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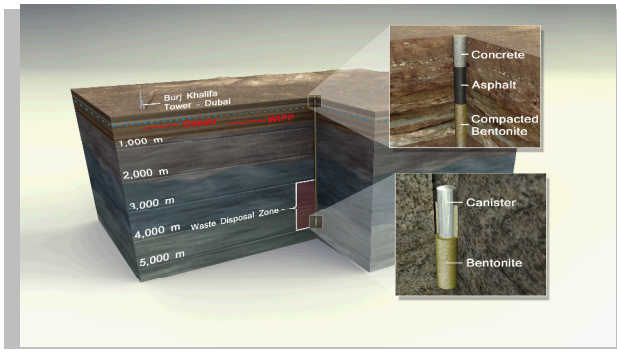

Update on the United States Department of Energy's Used Fuel Disposition R&D Campaign

Presented by: Kevin A. McMahon

Nuclear Waste Disposal Research & Analysis

Sandia National Laboratories, Albuquerque, New Mexico, USA

at GLOBAL 2015, Paris France, September 2015

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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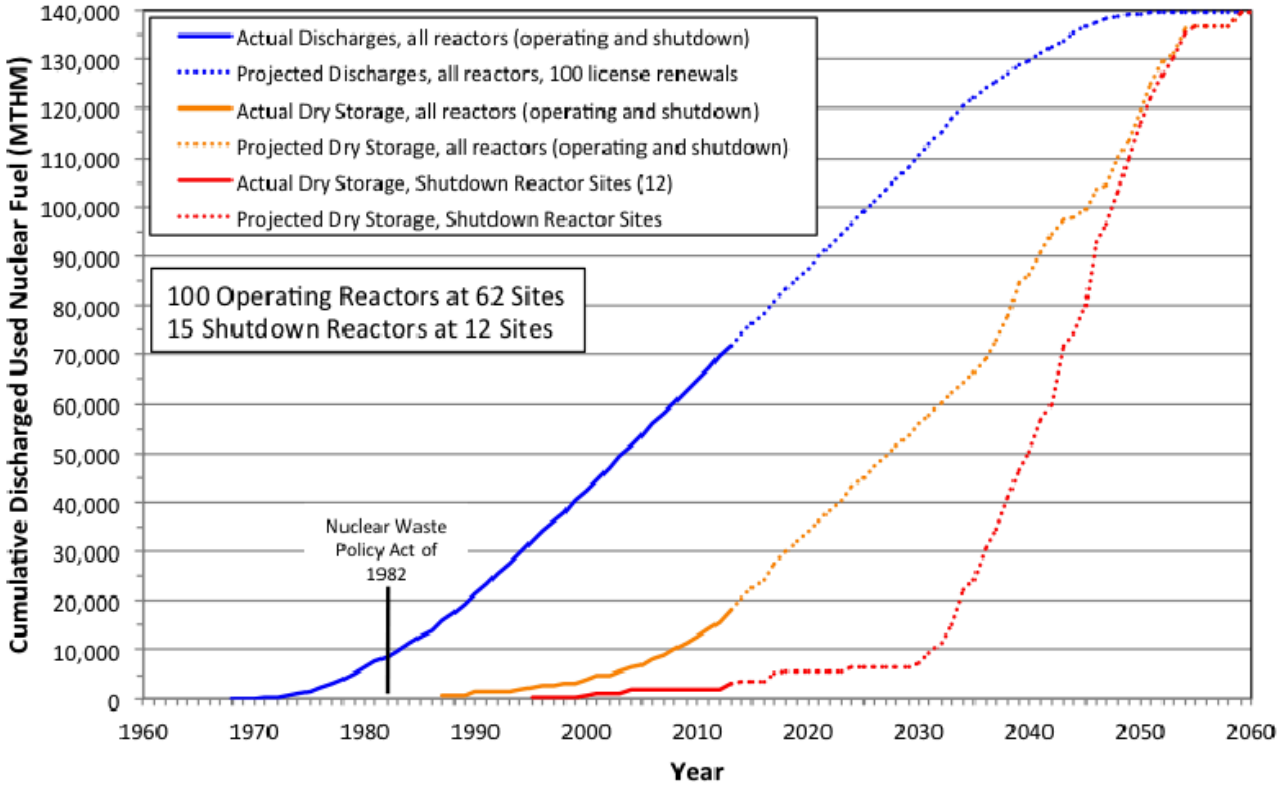
Outline

