

Activities of the IAEA on RWM and disposal, from technology and safety points of view

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Gemeinsames Seminar der Eidgenössischen Kommissionen für
Strahlenschutz KSR und nukleare Sicherheit KNS

«Radioaktive Abfälle»



Contents

- IAEA Assistance to Member States
- IAEA Safety Standards and other publications
- International Projects and support to Member States
- Joint Convention
- ARTEMIS Review



IAEA Safety Standards and other publications

IAEA Assistance to Member States

The IAEA is assisting member states through:

- Developing safety standards
- Supporting MS in the application of the safety standards through different means:
 - International projects
 - Direct support to Member States through:
 - Technical Cooperation Programme
 - Interregional and regional networks
 - National, regional and interregional trainings, workshops, technical meetings, conferences...
 - Expert Missions

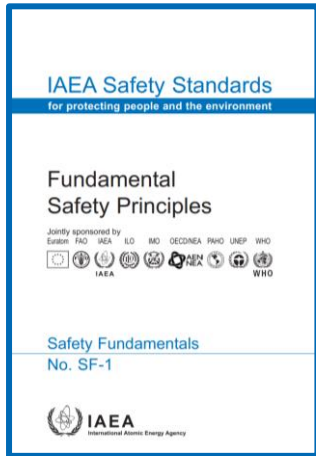
STATUTE



ARTICLE III: Agency Functions

6. To **establish or adopt**, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, **standards of safety** for protection of health and minimization of danger to life and property (including such standards for labour conditions), and to provide for the application of these standards to its own operations as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision; and to provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangement, or, at the request of a State, to any of that State's activities in the field of atomic energy;

IAEA Safety Standards



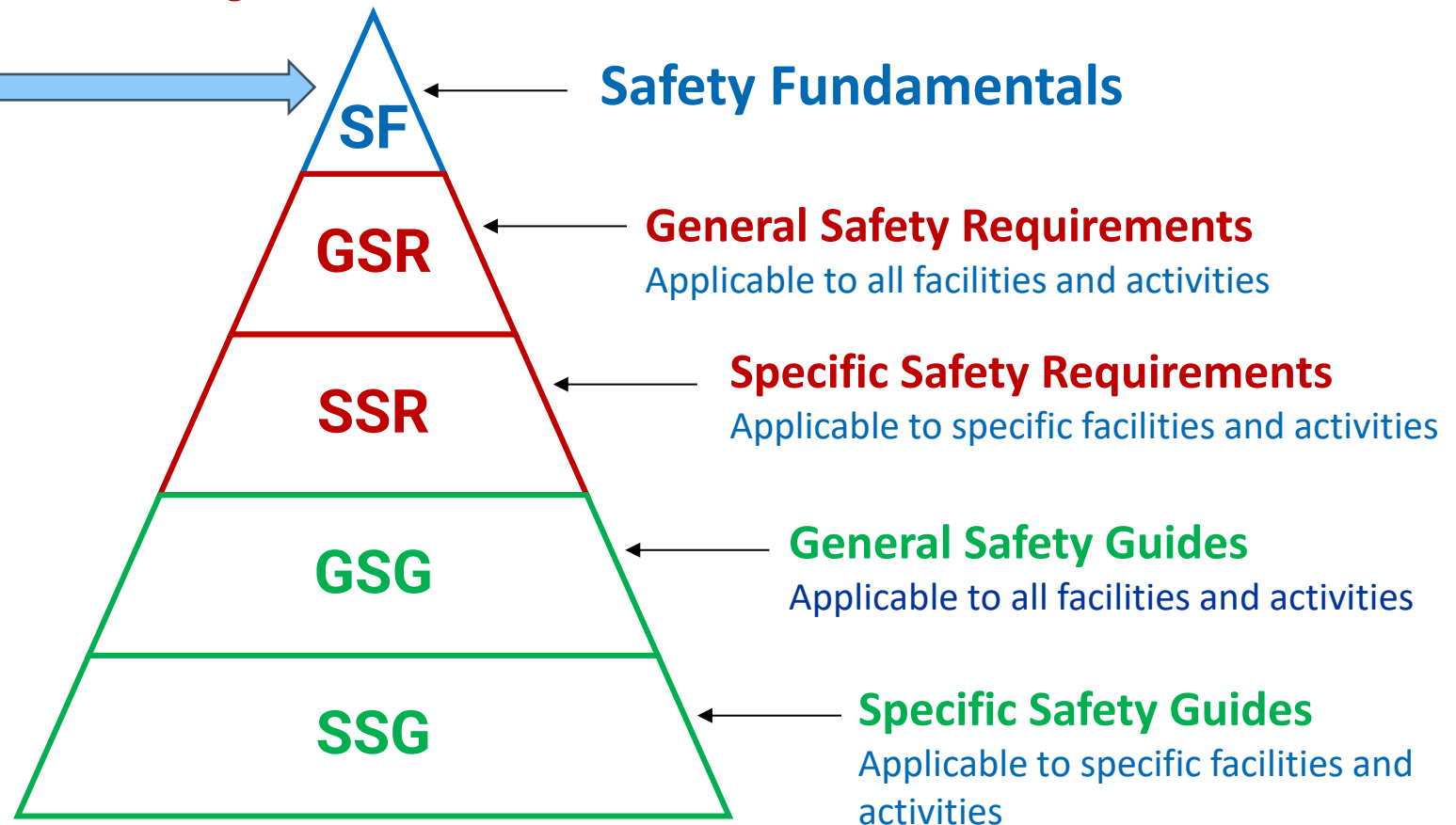
Fundamental Safety Objective:
protect people and the environment
from harmful effects of ionizing
radiation



Principle 7: Protection of present and future generations

Para. 3.29 of IAEA Safety Series No. SF-1:

“Radioactive waste must be managed in such a way as to **avoid imposing an undue burden on future generations**; that is, the generations that produce the waste have to seek and apply safe, practicable and environmentally acceptable solutions for its long term management. ...”



