



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Canadian Nuclear Safety Commission (CNSC) – Explaining our Regulatory Role and why we are involved early in a Deep Geological Repository for Used Nuclear Fuel



Huron-Kinloss Community Liaison
Committee
April 1, 2014

Scope of presentation



- CNSC is independent regulator
- No licence application, early in the process
- We do not promote the APM approach or nuclear energy
- CNSC role is to ensure safety

Outline



1. Overview of the CNSC
2. Regulating radioactive waste
3. Current (interim) management of used nuclear fuel
4. CNSC early involvement in the APM approach
 - CLCs and the CNSC
5. Independent research
6. International collaboration
7. CNSC's role in regulating the transportation of nuclear substances
8. Concluding comments

Canadian Nuclear Safety Commission (CNSC)



- Canada's nuclear regulator
 - Reports to Parliament through Minister of Natural Resources
- Regulates the use of nuclear energy and materials to:
 - protect the health, safety and security of Canadians and the environment;
 - implement Canada's international commitments on the peaceful use of nuclear energy; and
 - disseminate objective scientific information

Regulatory Philosophy

Licensees are responsible for the protection of health, safety, security, and the environment and respecting Canada's international commitments

CNSC is responsible for regulating licensees, assessing whether licensees are compliant with the NSCA, regulations, and international obligations

A regulator with 68 years of experience

Canadian Nuclear Safety Commission



Who we are

- Canada's independent nuclear regulator
- If a site is selected, rigorous review of application. Licence only issued if site is safe
- CNSC conduct safety checks - inspect, take samples to ensure community and environment safe

Who we are NOT

- Not the NWMO, not industry
- Not in charge of siting process, nor choose the site
- Not the organization who may construct a deep geological repository

CNSC Regulates Facilities and Activities



- Nuclear power plants
- Uranium mines and mills
- Uranium fuel fabricators and processing
- Nuclear substance processing
- Industrial and medical applications of nuclear substances, such as nuclear medicine and cancer treatment centers
- Research labs and educational facilities
- Export/import of controlled nuclear substances, equipment and technology
- Waste management facilities



...from cradle to grave

Independent Commission



- Quasi-judicial administrative tribunal
- Commission members are independent
- Commission hearings are public and Webcast
- Supported by a Secretariat and independent legal services



Transparent decision-making

CNSC Staff

**Scientific, technical and other professional staff,
responsible for:**



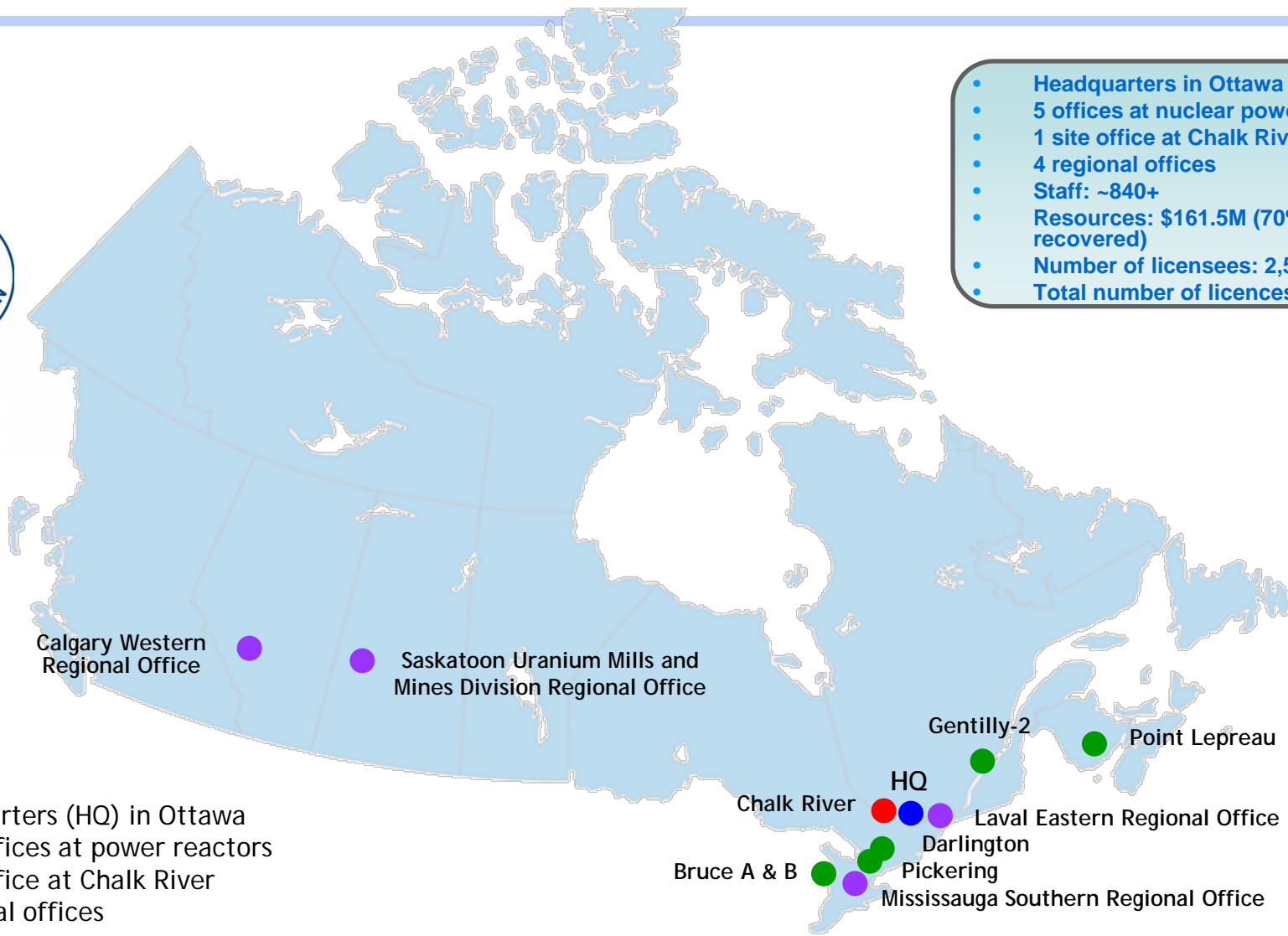
- implementing the decisions of the Commission
- verifying compliance with licences and regulations
- reviewing licence applications and performing EA review work
- developing regulatory guidance
- advising on regulatory policy and options
- engaging citizens and communities through outreach



