TRANSPORTATION

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OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY

PRESENTATION TO THE
NUCLEAR WASTE TECHNICAL REVIEW BOARD
MARCH 7-8, 1989
NUCLEAR WASTE POLICY ACT

- DOE RESPONSIBLE FOR TRANSPORT OF SPENT FUEL AND HIGH-LEVEL WASTE
- DOE TAKES TITLE AT REACTOR (SHIPPER OF RECORD)
- PRIVATE SECTOR TO BE USED TO "FULLEST EXTENT POSSIBLE"
- NRC-CERTIFIED CASKS TO BE USED
- COSTS OF TRANSPORTATION TO BE COVERED BY WASTE FUND
THE NUCLEAR WASTE POLICY AMENDMENTS ACT OF 1987 BROUGHT NEW REQUIREMENTS TO THE OCRWM TRANSPORTATION PROGRAM

- **SECTION 180 (A)** — USE NRC CERTIFIED TRANSPORTATION PACKAGE
- **SECTION 180 (B)** — PRENOTIFY STATES/LOCAL GOVERNMENTS UNDER NRC REGULATIONS
- **SECTION 180 (C)** — PROVIDE TECHNICAL ASSISTANCE AND FUNDING TO TRAIN LOCAL GOVERNMENTS & TRIBES ON ROUTINE TRANSPORTATION & EMERGENCY RESPONSE
FEDERAL REGULATION OF TRANSPORTATION

NUCLEAR REGULATORY COMMISSION
(10 CFR 71, 73)
- CASK DESIGN & TESTING
- PHYSICAL PROTECTION
- PRENOTIFICATION

DEPARTMENT OF TRANSPORTATION
(49 CFR 106-399)
- OPERATIONAL PROCEDURES
- LABELING, MARKING
- PLACARDING
- ROUTING
- DRIVER TRAINING
CASK DEVELOPMENT

FROM-REACTOR CASKS
FROM-MRS CASKS
SPECIALTY CASKS
DEFENSE WASTE CASKS

SYSTEMS TECHNOLOGY AND DEVELOPMENT

TESTING
CURRENT STATUS
OF THE
FROM-REACTOR CASK
DEVELOPMENT INITIATIVE
CASK SYSTEMS
DEVELOPMENT
PROGRAM INTERFACES

OCRWM

DOE-ID

SNL

EG&G

CASK CONTRACTORS
## Present Generation Casks

<table>
<thead>
<tr>
<th>Cask</th>
<th>Mode</th>
<th>Capacity PWR/BWR</th>
<th>Estimated Shipments/Yr. for 3000 MTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLI - 1/2</td>
<td>LWT</td>
<td>1/2</td>
<td>6711</td>
</tr>
<tr>
<td>TN - 8L/TN - 9</td>
<td>OWT</td>
<td>3/7</td>
<td>2119</td>
</tr>
<tr>
<td>IF - 300</td>
<td>RAIL</td>
<td>7/18</td>
<td>880</td>
</tr>
<tr>
<td>NLI - 10/24</td>
<td>RAIL</td>
<td>10/24</td>
<td>631</td>
</tr>
</tbody>
</table>

LWT = Legal Weight Truck  
OWT = Overweight Truck
<table>
<thead>
<tr>
<th>CASK TYPE</th>
<th>CAPACITY</th>
<th>ESTIMATED SHIPMENTS/YR. FOR 3000 MTU</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWT (MIN. CAP)</td>
<td>2/6</td>
<td>2940</td>
</tr>
<tr>
<td>LWT (MAX. CAP)</td>
<td>4/9</td>
<td>1609</td>
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<tr>
<td>OWT (MIN. CAP.)</td>
<td>4/14</td>
<td>1411</td>
</tr>
<tr>
<td>OWT (MAX. CAP.)</td>
<td>6/14</td>
<td>1060</td>
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<tr>
<td>R/B (MIN. CAP.)</td>
<td>16/40</td>
<td>389</td>
</tr>
<tr>
<td>R/B (MAX. CAP)</td>
<td>26/52</td>
<td>259</td>
</tr>
</tbody>
</table>

