

**Minutes from the August 27, 1993 Meeting
Concerning
Burnup Credit as it relates to the Multi-Purpose Canister**

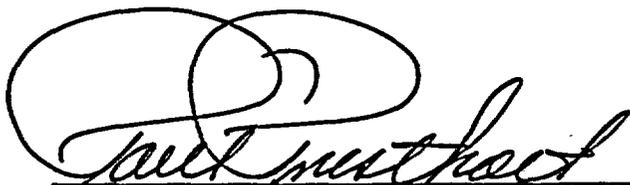
On August 27, 1993, staff from the Nuclear Regulatory Commission and representatives from the Office of Civilian Radioactive Waste Management (OCRWM), Department of Energy (DOE), met to discuss the current development status of the Multi-Purpose Canister (MPC) concept and the DOE position on technical issues which must be resolved related to burnup credit. In addition, the meeting was to establish NRC and DOE staff interactions at all levels and on all issues relating to the applicability of burnup credit for storage, transportation, and disposal. The list of attendees is attachment 1.

The meeting opened with DOE providing an overview of the problem with the main focus on burnup credit. This was followed by a DOE presentation on the description of the MPC system, recent MPC activities, perceived advantages of the MPC system, major MPC implementation milestones, and the need for burnup credit. A copy of the DOE handout is attachment 2. Next, DOE discussed the burnup credit program including: 1) background and progress relative to storage and transportation; 2) MPC system impacts; 3) burnup credit strategy; 4) NRC/DOE technical exchanges; and 5) a summary. This presentation is included in attachment 3. Finally, DOE concluded its presentation by furnishing a list of contacts within the OCRWM office concerned with the MPC or burnup credit. The list is attachment 4.

Following the presentations a number of potential issues were brought up by the NRC. These were: 1) ingress of a moderator such as water, over time, at a repository; 2) accommodating fuel different from standard reactor fuel, which includes fuel in the DOE inventory and new forms of fuel that will come into use in the years ahead; 3) consideration of fuel slumping in the canister; 4) development of a standard MPC terminology; and 5) assurance that a standard package will not drive future technical decisions such as the size of the repository, the underground configuration, etc. Two action items were taken by the DOE staff. These were: 1) to furnish the technical manuals for the "FORK" detector that measures gross neutrons and gross gammas and may be suitable for verifying proper loading of a canister; and 2) to develop a drawing that shows the relationship of the MPC to the different overpacks and to give a name to each part agreeable to DOE and NRC thereby establishing a standard terminology. DOE stated that a topical report on a burnup credit strategy for Pressure Water Reactor (PWR) can be expected during the third quarter of calendar 1994, and expressed its need for a quick evaluation by NRC.

The State of Nevada made three points in closing. First, there needs to be more discussion on the wide range of fuels that presently exists in the industry. With the trend towards longer fuel cycles and higher enrichments, DOE should evaluate fuel characteristics that may come in the future. Second, there are other alternatives to the MPC that provide compatibility across the elements of the waste program. Burnup credit should be applicable to these

other concepts as well and not be limited to just MPCs. Finally, the State is concerned that decisions are being made relative to storage and transportation elements of the program that could affect the thermal loading of the repository. NRC and DOE must consider the thermal design decision and be driven by safety and not by system optimization.



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Repository Licensing and Quality Assurance
Project Directorate
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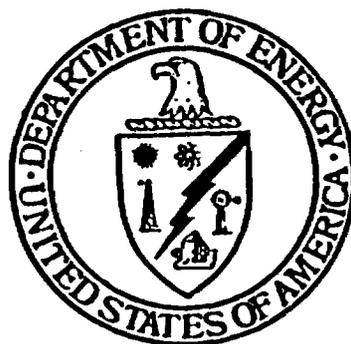
John P. Roberts, Director
Regulatory Compliance Division
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Steve Frishman	State of Nevada on the phone	

**U.S. Department of Energy
Office of Civilian Radioactive Waste Management**

Burnup Credit Program



James Carlson

August 27, 1993

Attach 2

Burnup Credit Program

- **Background**
- **Progress Relative to Storage and Transportation**
- **MPC System Impacts**
- **Burnup Credit Strategy**
- **NRC/DOE Technical Exchanges**
- **Summary**

