

nwmo

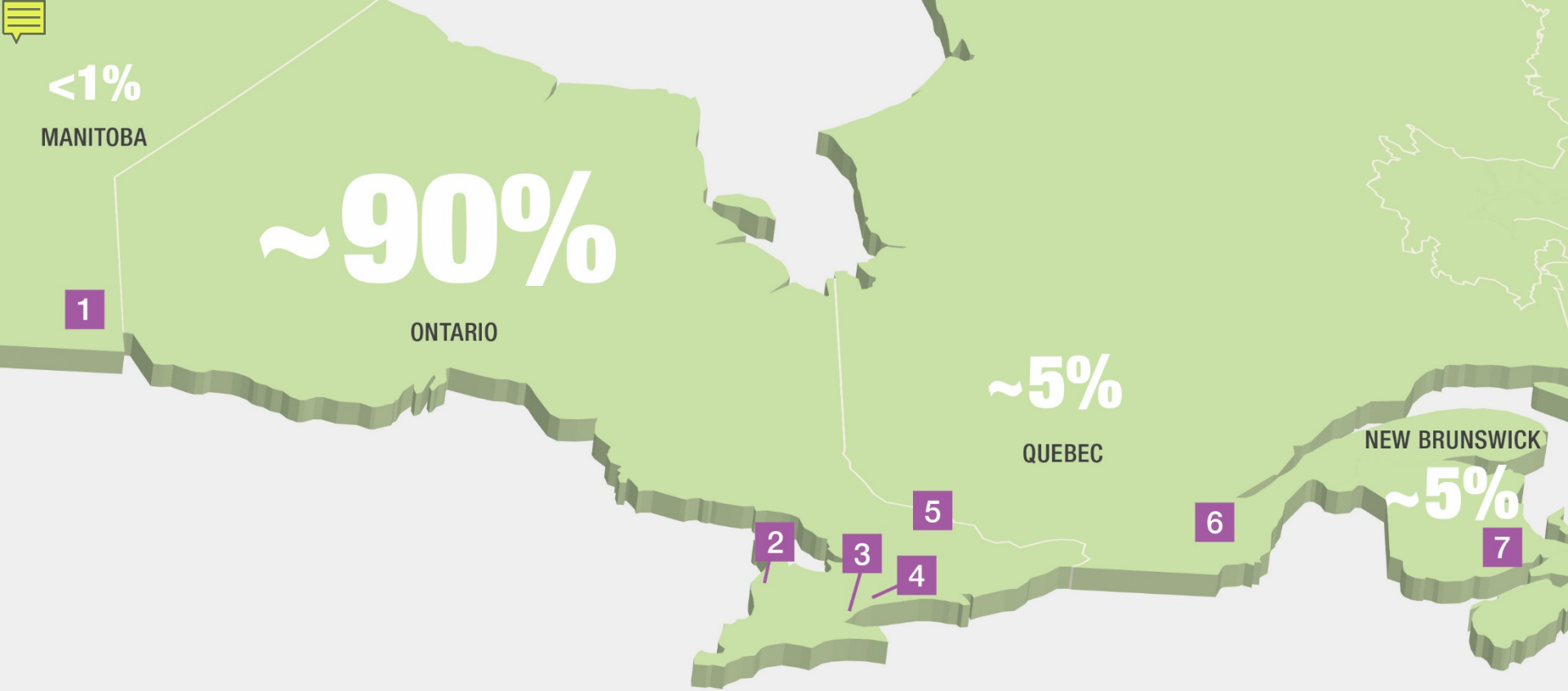
NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

