Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Relative Risk Analysis of Alternative Means

OPG's DGR for Low- and Intermediate-level Radioactive Waste

PMD 14-P1.2C

CNSC Staff Presentation

Joint Review Panel Hearing

nuclearsafety.gc.ca

9-19 September 2014

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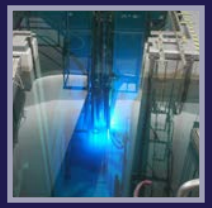
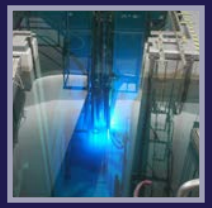





Presentation Overview

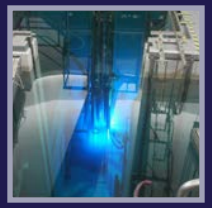
- Summary of information request
  - relative risk analysis of four identified alternative means
  - risk perception/risk acceptability
- CNSC staff assessment methodology
- Results of CNSC staff review
- Impact to CNSC staff's previous Environmental Impact Statement (EIS) and licensing assessment






Summary of Information Request

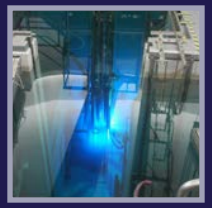
- To provide a renewed and updated analysis of the relative risks of siting alternatives under alternative means:
  - "status quo" at the Western Waste Management Facility (WWMF)
  - enhanced storage at the WWMF
  - proposed Deep Geologic Repository (DGR)
  - conceptual DGR in granitic bedrock of the Precambrian Canadian Shield






Summary of Information Request (cont'd)

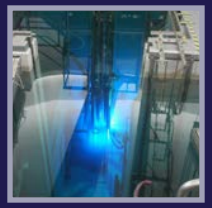
- Relative risk analysis of community acceptance
  - risk perception of the four alternative means
- Completed by independent risk assessment experts (known as the "Independent Expert Group" – IEG)
- The IEG
  - were contracted by OPG to respond to the IRs
  - have expertise in geological and chemical engineering, a broad variety of nuclear issues, and risk sciences including risk analysis






CNSC Staff Assessment Methodology

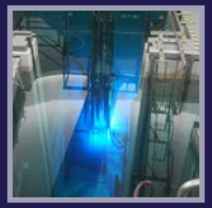
- International Atomic Energy Agency (IAEA) and CNSC guidance documents
- Independent CNSC research on the safety of geological disposal
  - sedimentary rocks
  - Canadian Shield rocks
- Experience gained from CNSC's involvement in the Seaborn panel






CNSC Staff Review Baseline Information – Key Observations

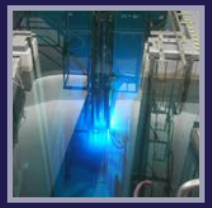
- Baseline information used by the IEG forms the basis upon which the risk assessments are made
- Staff's review focussed on 6 of 12 pathways of harm identified by IEG
- Staff's assessment of the IEG report identified:
  - misleading statements and what they imply about granite in the Canadian Shield when comparing the Bruce DGR site with a hypothetical site in the Canadian Shield, such as characteristics of fractures in Canadian Shield granite
  - omission of short-term risk of tritium exposure






Baseline Information - Characteristics of Fractures in Canadian Shield Granite (1)

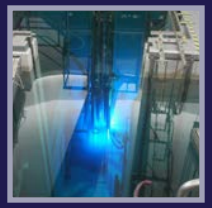
- Statements in the IEG report are misleading, for example:
  - "All granite bodies in the Canadian Shield are known to be naturally fractured, and the details of the disposition, extent, connectivity, and aperture (opening size) of these fractures are uncertain and no amount of investigation can reduce the uncertainty to zero." (IEG report page 11)
- Statements like those given in the example give the impression that limestone is not "naturally fractured"






Baseline Information - Characteristics of Fractures in Canadian Shield Granite (2)

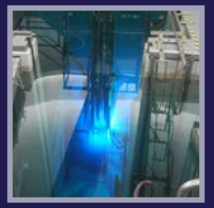
- However, the Lac du Bonnet batholith in the Canadian Shield was characterized as sparsely fractured granite during previous investigations conducted by Atomic Energy of Canada Limited
- Out of context statements about rock types could lead to misconceptions about the suitability requirements for this, or other, deep geological repository projects






Baseline Information - Loss of Institutional Control (1)

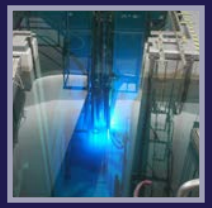
- The IEG assumes that Institutional Control (IC) could be maintained indefinitely in the normal evolution scenario for both surface options
- On its own, Institutional Control is not a pathway of harm
- Could lead to three major pathways:
  - enhanced transport of radionuclides by water and by gas due to the deterioration of containment structures, and inadvertent human intrusion
- Reliance on IC should be limited to a few hundred years based on CNSC and other international guidance
- Because of the high possibility of loss of IC in the future, it should not be incorporated as a safety measure in long-term safety assessments after a few hundred years






