

Current Status of U.S. Nuclear Waste Management Programs*

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Presentation Outline

- **Introduction**

- **Waste Isolation Pilot Plant**

- **Blue Ribbon Commission on America's Nuclear Future**

- **U.S. DOE's Nuclear Waste Management Strategy**
 - Used Fuel Disposition Campaign
 - Nuclear Fuel Storage & Transportation Planning Project

- **Concluding Remarks**



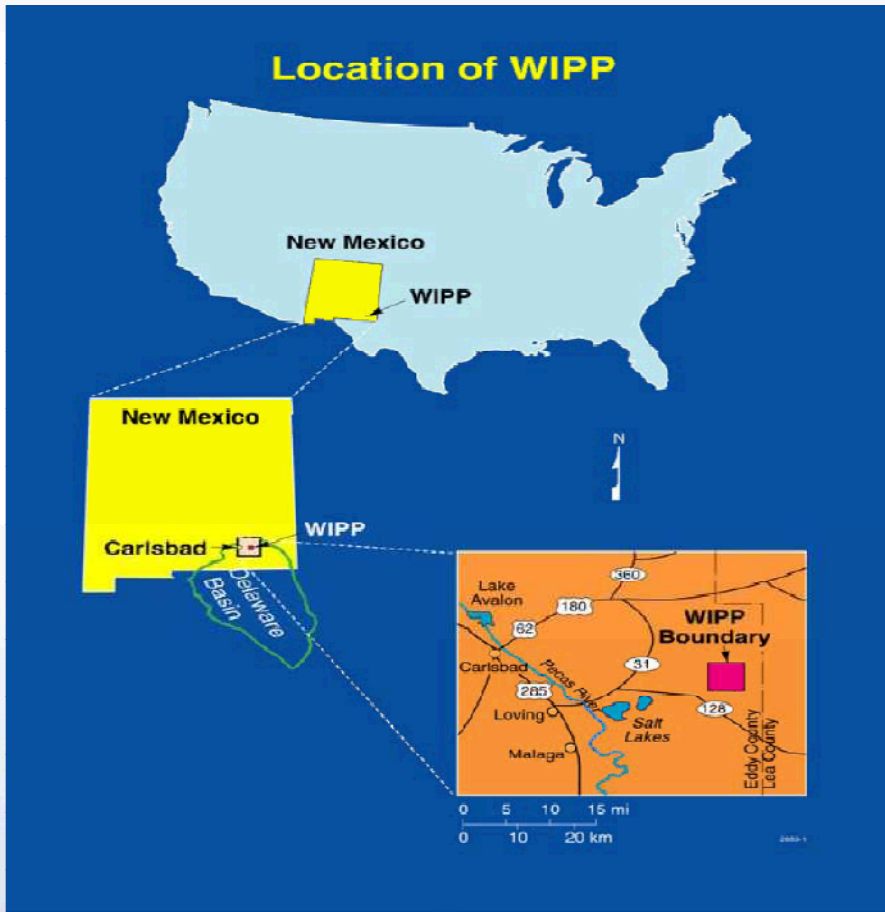


Introduction

- **The purpose of this paper is to describe the current status of nuclear waste management programs in the United States and update since 3rd EAFORM**
- **Progress since 3rd EAFORM in 2010:**
 - DOE is completing 3rd Re-Certification Application for the Waste Isolation Pilot Plant (WIPP)
 - The Blue Ribbon Commission on America's Nuclear Future (BRC) completed and issue its recommendations for the management of nuclear waste in January 2012
 - DOE issued its strategy for the management of nuclear waste in January 2013
 - Generic RD&D in Storage, Transportation and Disposal under the Used Fuel Disposition Campaign (UFDC) has continued
 - The Nuclear Fuels Storage and Transportation Planning Project has been initiated



WASTE ISOLATION PILOT PLANT (WIPP)

