Department of Energy
Spent Nuclear Fuel - Update

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• Department of Energy/Environmental Management (DOE/EM) Organization

• Spend Nuclear Fuel (SNF) Mission/Vision

• Current Status of DOE SNF

• Partnership with Material Management & Minimization (formerly known as Global Threat Reduction Initiative (GTRI))

• Ongoing/Upcoming Activities

• Summary
• Safe and secure operations in a cost-effective manner
• Protect human health and the environment
• Work with all stakeholders (including International community) and comply with legal agreements
• Achieve SNF end-state
DOE Spent Nuclear Fuel Inventory
(January 2016)

- Hanford, WA: ~2,130 MTHM
- Fort St Vrain, CO: ~15 MTHM
- Savannah River Site, SC: ~30 MTHM
- Idaho: ~275 MTHM
- Other Domestic Sites: ~2 MTHM

TOTAL
Spent Nuclear Fuel: ~2,450 MTHM

MTHM of SNF – Metric Tons Heavy Metal
Source of SNF in DOE Inventory

- DOE production reactors (majority of inventory)
- Core debris from the Three-Mile Island Reactor
- Commercial power demonstration projects
  - Shippingport Atomic Power Station, Shippingport, Pennsylvania
  - Peach Bottom Atomic Power Station, Peach Bottom Township, Pennsylvania
  - Fort Saint Vrain Generating Station, Platteville, Colorado
- Domestic Research Reactors (DRR)
  - Includes DOE labs, Universities, and other Government agencies
- Foreign Research Reactors (FRR) – 41 countries
EM Partnership with Material Management & Minimization (aka Global Threat Reduction Initiative (GTRI))

- EM supports the U.S. non-proliferation and highly-enriched uranium (HEU) minimization policy
  - Support Department’s efforts to secure and consolidate HEU and plutonium materials to prevent them from falling into the hands of terrorists
  - Disposition of nuclear materials in a manner that renders these nuclear materials non-proliferable
- EM continues to receive, safely store, and securely manage SNF via FRR SNF Acceptance Program from research reactors with 41 participating countries
  - Spent Fuel is of U.S.-origin
- All fuel received is consolidated at SRS & INL
  - Aluminum-clad fuel is stored at SRS
  - Non-aluminum-clad fuel is stored at INL
- EM also supports the Gap Removal Program through receipt, storage and disposition of high risk, vulnerable nuclear materials of primarily non U.S.-origin; this includes
  - Pu (e.g., Sweden, Belgium, Italy)
  - SNF (e.g., Chile)
FRR SNF Acceptance Program

- From the start of the policy on the FRR SNF in 1996, DOE has received ~ 9,665 SNF assemblies (SRS: ~ 8,100 SNF assemblies; Idaho: ~ 1,500; and Y-12 ~ 65)

- The material received accounts for:
  - ~1,300 kilograms of HEU
  - ~3,760 kilograms of low enriched uranium (LEU)

- Source of HEU and LEU received were used in foreign research reactors from countries, e.g. Australia, Brazil, Indonesia, South Africa

- FRR Program ends in 2019
  - SNF shipments expected in the next 4 years from Canada (including liquid target residues), Peru, Finland, Australia, etc.
  - Exception for Austria (2025) and Japan (2029)
Ongoing/Upcoming Activities

- EM in coordination with NNSA is working with our partners to develop viable disposition paths for planned and potential receipts of nuclear materials
  
  - FRR Receipts
    - Canada
    - Germany
    - Japan
  
  - DRR Receipts
    - Molybdenum (MO) -99
  
  - SNF Working Group
DOE and the Canadian Nuclear Laboratories (CNL) signed a contract (March 2012) to receive fuel assemblies (HEU) from National Research Universal (NRU) / National Research Experimental (NRX) Reactors

- SRS completed modifications of Shielded Transfer System at L-Basin to enable receipt of this fuel
- Campaign is ongoing

DOE and CNL signed a contract (Sept 2012) to receive Target Residual Material (TRM) liquid HEU from medical isotope production

- Modifications at SRS to receive liquid HEU in H-Canyon
- About a 1 to 2 year shipping campaign, projected to start in 2016

HEU from the TRM liquid HEU campaign will be processed, along with aluminum-clad SNF, in H-Canyon and downblended to LEU and shipped to Tennessee Valley Authority for fabrication into commercial fuel
German Pebble Bed Research Reactor Fuel

- DOE-EM evaluating feasibility, including potential environmental impacts, for possible receipt, storage, processing and disposition of German pebble bed research reactor fuel containing U.S.-origin HEU

- HEU material was provided for purposes of peaceful uses and development of nuclear energy

  - Explored the use of coated fuel particles embedded in graphite spheres, used in pebble-bed research reactors, and cooled by helium (high temperature gas-cooled reactor, HTGRs)
Statement of Intent with Japan

• DOE and Japan reached an agreement (March 2014) to reduce proliferation risks
  - Japan will send their HEU and Pu to U.S. (by 2019)
  - The US will assist Japan in research reactor SNF management and cooperate on upcoming R & D projects
• EM working with NNSA on receipt and disposition options for Pu as well as extending receipt of FRR fuel (until 2029)
  - Subject to completion of appropriate environmental analysis for SNF extension to 2029
The American Medical Isotopes Production Act of 2012

- Accelerate the establishment of reliable supplies of MO-99 without the use of highly enriched uranium
- Requires DOE to provide LEU to vendors and retain responsibility for the final disposition of SNF and radioactive waste that does not have access to commercial disposal path
- Program established as required by the Legislation (Jan 2016)
SNF Working Group

• DOE complex-wide coordination of SNF issues by establishing an internal DOE working group in 2014
  
  ➢ Co-chaired by Office of Environmental Management and Nuclear Energy, other participants include:
    ✓ Office of Science, Naval Reactors, and NNSA
    ✓ DOE field sites that manage DOE SNF

• SNF working group goals are to
  
  ➢ Promote integration and issue resolution across the DOE complex
  ➢ Strategic planning
  ➢ Cost-effective management
  ➢ Consistency across the DOE complex
  ➢ Efficient knowledge exchange
SNF Working Group- Objectives

• SNF working group objectives include:

  ➢ Develop complex-wide strategies for storage, retrieval, packaging, transportation, technology development, processing, and/or disposal

  ➢ Integrate and leverage DOE SNF management and disposition activities across the complex

  ➢ Work to develop waste acceptance criteria for a future repository

  ➢ Support non-proliferation goals

  ➢ Reestablish National SNF Program and oversee complex-wide database of DOE’s SNF
• Initial meeting held in November 2014, in Idaho Falls; 2 others since then (Oak Ridge, June 2015); Las Vegas (November 2015)

  ➢ Identified collaborative efforts that would benefit the SNF complex
    ✓ Evaluate DOE security and safeguards strategy
    ✓ Creating a disposition roadmap
    ✓ Updating the SNF database
  ➢ Promoted SNF activities as “one DOE”
  ➢ Discussed working relationships with other cross-cutting organizations, such as Tank Waste Corporate Board

• Next meeting at SRS in Spring 2016
Summary

• EM is continuing to work closely with NNSA and international partners to support non-proliferation and HEU minimization objectives
• Processing limited amount of SNF (SRS and Idaho)
• Ability to continue safe near-term storage
  ➢ Invest in infrastructure upgrade
  ➢ Comply with site-specific agreements
• DOE endorsed (Jan 2013) key principles of BRC’s recommendations – legislation needed for implementation
• Established SNF Working Group (in 2014)
• March 2015, decision to consider defense-only repository
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Questions