Outline

1. National Problem, National Program
2. Program Stages and Status
3. Regulatory Basis
4. Scientific Basis

National Program

1. Waste characteristics and locations
2. Waste acceptance at source locations
3. Transportation
   - 3.1 Nationwide
   - 3.2 Nevada
4. Yucca Mountain repository
5. Science and technology

Current Status

- **1. Repository**
  - **February 2002: Site recommended by Secretary and President**
  - **April 2002: Nevada Governor submits Notice of Disapproval to Congress**
  - **May - July 2002: Congress overrides Notice of Disapproval, approves site**
  - **July 23, 2002: President Bush signs congressional resolution approving Yucca Mountain, allowing the project to proceed to the next step**
  - **Next steps:**
    - **December 2004: License Application**
    - **2010-2034: Waste emplacement**
    - **2000-(2110?): Test and monitor - performance confirmation**
    - **(2110?): Close, seal, decommission**
- **2. Waste Acceptance, Transportation**
  - **Programs being developed**
  - **Begin operation - 2010**

EPA Standard

- Reasonable expectation, based on performance assessment, including uncertainty
- Compliance based on mean of distribution
- Accessible environment: 10,000 years
- Individual protection: 15 mrem/year
- Groundwater protection: radionuclide concentration
- Human intrusion
- Peak dose rate after 10,000 years published in Final Environmental Impact Statement

Source: 40 CFR 197

NRC Requirements

- Risk-informed, performance-based criteria for a Yucca Mountain facility - implementation of EPA standards
- Licenses required
  - Construction authorization
  - License to receive and possess
  - Amendment for permanent closure
  - Termination of license
- Quality assurance
- Preclosure safety analysis
- Postclosure safety analysis
  - Performance objectives - performance assessment
  - Multiple barriers
  - Performance confirmation

Path Forward

- Submit license application in late 2004 for a construction authorization
  - Complete testing needed to support license application
  - Incorporate phased development
  - Refine the conceptual design for the waste package, surface and subsurface facilities
- Develop transportation program to support waste acceptance in 2010
- Inaugurate separate science and technology program
  - Increase confidence in performance
  - Improve schedule and cost
  - Initiate "out-of-the-box" projects to advance the technology
- Obtain access to the Nuclear Waste Fund
- Determine the most effective long-term management and financing plan for the program

Barriers Potentially Important to Waste Isolation

- Surficial soils and topography
- Unsaturated rock layers overlying the repository
- Drip shield
- Waste package
- Spent-fuel cladding
- Waste form
- Drift invert below the waste package
- Unsaturated rock layers below the repository
- Groundwater flow-path materials

Material Science Issues in Repository Performance
(Sessions in this Symposium)

- Waste Package Degradation (4)
- Waste Form Degradation (2, 3, 5, 6, 7, 8, 9)
- Transport Through Engineered Systems (3, 4, 8, 10)
- Transport Through Natural Systems (3, 7, 11)

Conclusions

- Yucca Mountain site has been designated
- Next big steps
  - NRC licensing
  - Design, construction, operation
  - Test, monitor, performance confirmation
- Scientific basis - materials research continues
- Materials science is critically important to public safety
  - Long-term integrity of the waste package is important, but it is <u>not</u> a silver bullet solely responsible for public safety