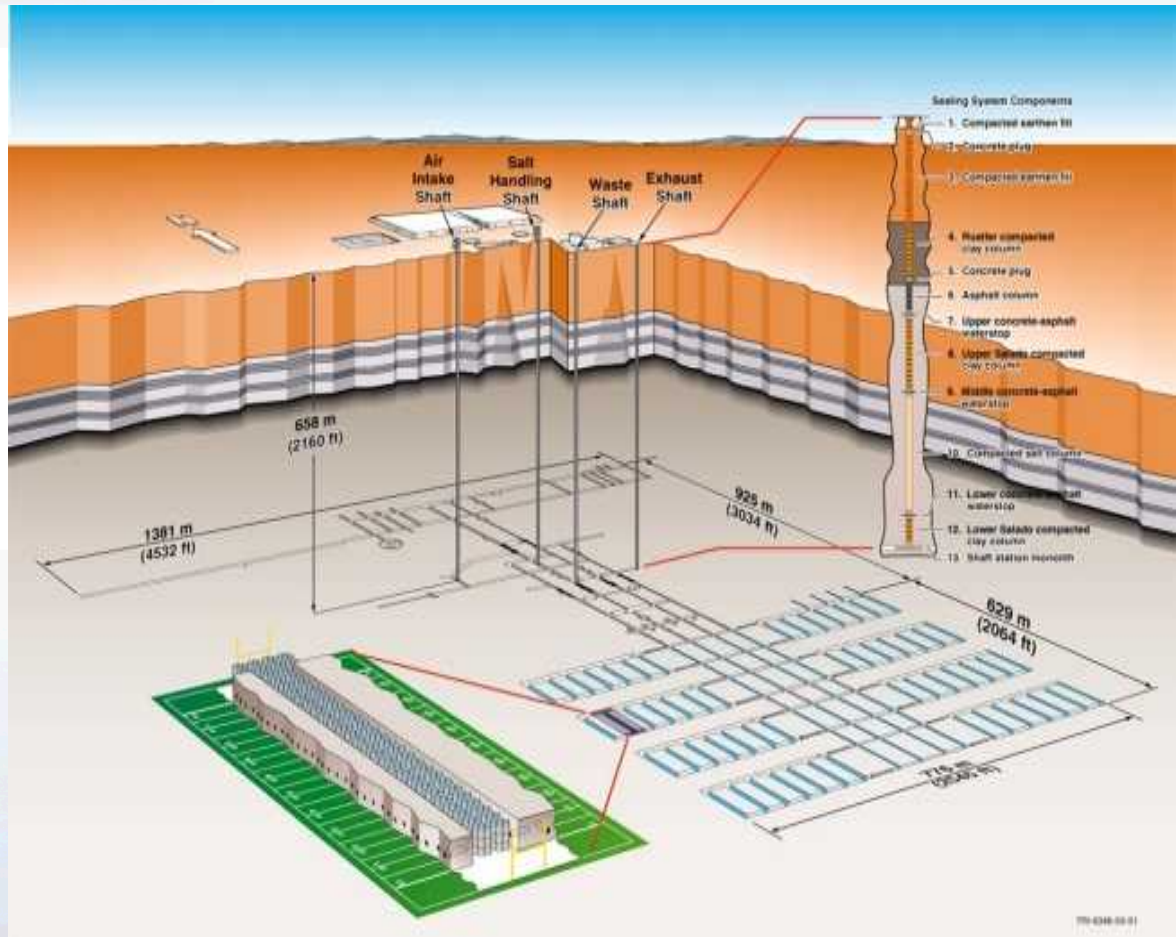


WIPP, located approximately 42 km (26 miles) due east of Carlsbad, New Mexico, is the first deep geologic repository certified in the U.S. to safely and permanently dispose of transuranic waste generated from the research and production of nuclear weapons.



TRU waste is the U.S. equivalent to Europe's intermediate-level waste, between low-level waste (LLW) and high-level waste (HLW), and requires long-term isolation in a deep geologic repository.





Schematic of the WIPP Facility.

The Waste Isolation Pilot Plant Land Withdrawal Act of 1992 (Public Law 102-579) mandates the location and provisions for development of WIPP, including compliance with EPA disposal regulations.





A key requirement for WIPP is recertification at five year intervals following initial receipt of waste to ensure that WIPP continues to comply with the applicable disposal regulations. EPA's first recertification of WIPP was in March 2006 and the second in November 2010. In March 2014, the DOE will complete the third re-certification application for WIPP and submitted it to the EPA.

