

Implementing Canadian Plan for the Long-Term Management of Used Nuclear Fuel



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nwmo

NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

SOCIÉTÉ DE GESTION
DES DÉCHETS
NUCLÉAIRES

History of Long-Term Management of Used Fuel Programs

- » **1978:** Porter Commission on Electricity Planning in Ontario
- » **1980:** Governments of Canada and Ontario initiate Canadian Nuclear Fuel Waste Program
- » **1989:** Concept of geological disposal referred to an Environmental Assessment Panel
- » **1998:** Panel reports findings and makes recommendations
 - ◆ Geological disposal technically safe
 - ◆ Public acceptance not demonstrated
- » **2002:** *Nuclear Fuel Waste Act* requires NWMO be formed

2002 Nuclear Fuel Waste Act



- » Nuclear Energy Corporations to:
 - ◆ Form and fund NWMO
 - ◆ Contribute to trust funds

- » NWMO
 - ◆ Establish an Advisory Council
 - ◆ Conduct study of alternatives and make recommendation
 - ◆ Implement government decision
 - ◆ Define contributions to trust funds
 - ◆ Report annually to parliament

- » Government of Canada
 - ◆ Approves NWMO recommendation
 - ◆ Approves trust fund contributions

Progress Since 2002

- » 2002: NWMO established by OPG, HQ, NBP
- » 2005: Study of alternatives completed
 - ◆ Recommendation made for Adaptive Phased Management
- » 2007: Government accepts NWMO recommendation
- » 2008: NWMO issues implementation plan
- » 2010: NWMO initiates site selection process
- » 2018: Potential date for completion of site investigations

NWMO Study of Alternatives (2002-2005)

- » NWMO led three-year study – engaged nation-wide:
 - ◆ 18,000 Canadians including 2500 Aboriginal people
 - ◆ 120 information & discussion sessions
 - ◆ Initiated research – contributions from 500 experts

- » Canadians told us:
 - ◆ Safety and security is top priority
 - ◆ Take action now
 - ◆ International standards
 - ◆ Approach must be adaptable (e.g. potential for recycle)



Adaptive Phased Management: Canada's Plan for the Long-Term Management of Used Nuclear Fuel

APM emerged from dialogue with citizens and experts – best met key priorities

A Technical Method

- » Centralized containment and isolation of used nuclear fuel in deep geological repository
- » Continuous monitoring
- » Potential for retrievability
- » Optional step of shallow underground storage

A Management System

- » Flexibility in pace and manner of implementation
- » Phased and adaptive decision-making
- » Responsive to advances in technology, research, Aboriginal Traditional Knowledge, societal values
- » Open, inclusive, fair siting process - seek informed, willing host community
- » Sustained engagement of people and communities throughout implementation