IAEA Safety Standards

Standards for Predisposal

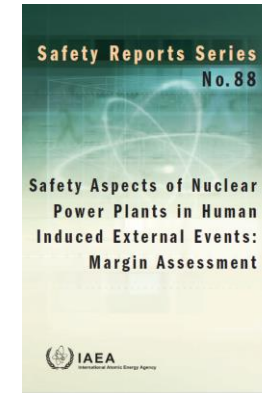
Standards for Disposal



Other IAEA publications

The IAEA has published a number of publications related to the safe management of spent fuel and radioactive waste.

Currently there are more than 40 different publications in the area of safety of management of spent fuel and radioactive waste 7 more are in process of drafting and publication.



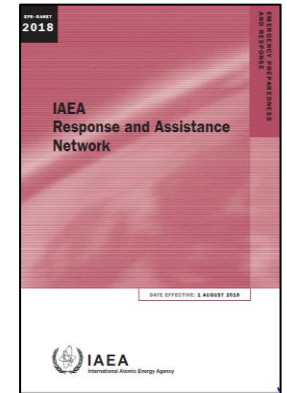
Safety Reports



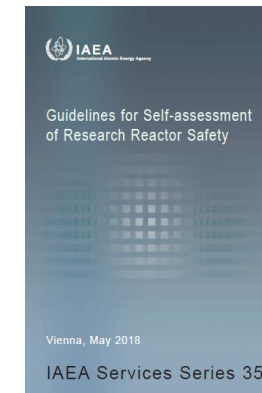
Technical Reports



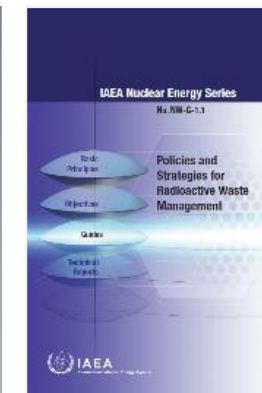
TECDOCs



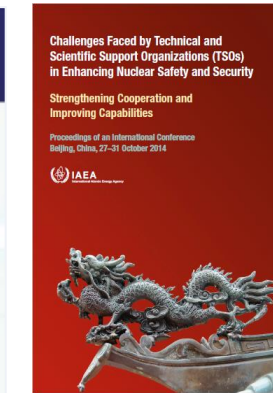
EPR Series



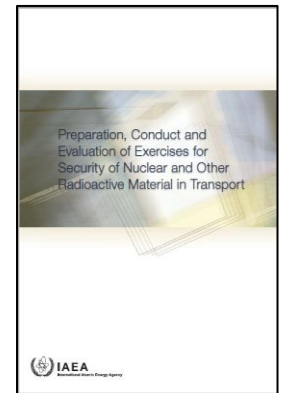
Services Series



Nuclear Energy Series

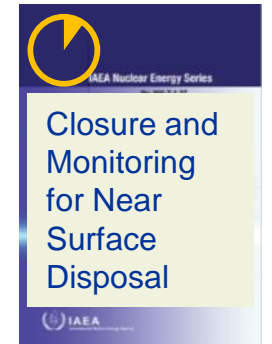
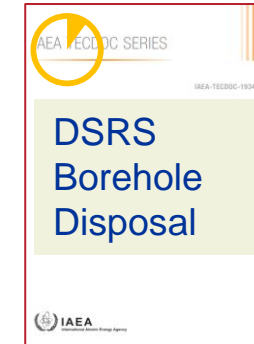
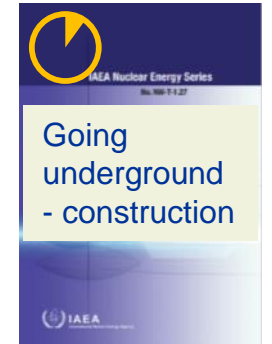
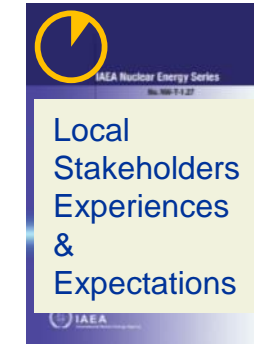
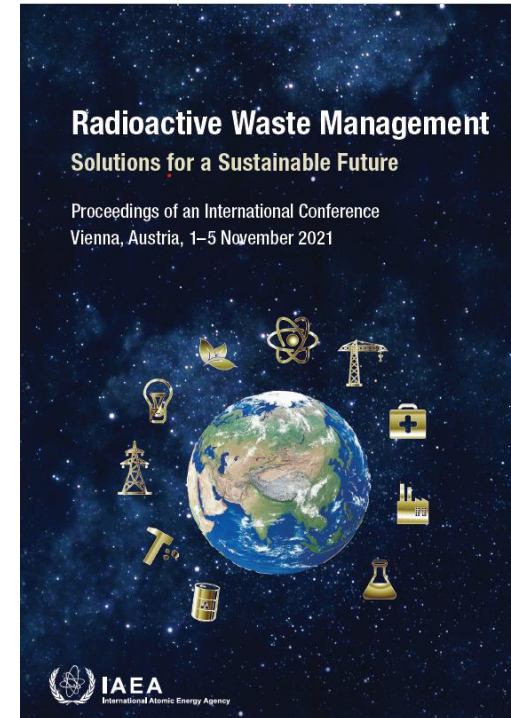
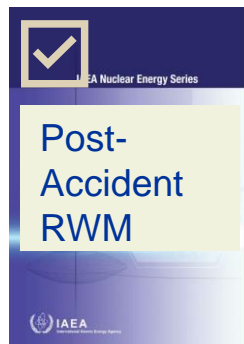
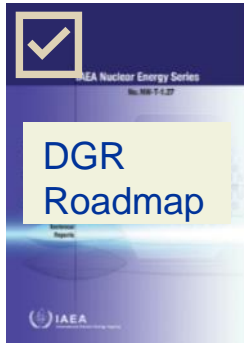
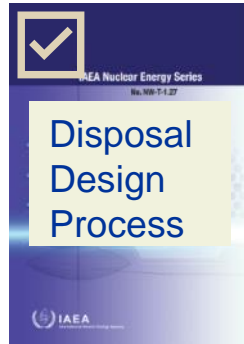
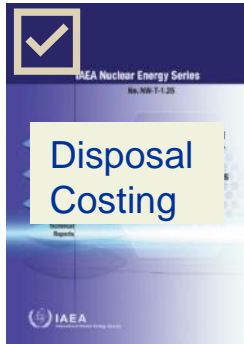
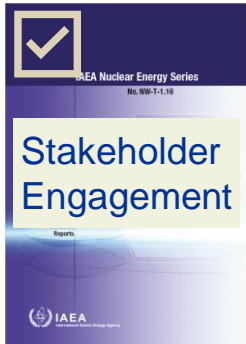


