IAEA, Vienna (2015).
- INTERNATIONAL ATOMIC ENERGY AGENCY, CRAFT: *The International Project on Complementary Safety Reports (2011–2014)*, IAEA-TECDOC-2017, IAEA, Vienna (2022)
- INTERNATIONAL ATOMIC ENERGY AGENCY, The Behaviours of Cementitious Materials in Long Term Storage and Disposal of Radioactive Waste: *Results of a Coordinated Research Project*, IAEA-TECDOC-1701, IAEA, Vienna (2013).
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, INFCIRC/546, IAEA, Vienna (1997).
- The Agency's Safeguards System, INFCIRC/66/Rev.2, IAEA, Vienna (1968).
- Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, INFCIRC/540 (Corrected), IAEA, Vienna (1997).

- INTERNATIONAL ATOMIC ENERGY AGENCY, IAEA Nuclear Safety and Security Glossary, Non-serial Publications, IAEA, Vienna (2022)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment Methodologies for Near Surface Disposal Facilities, Non-serial Publications, IAEA, Vienna (2004)

7. OVERVIEW

The tentative table of contents for the proposed publication at initial revision stage is kept as it was in GSG-3 as follows.

1. INTRODUCTION
 - 1.1. Background
 - 1.2. Objective
 - 1.3. Scope
 - 1.4. Structure
2. DEMONSTRATING THE SAFETY OF THE PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
3. SAFETY PRINCIPLES AND SAFETY REQUIREMENTS FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
 - 3.1 Safety principles
 - 3.2 Requirements for the safety case and safety assessment
 - 3.3 Responsibilities for developing the safety case and safety assessment
 - 3.4 Content of the safety case and safety assessment
 - 3.5 Maintenance of the safety case and safety assessment
 - 3.6 Documentation of the safety case and safety assessment
 - 3.7 Use of the safety case and safety assessment
4. THE SAFETY CASE FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
 - 4.1 Role and development of the safety case
 - 4.2 Components of the safety case
 - 4.3 Interacting process
5. SAFETY ASSESSMENT FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
 - 5.1 Introduction
 - 5.2 Overall approach
 - 5.3 Assessment context
 - 5.4 Description of the facility or activity and of the waste
 - 5.5 Development and justifications of the scenarios
 - 5.6 Formulation and implementation of assessment models
 - 5.7 Performance of calculations and analysis of results
 - 5.8 Analysis of assessment results
6. SPECIFIC ISSUES FOR THE SAFETY CASE AND SAFETY ASSESSMENT FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
 - 6.1 Graded approach
 - 6.2 Defence in depth
 - 6.3 Reliability
 - 6.4 Expected lifetime of the facility
 - 6.5 Long term storage
 - 6.6 Evolution of the safety case over the facility lifetime

- 6.7 Integration of safety assessment for the predisposal management of radioactive waste into the safety analysis or safety case for the facility or activity generating the waste
- 6.8 Considerations for emergency preparedness and response
- 7. DOCUMENTATION AND USE OF THE SAFETY CASE FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
 - 7.1 Documentation of the safety case
 - 7.2 Uses of the safety case
- 8. REGULATORY REVIEW PROCESS FOR THE SAFETY CASE FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
 - 8.1 Objectives and attributes of the regulatory review process
 - 8.2 Managing the review process
 - 8.3 The use of a graded approach by the regulatory body
 - 8.4 Conduct of the review and reporting of review findings

REFERENCES

- ANNEX I: EXAMPLES OF HAZARDS AND INITIATING EVENTS FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE
- ANNEX II: TOPICAL ISSUES FOR REVIEW OF THE SAFETY CASE FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE BY THE REGULATORY BODY
- ANNEX III: SAMPLE TEMPLATE FOR A REGULATORY REVIEW REPORT FOR PREDISPOSAL MANAGEMENT OF RADIOACTIVE WASTE

The table of contents and the structure of proposed publication can change during drafting; however, all proposed topics will be included in the draft publication.