CNSC Offices



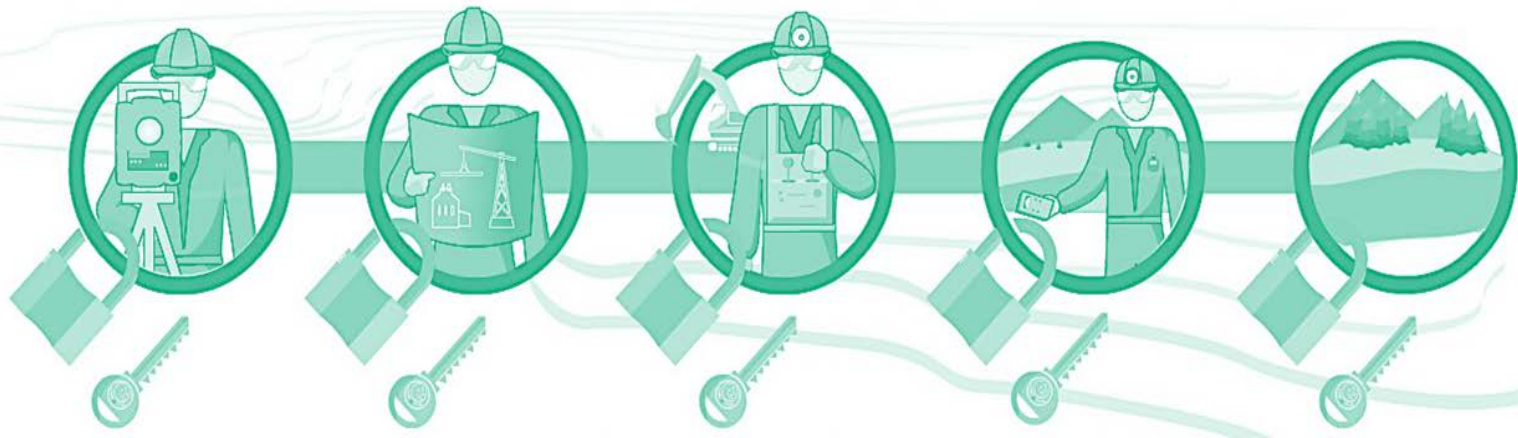
- Headquarters in Ottawa
- 5 offices at nuclear power plants
- 1 site office at Chalk River
- 4 regional offices
- Staff: ~840+
- Resources: \$161.5M (70% of costs recovered)
- Number of licensees: 2,500
- Total number of licences: 3,300



- Blue dot: Headquarters (HQ) in Ottawa
- Green dot: 5 site offices at power reactors
- Red dot: 1 site office at Chalk River
- Purple dot: 4 regional offices

CNSC Licensing Process Overview (1)

