U.S. DEPARTMENT OF ENERGY

Nuclear Fuels Storage & Transportation Planning Project
Office of Fuel Cycle Technologies

Nuclear Energy

Overview of the Department of Energy's Nuclear Fuels Storage and Transportation Planning Project (NFST)

John C Wagner
National Technical Director, DOE-NE NFST
Oak Ridge National Laboratory

Institute of Nuclear Materials Management, 55th Annual Meeting
July 20 – 24, 2014
Atlanta, Georgia USA

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Outline

- Background, Mission, Objectives
- Selected Activities
- Concluding Remarks

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

NFST Established in FY 2013 to Plan for Interim Storage and Transportation

NFST NUCLEAR FUELS STORAGE & TRANSPORTATION

Mission

- Lay the groundwork for implementing interim storage, including associated transportation, per the Administration's *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste,* and develop a foundation for a new nuclear waste management organization

Purpose

- Make progress on this important national issue
- Build foundation that could be transferred to a new waste management disposal organization (MDO)

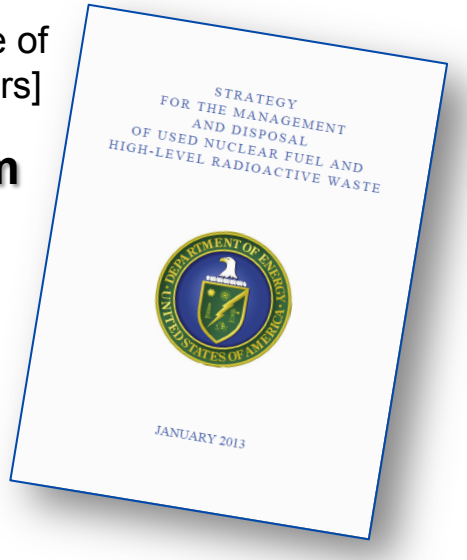
Activities

- Align with BRC recommendations
- Lay ground work for implementing the *Strategy*
- Within existing NWPA
- Consistent with budget direction and authorization

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste

- **"With the appropriate authorizations from Congress, the Administration currently plans to implement a program over the next 10 years that:**
  - Sites, designs and licenses, constructs and begins operations of a **pilot interim storage facility by 2021** with an initial focus on accepting used nuclear fuel from shut-down reactor sites;
    - [Development of transportation capabilities…to facilitate the acceptance of used nuclear fuel at a pilot interim storage facility within the next 10 years]
  - Advances toward the siting and licensing of a **larger interim storage facility to be available by 2025** that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities



