IAEA Safety Standards on Disposal of Radioactive Waste

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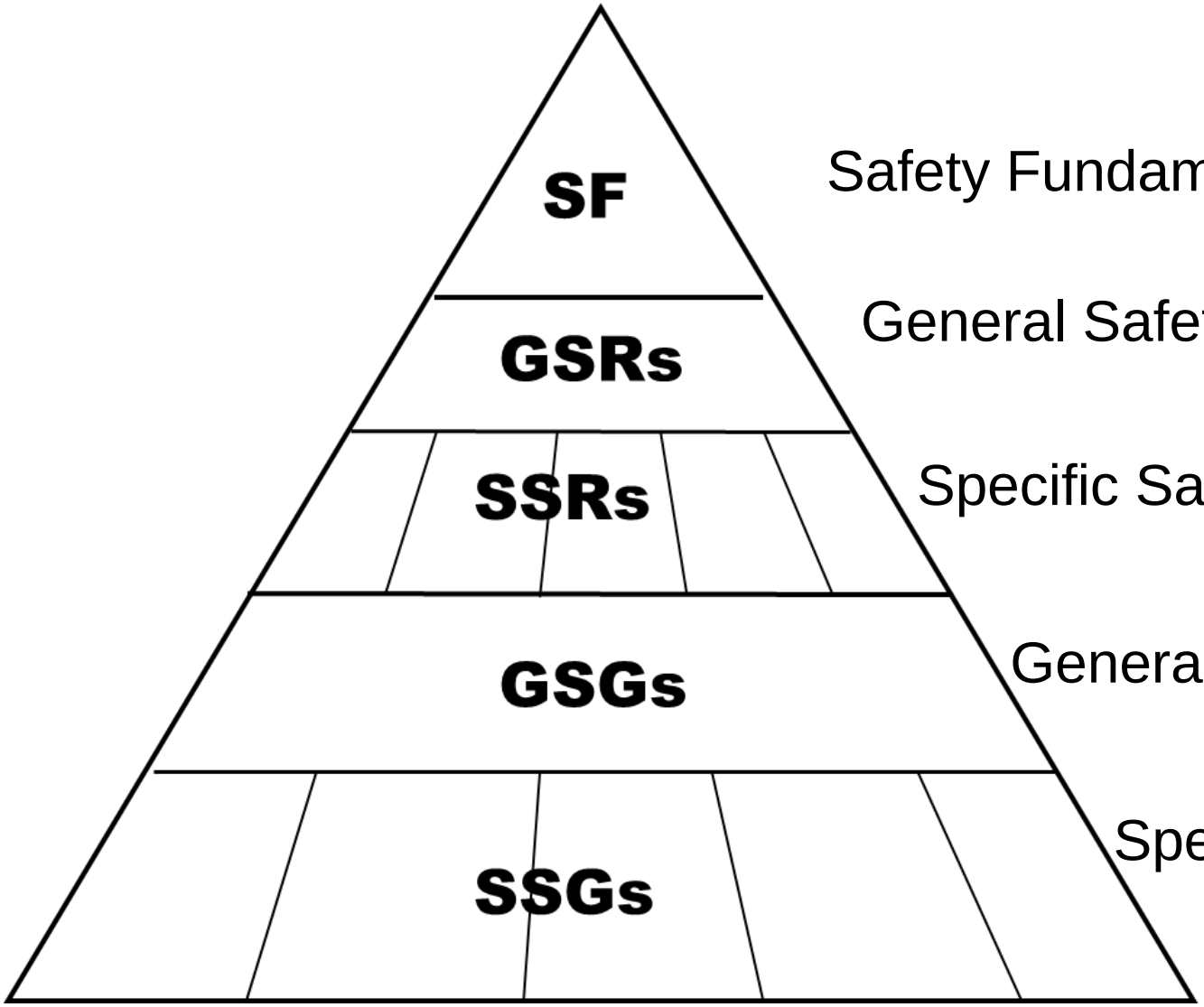
Section Head

Waste and Environmental Safety Section

Outline

- Overview of Safety Standards
  - Structure
  - Key Safety Standards on predisposal and disposal
- Safety Requirements on Disposal of Radioactive Waste
- Safety harmonization projects on disposal
  - Safety case and safety assessment
  - PRISM – near surface disposal
  - GEOSAF – geological disposal

