G. Bruno - Y. Kumano - K. Moeller

The IAEA activities and international projects on the safety of radioactive waste disposal

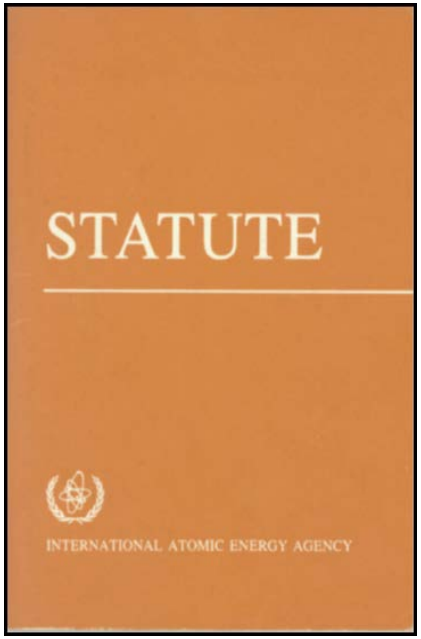
Overview

- The IAEA Safety standards
  - Basic elements
  - The IAEA safety standards related to disposal of RW
- The application of safety standards
  - International harmonization projects
  - Peer review services
- conclusion

Statutory Obligations (1957)

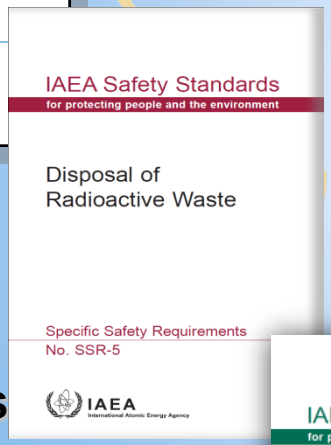
Article III, *Functions*
Paragraph A.6.

" 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 operation as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency …; "

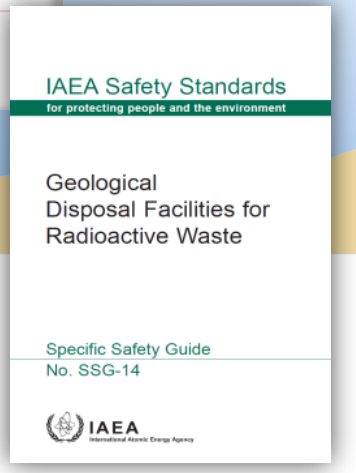


Safety Standards Categories

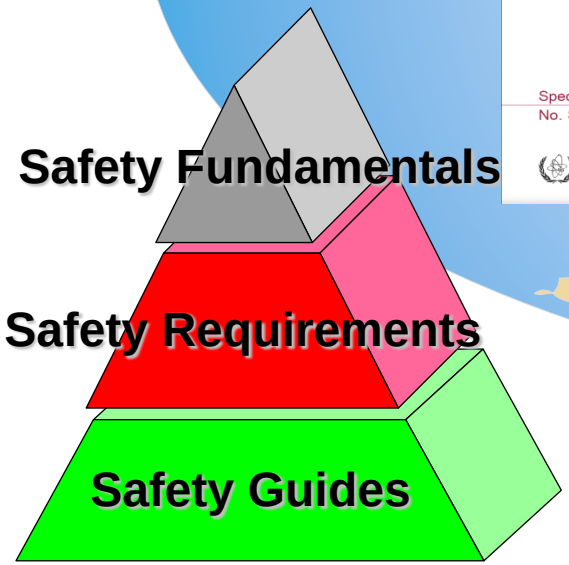
Fundamental Safety Principles



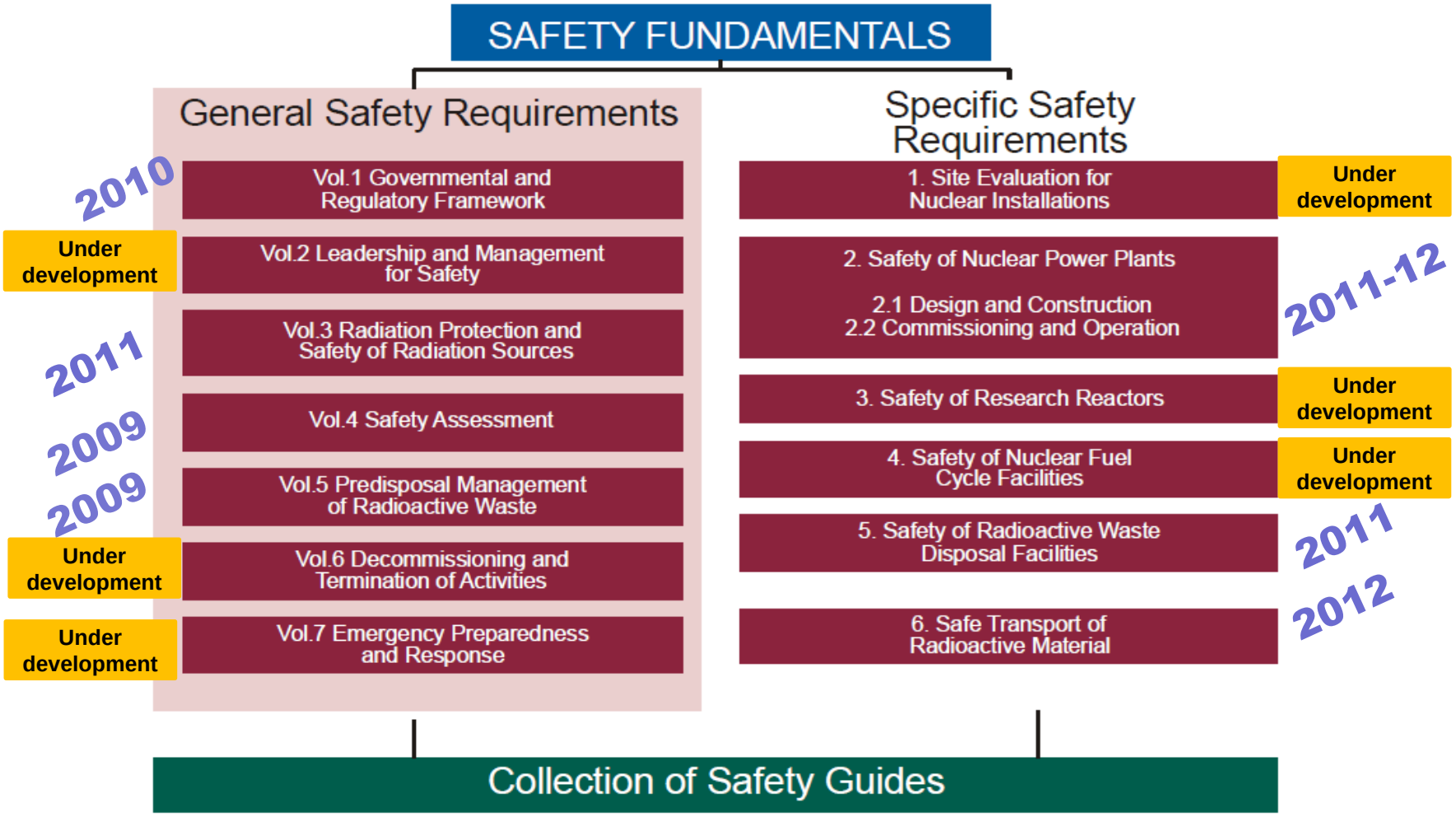
Requirements – Legal, Technical, & Procedural Safety Imperatives



