

International Atomic Energy Agency

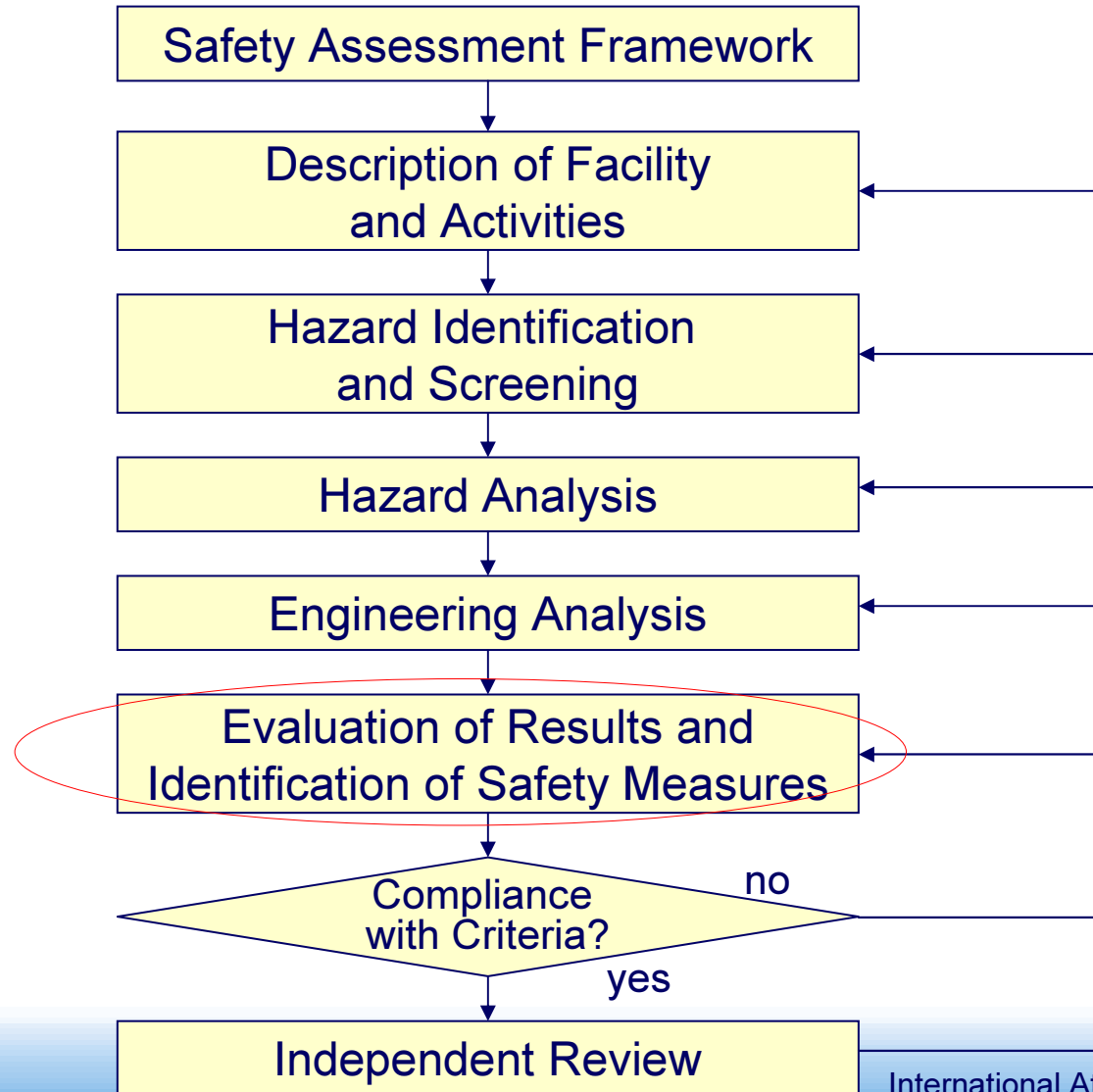
**Integration of Industrial Safety, Nuclear
Safety And Management Through Work
Control**

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Workshop on Safety Assessment for Decommissioning of Nuclear Power
Plants and Research Reactors

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Safety Assessment Process



Changing Configurations and Temporary Equipment Create Challenges



Health & Safety During Decommissioning

- Objectives: protect workers, the public and the environment
- Good Health and Safety is also good business as poor safety damages operators organizations reputation
- Safety assessment must be performed to identify hazards (radiological and non-radiological)
- Hazards and protective measures may be different than during operations
- Expect new hazards as abandoned systems are opened