R/B = RAIL/BARGE
SELECTED CONTRACTORS

LEGAL WEIGHT TRUCK CASKS
- GA TECHNOLOGIES ($8.5 MILLION)
- WESTINGHOUSE ELECTRIC CORPORATION ($7 MILLION)

RAIL/BARGE CASKS
- BABCOCK & WILCOX ($14.9 MILLION)
- NUCLEAR ASSURANCE CORPORATION ($9 MILLION)
- NUCLEAR PACKAGING, INCORPORATED ($13.6 MILLION)
THE DESIGN PROCESS

- **CONCEPTUAL DESIGN**
  - IDENTIFY BROAD REQUIREMENTS
  - "ROUGH OUT" A DESIGN ENVELOPE

- **PRELIMINARY DESIGN**
  - NARROW THE DESIGN REQUIREMENTS
  - STUDY ALTERNATIVES WITHIN DESIGN ENVELOPE
  - FIX DESIGN ENVELOPE

- **FINAL DESIGN**
  - FIX DESIGN REQUIREMENTS
  - OPTIMIZE DESIGN ON ALTERNATIVES
  - FIX "FINAL" DESIGN
# LEGAL WEIGHT TRUCK CASKS

<table>
<thead>
<tr>
<th></th>
<th>GA</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPACITY/ASSEMBLIES</strong></td>
<td>4PWR 9BWR</td>
<td>3PWR 7BWR</td>
</tr>
<tr>
<td><strong>SHAPE</strong></td>
<td>SQUARE CAVITY</td>
<td>CYLINDRICAL</td>
</tr>
<tr>
<td><strong>MATERIALS</strong></td>
<td>STAINLESS STEEL/DEPLETED URANIUM</td>
<td>TITANIUM ALLOY/DEPLETED URANIUM</td>
</tr>
<tr>
<td><strong>SPECIAL</strong></td>
<td>ALUMINUM HONEYCOMB IMPACT LIMITERS 2 CASKS: 1 PWR, 1 BWR</td>
<td>TOROIDAL IMPACT LIMITERS</td>
</tr>
</tbody>
</table>

**PWR** = PRESSURIZED WATER REACTOR  
**BWR** = BOILING WATER REACTOR
## RAIL/BARGE CASKS

<table>
<thead>
<tr>
<th></th>
<th>NUPACK</th>
<th>B &amp; W</th>
<th>NAC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPACITY</strong></td>
<td>21/48</td>
<td>24/49</td>
<td>26/52</td>
</tr>
<tr>
<td><strong>SHAPE</strong></td>
<td>CYLINDRICAL</td>
<td>CYLINDRICAL</td>
<td>CYLINDRICAL</td>
</tr>
<tr>
<td><strong>MATERIALS</strong></td>
<td>STAINLESS STEEL/LEAD</td>
<td>STAINLESS STEEL/LEAD</td>
<td>CARBON STEEL/DEPLETED URANIUM</td>
</tr>
<tr>
<td><strong>SPECIAL</strong></td>
<td>THERMAL DIODE</td>
<td>BORATED CONCRETE NEUTRON SHIELD</td>
<td>WEDGE LOCK CLOSURE</td>
</tr>
</tbody>
</table>
1988 CASK SYSTEM DEVELOPMENT PROGRAM

- Focus has been on "From-Reactor" Cask Development
- Five contracts have been signed with Westinghouse, B&W, GA, NUPAC, and NAC
- All kickoff meetings held
- All start-work briefings completed
- All contractors authorized to begin design
- All contractors QA surveys completed
- All contractors had initial meeting with NRC
CASK SYSTEM TECHNOLOGY DEVELOPMENT

- BURN-UP CREDIT
- SOURCE TERM
- COMPUTER CODE BENCHMARKING
- MATERIALS AND COMPONENT DEVELOPMENT
- CASK WEEPING
BURNUP CREDIT