Guidance on Best Practice to Meet Requirements



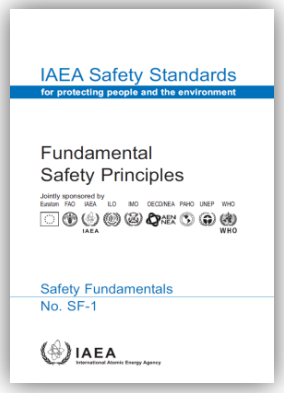
Long term structure of safety standards

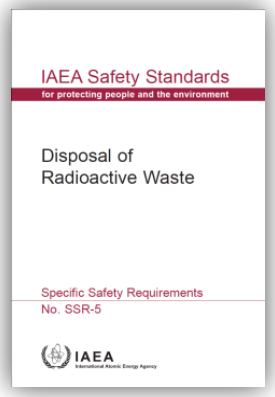


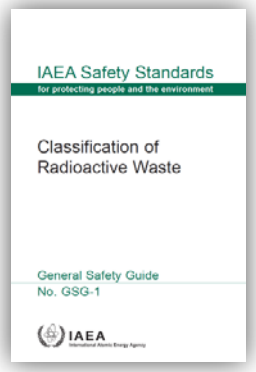
Status of Safety Standards

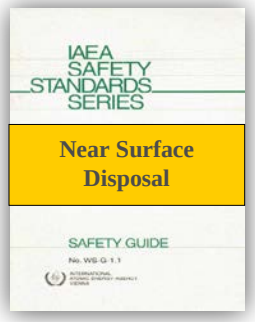
- IAEA Safety standards are
  - Binding for IAEA's own activities
  - Not binding on the Member States (but may be adopted by them) EXCEPT in relation to operations assisted by the IAEA:
    - ➢ Integrated Regulatory Review Service
    - ➢ Technical Cooperation Fund work
    - ➢ States wishing to enter into project agreements with the IAEA

Safety Standards for Disposal

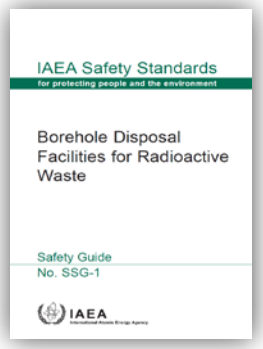


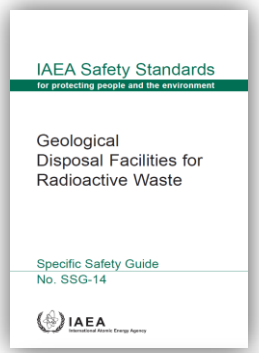


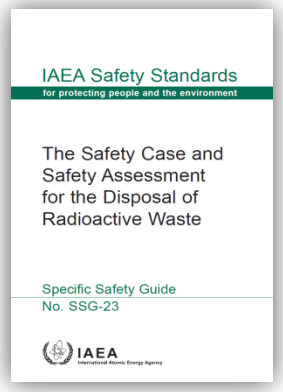


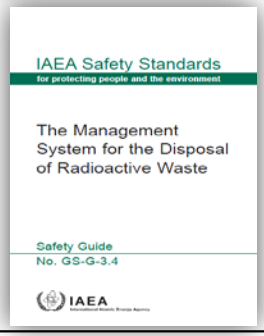


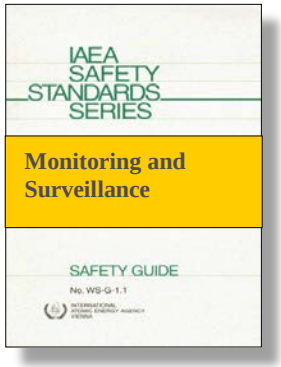
DS 356











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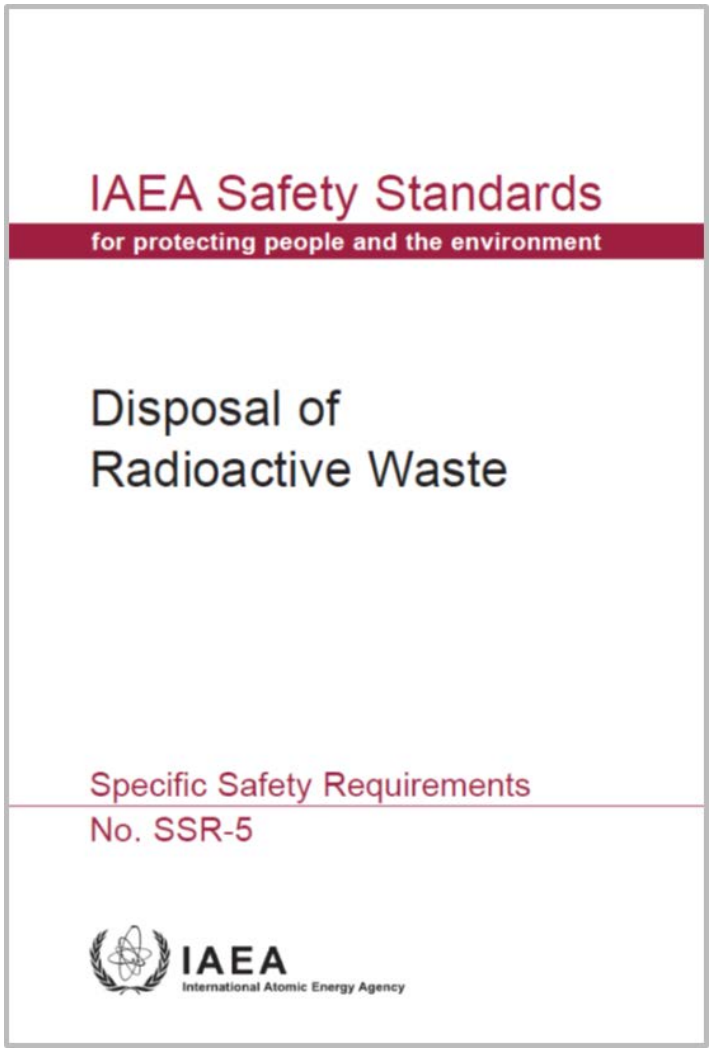
Disposal – Safety Requirements