Hierarchical structure - principles



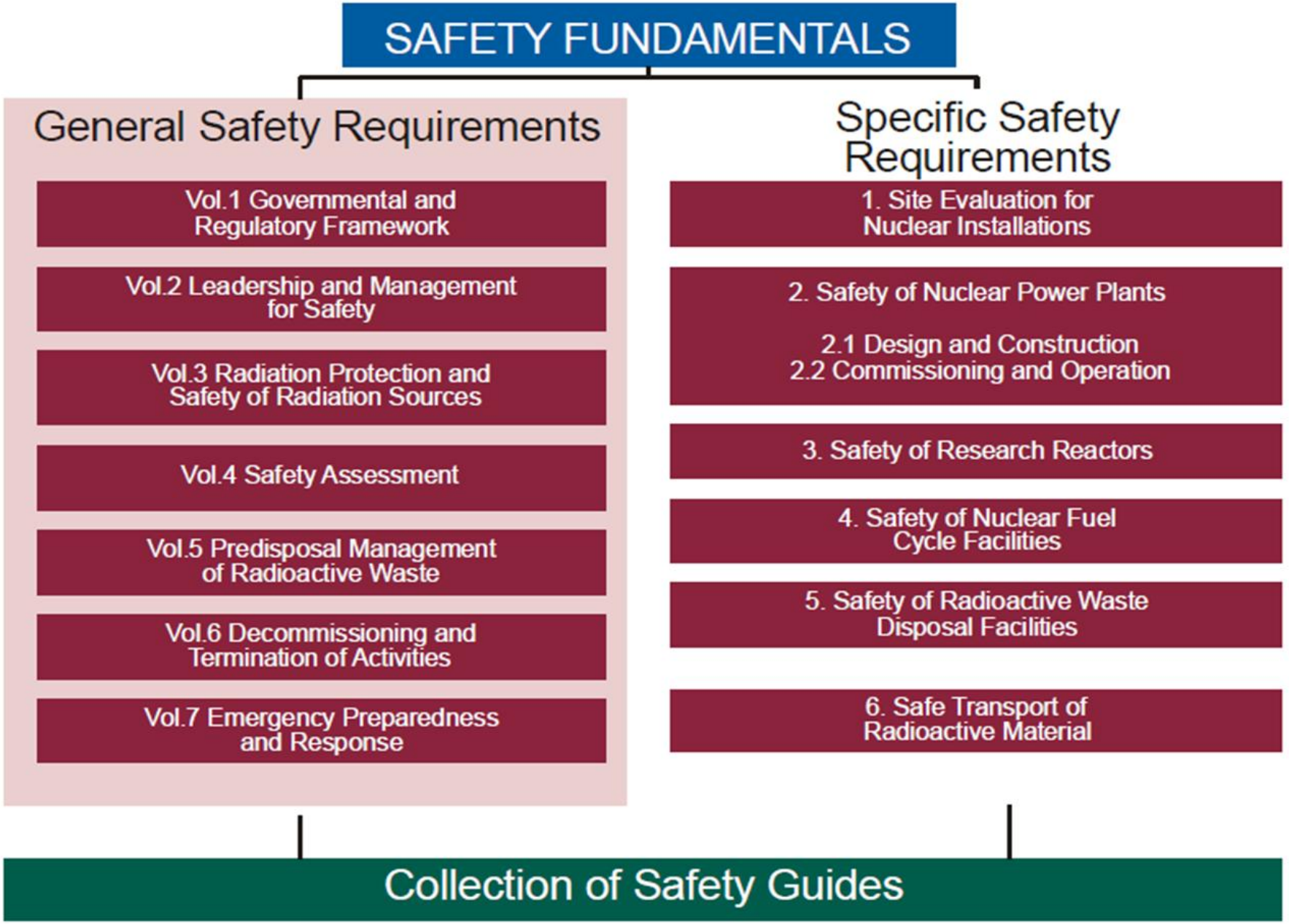
Safety Fundamentals

General Safety Requirements

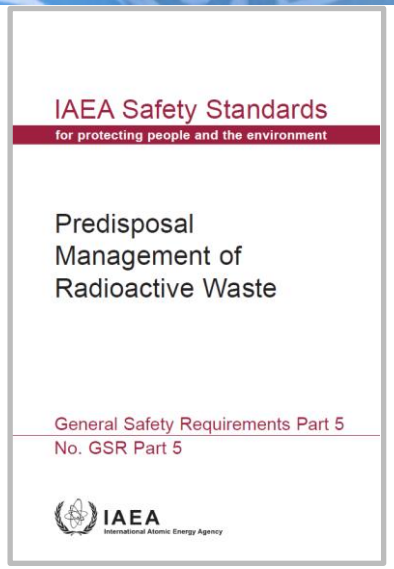
Specific Safety Requirements

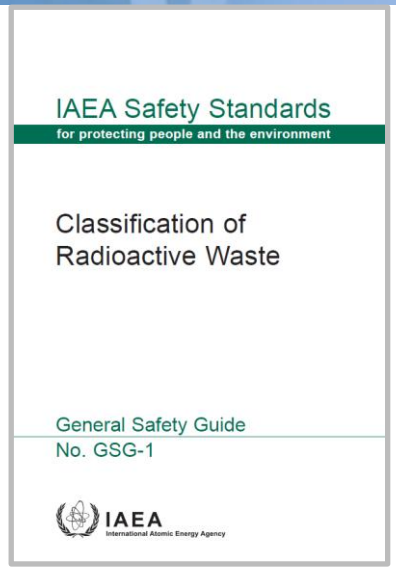
General Safety Guides

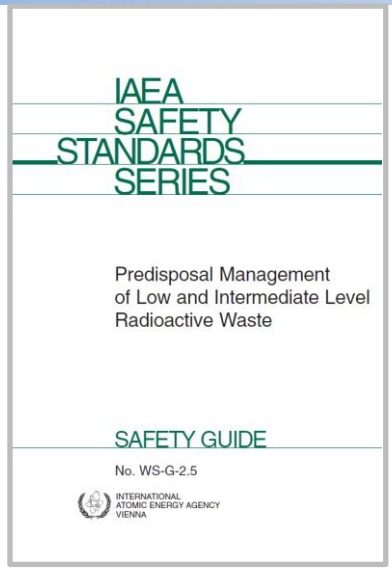
Specific Safety Guides

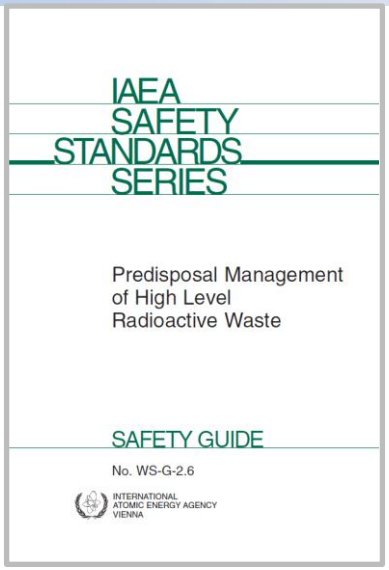

SAFETY FUNDAMENTALS
General Safety Requirements
Vol.1 Governmental and Regulatory Framework
Vol.2 Leadership and Management for Safety
Vol.3 Radiation Protection and Safety of Radiation Sources
Vol.4 Safety Assessment
Vol.5 Predisposal Management of Radioactive Waste
Vol.6 Decommissioning and Termination of Activities
Vol.7 Emergency Preparedness and Response
Specific Safety Requirements
1. Site Evaluation for Nuclear Installations
2. Safety of Nuclear Power Plants
2.1 Design and Construction
2.2 Commissioning and Operation
3. Safety of Research Reactors
4. Safety of Nuclear Fuel Cycle Facilities
5. Safety of Radioactive Waste Disposal Facilities
6. Safe Transport of Radioactive Material
Collection of Safety Guides

