Waste Safety Standards Committee
42nd Meeting

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Agenda W 6.10
Safety Aspects of Development and Management of Uranium Production by In Situ Leaching

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Outline

• Background
• Objective
• Scope
• Status of development
• Structure
• Way-forward
In-Situ Leaching for Uranium (ISL)

- Primary supply
  - Open pit
  - Underground mining
  - In-situ leaching

- In-situ leaching
  - 2009: 36%
  - 2010: 41%
  - 2013: 47%
  - 2014: >50%
  - 2015: 48%

Data from WNA

Image courtesy Heathgate Resources
Background

- **WASSC 31** (June 2011) concluded **WS-G-1.2** to be revised at the light of the new requirements and developments. **WASSC 32** (November 2011) and **CSS 31** (March 2012) endorsed the DPP
  - *The document must be clear on the inclusion of “in situ recovery”, as this has become a major resource recovery and process for uranium.*

- **Working title**: Management of Radioactive Residues from Uranium Production and Other NORM Activities (Endorsed at **WASSC 38**, Nov 2014)
Scope of DS459

- Uranium mining and processing
- Rare earth extraction
- Thorium extraction and use
- Niobium extraction
- Non-U mining – including radon
- Oil and gas
- TiO₂
- Phosphates
- Zircon and Zirconia
- Metal production (Sn, Cu, Al, Fe, Zn, Pb)
- Burning of coal etc.
- Water treatment – including radon

- Decommissioning and closure
  - Operation
  - Storage
  - Construction
  - Reuse/Recycle
  - Design
  - Treatment
  - Characterization
  - Siting
  - Generation
  - Planning

- Liquid waste
- Manufactured items containing NORM
- Contaminated items
- Higher activity waste
- Bulk minerals processing residues other than uranium mill tailings
- Waste rock, mineralized waste rock and similar residues
- Uranium mill tailings
## Contrasting ISL with other forms of uranium production

<table>
<thead>
<tr>
<th>Open-pit</th>
<th>Underground</th>
<th>ISL</th>
</tr>
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<tbody>
<tr>
<td><strong>Big volume of tailings which cause significant concerns</strong></td>
<td><strong>Significantly potential risk of groundwater</strong></td>
<td></td>
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<tr>
<td>Large stockpiles of waste rock, sub-economic ore and/or overburden</td>
<td>Much smaller waste rock production volumes</td>
<td>Large volume of waste water</td>
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<tr>
<td>Potential for waste water, drainage and seepage to cause environmental problems</td>
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<td>Waste sludges and evaporate salts of high specific activity but small volume</td>
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</tbody>
</table>
To address ISL adequately, we need to develop an ISL specific safety guide, or at least a safety report.

Consultancy was held to develop a DPP on safety of In-situ Leaching, 15 to 19 June 2015.

The DPP was approved by the 257th Coordination Committee Meeting held on 13 May 2016.
IAEA Publications on ISL


• International Atomic Energy Agency. Recent developments in uranium resources and production with emphasis on in situ leach mining. IAEA-TECDOC-1396. Vienna, Austria (2004).


• International Atomic Energy Agency. Developments in In situ leach (ISL) Mining – Overview of ISL operation. IAEA Nuclear Energy Series No. NF-T-1.4, Vienna, Austria (2016).
Objective of the Safety Report

• To provide guidance for Member States on the development and management of safety aspects of ISL facilities.

• To support the development of a framework for the protection of human health and protection of the environment associated with an ISL facility from development to decommissioning and post decommissioning management.

• To support applicable IAEA standards and other supporting publications.

• To provide reference for protection of human health and protection of the environment at ISL facilities.
Scope

• Cover the lifetime of ISL facilities, from exploration, planning and licensing through to decommissioning and post closure long term management.

• Topics including development of a legal and regulatory framework, radiation protection, safety assessment, residue management, licensing and inspection, groundwater restoration and monitoring, decommissioning and post-decommissioning management of sites and facilities

• Security is out of the scope of the SR
Status of development

- Consultancy meeting, 29 February – 4 March 2016
- Consultancy meeting, 27 June – 1 July 2016
- Technical Meeting on the Safety of Uranium Production Using the In Situ Leaching Method, 10–14 October 2016, eleven participants representing ten Member States
Structure of Content

1. Introduction
2. Overview of ISL Facilities
3. Safety Approach
4. Legal Framework and Regulatory Supervision
5. Safety Consideration in the Development and Management of an ISL Facility
6. Decommissioning
7. Other Considerations

Appendix I. Groundwater restoration techniques
Appendix II. Example of the USA and Australia Legal and Regulatory Approach for ISL
Appendix III Performance of the Regulatory Review
Appendix IV. Detailed Inspection Guidance for ISL Facility
Appendix V. Examples of Accidents and Events That Have Occurred at ISL Operation
Appendix VI. Glossary
Way forward

• The draft is being reviewed to address the comments and to address some consistency and language issues.

• It was recommended to facilitate the process of publication of the Safety Report, notes that this will be a valuable document for Member States involved in ISL for uranium production and in particular it will be valuable to those Member States that are less experienced in safety and regulatory aspects for ISL projects.

• It was also recommended to enhance knowledge sharing in ISL amongst relevant Member States, on challenging issues, such as groundwater protection and restoration, regulatory capacity building in review and oversight of ISL facilities.
Thank you!