Applicable to disposal of all types of waste in designed disposal facilities

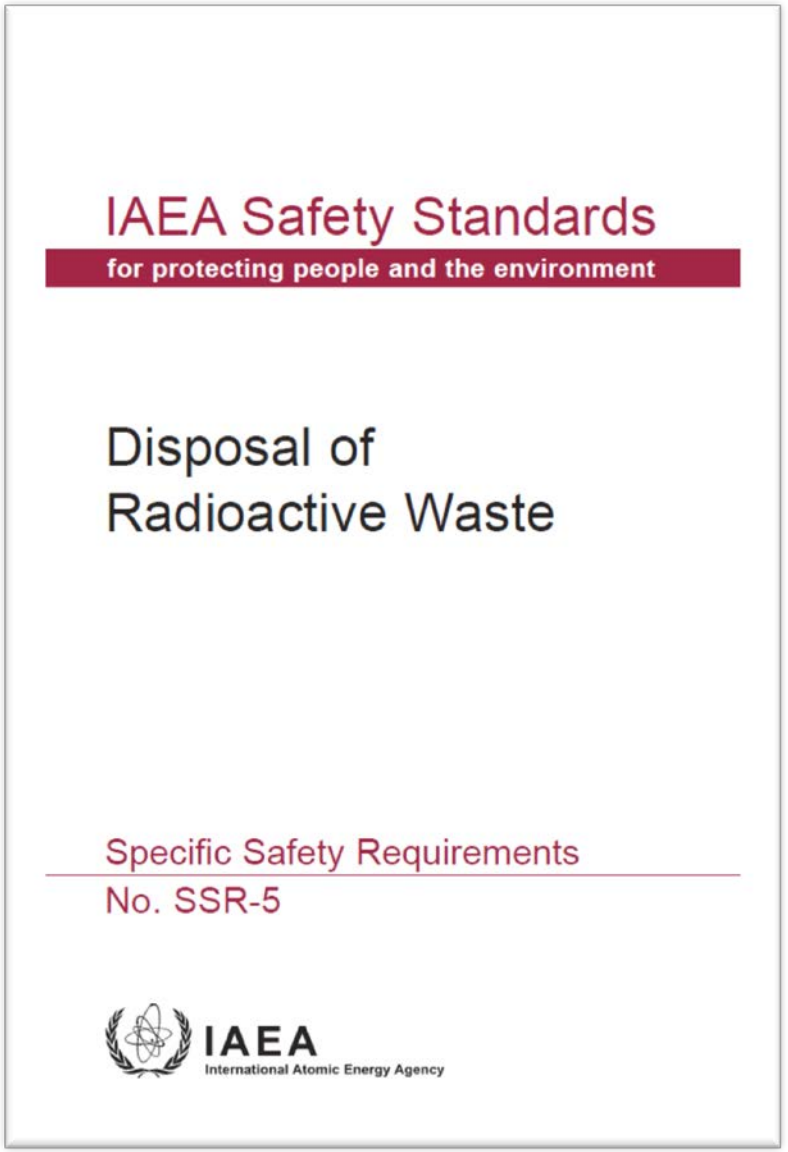
Covers

- Operational phase
- Post-closure phase

A total of 26 requirements

SSR-5: Disposal of Radioactive Waste

1. INTRODUCTION
2. PROTECTION OF PEOPLE AND THE ENVIRONMENT
3. SAFETY REQUIREMENTS FOR PLANNING FOR THE DISPOSAL OF RW
4. REQUIREMENTS FOR THE DEVELOPMENT, OPERATION AND CLOSURE OF A DISPOSAL FACILITY
5. ASSURANCE OF SAFETY
6. EXISTING DISPOSAL FACILITIES



The Safety Requirements on Disposal of RW

Planning for disposal

1. Government responsibility
2. Regulator's responsibility
3. Operator's responsibility
4. Safety in development and operation
5. Passive means for safety
6. Understanding and confidence in safety
7. Multiple safety functions
8. Containment
9. Isolation
10. Surveillance and control

Development

11. Stepwise development
12. Using the safety case
13. Scope of the safety case

Operation and closure

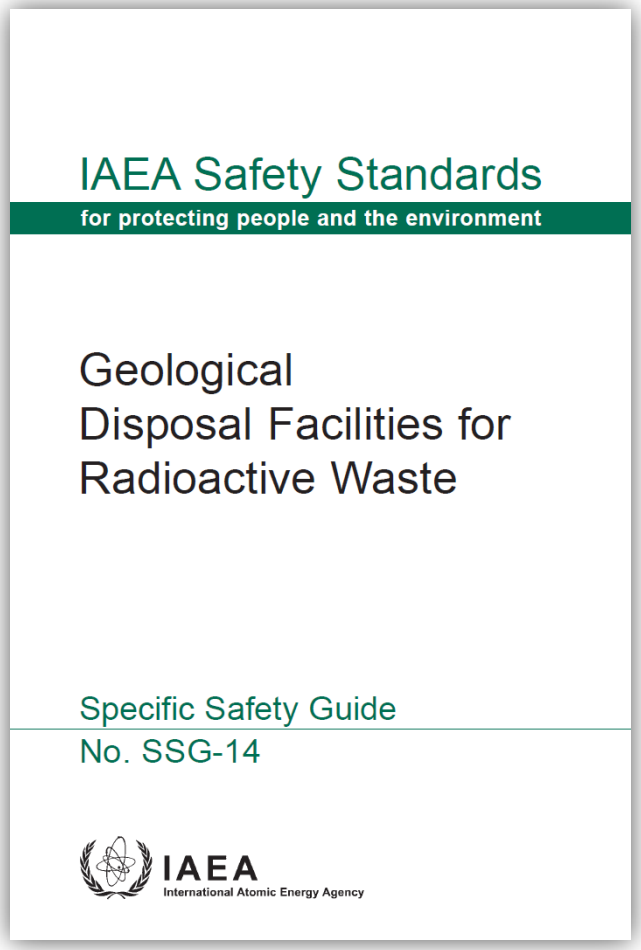
14. Documenting the safety case
15. Site characterization
16. Design
17. Construction
18. Operation
19. Closure

