

National Nuclear Security Administration Savannah River Site



Fissile Materials Disposition Program Overview SRS Citizens Advisory Board January 29, 2013

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NNSA Mission Areas

Defense Programs

Maintain a safe, secure, and reliable nuclear weapons stockpile to help ensure the security of the U.S. and its allies, deter aggression, and support international stability



A National Ignition Facility technician examines a damage inspection instrument used to assess the optics in the target chamber.

Naval Reactors

Provide the U.S. Navy with safe, militarily effective nuclear propulsion systems, and ensure their continued safe and reliable operation



Nuclear-powered submarine, VIRGINIA, returning to port following her highly successful sea trials.

Defense Nuclear Nonproliferation

Detect, secure, and dispose of dangerous nuclear and radiological material, and related WMD technology and expertise



A container with naturally occurring radioactivity processed through a radiation portal monitor as part of NNSA's Second Line of Defense Program.

Emergency Operations

Administer and direct the programs of the national nuclear / radiological emergency response capability to ensure availability and viability to respond to nuclear and radiological emergencies within the U.S. and abroad



Dep Energy Sec Daniel Poneman (center) reviews Leading Nuclear Counterterrorism Assets.

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Defense Nuclear Nonproliferation

The mission of the Office of Defense Nuclear Nonproliferation (DNN) is to provide policy and technical leadership to limit or prevent the spread of materials, technology, and expertise related to nuclear and radiological weapons and programs; to advance technologies to detect foreign nuclear proliferation and detonation; and to eliminate, secure, and safeguard inventories of materials and infrastructure usable for nuclear weapons programs.



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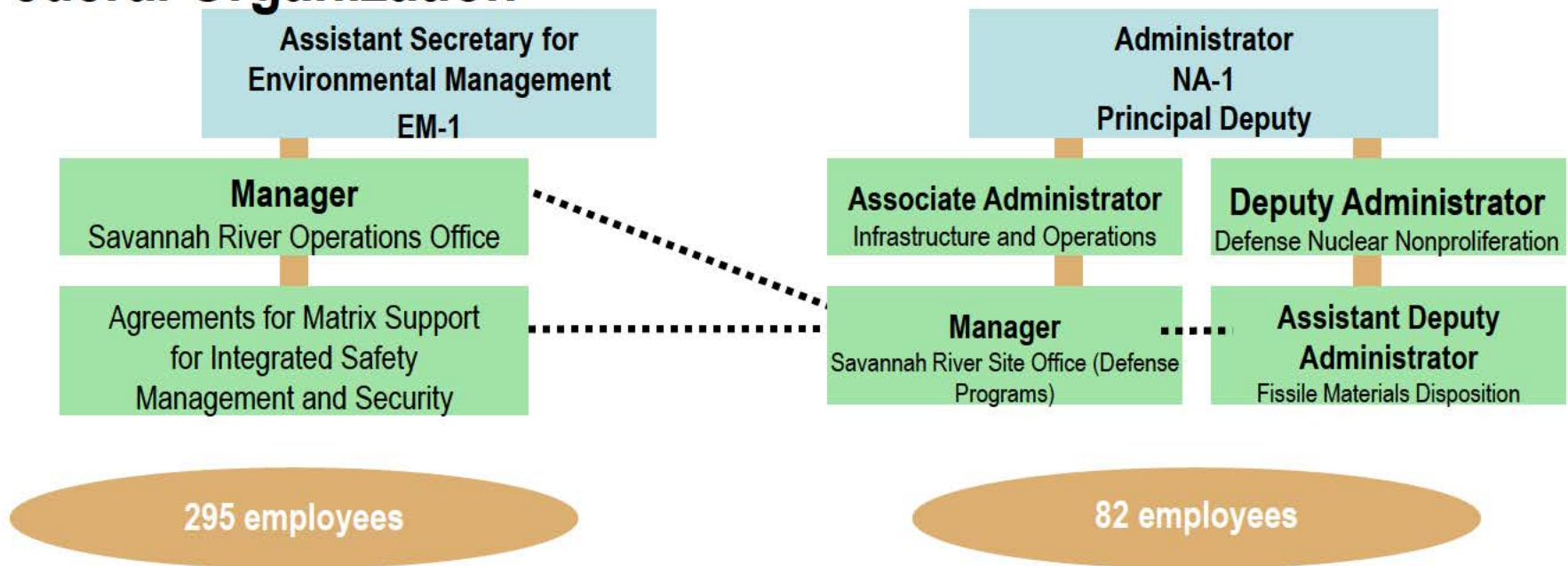
Defense Nuclear Nonproliferation

