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## **Legal and Governmental Aspects – National Policies on Decommissioning and Waste Management**

**Ingemar Lund - Swedish Radiation Protection Authority,  
SSI, Sweden**

IAEA Regional Workshop: Legal and Regulatory Aspects  
of Decommissioning of Research Reactors  
Manila, Philippines, 26 -30 June 2006

### **DECOMMISSIONING**

The administrative and technical actions taken  
to allow the removal of some or all of the  
regulatory controls from a nuclear facility

...but scope and meaning varies between  
**Member States...**

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## Objective

The need for development and implementation of consistent and integrated strategies for

- Decommissioning of facilities, and
- Safe management of radioactive waste

Co-ordination of decommissioning with national policies for spent fuel and radioactive wastes, including disposal

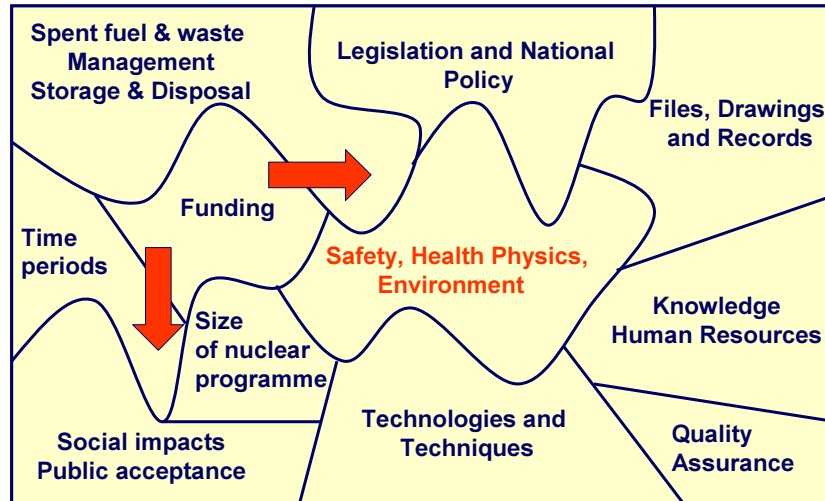
## Consistent and integrated strategies

IAEA has defined three major generic options/ strategies [e.g. IAEA Safety Guide WS-G-2.1 ]:

- Immediate dismantling
- Deferred dismantling
- Entombment

Constraints and overruling factors may necessitate a combination of strategies or exclude one or more of the above strategies from consideration...

## Consistent and integrated strategies



Not a jigsaw-puzzle but all pieces must fit!

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## Consistent and integrated strategies

Lack of consistent and integrated strategies may lead to:

- Failure in reaching the decommissioning objectives (acceptable waste packages, time-plan, costs, release of site);
- Increased risks and radiation doses (nuclear and industrial safety, re-work, re-conditioning);
- Failure in meeting the authorized decommissioning end-point criteria;
- Publicly unacceptable decommissioning procedures and/or waste management procedures;
- Undue burden on future generations.

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## Consistent and integrated strategies

### GOVERNMENT

- Legal and organisational framework
- Establish independent regulatory functions/authorities
- Allocate legal, technical and financial responsibilities
- Responsible for national decommissioning policy
- National scientific and technical expertise
- Establish funding mechanisms

## Consistent and integrated strategies

### REGULATORY BODY

- Safety, RP & environmental requirements and criteria
- Ensure and regulate decommissioning planning (all stages)
- Review planning (before implementation!)
- Inspect and review decommissioning activities
- Establish policy and criteria for collection and retention of records and reports
- Establish acceptance criteria for possible end states
- Ensure that involved parties (“stakeholders”) may provide comments on decommissioning plans before approval

## Consistent and integrated strategies

### Scope of decommissioning could include:

- De-fuelling (on-site fuel storage?)
- Retrieval and packaging of accumulated operational waste (on-site storage or even disposal)
- Radioactive waste transport and disposal
- Removal of conventional facilities
- Removal of non-radioactive structures above and/or below ground-level
- Contaminated ground remediation
- Landscaping and site de-licensing