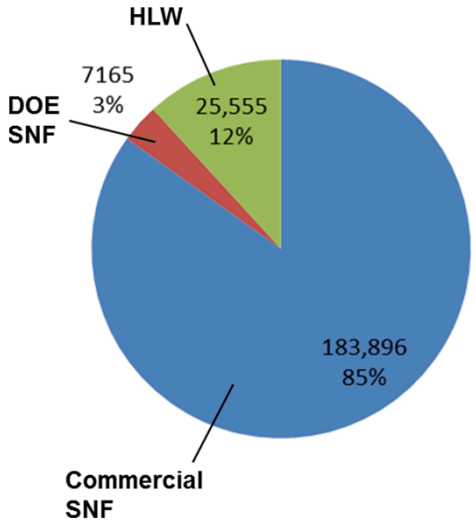
- Where the Used Fuel Disposition (UFD) R&D Campaign fits in the US Program
  - Organization
  - Mission
- Scope of the UFD R&D program
- Near Term R&D Priorities

Historical and Projected Spent Nuclear Fuel (SNF) and High-Level Radioactive Waste (HLW) in the United States



Historical and Projected Commercial SNF Discharges

Projected Volumes of SNF and HLW in 2048



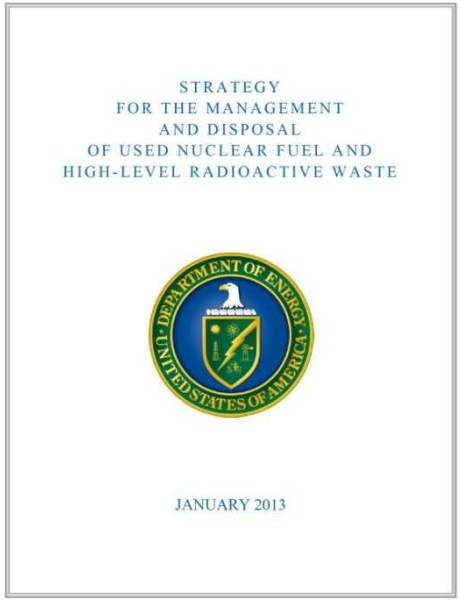
Volumes shown in m^3, assuming constant rate of nuclear power generation and packaging of future commercial SNF in existing designs of dual-purpose canisters

Summary of the Administration's UNF and HLW Strategy

Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste issued January 2013

The Strategy is:

