Nuclear Waste Management Organization (NWMO)

Adaptive Phased Management (APM) Project

South Bruce Community Liaison Committee (SBCLC) Meeting

October 8, 2015 – 7:00 p.m.
Municipal Office, 21 Gordon Street East, Teeswater

AGENDA

1. **Call to Order**

2. **Adoption of Agenda**

3. **Disclosure of Pecuniary Interest and Nature Thereof**

4. **Minutes of the Previous Meeting**

   4.1. August 13, 2015 SBCLC Regular Meeting

5. **Delegations**

6. **NWMO CLC Task List Review**

7. **Reports**

   7.1. **Progress Update** – Jo-Ann Facella, Director of Social Research and Dialogue, NWMO

   7.2. **NWMO Update** – Paul Austin, Relationship Manager, Southern Ontario and Mike Krizanc, Communications Manager

8. **Education**

9. **Communications**

10. **New Business**

11. **Adjournment**

Nuclear Waste Management Organization (NWMO)

Adaptive Phased Management (APM) Project

Community Liaison Committee (CLC) Meeting

Thursday, August 13, 2015

MINUTES

The South Bruce Community Liaison Committee met on Thursday, August 13, 2015 at 7:18 p.m. at the South Bruce Municipal Office, 21 Gordon Street East, Teeswater.

Members Present:	Mayor Robert Buckle; Councillor Margie Bates; Councillor Mark Goetz; Brian Knox; Les Nichols
Members Absent:	Jim Gowland, Chair; Doug Culbert, Vice-Chair; Corbyn Critchfield; George Miller
NWMO Staff:	Paul Austin, Relationship Manager for Southern Ontario; Marie Wilson, Communications; Neale Hunt, Manager, Used Fuel Safety Assessment
Municipal Staff:	Kendra Reinhart, Administrator-Treasurer; Julie Ireland, CLC Secretary

1. **CALL TO ORDER:**

Both Chair Jim Gowland and Vice-Chair Doug Culbert were unable to attend the meeting. By consensus, the quorum of members in attendance selected Les Nichols to preside. The meeting was called to order at 7:18 p.m.

2. **ADOPTION OF AGENDA:**

MOTION CLC-2015-113
Moved by Margie Bates,
Seconded by Mark Goetz;
Agenda That the Agenda for the South Bruce Community Liaison Committee Meeting of August 13, 2015, be approved.
Motion: Carried

3. **DISCLOSURE OF PECUNIARY INTEREST AND NATURE THEREOF:**
None

4. **MINUTES OF THE PREVIOUS MEETING:**

4.1 July 9, 2015 SBCLC Regular Meeting

MOTION CLC-2015-114
Moved by Brian Knox,
Seconded by Margie Bates;
Minutes That the Minutes of the South Bruce Community Liaison Committee Meeting held on July 9, 2015, be adopted as printed and circulated.
Motion: Carried

5. **DELEGATIONS:**
None

6. **NWMO TASK LIST REVIEW:**

7. **REPORTS:**

7.1 **NWMO Update** (Oral)
Paul Austin, Relationship Manager, Southern Ontario

MOTION CLC-2015-115
Moved by Margie Bates,
Seconded by Mark Goetz;
Report That the verbal report of the NWMO to the August 13, 2015 South Bruce Community Liaison Committee meeting, be received for information.
Motion: Carried

7.2 **Format of Meeting Minutes**
Julie Ireland, Project Co-ordinator, SBCLC

MOTION CLC-2015-116
Moved by Brian Knox,
Seconded by Margie Bates;
Report That the report titled "Format of Meeting Minutes" presented to the August 13, 2015 South Bruce Community Liaison Committee meeting, be received for information.
Motion: Carried

8. **EDUCATION:**

8.1 **Overview of DGR Radiological Safety**
Neale Hunt, Manager, Used Fuel Safety Assessment, NWMO

MOTION CLC-2015-117
Moved by Mark Goetz,
Seconded by Margie Bates;
Report That the verbal report of the NWMO regarding an Overview of DGR Radiological Safety presented to the August 13, 2015

South Bruce Community Liaison Committee meeting, be received for information.

