Yucca Mountain Lessons Learned

Waste Management, 2011
Panel: US DOE Yucca Mountain Site and the Alternatives
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Nuclear Energy

- Sustained exemplary levels of safety and operational performance provide sound basis for confidence in nuclear energy
- Public support for nuclear energy is strong and growing
- New Plant Development is proceeding in step with economic conditions
- Industry success is undergirded by considerable experience with the safe management of used nuclear fuel
**Used Nuclear Fuel**

- **Used fuel inventory thru 2009**
  - Approximately 62,500 MTU
  - Increases 2 - 2.4k MTU annually

- **ISFSI storage thru 2009**
  - 14,000 MTU
  - Over 1200 casks/canisters loaded
  - 49 Operating ISFSIs

- **ISFSI inventory by 2020**
  - Estimating 26,200 MTU
  - 2,600 casks/canisters loaded
  - At 75 ISFSIs
  - Fuel from 118 reactors
  - Harris – lone plant site w/o ISFSI

- **ISFSI inventory by 2040**
  - Likely to exceed 70,000 MTU
Integrated Used Fuel Management

- Industry supports a three-pronged approach to used fuel management
  - Interim storage at reactor sites and centralized location(s)
  - Research, Development & Demonstration of advanced fuel cycles and recycling technologies with deployment at the right time
  - Permanent disposal facility
- Federal approach to date has been inconsistent and has lacked policy and management accountability, impeding ability to pursue facilities
- Blue Ribbon Panel considering lessons learned, options
Yucca Mountain Timeline

- 1982 Nuclear Waste Policy Act (NWPA)

- 1987 NWPA amended – Site characterization narrowed to Yucca Mountain

- 1998 contractual deadline for DOE waste acceptance

- 2002 Yucca Mountain Development Act completes site characterization, begins licensing

- 2004, DOE misses commitment date for License Application (LA), initiates changes

- June 2008 DOE submits LA

- Feb. 2010 NRC staff questions on LA answered

- Oct. 2010 Project Terminated
Yucca Mountain 2010

- **February:** DOE budget request zeros out funding for the project
- **March:** DOE files motion with NRC Licensing Board (ASLB) to withdraw License Application (LA)
- **March through June:** Multiple Stakeholders oppose motion to withdraw before ASLB and in U.S. Court of Appeals
- **June:** ASLB rules DOE *does not* have legal authority to withdraw LA
- **June - December:** NRC Commissioners consider review of ASLB ruling, but have yet to issue a decision while courts await final agency action
- **October:** DOE Office of Civilian Radioactive Waste Management “ceases to exist”, all project records turned over to DOE Office of Legacy Management
- **October:** NRC initiates “orderly closeout” of LA review
Yucca Mountain Lessons Learned

- What did not work
  - Governance
  - Financing via Appropriations

- What did work
  - Public Process
  - Regulatory framework
  - Science
  - Step-wise implementation
  - Systems integration
Funding and Governance Timeline

- NWPA
- NWPA
- 1998 Deadline
- Missed LA
- NRC Q’s Answered

= New Director (or acting Director) appointed

Program Funding (Millions of $*)

- Constant 2007 $ until 2007, actual $ thereafter
Public Process

- All aspects of project vetted in hundreds of public meetings over two decades
  - DOE, NRC, NWTRB, ACNW mtgs.
  - Site Recommendation hearings
  - Others

- Numerous project documents subjected to public review and comment
  - EPA, DOE and NRC rulemakings
  - Multiple EISs
  - Science and Engineering Report
  - Site Recommendation documents

- Extensive record documenting that all comments were addressed
Regulatory Framework

- NRC Regulations based on state-of-the-art science
  - Total Systems Performance Assessment
  - Risk-informed, performance-based rule and review plan
- NRC staff was well prepared for review
- Extensive pre-LA interactions
  - Key technical issues identified early, many resolved prior to LA
- Thorough and efficient technical review of LA
- Process engendered public confidence in many areas
- Adversarial licensing adjudication as final test
- Nevertheless, some room for improvement
  - Timing of regulation issuance
  - Narrow court ruling on time of compliance
  - Dual rulemaking responsibilities (EPA & NRC)
Science

- Expertise from multiple National Laboratories, leading universities, USGS, and others
- Thousands of scientific and technical experts
- Extensive on-site and laboratory investigations
- State-of-the-art methodology (TSPA)
- International peer review
- Comparative review with independent organizations
  - EPRI, Nevada, NWTRB, ACNW, etc.
- Whenever concerns were raised, additional work was done and confidence in results strengthened
  - Licensing process would have further challenged results
Step-wise implementation

- Repository design process was iterative and informed by independent scientific, technical, and stakeholder views
  - NWTRB
  - ACNW
  - EPRI
  - International Peer review
  - Opponents

- Each iteration was implemented in a transparent manner

Systems Integration

- Engineered barriers designed to work in harmony with natural environment
- TAD program developed to minimize commercial used fuel handling at site
- Aging pad designed to address thermal issues
- Repository designed to accept multiple waste forms
Conclusion

- Nearly 30 years experience with DOE management of used fuel indicates the need transformative change
  - Effective and stable leadership to assure sustained success
  - Access to funding sufficient to support sustained long-term commitment
  - Accountability to industry, ratepayers, and public
  - Operate like a private company, not DOE – driven by sound business practices, not political whim
- Fed-Corp concept is capable of effecting change
- The Yucca experience also produced many valuable positive lessons learned – what was gained should not be lost