8. PRODUCTION SCHEDULE:

Provisional schedule for preparation of the publication, outlining realistic expected dates for each step:

	DATE
STEP 1: Preparing a DPP	DONE
STEP 2: Internal review of the DPP (Approval by the Coordination Committee)	Q3 2023
STEP 3: Review of the DPP by the review Committee(s) (Approval by review Committee(s))	Q4 2023
STEP 4: Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP	Q1 2024
STEP 5: Preparing the draft publication	Q2 2024 – Q4 2025
STEP 6: First internal review of the draft publication (Approval by the Coordination Committee)	Q1 2026
STEP 7: First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments)	Q2 2026
STEP 8: Soliciting comments by Member States	Q3 2026
STEP 9: Addressing comments by Member States	Q1 2027

STEP 10: Second internal review of the draft publication (Approval by the Coordination Committee)	Q2 2027
STEP 11: Second review of the draft publication by the review Committee(s) (Approval of the draft)	Q4 2027
STEP 12: Endorsement by CSS	Q2 2028
STEP 13: Approval by the Board of Governors (for SF and SR only)	N/A
STEP 14: Target publication date	2029

9. RESOURCES

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

- Secretariat:
 - 24 staff weeks
- Member States:
 - 15 consultant weeks (assuming 3 one-week consultancy meetings, each with 5 experts)
 - 1 Technical Meeting, each with participants from 30 Member States
 - 6 consultant weeks (assuming 6 one-week home based assignments)

ANNEX

Feedback from WASSC members on the application of GSG-3 is available on the Nuclear Safety and Security Online User Interface platform ([NSS-OUI](#)). These are related to:

- The use of terminology consistent with other publications
- Consistency with later published safety standards and up to date references
- Responsibilities for developing the safety case and performing safety assessment in case when predisposal waste management facility is an integral part of or is collocated with other nuclear installation
- Content of the safety case and safety assessment at different stages of predisposal facility lifetime and for different level of potential hazard
- Elaboration of scenarios for anticipated operational occurrences and design basis accidents to be assessed
- Addressing strategy for safety in the safety case
- Use of the safety case, including its use for authorization
- Regulatory review of the safety case including its objectives and attributes

In 2022, the IAEA published a Safety Report Series No. 123 on Applicability of Safety Standards to Non-Water-Cooled Reactors and Small Modular Reactors (can be downloaded as a preprint version at

the following link: [SRS-123](#)). The report identified gaps and areas in predisposal management of radioactive waste for additional consideration, that might need to be addressed in its safety assessment and safety case.

“The operational safety of waste management facilities at ‘evolutionary and innovative designs’ (EIDs) sites could be impacted by the use of EIDs for cogeneration on the same site. This is not always well-covered by the existing safety standards. For example, Requirement 8 of GSR Part 4 (Rev. 1) (assessment of site characteristics) calls for human-induced external hazards, such as those arising from industrial activities, to be identified, but mention of external industrial hazards in GSG-3 is limited to an Annex, which is not an official part of the guidance.”

The ‘human-induced external events’ are referred in the list of ‘external initiating events’ in the main text of GSG-3 and ‘nearby industrial activities (toxic gases, corrosion, smoke)’ are mentioned in the list of ‘external human factors’ in the Annex I of GSG-3. Clear recommendations on consideration of external hazards from industrial activities in performing safety assessment and developing safety case would be helpful.

“While sequential construction of power reactors at a single site is not new, GSG-3 does not address this point specifically and it might be helpful for it to do so, with evidence gathered from actual experience in such situations.”

The sequential construction of new power reactors or other nuclear facilities will be considered during the revision of GSG-3 based on the experience of Member States. In addition, the link between the safety assessment for predisposal waste management facilities and the safety analysis for the power reactors or other nuclear facilities at the single site will be considered.