At WIPP, TRU waste is placed in disposal rooms located 655 meters (2,150 feet) underground within a geologically stable salt formation known as the Salado.

The WIPP design includes ten panels, each made up of seven disposal rooms. Waste has been placed in Panels 1 through 5, and disposal operations are taking place in Panel 6. Mining in Panel 7 began in April 2010 and is still underway.



WIPP received the first shipment of TRU waste on March 26, 1999. As of July 2013, nearly 11,500 waste shipments, totaling more than 87,000 m³ of contact handled (CH) waste and more than 300 m³ of remote handled (RH) TRU waste have been made to WIPP. Progress at WIPP has led to the cleanup of TRU wastes at 22 sites in the U.S.





In addition to being the U.S. national repository for TRU wastes, WIPP is a unique facility for researching a variety of subjects. WIPP provides a suitable environment for the conduct of experimental programs in many scientific disciplines, including particle astrophysics, waste repository science, mining technology, low radiation dose physics, fissile materials accountability and transparency, and deep geophysics. Current and past underground experiments include:



Enriched Xenon Observatory clean-room modules are put in place at WIPP.

- **The Enriched Xenon Observatory (EXO), an experiment in particle physics aiming to detect “neutrino-less double beta decay”. A 200-kg detector using liquid xenon is currently being installed at the WIPP. Many research and development efforts are underway with the goal of probing new physics and the mass of the neutrino.**
- **Biological experiments continue underground testing effects of low background radiation on bacteria.**





The Yucca Mountain Project

- **“Yucca Mountain is not a workable option” (DOE licensing motion, March 3, 2010)**
 - “the Secretary’s judgment ... is not that Yucca Mountain is unsafe or that there are flaws in the [License Application], but rather that it is not a workable option and that alternatives will better serve the public interest.” (DOE filing to NRC Licensing Board, May 27, 2010, footnote 102)
- **Yucca Mountain licensing hearings were suspended pending court action**
 - August 13, 2013 ruling by the US Court of Appeals for the District of Columbia directed the U.S. Nuclear Regulatory Commission to continue the licensing process for Yucca Mountain using available funds.
- **All current DOE activities related to disposal of spent nuclear fuel and high-level radioactive waste have moved to the DOE Office of Nuclear Energy and are limited to generic R&D**
- **The Nuclear Waste Policy Act remains in effect**



Current U.S. Nuclear Waste Management Activities

Blue Ribbon Commission on America's Nuclear Future

In late January 2010, the U.S. Administration created the Blue Ribbon Commission on America's Nuclear Future, an advisory committee to the DOE. Its charter asks the BRC to conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle. This is to include alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel, high-level waste, and materials derived from nuclear activities.

The fifteen member BRC consists of a broad range of nationally recognized policy, technical, academic, corporate and union expertise. The BRC initially met in early March 2010 and is currently gathering information, having met regularly. It has also organized three subcommittees: Disposal, Reactor and Fuel Cycle Technology, and Transportation and Storage.





Blue Ribbon Commission on America's Nuclear Future

- **BRC will provide advice, evaluate alternatives, and make recommendations for a new plan to address these issues:**
 - Evaluation of existing fuel cycle technologies and R&D programs. Criteria for evaluation should include cost, safety, resource utilization and sustainability, and the promotion of nuclear nonproliferation and counter-terrorism goals
 - Options for safe storage of used nuclear fuel while final disposition pathways are selected and deployed
 - Options for permanent disposal of used fuel and/or high-level nuclear waste, including deep geological disposal
 - Options to make legal and commercial arrangements for the management of used nuclear fuel and nuclear waste in a manner that takes the current and potential full fuel cycles into account
 - Options for decision-making processes for management and disposal that are flexible, adaptive, and responsive
 - Options to ensure that decisions on management of used nuclear fuel and nuclear waste are open and transparent, with broad participation
 - The possible need for additional legislation or amendments to existing laws, including the Nuclear Waste Policy Act of 1982, as amended