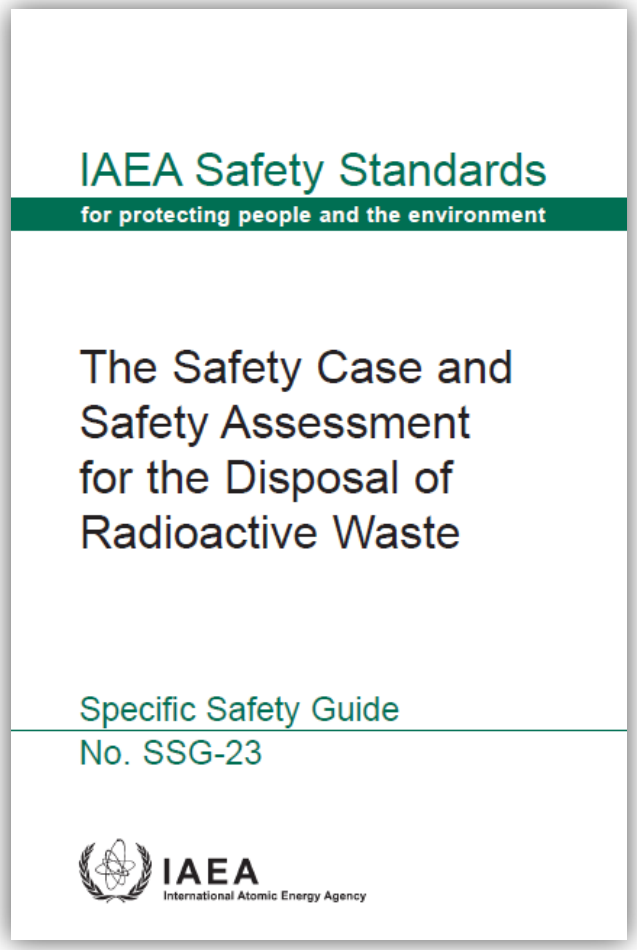
Assurance for safety

20. Waste acceptance
21. Monitoring
22. Post-closure & institutional control
23. Accountancy and control
24. Nuclear security measures
25. Management systems

26. Existing disposal facilities

Specific Safety Guides on Disposal of RW

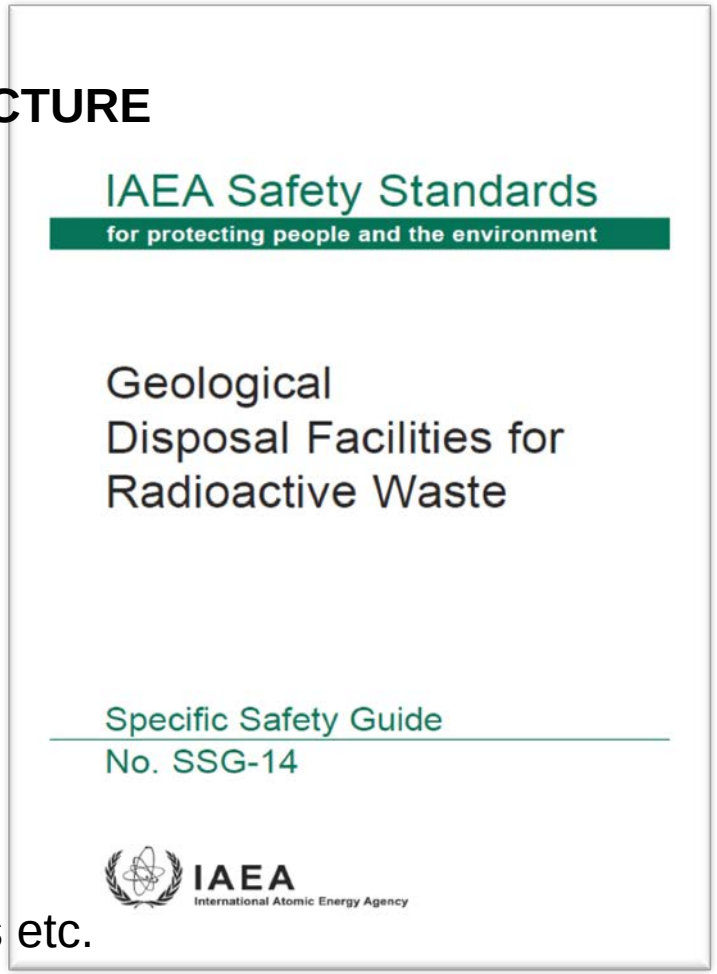




SSG-14:
Geological Disposal Facilities for Radioactive Waste

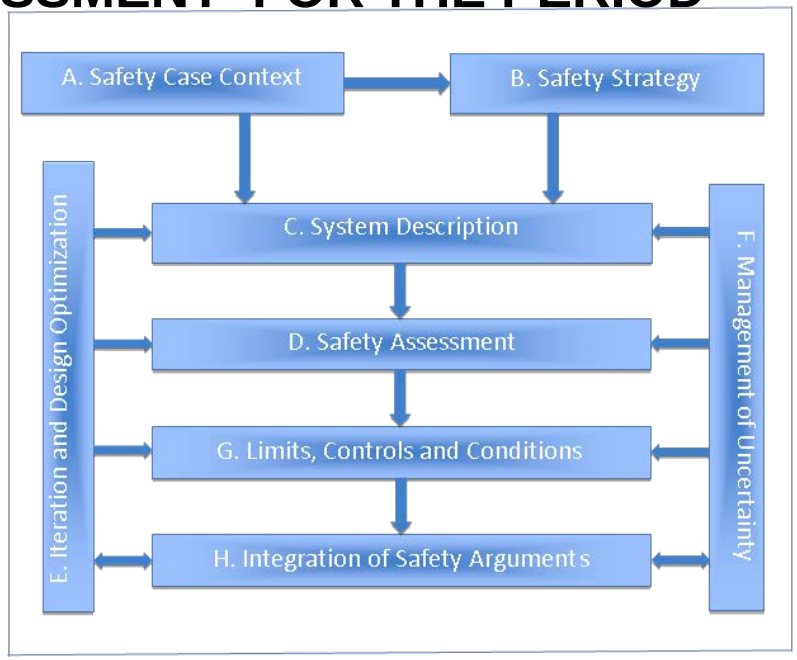
1. **INTRODUCTION**
2. **OVERVIEW OF GEOLOGICAL DISPOSAL AND ITS IMPLEMENTATION**
3. **LEGAL AND ORGANIZATIONAL INFRASTRUCTURE**
4. **SAFETY APPROACH**
5. **THE SC AND SA**
6. **ELEMENTS IN A STEPWISE APPROACH TO THE DEVELOPMENT OF A GEOLOGICAL DISPOSAL FACILITY**

