

SPESS F
Document Preparation Profile (DPP)
Version 4.1 dated 17 November 2023

1. IDENTIFICATION

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

Safety Guide

Working ID: DS550

Proposed Title: Storage of Radioactive Waste

Proposed Action: revision of a publication

Storage of Radioactive Waste, 2006, WS-G-6.1

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

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

2. BACKGROUND

An increase in the number of nuclear and non-nuclear applications, nuclear power plants and research reactors undergoing decommissioning or having completed decommissioning has led to an increase in the volume of radioactive waste to be stored. Member States have identified a need to establish new storage facilities, or else extend the design lifetime of the existing storage facilities when radioactive waste disposal facilities cannot be made available within the expected time frame. Considering extended storage periods, the ageing management of packages and facilities for radioactive waste has been identified as an overarching issue by the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management at the Seventh Review Meeting in 2022.

IAEA Safety Standards Series No. WS-G-6.1 was published in 2006, with the objective to provide regulatory bodies and operating organizations that generate and manage radioactive waste with recommendations on how to meet the safety requirements established in IAEA Safety Standards Series No. WS-R-2, Predisposal Management of Radioactive Waste, Including Decommissioning, for the safe storage of radioactive waste. The Safety Guide is applicable to all storage facilities, with separate sections covering small and large storage facilities. The storage of radioactive waste means the holding of radioactive waste in a facility that provides for its containment, with the intention of retrieval.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

Since 2006, several Safety Standards Series publications have been revised and new safety standards have been published that affect the contents of WS-G-6.1. The recommendations on how to meet the safety requirements as presented in WS-G-6.1, do not incorporate the new information, approaches and practical experiences contained in Safety Requirements published after 2006 such as IAEA Safety Standards Series Nos GSR Part 3, GSR Part 4 (Rev. 1), GSR Part 5, GSR Part 6, GSR Part 7 or being under revision or publication procedures during working on this proposed publication. WS-G-6.1 also

needs to be aligned with the other Safety Guides on predisposal management of radioactive waste published after 2006, such as IAEA Safety Standards Series Nos. SSG-40, SSG-41, SSG-45, GSG-1.

At the 52nd WASSC meeting in October 2021, WASSC requested the Secretariat to develop a DPP to revise WS-G-6.1 (action under agenda item W2.2¹).

The proposed publication will elaborate on the place and on the links of radioactive waste storage in the national radioactive waste management programme.

The latest recommendations on ageing management for long term storage of radioactive waste and for extended storage beyond the design lifetime will be provided, including the feasibility and safety aspects of waste retrieval and the subsequent steps up to the transfer of waste from the storage facility.

Recommendations on the development of a safety case for storage of radioactive waste and performing a corresponding safety assessment need to be moved from Appendix to the main body of the proposed publication, revised to bring them in line with The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSG-3, published in 2013, and to address the waste acceptance criteria.

The proposed publication will differentiate storage facilities not only according to the scale (small and large), but also according to the purpose and intended time of storing waste (decay storage, hold storage, long term storage).

Superseded references in WS-G-6.1 need to be updated with new publications to ensure consistency and provide up to date information.

4. OBJECTIVE

The objective of the proposed publication is to provide recommendations and guidance on how to comply with current safety requirements for storage of radioactive waste.

The revised Safety Guide is intended for regulatory bodies, technical support organizations and operating organizations that generate and manage radioactive waste.

5. SCOPE

The proposed publication will apply to the storage of radioactive waste in a wide range of facilities, including those at which waste is generated, treated, and conditioned. The storage facility could range from a secure cupboard or closet in a laboratory, through to larger designated areas such as rooms or buildings, up to and including a large site dedicated to the storage of radioactive waste.

This Safety Guide will address the entire period of storage, ranging from only few days, weeks, or months - in case of decay storage - to a few decades and even hundred years as for long term storage.

To address wide range of storage facilities and different stages of their lifetime a graded approach is intended to be applied in the text of proposed publication both in terms of implementation of safety requirements and for development of the safety case with supporting safety assessments.

The proposed publication will highlight the physical protection of storage facilities and considerations for control and accounting of radioactive waste and accounting and control of nuclear material, where appropriate, to recognize implications for safety.

¹ Three actions were requested 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.

The proposed publication is intended to apply to new storage facilities for radioactive waste and will include recommendations on how to apply it for existing storage facilities.

The proposed publication will not address:

- a) The wet or dry storage of spent nuclear fuel declared as radioactive waste, which is addressed in IAEA Safety Standards Series No. SSG-15 (Rev 1);
- b) The storage of waste from the mining and processing of uranium and thorium ores and minerals;
- c) The storage of other waste containing elevated concentrations of naturally occurring radionuclides and waste from mineral processing activities.

