Purpose and Expectations of the Workshop

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Overriding Principles + Requirements

- Joint Convention: Art. 26 – “Decommissioning”
  ‘Each Contracting Party shall take the appropriate steps to ensure the **safety** of decommissioning of a nuclear facility. Such steps shall ensure that: (i) qualified staff and **adequate financial resources** are available; …’
- IAEA Safety Fundamentals: Principle 1 – “Safety”
  ‘… Provision must also be made for the fulfilment of **funding requirements** in the long term’

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Purpose + goals of workshop (I)

- Note that cost calculations are a living document that needs regular updates from initial calculations at an early stage to detailed calculations before dismantling
- Learn how to prepare an appropriate cost calculation for decommissioning of a research reactor / facility
- Become aware of prerequisites necessary for a good, reliable cost calculation
- Funds must be available when needed. This needs a plan, a cost calculation, a funding system, a budget and the knowledge of the respective interrelations
- Understand the importance of regular cost updates
- Learn to cope with uncertainties in cost calculations

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Purpose + goals of workshop (II)

- Learn from practical experience (e.g. ASTRA)
- Understand the cost calculation methodology
- Get trained on cost calculation in a practical exercise
- Learn to calculate the complete costs and don't forget licensing cost(!)
- Understand that a good and reliable cost calculation
  - is not a simple and easy task,
  - may take a lot of time (years!),
  - needs a good plan (iterative process) and a lot of technical detail,
  - is an instrument in decision making on alternatives.
- Reminder: SAFETY FIRST in selecting alternatives!

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Development of plan + cost with time

Phase	Plan	Cost calculation
Design stage	Initial plan	Initial cost calculation
Operation	Ongoing plan	Ongoing cost calculation
Shut down	'Final' plan	'Final' cost calculation

- Plan and cost calculation go in parallel
- Accuracy of cost calculations increases step by step
- The exercise is targeted at the 'final' stage

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Costing Approach (I)

- Prepare a (detailed) decommissioning plan
  - No plan → no cost calculation → no funding / safety
  - The better the plan → the better the cost calculation
  - A 'black box' calculation will not work
- Calculate decommissioning costs based on the plan
- Iterate between planning and cost calculation and decide on options
- Update the plan and the cost calculation regularly
- Ensure funding: have money available when needed
  - Make early arrangements for including decommissioning funds into the national budget (State operations!)
  - Ensure the timely (annual?) transfer of funds to the budget of the operator to allow a smooth implementation of the project
  - Set up a 'decommissioning fund' in case of private operators

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Costing Approach (II)

- Even if the best of a decommissioning plan and cost calculation has been prepared:
  - Expect surprises during the decommissioning of a facility in terms of both, technical aspects and the associated costs
  - maintain flexibility and cope with surprises
- If necessary, apply for an amendment of a license

- Please note:

  The ‘bottom up’ approach is used as the basis for this workshop and the exercise

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Example: interrelation between plan + cost (I)

1. Planning is a prerequisite for cost calculation

- Major D+D activities to be planned (PRR-1 example)
  - management of fuel
  - management of materials and waste / clearance
  - removal of (radioactive) materials from the reactor
  - characterisation of reactor, east and west wing
  - dismantling and decontamination
  - final radiological survey of buildings
  - application for release of buildings from reg. control
  - characterisation of the site
  - clean-up of the site
  - final radiological survey
  - application for release of site from reg. control

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Example: interrelation between plan + cost (II)

2. There are many options for the execution of the various decommissioning steps and decisions have to be taken at all levels of the planning process

- Example: Management of PRR-1 fuel
  - Option 1: Store fuel on PNRI premises
  - decide on storage period and storage concept, e.g. container or 'building'
  - Option 1a: Building
  - decide on building (type, size; above/below ground)
  - construct the building
  - unload fuel and transfer it to the 'building' (how?)
  - store it for X years (and then? / open end!)

  → calculate COSTS

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Example: interrelation between plan + cost (III)

- Option 1b: Storage container
- select a qualified container (type, manufacturer, …)
- buy container(s)
- transfer fuel to storage container
- store fuel for X years (and then? / open end!)

→ calculate COSTS

- Option 2: return fuel to the USA
- remove the fuel from the present store
- transfer fuel to a transport container
- ship fuel to the USA (end of liabilities for the fuel!)

→ calculate the COSTS

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Example: interrelation plan + costs (IV)

- COSTS cannot be calculated without clear decisions and an overall PLAN!
- Costs can be very different for the various options
- Cost calculations are incomplete in open end cases
- Cost calculation can be **one** of the deciding factors for the selection on options
- Be reminded: Primary factor is the ‘feasibility’ of the decommissioning concept / plan
  - protection of people (occupational and public)
  - protection of the environment
  - use of proven and safe technology
  - likelihood of obtaining a license
  - public perception / acceptance

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Expectations

- Be able to calculate the decommissioning cost of a research reactor, if necessary with specialist support
- Note that a 'Black Box' approach does not work
- Know the 'cost drivers' identified in other countries
- Be aware of, and be able to deal with uncertainties associated with cost calculations, e.g.
  - technical issues / new technologies
  - increase of prices / inflation / discounting / exchange rates
  - change of policy / politics / laws and regulations
  - long time scales, e.g. storage and disposal
- Calculate costs early in order to secure funding
- Initiate planning and cost calculations for nuclear facilities at national level now, if not yet done!

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THANK YOU