Baseline Information – Loss of Institutional Control (2)

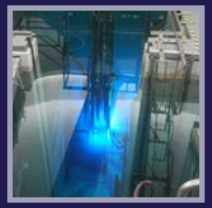
- Estimates in an IEG report appendix show that “loss of stewardship” for surface options result in a dose of 1000 mSv per year for someone “growing crops on land”
- Risk assessment results (for loss of IC) should therefore be portrayed as having a high consequence for the >100 year timeframe, not medium-low as estimated by the IEG
- Without IC, surface options for long-term management of OPG’s low- and intermediate-level waste are not safe after a few hundred years
- Canadian and international consensus is that IC cannot be guaranteed after a few hundred years and therefore, surface management options are not safe beyond that timeframe






Baseline Information – Tritium Exposure: Short-term Risk Assessment, an Unexplored Topic

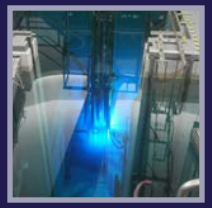
- This topic was not explored in the IEG report
- Minimal data for tritium gas generation versus tritiated water at any waste facility
- Passive releases of tritiated water at the Western Waste Management Facility are high in the Low Level Storage Buildings
- Inhalation of tritium gas itself results in only a very low dose
- Ventilation and routine monitoring of tritiated water in air by OPG will mitigate risks






Baseline Information – Worker Health and Safety (<100 years)

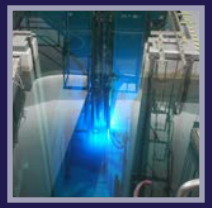
- Generalized comments were made relating to the relative risk assessment of worker health and safety (< 100 years)
- Work-related injury rates per 100 full time workers for 2012:
  - construction sector: 3.7
  - underground mines: 4.09
  - stone underground mines: 3.24
- Injuries generally related to underground mining activities
- Underground repositories have a short mining period compared to overall operational period
- The likelihood rating for injury from both aboveground and underground options should therefore have been rated as equal






CNSC Staff Review - Relative Risk Assessment

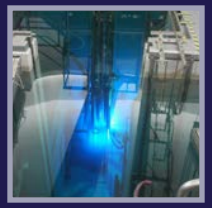
- IEG reports are at a relatively high level (qualitative)
- Risk assessment methodology is sound
  - in line with Multi-Criteria Decision Analysis
- Concerns associated with key observations do not affect the current safety case for the DGR Project






CNSC Staff Review - Relative Risk Perception (1)

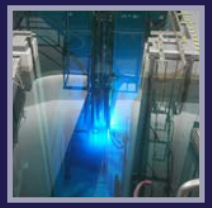
- Risk perception study provides a limited view of public and Aboriginal comments
- The Risk Perception Report does not consider OPG or CNSC staff's responses and efforts to address concerns
- Trust of the regulator and proponent is a large component of risk acceptability
- CNSC staff's priority is to ensure protection of health, safety and security of people and the environment
- The CNSC's mandate is to provide objective, scienfitic regulatory information






CNSC Staff Review - Relative Risk Perception (2)

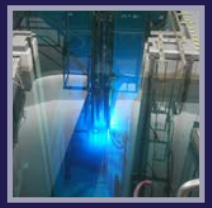
- Licensees are required to have a public information program
- The CNSC is committed to adopting best international practices in terms of social acceptability and siting deep geologic repositories
- CNSC and OPG activities prior to submission of the EIS and licence application are aligned with Nuclear Energy Agency guidance:
  - openness
  - clarity
  - accountability
  - independence
  - competence






CNSC Staff Review - Relative Risk Perception (3)

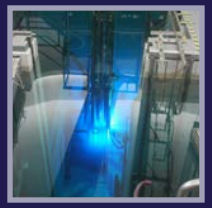
- "Social acceptability is not a criterion that appears in the NSCA"
- CNSC staff are unable to provide further review of the relative risk perception report without criteria to base the review against
  - criteria do not exist in CNSC's safety-focused regulatory framework






Impact to CNSC Staff Recommendations - EIS

- No new information was provided in the IEG report to change CNSC staff conclusions for the review of alternative means
- Long-term safety case assessment and conclusions remain the same
- CNSC staff's conclusions with respect to OPG's EIS submissions remain as presented in EIS-13-P1.3






Impact to CNSC Staff Recommendations - Licensing

- CNSC staff remain satisfied that OPG is qualified and will make adequate provisions to protect persons and the environment
- CNSC staff's conclusions with respect to OPG's request for a Licence to Prepare a Site and Construct the DGR Project remain as presented in EIS-13-P1.2

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