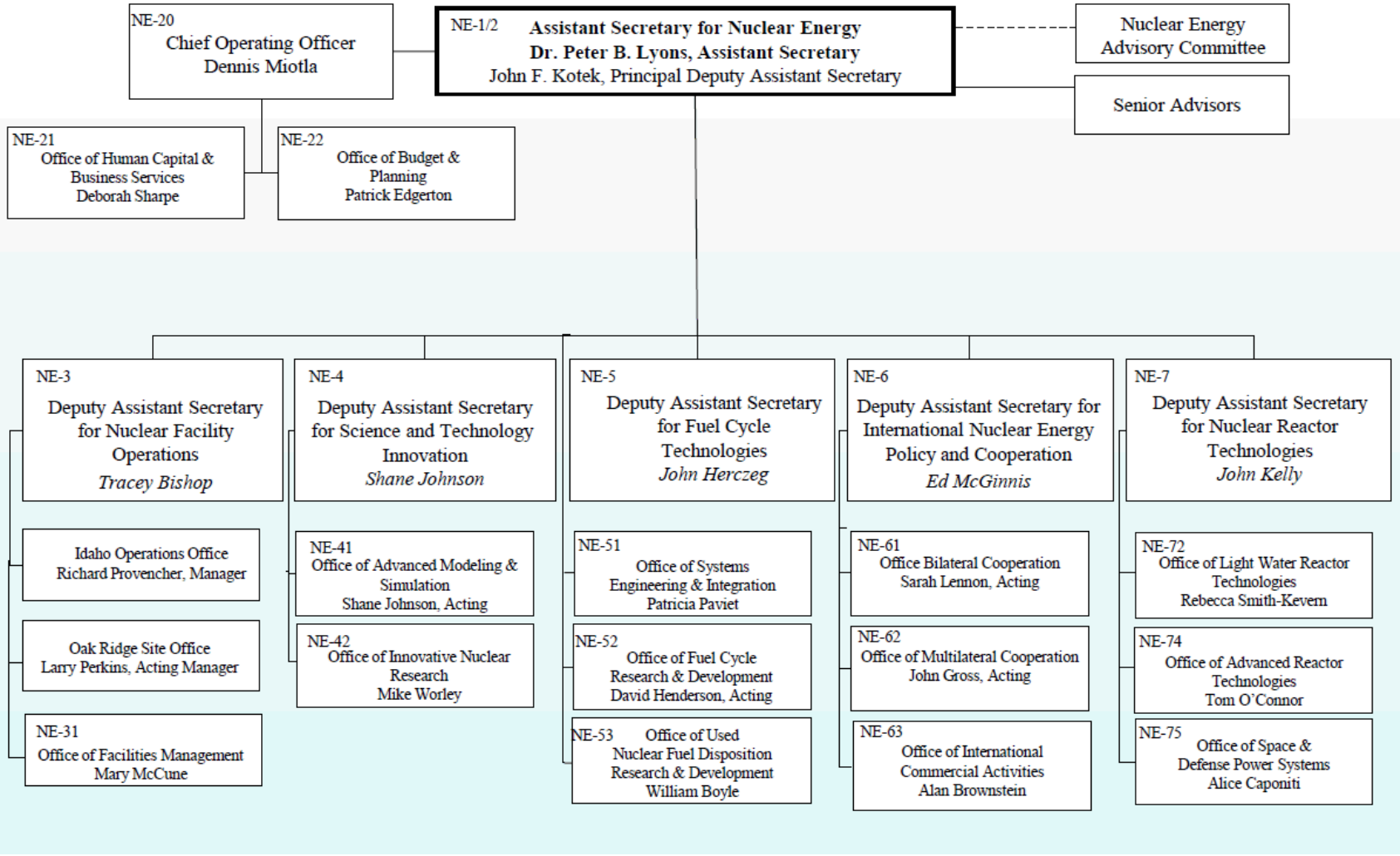
- A statement of Administration policy regarding the importance of addressing the disposition of used nuclear fuel and high-level radioactive waste
- The response to the final report and recommendations made by the *Blue Ribbon Commission on America's Nuclear Future*
- The initial basis for discussions among the Administration, Congress and other stakeholders