Legislation required for implementation of key aspects

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

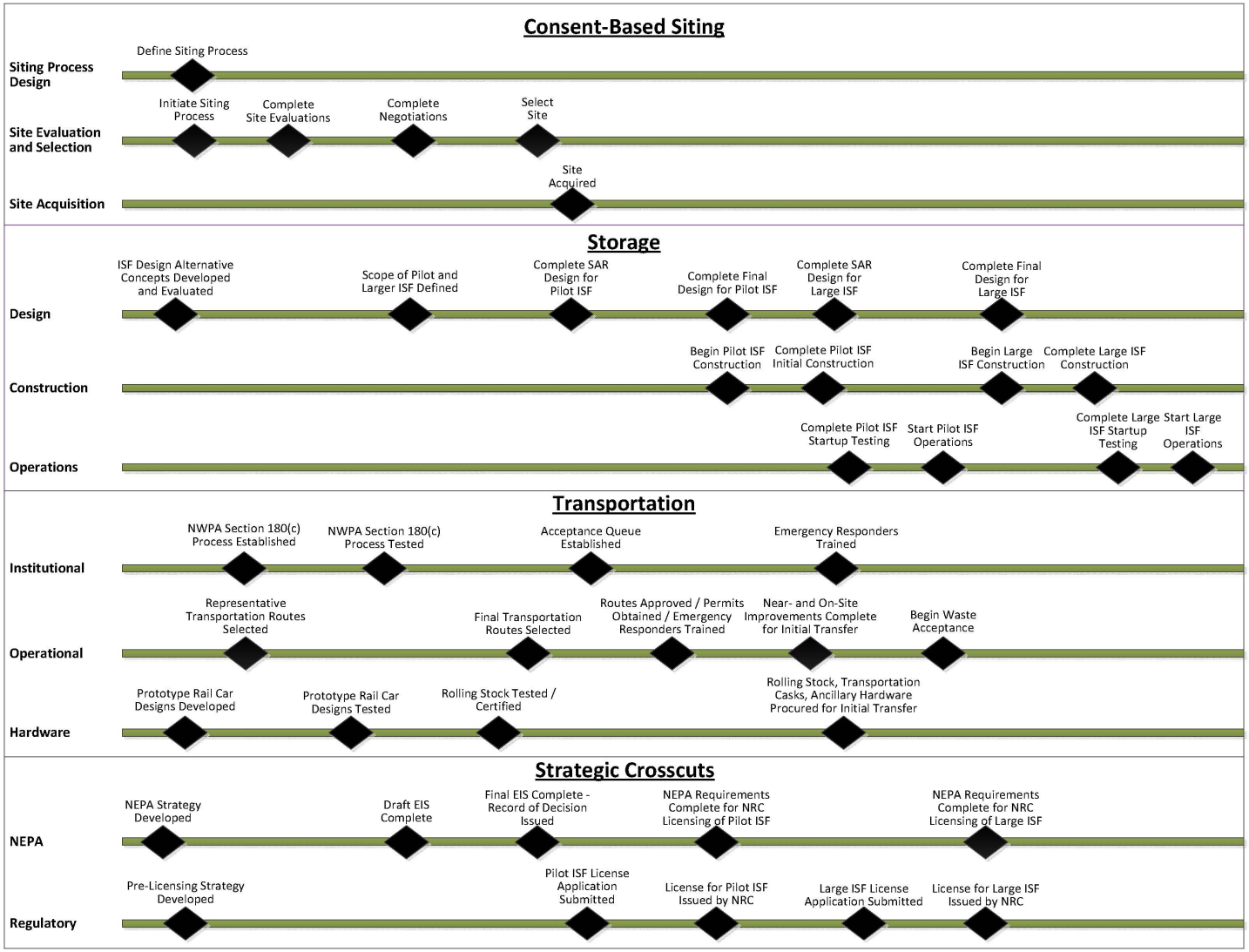
Near-Term Priorities to Lay the Groundwork for *Strategy* Implementing

- **Prepare for implementation of a pilot interim storage facility (ISF) with initial focus on receiving used nuclear fuel (UNF) from the shutdown reactor sites**
- **Make progress on long lead-time, destination-independent aspects of the transportation infrastructure, such as certification of railcars**
- **Develop and evaluate options for decision-makers on the design of an integrated waste management system**
- **Establish a unified and integrated UNF database and analysis system to characterize the input to the waste management system**
- **Develop generic information materials on storage and transportation of UNF to support stakeholder and public interactions**

