General Radiation Protection Considerations in Uranium Mining and Processing

Training Package on Occupational Radiation Protection in Uranium Mining and Processing Industry
International Safety Standards

• 2006 IAEA – Fundamental Safety Principles
  – Justification
  – Optimisation
  – Limitation

• 2014 IAEA – Radiation Protection and Safety of Radiation Sources, General Safety Requirements – Part 3
  – General requirements for planned, emergency & existing exposure situations
Scope of Regulations
Exposure Situations

• Prior to human intervention (exploration or mining) exposure to naturally occurring radioactive material (NORM), including uranium, is an existing exposure situation
  – Regulation & controls generally not required

• The mining & processing of NORM that results in occupational exposures is a planned exposure situation
  – Regulation & controls generally required
Planned Exposure Situation

- GSR Part 3 requirements for planned exposure situation apply when:
  - Activity concentration of any radionuclide of uranium decay chain >1 Bq/g or K-40 >10 Bq/g
  - Public exposures exist
  - Exposure to radon & radon progeny is controlled or above reference levels

- Uranium mining typically has activity concentrations >1 Bq/g
- Graded approach required based on exposure risk
Responsibilities
• For all exposure situations (existing, planned & emergency):
  – Establish & maintain a legal & regulatory framework for protection & safety
  – Establish independent regulatory body with clear responsibilities & functions

• Including:
  – Graded approach based on risk; education, training, qualifications & competence; technical services (i.e. dosimetry, environmental, calibrations); decommissioning & transport (IAEA Requirements SSR 6);
Regulatory Body

• General Requirements
  – Establish requirements for radiation protection; specific requirements; education & training; incident learnings; acceptance & performance requirements for sources; provision to accept & maintain records

• Planned exposure situations
  – Establish & enforce requirements for protection & safety; compliance with dose limits; ensure operator monitors & records occupational exposures
Organisation & Workers

• The organisation has primary responsibility for protection & safety
  – Optimisation of protection & safety; compliance to dose limits; programs established & maintained

• Workers have responsibility to fulfil obligations related to protection & safety
  – Use of monitoring & personal protection equipment (PPE); compliance with health surveillance; dose assessment; instructions & training; feedback to management
# Organisational Responsibilities

<table>
<thead>
<tr>
<th>Role</th>
<th>Key Responsibilities</th>
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<tr>
<td>Management</td>
<td>Provision of appropriate resources to meet radiation safety requirements.</td>
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<tr>
<td>Technical Management</td>
<td>Implement and maintain engineering controls.</td>
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<tr>
<td>Supervisors</td>
<td>Implement and maintain administrative and PPE controls.</td>
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<tr>
<td>Radiation Protection/Safety Officers*</td>
<td>Develop and implement monitoring programs. Review and provide feedback for other controls.</td>
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<tr>
<td>Workers</td>
<td>Use all controls as directed. Follow requirements for protection.</td>
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* Dependent on organisational structure & arrangements
Graded Approach

• Optimise resources commensurate with risk
• Assess risk at all stages of operation
  – Exploration; mining; processing; decommissioning; closure & remediation
Overview to Graded Approach

Operator notifies regulator

Screening assessment determines activity concentrations and doses

< 1 Bq/g U/Th or fertilizers, soil amendments and construction materials

Existing exposures

< 1 mSv/a

No radiological controls apply

Doses during ops and post-closure

< 1 mSv/a

Guidance on case by case basis

> 1 mSv/a

Exemption

> 1 Bq/g U/Th

Planned exposures

Safety assessment and radiological environmental impact assessment

Authorisation

Registration

Licence
Key Messages

• IAEA provides guidance for safety requirements
• Scope of regulations dependent on exposure situation
• Government establishes framework, regulatory body enforces requirements, organisations & workers implement
• Know key responsibilities
• Graded approach commensurate with risk
Facilitated Discussion 1

• What are some of the key differences in the responsibilities of the Government, Regulatory Body and the Operator?
  – The government must ensure that they establish the legal framework for establishment of the regulatory body. The regulatory body must enforce the requirements on all operations and operators must implement all regulatory requirements
Facilitated Discussion 2

• Discuss the implementation of a graded approach under a number of different potential exposure situations (i.e. <1 Bq/g U/Th & <1 mSv pa. vs. >1 Bq/g U/Th & >1 mSv pa.)
  – The first case is an existing exposure situations where no radiological controls are required. The second case is a planned exposure situation that requires regulation and the application of appropriate controls.
Thank you!