



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

Developing A Successful Transportation Program

Presented to:
**Nuclear Waste Technical Review Board Panel on the
Waste Management System**

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Transporting Successfully

- **We are presented with numerous *challenges*:**

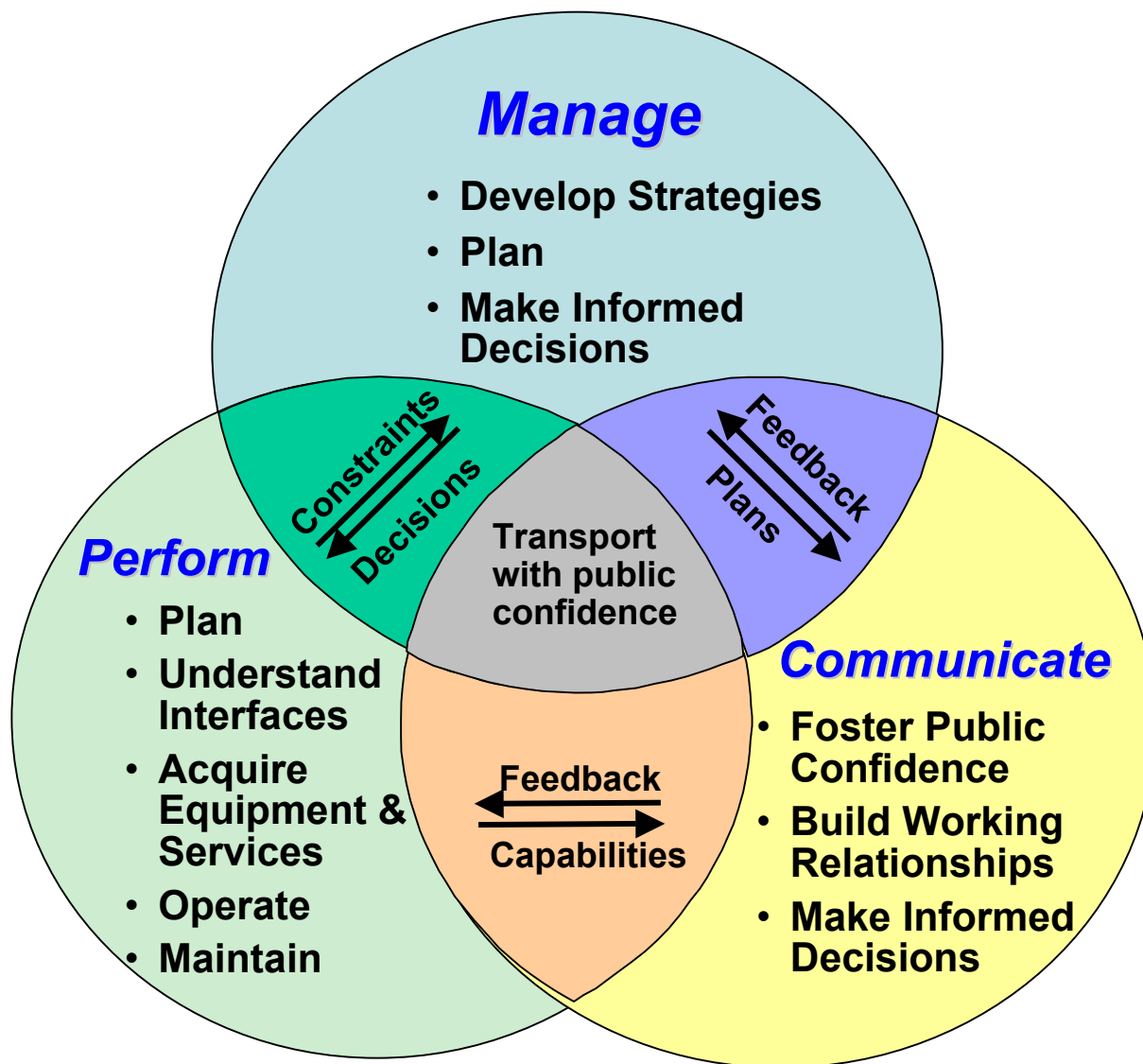
- Funding constraints
- An evolving regulatory framework
- Risk management

and *opportunities*:

- Open and transparent communications
- Decisions informed by national and international experience and expertise
- Safe and secure transport
- A transportation program recognized worldwide for its success



Transportation Program Development



Transportation Program Development

Manage

Formulate Strategies

Develop Plans

Make Informed Decisions



Managing Transportation

- **Transportation Strategic Plan will present vision and approach to planning, developing and operating a transportation system**
 - Lay out the path we will follow toward developing the transportation project plan and operational transportation plans
 - Describe the process we will use to work closely and cooperatively with Federal agencies, States, Tribes, local governments, waste owners and other parties in developing more detailed plans, operating the system and communicating with them
 - Describe key decisions
- **Transportation Project Management Plan**
 - Define how project will realize strategies and meet goals
 - Describe at a high level how and when transportation system components will be acquired and mobilized
 - Greater detail will be found in operations plans



Transportation Budget

- In response to Congressional 1996 direction to emphasize completion of characterization of the Yucca Mountain Site, Office of Civilian Radioactive Waste Management (OCRWM) stopped funding transportation activities
 - No funding for transportation activities, except those necessary to support preparation of the Yucca Mountain Final Environmental Impact Statement (FEIS)
 - Limited funding for transportation activities was resumed in FY02 (\$1.2 million)
- Secretary requested \$38 million for transportation in FY03, based on \$591 million for the program
- Omnibus Appropriations Bill for FY03 signed; \$460 million for the program
- Evaluating transportation funding in the context of program priorities