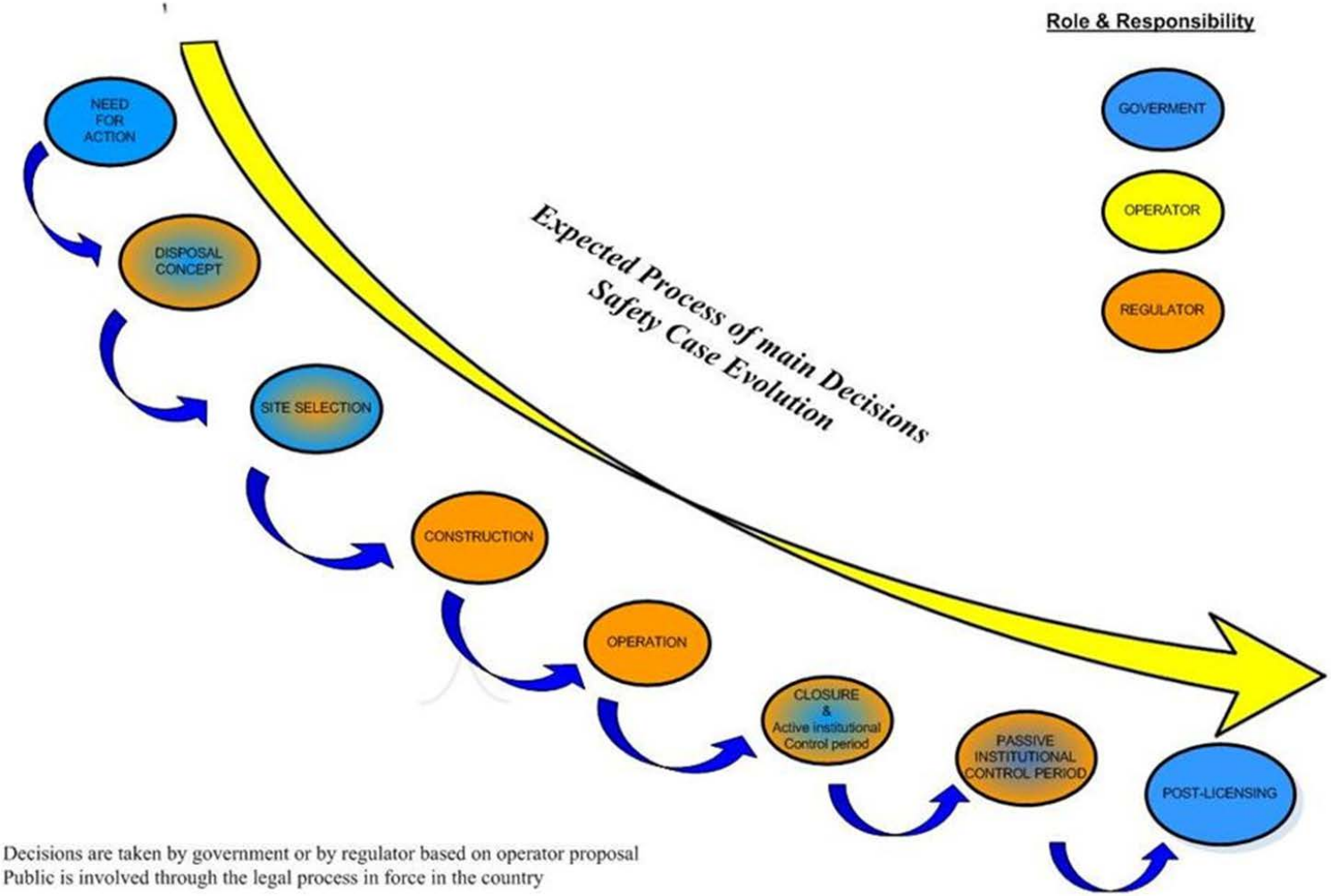
- Step by step development and evaluation
- Site characterization
- Design
- Waste acceptance
- Construction / Operation / Closure
- Monitoring programmes
- Surveillance and control of passive safety
- The period after closure and institutional controls etc.



SSG-23 - SC and SA for disposal of RW

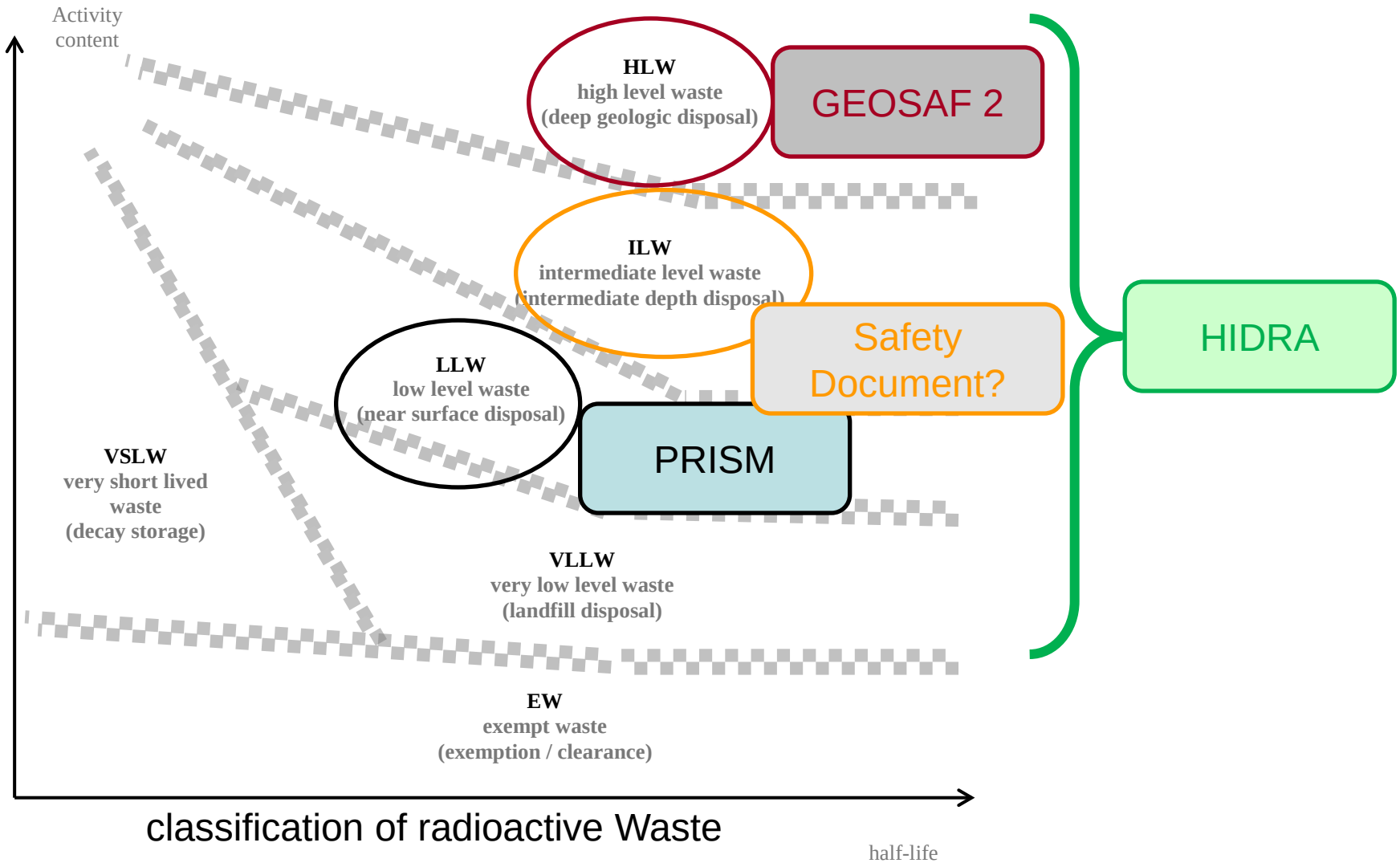
1. **INTRODUCTION**
2. **DEMONSTRATING THE SAFETY OF RW DISPOSAL**
3. **SAFETY PRINCIPLES AND SAFETY REQUIREMENTS**
4. **THE SAFETY CASE FOR DISPOSAL OF RW**
5. **RADIOLOGICAL IMPACT ASSESSMENT FOR THE PERIOD AFTER CLOSURE**
6. **SPECIFIC ISSUES**
   - Evolution of the safety case
   - Graded approach
   - Defence in depth
   - Robustness
   - Time frame for the assessment
   - Human intrusion
   - Institutional control
   - Retrievability of waste
   - Appraisal of options
7. **DOCUMENTATION AND USE OF THE SAFETY CASE**
8. **REGULATORY REVIEW PROCESS**