Motion: Carried

9. COMMUNICATIONS:

9.1 Leanne Martin, Clerk, Municipality of South Bruce, Letter dated July 29, 2015, Providing a Copy of the Motion Regarding the Site Selection Process for Phase 2 Field Studies that was Approved by the Council of the Municipality of South Bruce

MOTION CLC-2015-118
Moved by Bob Buckle,
Seconded by Mark Goetz;
Communication That the letter from Leanne Martin, Clerk, Municipality of South Bruce, dated July 29, 2015, regarding the Site Selection Process for Phase 2 Field Studies that was approved by the Council of the Municipality of South Bruce at its meeting held on July 28, 2015, be received for information.

Motion: Carried

10. NEW BUSINESS:

None

11. ADJOURNMENT:

MOTION CLC-2015-119
Moved by Bob Buckle;
Adjournment That we do now adjourn at 8:33 p.m., to meet again on Thursday, September 10, 2015 at 7:00 p.m., or, at the call of the Chair.

Motion: Carried

____________________ ____________________
Chair Vice-Chair

____
CLC Secretary

NWMO — Nuclear Waste Management Organization / Société de gestion des déchets nucléaires

Progress Update

Presented by: Jo-Ann Facella
October 2015

Where we are in the process

- ✓ Initial Screening
- ✓ Preliminary Assessment – Phase 1
  - ✓ Desktop Assessment
- Preliminary Assessment – Phase 2
  - Initial Borehole Studies
  - 2D Seismic
  - Detailed Mapping

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New materials to support learning and dialogue

- Draft Implementation Plan 2016 to 2020
- Updated project description
- New backgrounders

3

Implementation Plan: Eight objectives

- Build sustainable, long-term relationships with interested Canadians and Aboriginal peoples of Canada, and involve them in setting future directions for the safe, long-term management of used nuclear fuel.

  Continue to adapt plans for the management of used nuclear fuel in response to evolving societal expectations and values, insight from Aboriginal Traditional Knowledge, and changes in public policies.

4

Implementation Plan: Eight objectives

- Implement collaboratively with communities the preliminary assessments of site suitability for locating the deep geological repository and Centre of Expertise in a safe location in an informed, willing host community.

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Implementation Plan: Eight objectives

- Conduct testing to prove that engineered barriers meet all safety requirements and can be produced effectively and efficiently.
- Continuously improve technical knowledge in collaboration with universities and international partners, and adapt plans consistent with international best practices.

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Implementation Plan: Eight objectives

- Advance planning and capabilities for the construction and operation of the deep geological repository and the associated Centre of Expertise at the site selected to host the project.

Implementation Plan: Eight objectives

- Establish safe, secure and socially acceptable plans for transporting used nuclear fuel.
- Ensure funds are available to pay for the safe, long-term management of Canada's used nuclear fuel.
- Maintain an accountable governance structure that provides confidence to the Canadian public in the conduct of the NWMO's work.

Project Description

Updated Information

- Used nuclear fuel
- Canada's plan
- Facility descriptions
- Repository phases
- Regulatory oversight
- Project economics

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Backgrounders: New and in progress

- Multi-barrier system
- International programs
- Initial borehole drilling and testing
- Economic modeling
- Centre of expertise

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Key topics to explore going forward