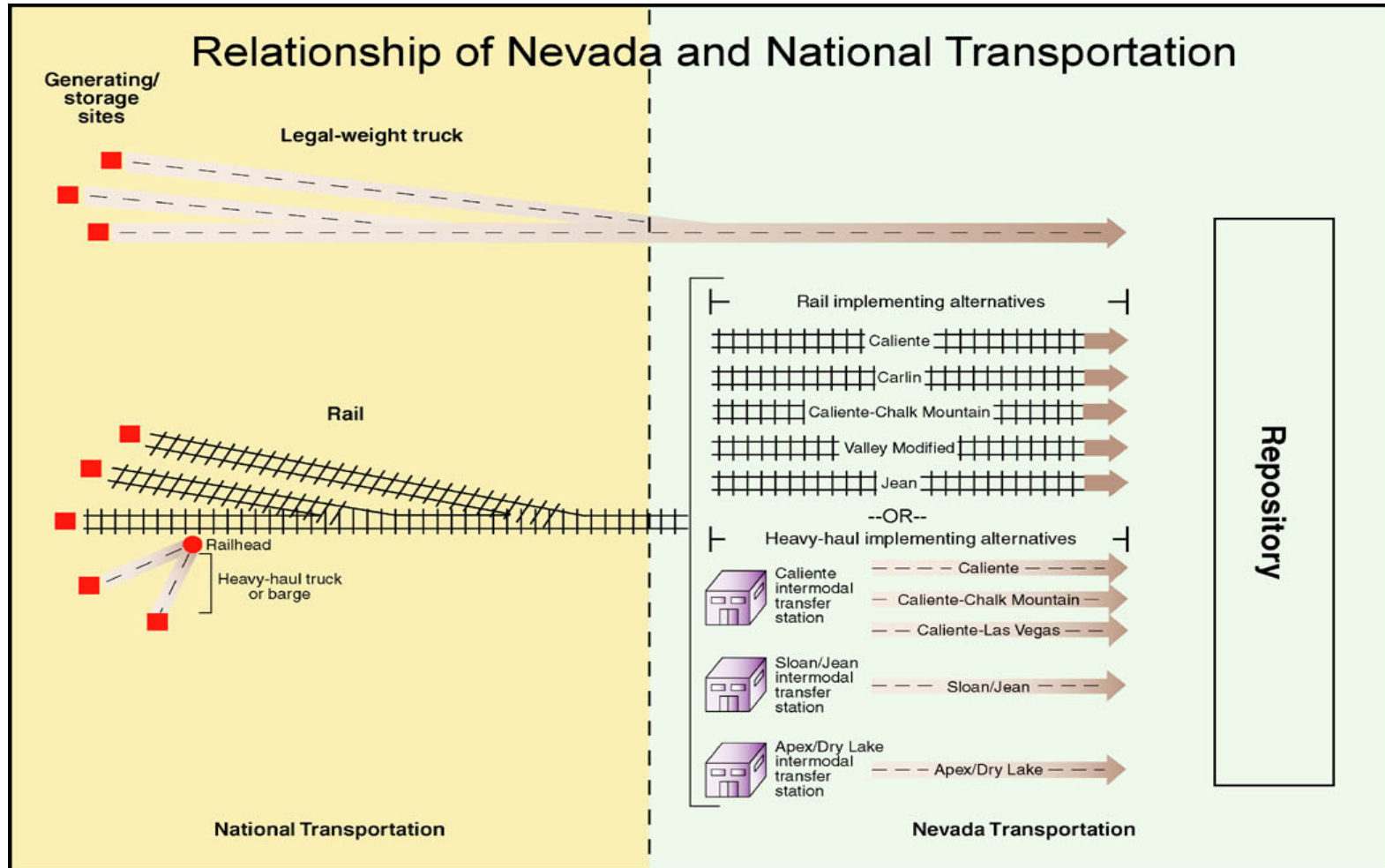


Moving Toward 2010: Transportation Priorities

<ul style="list-style-type: none">• FY 2003<ul style="list-style-type: none">– Issue Transportation Strategic Plan– Develop Transportation Project Management Plan– Define requirements– Resume cooperative agreement activities (subject to funding)– Develop acquisition strategy– Develop repository receipt facilities & interface protocols	<ul style="list-style-type: none">• FY 2004<ul style="list-style-type: none">– Initiate cask system procurements with initial priorities on “long lead” systems– Update and evaluate utility site interface data and servicing needs– Re-establish dialogue with utilities to further refine planning and operational details	<ul style="list-style-type: none">• FY 2005 and Beyond<ul style="list-style-type: none">– Develop transportation operations plans– Continue cask acquisition activities– Establish transportation routes– Begin 180(c) grant funding for state and tribe emergency responder training– Acquire transportation services– Acquire cask fleet maintenance capabilities– Complete operational readiness demonstrations
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A Complex System



FEIS Transportation Scenarios



Transportation Mode Options

- **Yucca Mountain Final Environmental Impact Statement examined impacts of transporting spent nuclear fuel (SNF) and high-level waste (HLW) by “mostly rail” and “mostly truck”**
- **Each mode has implications for supporting infrastructure needed and waste delivery schedules, including**
 - **Potential need for intermodal facilities**
 - **Number and types of casks required**
 - **Number and types of repository surface facilities required**



Operational Assumptions: Transportation Mode and Cask Fleet

MOSTLY RAIL SCENARIO		
Summary of Estimated Number of Shipments for National Transportation		
	Truck	Rail
Proposed Action (24 years)	<1,100	<10,000 casks <3,300 trains*
Annual	≈45/yr	≈400 casks/yr <135 trains/yr*
Estimated Cask Fleet		
	Truck	Rail
Proposed Action	≈10	≈90

MOSTLY TRUCK SCENARIO		
Summary of Estimated Number of Shipments for National Transportation		
	Truck	Rail
Proposed Action (24 years)	<53,000	≈300 casks ≈100 trains
Annual	≈2,200/yr	12-13 casks/yr <5 trains/yr
Estimated Cask Fleet		
	Truck	Rail
Proposed Action	≈110	N/A

*Based on three rail casks per train shipment.