SOCIÉTÉ DE GESTION
DES DÉCHETS
NUCLÉAIRES



Used Nuclear Fuel Transportation

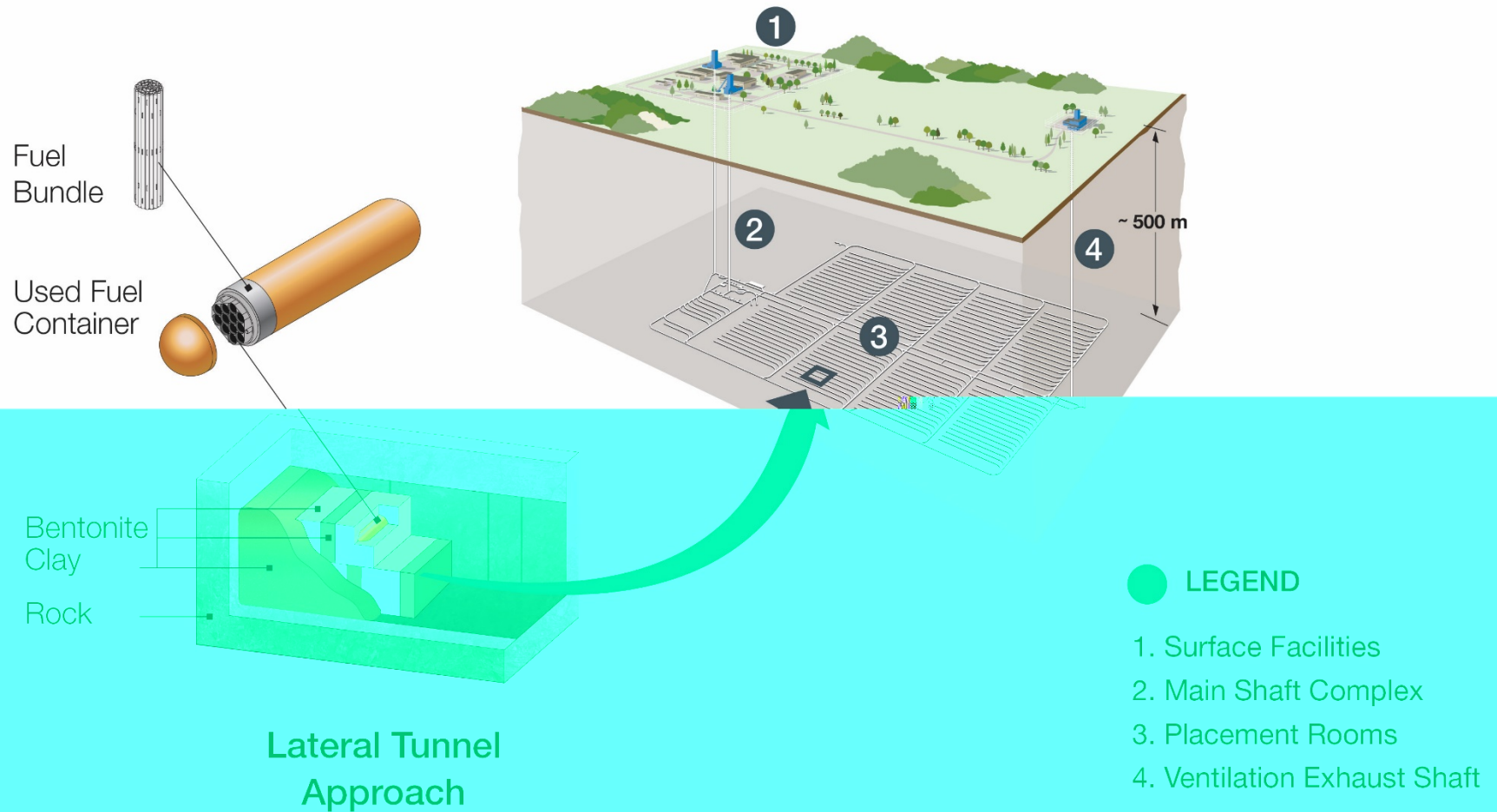
Yang Sui, Design Engineer



■ Interim Storage Facilities

1. Whiteshell Laboratories, Manitoba
2. Bruce Nuclear Generating Station, Ontario
3. Pickering Nuclear Generating Station, Ontario
4. Darlington Nuclear Generating Station, Ontario
5. Chalk River Laboratories, Ontario
6. Gentilly Nuclear Generating Station, Quebec
7. Point Lepreau Nuclear Generating Station, New Brunswick

