



CANADIAN INTERIM STORAGE PLANS & INTEGRATION WITH DISPOSAL

Mohan Rao, Ontario Hydro

Technical Challenges to Interim Storage of Spent Fuel
**US Nuclear Waste Technical Review Board Meeting,
Dallas, Texas, November 1-2, 1993**

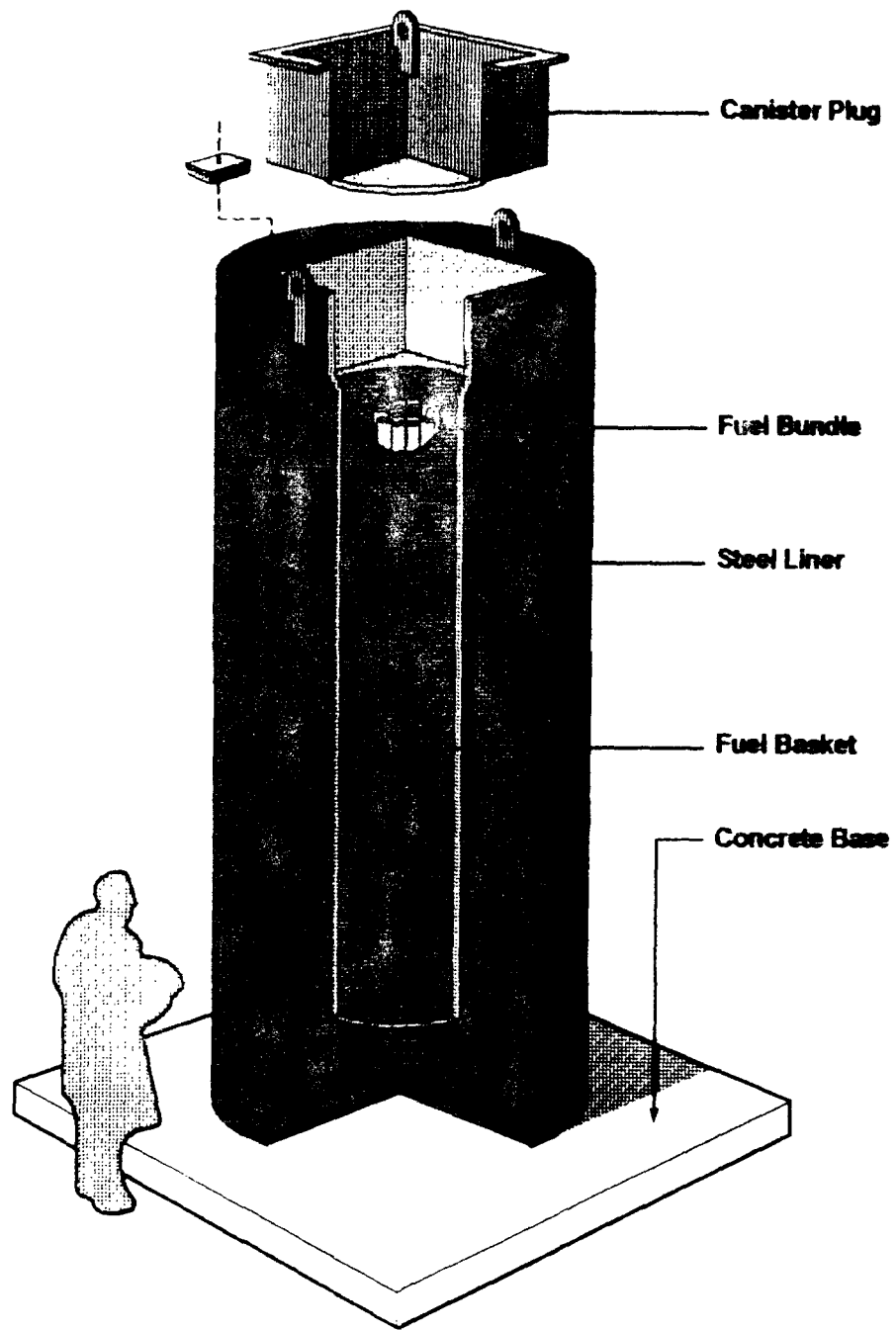
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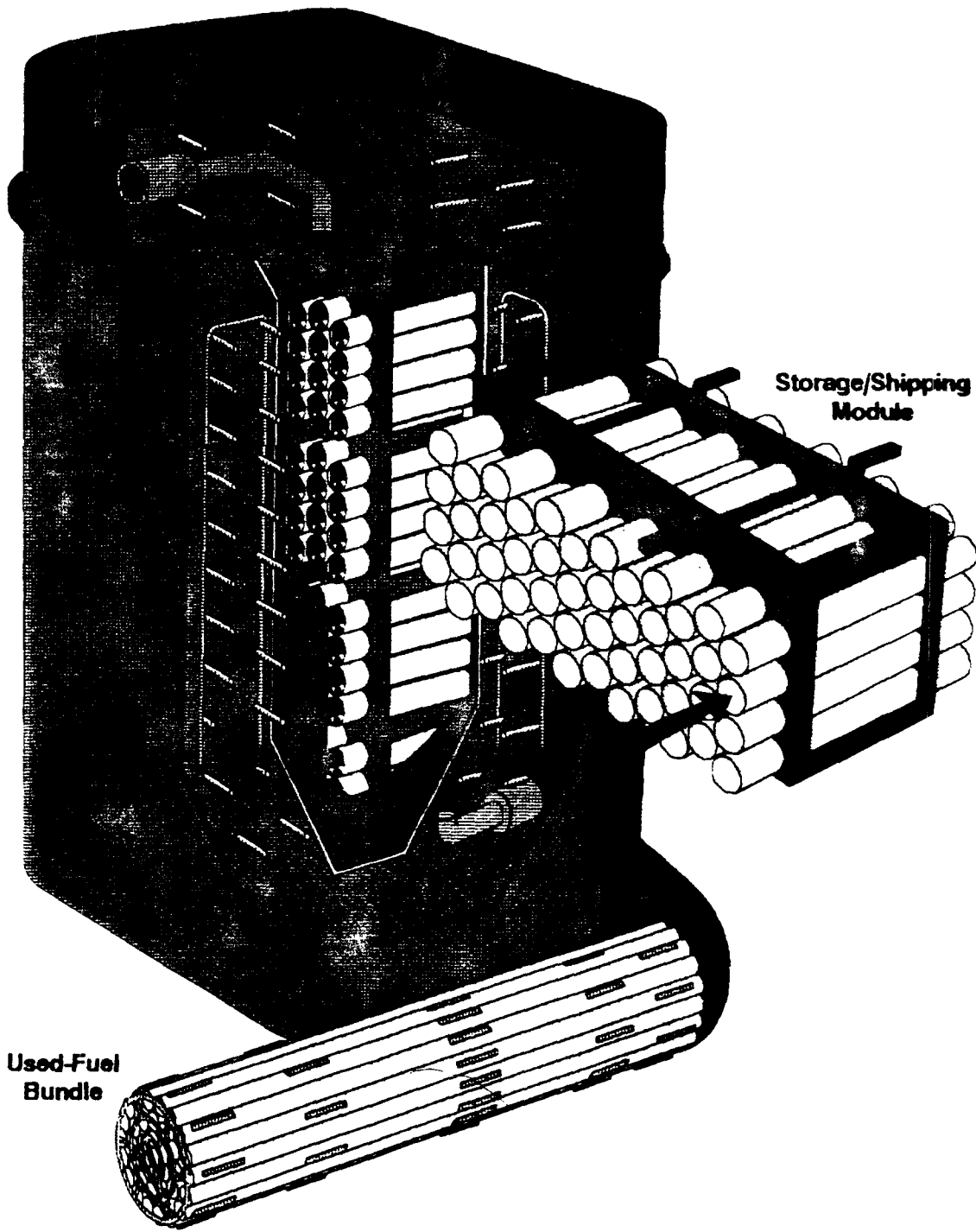
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STORAGE HIGHLIGHTS IN CANADA