Proceedings Series



Non-serial publications

IAEA Nuclear Energy Series guidance supporting disposal programme



“DGR Roadmap and Site investigations published – hard copies available (Sept 2024)”

Disposal of Radioactive Waste

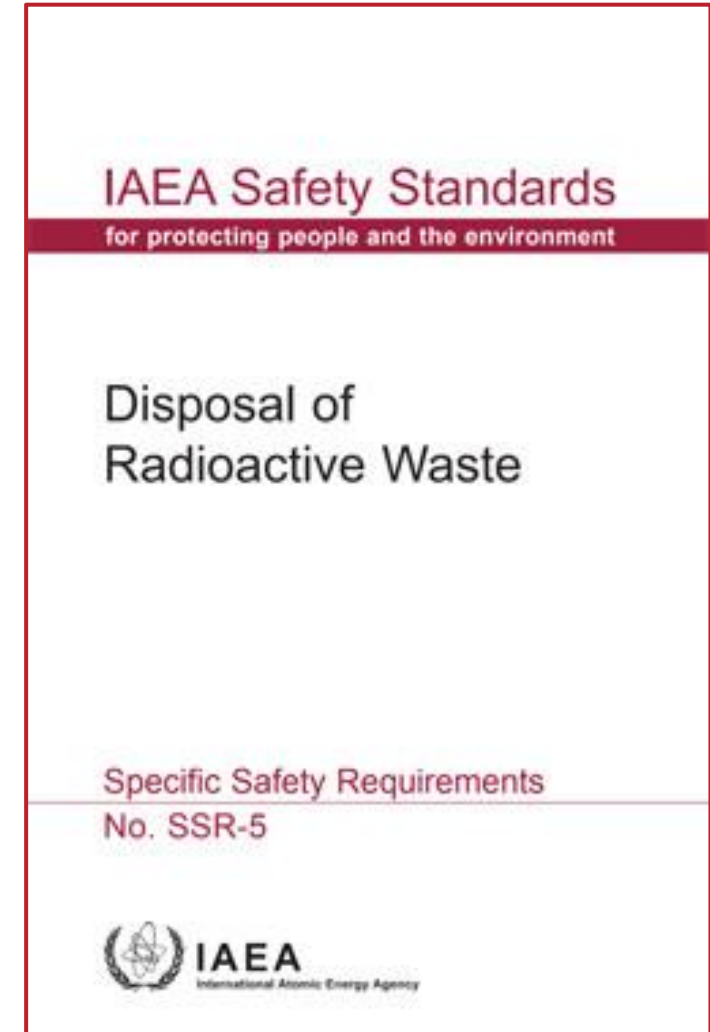
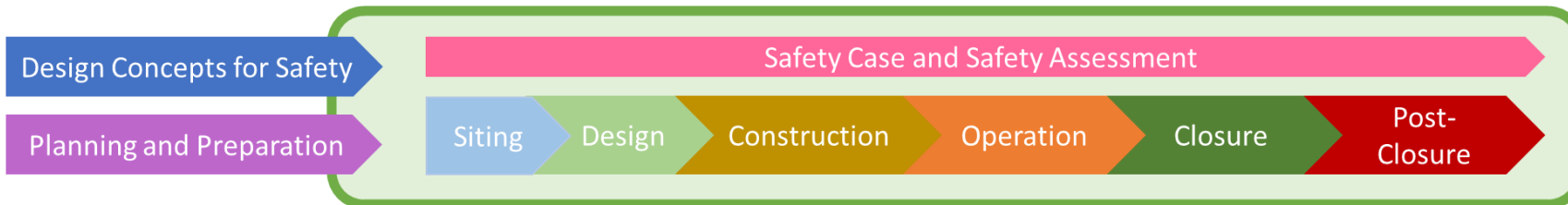
IAEA Specific Safety Requirements No. SSR-5

Sets out the safety objectives and criteria for disposal.