BRC Recommendations – January 2012

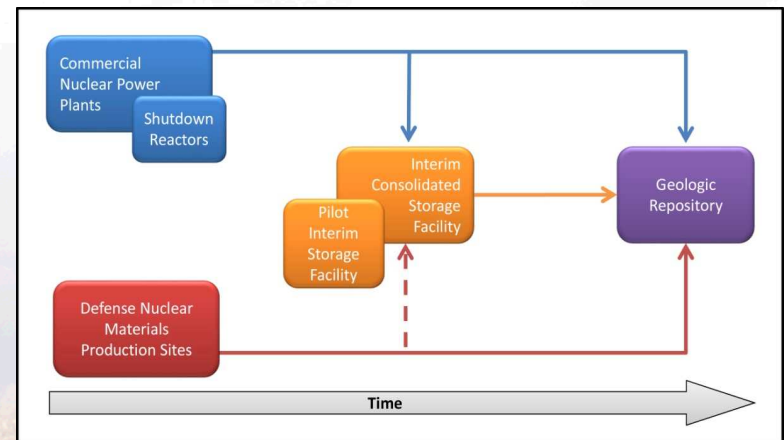
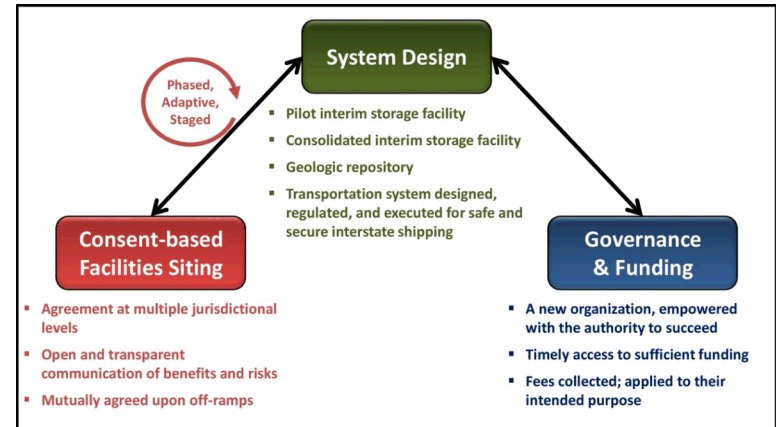
- **A new, consent-based approach to siting future nuclear waste management facilities**
- **A new organization dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed**
- **Access to the funds nuclear utility ratepayers are providing for the purpose of nuclear waste management**
- **Prompt efforts to develop one or more geologic disposal facilities**
- **Prompt efforts to develop one or more consolidated storage facilities**
- **Prompt efforts to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste to consolidated storage and disposal facilities when such facilities become available.**
- **Support for continued U.S. innovation in nuclear energy technology and for workforce development.**
- **Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns.**