- **Seven CANDU Stations**
- **Used Fuel Bundles (17,000 Mg)**
- **Mostly wet storage; 700 Mg in dry storage**
 - **pools**
 - **Canisters/Dry Storage Containers (DSCs)**



DRY STORAGE CANISTER



Dry Storage Container (DSC)

FUTURE PLANS/INTEGRATION HIGHLIGHTS

- **Disposal Plan**
- **Extended storage as a contingency**
- **Wet storage integration**
 - **Defuelling/transport/disposal**
- **Dry storage integration**
 - **Defuelling/transport/disposal**
 - **Direct disposal (DSCs)**

DSC is being developed as a multi-purpose container.

Expanding clay & crushed granite

Crushed granite and clay

Concrete
Plug

to surface

Access
Tunnel

DSC - ROLE AS A MULTI-PURPOSE CONTAINER (MPC)

1. Reference concept

- **three barriers, three fuel handling steps**

2. Alternate/future concept

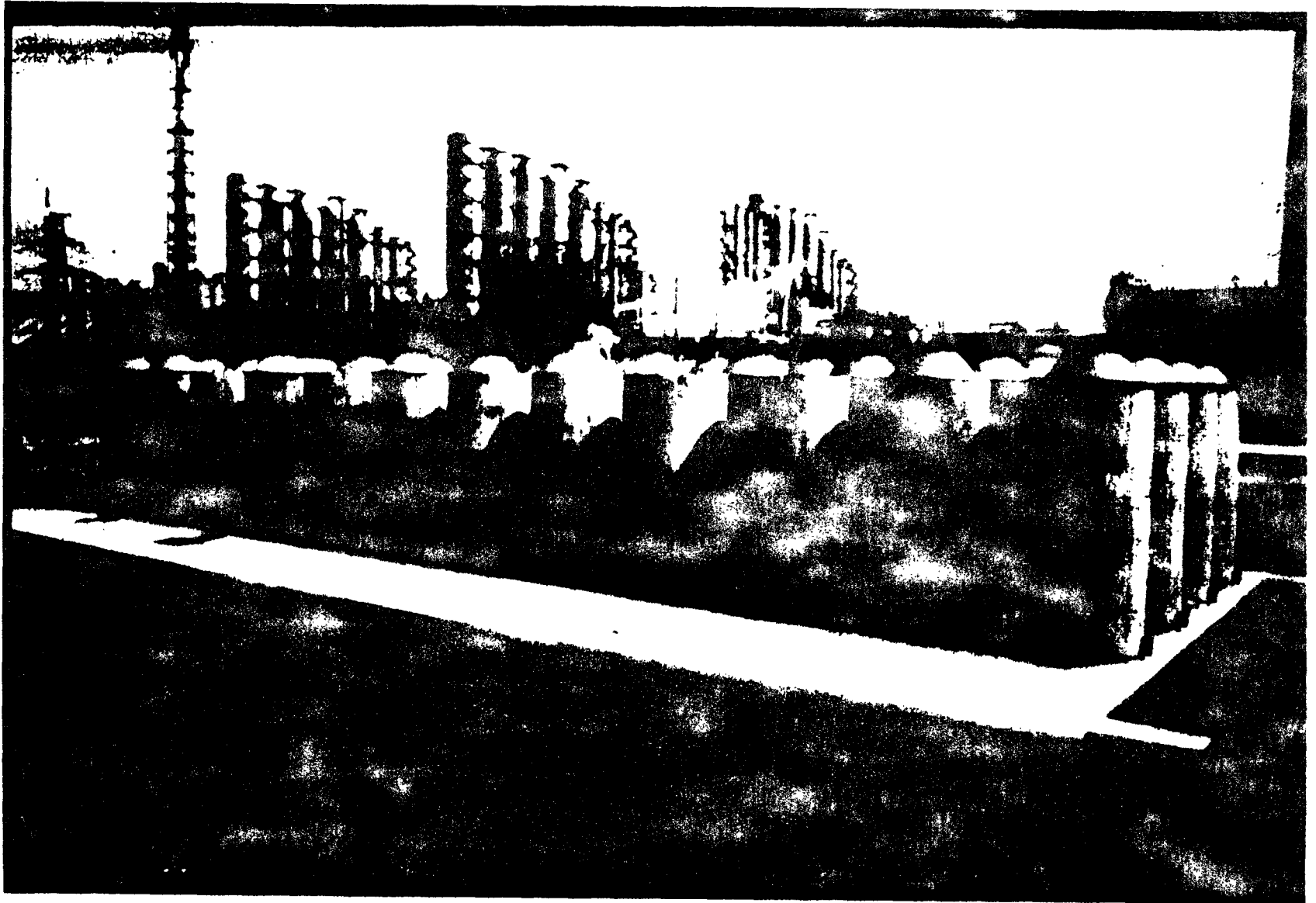
- **DSCs as MPC**
- **cost/benefits**

DSC - BACKGROUND

- **On-site waterpools getting filled**
- **Dry storage developed as a storage alternative**
- **Design is suited for multi-purpose use (storage, transportation and disposal)**
 - **will be used at Pickering**

**Pickering will have Canada's
"MRS"**

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DRY STORAGE - DOUGLAS POINT

DSC - DEVELOPMENT

- 1. DSC - approved storage container**
 - **demonstration**
 - **Pickering facility**
 - **future facilities - Bruce**
 - **extended storage**

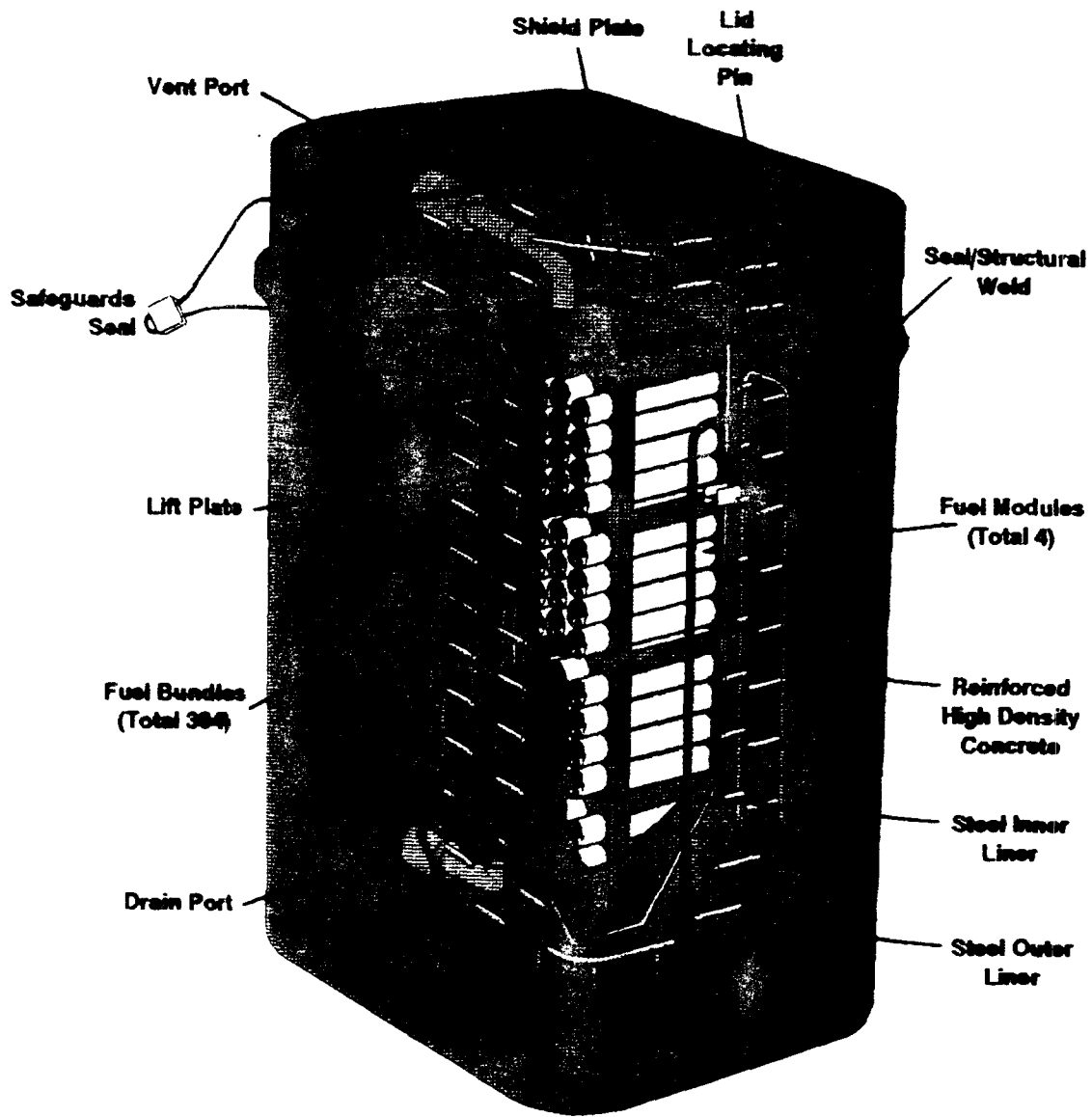
- 2. DSC - transportation**
 - **licensing tests**

