



SENES Consultants

Specialists in Energy, Nuclear and Environmental Sciences

Responsible Management for Health, Safety and Environment (HSE) in Uranium Mining & Mineral Processing Projects

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Outline



1. Public Support

2. Responsible HSE Management in Uranium Mining and Mineral Processing



1. Public Support



1. Public Support



Public support (not to be confused with public acceptance) ...in mining projects

Seek, gain and maintain it

Really need to pay attention to it

Two extremes:

- 1. Fixed upfront design & planned activities for a proposed mining project and then seek support => Increasingly fails**
- 2. Give in on all fronts about a proposed mining project with a view to secure permitting => Greatly reduces op. margins**

1. Public Support



In reality, seeking public support in projects is inherent to the mining sector from its inception

The mining sector tends to be ahead of many other industrial sectors when it comes to addressing public support

But public support expectations have steadily grown especially in mining. And past practices cannot be taken for granted

1. Public Support



Pay attention upfront to public interest and adapt

Environmental, safety, etc. issues not necessarily of prime interest or concern by the wider public

Better to seek public interests and concerns ...than guessing (educate is a 2 way street)

Evolving from DAD to MUM (ICRP, R. Clarke):

- **DAD: Decide, Announce and Defend**
- **MUM: Meet, Understand and Modify**

1. Public Support



An evolving situation on the coverage of environmental, safety, ...socio-economic issues through the development of mining projects

Past

- Environmental Impact Assessment (EIA)

Recent/Current

- Environmental and Social Impact Assessment (ESIA)

Current/Future?

- Social and Environmental Impact Assessment (SEIA)

1. Public Support



A possible useful way forward:

- Operators to seek upfront public input on their proposed mining projects
- Account for it in project shaping & development with a view to gain and maintain public support
- Reach a social-economical-environmental “deal”, next move to standard regulatory licensing & permitting procedure for mining projects
 - Regulatory licensing/permitting may not be sufficiently flexible to address socio-economic environment deal from cradle to grave

1. Public Support...from DAY 1



Transparency in the Extraction Industry (especially mining deals) as a cornerstone

- Transparency is a key part to help build fair public expectations all along a mining project life span
- Some key items need particular attention: e.g.
 - Applicable Treaties, Land Rights, etc.
 - Fairness in mining royalties, taxation systems, etc.
 - Benefits to local communities
- For enhanced public support & trust, the above should not be overlooked

1. Public Support...from DAY 1



Transparency in the Extraction Industry (especially mining deals) as a cornerstone

- **Reporting on mining deals :**
 - Extraction Industry Transparency Initiative (EITI), USA Dodd-Frank Act, EU transparency legislation, etc.
- **Downsides of insufficient transparency and public trust:**
 - Public expectations can become speculative and unreliable
 - A range of issues (e.g. HSE) may serve later on to gain grounds on other issues (e.g. socio-economics) that should have been dealt with in the first place

1. Public Support...from DAY 1



Mining Licensing/License

- Need an adequate and modern regulatory regime with a related (comprehensive) licensing procedure in place
- Great that many emerging mining countries (e.g. Africa & Central Asia) recently upgraded their regimes
- Continued effort required for systematic implementation and compliance
- Alignment with regulatory process is paramount
 - Including for social & environmental impact assessment, license, mining development, etc. (and a related sound sequence)
 - Experience shows that misalignment can be legally challenged

1. Public Support...from DAY 1



Social Engagement/Contract

- **Social Licensing/License may be a genuine concept but it will likely remain ill-defined**
 - Can confuse or hinder progress on Mining Licensing/License
- **On Social and Communities Aspects, practices in developed countries may not necessarily be ahead**
 - Many countries in Africa and Central Asia have more advanced practices in place (even if not in mining)
- **The above should be clearly borne in mind**



2. Responsible HSE Management in Uranium Mining & Mineral Processing



2. Responsible HSE Management



Outline

- Policy
- Baseline
- Assessment
- Op. preparation for implementation
- Monitoring, reporting, review & continued improvement
- Some insights on decommissioning

2. Responsible HSE Management



We are not starting from scratch in uranium mining & mineral processing

Good to see an established culture where HSE gets increasingly considered early in the process

From geology (e.g. N43-101 and JORC reports) to PEA, PFS, BFS or DFS - with an increasing level of considerations for HSE

2. Responsible HSE Management



HSE considerations & implementation all along

- a) Policy
- b) Baseline
- c) Assessment
- d) Op. preparation for implementation
- e) Commissioning & operation
- f) Decommissioning & closure

2. Responsible HSE Management



If management is adequate for conventional HSE risk, the bulk of the job should be taken care of

Good practices are already well known for the remaining risk, including radiation safety

Radiation should be addressed in a proportionate manner as part of overall HSE management

- However, public expectations are probably the highest for radiation, wastes, discharges, etc.