- Goal 1: Reduce and protect vulnerable nuclear and radiological material at civilian sites worldwide;
- Goal 2: Develop novel technologies to detect foreign nuclear weapons proliferation and detonation, and to verify foreign commitments to treaties and agreements;
- Goal 3: Prevent the proliferation of weapons of mass destruction (WMD) by strengthening the nonproliferation, nuclear security, and arms control regime;
- Goal 4: Secure vulnerable nuclear weapons and weapons-usable nuclear materials worldwide and deter, detect, and interdict their illicit trafficking; and,
- **Goal 5: Reduce inventories of surplus weapon-usable fissile materials in a safe, secure, and irreversible manner.**

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Federal Organization



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Fissile Materials Disposition: Meeting NPT and Presidential Commitments

NPT Commitments:

- Article VI of the NPT states:
“Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control.”
- Disposing of surplus U.S. weapon-grade plutonium and HEU demonstrates that the United States is living up to its nonproliferation commitments under Article VI of the NPT by drawing down its nuclear arsenal in a transparent and irreversible manner.

Presidential Commitments:

- Presidential Decision Directive 13 — U.S. policy since 1993 has been to “seek to eliminate the accumulation of stockpiles of highly-enriched uranium or plutonium.”
- President Obama’s Goal of “World Without Nuclear Weapons” — Secretary Chu’s speech to IAEA noted U.S. efforts to achieve President Obama’s vision for a nuclear-free world as laid out in Prague by taking concrete steps including the construction of a U.S. MOX fuel fabrication facility to “permanently and transparently eliminate at least 34 metric tons of surplus U.S. weapons plutonium.”

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FMD Nonproliferation Strategy

- Maintain the infrastructure to eliminate weapon-usable HEU that is excess in the U.S. or returned to the U.S. by NNSA's Global Threat Reduction Initiative (GTRI).
- Develop the capability to eliminate weapon-grade plutonium that is in excess to U.S. national security needs.
- Partner with Russia and other international partners to eliminate fissile materials.