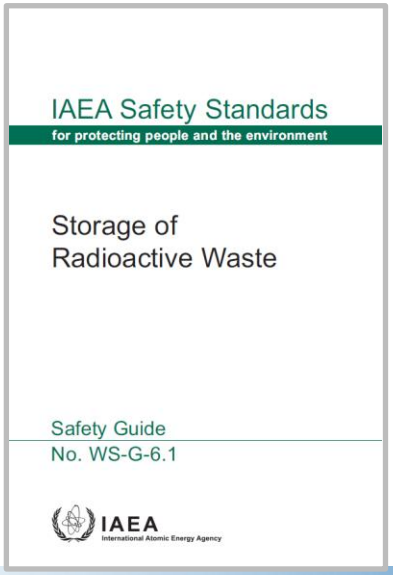
Predisposal & Classification

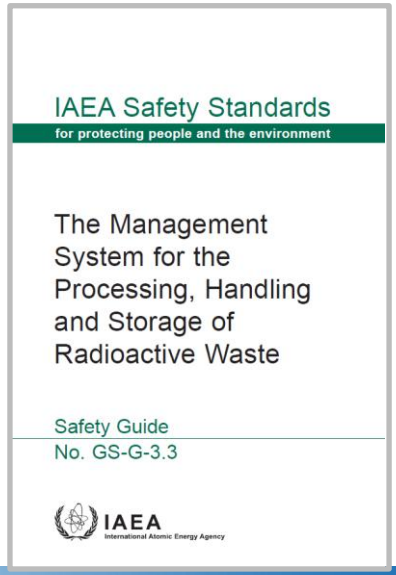


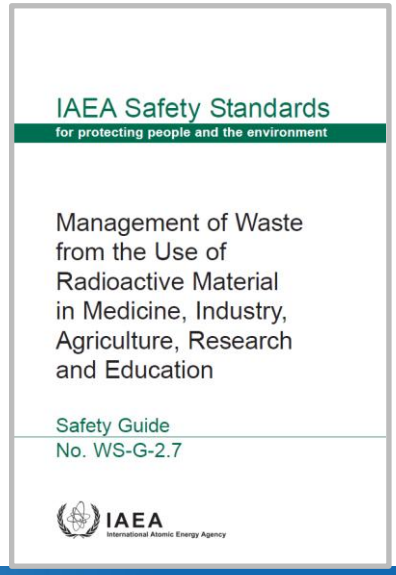




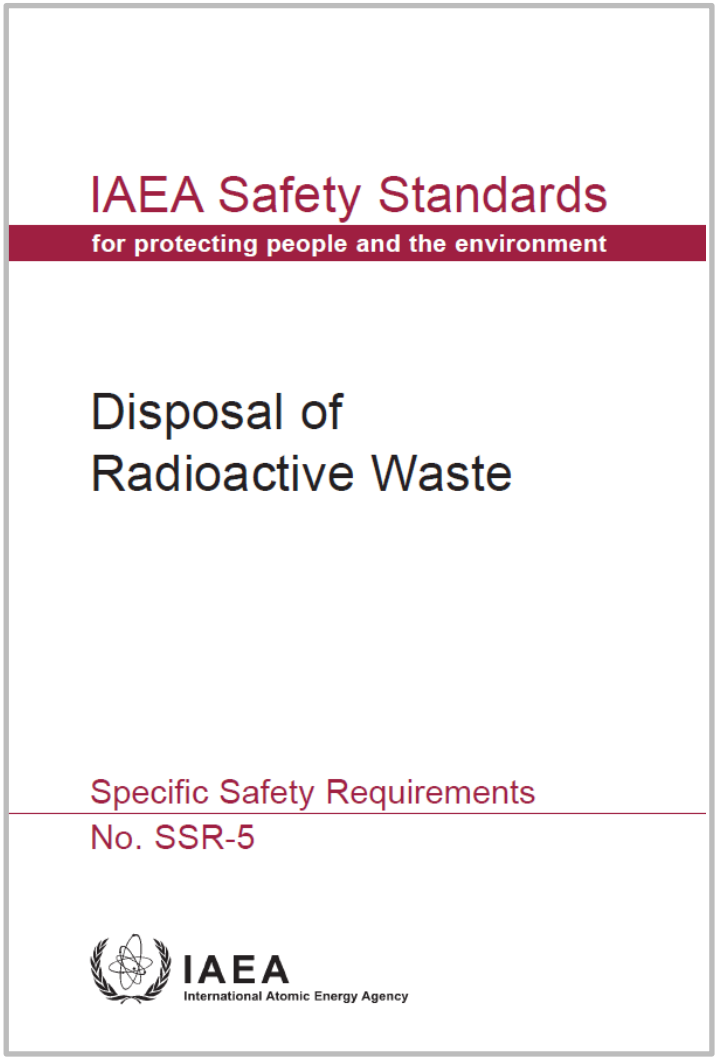




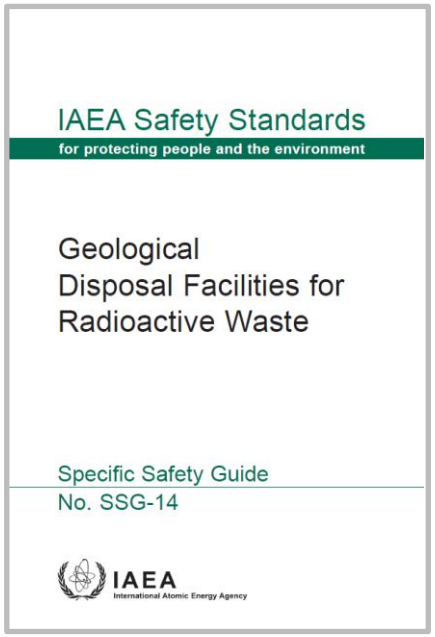


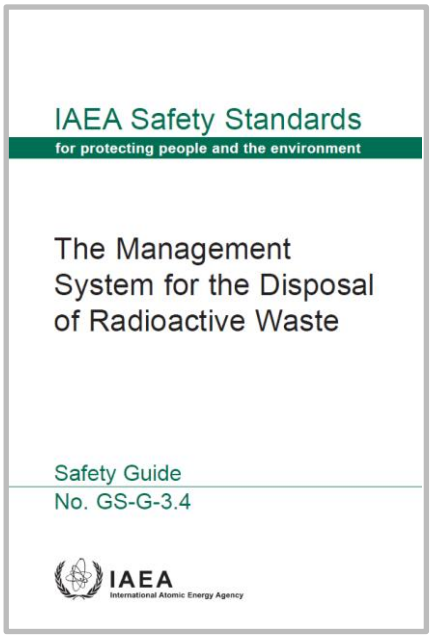


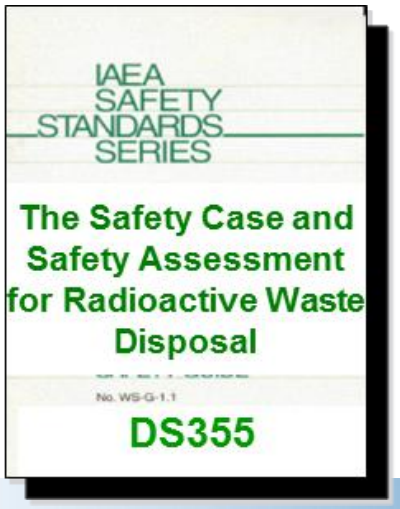
Disposal – Safety Requirements

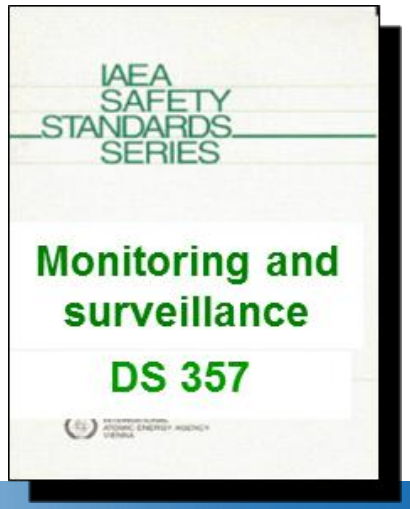


Disposal – selected Safety Guides









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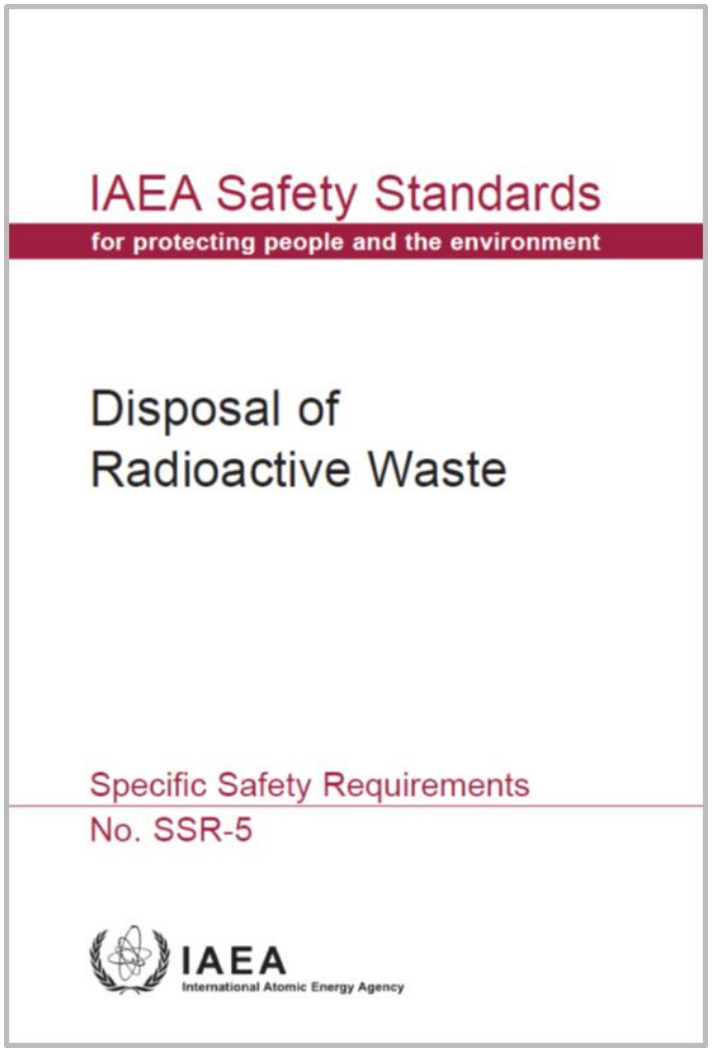


Applicable to disposal of all types of waste in designed disposal facilities

Covers

- Operational phase
- Post-closure phase

Consistent with ICRP Publications 77, 81 and 103

A total of 26 requirements

The Requirements

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
11. Stepwise development
12. Using the safety case
13. Scope of the safety case
14. Documenting the safety case
15. Site characterization
16. Design
17. Construction
18. Operation
19. Closure
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

Radiation protection criteria – post-closure

- Dose constraint of 0.3 mSv/y or risk constraint of 10^{-5} per year
  - Representative person
  - Natural processes
- Inadvertent human intrusion
  - < 1 mSv/y: No further action
  - 1 – 20 mSv/y: Reduce probability or consequences
  - > 20 mSv/y: Consider alternative disposal options

Passive means for the safety of the disposal facility

- Safety shall be ensured by passive means and need for actions after closure shall be minimized

Multiple safety functions

- Host environment, engineered barriers and operation shall provide multiple safety functions
- Multiple physical barriers
  - The barriers shall provide physical and chemical properties/processes that contributes to containment and isolation
- The disposal system shall not rely on single safety function

Containment of radioactive waste

- Containment shall be provided until radioactive decay has significantly reduced the hazard
- Heat generation shall be considered
  - Adverse impacts on the disposal system

Isolation of radioactive waste

- The site, design and operation shall isolate the waste from people and the accessible environment
- Several hundred years for short lived waste
- At least several thousand years for intermediate and high level waste