Five stages in the lifecycle of a nuclear facility



***Licence to
Prepare Site***

***Licence to
Construct***

***Licence to
Operate***

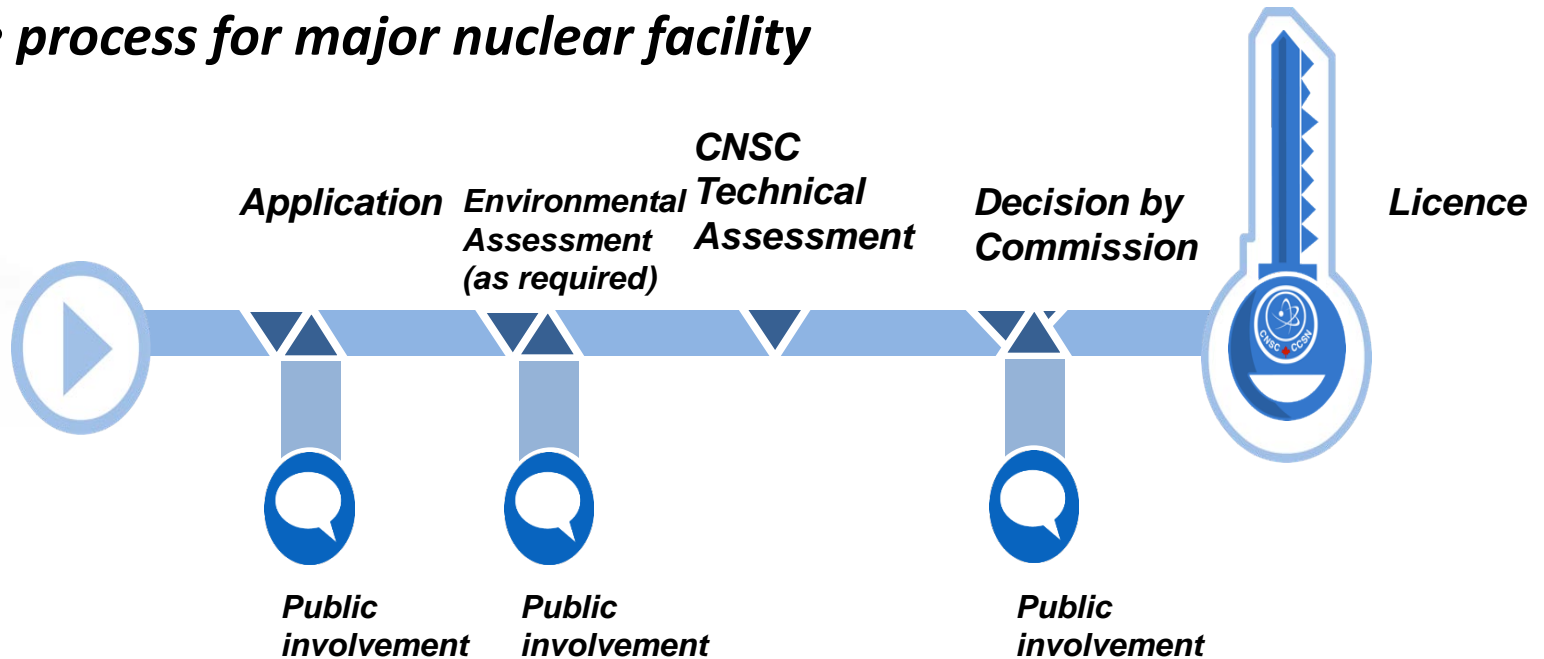
***Licence to
Decommission***

***Licence to
Abandon***

***(Release from
CNSC
licensing)***

CNSC Licensing Process Overview (cont'd)

One process for major nuclear facility



Ongoing public involvement, Aboriginal consultation and environmental monitoring

Public Involvement in the Process



Environmental Assessment (EA): OPG DGR Approach vs Approach for new projects

OPG DGR project

- Remained a Joint Review Panel (JRP) after Canadian Environmental Assessment Act (CEAA) changed in 2012
- Minister of Environment makes the EA decision
- JRP member = CNSC Commission
- JRP members can make decision on first stages of licensing if positive EA decision



New Major projects

- CEAA 2012 and its Regulations apply
- CNSC Commission makes both EA decision and licensing decision
- Follows Commission Public Hearing process
- Similar EA process e.g. CNSC produce Guidelines, review Environmental Impact Statement, public participation opportunities

Public involvement throughout

Harmonization with Provincial/Federal Agencies

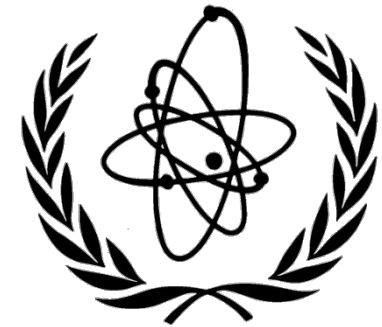


- CNSC utilizes a harmonized or joint review approach with other federal, provincial or territorial departments in such areas as health, environment, transport and labour.
- The CNSC would expect nuclear facilities to comply with all applicable federal and provincial regulations.
- Joint Regulatory Review Process
- Federal and provincial agencies are considered in the regulatory process and are reflected, as appropriate, in the licence in the form of site-specific requirements.

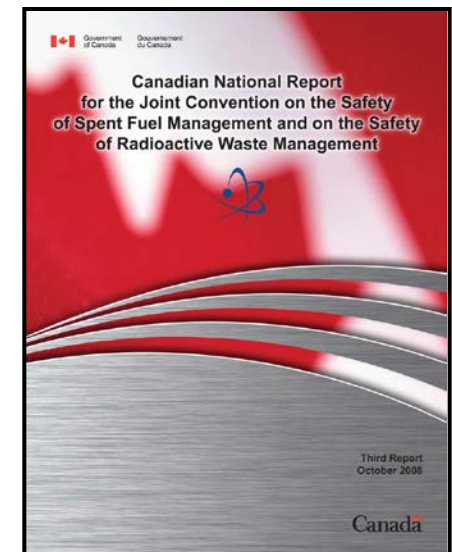
National and International Perspectives



- International Atomic Energy Agency (IAEA)
 - Radioactive Waste Management Committee
 - Transport Safety Standards Advisory Committee
 - Radiation Safety Standards Committee
- Nuclear Energy Agency (NEA)
 - Radioactive Waste Management Committee
- Canadian Standards Association (CSA) (national)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management



IAEA



Compliance Program



Verification



Clarity



Enforcement



Regulatory Approach for Radioactive Waste

- Approach stems from the *Nuclear Safety and Control Act* (NSCA), and CNSC regulatory policy document ***P-290, Managing Radioactive Waste***



Three principles:

- Plan for the complete life of the facility
- Multi-barriers between radioactive material and people/the environment
- Defence in depth – never rely on a single system or process for protection

Canada's Radioactive Waste Classification



- 1) High-level radioactive waste (HLW)
- 2) Intermediate-level radioactive waste (ILW)
- 3) Low-level radioactive waste (LLW)
 - o low-level short-lived radioactive waste (VSLLW)
 - o very-low-level radioactive waste (VLLW)
- 4) Uranium mine and mill tailings



HLW



ILW



LLW



Uranium mine & mill tailings

How Used Nuclear Fuel is Currently Managed (interim storage)

- Each reactor site has wet storage pools for used nuclear fuel storage (15 to 20 yrs of operation)
- After a period in wet storage (7 to 10 yrs), used nuclear fuel can be transferred to dry storage
- Each reactor site has facilities for the safe, dry storage of used nuclear fuel
- Dry storage facilities:
 - are monitored and have no impact on the public and the environment
 - meet requirements for national security and international agreements



Interim Management of Used Nuclear Fuel (cont'd)