U.S. DEPARTMENT OF ENERGY

Nuclear Energy

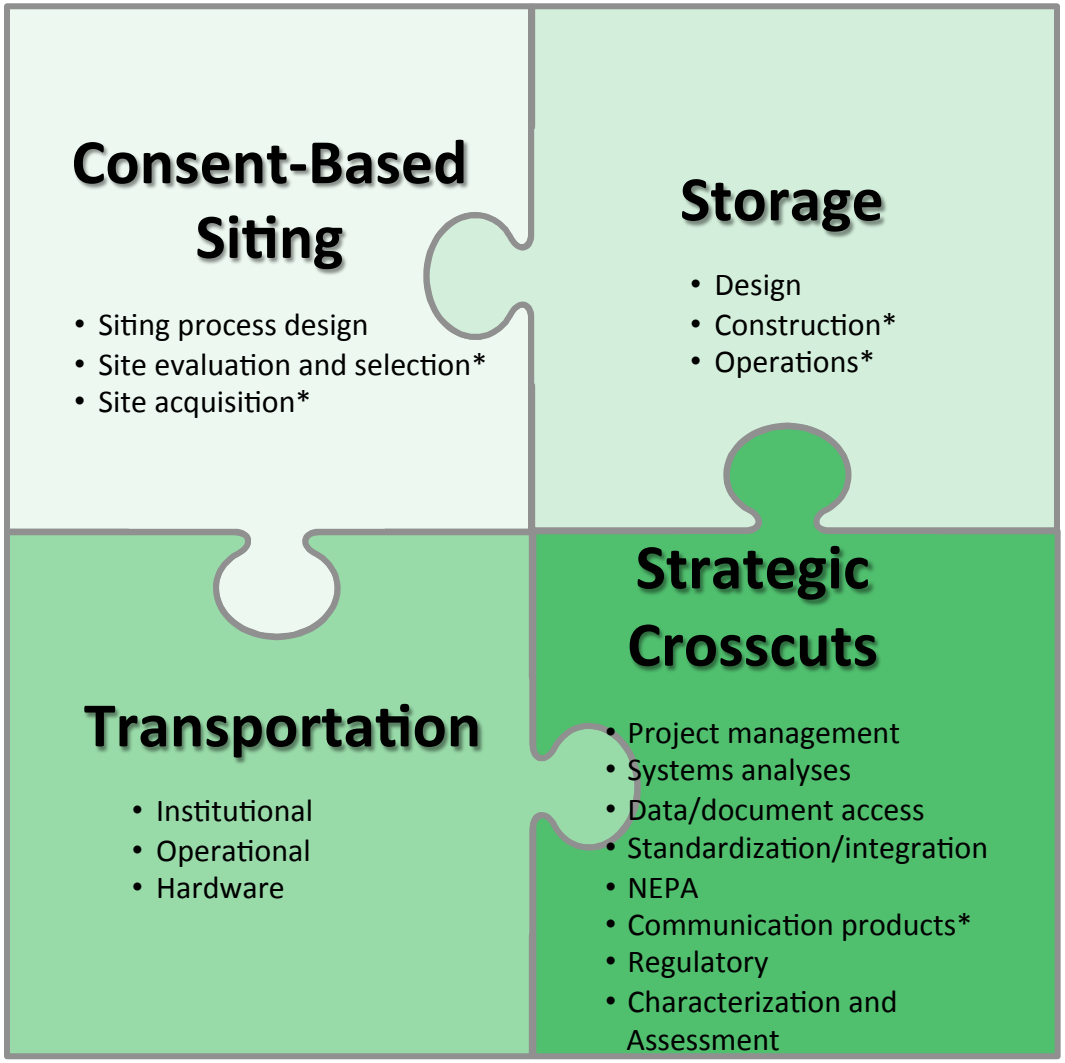
High-Level Milestones to Implement the *Strategy*



STORAGE & TRANSPORTATION

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

NFST Has Four Key Elements



* Indicates areas that are not currently active

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Outline

- Background, Mission, Objectives
- **Selected Activities**
- Concluding Remarks

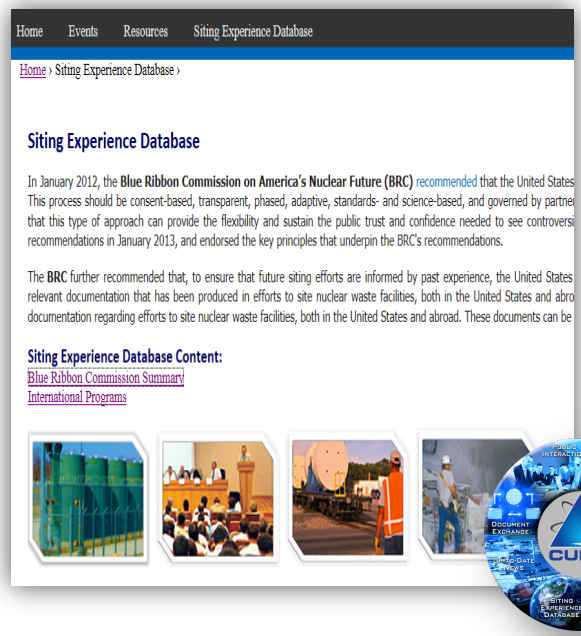
U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Preparing to Support the Establishment of a Publicly Accepted Consent-Based Siting Process