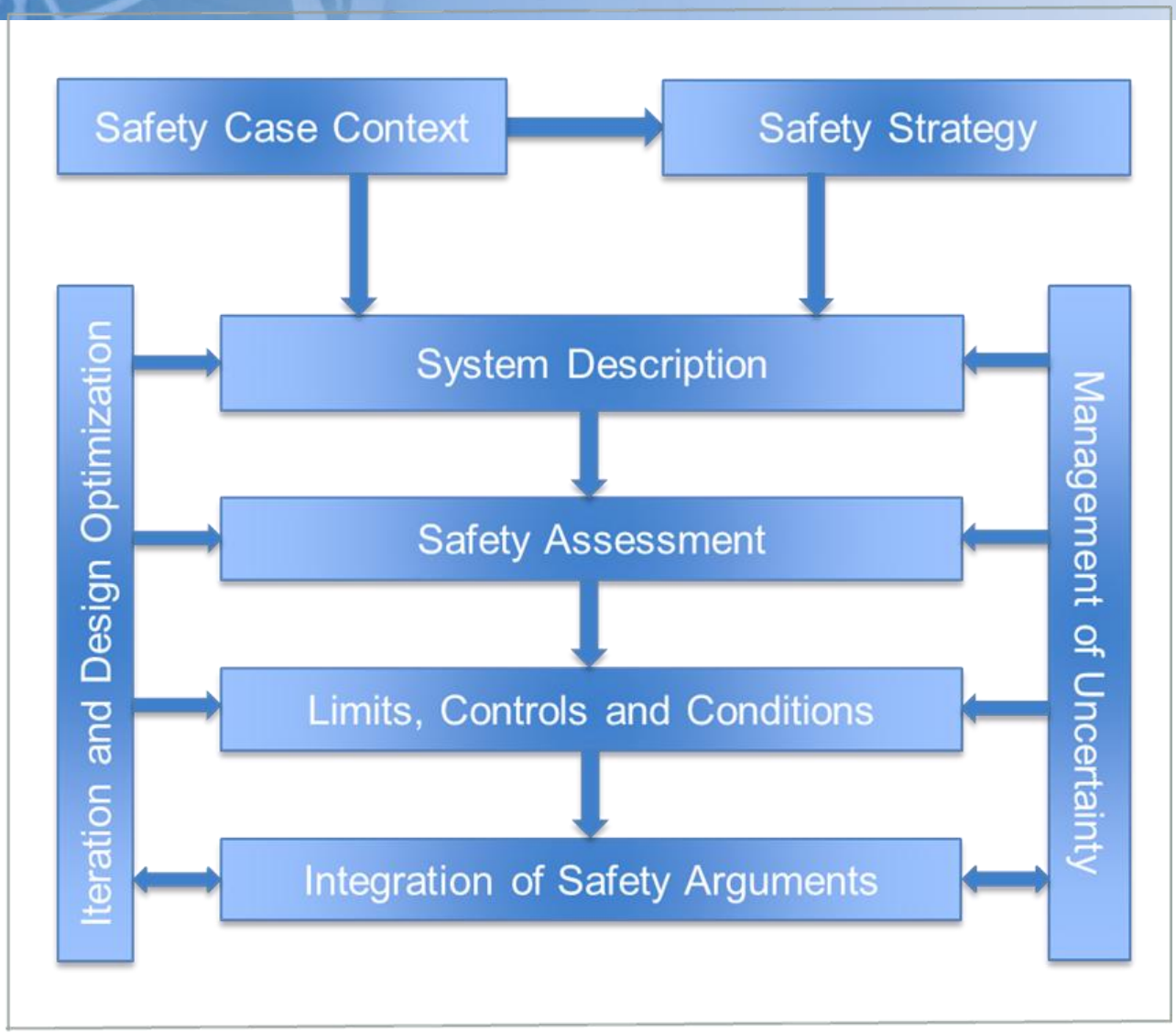
Scope of the safety case and safety assessment

- Demonstrate the level of protection of people and the environment