Background

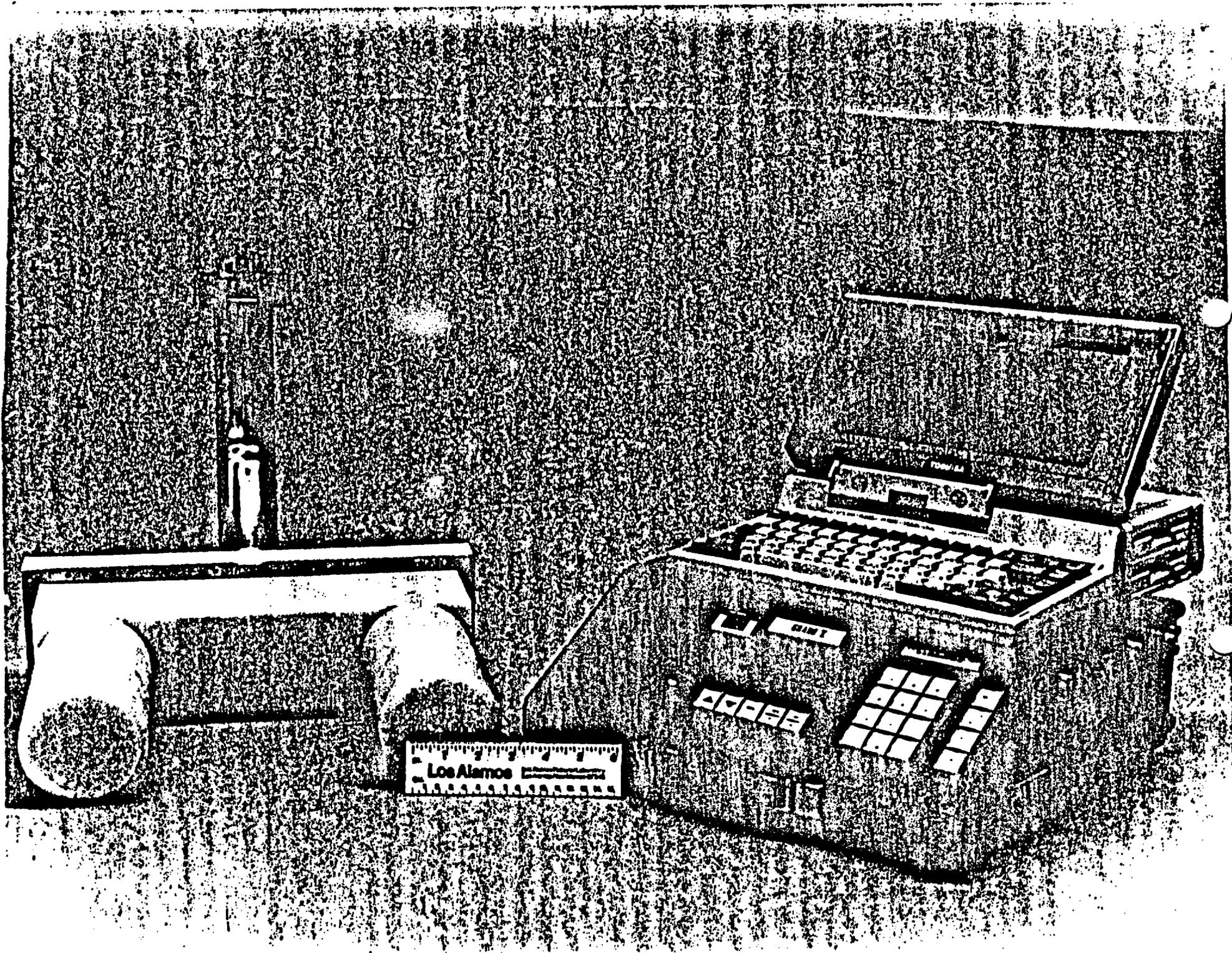
- **Historically NRC has required designers of light water reactor spent fuel storage and transportation systems to assume fresh fuel for criticality calculations**
- **Burnup credit definition**
 - **Taking credit for the decrease in reactivity caused by net depletion of fissile material and accumulation of neutron absorbers to demonstrate criticality safety**
- **OCRWM burnup credit program has been underway for several years**
 - **Cask Systems Development Program**
 - **Focus has been storage and transportation**
- **Need broader DOE focus and NRC Staff involvement due to wider applicability of MPCs**