- **Developed a database of prior siting efforts**
  - http://curie.ornl.gov/SED/pages/sed-homepage
- **Reviewing and evaluating lessons learned from prior domestic and international siting efforts**
- **Evaluating public preferences related to consent-based siting and UNF management**

BRC recommendation:
DOE should build a data base of the experience that has been gained and relevant documentation produced in efforts to site nuclear waste facilities, in the United States and abroad.

Several local communities have expressed interest to DOE in hosting an ISF

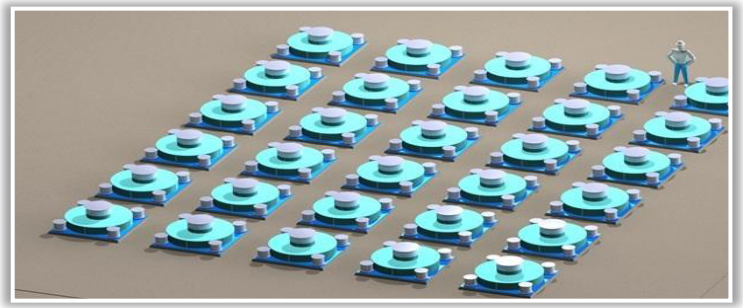


U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Laying the Groundwork for Consolidated Interim Storage

- **Evaluating interim storage design concepts, with input from industry contractors**
  - **Recently initiated new Task "*Generic Design Alternatives for Dry Storage of Used Nuclear Fuel*"**
- **Preparing facility functions and requirements**
- **Evaluated costs and impacts of opening non-disposable storage canisters**
- **Developing data on alternative generic design concepts for receiving, storing, handling, and repackaging UNF canisters to support systems analyses**

BRC recommendation:
"Perform systems analyses and design studies needed to develop a conceptual design for a spent fuel storage facility"



U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Evaluating Design Options for the Pilot (Flexible, Adaptable, and Expandable)

- **Dry Storage Alternatives**
  - Vented concrete at grade in horizontal and vertical vendor specific systems currently in use
  - Vaults for dry canisters
  - Universal storage overpacks
  - Universal underground systems
- **Required Support Systems/Facilities**
  - Cask-handling facility
    - Large shielded cell vs. transfer cask may offer time in motion and ALARA advantages
  - Storage overpack fabrication
  - Rail and cask maintenance
  - Security systems, infrastructure, and balance of plant
- **Potential Co-located Systems (may or may not be deployed with Pilot)**
  - Laboratory for supporting long-term storage and developing repackaging techniques
  - Fuel remediation capability for damaged or failed fuel
  - Related manufacturing facilities

Humboldt Bay Underground Storage

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Evaluating Design and Scope of the Pilot ISF for Initial Operations

LaCrosse
5*;0**
NAC-MPC with MPC-LACBWR canister

Zion
61*;4** **(est.)**
NAC MAGNASTOR with TSC-37 canister

Big Rock Point
7*;1**
BFS/ES Fuel Solutions W150 with W74 canister

Trojan
34*;0**
TranStor cask with Holtec MPC-24E/EF canisters

Yankee Rowe
15*;1**
NAC-MPC with Yankee-MPC canister

Humboldt Bay
5*;1**
Holtec HI-STAR HB with MPC-HB canister

Maine Yankee
60*;4**
NAC-UMS with transportable storage canister (TSC)