Decisions are taken by government or by regulator based on operator proposal
Public is involved through the legal process in force in the country

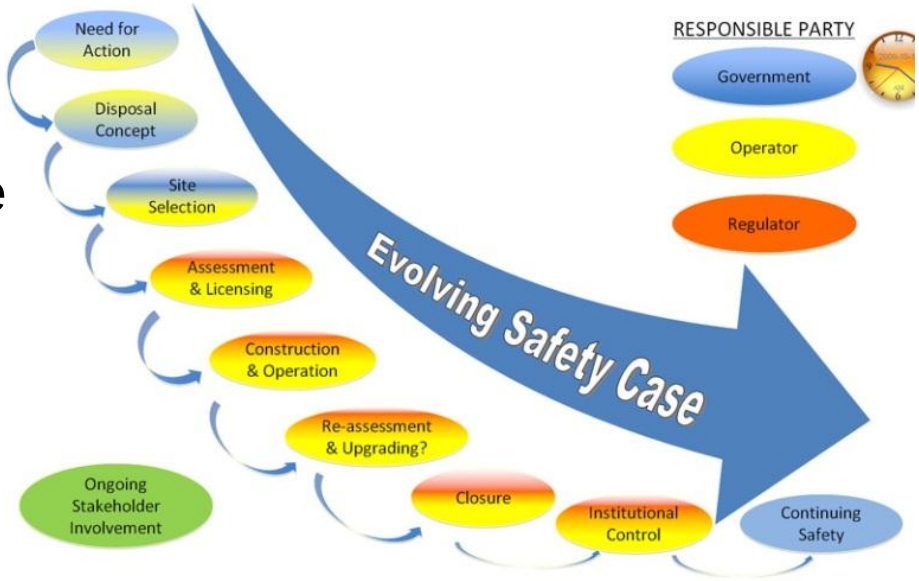
Current activities on disposal of RW



PRISM Project:

PRactical Illustration and Use of the Safety Case Concept in the Management of Near-Surface Disposal

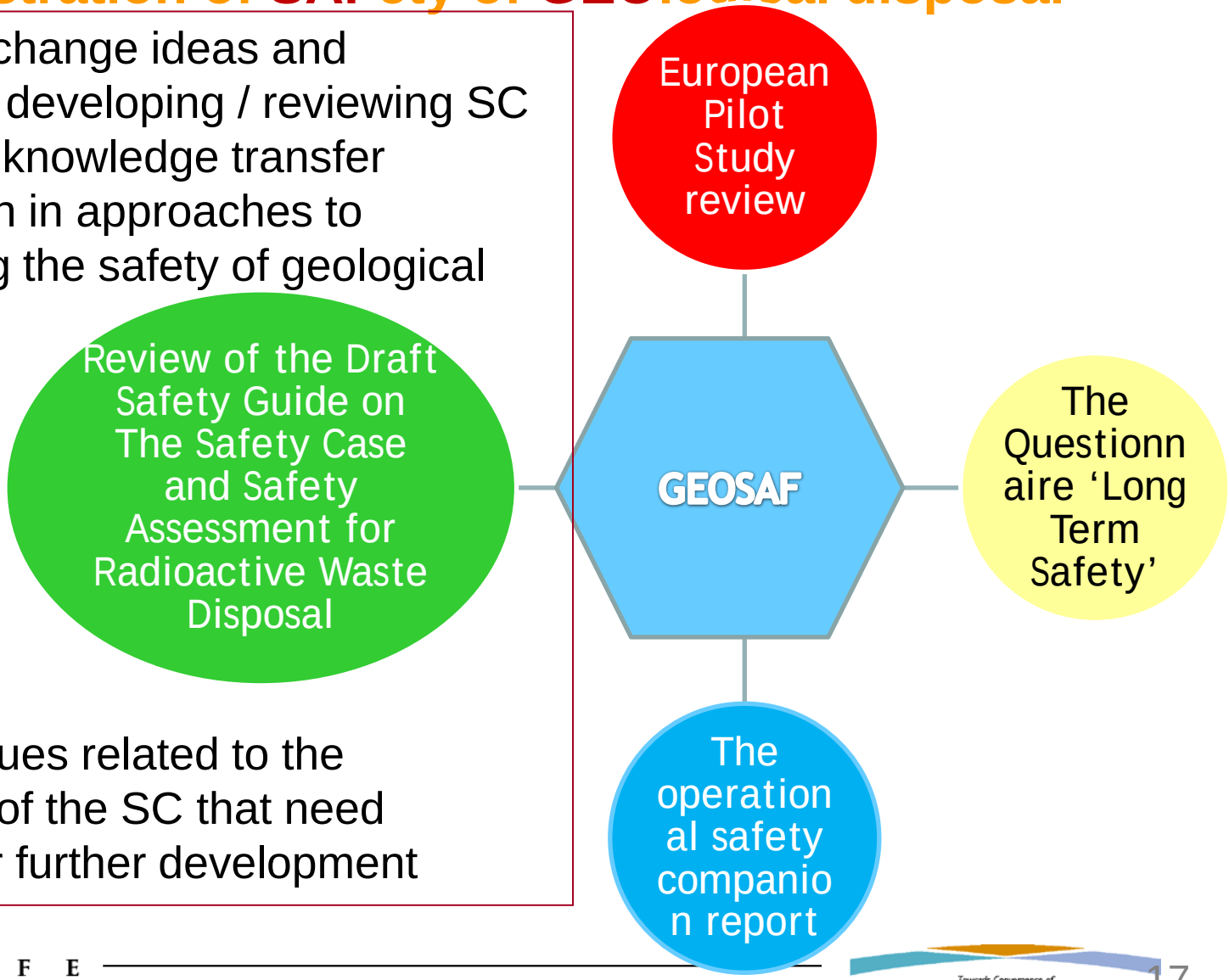
- **Objective:**
  To share experience and communicate good practice, in particular concerning:
  - The components and expectations of the safety case and their evolution over the lifecycle of a near-surface radioactive waste disposal facility
  - Decision making at different stages in the facility lifecycle, using the safety case
- **Task Groups:**
  - Understanding the safety case
  - Disposal facility design
  - Managing waste acceptance
  - Managing uncertainty
- **Finished in 2012**