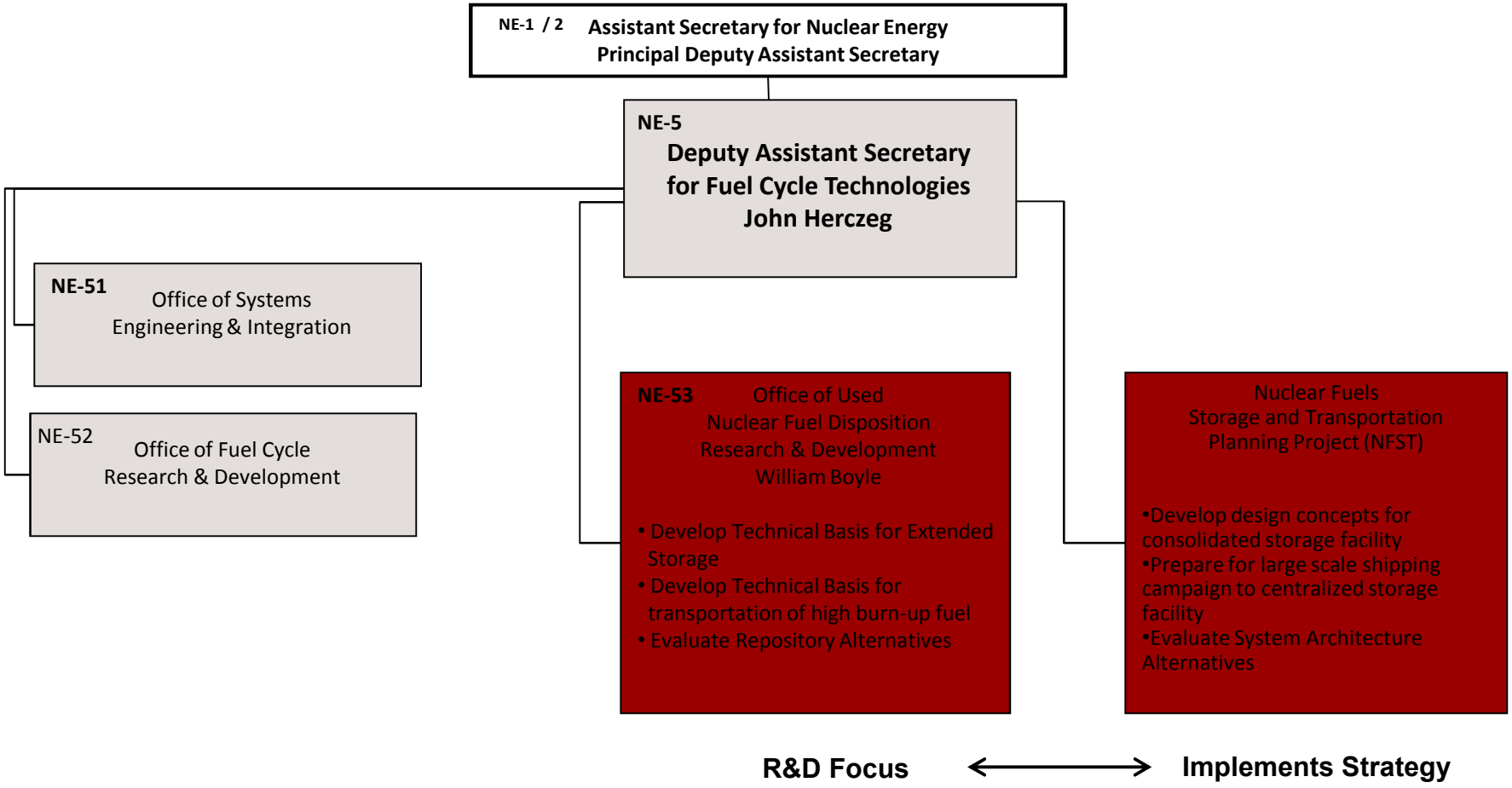
The Strategy outlines a 10-year program of work that:

- Sites, designs, licenses, constructs and begins operations of a pilot interim storage facility (operating 2021)
- Advances toward the siting and licensing of a larger interim storage facility (operating 2025)
- Makes demonstrable progress on the siting and characterization of repository sites (repository sited 2026, licensed 2042, operating 2048)

DOE-NE Organization Chart



DOE Office of Nuclear Energy
Office of Fuel Cycle Technologies (NE-5)



Used Fuel Disposition R&D Campaign Mission

The *DOE Office of Used Nuclear Fuel Disposition Research and Development and nine national laboratories participate in the DOE Office of Nuclear Energy's "Used Fuel Disposition Campaign"*