- Provide assurance that safety requirements will be met

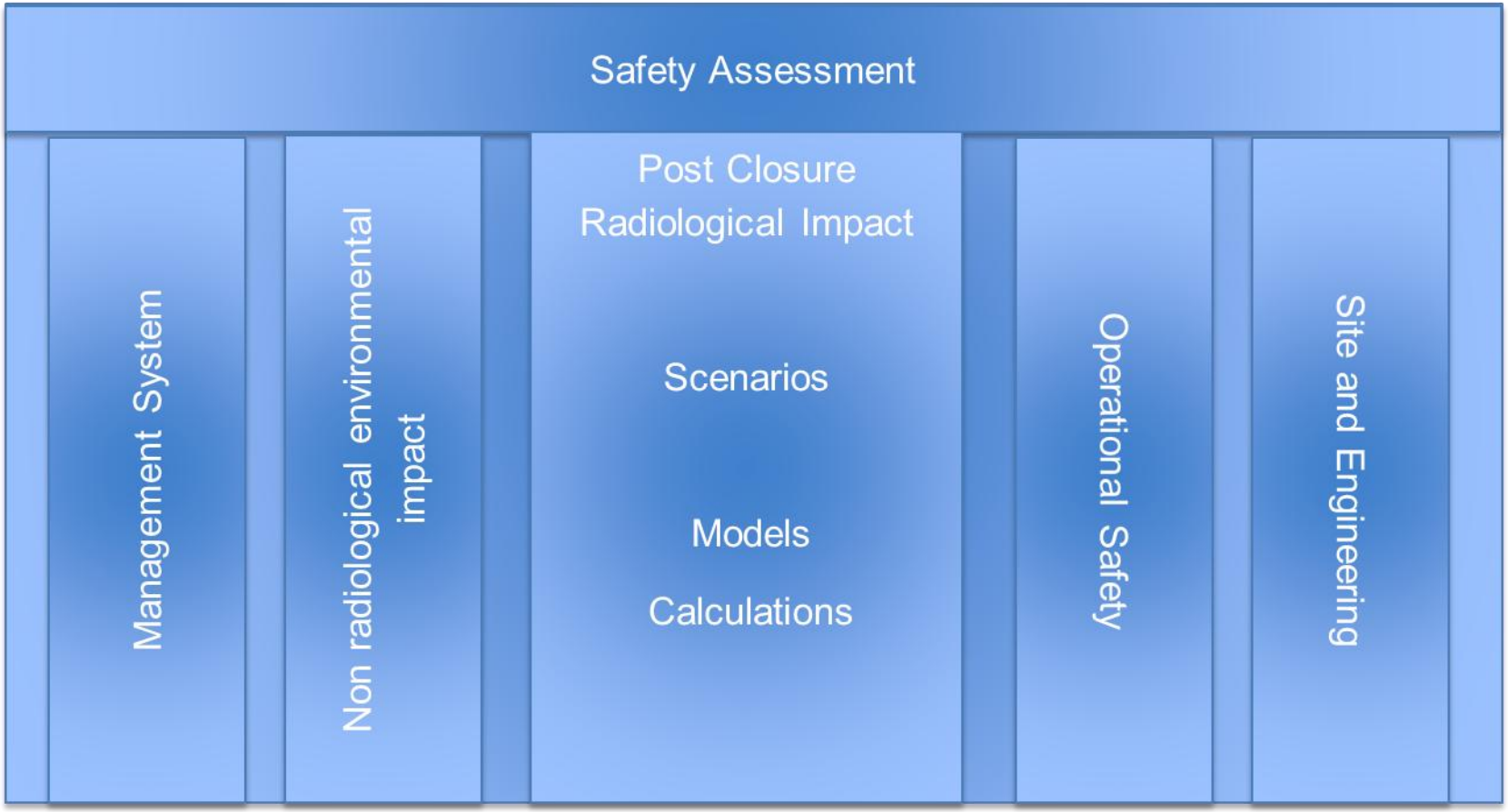
The period after closure and institutional controls