Rancho Seco
21*;1**
TransNuclear NUHOMS with FO-DSC, FC-DSC, and FF-DSC canisters

Connecticut Yankee
40*;3**
NAC-MPC with CY-MPC canister

Pilot

248 UNF casks
15 GTCC casks (est.)
7,649 assemblies
2813 MTHM
4 different vendors
7 storage systems

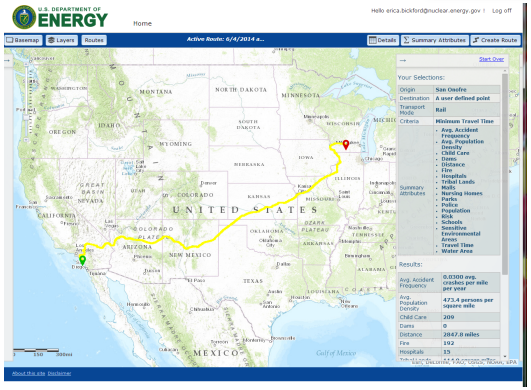
*UNF Casks
**GTCC Casks

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Preparing for the Large-Scale Transportation of UNF and HLW

- **Collaborating with stakeholders through State Regional Groups and tribal representatives**
  - Revised NWPA 180(c) policy and
  - National Transportation Plan
  - Routing options
- **Planning for design, testing, and acquisition of rail cars and transportation casks**
- **Assessing needs and developing plan for removing UNF from shutdown reactor sites**
- **Developing new routing capabilities and investigating routing options from shutdown reactor sites**
- **Released Request for Information / Sources Sought notice for procurement of AAR S-2043 Compliant Railcar**

BRC recommendation:
"Complete development of procedures and regulations for providing technical assistance, funding, and training to local groups in preparation for movement of spent fuel"

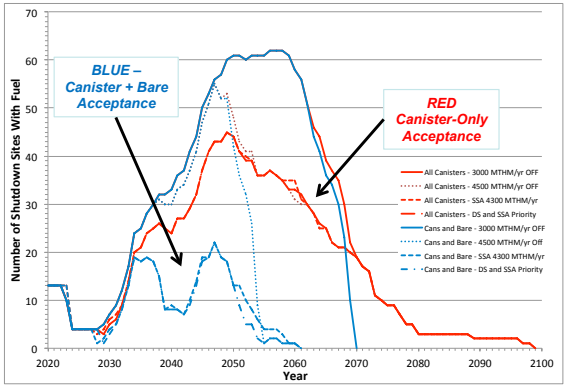


U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Developing and Applying Waste Management Systems Analysis Capabilities and Data

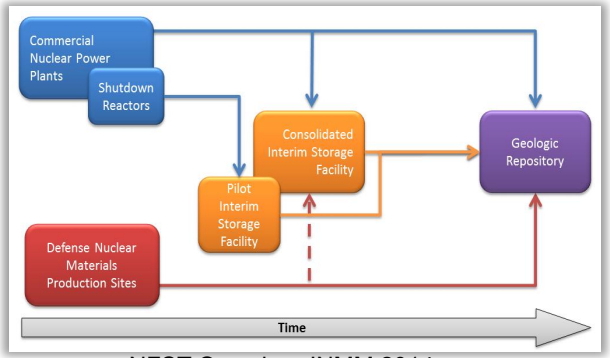
- **Reestablished capabilities and performed systems analysis of alternative approaches for accepting and moving fuel; continuing activity**
  - Developing methodologies, approaches, and tools to analyze the waste management system
  - Provided insights regarding potential waste management system architectures
  - Exposed data and analysis capability needs
- **Identifying opportunities for better integration of storage into the waste management system, including consideration of standardization and alternative storage systems at ISF**

BRC recommendation:
"Develop systems analyses to provide quantitative estimates of the system benefits of utility actions"



