Management of Spent Nuclear Fuel: What, Where – and When?

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The Nuclear Waste Technical Review Board

• Established by the 1987 amendments to the Nuclear Waste Policy Act to:
  • Evaluate the “technical and scientific validity” of DOE activities related to implementing the NWPA, including
    – Transportation, packaging, and storage of spent nuclear fuel (SNF) and high-level radioactive waste (HLW)
    – Site characterization, design, and development of facilities for disposing of such wastes.
  • Required by law to report its findings, conclusions, and recommendations at least twice each year to Congress and the Secretary of Energy.
  • Eleven Board members:
    • Technical and scientific experts
    • Nominated by the National Academy of Sciences; appointed by the President
    • Serve on a part-time basis for four-year terms.
  • Board documents:
    • Reports, correspondence, meeting transcripts and materials, congressional testimony, etc. can be found at www.nwtrb.gov
    • Basis for Board perspectives on SNF and HLW program
The Big Picture in 2015

• Disposal of SNF and/or HLW in deep underground repository – internationally accepted concept
• Many countries with nuclear power programs have plans for repository disposal of SNF and/or HLW
• Many countries with repository programs have had resets
• No SNF or HLW disposed of to date
• No country has an operational repository for SNF or HLW
• No country has a repository licensed for SNF or HLW
• Reprocessing is not a final solution
• Long-term storage of SNF and/or HLW is today’s reality – mainly at nuclear power plant sites
Progress Is Being Made…

- **Sweden:**
  - Osthammar/granite
  - License application submitted 2011 – under review by regulator
  - SKB/KBS-3 concept, small SNF canisters (4 PWR/9 BWR)
- **Finland:**
  - Olkiluoto/granite
  - License application submitted 2012 – under review by regulator
  - SKB/KBS-3 concept, small SNF canisters (4 PWR/9 BWR)
- **France:**
  - Bure/argillite (clay)
  - Public Debate concluded in 2014
  - License application scheduled for submission to parliament 2017
  - Vitrified HLW containers, now adding PWR MOX SNF
In the Works…

- **Belgium**
  - Not officially adopted repository as strategy for SNF disposition
  - Completing performance assessment on data from URL in boom clay near the Dessel/Mol site

- **Canada**
  - Adaptive Phased Management approach
  - 22 communities expressed interested
  - 9 now eliminated for technical reasons

- **China**
  - Planning a URL in granite near Beishan
  - Now also considering a URL at a clay site

- **Germany**
  - Repository Siting Act passed in 2014
  - Commission created to develop a siting process
In the Works… (cont’d)

- **Japan**
  - Moved away from former consent-based process
  - Central government to identify potential sites
- **Korea**
  - Centralized interim storage facility planned by 2024
- **Russia**
  - Centralized wet and dry SNF storage facilities at Zheleznogorsk
  - URL planned in granite (Nizhnekansk) at intended repository site
  - Repository schedule: decision by 2025; operations by 2035
- **Spain**
  - Repository disposal is long-term strategy for SNF disposition
  - Centralized interim storage facility for SNF to be built
  - Site at Villar de Canas selected using consent-based siting process
- **Switzerland**
  - Away-from-reactor centralized storage facility operating since 2000
  - URLs in granite (Grimsel) and opalinus clay (Mont Terri)
  - Sectoral Plan extended in 2014 by additional two to five years
In the Works… (cont’d)

• United Kingdom
  – “Managing Radioactive Waste Safely” being revised/replaced
  – New approach outlined in 2014 government White Paper

• United States
  – Yucca Mountain
    • SERs to be completed by January 31, 2015
    • Contentions remain unresolved
  – BRC Report, January 2012, recommended:
    • “Adaptive, staged, consent-based, transparent, standards-and-science based” site selection process
    • Single-purpose organization with necessary authority and resources
    • One or more consolidated interim storage facilities for SNF
  – DOE Response/Administration Strategy, January 2013, planned:
    • Interim Storage Facilities: pilot in 2021, larger facility in 2025
    • Repository operations to start in 2048
  – DOE-NE “Disposal Options” report, October 2014, recommended:
    • Separate repository for some DOE SNF and HLW and some navy SNF
    • Research, development and demonstration program for borehole disposal
Is There Common Ground?

• Sweden, Finland and France:
  – All used consent-based site selection processes
  – All have single-purpose implementers
  – All have long-term, multi-year assured budgets
  – All have stable political support
  – All have high staff retention rates
  – All have focused on:
    • Demonstration of long-term safety, rather than just meeting regulatory requirements
    • Establishing and maintaining public acceptance

• However:
  – None of these factors guarantees success
  – Sweden and France initially had “resets”
  – Each program has its own individual characteristics
Related Board Reports, etc.

- “DOE Activities to Preserve Yucca Mountain Repository Project Records”: 2013.