- Planning for borehole drilling
- Centre of Expertise
- Project economics

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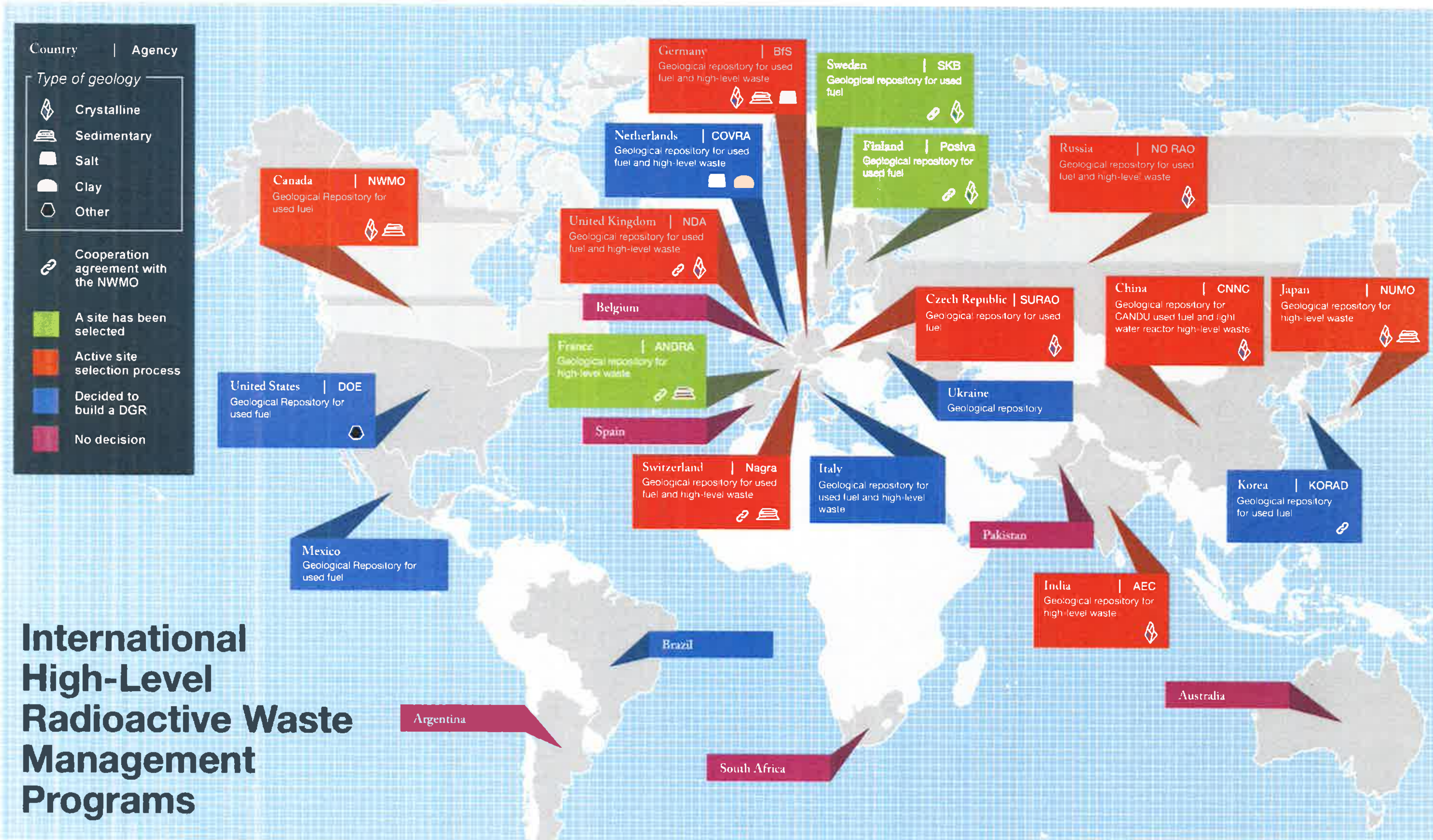
Country | Agency
Type of geology
Crystalline
Sedimentary
Salt
Clay
Other
Cooperation agreement with the NWMO
A site has been selected
Active site selection process
Decided to build a DGR
No decision
Canada | NWMO
Geological Repository for used fuel
Germany | BfS
Geological repository for used fuel and high-level waste
Sweden | SKB
Geological repository for used fuel
Netherlands | COVRA
Geological repository for used fuel and high-level waste
Finland | Posiva
Geological repository for used fuel
Russia | NO RAO
Geological repository for used fuel and high-level waste
United Kingdom | NDA
Geological repository for used fuel and high-level waste
Belgium
Czech Republic | SURAO
Geological repository for used fuel
China | CNNC
Geological repository for CANDU used fuel and light water reactor high-level waste
Japan | NUMO
Geological repository for high-level waste
France | ANDRA
Geological repository for high-level waste
United States | DOE
Geological Repository for used fuel
Ukraine
Geological repository
Spain
Switzerland | Nagra
Geological repository for used fuel and high-level waste
Italy
Geological repository for used fuel and high-level waste
Korea | KORAD
Geological repository for used fuel
Mexico
Geological Repository for used fuel
Pakistan
India | AEC
Geological repository for high-level waste
Brazil
Argentina
Australia
South Africa
International High-Level Radioactive Waste Management Programs