Deep Geological Repository (DGR)





MANITOBA

ONTARIO

QUEBEC

NEW BRUNSWICK

1

2

3

4

5

● Preliminary Assessments Underway in the Area

- 1. Ignace
- 2. Manitouwadge
- 3. Hornepayne
- 4. Huron-Kinloss
- 5. South Bruce





● Preliminary Assessments Underway in the Area

- 1. Ignace
- 2. Manitouwadge
- 3. Hornepayne
- 4. Huron-Kinloss
- 5. South Bruce

■ Interim Storage Facilities

- 1. Whiteshell Laboratories, Manitoba
- 2. Bruce Nuclear Generating Station, Ontario
- 3. Pickering Nuclear Generating Station, Ontario
- 4. Darlington Nuclear Generating Station, Ontario
- 5. Chalk River Laboratories, Ontario
- 6. Gentilly Nuclear Generating Station, Quebec
- 7. Point Lepreau Nuclear Generating Station, New Brunswick





Transportation Objective

- Develop a safe, secure and socially acceptable transportation plan to move used nuclear fuel to the repository location.

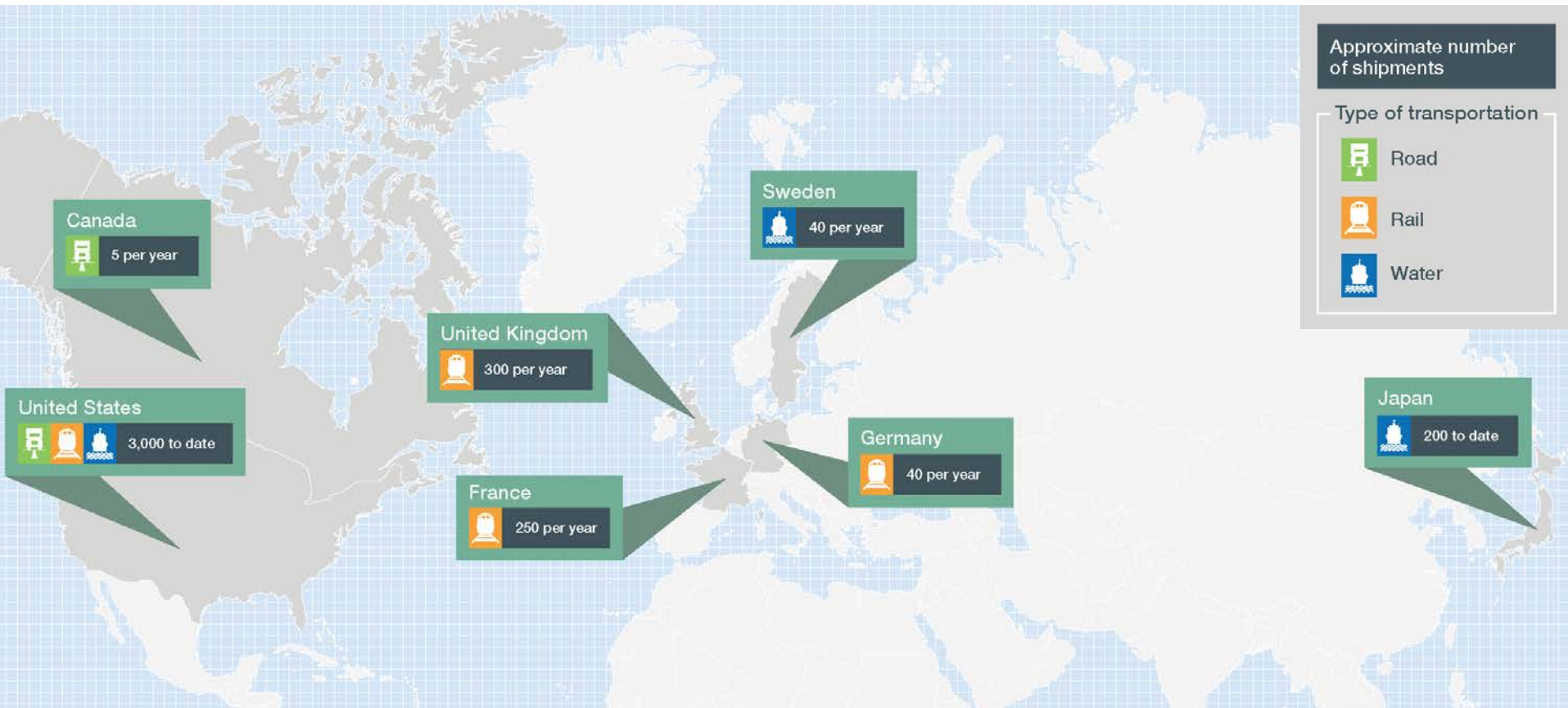




Transportation Objective

- Develop a safe, secure and socially acceptable transportation plan to move used nuclear fuel to the repository location.
 - Learning from international experience
 - Adhering to stringent regulatory framework
 - Designing and testing robust transportation packages
 - Transportation system planning
 - Emergency response planning