Used nuclear fuel in wet storage within reactor bays

Dry storage containers holding used nuclear fuel



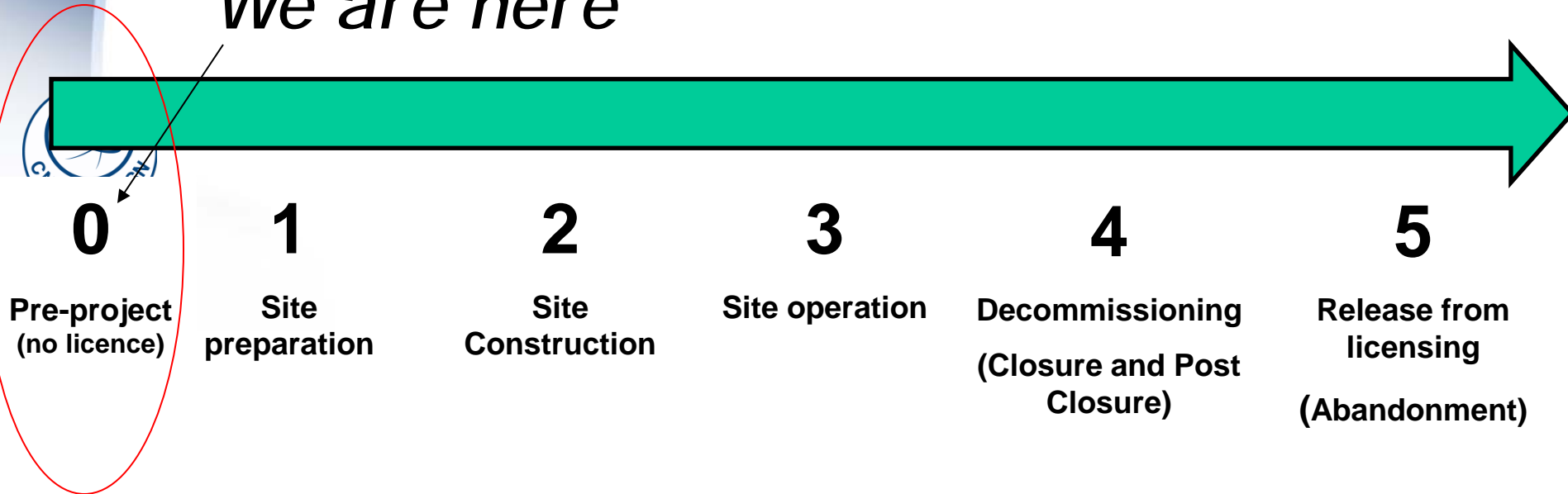
CNSC Involved Early in the APM Process (Pre-project Phase)

- **No application has been received for the APM project**
- **Objectives**
 - Build independent knowledge
 - Start a dialogue with future applicant
 - Communicate the CNSC's role and responsibilities as Canada's nuclear regulator
 - Clarify CNSC regulatory expectations and requirements
 - Focus on key safety aspects
 - Maximize national and international collaboration
 - Review key research publications from future applicants



CNSC Involved Early in the APM Approach (Pre-project Phase)

We are here



Financial guarantees are required at stages 1 through 4

Environmental Assessment required before licensing decision

Staged approach / Early planning

CNSC/NWMO APM Service Agreement (Pre-project Phase)



- Memorandum of Service between CNSC and NWMO in advance of a licence submission:
 - Presentations at public meetings to provide information on the nuclear regulator's role
 - Communication - meetings, etc
 - Review of NWMO communication material with respect to CNSC's regulatory role, licensing process
 - Pre-project reviews of conceptual design and post-closure safety assessment reports for two hypothetical but realistic sites (crystalline & sedimentary)
- Agreement Renewed in March 2014

CNSC involvement will continue & expand as APM Project unfolds

Pre-project phase: Outreach Activities



- CNSC is available to talk to communities/CLC
- CNSC meets with Communities/CLC who are interested in learning more about CNSC's regulatory role
 - ☑ Day-long meeting in Ottawa with representatives (typically the Mayor and Council) from the communities. CLCs have also requested the day-long meeting
 - ☑ At the request of local CLC, CNSC has presented at CLC meetings. This is an initial meet and greet.
 - ☑ At the request of CLCs, conduct CNSC held Open Houses in those communities
- CNSC will continue to work with CLCs if requesting additional CNSC outreach activities

CNSC and CLCs relationship will continue & expand as APM approach unfolds

CNSC Pre-project phase: technical review

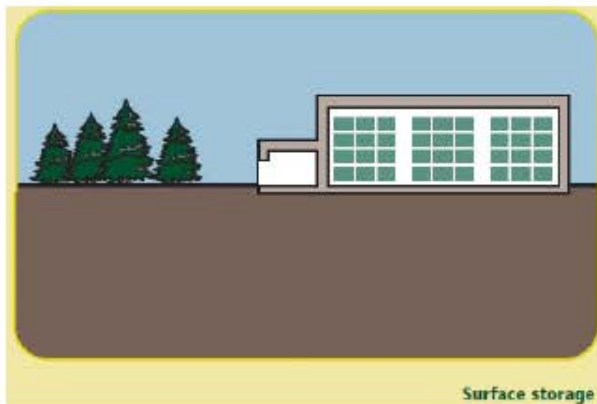


- No site selected, therefore can only look at some components of a conceptual Safety Case
- Pre-project technical review - conceptual repository design and post closure safety assessment reports for Crystalline and Sedimentary Rock
 - high-level review to identify “red flags”/ impediments to licensing
 - Issue high-level public statement
 - No regulatory decisions made
- Future pre-project technical reviews