A site has been selected

Country	Status of Site Selection Process
Finland	Has a multi-step process and has received regulatory acceptance for the first step to construct a repository in Olkiluoto.
France	Is seeking licence to build a repository in Bure.
Sweden	Has submitted a licensing application to build a repository in the municipality of Östhammar.

Active site selection process

Country	Status of Site Selection Process
Canada	At the preliminary assessment step of a nine-step process for selecting a site; currently working with communities interested in learning more about the project.
China	Preliminary site characterization activities at a potential site, to be followed by in-situ research and development in an underground research laboratory.
Czech Republic	Seven areas currently being considered based on technical process, with goal of selecting final and backup sites by 2025.
Germany	Passed a new siting law in 2013; first step in a step-wise process to be the establishment of a Commission for discussing basics of how to manage high-level waste and site selection criteria.
India	Siting based on technical process to identify repository site in stages; focus of siting activities in northwest Rajasthan region.
Japan	Implementing a government directed, technical site selection process.
Russia	Government directed, technical siting process. Focus is on the Kranoyarsk region.
Switzerland	Implementing a stepwise siting approach with participation of stakeholders and public; has identified six potentially suitable siting areas for low and intermediate waste and three for high level wastes.
United Kingdom	Has invited communities for "no commitment" discussions on hosting a repository.

Deep Geological Repositories: Internationally Recognized as Best Practice

"There is a technical consensus that the end point for spent fuel disposition must include geological disposal, either of the spent nuclear fuel itself or of long lived waste products produced by reprocessing the fuel. This is the only approach judged feasible for providing the necessary long term passive protection of humans and the environment."

- International Atomic Energy Agency, 2011

"For high level and long lived radioactive waste, the consensus of the waste management experts internationally is that disposal in deep underground engineered facilities — geological disposal — is the best option that is currently available or likely to be available in the foreseeable future."

- International Atomic Energy Agency, 2003

"It is broadly accepted at the technical level that, at this time, deep geological disposal represents the safest and most sustainable option as the end point of the management of high-level waste and spent fuel considered as waste."

- European Commission, 2011

"There is a worldwide consensus amongst technical experts in the field that properly established deep geological disposal is an entirely appropriate management approach for high-level waste and spent nuclear fuel (HLW/SF)."

- Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD), 2003

"The conclusion that disposal is needed and that deep geologic disposal is the scientifically preferred approach has been reached by every expert panel that has looked at the issue and by every other country that is pursuing a nuclear waste management program."

- Blue Ribbon Commission on America's Nuclear Future, 2012

For more information, please contact:

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nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Programs Around the World for Managing Used Nuclear Fuel

Canada's plan for the long-term management of used nuclear fuel calls for it to be contained and isolated in a deep geological repository.

Canada's approach is consistent with best practice around the world. Most countries with commercial nuclear power production are planning to isolate the waste by-product of their nuclear fuel cycle in a deep geological repository.

Deep geological repositories use a combination of engineered and natural barriers to safely contain and isolate used nuclear fuel from people and the environment. There is a consensus among major nuclear regulatory and monitoring organizations that repositories are the responsible way forward for long-term management of these materials.

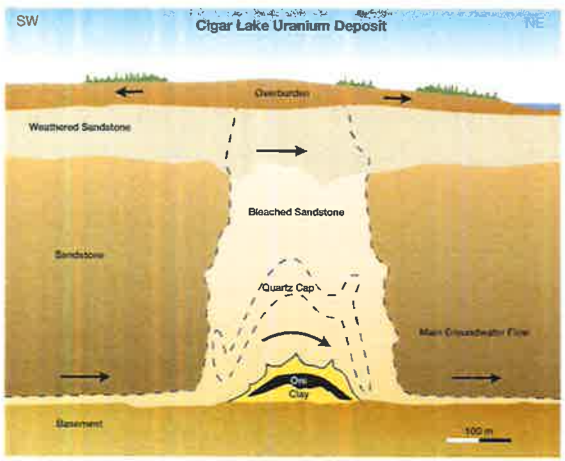
A small number of countries partly recycle their used nuclear fuel in existing reactors. Some countries are conducting research on advanced reactors that could also recycle used nuclear fuel. These advanced fuel cycles generate high level waste, a by-product with characteristics similar to used nuclear fuel. Studies conducted around the world have concluded that high level waste from reprocessing should also be contained and isolated in a deep geological repository.