## Consistent and integrated strategies

**End state of decommissioning ?**



**Future use of the site?**



## Consistent and integrated strategies

**The legal framework** varies between Member States and can

- be fully descriptive with detailed regulation of decommissioning during the full life-cycle of facilities
- be prescriptive and require early planning and progressive evolution of strategies with final choice being selected and justified
- be performance-based, not prescriptive, and allow operator to justify a preferred strategy in terms of factors such as safety, cost, social impacts, etc.
- not address decommissioning *per se* **but...**

## Consistent and integrated strategies

An **inadequate legal framework** in terms of decommissioning may result in lack of early decommissioning considerations and planning and is therefore undesirable

The safety and RP requirements should be proportionate to the level of risk and the complexity of the facility/activity to be decommissioned:

→ **A graded approach** should be used! ←

## Consistent and integrated strategies

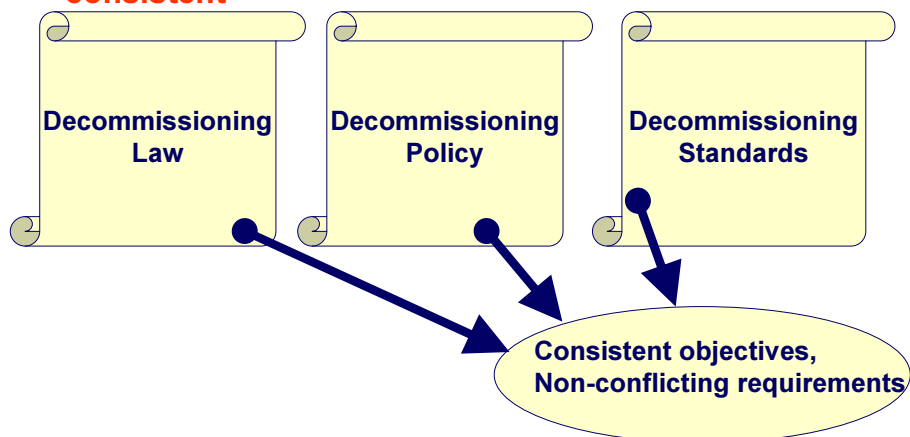
**National policy** limit or influence the selected strategy:

- Energy, education and research policy
- Sustainable development (re-use, recycling)
- National decommissioning strategy options
- Management of fissile and fertile materials
- Siting, operation and closure of waste repositories
- Legal status and responsibilities of services and utilities (e.g. separate waste management bodies)
- Legal requirements on funding & contingency

For any decommissioning strategy, it should be shown, transparently, how these have influenced the selection

## Consistent and integrated strategies

**Policy, requirements and standards should be consistent**



## Consistent and integrated strategies

If several regulatory bodies and/or inspectorates, on federal or regional level, regulate or inspect decommissioning activities, close co-operation should be ensured in overlapping areas...



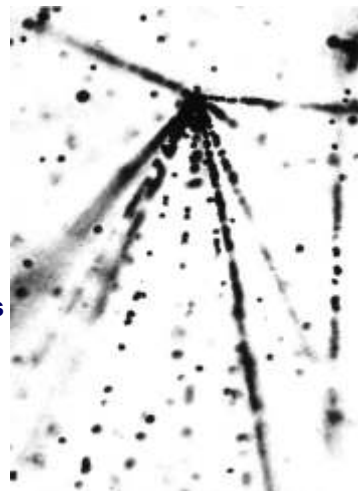
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## Spent Fuel and Waste Management

**Fundamental principles** of radwaste management are stated in IAEA Safety Series No. 111-F

Summarized (unofficially) as:

- Protect human health and environment
- No undue burden on future generations
- Appropriate national legal framework
- Clear allocation of responsibilities
- Minimise generation of radwaste
- Account for interdependencies
- Ensure safety (at all times) of radwaste management



