PROGRAM OVERVIEW FOR THE US NWTRB

THE OFFICE OF FISSILE MATERIALS DISPOSITION

Bill Danker
U.S. DEPARTMENT OF ENERGY

JANUARY 11, 1996
Background

- **End of the Cold War**
  - Weapons Production Ends
  - Uncertain Future for Surplus Fissile Materials

- **Presidential Nonproliferation Initiative**
  - Comprehensive Policy for Control and Disposition of Surplus Fissile Materials
  - U.S./Russian Summit Agreement

- **Organizing to Meet the Challenge**
  - Project Established January 1994
  - Permanent Office Established September 1994
Pu Inventories Today

Office of Fissile Materials Disposition

Total Inventory: 33.5 MT (Excludes Classified Inventories)
U.S. Production: 89 MT Weapons Grade
13 MT Reactor Grade

Source: December 7, 1993
Secretary O'Leary Openness Initiative
Goals of the Pu Disposition Program

The primary goal is to increase the proliferation-resistance of the Pu by making it meet the spent fuel standard. (Next Slide)

It is desirable to commence the disposition process within 10 years and complete the mission within approximately 25 years.

The criteria for selecting alternatives include cost, schedule, technical, non-proliferation, and policy considerations. (Second Slide)
Spent Fuel Standard (SFS)

Office of Fissile Materials Disposition

The spent fuel standard is the disposition standard whereby the residual fissile material is as unattractive and inaccessible for retrieval and weapons use as the residual plutonium in spent fuel form commercial reactors.
Disposition Selection Criteria

Resistance to Theft and Diversion
Resistance to Retrieval by the Host Nation
Technical Viability
Environment, Safety and Health Compliance
Cost Effectiveness
Timeliness
Fosters Progress with Russia and Others
Public and Institutional Acceptance
Making Decisions

Office of Fissile Materials Disposition

- Environmental Analyses (NEPA)
- Technical Assessments, Schedule & Cost Estimates, Policy Considerations

Records of Decision
Disposition

Office of Fissile Materials Disposition

• **Focus of Effort:** Down-select Technologies; Complete Evaluation of Environmental Impacts; and *Implement* Disposition

• **Plutonium Options**
  - Reactors
  - Immobilization
  - Geologic Disposal
  - Continued Storage
Reasonable Alternatives

Office of Fissile Materials Disposition

Plutonium Disposition Options

- No Disposition Action (Continued Storage)
- Deep Borehole (Immobilization)
- Deep Borehole (Direct Emplacement)
- Borosilicate Glass Immobilization - 3 Options
- Ceramic Immobilization - 2 Options
- Electrometallurgical Treatment
- Euratom MOX Fabrication/Reactor Burning
- Existing Light Water Reactors (LWRS)
- Partially Completed LWRS
- Evolutionary or Advanced LWRS
- CANDU Heavy Water Reactors
Environmental Analysis Schedule

Office of Fissile Materials Disposition

Focus on Effort: Completion of Environmental Analyses to Support Record of Decision and Implementation

- Notice of Intent: June 1994
- Implementation Plan: April 1995
- Draft: February 1996
- Final: Late Summer 1996
- Record of Decision: Fall 1996
Technical Schedule

- Screening was First Phase - Complete
  - Screening Report

- Second Phase - Technical, Economic, Nonproliferation and Schedule Analysis, and Experimental Work.
  - Basis of Down Selection of Alternatives to Produce Short List of Preferred Alternatives.
  - Early 1996

- Third Phase - In-depth Analysis, Experiments and Demonstrations to Support Decisions.
  - Summer 1996
Disposition Options

- Immobilization
  - glass, ceramic & glass-bonded zeolite

- Reactors
  - existing, partially completed and evolutionary light-water reactors (domestic)
  - CANDU option

- Deep Geologic Disposal
  - emplacement in deep borehole
Reactor Disposition Summary

Office of Fissile Materials Disposition

- MOX utilization is international fact-of-life
- Reactor-based Pu disposition approach
  - Provides proliferation resistance similar to commercial spent fuel
  - Viewed favorably by Russians
- Significant utility and private interest in mission
- No discrimination between reactor options based on S&S issues
- Involves no major technical risks
- Schedules dictated by availability of fuel
- Costs driven by facility ownership (LWR) and fuel design considerations (CANDU)
Non-Reactor Disposition Options

Office of Fissile Materials Disposition

• 1/94 NAS Report on Pu Disposition:
  – Immobilization in glass recommended as one of two key alternatives
  – Deep borehole was considered potentially faster and cheaper

• More than one disposition alternative may be needed to address the broad range of material forms
Non-Reactor Disposition Options

Geologic disposition alternatives include:

- Immobilized Pu spiked with HLW to U.S. high-level waste repository
  - Repository Impact Study underway by OCRWM

- Pu or immobilized Pu to custom geologic facility
  - No spiking with HLW
  - Deep borehole emplacement
Non- reactors disposition options

Office of Fissile Materials Disposition

Storage

Immobilization

Without HLW

Deep Borehole

With HLW

U.S. HLW Repository

PEIS Non-Reactor Options
Candidate Immobilization Facilities

Office of Fissile Materials Disposition

- Vitrification (borosilicate glass)
  - Can-in-canister at Savannah River
  - Adjunct melter at Savannah River
  - New Facility (Greenfield)

- Crystalline ceramics
  - Existing facilities
    > Can-in-canister at Savannah River
    > ANL/West facilities
  - New facility

- Electrometallurgical treatment
  - ANL/West facilities
Can-in-Canister Demo

Office of Fissile Materials Disposition

• “Cold” demo of can-in-canister vitrification option for Pu disposition

• 8-can and 20-can canisters poured at DWPF last week

• Post-test radiography and destructive analyses planned to confirm initial positive indications
Immobilization Disposition Summary

Office of Fissile Materials Disposition

• Planning assumptions identified
• Feeds and feed pretreatments defined
• Waste forms screened — three candidates selected
• Engineering facilities/approaches screened — six selected
• Detailed process flow sheets established
• Limited but important experiments on waste forms and facilities established
• PEIS data determined and provided
• Technical viability, cost estimate, and schedule estimates provided for subsequent verification
• Research plan established
• Dialogue with NRC initiated
• Interactions with Russia in progress
• If disposition forms cannot go to a repository, the alternative is "unreasonable"

• Early commitment made to fund RW involvement in assessing these forms