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U.S. Plutonium Disposition

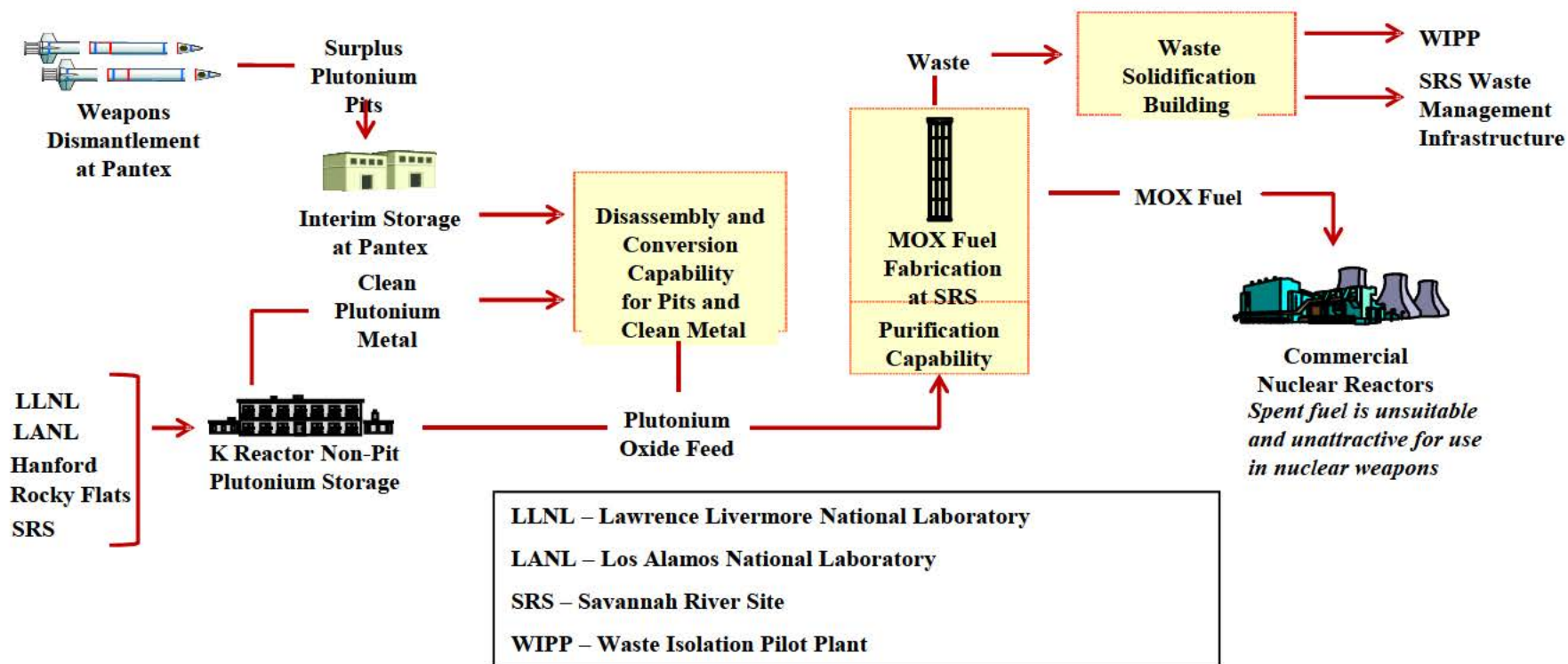
U.S. Plutonium

- Current plans call for at least 34 MT to be fabricated into MOX fuel and irradiated in existing commercial reactors.
- The majority of the material is in nuclear weapon pits stored at Pantex.

Key Facilities Being Constructed at the Savannah River Site:

- MOX Fuel Fabrication Facility (MFFF): Fabricates plutonium oxide and depleted uranium oxide into mixed oxide (MOX) fuel for subsequent irradiation in existing commercial nuclear power plants.
- Waste Solidification Building: Processes radioactive and mixed liquid waste streams from the MOX facility and pit disassembly and conversion operations.
- Alternatives being evaluated for disassembling nuclear weapons pits and converting the plutonium metal to oxide form; a preferred alternative was announced by the Department in January 2012, which utilizes existing facilities, including PF-4 at LANL and H-Canyon and MFFF at SRS.

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Mixed Oxide Fuel Fabrication Facility

- Began Construction: August 2007
- Main process building structure will be complete in March 2013
- Now installing piping, HVAC, glove boxes, cable trays, roof
- 12 of 16 support facilities are complete
- 4 remaining support buildings are in planning phases
- NNSA is currently reviewing a baseline change proposal on the project
- Current Employment: 2200