Examples in Nature

Radiation

There are several locations where natural radioactivity has been contained for millions of years by the surrounding geology. These natural systems provide strong evidence supporting the concept of containment within a deep geological repository under similar conditions.

The Cigar Lake uranium deposit in Saskatchewan is one billion years old and is buried 450 metres below the surface, surrounded and protected by a layer of naturally occurring clay. There is no trace of radioactive components from the deposit at the surface. This is an example of how the deep geological repository can contain and isolate used nuclear fuel.



Uranium buried 450 metres underground for one billion years has left no trace of radioactivity at the surface.

Examples in Nature

Copper

Copper is a natural material that is known to be durable under deep rock conditions where there is no oxygen to cause corrosion. For example, naturally pure copper ore has been mined from around the Great Lakes; First Nations people in the area used surface outcrops of this copper.

Also, natural copper plates found in the mudstones from South Devon, U.K., provide an example for used nuclear fuel canisters placed in a clay backfill. These copper plates were formed 200 million years ago and show little corrosion since that time, due in part to the protection of the clay-rich mudstone.

Found in clay-rich mudstone, this 12-centimetre copper plate experienced little-to-no corrosion for 200 million years.

Clay

The sequoia-like trees in Dunarobba forest, Italy, were buried in clay for 1½ million years. The clay minimized the flow of water to the trees, preventing them from decomposing. The trees did not fossilize; they are still made of wood.

Sequoia-like trees, buried in clay for 1 ½ million years, did not decompose

For more information, please contact:

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Ensuring Safety: Multiple-Barrier System

Within a deep geological repository, a series of engineered and natural barriers will work together to safely contain and isolate used nuclear fuel from people and the environment. Each of these barriers provides a unique and stand-alone level of protection. If any of the barriers deteriorate, the next one comes into play. Safety is the top priority in implementing Canada's plan for the long-term management of used nuclear fuel.

When used nuclear fuel is removed from a reactor, it is radioactive and requires careful management. Although its radioactivity decreases with time, for practical purposes, used nuclear fuel remains hazardous, essentially indefinitely.

Used nuclear fuel is a solid material. It is largely made of uranium oxide. Uranium is a naturally occurring chemically hazardous element. The used fuel also contains small amounts of other hazardous elements that were either in the original uranium ore or produced in the reactor.

While the amount of radioactivity in used fuel decreases quickly at first, it takes a very long time to decrease to a level that would be safe for direct exposure.

The radioactive atoms in used fuel emit radiation in the form of electromagnetic waves and high-speed particles. Exposure to these waves or particles can be controlled through distance from the source of radiation, in this case a fuel bundle, as well as through shielding or barriers.

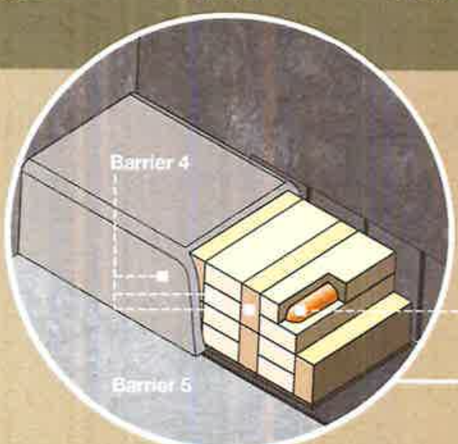
BARRIERS

#1 The Fuel Pellet

The first barrier in the multiple-barrier system is the fuel pellet. Fuel pellets are made from uranium dioxide powder, baked in a furnace to produce a hard, high-density ceramic. Ceramics are extremely durable; they do not readily dissolve in water, and their resistance to wear and high temperatures make them one of the most durable engineered materials.

