MPC TRANSPORTATION CASK

J. R. Clark

MPC Project Manager
Civilian Radioactive Waste Management System
Management and Operating Contractor

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MPC

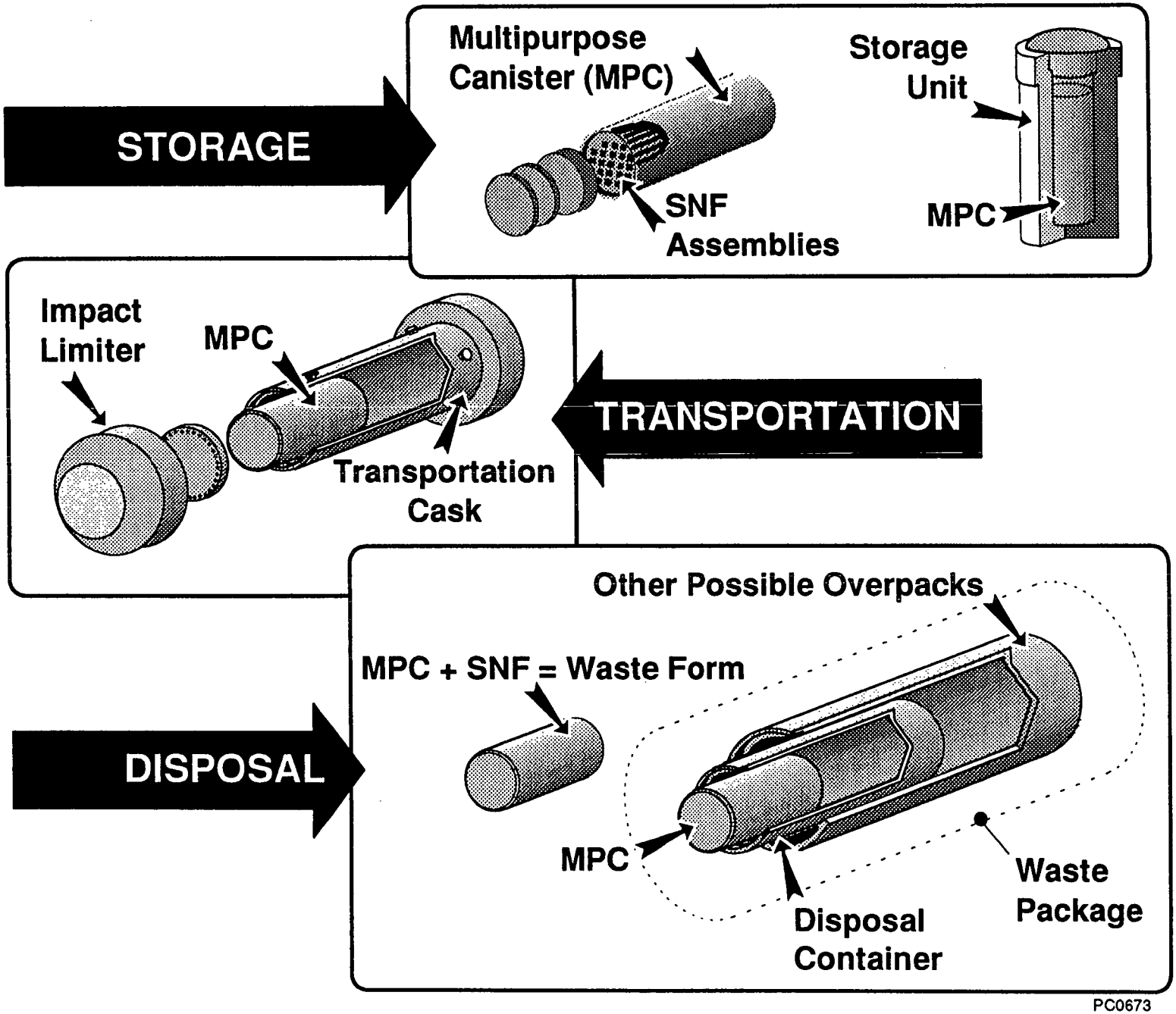
The MPC is a sealed metallic container containing multiple spent nuclear fuel assemblies in a dry, inert environment and overpacked separately and uniquely for the various system elements of storage, transportation, and disposal.

MPC System

The MPC System is composed of:

- the canister
- a transportation cask
- a rail car
- a storage unit
- a transfer cask
- ancillary equipment

Multipurpose Canister (MPC) System



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Benefits of MPC System

- **MPC System allows the same package to be used for:**
  - **assembly loading**
  - **at-reactor storage if required**
  - **transportation to repository or MRS**
  - **MRS storage**
  - **disposal**

Benefits of MPC System (Continued)

- Reduced handling of individual assemblies
- Reduced number of shipments
- Lower total system life cost
- Offset utility costs for at-reactor storage
- Near term relief for utilities by 1998
- Standarized design
- Reduction in low-level radioactive waste generation
- Allows early spent fuel pool decommissioning

Conceptual Design

- CDR for MPC System issued in 1993
- Included conceptual design of large and small transportation casks (75 ton and 125 ton)
- The CDR was used to support adoption of the MPC System into the CRWMS baseline