The FEIS included two transportation scenarios and states preference for rail, both nationally and in Nevada



Target Acceptance Rates for Planning

Reference case used for planning is based on the following target acceptance rates*

Year	Commercial SNF Target Receipt Rate
2010	400
2011	600
2012	1,200
2013	2,000
2014	3,000

* The rates in this schedule are targets only and do not create any binding legal obligation on the Department of Energy

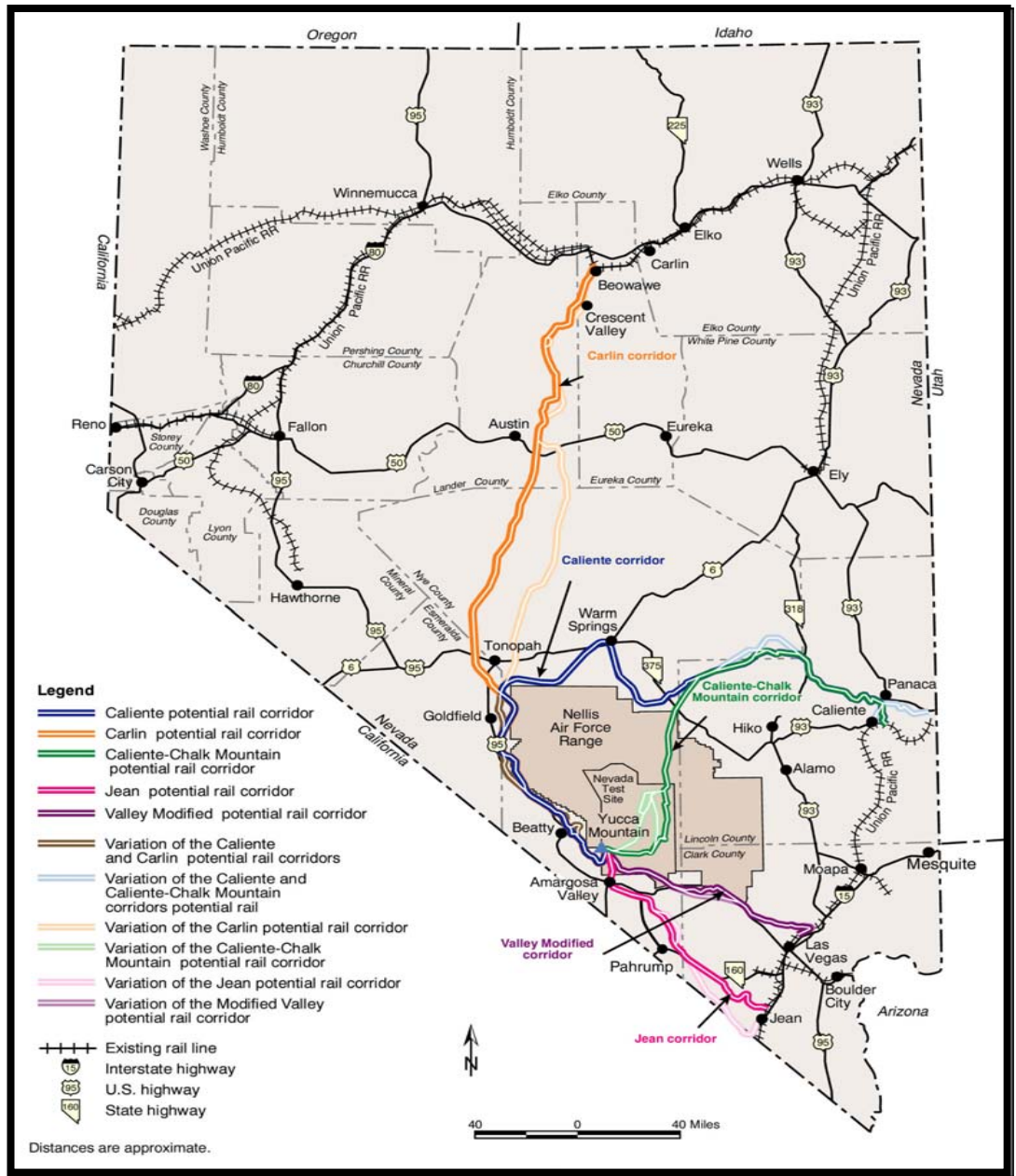


Nuclear Environmental Policy Act Activities

- The impacts of transporting SNF and HLW to the repository by both truck and rail examined in the Yucca Mountain Final Environmental Impact Statement
- Existing National Environmental Policy Act (NEPA) documentation is sufficient to make a decision on mode and corridor
- If “mostly rail” decision is made, then a preferred corridor in Nevada will be selected in consultation with affected stakeholders
- Once corridor is selected the required NEPA documentation for alignment selection must be developed



Potential Nevada Rail Corridors



Transportation Program Development

Perform

Plan

Understand Interfaces

Acquire Equipment & Services

Operate

Maintain



Transportation Planning

- **Transportation planning is still at an early stage**
- **Develop Transportation Operations Plans**
 - Requirements used to develop the details of individual shipping campaigns
 - Schedules
 - Materials to be shipped
 - Casks to be used
 - Mode
 - Routes
 - Emergency preparedness
 - Tracking & communication



Transportation Planning

(Continued)