Addresses specific safety requirements for development, operation and closure of disposal facility.

Applies to all types of radioactive waste and all types of disposal facility.

Does not address broader issues of site selection, transport of waste to the site, non-radiological environmental impacts and stakeholder involvement.



Safety Guides on Disposal Facilities for Radioactive Waste

IAEA Specific Safety Guide SSG-29 (Near Surface)

IAEA Specific Safety Guide SSG-14 (Geological)

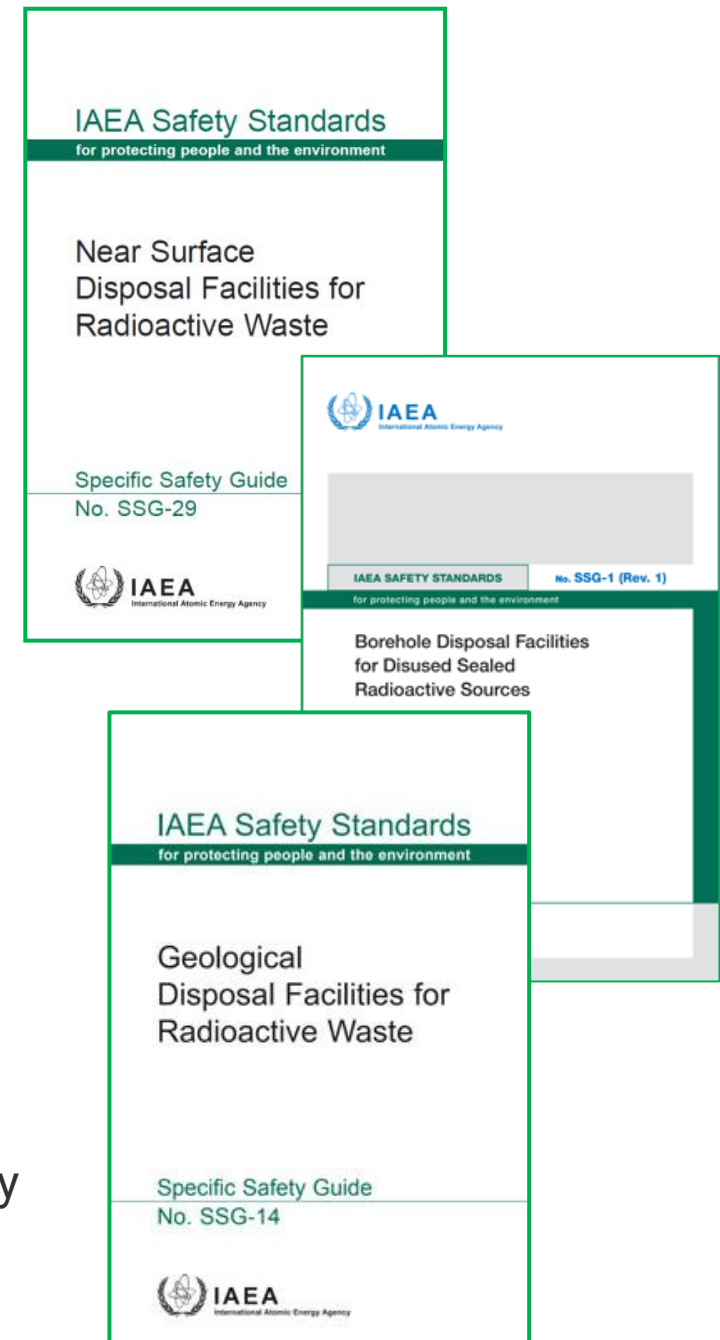
IAEA Specific Safety Guide SSG-1 (Borehole)

Define responsibilities of the government, regulatory body and the operator

Safety approach:

- Safety in the development process
- Containment
- Isolation
- Multiple safety functions
- Passive safety
- Surveillance & control of passive safety features

Define the scope, preparation, approval and use of the safety case and safety assessment