APM approved by Federal government June 2007

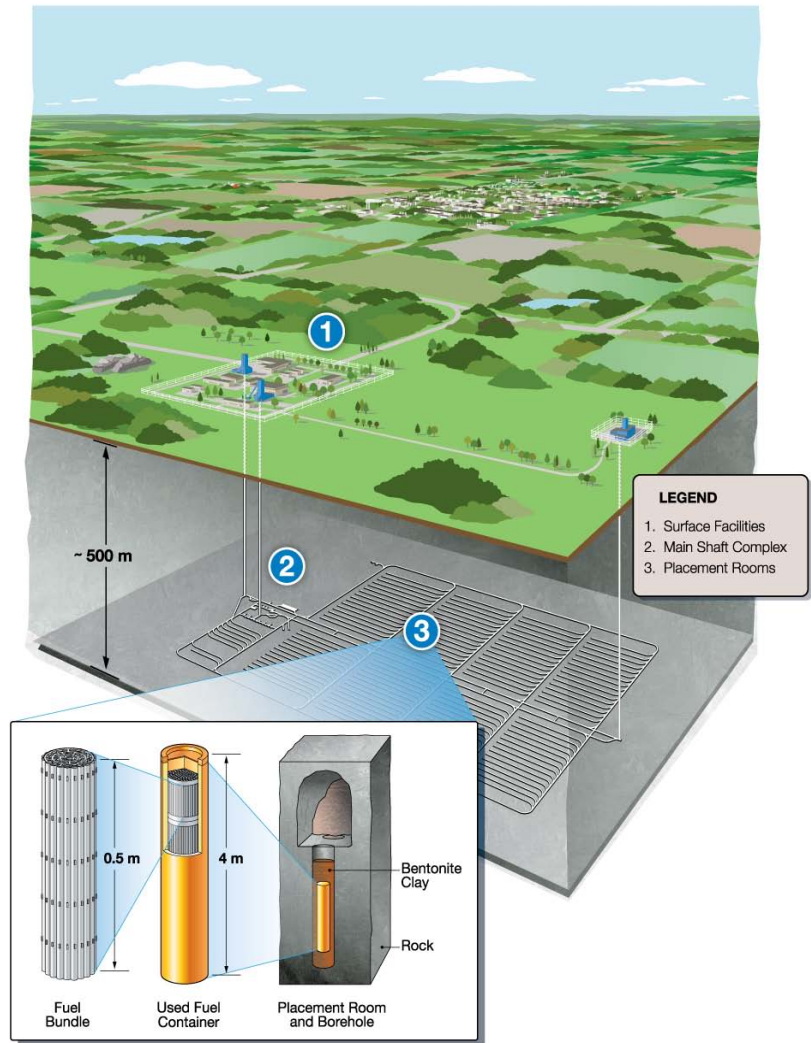
International Comparison



Country	National Plan for High-Level Waste	Repository Target In-Service Date
Finland	Geological Repository	2020: Willing host community selected
Sweden	Geological Repository	2025: Willing host community selected
France	Geological Repository	2025
Germany	Geological Repository	No date fixed
Japan	Geological Repository	2040
Switzerland	Geological Repository	2040
UK	Geological Repository	2040
Canada	Geological Repository	2035 earliest
USA	Geological Repository	Blue Ribbon panel now reviewing
Belgium	No decision	Research on geological repository underway
Spain	No decision	Research on geological repository underway

National Infrastructure Project

- » High technology, deep geological repository
 - ◆ Investment of \$16-24 billion
 - ◆ Will operate as centre of expertise
 - ◆ Sustainable over more than 100 years
- » Long-term partnership between NWMO and community
- » Fosters community well-being
- » Strongly regulated



2011-2015 Implementation Plan



- » Build long-term relationships with interested Canadians and involve them in setting future directions
- » Implement collaboratively the process for siting a deep geological repository
- » Further develop designs and safety cases for a repository in both crystalline and sedimentary rock formations
- » Ensure funds are available
- » Adapt plans in response to new knowledge and international best practices
- » Maintain an accountable governance structure
- » Build and sustain an effective organization

Ongoing Relationship Building



NWMO continues to:

- » Build awareness of the site selection process
- » Involve interested organizations and individuals in implementation of APM
- » Report out regularly on plans and progress

Building and maintaining relationships on many levels:

- » Communities and regions learning more about the site selection process
- » Municipal associations, community advisory groups
- » Aboriginal organizations, NWMO Elders Forum, Niigani
- » Reactor site communities
- » Diversity of interests – environment, industry, research, international
- » Federal and Provincial Governments

Collaborative Design of Process for Site Selection

- » **2008: Public dialogue on principles for siting**
- » **2009: Public review of draft site selection process**
 - ◆ Citizens panels, open houses
 - ◆ Multi-party dialogues with diversity of interests
 - ◆ National, regional Aboriginal organizations
 - ◆ Elders Forum, Aboriginal Working Group
 - ◆ Municipal Associations and Municipal Forum
 - ◆ Federal and Provincial government departments
 - ◆ Web-based dialogues
 - ◆ Nation-wide telephone survey
- » **2010: Published site selection process**
 - ◆ Published in May 2010, refined with public input
 - ◆ Marked initiation of siting process



Site Selection Criteria



» **Ensure technical safety – to protect humans and the environment, now and in the future:**

- ◆ Progressive and thorough site evaluation process
- ◆ Comprehensive technical site evaluation criteria

» **Beyond technical safety – to foster the well-being of the community:**

- ◆ Socio-economic criteria to assess the potential effects of the project on the community



How will the Site be Chosen?

- » Focus on safety
- » Meet or exceed regulatory requirements
- » Informed and willing host community
- » Community-driven
- » Shared decision-making
- » Involve surrounding communities, region and aboriginal peoples



NWMO Site Selection Process

Step 1

Becoming aware & informed

Steps 2, 3 & 4

Assessing interest & suitability

- Community visioning
- Screening
- Feasibility
- Detailed assessment
- Regional study & involvement
- Centres of expertise launched

Step 5

Community assesses & demonstrates willingness

Step 6

Preferred site identified

- Collaborative agreement established

Step 7

Regulatory review & approvals

- Site is selected

Step 8

National centre of expertise established & construction of underground demonstration facility