Used Nuclear Fuel Transportation Experience



50 years of safe transport internationally and in Canada: no serious injuries, health impacts, fatalities or environmental consequences attributable to the radiological nature of used nuclear fuel shipments

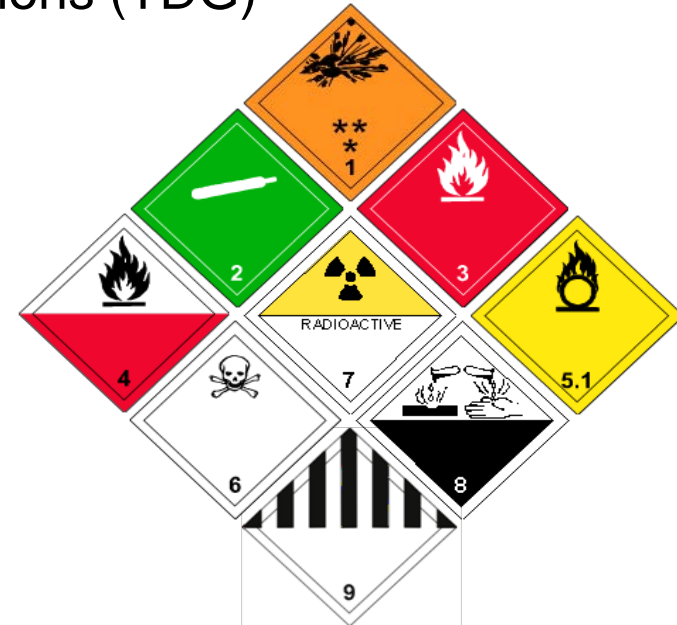
Radioactive Materials Transportation Regulation

Transport Canada

- Transportation of Dangerous Goods Regulations (TDG)
- Sets transport requirements for all 9 classes of dangerous goods

Canadian Nuclear Safety Commission

- Covers Class 7 Radioactive Materials
- Sets transport packaging requirements
- Packaging and Transport of Nuclear Substances Regulations (PTNSR)
- Based on International Atomic Energy Agency (IAEA) Standards





Used Nuclear Fuel Transportation Packages

- Packages must meet the design and safety requirements of Canadian regulations as set by the Canadian Nuclear Safety Commission (CNSC)
 - Based on International standards as set by the International Atomic Energy Agency (IAEA)
- Safety is built into the packages
 - The requirements include impact, thermal, and immersion to ensure that the package can withstand severe accident conditions
- CNSC reviews and certifies packages for the transport of radioactive materials in Canada

Transportation Package Options

Basket Transportation Package (BTP):