RFP for MPC System

- Issued on June 3, 1994
- Bids due October 3, 1994 (Price on Oct 17)
- Contract(s) to be awarded by March 1995
- Target MPC deployment in early 1998
- Over 100 copies have been sent out
- Bidders' conference held on June 16, 1994

Scope of RFP

- **Three phase procurement**
  - **Phase 1: Design & SAR Preparation**
  - **Phase 2: Certification and prototype fabrication**
  - **Phase 3: Fabrication of MPCs for 1998 & 1999**
- **Phase 1: Design of Large and Small MPC Systems**
  - **MPC**
  - **transportation cask & rail car**
  - **storage mode**
  - **on-site transfer system**
  - **ancillary equipment**

Scope of RFP (Cont'd)

- **Phase 2: (Optional)**
  - **Certification of all of the above**
  - **Regulatory testing of 1/4 scale model of transportation cask**
  - **Fabrication and testing of prototypes**
- **Phase 3: (Optional)**
  - **Fabrication and delivery to utilities of MPCs for 1998 and 1999 requirements**

MPC Certification Requirements

- **Design and get NRC certification (10 CFR 71) for the transportation cask including the MPC**
- **Design and get NRC certification (10 CFR 72) for the storage mode including the MPC**
- **Do not include anything in the MPC design which would preclude licensing for disposal under 10 CFR 60.**

Prescriptive Requirements

- Canister Material
- Basket Materials
- Excess Absorber in Basket
- Cladding Temperature Limits
- Allowable Heat Load

Transportation Cask Requirements

- Complete systems
  - cask
  - rail car
  - ancillary equipment
- Must meet all NRC regulations in 10 CFR 71
- Must meet Association of American Railroads requirements for unrestricted interchange
- Cask provides containment, not the MPC
- Large and small systems

Utility Requirements

- 88 to 103 reactors can handle 125 ton system
- 14 to 23 reactors can handle 75 ton system
- From 4 to 19 reactors can not handle either system

Large and Small Systems

- **Maximum weight on crane hook:**
  - **Large < 125 tons**
  - **Small < 75 tons**
- **Maximum transport weight including rail car:**
  - **6 axle car < 394,500 lbs**
  - **4 axle car < 263,000 lbs**
- **Maximum dimensions:**
  - **Length < 210 inches - both**
  - **Loading pit**
    - » **Large 8' x 8'**
    - » **Small 7' x 7'**

Design Basis Spent Nuclear Fuel

	PWR	BWR
Fuel Cell Opening	**9" square**	**6" Square**
Decay Time (Years)	**5 (storage)** **10 (transport)** **20 (disposal)**	**5 (storage)** **10 (transport)** **20 (disposal)**
Large & Small MPCs		
U-235 Enrichment, w/o	**3.75**	**3.75**
Burnup, MWD/MTU	**40,000**	**40,000**
Enhanced Fuel Acceptance MPCs		
U-235 Enrichment, w/o	**5.83**	**4.14**
Burnup, MWD/MTU	**60,000**	**50,000**
Stainless Steel Clad SNF MPCs		
U-235 Enrichment, w/o	**4.94**	**3.93**
Burnup, MWD/MTU	**55,000**	**22,500**

Performance Requirements
Storage and Transportation

Structural: 9 Meter Transport Drop and 1 Meter Pin Puncture:
MPC basket may not yield or buckle
Transportation cask inner wall may not buckle

Criticality: K-effective < 0.95
75% credit for fixed neutron absorbers in basket
Burnup credit for large MPC PWR basket
No credit for moderator exclusion (flooded)

Performance Requirements
Storage and Transportation (Cont'd)

Shielding: Dose rate < 10 mrem/hr at 2 meters from package
Dose rate < 200 mrem/hr on cask surface
Dose rate on MPC lid surface ALARA

Thermal: Transportation Fire Accident: 800 C for 30 minutes
Storage fuel cladding temperature < 340 C (10 year)
< 380 C (5 year)

Containment: Transportation cask is containment for transport
MPC is containment for storage

Cover Gas: Helium or argon (inert gas)

Disposal Interface Requirements

Criticality:	**k-effective < 0.95**
	75% credit for fixed neutron absorbers in basket
	Burnup Credit for all MPC baskets
	No credit for moderator exclusion (flooded)
	No credit for water gaps in small PWR baskets
	Provisions for addition of filler materials
Thermal:	**Maximum MPC heat load is 14.2 kW for MPC**
	Fuel cladding temperature < 350 C
	MPC surface temperature < 225 C
Containment:	**MPC has no containment function in disposal**
Cover Gas:	**Air**

Disposal Interface Requirements (Cont'd)

Materials: **MPC Shell and Lids - Low carbon austenitic Stainless steel or stabilized austenitic stainless steel**

Shield Plug - Depleted uranium, steel, or other high density material (no lead) sheathed in stainless steel

SNF Basket (Structural) - Low carbon austenitic stainless steel or stabilized austenitic stainless steel

SNF Basket (Neutron Absorber) - Boron or B4C dispersed in austenitic stainless steel or aluminum alloy matrix

Other Requirements

- Intermodal capability
- Compatible with OSS/OST
- Remote handling capability
- ALARA
- Equipment intensive
- Option for full scale testing
- Human factors and system safety