Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

PMD 14-P1.2G

Additional Information from PMD 14-P1.10A

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

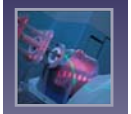
CNSC Staff Presentation

Joint Review Panel Hearing

nuclearsafety.gc.ca

9-19 September 2014

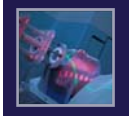
Canada


Presentation Overview

- Releases of radioactivity from RWOS-1 into the aquifer
- The theoretical justification for the correlation between C-14, Cl-36, I-129 and the Co-60 content of the DGR containers
- Scaling factors
- The 'major problem' with the Cl-36 inventory
- Emissions of I-131 from WWMF
- Calandria and zirconium
- Comments regarding the incidents at the WIPP






Radioactive Waste Operations Site 1 (RWOS 1)

Radioactive Waste Operations Site (RWOS) 1 – Background

- In 1968, the Radioactive Waste Operations Site (RWOS) 1 was established to accommodate waste from the Douglas Point Nuclear Generating Station
- RWOS 1 operated until 1976
- RWOS 1 was closed and RWOS 2 (Western Waste Management Facility) began operations
- RWOS 1 contained wastes in several types of in-ground structures

RWOS 1 – Remediation

- Quarterly water samples were collected from 10 locations and analyzed for tritium and gross beta
- A number of investigations and remedial actions were carried out to correct deficiencies

RWOS-1 – Results of Groundwater Monitoring

- From 2000 onwards, OPG has reported an overall downward trend in tritium in the RWOS wells
- Over the recent period 2008-2013, current tritium concentration measurements have not exceeded 2,500 Bq per litre and gross beta have been less than 1.2 Bq per litre
- For context, the drinking water guideline is 7,000 Bq per litre
- Groundwater on site is not a source of potable water

Waste characterization

- Theoretical justification for the correlation between difficult-to-measure radionuclides
- Scaling factors
- 'Major problems' with Cl-36 inventory

Principles of Scaling Factors

- Appropriate use of scaling factors are based on understanding nuclide production mechanisms and their physico-chemical behavior
- Scaling factors are based on sufficient measurements of difficult-to-measure radionuclides (DTMR)
- Scaling factors can be appropriate if they allow conservative predications of DTMR

Use of Scaling Factors

- Data and validation of scaling factors is described in a number of Information Requests
- CNSC staff recommended an updated inventory based on international best practices (i.e., ISO 21238-2007)
- Conservatism was built into the safety case

Chlorine-36 Activity in Resins

- Resins are a small part of the Cl-36 inventory
- Assuming Dr. Greening is correct, in 2062 there would be 7.4×10^{11} Bq instead of 7.4×10^{8} Bq of Cl-36
- Cl-36 activity is still 10 000 times below the total activity at closure in 2062 (5.7×10^{15} Bq)
- Variants of the normal evolution scenario would continue to be many orders of magnitude below 0.3 mSv

Summary

- CNSC staff recommendation #2 expected that OPG would derive the 95th percentile value of all radionuclides important to the safety case
- These estimates must be representative of the different waste streams, the different CANDU power reactors and over extended periods of time
- OPG's proposed inventory verification plan conforms with ISO 21238-2007

Emissions of Iodine-131 at WWMF

Emissions of I-131 from WWMF

- Releases of nuclear substances from facilities at the Western Waste Management Facility are monitored
- Iodine-131 is released from the incinerator stack
- Annual iodine-131 releases over the past 4 years varied between 6.06×10^4 Bq and 9.7×10^4 Bq
- Releases of iodine-131 are less than 0.01% of the annual release limit of 1.9×10^{12} Bq

Calandria and Zirconium

Zirconium Alloy use in CANDU Reactors

- Zirconium alloys of varying thickness are used in CANDU reactors for different uses:
  - Pressure tube thickness: 4 mm
  - Calandria tubes: 1.4 mm
  - Fuel cladding: 0.4 mm
- It is misleading to compare the fuel cladding with calandria and pressure tubes

Zirconium Alloys use in CANDU Reactors (cont'd)

- On September 10th, 2014, OPG clarified that the volume reduction process for the retube waste does not generate more than 0.05 percent of the total mass as dust
- OPG assumed the dust particles to be approximately 3 microns in size
- Even under a worst-case scenario, this is not enough "critical mass" to sustain combustion

Recent Incidents at the WIPP

Comments regarding Incidents at the WIPP

- "the U.S. Department of Energy has announced that the WIPP facility may not be open for up to three years."
  - The WIPP only re-open when it is safe to do so
  - The U.S DOE is planning and implementing corrective actions in order that operations can resume as quickly as it is safe to do so
- CNSC staff will continue to monitor the results of the investigation for regulatory lessons learned

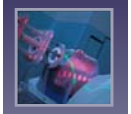
Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Thank You!

nuclearsafety.gc.ca

facebook.com/CanadianNuclearSafetyCommission

youtube.ca/cnscccsn



Canada