Conceptual Design of a Used Fuel Packaging Plant

Waste Management, Decommissioning and Environmental Restoration for Canada's Nuclear Activities, September 11-14, 2011

Kristina Gillin, Candesco
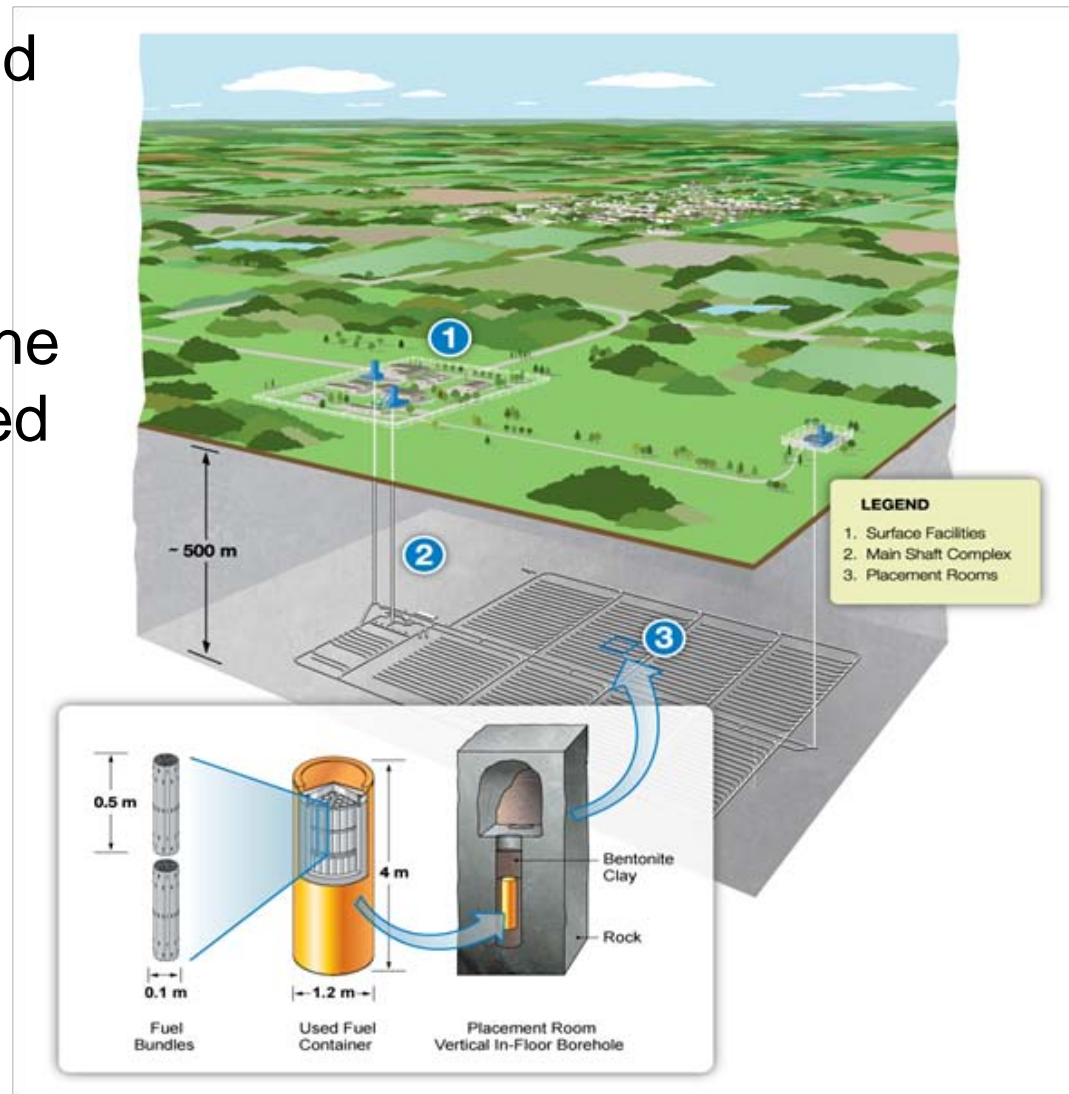Anders Nyström, SKB International
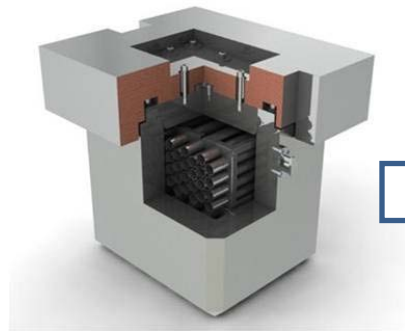Alan Murchison, NWMO