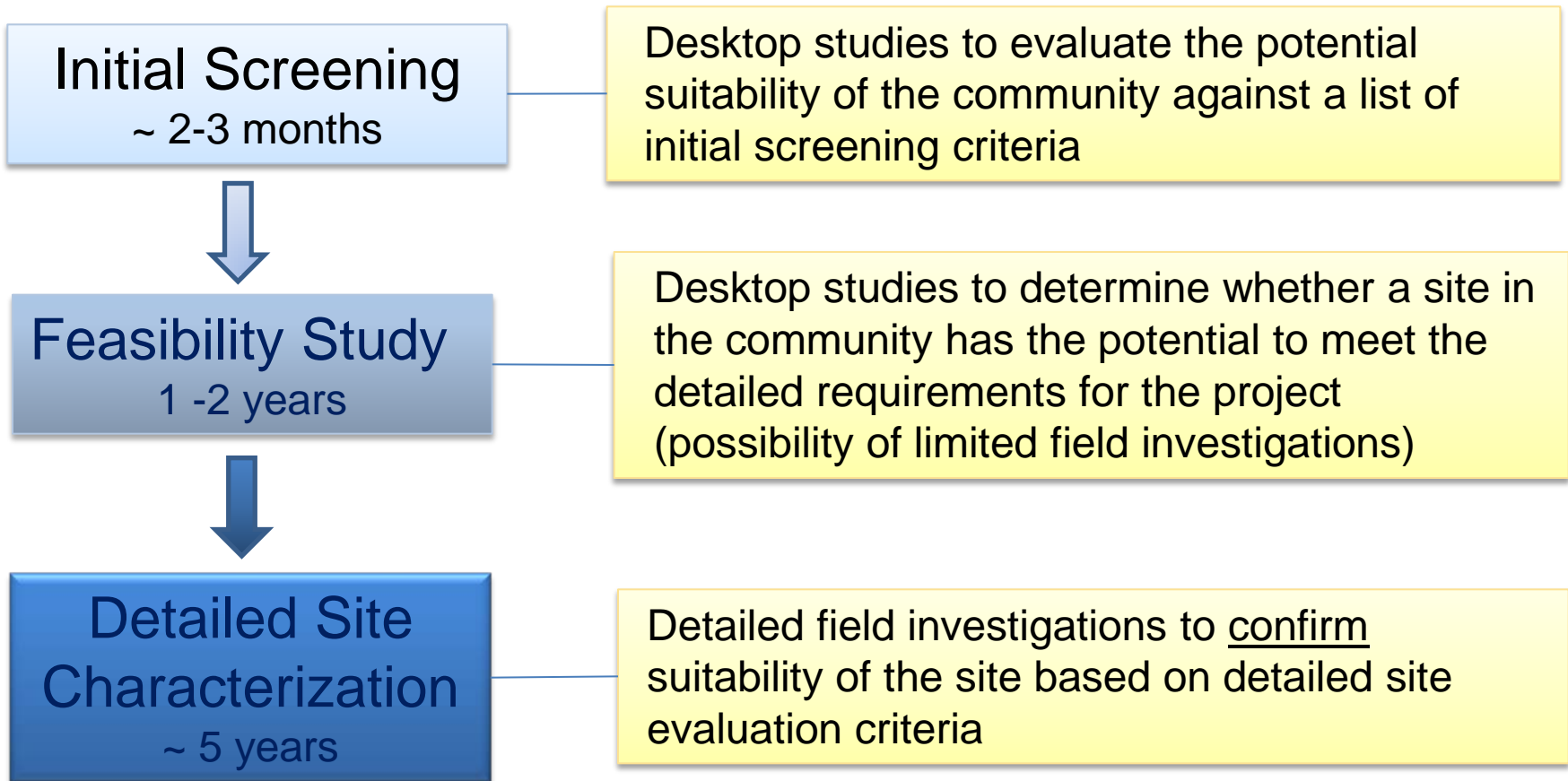
Step 9

Construction of repository begins...