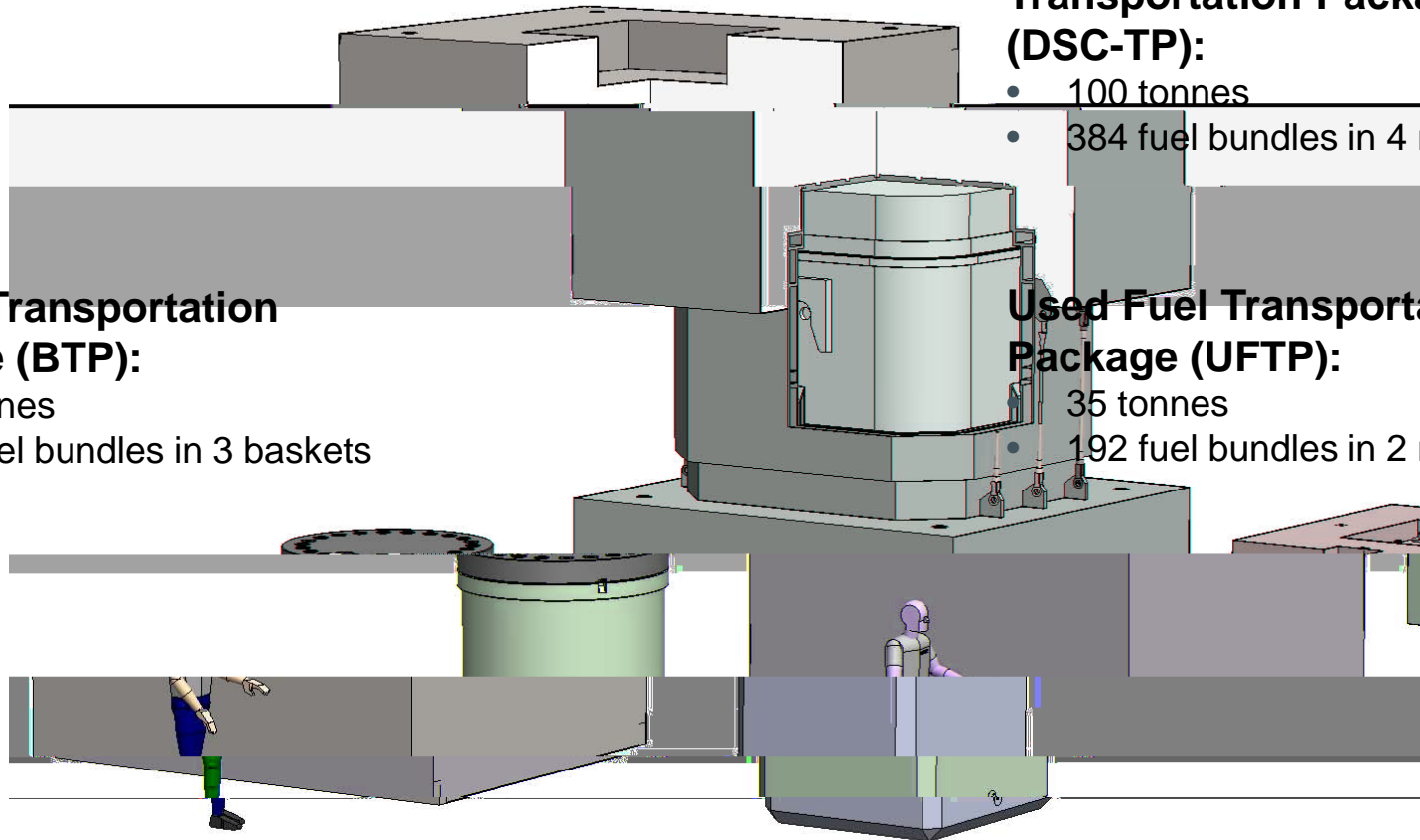
- 25 tonnes
- 180 fuel bundles in 3 baskets

Dry Storage Container – Transportation Package (DSC-TP):

- 100 tonnes
- 384 fuel bundles in 4 modules

Used Fuel Transportation Package (UFTP):

