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Supplementary Information
Oral Intervention

Presentation from
Rachel Western

In the Matter of

Ontario Power Generation Inc.

Proposed Environmental Impact Statement for OPG's Deep Geological Repository (DGR) Project for Low and Intermediate Level Waste

Joint Review Panel

September 16 to October 12, 2013

Renseignements supplémentaires
Intervention orale

Présentation par
Rachel Western

À l'égard de

Ontario Power Generation Inc.

Étude proposée pour l'énoncé des incidences environnementales pour l'Installation de stockage de déchets radioactifs à faible et moyenne activité dans des couches géologiques profondes

Commission d'examen conjoint

16 septembre au 12 octobre 2013

Canada

Review of Ontario Power Generation's Safety Case

Dr Rachel Western
BA(Oxon) PhD MRSC
- for Northwatch

Proposed Nuclear Waste Disposal Facility
- Bruce Site near Lake Huron

Radionuclide Release to the Surface

March 2010 -
Nuclear Waste Advisory Associates
- 100 Issues

August 2011 –
Nuclear Decommissioning Authority
- 500 issues

Release
-with water
-with gas

Complex Chemical Processes

Assumed Dry
-Baseline Hydrogeology
Not Established
-Gas Balance Calculations Complex

New Safety Case Needed

Paper
Plastic
Cement

Carbon

Assumed Dry
Radionuclides not Released

Million Years

Water Needed to Allow
Gas Production

- Prevent Escape of Water
- Allow Release of Gas

Calculation of Pressure Balance Complex

Water Pressures not Understood

Vertical Conductivities Inferred not Measured

High Permeability Zone
Cannot be Ruled Out

- ‘what-if’ scenario
non conservative

Chemical Understanding Needed

Pessimistic/Optimistic

Sorption

Solubility Determines Toxicity

Useful Chemical Values
too Complex to Calculate

Ninety Elements
-Link up in many, many different ways
-Many, many different behaviours

Range – one to one million

Essentially Unknowable

200 million-fold error

‘Elemental Solubility’
but elements don’t travel Solo

Radionuclides and chemicals

Solubility of Carbon
-Diamonds
-Sugar

'Complexes'

Wet repository scenario not robustly tested

Shaft Sealing not Proven Technology

Seemingly Innocuous
-Paper
-Plastic
-Cement

Carbon-14 could exceed safety limits

Wood
Paper
Cellulose
Isosaccarhinic acid

Much work done
- Remains key uncertainty

2013 – new chemical complex discovered

Need Representative Sample

Unsupported Assumptions

Chosen model system not well suited

More understanding required

Risk presented unknown

Cement Grout causes corrosion problems

Polymer alternative

Problems with Polymers
- understanding limited

Superplacticiser additives
-Up to 10,000 fold increase
in solubility
-Further research required
- Relevant chemicals unknown

PVC Degradation
-Thermal
-Chemical
-Microbial
-Radiolytic

Leading to Accelerated Release

Non Aqueous Phase Liquids

-NAPLs

Relevant Data Limited

Carbon-14

-2008 Meeting

-Long held opinions that tended to give a lower dose - incorrect

Carbonation

Even Mixture with Non-Radioactive

Complex Model Needed

Uncertainties in some key Parameters

Little work on Carbon and Sorption

More Data Also Needed on Solubility

December 2012
- Release of Carbon exceeded risk guidance

OPG treat Carbon as a Special Case

Assumption of dry repository
-Not Robust

New Safety Case needed on basis of wet repository plus poor shaft sealing

Chemistry Complex
-Even seemingly Inert
Chemicals can have severely detrimental effect.

Further research may lead to Realisation of excess hazard

OPG do not know what hazard the proposed repository would present – and so should not be given the go-ahead