- **Coordination with states and localities**
- **Lessons learned**
- **Other information to assure safety and security**
- **Site servicing plans**
- **Campaign plans**
- **Security**
- **Interactions with interested parties**
- **Work cooperatively with States and Tribes through the planning process successfully used by DOE's Waste Isolation Pilot Plant (WIPP)**
 - **Protocols**



Understand Interfaces: Site Evaluations and Planning

- **OCRWM prepared Site Planning Documents (SPDs) that define site specific interfaces**
- **Documents identify:**
 - **Cask handling interfaces for each site**
 - **Transportation capability between the sites and the nearest interstate or mainline rail**
- **The SPDs must be updated or initiated to reflect current site infrastructure conditions**
- **Next step is development of Site Servicing Plans (SSPs)**



Understand Interfaces: Site Servicing Plans

- **Site Servicing Plans (SSPs) define how each site will be serviced**
- **Establish cask needs, routes, and other operational interfaces**
- **Establish service responsibilities between waste owners and DOE's service contractors**
- **Identify site interfaces, near-site transportation infrastructure considerations needed for developing final plans and operating procedures**
- **Identify special site equipment**
- **Identify site personnel training requirements**



Establish Waste Acceptance Planning Basis

- Waste acceptance planning could impact transportation infrastructure and cask acquisition plans and schedules
- Establish initial planning basis for startup period beginning with 400 MTU commercial and DOE defense waste in 2010
- Provide programmatic flexibility to adjust planning basis as transportation campaign information becomes available

Waste Acceptance Policy Decision Dependencies	Non-Policy Impacts								
	Cask Type	Cask Quantity	Cask Cost	Cask Design Variations	Transportation Equipment	Cask Maintenance Facility	Training	Route Selection	
Policy Decisions									
Start-Up Acceptance Rate		●	●						●
Maximum Acceptance Rate		●	●						●
Fuel Form and Type	●	●	●	●	●	●	●	●	
Initial Start-Up Queue	●	●	●						●
Queue Servicing Plan	●	●	●						
Utility Packaging Cost	●	●	●	●					
Repackaging to Achieve Standardization	●			●	●	●	●		



Define Cask Strategy

- Procure existing, NRC-certified cask designs from private vendors
- If existing cask designs need to be enhanced, develop a strategy for acquiring suitable shipping casks
- Long lead time for design, testing, certification, and fabrication of new cask designs
- Establish the specific number and types of casks required
- Develop performance based specification
- Address potential impacts on ancillary transportation equipment design as well as the repository receiving and handling design

Cask Design and Acquisition Policy Decision Dependencies	Non-Policy Impacts			
	Specification Development	Transportation Equipment	Campaign Planning	Cask Maintenance Facility
Policy Decisions				
Design Process	●	●		●
Testing and Certification	●		●	
Cask Acquisition Plan		●	●	●



Transportation Casks - Rail

RAIL SPENT FUEL TRANSPORTATION CASKS

Model (Type)	Vendor	Capacity (MTU) ¹	No. Built	COG (Expires)	ALLOWABLE CONTENTS
MP-187 (Canister)	Transnuclear	24P (10.56)	1	9255 Rev 6 (9/03)	PWR: B&W 15x15 assemblies, <3.43 w/o U-235 5 to 8 years cooled, 30 GWD/MTU 9 to 17 years cooled, 40 GWD/MTU PWR: WE 14x14 SStI clad assemblies, <4.05 w/o U-235 38 years cooled, 45 GWD/MTU
HI-STAR 100 (DP Canister)	HOLTEC International	24P/68B (10.56/12.53)	7	9261 Rev 1 (3/04)	Allowable contents specified in a 26-page appendix to the CoC. Every type of standard fuel assembly can be transported. PWR: 7 to 10 years cooled, 24.5 GWD/MTU 15 years cooled, up to 44.1 GWD/MTU BWR: 8 years cooled, 24.5 GWD/MTU 15 years cooled, 39.1 GWD/MTU
TN-68 (DP Bare fuel)	Transnuclear	68B (12.53)	15	9293 Rev 1 (2/06)	BWR: 10 years cooled, 40 GWD/MTU, <3.7 w/o U-235 (29 more are on order for storage at Peach Bottom)
NAC-STC (DP Bare fuel) & (DP Canister)	NAC International	26P (11.43)	6	9235 Rev 4 (3/04)	PWR: 6.5 years cooled, 40 GWD/MTU, <3.7 w/o U-235 10 years cooled, 45 GWD/MTU, <3.7 w/o U-235 Max fuel assy length = 165" Yankee Rowe fuel: All types
TS-125 (DP Canister)	BNFL Fuel Solutions	21P/64B (10.56/11.24)	0	9276 Rev 0 (9/07)	PWR: 6 years cooled, 35 GWD/MTU, <4.6 – 5.0 w/o U-235 25 years cooled, 60 GWD/MTU, <4.6 – 5.0 w/o U-235 BWR: Limited to all types of Big Rock Point fuel.
MP-197 (Canister)	Transnuclear	61B (11.24)	0	9302 Rev 0 (7/07)	BWR: 6 years cooled, 27 GWD/MTU, <4.4 w/o U-235 15 years cooled, 40 GWD/MTU, <4.4 w/o U-235
NAC-UMS (DP Canister)	NAC International	24P/57B (11.43/10.50)	0	9270 Rev 0 (10/07)	Allowable PWR and BWR contents are specified in a 20-page appendix to CoC.

