Radiation Protection Considerations in the Primary Approvals Phases of Major Projects

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1. Introduction

In Australia, mining projects involving uranium require approval from the national and state governments. This involves conducting an impact assessment followed by a period of public review and subsequent response to government or public concerns.

Impact assessment are broad and usually cover; environmental, social, health, public safety and economic aspects.

Information needs to be communicated in a credible and understandable manner for all audiences. This means making complex information simpler, while making sure that it maintains its technical integrity.

Poorly communicated information, which is overly complex, overly simplified or incomplete, can result in significant delays to the project approval which can potentially impact on project timelines.

Radiation and its impacts usually draw a disproportionate amount of both government and public scrutiny compared to other potential impacts and risks.

Radiation assessments need to be clearly presented and communicated with sufficient detail so that all stakeholders can understand the impacts and make informed decisions. This requires a balance between scientific fact, digestible information and demonstrable competence.
This presentation outlines the basic radiation protection for an impact assessment.

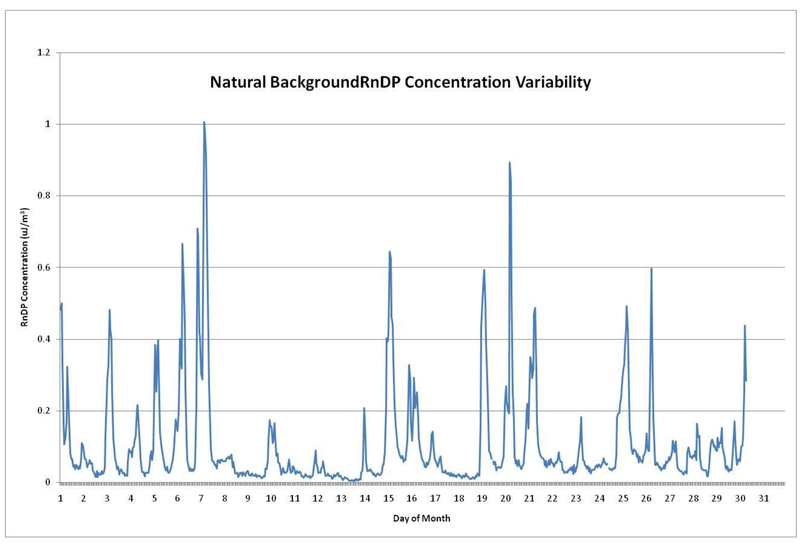
2. Radiation Impact Assessment

Impact assessments are usually based on an agreed ***terms of reference*** which define the minimum requirements for the assessment. Typically these are:

Baseline Characterisation

- The proponent is responsible for the radiation increment above pre-existing levels
- Undertake adequate baseline monitoring including:
  - Broad area gamma radiation surveys
  - Radon and Radon decay product (RnDP) concentrations in air (real time monitoring shows any diurnal or seasonal variation)

Figure 1: *Typical Diurnal Variation in Natural Background RnDP Concentrations*



  - Radionuclides concentrations in Airborne Particulates, Surface Water, Groundwater, Vegetation (short+long lived) & Fauna
- Monitor potential exposure pathways
- Present data in understandable manner

Determining Incremental Radiological Concentrations due to the Operation

- The potential increment above baseline can be determined through;
  - Modelling
  - Consideration of other similar operations
  - First principles/"rules of thumb"
- Be conservative when making assumptions
- Examples of increment assessment include;
  - Contaminant and fate modeling
  - Air quality modeling for dust deposition and dust concentrations
  - Using first principles for determining gamma radiation levels

Radiation Impact Assessment

- Assess *impact* from any increment
- Estimate Doses for Workers, the Public (sensitive receptors) and to non human biota (eg: using an ERICA assessment)

Table1: *Methods tor Calculating Projected Doses*

Exposure Situation	***Exposure Pathway***		
	Gamma Radiation	***Inhalation of Radon Decay Products***	***Inhalation of Radionuclides in Dust***
Exploration	*Calculate based on uranium ore grade & exposure time*	*Usually negligible - review results from elsewhere*	*Usually negligible - review results from elsewhere*
Mine workers	*Review doses from similar mines/calculate based on ore grade*	*Calculate based on ventilation rates*	*Usually low – calculate based on estimated ore grade and dust concentrations*
Processing plant workers	*Consider type of material in area & calculate use results form elsewhere*	*If outdoor processing plant then negligible*	*Consider type of material in particular area and calculate – or use results form elsewhere*
Transport	*Estimate from other similar activities*	*No reasonable exposure situation*	*No reasonable exposure situation*
Public	*Negligible at distance*	*From air quality modelling*	*From air quality modelling*

- Provide sufficient information to justify any assumptions in impact assessment

Table 2: *Calculated Radon Emission Rates from Fictional Project for Air Quality Modelling*

Activity	***Peak Year of Production***		
	Area (ha)	***Radon Emission Rates ($Bq/m^2/s$)***	***Total Emission (kBq/s)***
Open Mine Pit	*100*	*3.6*	*3600*
Waste Stockpiles	*40*	*1.2*	*480*
Tailings Dry Beach area	*25*	*3.0*	*750*
Tailings Water covered	*30*	*0.05*	*15*

Management Controls

- Describe the company approach/philosophy
- Describe the management measures
- Identify how ALARA would be implemented
- Describe the Radiation Management Plan and the Radioactive Waste Management Plan

3. Conclusions

- Demonstrate internal competency by conducting baseline monitoring properly
- Understand the radiation background
- Present data understandably
- Ensure that information is presented for the multiple audiences (technical, government and public)
- Don't assume that people will just "get it"