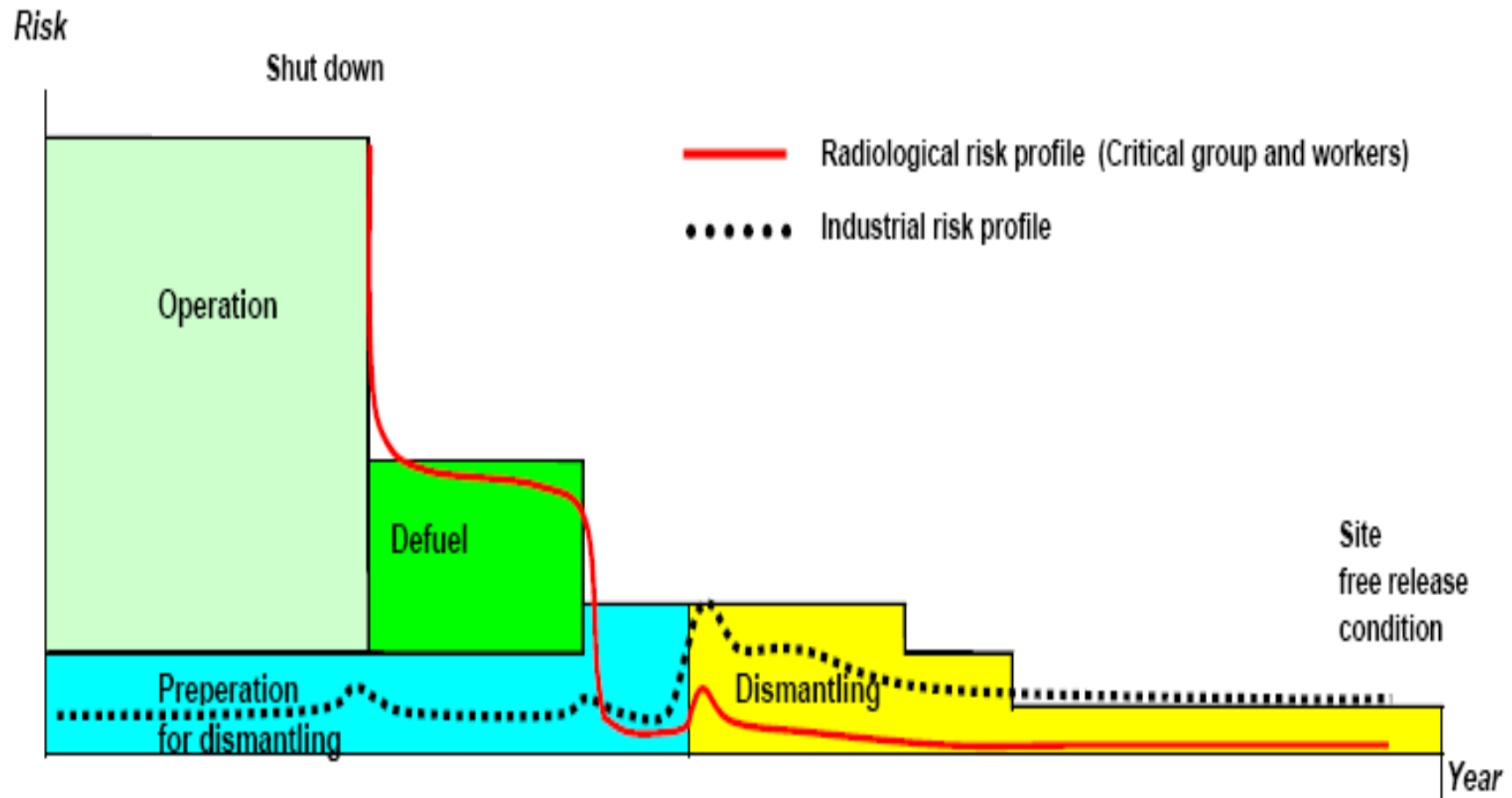


Health & Safety During Decommissioning

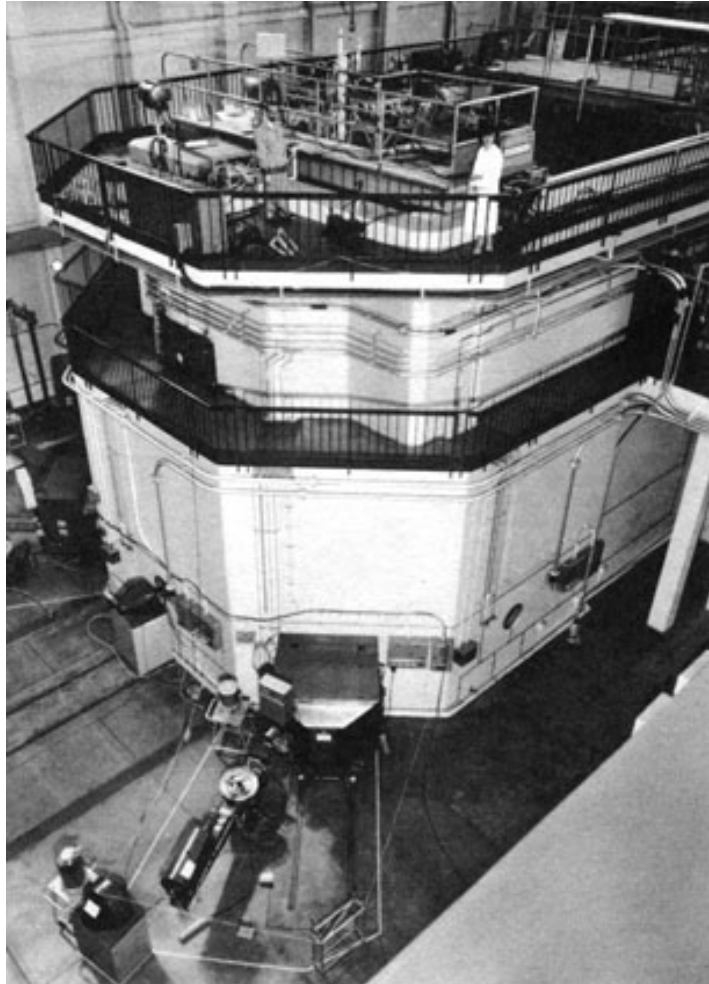
- In general, radiological hazards decrease and industrial hazards increase throughout the decommissioning process
- Conditions may change daily and methods to maintain worker awareness must be implemented
- Health and Safety must be an integral part of all operations
- Everyone must take responsibility for they own safety and that of their work mates