GEOSAF project
Demonstration of SAFety of GEOlogical disposal

- A forum to exchange ideas and experience in developing / reviewing SC
- a platform for knowledge transfer
- Harmonization in approaches to demonstrating the safety of geological disposal

- To identify issues related to the development of the SC that need clarification or further development



GEOSAF project

Deliverables

- Final report
- Operational safety position paper
- Companion report on operational safety

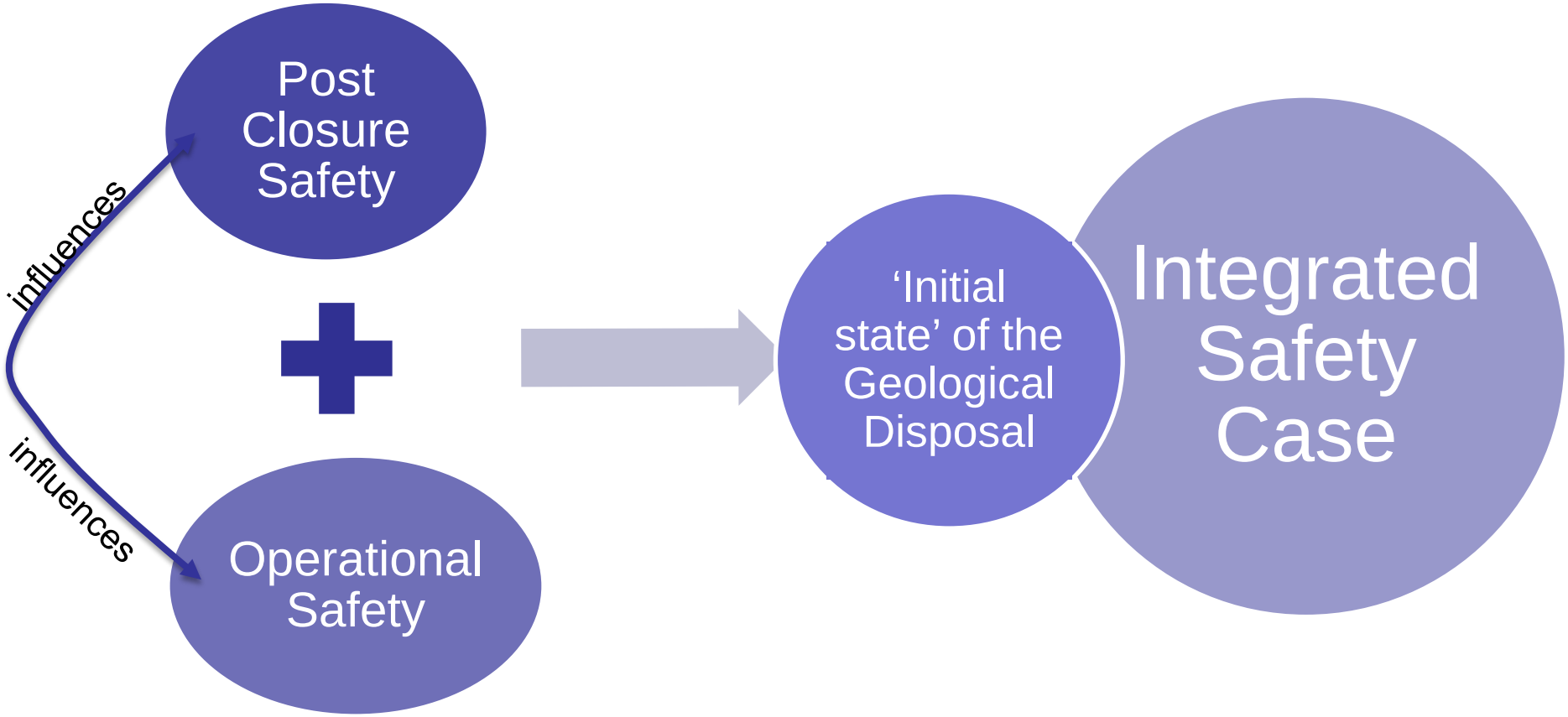
Final Report

http://www-ns.iaea.org/projects/geosaf/

GEOSAF I 2008-2011
→ Follow-up activity
GEOSAF II 2012-2014/2015

GEOSAF II : Objective

Integration of post-closure safety and operational safety into the Safety Case

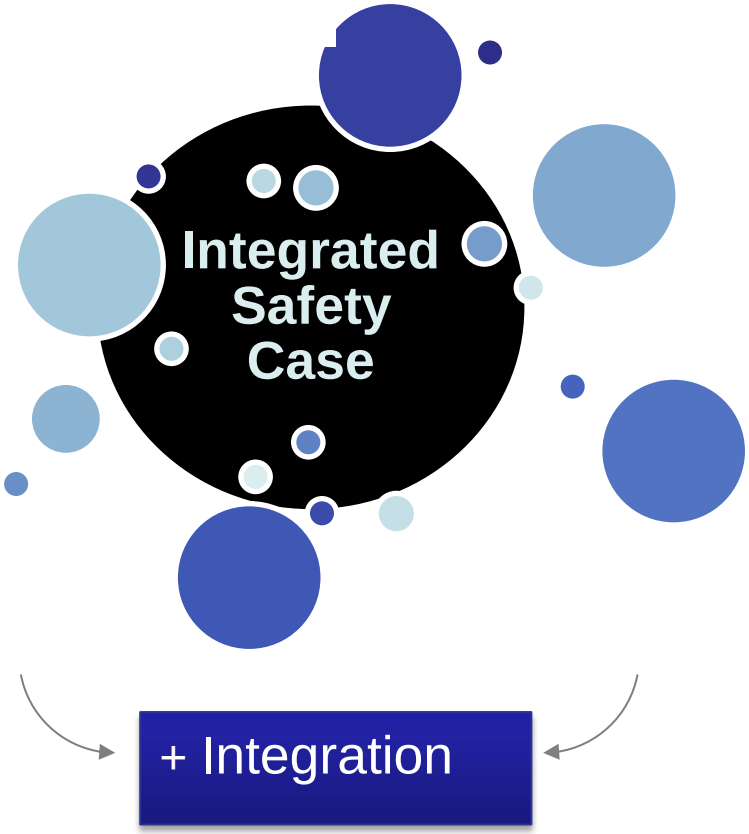


GEOSAF II : main topics

Operational safety
- Safety in operation – protection of workers
- Impact of operations on long term safety

Long term safety

Operational Safety: Information gathering and key findings on national GD programmes



Contradicting operational safety and post-closure safety **requirements**

Definition of the '**Initial State**' of the facility, where Operational phase ends and Post-closure phase starts.

Classification of SSCs and its implication on operational safety and post-closure safety

HIDRA Project:
Human Intrusion in the context of Disposal of RadioActive waste

Objective:

1) Share experience and practical considerations

2) Provide guidance document that includes;

Role of Human Intrusion in context of the Safety Case
Methodology or Process
Examples etc.