Progress Relative to Storage and Transportation

- **OCRWM burnup credit activities have been aimed at transportation casks**
- **NRC approval of burnup credit for storage is likely to follow approval for transportation**
- **Burnup credit activities have been limited to PWRs**
- **Short term issues identified and potentially resolved**
 - **Burnup verification by measurement**
 - **Axial burnup profiles (end effects)**
 - **Benchmarking actinide and fission product inventories**
 - **Benchmarking criticality analysis methods**

Burnup Verification Measurement

- **OCRWM has identified a device suitable for verifying proper loading of a burnup credit cask**
- **The “FORK” detector has been used by IAEA in safeguards applications to verify nuclide inventories**
- **The “FORK” detector is a passive device that measures gross neutrons and gross gammas**
- **OCRWM has completed one proof of principle campaign at Duke Power Oconee Plant**
- **More tests are planned**



Los Alamos

Axial Burnup Profiles

- **Axial distribution of burnup in spent fuel is not uniform (BWR & PWR)**
- **OCRWM is currently pursuing burnup credit for PWR spent fuel for storage and transportation**
- **PWR fuel is characterized by a uniform central region (80%-90%) and underburned top and bottom ends (5%-10% each end)**
- **PWR end effects are being characterized and are conservatively accounted for in criticality safety design**

Benchmarking Actinide and Fission Product Inventories

- **Radiochemical assays have been performed on spent fuel samples**
- **Used to benchmark radionuclide prediction codes**
 - **All important actinides assayed**
 - **Selected fission products assayed (those not assayed will be ignored)**

Benchmarking Criticality Analysis Methods

- **OCRWM is developing a standard problem set for benchmarking criticality analysis methods**
- **Fresh fuel critical experiments**
- **Reactor restart criticals (effects attributable to spent fuel)**

MPC System Impacts

- **A decision to proceed with MPC system necessitates addressing Repository Issues now**
 - **Long term reactivity of spent fuel**
 - **Basket/poison integrity over time**
- **Repository issues need not be resolved at time of MPC implementation**
- **Incorporate best available information relative to disposal**
- **Provide confidence that fuel removal from MPCs prior to disposal will not be necessary**

Burnup Credit Strategy

- **Identify disposal issues and feasible solutions**
- **Initiate broader interaction with NRC**
- **Develop burnup credit topical reports**
 - **PWR storage & transportation**
 - **PWR/BWR disposal**
 - **BWR storage & transportation (if needed)**
- **Topical report on PWR storage and transportation submitted first**
 - **Target date for submittal 3rd Quarter 1994**
 - **Approval of first topical report 3rd Quarter 1995**

NRC/DOE Technical Exchanges

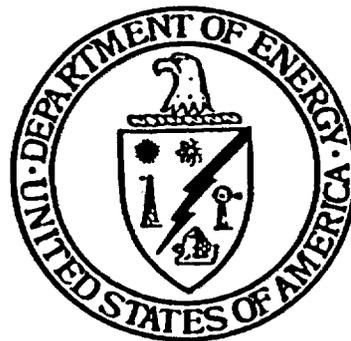
- **Technical briefing on burnup credit to be scheduled in near future**
- **Anticipate additional meetings on burnup credit as topical reports are developed**

Summary

- **OCRWM's burnup credit program previously focused on transportation issues**
- **MPC system concept requires addressing repository issues now**
- **Successful resolution requires broad review by NRC staff**
- **NRC/DOE technical exchanges should begin now to support first topical report submission in 1994**