nwmo

NUCLEAR WASTE MANAGEMENT ORGANIZATION

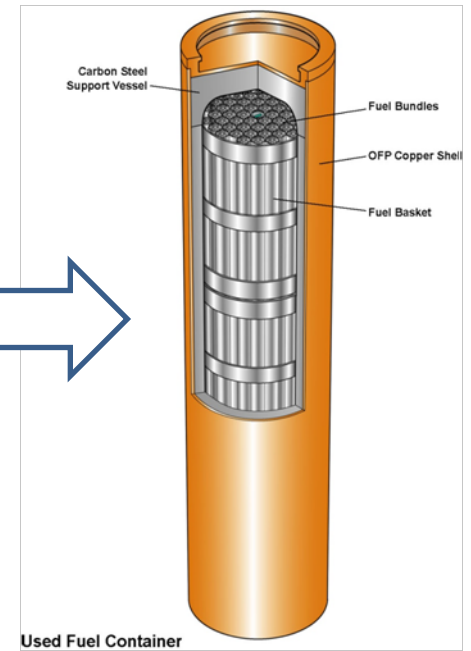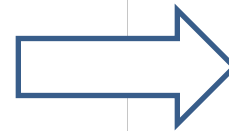SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Background

- Part of Adaptive Phased Management

- Conceptual design of the packaging plant updated by SKB International

LEGEND
1. Surface Facilities
2. Main Shaft Complex
3. Placement Rooms

~ 500 m

0.5 m

4 m

0.1 m

1.2 m

Bentonite Clay

Rock

Fuel Bundles

Used Fuel Container

Placement Room
Vertical In-Floor Borehole

Purpose

Used Fuel Packaging Plant

Carbon Steel Support Vessel
Fuel Bundles
OFP Copper Shell
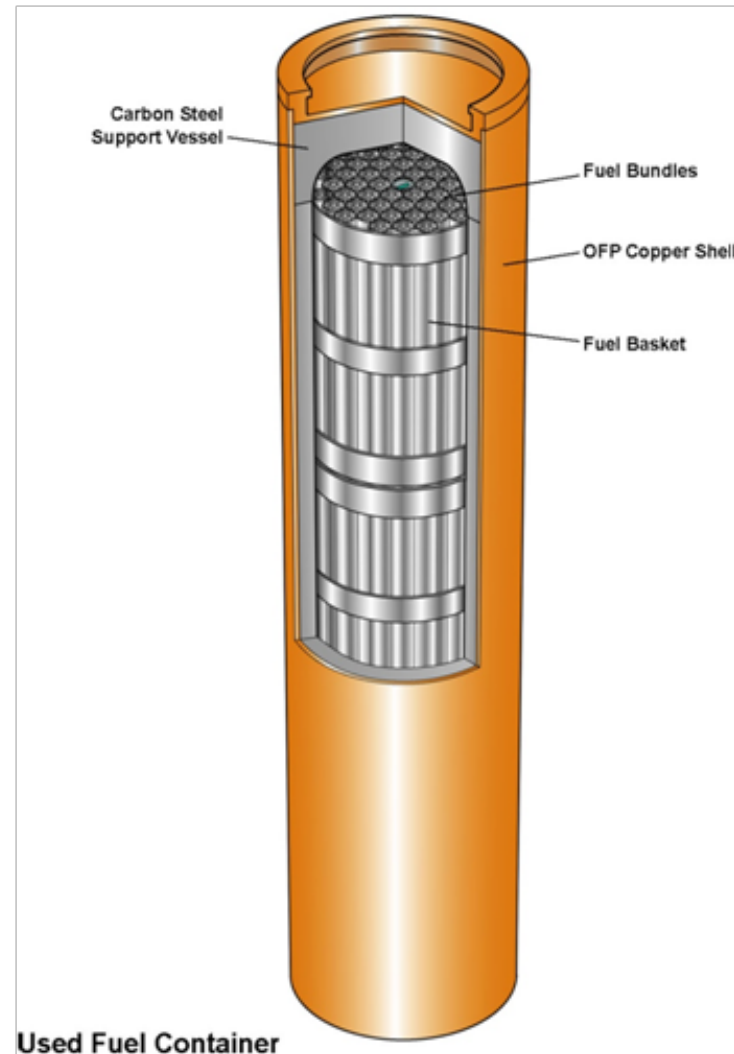Fuel Basket