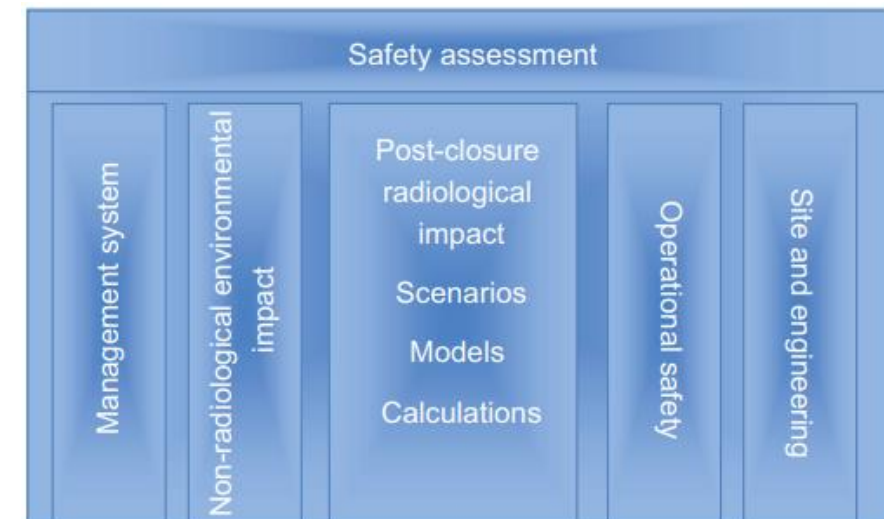
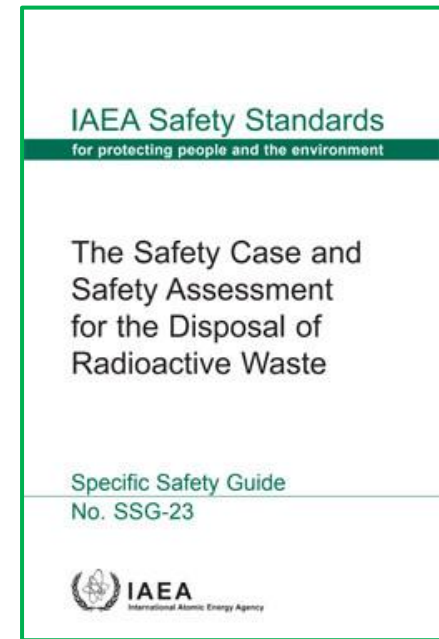
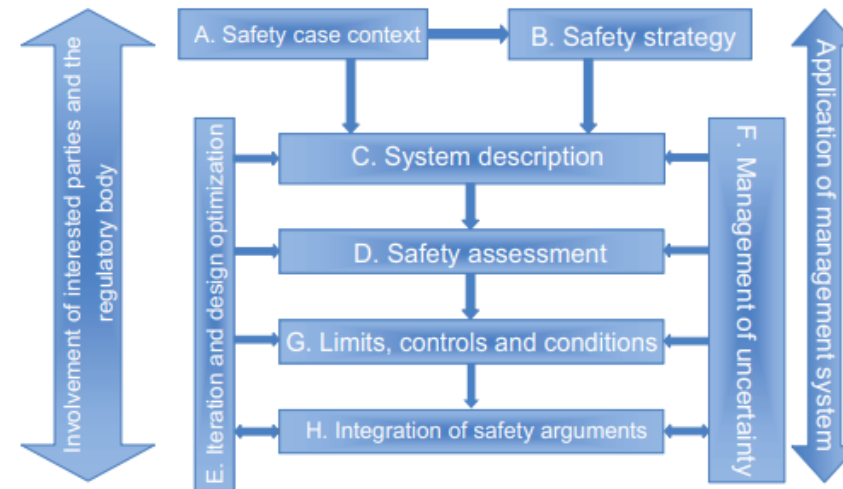
The SC and SA for the Disposal of Radioactive Waste

IAEA Specific Safety Guide SSG-23

Covers the preparation of the safety case and supporting safety assessment for all types of radioactive waste.

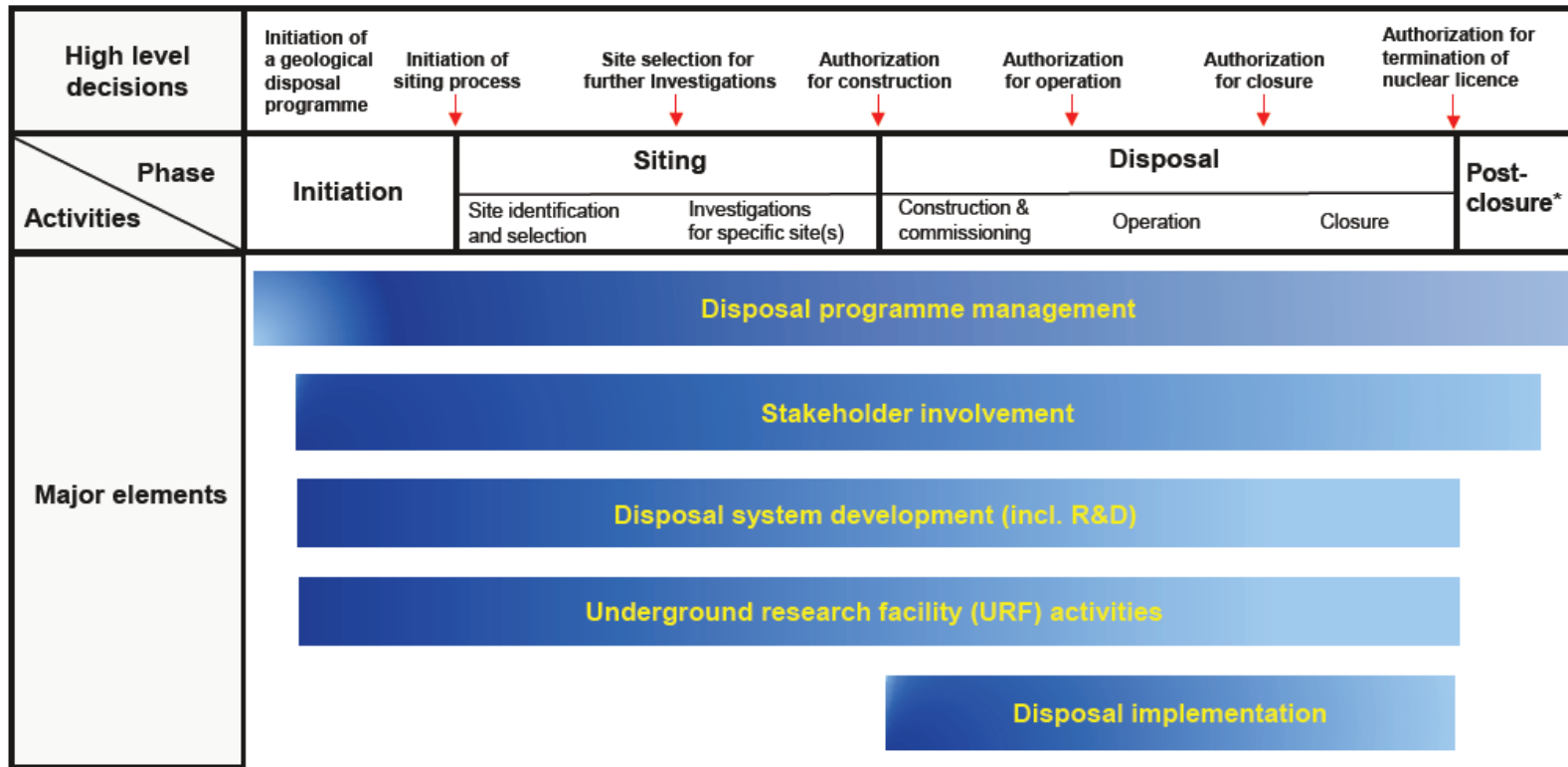
Provides guidance and recommendations on all periods in the development of a disposal facility with emphasis on its impact after closure.