1. Average kgU per assembly based on discharges from standard reactors as given in 1994 RW-859: BWR = 184.3 PWR = 439.8.



Transportation Casks - Truck

TRUCK SPENT FUEL TRANSPORTATION CASKS

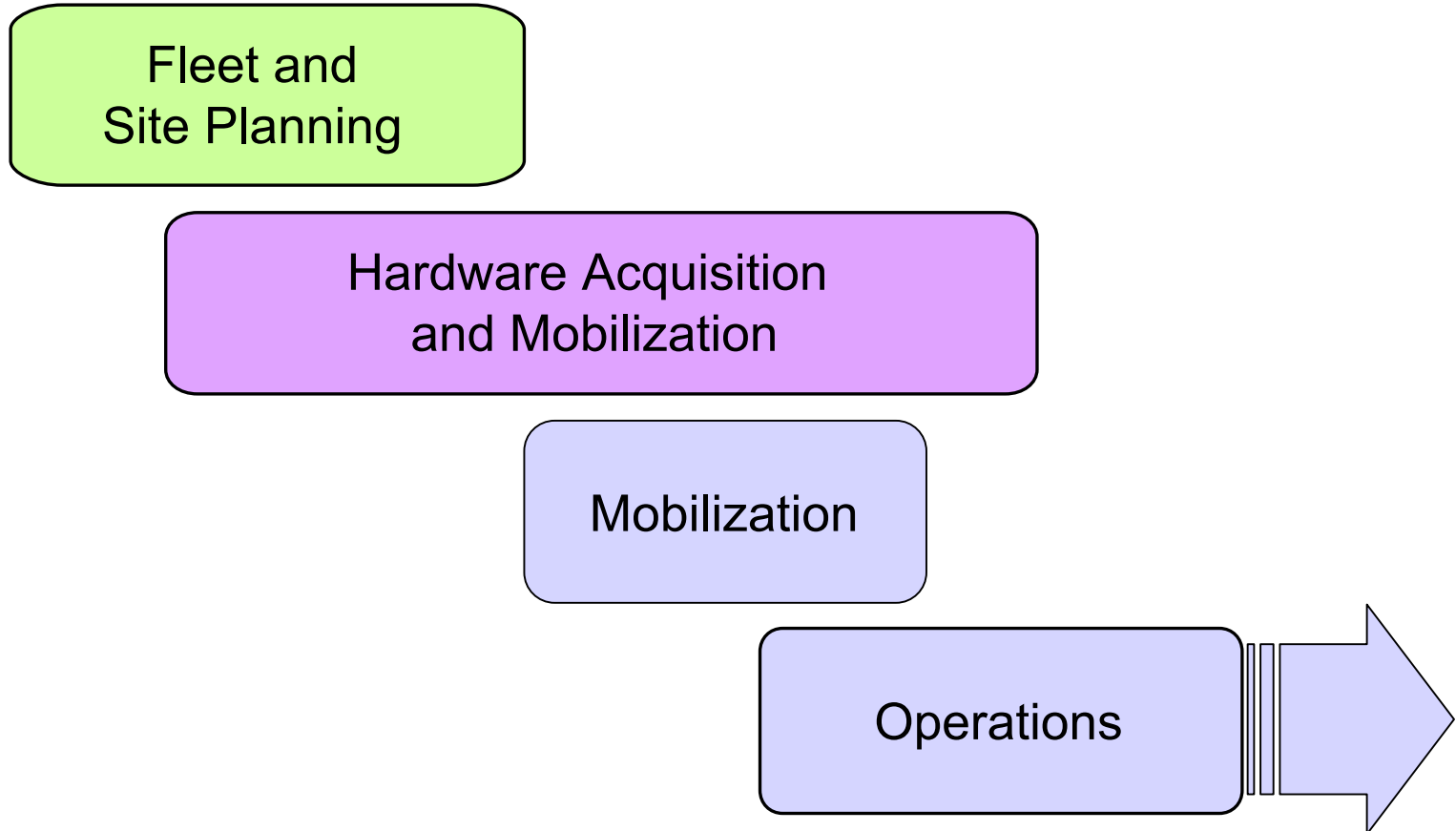
Model	Vendor	Capacity (MTU) ¹	Number Built	Part 71 COC (Expires)	ALLOWABLE CONTENTS
NAC-LWT	NAC International	1P/2B (.44/.37)	8	9225 Rev 31 (2/05)	PWR: 2 years cooled, 35 GWD/MTU, <3.5 – 3.7 w/o U-235 BWR: 2 years cooled, 30 GWD/MTU, <4.0 w/o U-235
GA-4	General Atomics	4P (1.76)	0	9226 Rev 1 (10/03)	PWR: 10 years cooled, 35 GWD/MTU, >3.0 <3.15 w/o U-235 15 years cooled, 45 GWD/MTU, no min <3.15 w/o U-235 Maximum decay heat per assembly: 0.617 kw (The GA-4 has been analyzed for partial loadings with higher decay heats. NRC approval has not been requested, but could be obtained.)
GA-9	General Atomics	9B (1.66)	0	9221 Rev X (N/A)	Not certified. NRC review is inactive.

1. Average kgU per assembly based on discharges from standard reactors as given in 1994 RW-859: BWR = 184.3 PWR = 439.8.



Acquisition Strategy Overview

Phased Implementation



Federal Facility
Operational 

Acquire Capabilities

Fleet and Site Planning

- Project Plan
- Service Planning Documents
- Cask Fleet Planning
- Establish servicing strategy
- Fleet Acquisition and procurement plans
- QA Plan
- Communication and Outreach Plan
- Implementation schedules

Hardware Acquisition and Mobilization

- Acquire Cask Fleet
- Provide QA oversight
- Acquire transporters and auxiliary equipment
- Facility support equipment
- Route Identification
- Training and readiness
- Acquire transportation services
- Site Service Plans
- Initiate outreach and communications
- Develop integrated servicing schedules

Mobilization and Operations

- Perform waste acceptance
- Transport SNF & HLW
- Inter-modal as required
- Provide route tracking
- Provide en-route security
- Perform cask and equipment maintenance
- Continue communication and outreach
- Maintain servicing schedules