Campaign Mission: 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

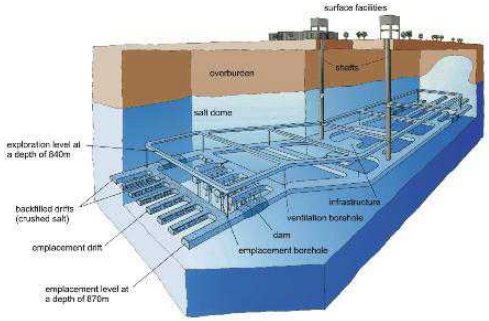
Campaign Strategic Focus: Storage and Transportation R&D

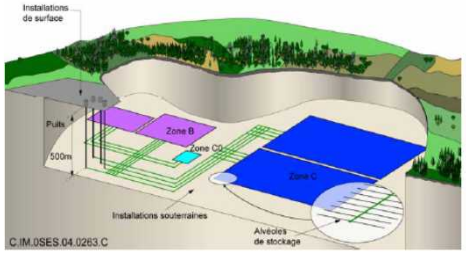
Prepare for extended storage and eventual large-scale transport of used nuclear fuel (UNF) and high-level waste

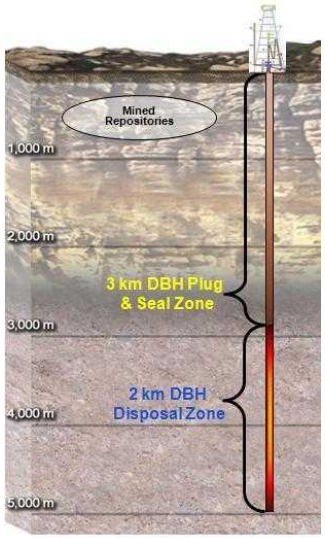
- Develop additional confidence in the technical basis for:
  - Extended storage of used nuclear fuel
  - Fuel retrievability and transportation after extended storage
  - Transportation of high-burnup used nuclear fuel

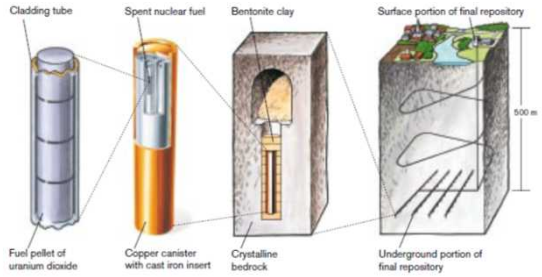
UFD Campaign Strategic Focus: Disposal R&D

- Provide a sound technical basis for multiple viable disposal options in the US
- Increase confidence in the robustness of generic disposal concepts
- Develop the science and engineering tools needed to support disposal concept implementation









Used Fuel Disposition R&D Campaign External Collaborations

Sandia National Laboratories

- Industry
  - DOE/Electric Power Research Institute (EPRI) Storage Demonstration Collaboration initiated FY13
  - Participation in EPRI Extended Storage Collaboration Program (ESCP) (with NRC and international groups)
- International Collaborations
  - Participation in international Underground Research Laboratories in Europe and Korea and in multi-national disposal research activities
  - Bilateral agreements on storage and disposal R&D with Korea, Japan, China
  - MOU for salt disposal R&D with Germany
  - IAEA working groups in storage and transportation
  - Collaboration with Germany and Japan on extended performance of bolts and seals for bolted storage casks
- DOE NE University Programs
  - 20 UFD-relevant university grants awarded since 2010 (total value ~ $14M)
  - 3 UFD-relevant Integrated Research Projects in storage R&D since 2011 (total value ~$11.5M)
- Other university collaborations (MIT, U. of Oklahoma, UNLV, University of Sheffield UK)