Used Fuel Container

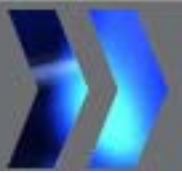# Key Assumptions and Requirements

- Located at repository site

- Used fuel arrival by road

- Surge storage for fuel and containers

- 120,000 bundles per year

- 360-bundle container design

Used Fuel Container – Reference Design

- 360 fuel bundles
  - Six layers
  - 60 bundles per layer

- Length ≈ 4 metres

- Diameter ≈ 1.2 metres

- Total mass ≈ 27 tonnes

Carbon Steel
Support Vessel

Fuel Bundles

OFP Copper Shell
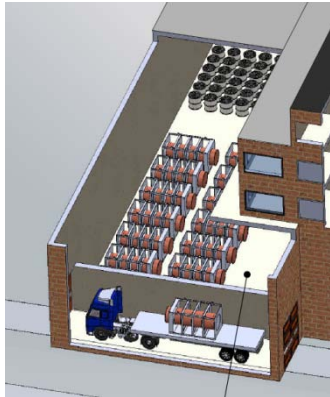
Fuel Basket

Used Fuel Container

Legend:
1. Receiving and Shipping Hall
2. Cask Preparation Cell
3. Module Storage Pool
4. Module Handling Cell
5. Fuel Handling Cell
6. Inerting Station
7. Welding Station
8. Machining Station
9. NDT Station
10. Filled Container Storage
11. Dispatch Hall
12. Receiving Hall for Empty Used Fuel Containers
13. Shielded Frame
14. Air-Cushion Transporter
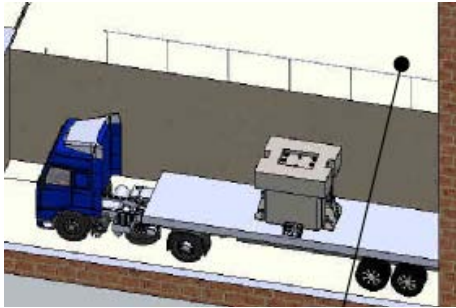
Empty Container Handling

➡ Unload from trailer
    ➡ Inspect and verify
        ➡ Install in shielded frame

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➡ Transfer to fuel handling cell
    ➡ Raise and dock with cell
        ➡ Remove fuel baskets

Used Fuel Handling

➡ Unload from trailer
   ➡ Remove impact limiter
      ➡ Dock with shielded cell

➡ Lift into cell
   ➡ Transfer to adjacent
         fuel handling cell

➡Push into fuel basket
   ➡ Verify identity
      ➡ Lower baskets
            into container

Container Sealing and Testing

Separate stations for:

➡ "Inerting" and bolting of steel lid

➡ Welding of copper lid

➡ Machining

➡ Non-destructive testing

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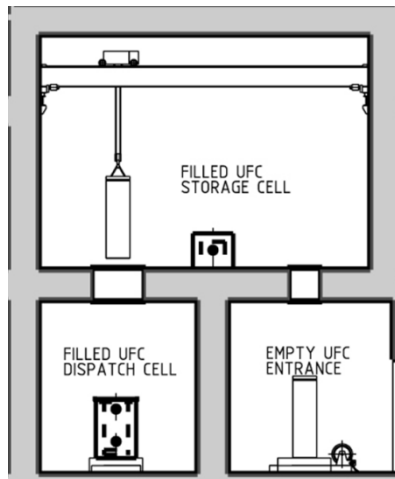
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➡ Remove from shielded frame
    ➡ Inspect and check for contamination
        ➡ Transfer to storage position

    ➡ Failed containers are reopened

➡ Lower into shielded transfer cask
    ➡ Install cask lid
        ➡ Transfer to rail wagon
            ➡ Dispatch

Conclusions

The used fuel packaging plant is:

- **Feasible** – but more work needed to optimize and demonstrate

- **Highly dependent** – on site location and container design

- **Important** – to ensure reliable delivery to the repository

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