Impact of receipt strategies on pace of deinventorying sites


Ft. St. Vrain, vault



NFST Overview, INMM 2014

NFST 14
NUCLEAR FUELS STORAGE & TRANSPORTATION

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

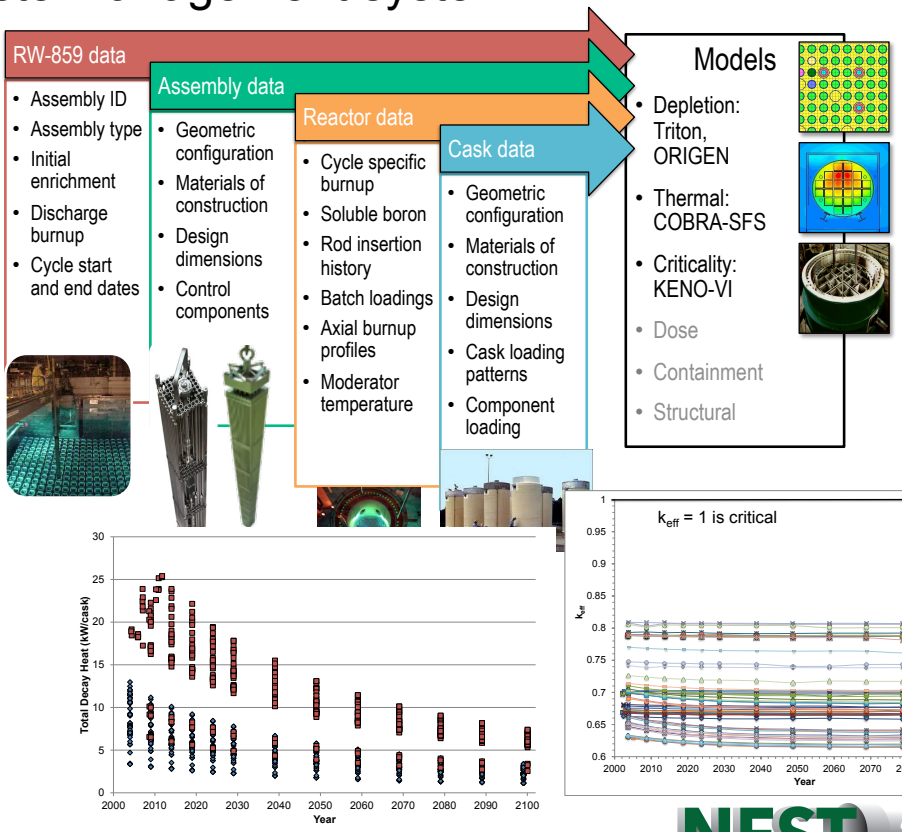
Developing the Basis for Future Decisions Regarding Standardization

- **Standardization offers the potential for significant system-wide benefits**
  - Benefits recognized in previous periods, e.g., MPCs & TADs, and by BRC and FY12 congressional budget direction
  - Opportunities include canisters, overpacks, casks, and ancillary equipment
- **For a variety of reasons, legitimate questions persist about what, when, and how to standardize**
- **Any action to standardize by an implementing organization would require a major policy decision with significant implications**
- **In collaboration and consultation with industry, NFST is conducting a quantitative assessment of relevant options to establish the basis for future policy decision making**

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Developing the Unified Database and Integrated Analysis System

- **Used Nuclear Fuel Storage, Transportation, and Disposal Analysis Resource and Data System (UNF-ST&DARDS)**
  - Characterize the input to the waste management system
  - Provide a unified, controlled data source for key information
  - Assess issues and uncertainties related to the transportability of loaded casks, with emphasis on the shutdown sites
  - Provide an integrating (storage, transportation, and disposal), foundational resource with broad applicability
    - Waste management, Safety, Fuel cycle decisions, Safeguards and Security



NFST NUCLEAR FUELS STORAGE & TRANSPORTATION

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Outline

- Background, Mission, Objectives
- Selected Activities
- **Concluding Remarks**

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Making Progress on this Important National Issue