2. Responsible HSE Management



If management is adequate for conventional HSE risk, the bulk of the job should be taken care of

Examples:

- Above all, measures against conventional occupational health & safety risk of incident, accidents, injuries and fatalities - U mining not an exception
- Collection of run-off water and water treatment for contaminants in mining and milling effluents
- Management of stockpiles (ore, overburden, waste rock) and of tailings
- Stability and confinement of tailings disposal areas
- If materials contain sulphur, the management of possible acid mine drainage and risk of releases of contaminants into the environment

2. Responsible HSE Management



Good practices are already well known for the remaining risk, including radiation safety...

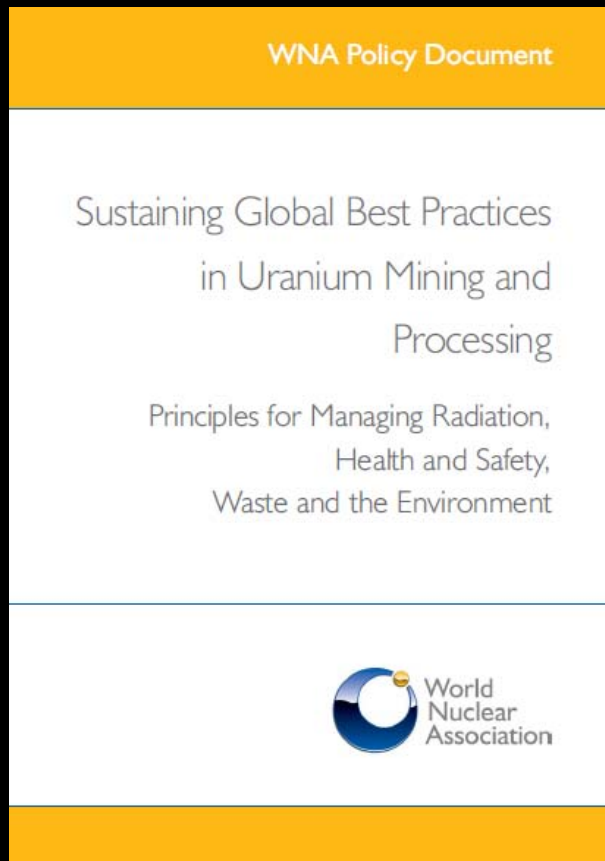
Examples:

- **Gamma:** Reduce (time, distance and shielding) direct exposure to external gamma radiation from larger sources: e.g. ore stockpiles
- **Radon:** Exhaust (out of workplaces) radon from process equipment. Tailings cover to be also designed to reduce radon emissions and their impacts. Pay attention to possible air recirculation issues
- **Radioactive dust:** Special measures for yellowcake and especially if calcined. For the rest, use standard dust suppression program
- **Sealed sources!** : The most intense sources not to be overlooked, especially with respect to exploration activities

2. ...Policy

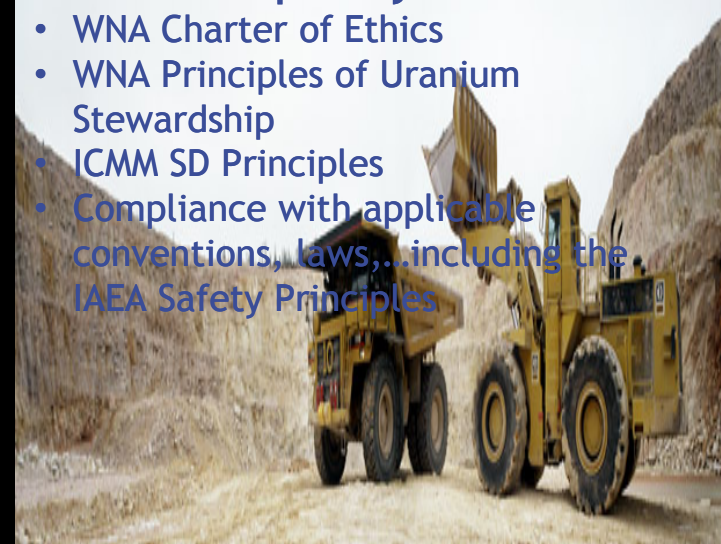


Example of a balanced policy for HSE management in uranium mining



This WNA policy endorses:

- WNA Charter of Ethics
- WNA Principles of Uranium Stewardship
- ICMM SD Principles
- Compliance with applicable conventions, laws,...including the IAEA Safety Principles



Outgrowth from an IAEA cooperation project

<http://www.world-nuclear.org/>

Look at publications->Position Statements

2...Policy



WNA policy document: A set of key principles

1. Sustainability [ICMM]
2. HSE Basics
3. Compliance [including IAEA]
4. Social Responsibility
5. Management of Hazardous Material
6. Quality Management System
7. Accidents and Emergencies
8. Transport of Hazardous Material
9. Systematic Approach to Training
10. Security of Seal Radioactive Sources and Nuclear Substances
11. Decommissioning and Site Closure

The essentials that you cannot afford to overlook!

+ Some HSE specifics in mining

Mining Safety

Radiation Safety

Personal Protective Equipment

Ventilation

Water Quality

Environmental Protection

2... Baseline



Environment...some examples

- Ecology, biology, ground/soil, water, air, radiation

Surrounding populations

- Distribution, nearest habitants, habits, food diets, etc.

Surrounding ecology

- Terrestrial, aquatic and atmospheric media

Surrounding land use

- Residential, parks, commercial, industrial, farming, etc.

2... Assessment



Source terms and Environmental vectors

- Emissions of contaminants
- Air, water, soil, radiation

Exposure pathways for contaminants that may result in:

- Worker & public exposures/doses, and their comparison to limits and standards
- Exposure of animals & plants (sensitive environment), and their comparison to guidance and benchmarks

2... Assessment...Optimisation



Protection achieved by a combination of means:

- **Design -> Management systems/procedures -> People**

Assessment to feed-in all three means

Iterative assessments (to Optimise design and activities) involve planners, designers, etc.

Assessment to feed-in:

- **Refinement of design & activities**
- **Development & implementation of HSE programmes**

2... Radiation Basics & Risk



Typical sources of natural radioactivity to be considered from a site:

Gamma Radiation

- “Volume” sources (as natural radioactivity is low-level)

Air Emissions

- Radon gas, (thoron gas) and long-lived radioactive dust

Liquid Emissions

- Long-lived radioactive particulates

...How they interconnect for design & operations

2... Assessment...Optimisation



Common functional gaps in radiation safety

- **Hands-on assessments are needed to help mine designers, planners and operators for the design & planning of facilities and activities. On-site and off-site exposures to be carefully examined and optimised**

2... Assessment...Optimisation



Common functional gaps in radiation safety

- **The assessments just viewed should not to be confused with subsequent radiation protection (control) programme. Assessments should serve as a basis for the design and refinement of RP programme**

2... Op. Preparation for Implementation



Examples of Op. RP Elements ...On the basis of a suitable assessment:

- Mining operational procedures (that built RP measures)
- Code of practices for RP
- Routine radiological monitoring schedule
- Dosimetry monitoring schedule
- Zoning and contamination control
- Procedure for off-site shipments
- Security & safety procedure for the use of sealed sources

2... Monitor, Report, Review, Improve



Monitor: Early detect trends and/or anomalies

Report: The more dynamic it is, the better

Review: Should regularly involve management & operational staff

Improve: After review, consider improvements and act timely

2...Decommissioning & closure



To set an initial decommissioning plan & funding ahead of operation is prudent & wise

Decommissioning plan & funding need to be reviewed regularly and, if needed, upgraded

A common mistake in decommissioning is to deal first with HSE issues & with socio-economics later

Better to deal with socio-economics upfront

Decommissioning is an opportunity to restore a site for re-use (IAEA decom conference in 2004)



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Thank you for your attention

Questions?

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