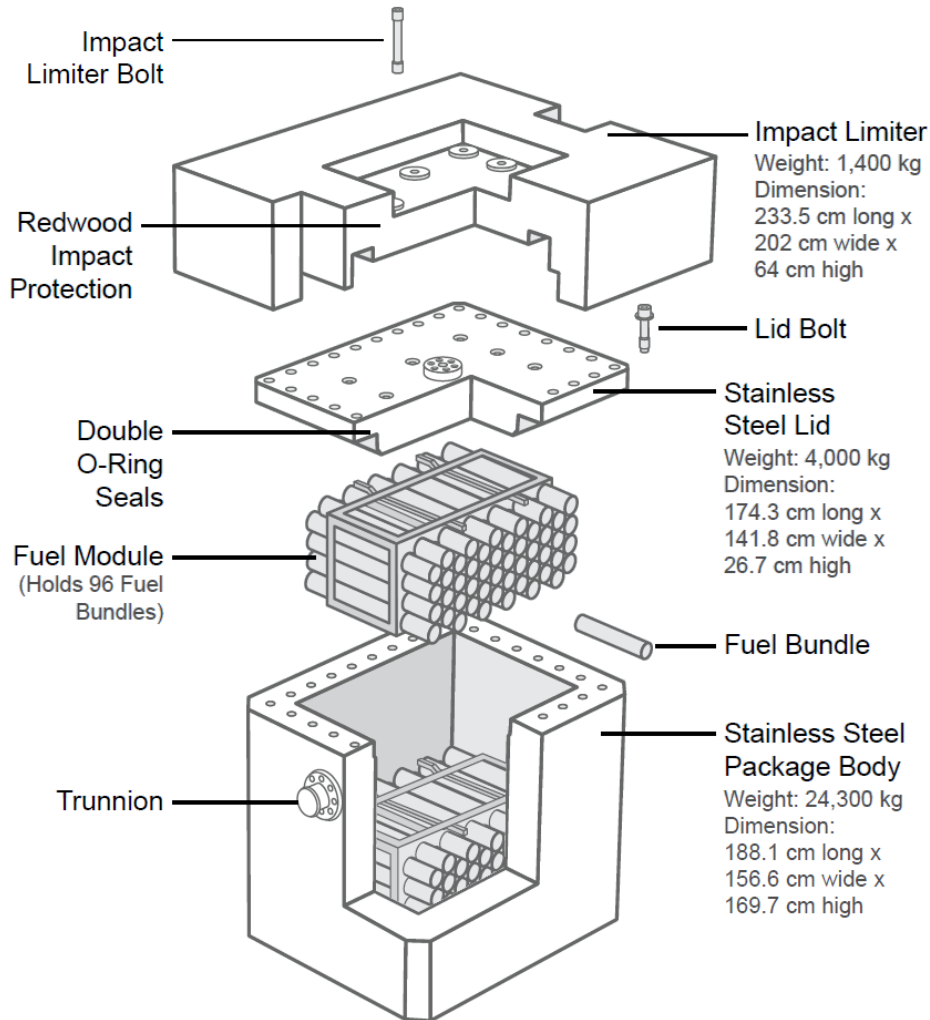
- 35 tonnes
- 192 fuel bundles in 2 modules



Under development for AECL style baskets (non-OPG used fuel)