Three Main Technical Evaluation Stages



Site evaluation process is driven by community's interest to participate:



Initiation of Site Selection Process

- » Site selection process initiated May, 2010
- » Supported by capacity-building program: *Invitation to Learn More*
 1. Briefings, information packages
 2. Access to independent expert advice
 3. Visit to interim storage facility to see how used fuel currently managed
 4. Support for community discussion of its long-term vision for sustainability
 5. Support for community to engage citizens in discussion of project
 6. Resources for small research projects by organizations, communities
- » On request of communities, NWMO provides initial screenings to explore potential suitability of the area

Status of Community Engagement

- » Since initiation of siting process earlier this year, NWMO has been responding to requests to Learn More:
 - ◆ Delivering detailed briefings on APM, site selection criteria and decision-making process
 - ◆ Responding to community requests for public information displays, kiosks
 - ◆ Arranging visits to OPG facilities to tour interim storage facilities
 - ◆ Supporting community engagement of independent expertise

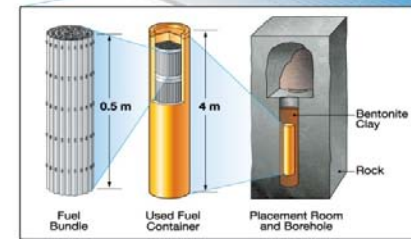
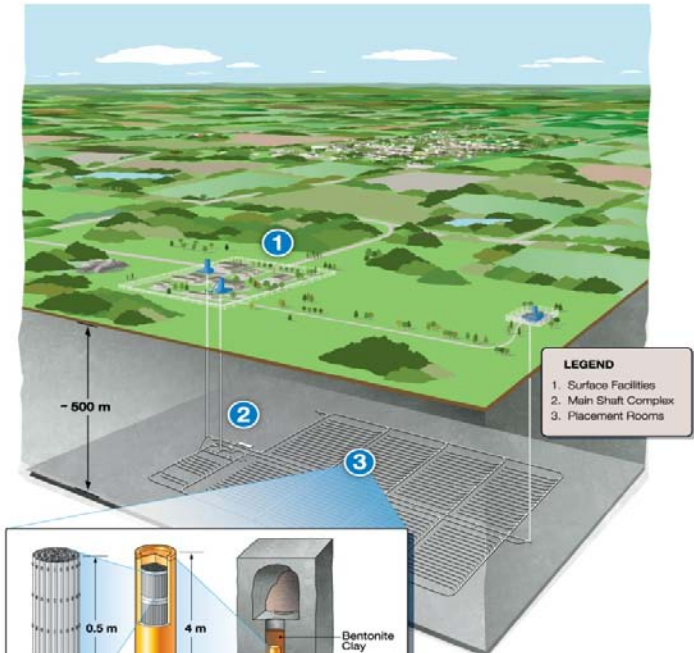
- » CNSC staff responding to requests of communities to meet for briefings on regulatory framework

- » NWMO delivering Initial Screenings on request of communities:
 - ◆ 4 communities
 - 2 in NW Ontario (Ignace and Ear Falls)
 - 2 in Northern Saskatchewan (English River First Nation, Pinehouse)

Repository Technical Development Program

» Main Objectives:

- ◆ Complete generic repository design development by 2018
 - Update reference conceptual design and safety case for crystalline rock by 2011 and submit to CNSC for pre-project review
 - Establish reference conceptual design and safety case for sedimentary rock by 2013 and submit to CNSC for pre-project review
- ◆ Further increase confidence in the deep geological repository safety case
- ◆ Enhance understanding of processes that may influence repository safety



APM Technical Program Areas of Work

» Engineering Design Optimization:

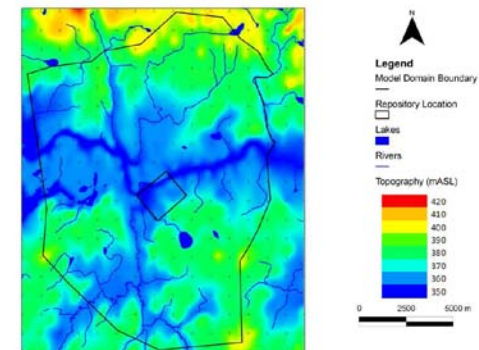
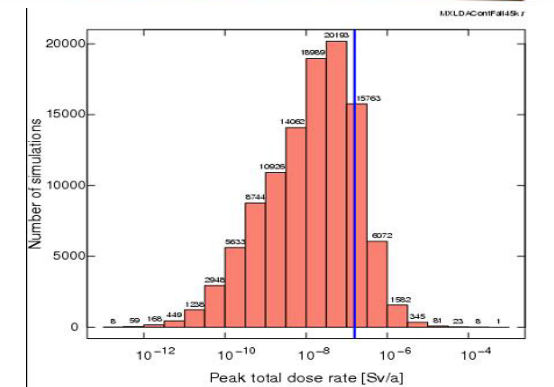
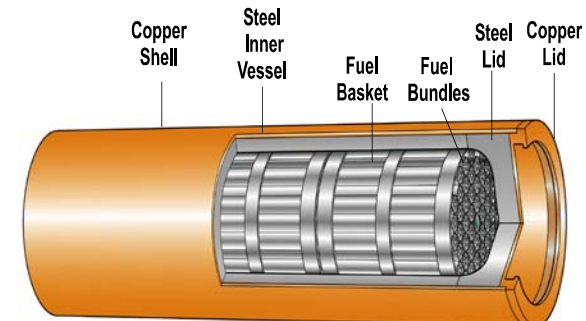
- ◆ container development: copper & steel
- ◆ packaging plant development
- ◆ repository design & facility layout
- ◆ sealing materials
- ◆ underground demonstration of technology