- 3. DSC - disposal container concept**
 - **number of issues**
 - **need for significant R&D**

DSC - STORAGE CONTAINER

- **2.1 m x 2.2 m x 3.5 m,
384 fuel bundle payload,
500 mm reinforced HD
shielding concrete**
- **Two prototypes**
- **Licensed for use at Pickering**
 - **Phase I - 62 DSCs**
 - **Phase II - 700 DSCs**
- **Above-ground building
(first stage)**

**DSC is a licensed
storage concept**



DSC DETAILS

DSC - TRANSPORTATION CONTAINER

- **Foam-core, steel-lined impact limiters**
- **Additional armour**
- **Type B test compliance (Impact, puncture, fire)**
- **Desktop analysis**

**DSC is considered
transportable**



**DROP TEST
(PHOTOGRAPH 1)**



**DROP TEST
(PHOTOGRAPH 2)**



**DROP TEST
(PHOTOGRAPH 3)**

DSC - EXTENDED STORAGE

- **Concrete durability research**
- **Fuel durability research**

**DSC is a potential component
for extended storage.**

DSC - DISPOSAL CONTAINER CONCEPT

- **Reduced Handling**
- **Reduced demand on strategic metals (Titanium)**
- **Better shielding/access**

**Barrier effectiveness of DSC
in disposal is being studied**

DSC - KEY DISPOSAL CONDITIONS

- **500 year containment**
- **13 MPA pressure**
- **Less than 100°C temperature**
- **5 W bundle heat**
- **Environmental Conditions**

**DSC conditions more
stringent than storage
and transportation**

DSC/REPOSITORY COMPATIBILITY ISSUES

1. Mechanical handling

- **vault design**
- **container emplacement**
- **overpack**

2. Structural performance

- **strength**
- **containment**

3. Concrete durability

- **aging effects**
- **thermal effects**
- **wasteform/geochemical effects**

4. Liner corrosion

- **inner/outer liners**
- **microbial**

DSC - REPOSITORY COMPATIBILITY ISSUES (cont'd)

5. Hydrogen generation

- **production/transport**
- **effect on disposal performance**

6. Chemistry-related issues

- **hyperalkaline media**
- **corrosion**

7. Performance/cost issues

- **overall safety/system cost**
- **retrievability**

**Some degree of resolution
of issues needed for
taking up R&D**

CONCLUSIONS TO DATE

- **DSC is licensed storage concept and licenseable for transport**
- **OH committed to the use of DSC for interim storage**
- **DSC has the potential as a disposal barrier**
- **Disposal issues need to be resolved and commitment needed for R&D**
- **DSC is economic for storage alone; additional savings from the use of DSC as MPC likely**