U.S.-Russian Fissile Materials Disposition Programs

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End of cold war brings arms reduction

- Excess fissile materials accumulate in U.S. and Russia
- Potential for theft by terrorists and rogue nations declared to be a clear and present danger

U.S. commits to eliminate surplus fissile materials

- Approximately 200 metric tons of fissile materials declared excess to defense needs
- Material to never again be used to build a nuclear weapon

Weapons dismantlement

Plutonium components stored in heavily guarded bunkers at Pantex Plant (Amarillo, TX)
Program Objectives

- Dispose of surplus U.S. highly enriched uranium
- Dispose of 34 MT of surplus U.S. weapon-grade plutonium to reduce large storage costs
- Work with Russia to dispose of 34 MT of surplus weapon-grade Russian plutonium
U.S. Plutonium Disposition Strategy

Two facilities to be constructed at Savannah River Site

- Pit Disassembly and Conversion Facility: pits are disassembled and the resulting plutonium metal is converted to plutonium oxide and sent to MOX Fuel Fabrication Facility

- MOX Fuel Fabrication Facility: polished plutonium oxide is mixed with uranium oxide and resulting mixed oxide is formed into pellets that are loaded into MOX fuel assemblies

- Aqueous polishing capability included in MOX facility to remove impurities from plutonium feed material

- Disposition rate – up to 3.5 MT per year

Irradiate the Plutonium as Mixed Oxide (MOX) Fuel in Reactors; Most Impure Plutonium Purified at Enhanced MOX Facility
U.S. Plutonium Disposition Strategy

- MOX fuel will be irradiated in U.S. commercial reactors operated by Duke Power
  - Catawba Nuclear Power Station in South Carolina
  - McGuire Nuclear Power Station in North Carolina
  - Lead assembly insertion at Catawba scheduled for Spring 2005

- Once irradiated, the plutonium will meet the spent fuel standard
  
  "Spent Fuel Standard"
  Surplus plutonium is made as inaccessible and unattractive for retrieval and weapons use as the residual plutonium in spent fuel from commercial reactors
Pit Disassembly and Conversion Facility

- Designed by Washington Group International
- Design scheduled for completion in FY 2005
MOX Fuel Fabrication Facility

- Designed by Duke Cogema Stone & Webster
- Base design completed in December 2004
MOX Fuel Fabrication Facility

Approximate size of facility and support bldgs: 500,000 sq ft

Number of gloveboxes: approx. 300

Process units: 71

Plutonium oxide storage capability: 2 years

Fuel assembly storage capability: 1 year
MOX Fuel Fabrication Facility

- Use proven French Melox and LaHague fuel process and fabrication technology

- MOX Facility provides two major functions – aqueous polishing and fuel fabrication

- MOX fuel fabrication and support facilities located on 41 acres at the Savannah River Site

- Construction and operations will be licensed and regulated by the U.S. NRC
Aqueous Polishing and MOX Process Steps

Aqueous Polishing (AP)
- PuO₂
  - Dissolution
  - Purification cycle
  - PuO₂ conversion

MOX Process (MP)
- Polished PuO₂
  - Powder master blend and final blend production
  - Pellet production
  - Rod production
  - Fuel Rod assembling

Annual PuO₂ throughput: 3.5 MT/yr, 149 Assemblies/yr
Project Status

- Completed base design in December 2004
- DOE critical decision process scheduled to begin in first quarter 2005
- Site infrastructure, procurement, and construction planning underway
- NRC scheduled to issue Construction Authorization in February 2005
- Scheduled to submit operating license in 2005
Disposing of Surplus Russian Weapon-Grade Plutonium

- U.S. working with Russia to dispose of its surplus weapon-grade plutonium

- 2000 *Plutonium Management and Disposition Agreement (PMDA)* – commits the U.S. and Russia to each dispose of 34 metric tons of surplus weapon-grade plutonium

- U.S. working with Russia to adapt the design of the U.S. MOX facility for use in Russia

- U.S. also working with Russia to develop a licensing approach for the Russian facility that is similar to the U.S. NRC process
Key Provisions of the Plutonium Management and Disposition Agreement

- U.S.-Russian disposition to proceed in rough parallel
  - Initial disposition rate of 2 metric tons/year
  - Capability and capacity to disposition up to 4 metric tons/year
- Bilateral monitoring and inspection procedures to be developed prior to construction – *Agreement for international inspection to follow*
- Nuclear Liability – being addressed at the highest levels of both the U.S. and Russian governments
Other Key Provisions of the Plutonium Management and Disposition Agreement

- No separation of plutonium until 34 metric tons have been disposed – *Any subsequent (Russian) reprocessing of irradiated MOX fuel subject to mutually agreed monitoring measures*

- Additional quantities of plutonium may be added in the future

- Multinational financial assistance for Russian plutonium disposition