- Long term safety shall not rely on active institutional control

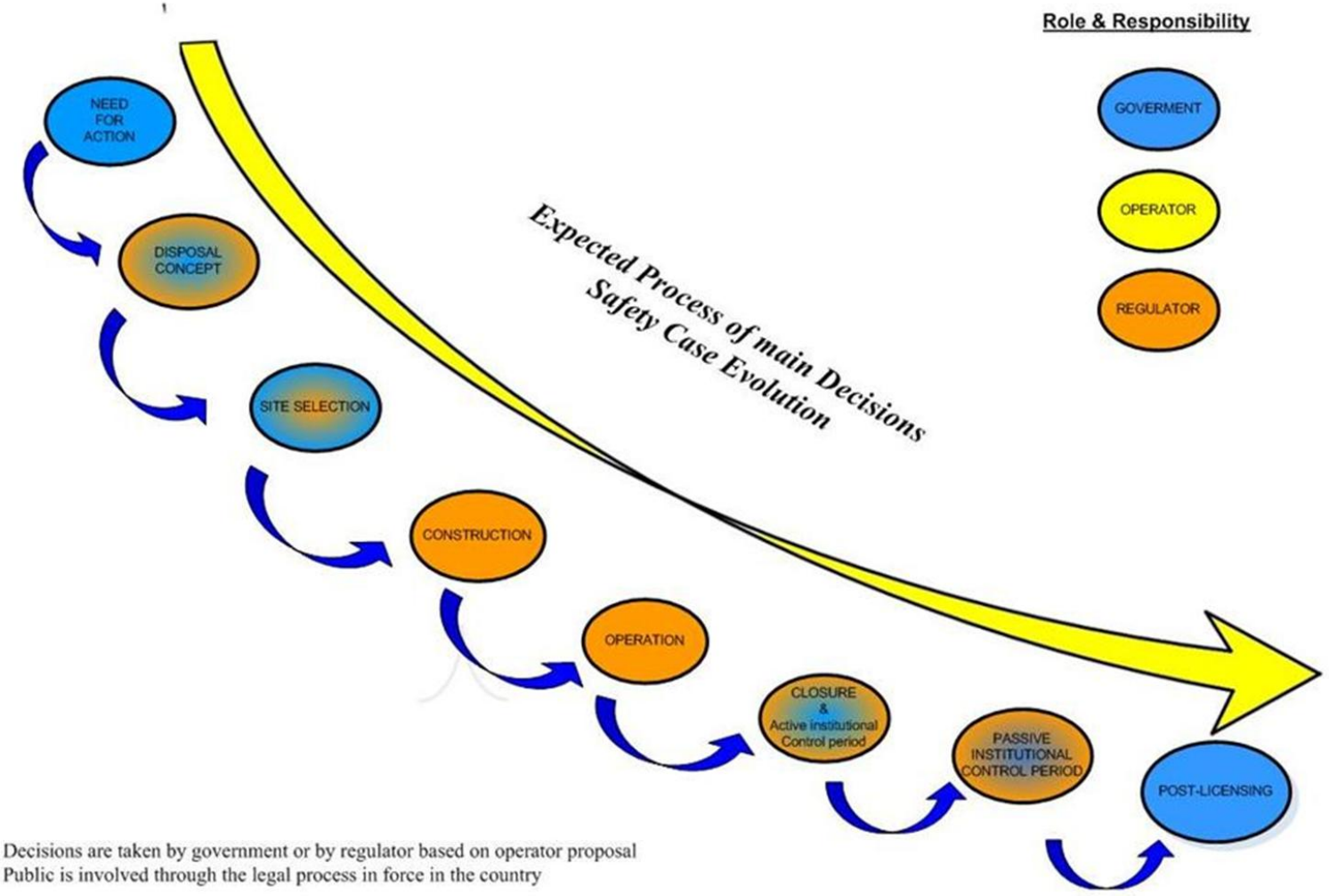
Components of the safety case



Components of the safety assessment



Using the safety case

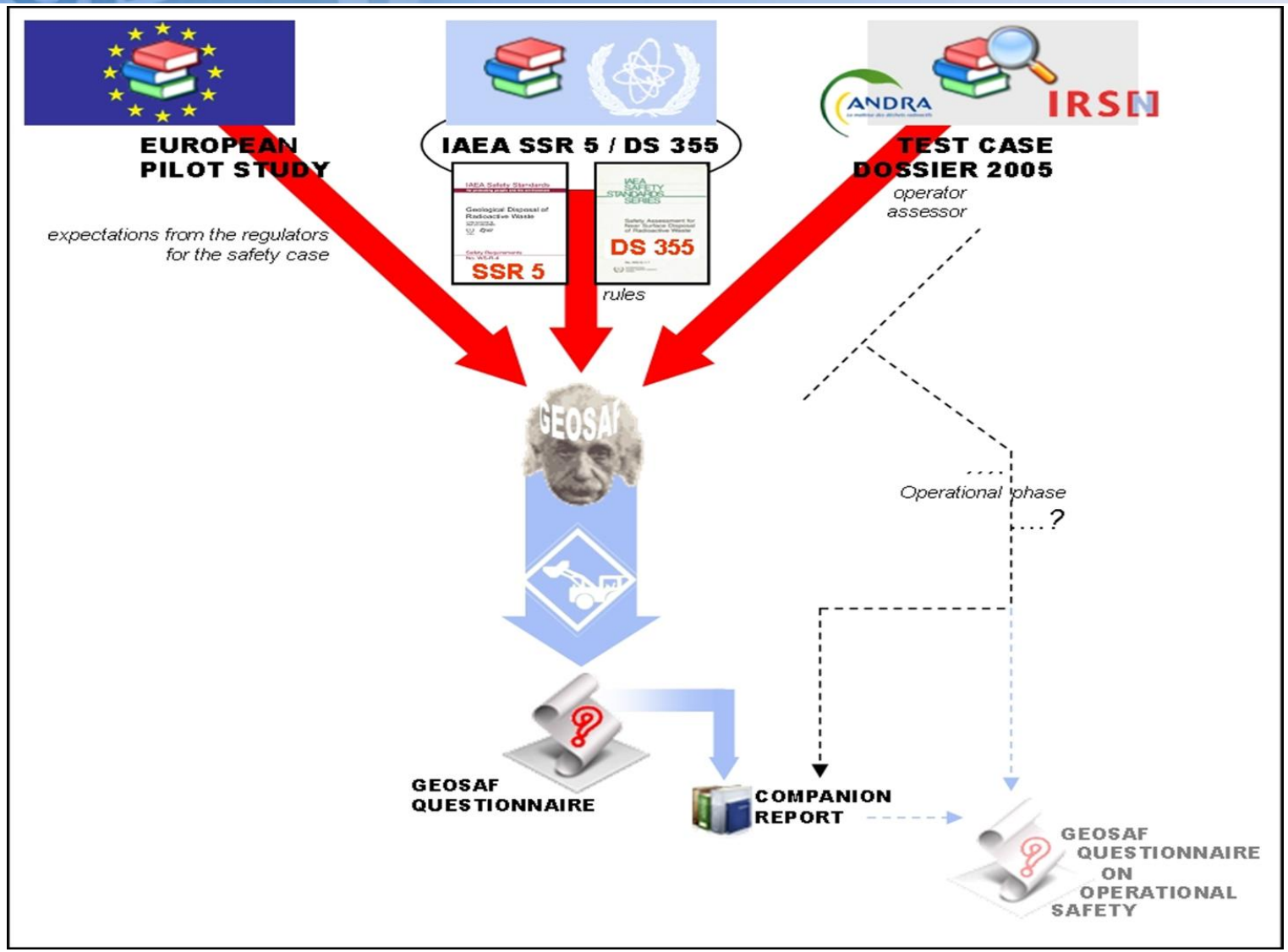


PRactical Illustration and Use of the Safety Case Concept in the Management of Near-Surface Disposal

- Share experience and communicate good practice
  - 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

Demonstration of Safety of Geological disposal

- Regulatory expectations for the structure and content of the safety case for geological disposal
- Ensuring effectiveness of IAEA Safety Standards
- Development of the safety case by the operator
- Review of the safety case by the regulator
- Cross views from regulators and operators to ensure effectiveness of standards
- To take advantage of existing or on-going national and international experiences and initiatives


EUROPEAN
PILOT STUDY
expectations from the regulators
for the safety case
IAEA SSR 5 / DS 355
SSR 5
DS 355
rules
ANDRA
IRSN
TEST CASE
DOSSIER 2005
operator
assessor
GEOSAF
Operational phase
...?
GEOSAF
QUESTIONNAIRE
COMPANION
REPORT
GEOSAF
QUESTIONNAIRE
ON
OPERATIONAL
SAFETY

Thank you!