Near-Term Priorities for UFD R&D
(Consistent with FY2016 Budget Request)

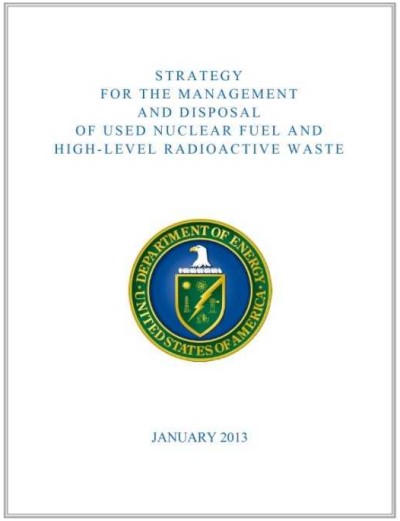
- Storage and Transportation R&D Activities
  - Collaborate with industry in designing and fielding a full-scale high-burnup dry storage demonstration test
  - R&D to support the storage demonstration test
  - Develop data and models for performance of fuel, cladding, canister, and canister internals in storage and transportation environments
- Disposal R&D Activities
  - Assess feasibility of direct geologic disposal of existing dry storage canisters
  - Conduct analyses and experiments to evaluate disposal options in crystalline, clay/shale, and salt host rocks, including continuation of international collaborations
  - Develop technical basis for deep borehole disposal concepts
  - Initiate a field test to examine viability of deep borehole disposal of HLW

See DOE FY2016 Congressional Budget Request vol. 3, p. 452-455, available at http://www.energy.gov/cfo/downloads/fy-2016-budget-justification

Long-Term UFD R&D Campaign Objectives

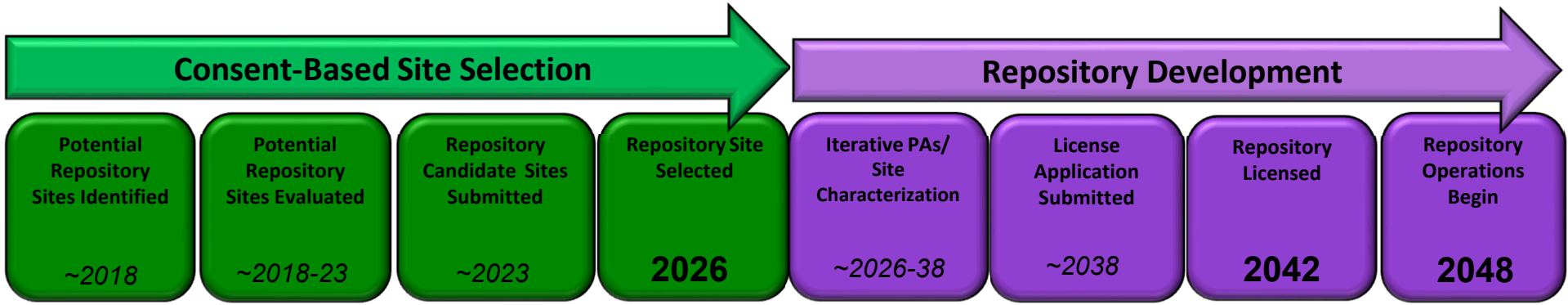
- Support the implementation of a full-scale NRC-licensed confirmatory storage demonstration facility, in collaboration with industry
- Develop the technical basis necessary to support eventual transportation of used nuclear fuel, including high-burnup fuel
- Collaborate with the Nuclear Fuel Storage and Transportation Planning Project to implement integrated storage, transportation, and disposal concepts

Support the Administration's 2013 *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*



R&D Path to Support DOE Waste Management Strategy

Storage & Transportation R&D supports 2025 Consolidated Interim Storage Facility



Approximate target dates (in *italics*) needed to meet milestones (in bold) set out in the 2013 DOE *Strategy*

Disposal R&D supports 2026 Repository Site Selection and 2042 Repository Licensing

Questions?

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