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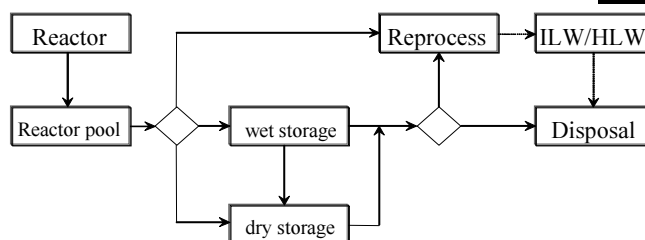
## Spent Fuel and Waste Management

- **Categorize** waste based on potential hazard and methods for handling and disposal
- IAEA definitions, Safety Series No. 111- G- 1.1, 1994, Classification of Radioactive waste
- **Minimize** the amount of waste generated (airborne releases) and final waste products
- **Condition** (immobilize) the wastes to ensure physical and chemical stability
- **Dispose** at carefully selected sites using suitable technology and multiple barriers to ensure effective isolation from man and the environment

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## Spent Fuel and Waste Management

### Spent Fuel Management options



**National policy** shall define acceptable options and include requirements for the management of all fissile material!

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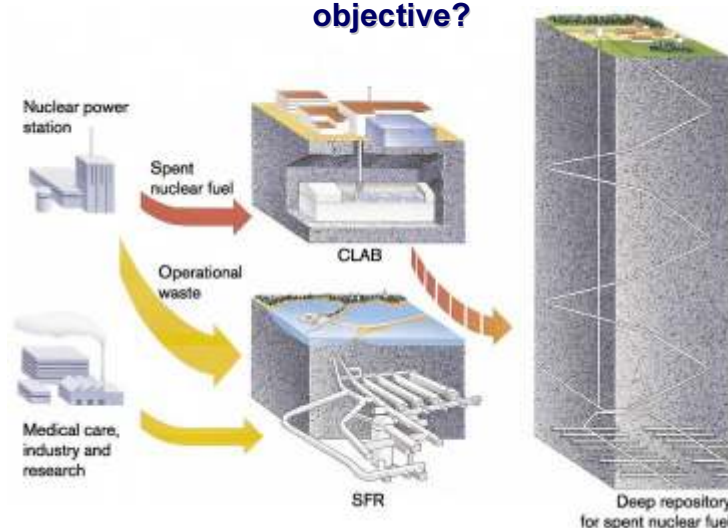
## Spent Fuel and Waste Management

Specifics of decommissioning wastes:

- Larger volumes over a relatively short time span;
  - Unusually large objects (e.g. reactor vessel), intact removal;
  - Materials of unusual nature (graphite, sodium, transformer oils, decontaminants):
  - Toxic (e.g. asbestos, beryllium) or mixed wastes;
- New challenges to existing waste management system

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## Complete waste management system – long-term objective?



Source: SKB AB, Sweden

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## Spent Fuel and Waste Management

Waste categories, amounts and “production times”

For **existing repositories**, if any:

- Safety, compatibility, access during decommissioning?
- Establishment of waste acceptance criteria (WAC)
- Transport and handling system

For **other waste streams** (non-existing repository):


- Interim storage of waste (on- /off-site?)
- Criteria for pre-conditioning of wastes ( >50 years?)
- Inspection, degradation, re-conditioning?

Avoid **re-work** and **non-optimised alternatives!**



Source: Studsvik Radwaste AB, Sweden



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## Interim or temporary storage

- Waste packages and storage (e.g. separate areas for different waste categories) needs careful attention;
- Account for any produced secondary wastes and releases of considered treatment processes;
- Characterise waste and store it safely (possibilities to inspect and monitor packages) and retrievable;
- Keep final conditioning options open until final WAC are available;
- Investigate and account for final conditioning and disposal of waste (if no repository or WAC).

## Summary

- Develop consistent and integrated strategies for decommissioning, spent fuel and waste management – use a graded approach
- Lack of consistent policies & strategies could negatively impact decommissioning and waste management and could lead to
  - Unsafe and costly activities,
  - Unacceptable end states, and
  - Undue burden on future generations