- SPENT FUEL IS REMOVED FROM REACTORS BECAUSE OF REDUCED REACTIVITY
  - NET DECREASE IN FISSION MATERIAL
  - NET INCREASE IN "POISONS"
- CURRENT PRACTICE IN U.S. IS TO BASE CRITICALITY DESIGN ON A FRESH FUEL ASSUMPTION
- BURNUP CREDIT IS THE TERM DESCRIBING CRITICALITY DESIGN BASED ON REDUCED REACTIVITY
- BURNUP CREDIT COULD RESULT IN INCREASED CASK CAPACITIES
OBJECTIVE OF SOURCE TERM PROGRAM

- TO DEVELOP A TECHNICALLY DEFENSIBLE STANDARDIZED METHODOLOGY FOR DEMONSTRATING THAT SPENT FUEL TYPE B PACKAGES SATISFY MAXIMUM PERMISSIBLE RELEASE RATES OF 10 CFR 71, I.E., THE A₂- CRITERION

- DEVELOP A CONSISTENT APPROACH FOR DETERMINING THE RELEASABLE "SOURCE TERM" ASSOCIATED WITH CASK CONTENTS
CASK TESTING TO ULTIMATELY LEAD TO CASK CERTIFICATION

- DOE-APPROVED ENGINEERING TESTS
- DESIGN VERIFICATION TESTS
- ACCEPTANCE TESTS
- PERFORMANCE EVALUATION TESTING
- FULL-SCALE TESTING (IF DECIDED)
TECHNICAL DATA BASE/MODEL MANAGEMENT

Expanded and more detailed data are being collected to enhance transportation analyses using current, modified or newly emerging models.

- Develop data bases
  - Collected accident rates for rail and road type
  - Developed unit cost and risk factors for national transportation network analyses

- Develop models
  - TRICAM developed for optimization analyses
  - TRANSMAP used for display of shipping routes
  - CASKCOM applied to life cycle costs analyses
  - Modifying RADTRAN for more specific route analyses
  - Updating and expanding highway and interline for modal analyses

- Uncertainty analysis
  - Prepared draft report on transportation life cycle cost uncertainty based on CASKCOM model
TECHNICAL ANALYSIS

COSTS AND RISKS OF VARIOUS TRANSPORTATION ALTERNATIVES/OPTIONS ARE EVALUATED IN TECHNICAL STUDIES

- COST/RISK STUDIES
  - PREPARED DRAFT REPORTS ON DEDICATED TRAINS AND TRUCK CONVOYS
  - EVALUATED COST/RISK OF DRY STORAGE CASKS AT REACTORS
  - PREPARED DRAFT REPORT ON RAIL ACCIDENTS/TRACK CLASS RELATIONSHIP

- SPECIAL STUDIES
  - HUMAN FACTORS EFFECTS ON OPERATIONAL SAFETY
  - NEAR-SITE INFRASTRUCTURE STUDY COMPLETED (PHASE I)
  - INITIATED PHASE II INFRASTRUCTURE STUDY
IN FY 1988, PROVIDED

- DRAFT OPERATION PLANS FOR BOTH TRUCK AND RAIL SHIPMENTS
- DRAFT OPERATIONS READINESS REVIEW PLAN FOR WEST VALLEY DEMONSTRATION PROJECT SHIPMENT CAMPAIGN
- DRAFT OPERATIONS SECTION OF TRANSPORTATION PLAN

IN FY 1989, IN GENERAL, EFFORTS WILL BE LIMITED

- SUPPORTING DEVELOPMENT OF TRANSPORTATION PLAN AS NEEDED
- LIMITED SYSTEMS INTEGRATION ACTIVITIES
- SUPPORT OF OCRWM SHIPMENTS AS FUNDED
OCRWM TRANSPORTATION INSTITUTIONAL ACTIVITIES
POLICY AND REGULATORY ANALYSIS

- PREPARE SPECIAL STUDIES:
  - SPENT FUEL SHIPPING CAMPAIGN STUDY
  - INSPECTION PROCEDURES AND PILOT STUDY WITH CVSA

- MONITORING AND SUMMARIZE LEGAL AND REGULATORY DEVELOPMENTS

- MANAGE THE TRANSPORTATION LEGISLATIVE DATABASE (TLDB)
1989 COOPERATIVE AGREEMENTS BETWEEN OCRWM TRANSPORTATION BRANCH AND SEVERAL NATIONAL AND REGIONAL GROUPS