**U.S. Department of Energy
Office of Civilian Radioactive Waste Management**

**Multi-Purpose Canister (MPC) System and
Burnup Credit**



Ronald A. Milner

August 27, 1993

Attach 3

Agenda

- **Introduction**
- **Multi-Purpose Canister (MPC) System and Burnup Credit**
- **Burnup Credit Program**
- **NRC/DOE Interactions**
- **Concluding Remarks**

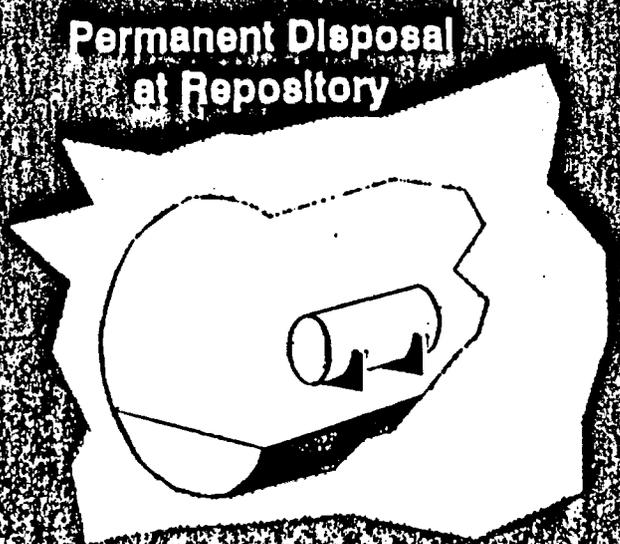
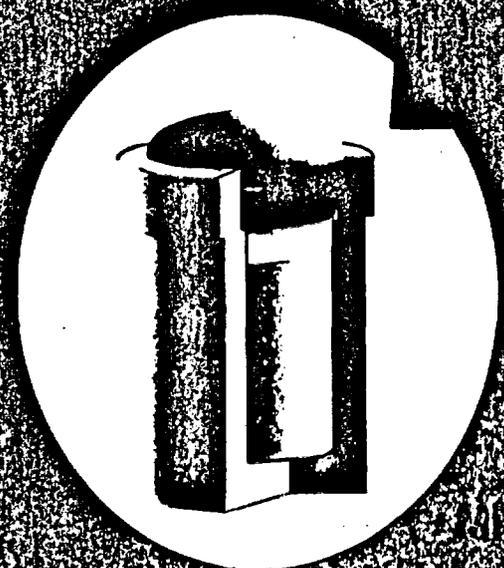
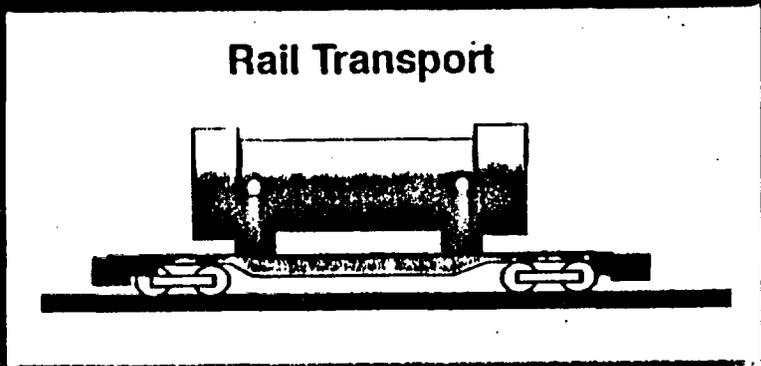
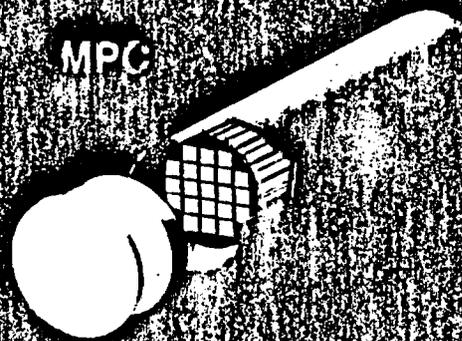
MPC and Burnup Credit