- **While legislation is needed to proceed in some areas, progress is being made in laying the groundwork**
  - ✓ Planning project established and multi-organizational team assembled
  - ✓ Siting Experience Database completed (now being maintained)
  - ✓ ISF design concepts developed/evaluated
  - ✓ Costs and impacts of opening non-disposable storage canisters evaluated
  - ✓ Feasibility of standardized canisters evaluated
  - ✓ Cooperative agreements with State Regional Groups and Tribes established
  - ✓ Draft National Transportation Plan and NWPA 180(c) policy prepared
  - ✓ Waste management system analyses capabilities established and applied
  - ✓ Unified database and analysis system established and applied
  - ✓ Preliminary evaluation of removing UNF from shutdown reactor sites completed
  - ✓ Evaluating design options for an integrated waste management system
  - ✓ …

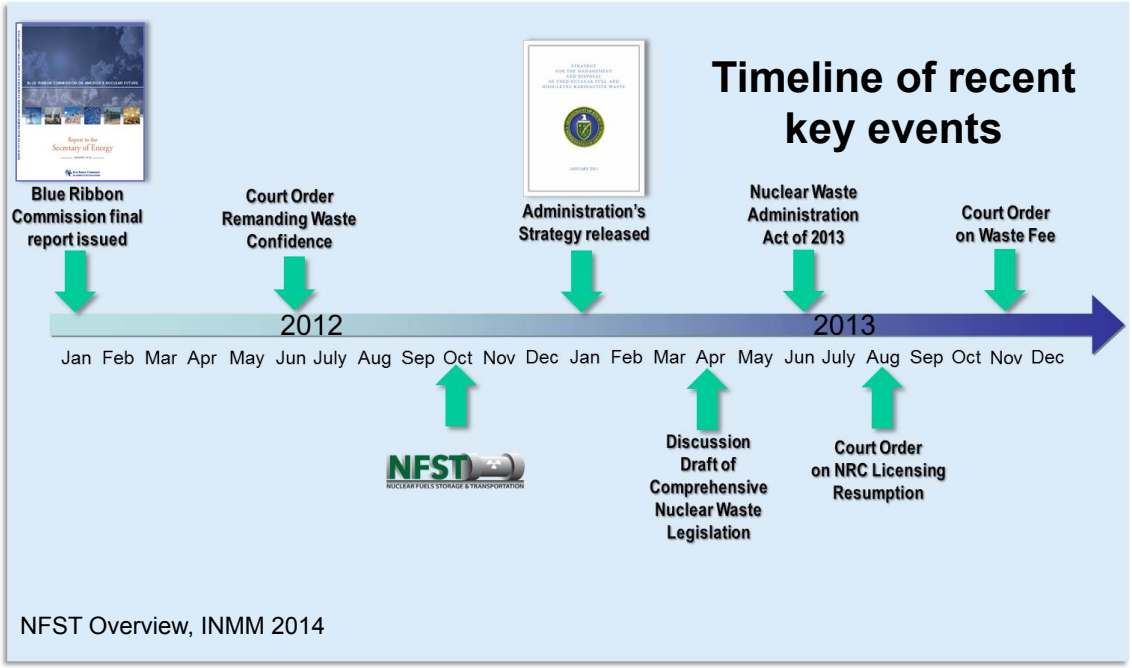
U.S. DEPARTMENT OF ENERGY

Nuclear Energy

To Fully Implement the *Strategy*, Legislation is Needed That Would:

- Permit construction of an ISF before repository construction license by NRC
- Create the Management and Disposal Organization (MDO)
- Define requirements for consent-based siting, per *Strategy*
- Permit new siting studies for a repository
- Allow funding changes for timely implementation by the MDO

DOE will continue the effort within existing authority until legislation is enacted



U.S. DEPARTMENT OF ENERGY

Nuclear Energy

Questions & Discussion

NFST NUCLEAR FUELS STORAGE & TRANSPORTATION