- SOUTHERN STATES' ENERGY BOARD (SSEB)
- WESTERN INTERSTATE ENERGY BOARD (WIEB)
- MID-WEST OFFICE OF THE COUNCIL OF STATE GOVERNMENTS (COSG)
- NATIONAL CONGRESS OF AMERICAN INDIANS (NCAI)
- NATIONAL CONFERENCE OF STATE LEGISLATURES (NCSL)
- COMMERCIAL VEHICLE SAFETY ALLIANCE (CVSA)
- COUNCIL OF RADIATION CONTROL PROGRAM DIRECTORS (CRCPD)
- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
NATIONAL AND REGIONAL GROUPS WORK WITH OCRWM TO RESOLVE MAJOR TRANSPORTATION INSTITUTIONAL ISSUES

- EMERGENCY RESPONSE (SSEB, WIEB, COSG)
- INSPECTION AND ENFORCEMENT (CVSA, CRCPD)
- OVERWEIGHT TRUCK SHIPMENTS (AASHTO)
- HIGHWAY ROUTING (WIEB, SSEB)
- RAIL AND BARGE ROUTING (SSEB)
- MIX OF TRANSPORTATION MODES (WIEB)
- INFRASTRUCTURE IMPROVEMENTS (SSEB, AASHTO)
- STATE, TRIBAL, AND LOCAL REGULATIONS (NCAI, NCSL)
OCRWM TRANSPORTATION INSTITUTIONAL ACTIVITIES
POLICY AND REGULATORY ANALYSIS

- PREPARE SPECIAL STUDIES:
  — SPENT FUEL SHIPPING CAMPAIGN STUDY
  — INSPECTION PROCEDURES AND PILOT STUDY WITH CVSA

- MONITORING AND SUMMARIZE LEGAL AND REGULATORY DEVELOPMENTS

- MANAGE THE TRANSPORTATION LEGISLATIVE DATABASE (TLDB)
GENERAL SCHEDULE FOR TRANSPORTATION ACTIVITIES

1989

- COMPLETION OF PRELIMINARY "FROM-REACTOR" CASK DESIGNS
- STUDY OF TECHNICAL CASK-DESIGN ISSUES
- ISSUANCE OF TRANSPORTATION DOCUMENTS
- CONDUCT SYSTEM STUDIES
- REVIEW MODIFICATIONS TO RISK METHODOLOGIES

1990

- REVIEW PROGRESS ON OWT UNIFORM PERMIT
- DECISION ON USE OF OWT
- COMPLETE FINAL DESIGN OF "FROM REACTOR" CASKS
- DEVELOP & RELEASE STRATEGY FOR ASSESSING TRAINING-ASSISTANCE REQUIREMENTS
GENERAL SCHEDULE FOR TRANSPORTATION ACTIVITIES (CONT.)

1991-1997

- COMPLETE TRANSPORTATION STUDIES FOR EIS
- SUBMIT SAFETY ANALYSIS REPORTS TO NRC FOR CASK DESIGNS (FROM-REACTOR)
- DETERMINE NEEDS FOR MRS CASKS, SPECIALTY CASKS, DEFENSE-WASTE CASKS AND INITIATE DEVELOPMENT, IF APPROPRIATE
- DETERMINE PREFERRED OPTION FOR MANAGING TRANSPORT OPERATIONS
- FINALIZE PLANS FOR TRAINING ASSISTANCE
- INITIATE EQUIPMENT ACQUISITION
GENERAL SCHEDULE FOR TRANSPORTATION ACTIVITIES (CONT.)

1998-2002

- DRAFT OPERATIONAL PROCEDURES
- DEVELOP LIMITED SHIPPING CAPABILITY, IF NEEDED
- IDENTIFY MODAL MIX
- IDENTIFY POTENTIAL ROUTES FOR EMERGENCY PREPAREDNESS PURPOSES
- BEGIN PROVIDING TRAINING ASSISTANCE
- ISSUE CASK-FLEET CONTRACT

2003

- INITIATE OPERATIONS