DOE's Nuclear Waste Management Strategy – January 2013

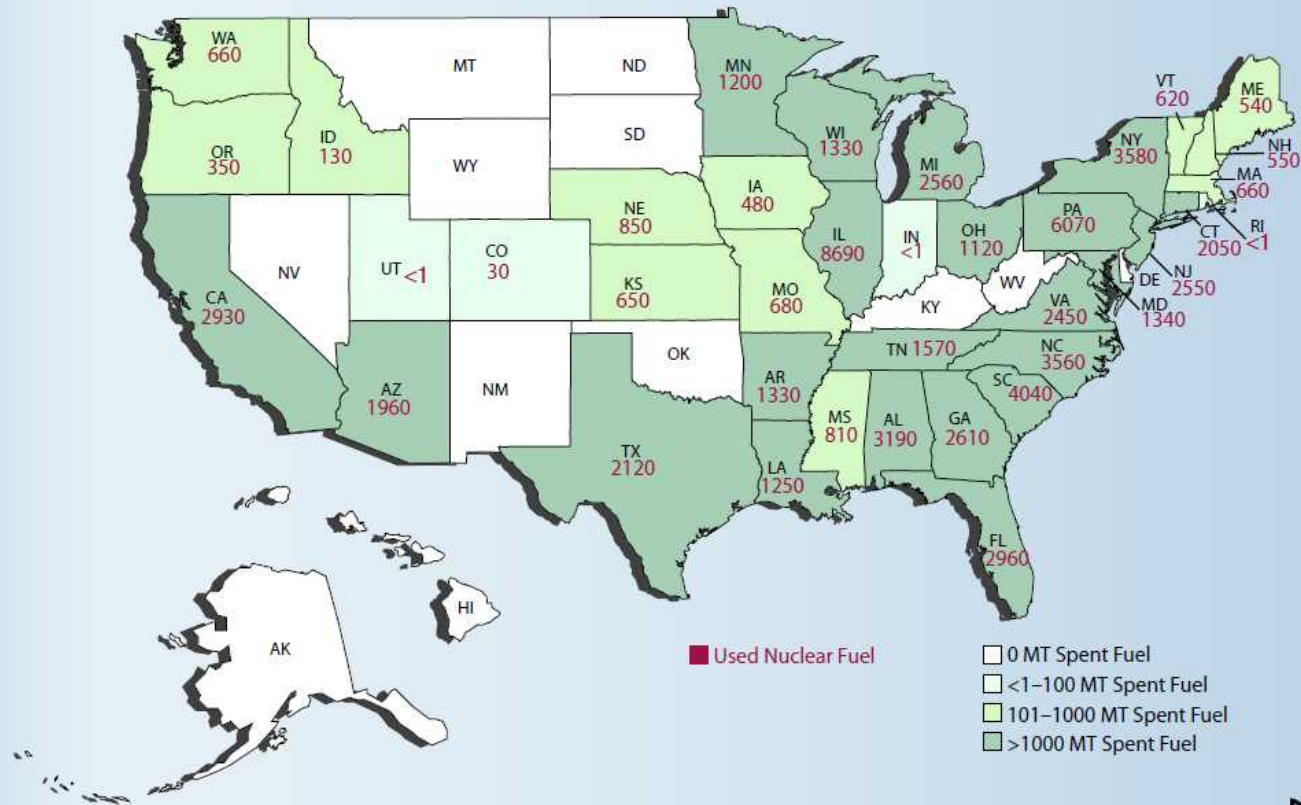
Assuming Congressional action, the Administration currently plans to implement a program over the next 10 years that:

- Sites, designs, licenses, constructs and begins operations of a pilot interim storage facility by 2021 with an initial focus on accepting UNF from shut-down reactor sites;
- Sites, designs, designs, licenses, constructs and begins operation of a larger interim storage facility 2025 to accept enough UNF to reduce expected government liabilities;
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048.
- Directly disposes ,without retrieval, of all currently existing UNF inventory (>65K MTHM, the largest in the world)



Where Used Nuclear Fuel is Today

Used Nuclear Fuel in Storage (Metric Tons, End of 2011)