Evolving Approach to Acquisition Strategy

ORIGINAL

- DOE developed cask technology
- M&O to integrate
- Commercial transportation services
- DOE provides maintenance

1986

INTERMEDIATE (RSC)

Industry to:

- Develop and provide casks
- Integrate operations
- Provide commercial transportation services
- Cask maintenance

1996

CURRENT (TIC)

- Industry to develop casks
- DOE to purchase casks from industry
- TIC to integrate
- TSC to coordinate commercial transportation services
- DOE provides maintenance

2002



Cask Systems Acquisition Approach

- DOE will procure existing, NRC-certified cask designs from private industry to the extent practicable
- Existing cask designs may need to be enhanced
- Recent industry emphasis on large dual-purpose rail casks
- For a mostly truck scenario or in case of contingencies, additional technology development may be required



Transportation & Maintenance Services Acquisition Approach

- In 2002, DOE issued a draft Scope of Work for a Transportation Integration Contractor (TIC)
 - TIC responsibilities would include planning and acquisition of equipment and services to support the start of waste acceptance in 2010
 - DOE announced in December that no RFP would be issued in FY03
 - DOE continuing to evaluate approach to use private industry effectively



Carrier Selection Approach

- **Transportation Services Contractor (TSC) will acquire transportation services as part of campaign planning (SSP)**
- **For each campaign**
 - **Select appropriate mode**
 - **Multiple service providers may be required**
- **Selection criteria**
 - **Mode requirements**
 - **Geography**
 - **Quality and safety record**



Routing

Highway

- **DOT routing regulations apply**
- **Routes are selected to reduce time in transit**
- **Vehicles operate over preferred routes**
 - Interstate highway system, including bypasses or beltways
 - A state or tribe may designate alternative routes in addition to or in lieu of the interstate system

Rail

- **There are no federal rail routing regulations**
- **Current DOE rail routing practices**
 - Minimize time, distance, number of carriers, interchange points
 - Maximize use of best track



Transportation Safety

- **Safety record for spent nuclear fuel shipments in U.S. and other industrialized nations is impressive and points the way to success**
 - Over 2,700 shipments in the U.S. during the past 30 years
 - 738 Navy container shipments, over 1 million miles since 1957
 - Average 650 shipments per year in France and Britain
 - There has never been a release of radioactive material harmful to the public or the environment
- **DOE will continue to review successful shipping programs to gain insights into practices that will help to ensure safe, secure, efficient, cost effective shipments**



Transportation Safety

Shipping Campaign	Material	Duration	Shipments	Mode	Shipper	Training	Coop. Png
Waste Isolation Pilot Plant	TRU (CH & RH)	1999-present	1350+	Truck, Rail (Planned)	DOE	✓	✓
Naval Nuclear Reactors	SNF	1957-present	~725	Rail	DOE/DOD	✓	✓
FRR SNF, Charleston NWS to SRS	MTR SNF, TRIGA SNF (transiting to INEEL)	1996-2006	24 to date; ~50 planned	Rail and Truck	DOE/FRRs	✓	✓
FRR SNF, SRS to INEEL	TRIGA SNF	1999-present	3	Truck	DOE	✓	✓
Cesium from 3 locations cross-country to Hanford	Cesium Capsules	1992-96	532	Truck	DOE	✓	✓
Shoreham (NY) to Limerick (PA)	Irradiated BWR ass'ys.	1994	33	Barge and Rail	LILCO	✓	✓
TMI to INEEL	Reactor Core Debris	1986-1990	22	Rail	GPU Nuclear	✓	✓
Brookhaven HFBR to SRS	HFBR SNF	1997	4	Barge and Truck	DOE	✓	✓
West Valley to INEEL	SNF	TBD	1 in 2003; ~5 planned	Rail	DOE	✓	✓
CLWR Watts Bar to INEEL	CLWR Assemblies	1999	4	Truck	DOE	✓	✓
Transportation Safeguards	Weapons and Components	1950s-present	N/A	Truck	DOE	✓	¹ M