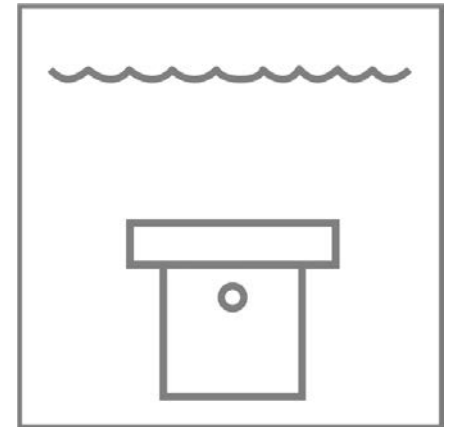
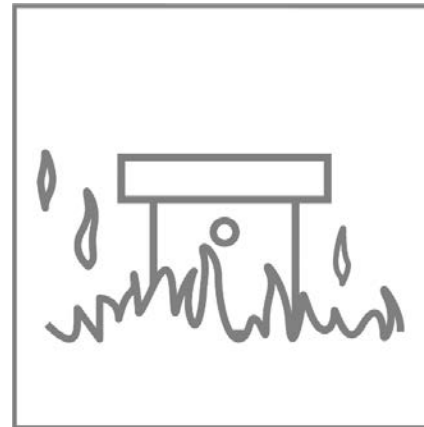
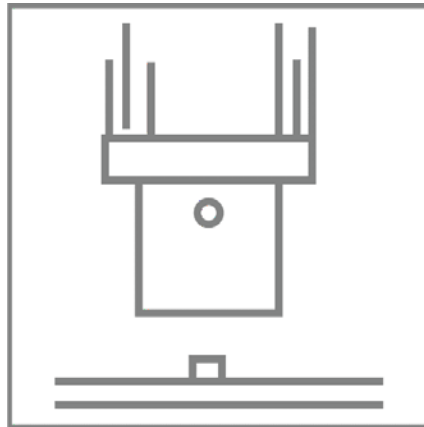
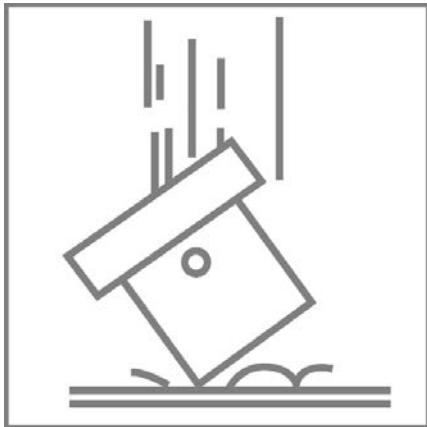
Certified to transport OPG used fuel

Used Fuel Transportation Package



Used Fuel Transportation Package: Tests

- Drop test → 9 m onto unyielding surface
- Penetration test → 1 m drop onto steel pin
- Thermal test → 800°C for 30 minutes
- Water immersion test → 15 m depth for 8 hours; 200 m for 1 hour