Changes during decommissioning NPP example



TRITON Research Reactor



OPERATION



**BEFORE
DISMANTLING**

On-going dismantling activities



Triton at the end of the dismantling works



Safety Management Principles

- All injuries and accidents are preventable
- A sound safety management programme includes
 - requirements
 - performance standards
 - implementing procedures
- Training on safety procedures and job related procedures
- Regular reviews of performance to ensure continuous improvement
- Prompt and comprehensive correction of deficiencies
- A blame tolerant policy for mistakes but discipline for negligence



Control of Work Principles

- **All routine work must be carried out in accordance with procedures that have been assessed and evaluated from a safety perspective.**
- **Non routine work must be planned safely, assessed and approved.**

Work Control Process

- **establish safe method of carrying out work**
- **subject planned work method to safety assessment**
- **make work request to work control**
- **work control schedule and obtain any specialist advice and permits to work (isolations)**
- **supervisor given work package with necessary controls and points for pre-job briefing**



Task Based Safety Assessment Process

- **Step 1: Identify the Hazards**
- **Step 2: Decide who might be harmed and how**
- **Step 3: Evaluate the risks and decide on precaution**
- **Step 4: Record your findings and implement them**
- **Step 5: Review your assessment and update if necessary**



DeSa project: Typical Hazards in a Decommissioning Environment

- **Chemical/toxic hazards:**
 - Chemotoxic material
 - Spills
 - Chemicals (aggressive chemicals)
 - Remark: no acid based batteries available at the reactor
 - Accidental mixing / combination of chemicals (e.g. in sewage systems, in decontamination work etc.)
 - Asbestos and other hazardous materials, like lead or beryllium
- **Pesticide use**
- **Biohazards**



Typical Hazards in a Decommissioning Environment

- **Physical hazards:**
 - Kinetic energy
 - Potential energy (springs, Wigner energy in graphite)
 - Degraded or degrading structures, systems and components
 - Steam
 - Temperature extremes (high temperatures, hot surfaces, cryogenics)
 - High pressure (pressurized systems, compressed air)

Typical Hazards in a Decommissioning Environment

- **Working environment hazards (1/2):**
 - Working at heights (e.g. ladders, scaffolding, man baskets)
 - Excavations, formation of underground cavities (subsidence) from rain, waste degradation etc.
 - Vehicle traffic
 - Heavy lifts, material handling, heavy equipment, manual lifting, overhead hazards, falling objects, cranes
 - Inadequate illumination
 - Inadequate ventilation
 - Noise (high noise areas and tools)



Typical Hazards in a Decommissioning Environment

- **Working environment hazards (2/2):**
 - Dust
 - Pinch points, sharp objects
 - Confined space
 - Dangerous equipment, e.g. power tools, compressed gas cylinders, welding and cutting, water jet cutting / decontamination, abrasive decontamination techniques, grinding, sawing
 - Remote work area
 - Obstruction of passageways or exits



DeSa: Research reactor test case

Chemical/toxic hazards	Identified	Origin
Hazardous materials	yes	asbestos from insulation of pipes cadmium at fuel drain tank
Working environment hazards		
Working at heights	yes	Work performed at the top of biological shield of the reactor hall
Vehicle traffic	yes	waste transports
Heavy lifts, material handling,	yes	lifting, cranes
Noise	yes	concrete demolition
Dust	yes	concrete demolition
Pinch points, sharp objects	yes	cutting operations
Dangerous equipment	yes	Use of various tools



DeSa: NPP test case

Industrial hazards	Relevant for planned work	Relevant for accident
Asbestos/glass wool in thermal insulation system	Y	N
Loss of power supply [loss of ventilation]	Y	Y
Falling of heavy loads	Y	Y
Falling loads on radioactive materials (packages)	Y	Y
Working at heights	Y	Y
High noise area	Y	Y
Obstruction of passageways or exits	Y	Y



Conclusion: A Sound Safety Management Programme Protects Workers and Prevents Events