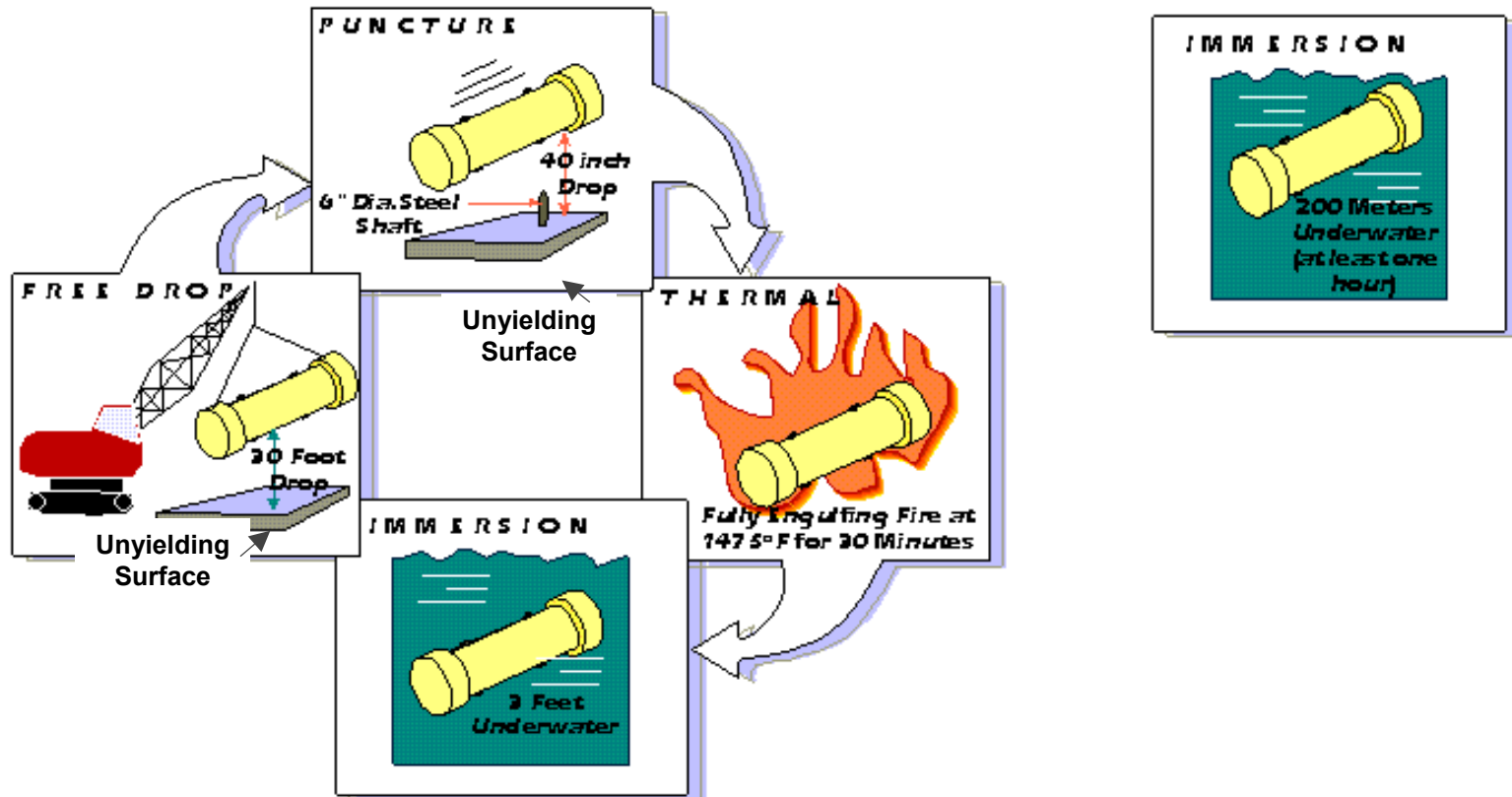
¹M = Modified cooperative planning approach to account for safeguards and classified materials requirements.



Cask Performance Requirements

Hypothetical Accident Conditions

Additional Test for SNF Casks



Cask Performance

- **Full-scale impact demonstrations in 1970s by Sandia to validate analytical and scale modeling methods and collect quantitative data on extreme and accident environments**
- **In late 1980s, NRC's Modal Study investigated protection provided against severe highway and railroad accidents**
- **In 2000, NRC CR-6672 concluded that casks would retain their integrity in more than 99.99% of accidents**
- **NRC conducting Package Performance Study to re-validate codes/models and adequacy of regulations**
 - Full scale testing being considered
 - 4 workshops scheduled for March to solicit input on testing protocols



Transportation Security

- **DOE has extensive experience in in the highly secure transportation of nuclear materials**
- **DOE and the NRC historically have conducted experiments and analyses to evaluate the consequences of severe accidents and postulated sabotage attacks**
- **DOE and NRC are participating in an international effort to study the effects of sabotage**
- **Since September 11, government agencies, including DOE and NRC, are undertaking a top-to-bottom review of security programs**
- **Anticipate regulations will be updated prior to 2010**



Transportation Security

(Continued)

- **Transportation planning activities will continue to identify measures that could afford further protection from sabotage**
- **Such measures could include**
 - **Armed escorts of shipments to provide continuity of protection across state lines**
 - **Near real-time satellite tracking so any deviation from planned schedules and routes is immediately detected**
 - **Additional barriers**
 - **Shipment via dedicated rail to minimize number of stops for service**
- **A Security Plan will be developed**



Shipment Tracking and Communications

- **A system that provides continuous, near real-time position tracking would be in place at all times for all shipments**
 - **TRANSCOM satellite tracking system or the equivalent**
 - **Provide drivers with advance warning of poor weather, congested traffic, construction zones, and other potential hazards**
 - **Unusual or unexpected situations encountered or any problems with the cask or other equipment would be immediately communicated**
 - **System would allow monitoring from a centralized location and communications with DOE, affected governments, and service providers**



Emergency Preparedness

- **State, tribal and local governments are responsible for responding to any accident within their jurisdiction**
- **NWPA section 180(c) provides for a combination of planning and training grants to states and tribes**
- **Federal agencies become involved when specifically requested by state or tribal authorities**
- **Federal Radiological Emergency Response Plan outlines each agency's responsibility**
- **DOE maintains a 24-hour on-call emergency program through 8 Regional Coordinating Offices located across the U.S**
- **Price-Anderson Act, indemnification coverage over \$9 billion**



Transportation Program Development

Communicate

Foster Public Confidence

Build Working Relationships

Make Informed Decisions



Communication

- **Foster public confidence**
 - Inform and educate
 - Provide opportunities for meaningful participation
 - Invite open and transparent communications
- **Build working relationships**
 - TEC/WG (Transportation External Coordination Working Group)
 - States, tribes and local governments
 - Cooperative agreements
- **Make informed decisions**
 - Advisory Groups (NWTRB, ACNW, NAS)
 - National and international experience and expertise



Transportation External Coordination Working Group

- **Established in 1992 to identify and discuss issues related to DOE transportation of radioactive materials**
- **Membership includes representatives from state, tribal and local governments; industry; and professional organizations**
- **For the last 10 years, DOE has shared information to:**
 - **Ensure that participants are knowledgeable about DOE shipping practices**
 - **Receive input on policy decisions regarding transportation through their jurisdictions**