Also provides recommendations on the involvement of interested parties, issues of communication of risk, approaches to decision making, and guidance and recommendations on the regulatory process



Recent publication:

Roadmap for implementing a geological disposal programme



* Responsibility may be transferred from the WMO to another organization





International Projects and support to Member States

GEOSAF project

TECDOC with outcomes of the GEOSAF project is in the process of publication.

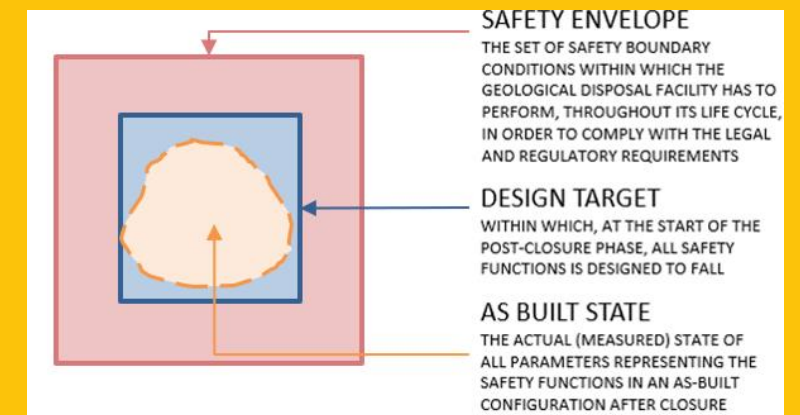
International Project on Demonstration of the Operational and Long-Term Safety of Geological Disposal Facilities for Radioactive Waste

GEOSAF Part I (2008-2011) - to harmonize views and opinions on the development of a safety case for a geological disposal facility, mainly focused on long term safety

GEOSAF Part II (2012-2015) - to address the interface between the operational and post-closure safety regimes and to elaborate on a structure and methodology to define an overarching safety case supporting the demonstration of safety of geological disposal, integrating both the operational and post-closure periods

GEOSAF Part III (2015-2021) - to develop practical guidance for the safety case illustrating through practical examples and case studies how the integrated safety case is to be built by waste management organizations and evaluated by regulatory bodies and TSOs

Elaborates on the definition and understanding of the concepts of **Safety Envelope (SE)**, **Design Target (DT)**, **As Built State (ABS)** which apply to both operational safety and post-closure safety.

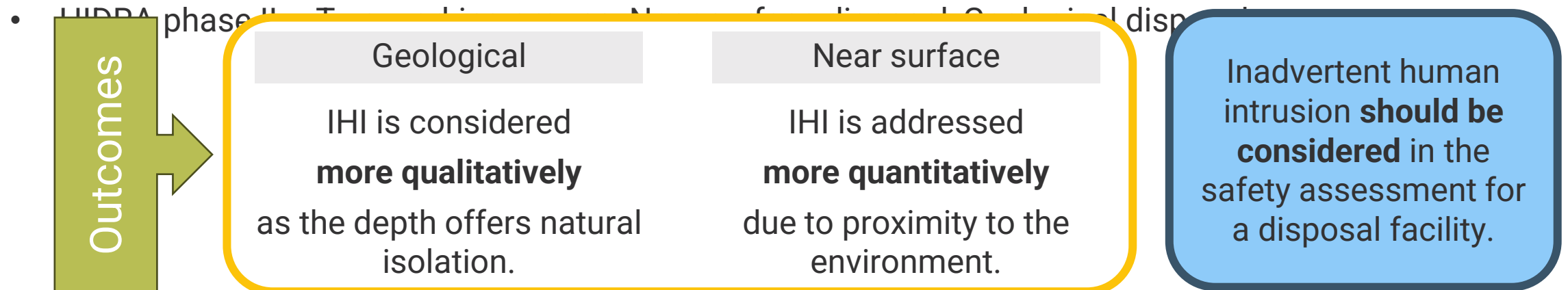


HIDRA project

TECDOC with outcomes of the HIDRA project is in the process of publication.

HIDRA - Human Intrusion in the Context of Disposal of Radioactive Waste

- The HIDRA project considered how to counter potential future human actions that could disturb areas occupied by radioactive waste disposal facilities
- Overall Goal: Enhance the robustness of the disposal facility by considering various measures to reduce the potential and consequences of inadvertent human intrusion.
- HIDRA phase I – Three working groups: Stylized Scenarios, Societal Factors, and Potential Measures.