3) Provide suggestions for communication strategies on;

Rationale for assessments of FHAs
Interpretation of the results of those assessment for the public

Project

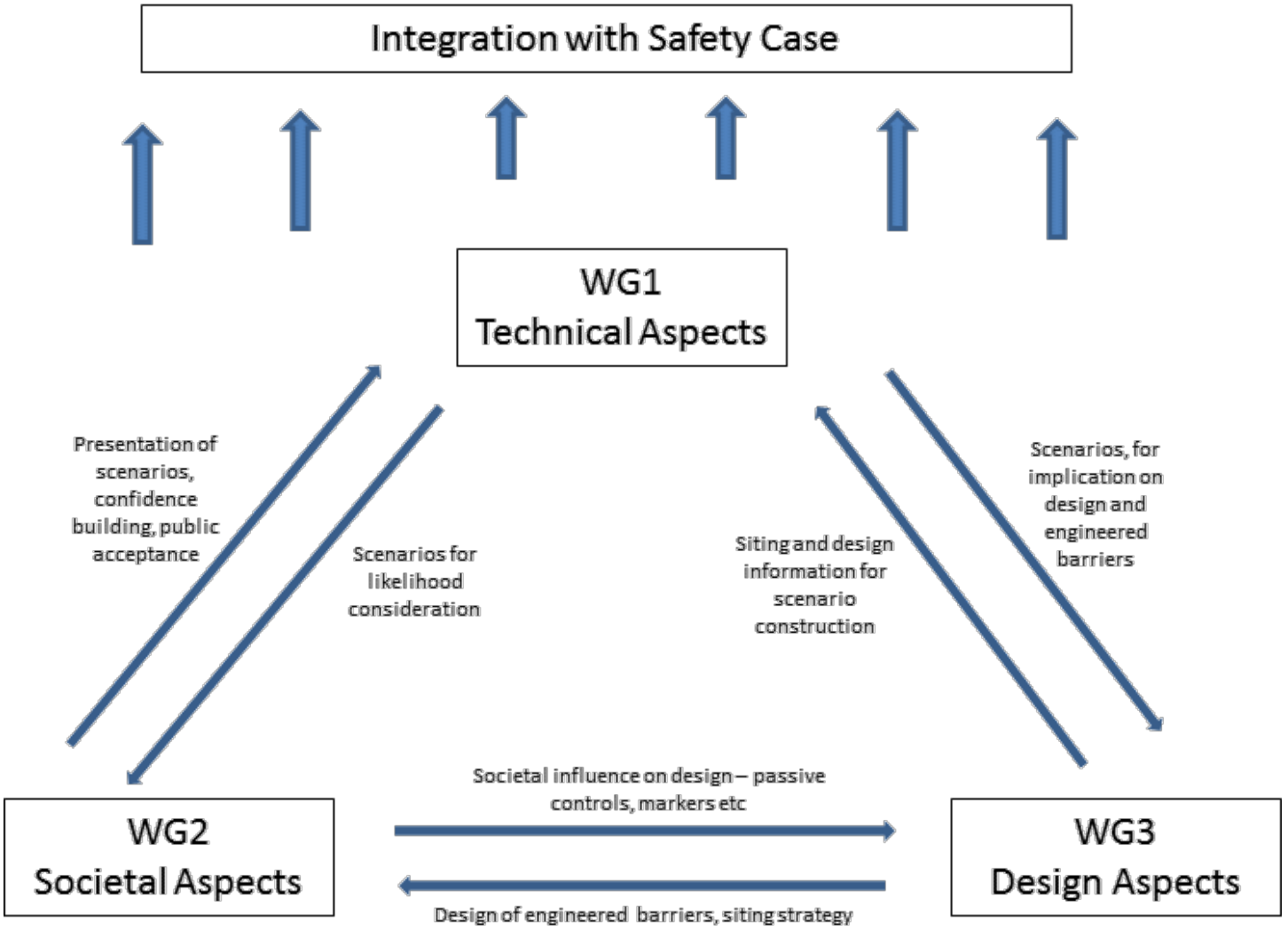
2-year project:

Annual plenary meeting & Task group activities

3 task groups:

Technical / Societal / Design aspects

HIDRA project (3) - Integration



HIDRA project (4) –Topics of WGs

WG1: TECHNICAL ASPECTS

- Provide a document that addresses the technical criteria related to potential scenarios of future human intrusion such as;
  - ❖ Drilling (Water resource / Mineral Exploration)
  - ❖ Excavation (Residential / Roadway)
  - ❖ Deep Geologic Disposal (Drilling / Mining / Solution Mining)

WG2: SOCIETAL ASPECTS

- Share, exchange information and communicate good practices on:
  - ❖ How societal aspects drive the generation of FHA scenarios
  - ❖ How the use of FHA scenarios helps to build confidence in the overall safety of the radioactive disposal facility
  - ❖ How to preserve knowledge throughout the life cycle
  - ❖ How to involve and communicate with stakeholders

HIDRA project (5) –Topics of WGs

- WG3: DESIGN ASPECTS
  - Linking Technical and Societal Conditions with Design & Siting - to consider the synthesis of site and societal considerations with the actual repository design & siting to develop the full scenarios to be considered as plausible.”
    - ❖Timing – effectiveness of barriers as a function of time
    - ❖Links between natural processes and intrusion
    - ❖Countermeasures – what types of barriers are effective against drilling or excavation
    - ❖How does design minimize impact / contact with any specific waste package (spatial issue)

http://www-ns.iaea.org/projects/hidra/default.asp?s=8&l=124

Peer Review Services

- Several review services are proposed by the IAEA:
  - IRRS (Integrated Regulatory Review Service)
  - OSART (Operational Safety Review Team)
  - WATRP
- The IAEA has for decades also organized peer reviews for facilities and activities related spent fuel and radioactive waste management
  - Yucca Mountain Site Characterisation Project (USA)
  - Near Surface Disposal (Australia)
  - IAEA-EC-Ukraine (WWER review, Ukraine)
  - Site Characterisation (South Korea) and selection (Lithuania)
  - Disposal (Russian Federation), etc.

Peer Review Services

- Need to harmonize delivery of these services was recognized, and in turn improve their quality and efficiency.
- Propose one house approach, instrument for the Member States
- In 2014, the Agency will introduce a new peer review service for spent nuclear fuel and radioactive waste management, decommissioning and remediation.

Conclusions

- Important role of the IAEA in assisting MS to meet challenges related to the safe disposal of RW
- Many IAEA Member States have made progress towards disposal but further efforts are needed – particularly for geological disposal.
- Complementary approach of safety standards and provision for their application aims at providing such an assistance
- Additional tools and instruments are also used such as Technical cooperation assistance, the “Joint Convention”, Networks (URF, DISPONET, ANSN), Nuclear Safety Action Plan.

Thank you!