#2 The Fuel Element and the Fuel Bundle

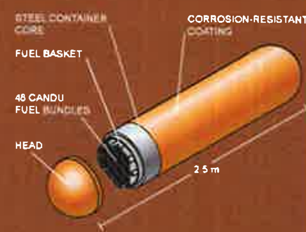
Each fuel bundle is composed of a number of sealed tubes called fuel elements. Fuel elements contain the fuel pellets and are made of a strong, corrosion-resistant metal called Zircaloy. The function of each element is to contain and isolate the fuel pellets.



BARRIERS

#3 The Used Nuclear Fuel Container

Used nuclear fuel bundles will be placed into large, very durable containers. In 2014, the NWMO refined its container design to one that is optimized for the used CANDU fuel produced by Canadian nuclear power reactors. Together with the bentonite clay buffer box (see Barrier 4), the container is a key part of the engineered barrier system.



The container prevents radionuclides in the fuel from escaping into the underground environment. It is engineered to remain intact and keep the used nuclear fuel completely isolated until the fuel's radioactivity has decreased to levels of natural uranium.

Each container holds 48 used fuel bundles in a steel basket within a carbon steel pipe. This steel pipe has the mechanical strength to withstand pressures of the overlying rock and loading from 3-kilometre-thick glaciers during a future ice age. The pipe is protected by a corrosion-resistant copper coating.

The container has a spherical head that is welded to the core of the container. This spherical shape is designed to withstand significant pressure.

The carbon steel pipe and copper coating technology for this container design are based on proven technology that is readily available in Canada. The used fuel container and supporting components will be manufactured and assembled at a container manufacturing plant which could potentially be located in the host community or surrounding region, depending on interest.

BARRIERS

#4 Bentonite Clay

Each used nuclear fuel container will be encased in a highly compacted bentonite clay buffer box during placement in the repository. Bentonite clay is a natural material formed from volcanic ash.

Bentonite is proven to be a powerful barrier to water flow. It swells when exposed to water, making it an excellent sealing material. Bentonite is also very stable, as seen in natural formations formed millions to hundreds of millions of years ago.

In the repository, the chemical properties of the bentonite clay, backfill, and sealants would also help to trap any radionuclides in the unlikely event they were to escape from the container.

Each buffer box will be placed and separated from the next with bentonite clay spacer blocks. Containers will be stacked in two layers.

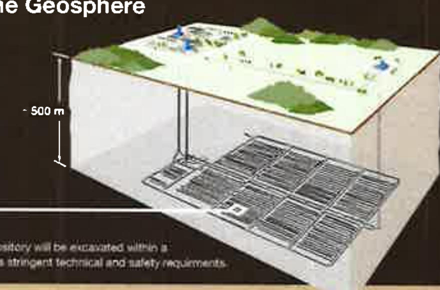
After the used nuclear fuel containers are placed in the repository, all open spaces in each underground chamber will be filled with bentonite clay.

A six- to 10-metre thick highly compacted bentonite clay seal and a 10- to 12-metre thick concrete bulkhead will be used to seal the entrance to each placement room.

Before closing the repository, all tunnels and shafts will be filled with similar backfill and sealants, isolating the repository from the environment. The performance of the repository will be monitored during placement operations and during an extended postclosure period.

Buffer box with container placed inside.

#5 The Geosphere



The deep geological repository will be excavated within a rock formation that meets stringent technical and safety requirements.

The geosphere forms a natural barrier of rock, which will protect the repository from disruptive natural events, water flow and human intrusion.

The repository will be approximately 500 metres underground – the exact depth will depend on the site. It will be excavated within a sedimentary or crystalline rock formation that meets the technical and safety requirements of the project. The rock formation selected will have low permeability, which means there will be little groundwater movement. The traces of water that exist at depth, known as porewater, can take a thousand years to move a metre through the rock and well over 100 thousand years to reach the surface.

It will ensure the repository safely contains and isolates the used nuclear fuel, even under extreme scenarios.