Regulatory preparedness for geological disposal Project

TECDOC: Guidance on Preparing for, and undertaking, Regulatory Reviews and Assessments of Geological Disposal Programmes is under development

Overall aim to develop guidance (TECDOC) on the types of preparations that a regulatory body should consider concerning the different stages of a programme leading to a geological disposal facility, specifically:

- competencies needed within the regulatory body to act as an independent and credible authority throughout all stages of a geological disposal programme
- early interaction between the regulatory body and decision-makers, as well as the prospective licensee in preparation for the initial licensing stage
- regulatory judgments and decisions in the presence of uncertainties, particularly in initial licensing decisions

Specific Clearance Project

Deliverables



SCALA

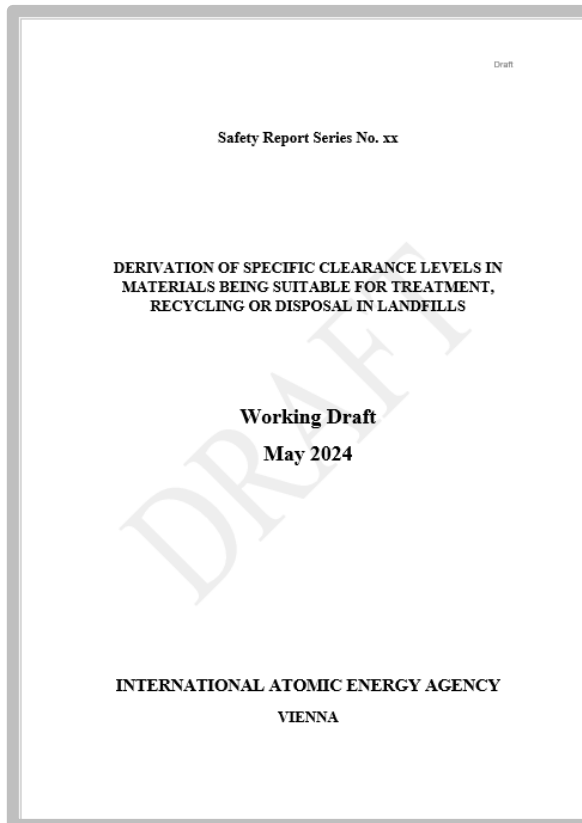
The IAEA Clearance Tool



Implements the models and methodology for derivation of Specific Clearance Levels

Will be distributed free of charge by the IAEA

Training will be provided



Models and methodology for derivation of Specific Clearance levels

RECYCLING of concrete, metals and combustibles

DISPOSAL in HWL, MWL and IWL

Activities related to radioactive waste disposal

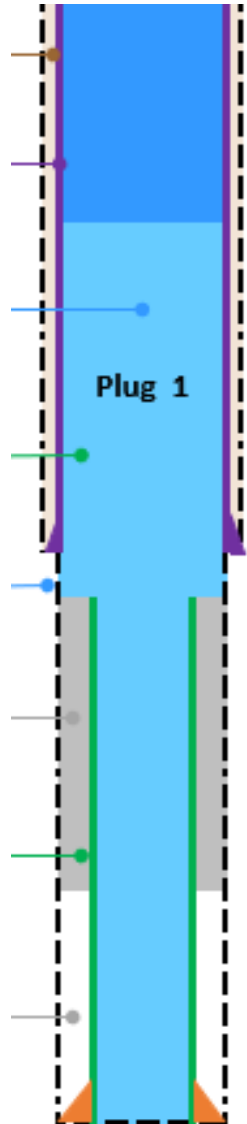
Development of Technical Notes

Ongoing activities in the area of radioactive waste disposal will result in development of several technical notes, namely:

- Development of Specific Guidance for the Application of Safety Standards to **Different Options for Disposal of Disused Sealed Radioactive Sources**
- Evaluation of IAEA Safety Standards for Applicability to **Deep Borehole Disposal of High and Intermediate Level Waste**
- Evaluation of the Applicability of IAEA Safety Standards for the **Development of Multinational Disposal Concepts**

The main objective of these technical notes is to analyse the applicability of the IAEA safety standards to their relevant topics

IAEA project on borehole disposal of disused radioactive sealed sources (DSRS)



Optimization of
safety case and
design (November
2024) workshops



IAEA Coordinated Research Project #T22003 on Deep Borehole Disposal (2024-2027)

Objectives:

- To enhance the international knowledge basis available on Deep Borehole Disposal
- To support Member States strategic decision on whether to pursue DBD as part of their national disposal programme
- To support preparatory work for one (or two) DBD field demonstrator(s)

Motivation:

- Request from Member States to provide a cooperation platform
- Potential to address disposal needs for small(er) or specific challenging wastes
- Specific plans in several Member States

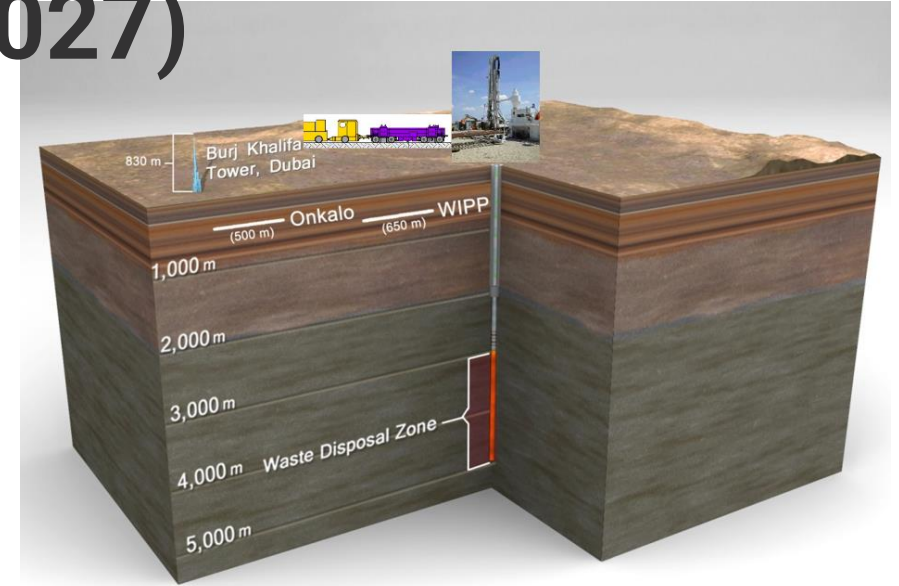


Figure courtesy of Sandia National Labs.