- **Multi-Purpose Canister (MPC) System**
- **Recent MPC Activities**
- **Perceived Advantages of MPC System**
- **Major MPC Implementation Milestones**
- **Need for Burnup Credit**

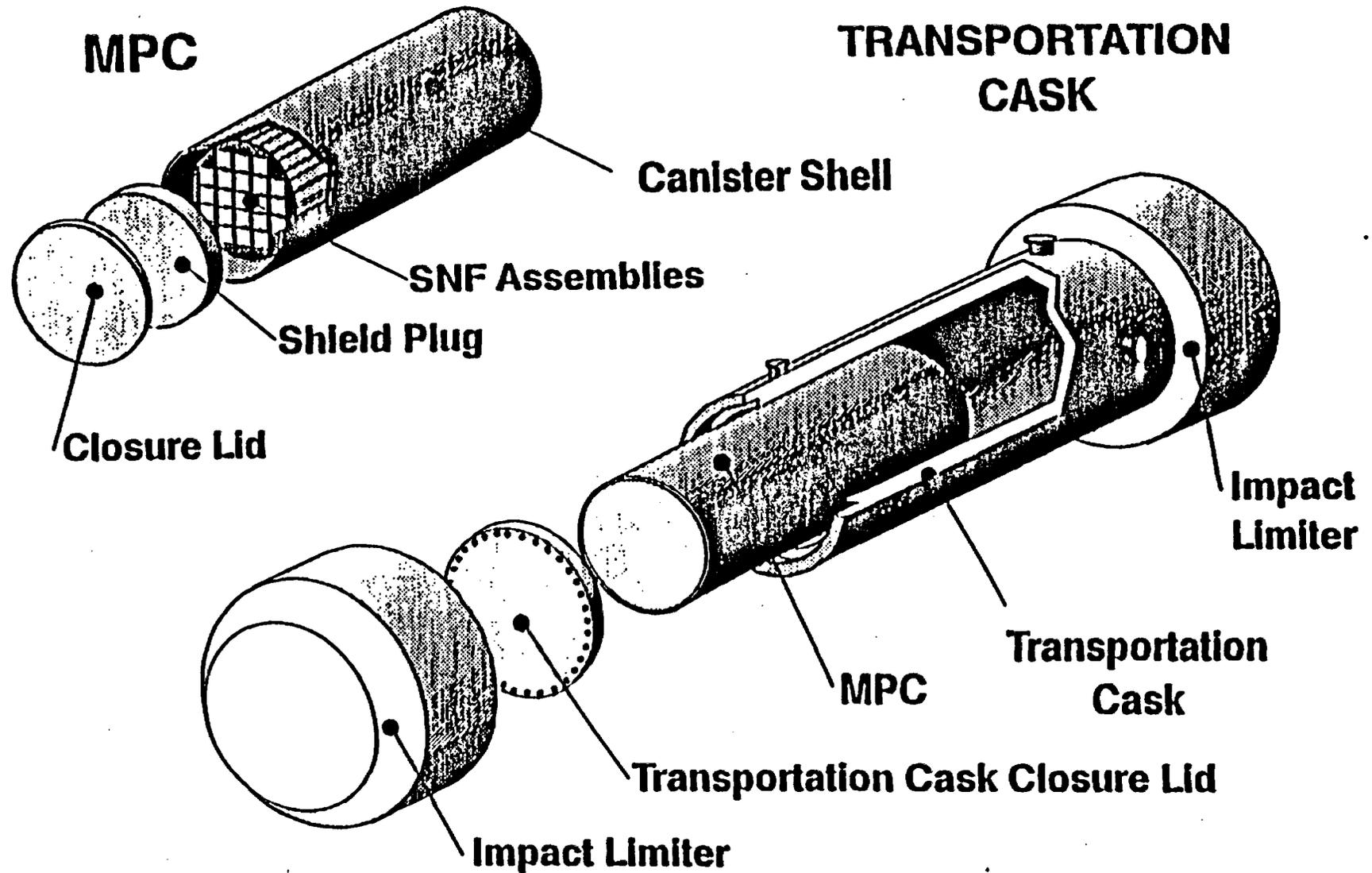
MPC System

- **Sealed canisters holding multiple SNF assemblies**
- **Canisters placed in separate overpacks for storage, transportation and geologic disposal**
- **Intention of never opening canisters to remove fuel once sealed**
- **Canister and overpacks must meet NRC regulations**
 - **Storage, 10 CFR 72**
 - **Transportation, 10 CFR 71**
 - **Disposal, 10 CFR 60**
- **At-reactor loading of MPCs must meet 10 CFR 50 requirements**