MOX Construction Site – July 2007



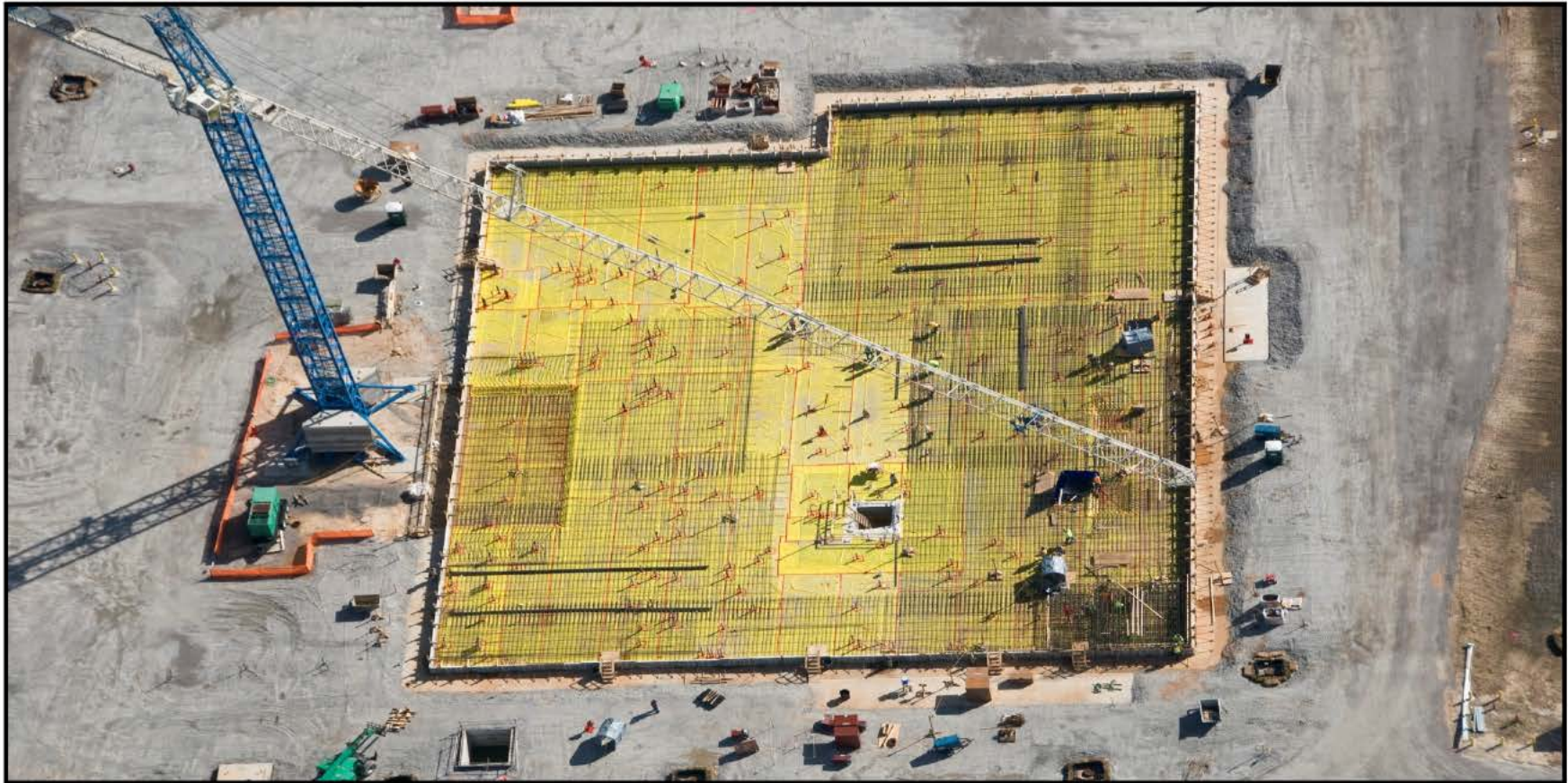
MOX Construction Site – December 2012

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Waste Solidification Building