CNSC Independent Research Program

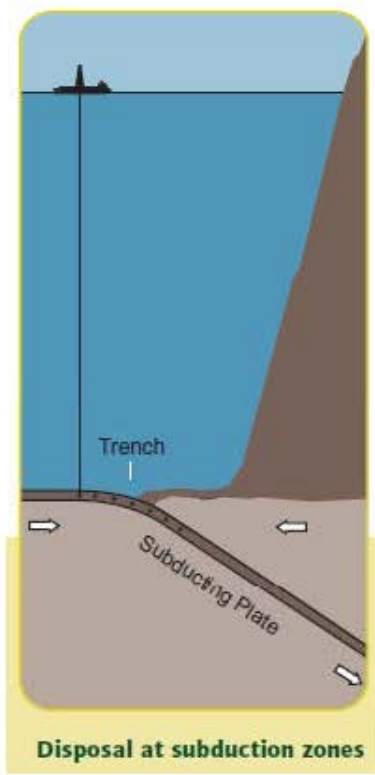


First, some background about why CNSC has an internal research program focused on repositories.....



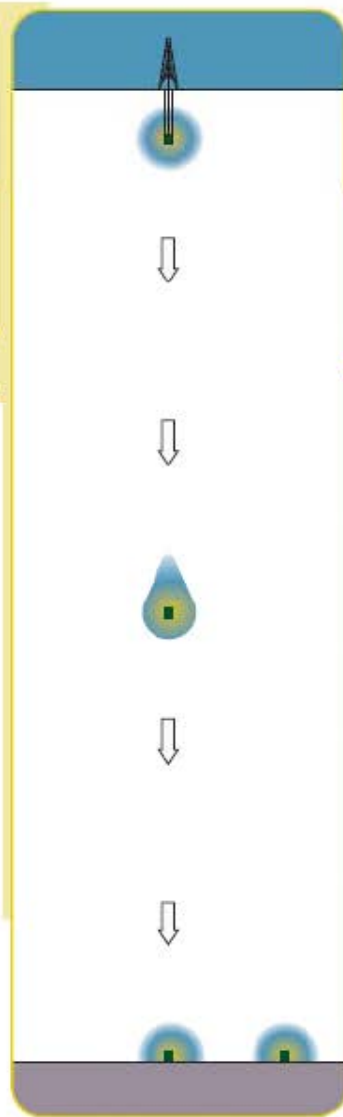
Surface storage

Surface storage



Disposal at subduction zones

Subduction zone

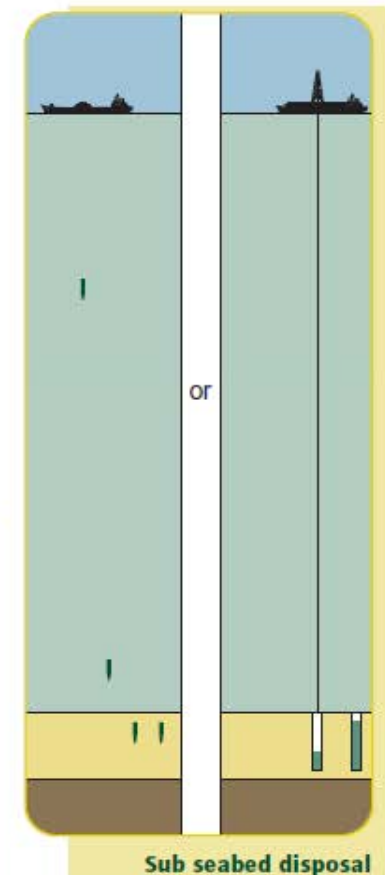


Disposal in ice sheets

Ice sheets



Disposal in space



Sub seabed disposal

Seabed

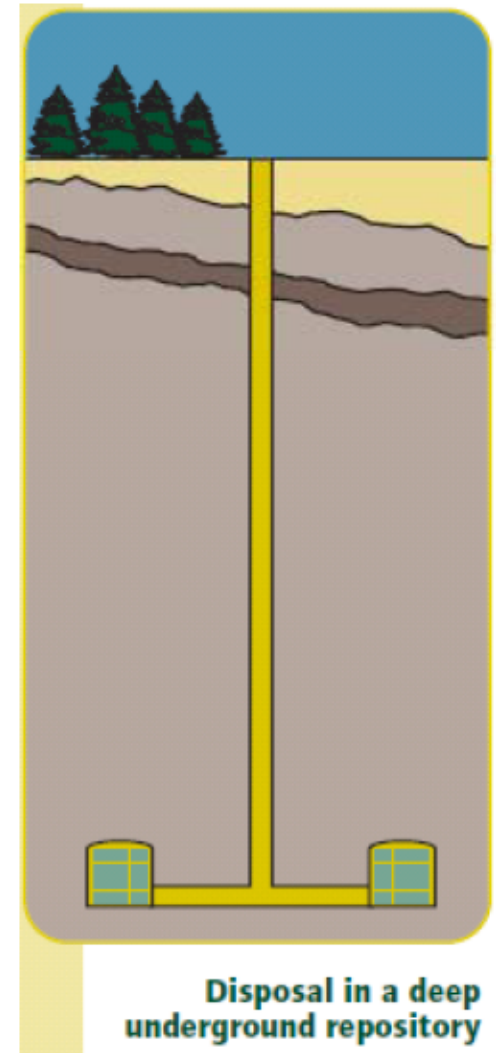
Space

“It has been the technical consensus of most waste management specialists for several decades that geological disposal, using a system of engineered and natural barriers, is the preferred option of disposal for high level and long lived radioactive waste.”