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, 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, 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, Classification of Radioactive Waste, IAEA Safety Standards Series No. GSG-1, IAEA, Vienna (2009).
- INTERNATIONAL ATOMIC ENERGY AGENCY, The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSG-3, IAEA, Vienna (2013). (under revision, DS553)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Licensing Process for Nuclear Installations, IAEA Safety Standards Series No. SSG-12, IAEA, Vienna (2010).
- 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, Leadership, Management and Culture for Safety in Radioactive Waste Management, IAEA Safety Standards Series No. GSG-16, IAEA, Vienna (2022).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Control of Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries, IAEA Safety Standards Series No. SSG-17, IAEA, Vienna (2012). (under revision, DS549)
- 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, Security of Radioactive Material in Use and Storage and of Associated Facilities, IAEA Nuclear Security Series No. 11-G (Rev.1), IAEA, Vienna (2019)

- INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13, IAEA, Vienna (2011)
- 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, IAEA Nuclear Safety and Security Glossary, Non-serial Publications, IAEA, Vienna (2022)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Licence Applications for Low and Intermediate Level Waste Predisposal Facilities: A Manual for Operators, IAEA-TECDOC-1619, IAEA, Vienna (2009)
- INTERNATIONAL ATOMIC ENERGY AGENCY, Management of Low and Intermediate Level Radioactive Wastes with Regard to their Chemical Toxicity, IAEA-TECDOC-1325, IAEA, Vienna (2002)
- 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, 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).
- INTERNATIONAL ATOMIC ENERGY AGENCY, Management of Large Volumes of Waste Arising in a Nuclear or Radiological Emergency, IAEA-TECDOC-1826, IAEA, Vienna (2017)

7. OVERVIEW

The tentative table of contents for the proposed publication is as follows.

1. INTRODUCTION
 - 1.1. Background
 - 1.2. Objective
 - 1.3. Scope
 - 1.4. Structure
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 - 2.1 Protection of human health
 - 2.2 Protection of environment

3. ROLES AND RESPONSIBILITIES FOR THE STORAGE OF RADIOACTIVE WASTE
 - 3.1 Responsibilities of the government
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 - 3.3 Responsibilities of operators
4. MANAGEMENT SYSTEM FOR THE STORAGE OF RADIOACTIVE WASTE
 - 4.1 Resource management
 - 4.2 Process implementation
 - 4.3 Safety culture
5. LIFETIME OF STORAGE FACILITY FOR RADIOACTIVE WASTE
 - 5.1 Siting and design
 - 5.2 Construction and commissioning
 - 5.3 Storage facility operation
 - 5.4 Shutdown and decommissioning
 - 5.5 Release from regulatory control
6. SAFETY CASE AND SAFETY ASSESSMENT FOR THE STORAGE OF RADIOACTIVE WASTE
 - 6.1 Development of the safety case and supporting safety assessment
 - 6.2 Documentation of the safety case
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7. OTHER CONSIDERATIONS FOR THE STORAGE OF RADIOACTIVE WASTE
 - 7.1 Small and decay storage facilities
 - 7.2 Long-term storage facilities
 - 7.3 Waste acceptance criteria
 - 7.4 Existing facilities
 - 7.5 Interface between safety and the system of accounting and control
 - 7.6 Interface between safety and physical protection for storage facilities
 - 7.7 Interface between safety and security measures
 - 7.8 Emergency preparedness and response

REFERENCES

Appendix I: POSTULATED INITIATING EVENTS FOR CONSIDERATION IN A SAFETY ASSESSMENT FOR THE STORAGE OF RADIOACTIVE WASTE

Appendix II: APPLICATION OF A GRADED APPROACH TO THE STORAGE OF RADIOACTIVE WASTE (very short-lived waste – high level waste; decay storage – long term storage)

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)	Q1 2023
STEP 3: Review of the DPP by the review Committee(s) (Approval by review Committee(s))	Q2 2023
STEP 4: Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP	Q4 2023
STEP 5: Preparing the draft publication	Q1 2024 – Q2 2025

STEP 6: First internal review of the draft publication (Approval by the Coordination Committee)	Q3 2025
STEP 7: First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments)	Q4 2025
STEP 8: Soliciting comments by Member States	Q1 2026
STEP 9: Addressing comments by Member States	Q2 2026
STEP 10: Second internal review of the draft publication (Approval by the Coordination Committee)	Q2 2026
STEP 11: Second review of the draft publication by the review Committee(s) (Approval of the draft)	Q4 2026
STEP 12: Endorsement by CSS	Q2 2027
STEP 13: Approval by the Board of Governors (for SF and SR only)	N/A
STEP 14: Target publication date	Q1 2028

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 WS-G-6.1 is available on the Nuclear Safety and Security Online User Interface platform ([NSS-OUI](#)). These are mainly related to aligning the current version of the Safety Guide with the latest revisions of safety standards, and this revision is aimed to address them as much as possible.

In 2022, the IAEA has completed an assessment of the applicability of the IAEA safety standards to non-water-cooled reactors (NWCRs) and small modular reactors (SMR). The assessment revealed that IAEA safety standards on predisposal management of radioactive waste are sufficiently general that they apply to all waste from ‘evolutionary and innovative designs’ (EIDs). However, upon detailed examination, a few areas were identified that may benefit from additional consideration. As an example, WS-G-6.1 expresses a preference for centralized storage of waste, but the guidance comprises just a paragraph 5.3 of WS-G-6.1. This guidance could sensibly be elaborated on and could elucidate the advantages and disadvantages of such a strategy and related matters, such as type of storage facility e.g., decay storage, or such as site selection for a centralized facility for the storage of waste. The findings of the abovementioned assessment are presented in IAEA Safety Reports Series No. 123 and can be downloaded as a preprint version at the following link: [SRS-123](#).