Used Fuel Transportation Package: Tests





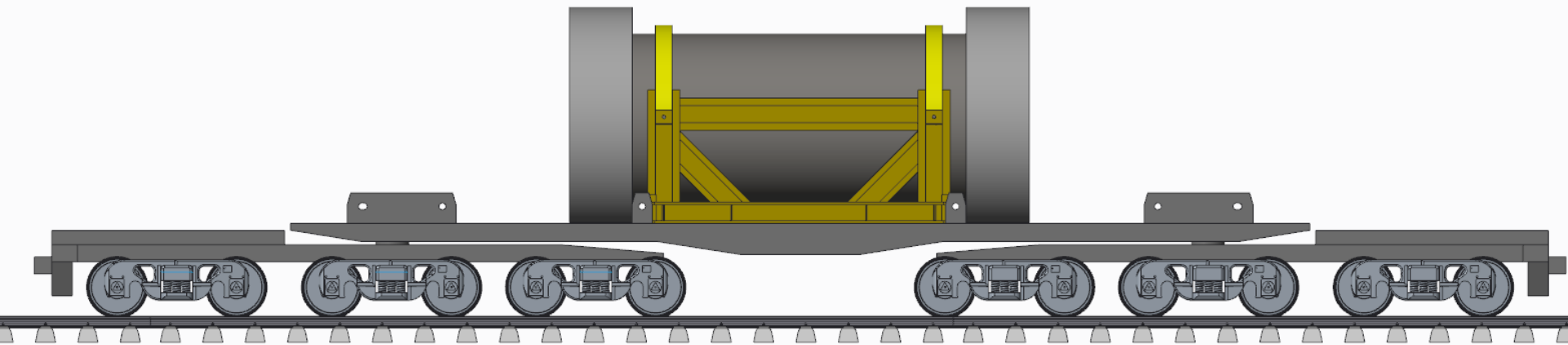
APM Transportation Video: Excerpt



Transportation Logistics



Transportation Logistics

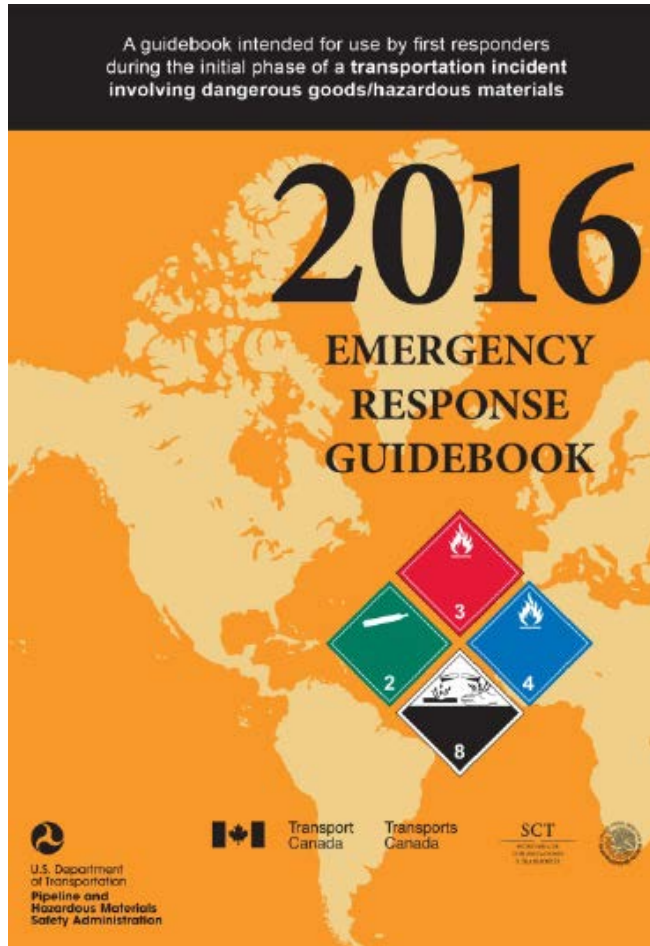




Transportation Logistics

- Assess logistics for moving used nuclear fuel from interim storage sites to potential host communities.
 - Road vs. rail transport
- Route assessments consider:
 - Infrastructure
 - Emergency Response Resources
 - Alternative Route Assessments
 - Safety Assessment – conventional accidents

Emergency Response Guidebook



GUIDE
163

RADIOACTIVE MATERIALS
(LOW TO HIGH LEVEL RADIATION)

ERG2012

POTENTIAL HAZARDS

HEALTH

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by shipping papers contain non-life endangering amounts. Partial releases might be expected if "Type A" packages are damaged in moderately severe accidents.
- Type B packages, and the rarely occurring Type C packages, (large and small, usually metal) contain the most hazardous amounts. They can be identified by package markings or by shipping papers. Life threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation and testing of packages, these conditions would be expected only for accidents of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type A, Type B or Type C packages. Package type will be marked on packages, and shipment details will be on shipping papers.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/h one meter from a single, isolated, undamaged package.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire control may cause pollution.

FIRE OR EXPLOSION

- Some of these materials may burn, but most do not ignite readily.
- Radioactivity does not change flammability or other properties of materials.
- Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475°F) for a period of 30 minutes.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first.** If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. • Stay upwind. • Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

PROTECTIVE CLOTHING

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

EVACUATION

Large Spill

- Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire

- When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.

Page 264

See Guide 163: Radioactive Materials



Summary

- Develop a safe, secure and socially acceptable transportation plan to move used nuclear fuel to the repository location.