IAEA.

http://www.iaea.org/OurWork/ST/NE/NEFW/wts_geologicaldisposal.html

<http://www.nda.gov.uk/documents/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=10622> (Image)



Source: George Hornberger, Vanderbilt University, available on the WIPP website

What to look for in a repository? (i.e. Key attributes)



- Predictability, geological stability and large lateral extent
- Low seismic risk
- Underground openings will be stable and relatively dry
- Regional stress regime is favourable for closing of vertical fractures
- Sufficient thickness of low permeability rock above and below a deep geological repository (DGR)
- Diffusion dominant transport around DGR
- Shallow groundwater system is isolated from the deeper groundwater system that will contain the DGR.
- Low potential for natural resources (oil, gas, minerals).

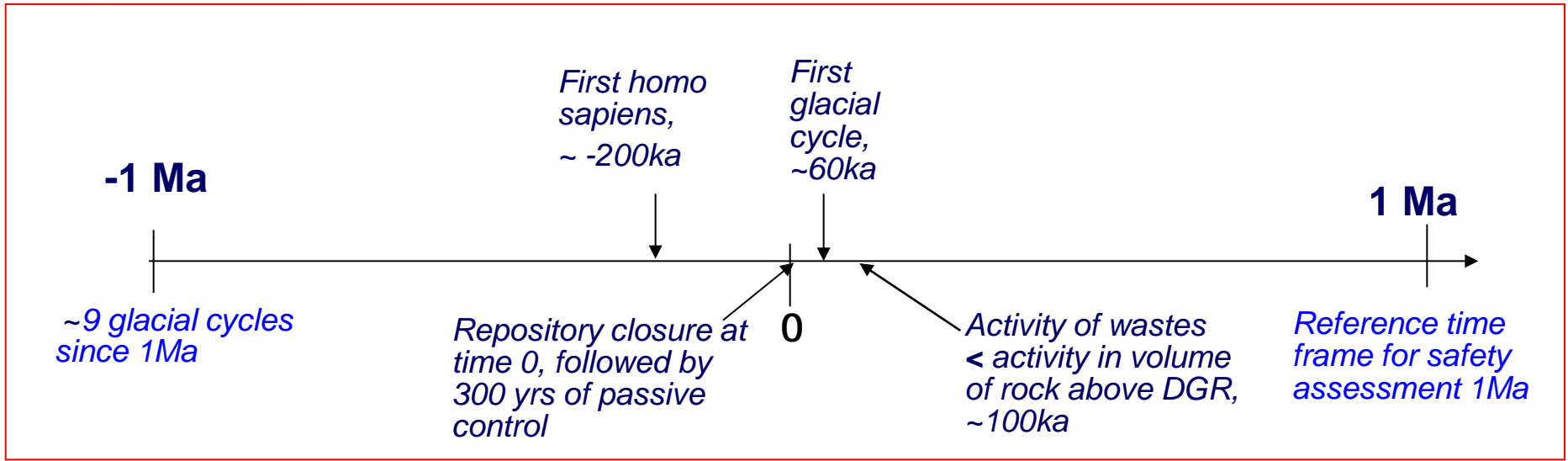
Perspectives on Timescale-example from Bruce peninsula