Coordination with States, Tribes and Local Governments

- **DOE is committed to an institutional process that will coordinate closely with states, tribes, and local governments affected by the transportation of SNF to Yucca Mountain**
 - **Consult with affected governments on route selection**
 - **Work closely with stakeholders on issues of public safety and emergency response preparedness**
 - **Communicate transportation plans to affected local governments (pre-notification) as part of the campaign planning process**
 - **NWPA Section 180(c) funding to support training and emergency preparedness planning**



Cooperative Agreements

- **Cooperative agreements with regional, national and technical organizations**
- **Valuable input on state and regional thinking and specific technical topics**
- **Current agreements with NCAI, NCSL and NARUC**
- **DOE intends to establish agreements with other groups, as appropriate, depending on funding**



Advisory Groups

- **Request NWTRB Comments and recommendations on TIC scope of work**
- **Support NAS Transport Risk Study, to start in FY 2003**
 - **Co-funded with NRC, DOT, and EPRI and focused on various studies from US and abroad**

International Cooperation

- **Participate in an international collaborative effort to study the effects of sabotage on SNF**
 - **France, Germany, Great Britain, the NRC and Sandia National Laboratories**



Moving Ahead

- **Success will require that we:**
 - **Ensure that the transportation system and its operation are safe, secure, and reliable**
 - **Work cooperatively with federal agencies, states, tribes, local governments, advisory groups, waste owners and other parties**
 - **Build upon DOE's impressive safety record and successful experience in establishing and conducting transportation programs**
 - **Use science and technology to create continuous improvements in the transportation system**
 - **Make informed decisions and manage effectively**
 - **Foster public confidence and build working relationships**

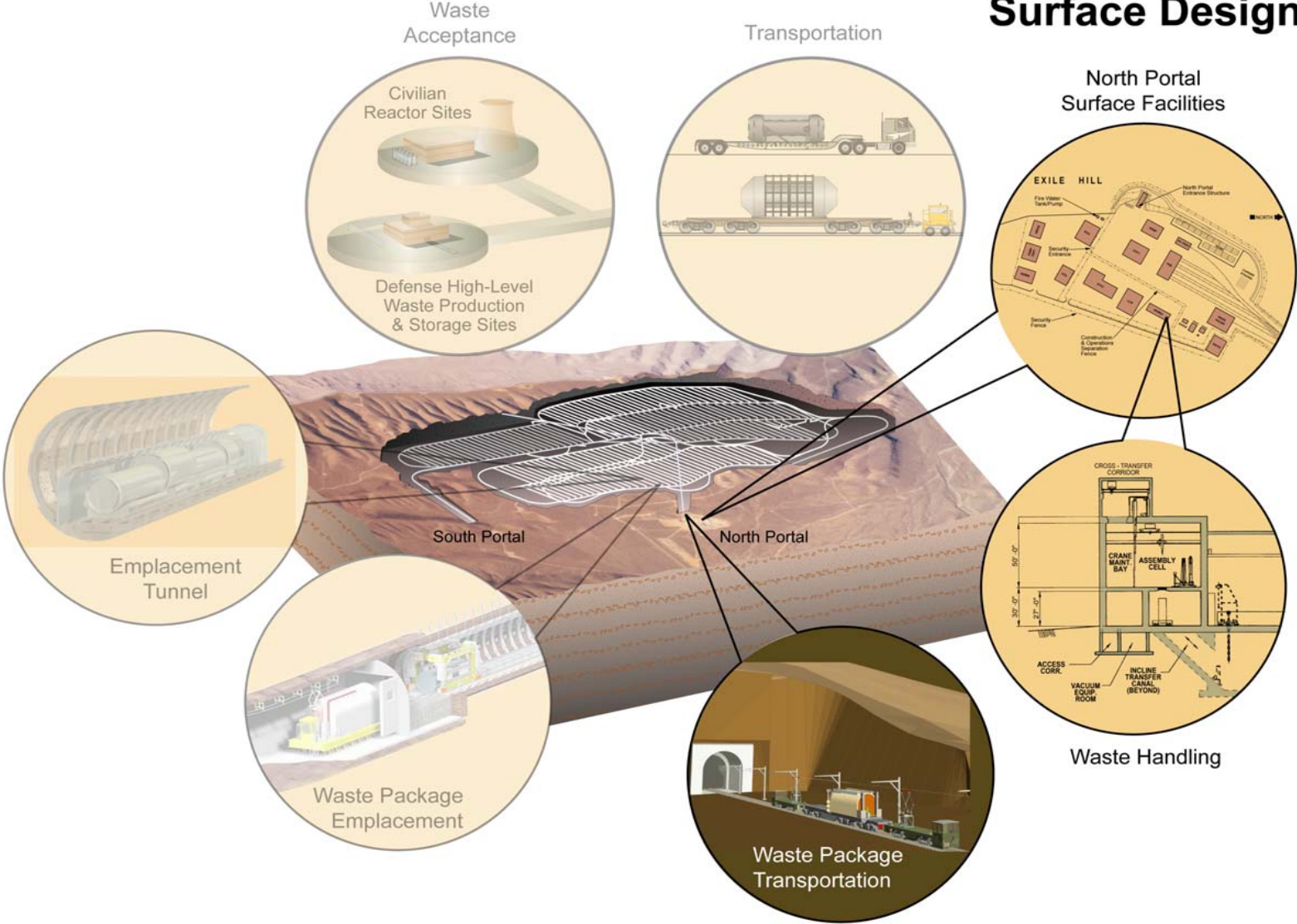


Moving Ahead

- **As the transportation system matures, we look forward to more opportunities to communicate on a broad range of issues**
- **We welcome recommendations from the NWTRB, other federal agencies and stakeholders so that we can successfully accomplish this important National mission**



Surface Design



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