Milestones in the Development of National Infrastructure for the Uranium Production Cycle Panel: Mining, decommissioning and remediation

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Development of National Infrastructure for the Uranium Production Cycle

Development of national infrastructure to support and regulate the uranium production cycle is a significant and complex task.

The IAEA has developed a Milestones approach to support Member States in developing national infrastructure in a systematic and manageable way. However, Circular Economy principles were not considered.
Milestones Approach...

**Milestone 1**
Ready to make a commitment to explore for uranium

**Milestone 2**
Ready to Commit to Develop a Uranium Mine and Processing Facility

**Milestone 3**
Ready to Commission and Operate a Uranium Mine and Processing Facility

**Milestone 4**
Ready to Decommission and RemEDIATE a Uranium Mine and Processing Facility

**Phase 1**
A Member State undertakes exploration and/or mining for the first time, or the first time in many years, but with no significant commitment to proceeding to mining and processing

**Phase 2**
A Member State initiates or reinvigorates uranium mining with known exploitable reserves

**Phase 3**
A Member State commissions and operates a uranium mine and processing facility or increases current capacity

**Phase 4**
A Member State with historic, closed uranium mines and processing facilities at the end of mine life or at a stage where mine sites are made safe but kept in a state for possible reopening in the future

**Exploration**

**Feasibility Planning and Construction of a Uranium Mine and Processing Facility**

**Operation of a uranium mine and processing facility**

**Decommissioning and remediation of a uranium mine and processing facility or a facility that is placed in care and maintenance**

*Approximately 15 – 30 years*
Milestone 4 – Overview of Activities

Decommissioning and Remediating a Uranium Mine and Processing Facility

- Complete all mining and processing activities

  Based on an approved decommissioning and remediation plan:
  - Decontamination and demolition of mine and processing facility workings
  - Management of mine wastes and effluents
  - Remediation of affected areas to a pre-determined condition (e.g. final lands use)
  - Monitor for effectiveness (could be many decades)
  - Transfer of ownership to representative government body through a prescribed institutional programme
Achieving Milestone 4 – Examples of Aspects to Develop

- **Legal and Regulatory Framework**
  - Regulations developed for decommissioning and remediation
  - Licence to decommission and remediation is granted based upon an agreed closure plan
  - Continue to have a well funded and trained regulatory body through the decommissioning and remediation phase

- **Stakeholder Involvement**
  - Consultation with interested parties prior to commencement of decommissioning and remediation
  - Stakeholders are involved in dialogue with the government, regulatory body and the operator regarding the requirements for final land use (end-state determination)
  - Government, regulatory body and operator have frequent stakeholder meetings at a prescribed frequency during the decommissioning and remediation phase

- **Waste Management and Minimization**
  - Regulatory guidelines and licence conditions in place for management of both radiological and non-radiological waste
  - An effective management plan needs to be in place to ensure ALARA to minimize legacy effects (e.g. tailings, waste rock piles, groundwater remediation)
  - Opportunities for recycling/reuse ought to be considered
  - Effective waste management and remediation is verified through on-going monitoring
Key Mining-Related Principles for a CE

- Designing out waste and pollution by fully costing impacts and identifying potential for value in materials recycling, reuse and repurposing (*Eliminating the Concept of Waste by Extending Resource Value*)
- Keeping products and materials in use to optimize value to the economy
- Regenerating natural systems to protect essential ecosystem services such as clean water, clean air, healthy soils, carbon storage, and flood protection.

Source: MERG/Enviro Integration Strategies Inc.
Conclusions

Re-thinking Mine Reclamation: from Harm Reduction to Value Generation

• Reclaiming for Recreational and Commercial Purposes
• Regenerating Land to Healthy Agro-Ecosystems
• Regenerating and Reclaiming to Natural Ecological Systems

The Evolution from Sustainable Development to the Circular Economy Concept and its Relevance to Mining

• CE concepts have contributed to the maturation of SD strategies by focusing on integrated and systems solutions that address two needs:
  - first, to move beyond the linear economic model; and
  - second, to accelerate the decoupling of economic growth from materials use and environmental impacts.

• This ambitious and transformative approach requires markets, policies and technologies to undergo significant recalibration and strategic interconnection.