Sediment deposition in Michigan Basin
~ -500Ma

End of Appalachian mountain-building

~9 glacial cycles have occurred since 1Ma



Reference time frame for safety assessment is 1Ma

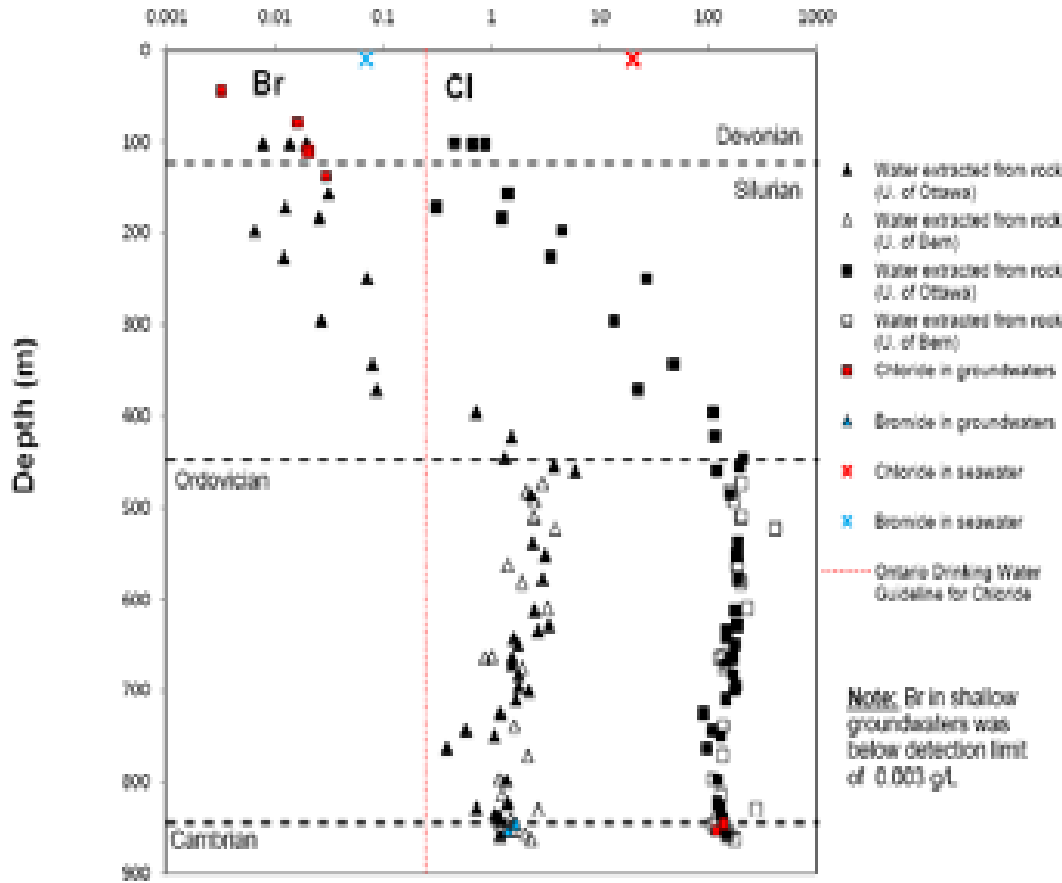
CNSC Independent Research Program



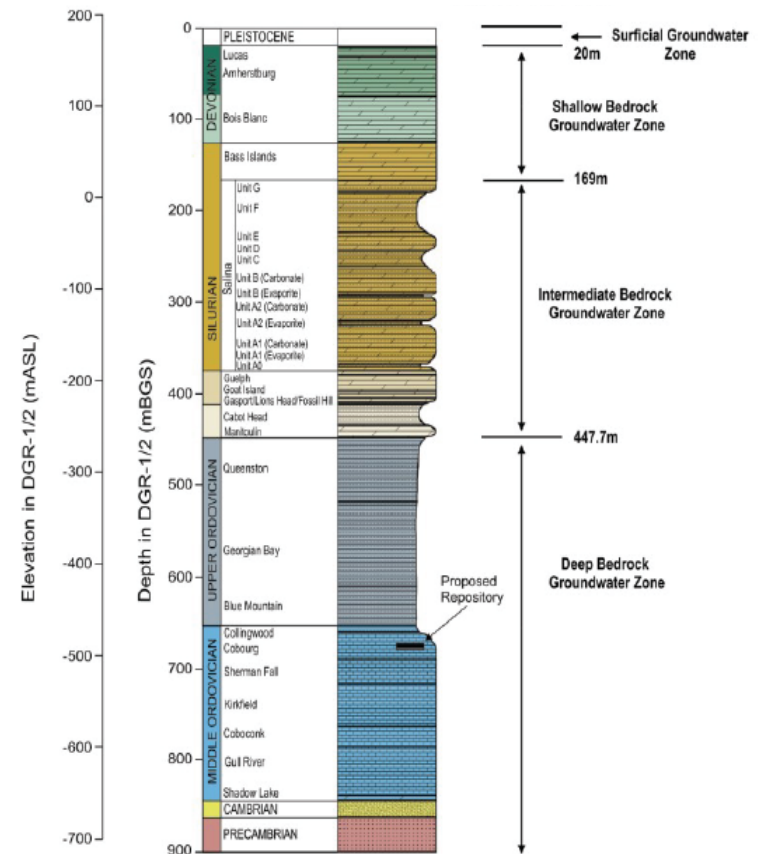
- Since 1978, CNSC involved in independent research and assessment, including international collaboration, on the safe long-term management of used nuclear fuel in geological repositories
- CNSC expanding this expertise to sedimentary rocks
 - Coordinated Assessment and Research Program (CARP)
- CNSC Regulatory Guide G-320, Assessing the Long-term Safety of Radioactive Wastes
 - Safety Assessment alone is not enough
 - Proponent has to present multiple lines of reasoning, and additional arguments to support the Safety Assessment
 - Safety Case is a collection of arguments backed up by a Safety Assessment

CNSC Independent Research Program CARP Research 1: Natural Tracer Study

Cl, Br concentrations (g/L)