- Began Construction: December 2008
- Process building civil/structural work complete
- Installation of mechanical and electrical systems in progress
- Long-lead equipment (process tanks, evaporators, cementation gloveboxes) installed in facility
- Baseline Change Proposal approved in December 2012
- Scheduled for Completion of Construction in 2013
- Operational in 2015
- Current Employment: ~320



Waste Solidification Building - January 2010



Waste Solidification Building – December 2012

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Plutonium Feedstock for MOX Facility

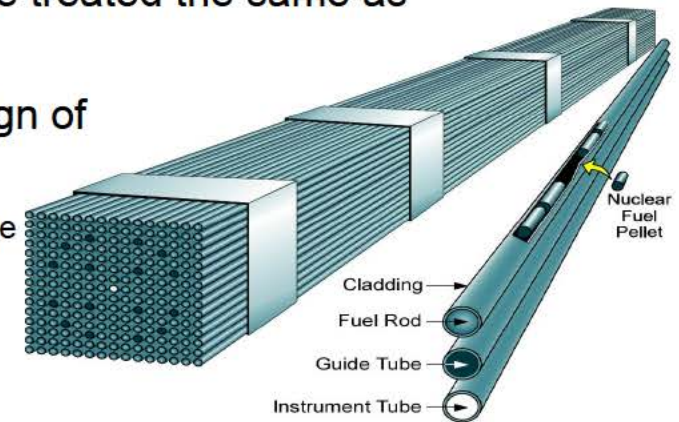
- While nearly 10 MT of early feedstock will be available to support initial operations at the MOX facility, the remaining 2/3 of the material planned for disposition is in nuclear weapons pits currently stored at the Pantex Plant in Amarillo, Texas.
- In order to provide the remaining plutonium oxide feedstock for the MFFF, the Department needs a pit disassembly and conversion capability.
- Recent changes in plans for operation of the H-Canyon at the Savannah River Site (SRS) in South Carolina, as well as the PF-4 facility at the Los Alamos National Laboratory (LANL) in New Mexico, made these facilities available to support the plutonium disposition mission and offered opportunities to avoid the cost of the previously planned multi-billion dollar Pit Disassembly and Conversion Facility (PDCF).

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MOX Fuel Experience

- MOX fuel is currently being used in 31 reactors world wide, and has been used for decades.
- MOX fuel assemblies look identical to uranium fuel assemblies used in commercial nuclear power reactors.
- Once irradiated, spent MOX fuel will be treated the same as conventional spent LEU fuel.
- U.S. MOX facility is based on the design of two French facilities:
 - Aqueous polishing process from the La Hague reprocessing plant and
 - Fuel fabrication process from the MELOX facility



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Customers for MOX Fuel

- NNSA continues to have utilities interested in MOX fuel, and is confident that we will have utilities under contract when the MOX facility is complete and prepared to provide fuel.
- The Tennessee Valley Authority (TVA) is currently exploring technical and regulatory requirements associated with irradiation of MOX fuel in five reactors pursuant to an interagency agreement that was signed in 2010.
- The current schedule calls for completion of a Supplemental Environmental Impact Statement, in which TVA is a cooperating agency, in Spring 2013
- In addition, NNSA is consulting with various fuel fabricators regarding the option of having them market MOX fuel to their utility customers.

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Plutonium Management and Disposition Agreement

- The landmark agreement will dispose of at least 68 metric tons of U.S. and Russian surplus weapon-grade plutonium.
- The agreement will eliminate enough material for at least 17,000 nuclear weapons.



*Secretary Clinton and Foreign Minister Lavrov
after signing the PMDA Protocol on April 13, 2010*



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Russian Plutonium Disposition

- The Russian program is similar to the U.S. program except that it will irradiate MOX fuel in Russian fast reactors under certain nonproliferation conditions
- U.S. contribution to the Russian program capped at \$400M; Russia to fund the balance
- The U.S. and Russia are working with the IAEA to develop a monitoring and inspection regime



Construction of the BN-800 Fast Reactor, Beloyarsk, Russia