Multi-Purpose Canister



MPC and MPC Transportation Cask



Recent MPC Activities

- **MPC Feasibility Study**
 - **Initiated by Director of OCRWM - October 1992**
 - **Evaluate perceived benefits and how to implement MPCs if beneficial to program**
 - **Completed study March 1993**
- **Currently developing conceptual designs of MPC Systems**
 - **Large MPC (125 Ton): 21 PWR/40 BWR**
 - **Small MPC (75 Ton): 12 PWR/24 BWR**
 - **Associated overpacks for Storage & Transportation**
- **MPC Stakeholder Workshops**
- **DOE decision on whether or not to proceed by January 1994**

Perceived Advantages of MPC

- **Facilitate compatibility of at-reactor dry storage with CRWMS**
- **Allow shutdown reactors to proceed with decommissioning of spent fuel pools**
- **Allow direct acceptance of SNF by CRWMS w/o repackaging**
- **Reduced contamination/LLW concerns**
- **Simplified CRWMS facilities (CMF, MRS, MGDS)**
- **More positive perception by public and MRS host**
- **Possible use for at-reactor storage by 1998**

Major MPC System Milestones

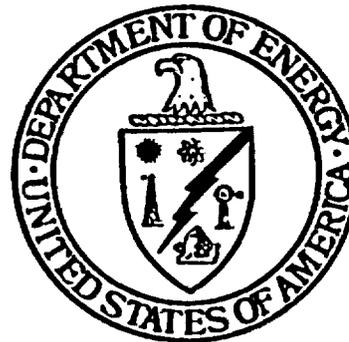
- **Draft report on MPC system conceptual designs by September 1993**
- **DOE decision to proceed by January 1994**
- **Issue RFP for design, certification, fabrication by April 1994**
- **Award multiple contracts by December 1994**
- **Submit transportation cask application by January 1996**
- **Certificates of Compliance for storage and transportation by July 1997**
- **Capability to deploy MPCs by January 1998**

Need for Burnup Credit

- **One of the most significant technical issues related to MPC use is burnup credit**
 - **Burnup credit can increase MPC capacity**
 - **Burnup credit supplements the use of poisons for criticality control for storage and transportation**
 - **Burnup credit may be needed to demonstrate criticality control in repository**
- **OCRWM ready to begin technical exchanges with NRC staff to resolve burnup credit issue**

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Office of Civilian Radioactive Waste Management**

NRC/DOE Interactions



Dwight Shelor

August 27, 1993

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NRC/DOE Interactions

- **DOE Points-of-Contact**
 - **Dwight E. Shelor (202) 586-6046**
Associate Director, Office of Systems and Compliance
 - **John P. Roberts (202) 586-9896**
Director, Regulatory Compliance Division
 - **Linda Desell (202) 586-1462**
Chief, Regulatory Integration Branch
 - **Priscilla Bunton (202) 586-8365**
Regulatory Integration Branch
- **Dwight Shelor is the formal point of contact for all correspondence**
- **DOE contractor personnel will use Regulatory Integration Branch to communicate with NRC**

NRC/DOE Interactions (cont'd)

- **The following individuals are OCRWM technical points-of-contact for the MPC system and burnup credit**
 - **Burnup credit**
Bill Lake
Transportation Branch
(202) 586-2840
 - **Multi-Purpose Canister System**
Jeff Williams
Facilities Development Branch
(202) 586-9620

Agenda

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- **Multi-Purpose Canister (MPC) System and Burnup Credit**
- **Burnup Credit Program**
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