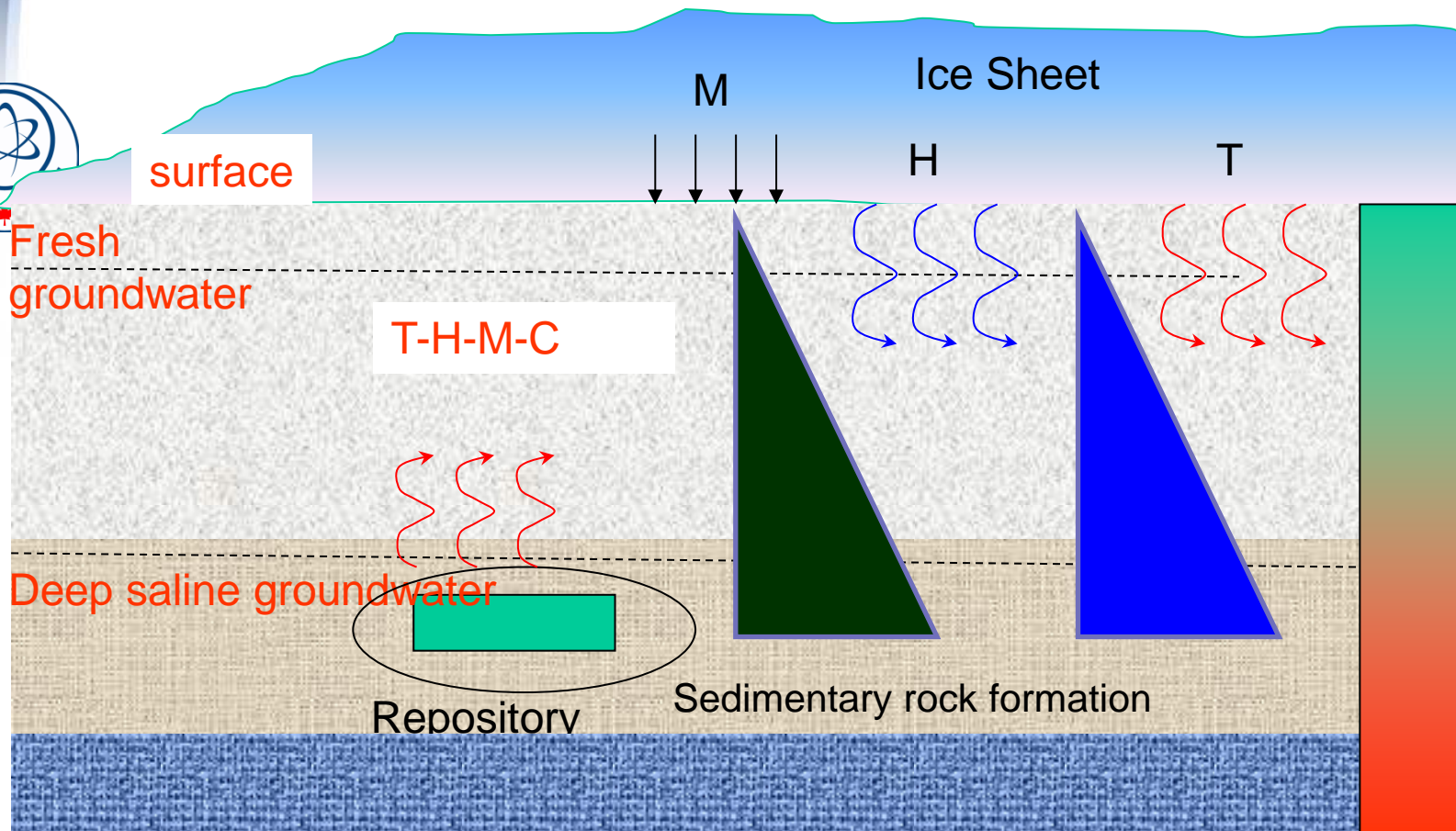


Formations at OPG's proposed DGR site at Bruce



CNSC Independent Research Program

CARP Research 2: Past and Future Glaciation



International Collaboration



- European Union
 - France - long term performance of shaft seals (SEALEX)
 - European Union - regulatory expectations, foster common understanding of technical key points for safety (SITEX)
- International Atomic Energy Agency (IAEA)
 - GEOSAF – harmonize approaches for the safety case
 - HIDRA – Human Intrusion
 - Underground Research Facilities Network
- NEA
 - RWMC- Radioactive Waste Management Committee
 - Integration group for review of the safety case (IGSC)
- Meet with other regulators (SSM, STUK, US EPA)
- Site visit URLs and existing repositories for L&ILW



International collaboration with other regulators



1) Sweden – Äspö: URL for Used Nuclear Fuel
– not final repository location



2) Finland – ONKALO: URL for Used Nuclear Fuel
– may become part of final UNF Repository



3) Sweden – SFR: near surface repository L&ILW
- may ask to expand for decommissioning waste



4) Finland – VJL – near surface repository for L&ILW
- one of two near surface repositories in Finland

International: Finland (cont.)



On inspection at ONKALO



CNSC's role in Regulating the Transportation of Used Nuclear Fuel

Transport Safety = Package Design



Responsibility



- The transport of nuclear substances (this includes used nuclear fuel) is regulated by:
 - Canadian Nuclear Safety Commission
 - Transport Canada
- For used nuclear fuel a transportation security plan is also required.

Consignors/shipper - Responsibilities



- The consignor is responsible for:
 - Selecting the proper package type
 - Preparing the package for shipment
 - Displaying proper safety marks on packages
 - Preparing the shipping documents
 - Implementing an Emergency Response Plan
 - Providing additional information to carriers, when applicable
 - Reporting Incident
 - Ensuring that workers have received Radiation Protection and TDG training
 - Maintaining records
- **In order to transport used nuclear fuel in Canada a transportation security plan is also required**

Emergency Response



- Regulations require consignors to provide a 24 hour number on shipping documents
- Consignor must be able to provide information about the goods being transported to first responders
 - First responders are typically local firefighters and police officers
- Consignor is responsible to respond to transport accident to ensure adequate clean-up

Emergency Response (cont.)



- CNSC Duty officers provide guidance to first responders and to persons involved in the remediation of an accident involving Class 7
- CNSC Transport Specialists can provide assistance to the duty officer and first responders

Concluding Comments

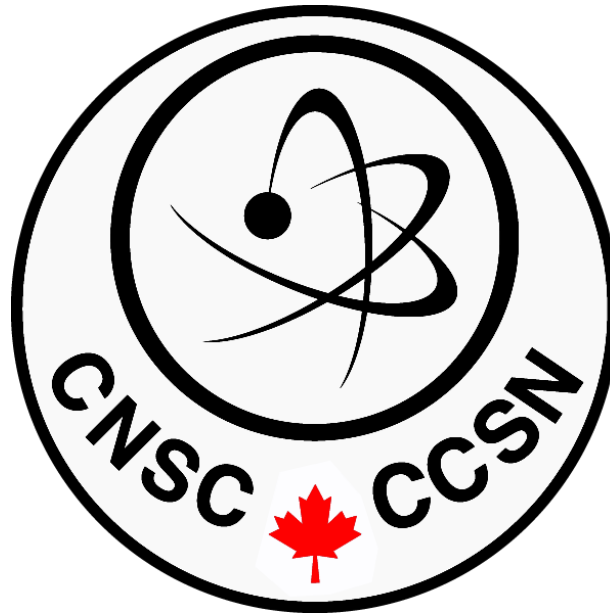


- Canada's independent nuclear regulator
- CNSC responsibilities include the licensing, compliance and enforcement of the radioactive waste management facilities in Canada
- Protection of workers, the public and the environment is top priority
- Transparency and, aboriginal and public consultation are strongly valued
- There is a harmonized approach to relations with other government departments

Concluding Comments (cont.)



- No licence application is expected in the next few years
- CNSC is involved early in the process as this is an international best practice.
- The CNSC uses a comprehensive licensing process that covers the entire lifecycle of a geological repository
- Transportation to repository site will be included in the licensing process



We Will Not Compromise Safety

nuclearsafety.gc.ca