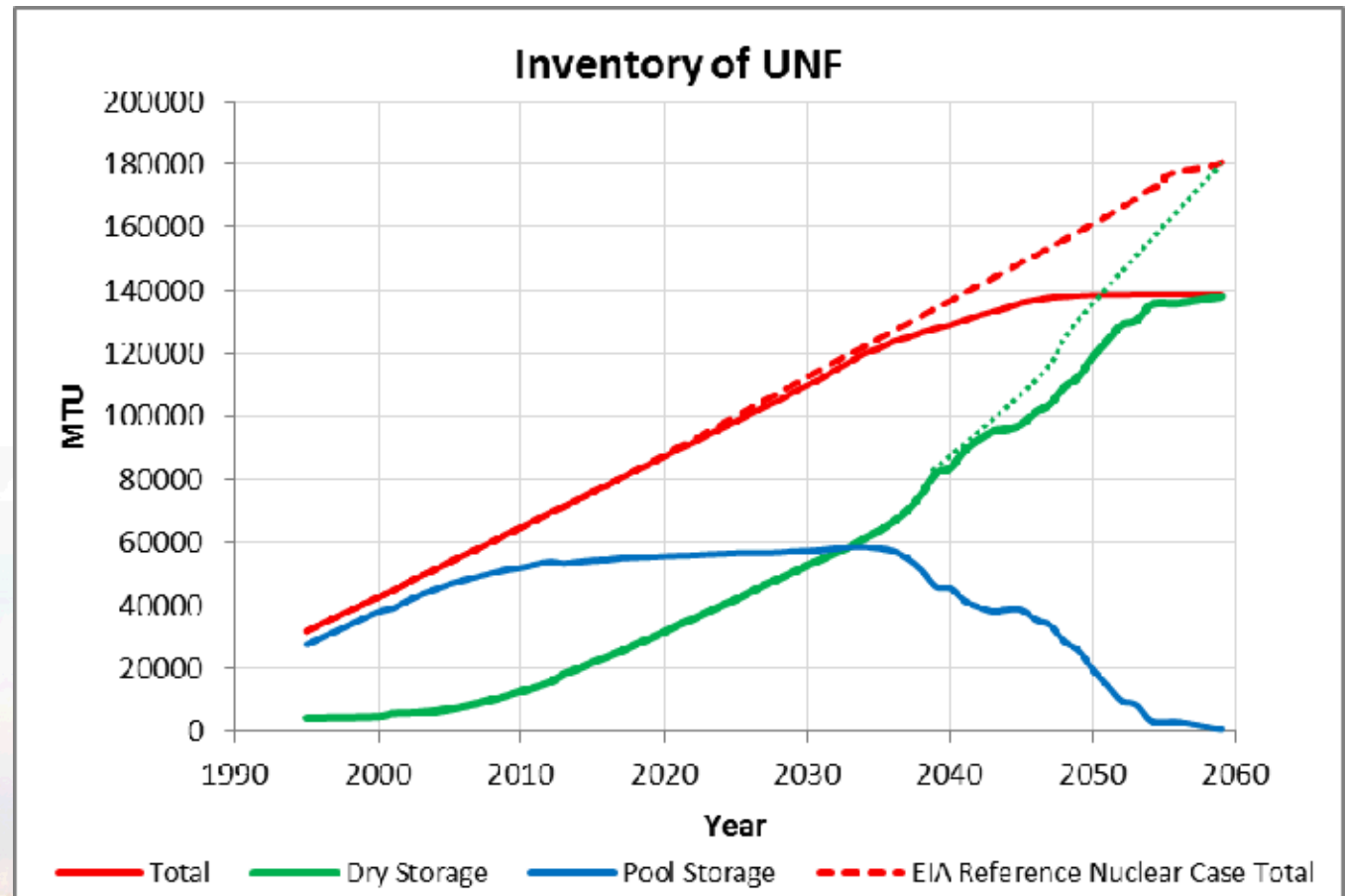


<http://nei.org/resourcesandstats/graphicsandcharts/usedfuel/>

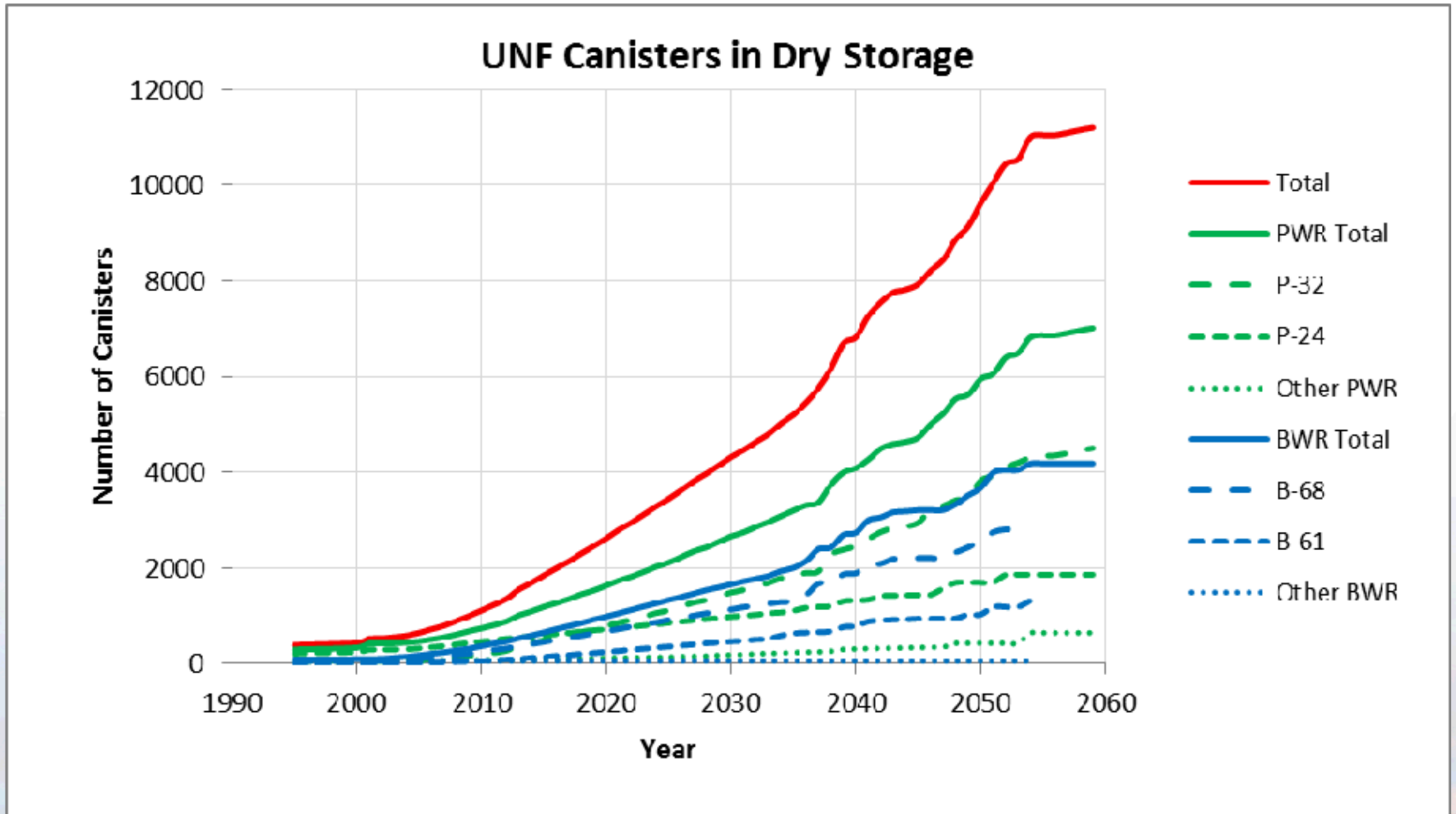


Projected U.S. Spent Fuel Inventory

- CALVIN-TSL Logistics Simulator (Nutt et al. 2012)
- Existing power plants with 20-yr life extensions
- Burnup increase to 5% enrichment
- Xfer from pools to dry storage at shutdown
- Some new builds



Projected Canisters in the U.S.



Current DOE Nuclear Waste Management Programs

- **All current DOE activities related to disposal of spent nuclear fuel and high-level radioactive waste have moved to the DOE Office of Nuclear Energy and are limited to generic R&D**
 - Used Fuel Disposition Campaign
 - ◆ Generic RD&D in Storage, Transportation and Disposal
 - ◆ The UFDC mission is to identify alternatives and conduct scientific research and technology development to enable storage, transportation and disposal of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles.
 - Nuclear Fuel Storage & Transportation Planning Project
 - ◆ Planning and Implementing, to the extent allowed by current U.S. Congressional authorization, the storage and transportation of components of the DOE Strategy





Concluding Remarks

- **Since the 3rd EAFORM, there have been a number of significant developments on the U.S. nuclear waste management programs:**
 - **First, the EPA issues its second re-certification for WIPP which determined that this facility continues to meet the established TRU waste disposal standards.**
 - **Second, the Blue Ribbon Commission on America's Nuclear Future, established in 2010 to make recommendations future nuclear waste management policies, issued its final report in 2012 containing six major recommendations.**
 - **Third, the DOE in 2013 issued a strategy, largely in response to the BRC's recommendations, which is committed to – assuming the necessary Congressional authorization and appropriation – to a program that will have an operational geologic repository by 2048 with two intermediate steps consisting of a pilot interim storage facility by 2021, a larger interim storage facility by 2025, and the needed large-scale UNF transportation system.**
 - **Fourth, DOE continues to focus on generic storage, transportation and disposal R&D campaign focused on addressing key technical challenges, and has initiated a new program aimed at the planning of the two aforementioned interim storage milestones.**