Completed second meeting in Fall of 2024

Participation: Australia (CSIRO, ARWA), China (ECUT), Czech Rep. (UJV Rez), Denmark (Danish Dekom, Geological Survey), Finland (GTK), Germany (BGETEC), Indonesia (BRIN), Malaysia (NMA), Netherlands (TNO, Covra), Norway (NND), Russia (RAS/Institute of Geology), Slovenia (ARAO), South Africa (NRWDI), UK (U Sheffield), Ukraine (NAS/REC), USA (SNL), USA (DBDC, Deep Isolation)

Training Courses

Comprehensive 5-day courses on disposal of radioactive waste

Example: Course on “Design principles and approaches for disposal of radioactive waste”

How repository design principles are implemented in a structured design process and to explore this process in a practical design exercise

Lectures & Discussions

- L1: Introduction to Repository Design Principles and Approaches
- L2: Systems engineering, optioneering and design decision-making
- L3: Managing the key design drivers: case studies
- L4: Solutions for waste packaging, emplacement and design of openings
- L5: Operational period requirements and constraints
- L6: Construction methods, materials and design choices

Linked Exercises

- E1: Selecting a repository concept
- E2: Incorporating high-level requirements and constraints
- E3: Design requirements for waste emplacement
- E4: Design requirements for repository operation
- E5: Design requirements for construction and closure

Training Courses

Generic Agenda for DGR Roadmap Course – to be adapted to user requirements					
	Monday	Tuesday	Wednesday	Thursday	Friday
09:00 – 10:30	Welcome: Introduction to the course <ul style="list-style-type: none"> Tutors and participants introduce themselves Introduce the Roadmap (L0) Introduce the Exercise (E0) 	E2: Your Management Systems	E4: A WBS for the evolving Safety Case	E6: Develop a WBS for Site Investigations	Complete Exercises and Prepare Group Presentations <ul style="list-style-type: none"> Groups consolidate their plans and develop PPT presentations
	Break (10:30 – 11:00)	Break (10:30 – 11:00)	Break (10:30 – 11:00)	Break (10:30 – 11:00)	Break (10:30 – 11:00)
11:00 – 12:30	L1: Engaging the Stakeholders L2: The Initiation Phase	L4: Disposal system development	L6: The Siting Phase	L8: Licensing	Group Presentations <ul style="list-style-type: none"> Presentation of the roadmaps developed by each group Feedback from tutors
	Lunch (12:30 – 14:00)	Lunch (12:30 – 14:00)	Lunch (12:30 – 14:00)	Lunch (12:30 – 14:00)	Lunch (12:30 – 14:00)
14:00 – 15:30	E1: Your National Framework and Stakeholders	E3: Your DGR concept options and design process	E5: Define an Approach to Siting	L9: Construction and Initial Commissioning Stage	Group Presentations <ul style="list-style-type: none"> Presentation of the roadmap developed by each group Feedback from tutors Concluding discussion and participants views
	Break (15:30 – 16:00)	Break (15:30 – 16:00)	Break (15:30 – 16:00)	Break (15:30 – 16:00)	Disperse
16:00 – 17:30	L3: Programme Planning	L5: The Guiding Safety Case	L7: Site Investigations	E7: Develop a WBS for Going Underground	

ARTEMIS Review

ARTEMIS: an integrated expert peer review service for **radioactive waste and spent fuel management**, **decommissioning** and **remediation** programmes.

Intended for facility operators and organizations responsible for radioactive waste management, as well as for regulators, national policy and other decision-makers.

Provides independent expert opinion and advice, drawn from an international team of specialists convened by the IAEA.

Reviews are based on the IAEA safety standards, technical guidance and international good practices.



Integrated Review Service for Radioactive
Waste and Spent Fuel Management,
Decommissioning and Remediation

ARTEMIS

ARTEMIS review benefits:

- Improved organizational performance;
- Enhanced safety, optimized operations and reduced costs;
- Improved transparency and stakeholder confidence, including with the general public; and
- Strengthened credibility of decision-making processes from expert technical and programme perspectives.

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

The Joint Convention is an 'incentive' convention that seeks to promote a high level of safety for the management of spent fuel and radioactive waste through a peer review process every three years.

Contracting Parties:

- **Submit** to all other Contracting Parties **National Reports** on how they meet their obligations under the Convention.
- **Seek clarification** on the National Reports of other Contracting Parties through a system of written **questions and answers**.
- **Present and discuss** their National Reports during the **Review Meeting** in Country Group sessions.

Benefits

Help to foster an international approach to spent fuel and radioactive waste management and sharing expertise in these areas.

Assure the public that national arrangements for spent fuel and radioactive waste management conform to international safety standards.

Increase opportunities to receive assistance, in the case of a country having limited resources to improve its infrastructure to enhance safety of spent fuel and radioactive waste management.



IAEA

Thank you!