» Safety Case:

- ◆ 4th Case Study: DGR in crystalline rock
- ◆ 5th Case Study: DGR in sedimentary rock
- ◆ safety system model validation
- ◆ corrosion processes & lifetime prediction

» Geoscience:

- ◆ geosphere stability
- ◆ groundwater flow & coupled modelling
- ◆ glaciation & potential impacts on repository
- ◆ site characterization methods & techniques



Technical Program Participants

- » Exchange agreements with equivalent organization in Sweden, Finland, France and Switzerland
- » Joint Development Projects in repository engineering, geoscience and safety assessment:
 - ◆ Äspö Hard Rock Laboratory (Sweden)
 - ◆ Mont Terri Underground Laboratory (Switzerland)
 - ◆ Greenland Ice Sheet – Glaciation Modelling
 - ◆ Eleven Universities

Transportation System Development in Canada



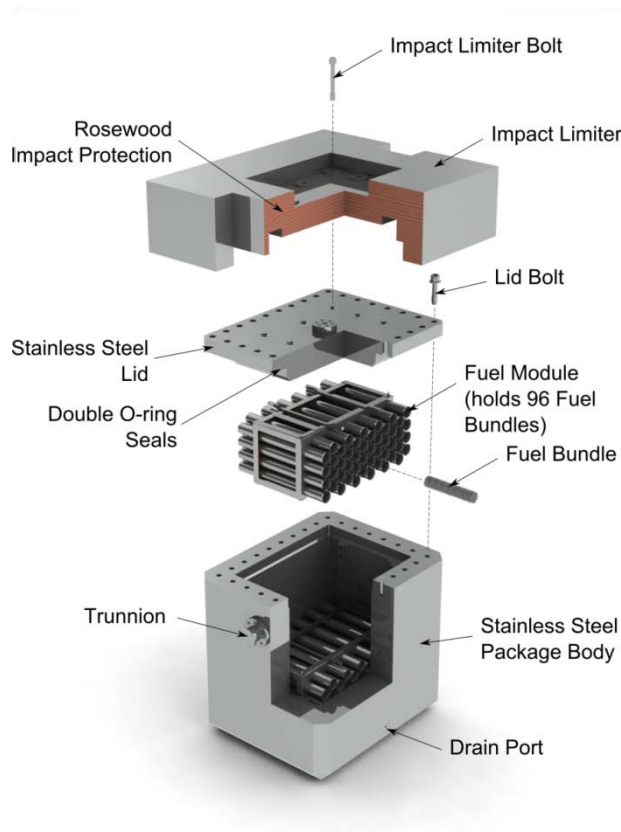
- » 1978 Canadian Nuclear Fuel Waste Management Program:
 - ◆ Repository technology developed by Atomic Energy of Canada Limited (AECL)
 - ◆ Transportation technology developed by Ontario Hydro (now OPG)

- » Demonstration transport cask developed in 1980s (designed, tested, certified and constructed)

- » Radiological risk assessment of transportation submitted in 1994 for public review (i.e., Seaborn Panel Hearings 1996/1997)

- » Transportation system costs produced in 2003:

- ◆ Approximately \$1 B for road, or mostly rail
- ◆ Approximately \$1.4 B for mostly water





- » Develop a framework for transportation feasibility studies assessment
 - ◆ Transportation infrastructure impacts, needs, and costs
 - ◆ Carbon footprint assessment
- » Prepare used fuel transportation logistics report
- » Update transportation radiological risk assessment (generic)
- » Briefings with governments and transportation organizations:
 - ◆ e.g. CNSC, Transport Canada, municipal leaders in nuclear communities, etc.
 - ◆ Communities involved in future assessments of transportation feasibility studies



Service arrangement between the CNSC and the NWMO

- » Pre-project review:
 - ◆ CNSC review of APM design concepts
 - ◆ Focused on conceptual designs and postclosure safety assessments for crystalline & sedimentary rock types
 - ◆ Agreement on process for pre-project review was reached

- » Meeting with communities at their request

- » Coordination among Federal Authorities on transportation issues