

# Status of U.S. Spent Nuclear Fuel Management

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# U.S. Spent Nuclear Fuel

- Nuclear energy supplies 20% of U.S. electricity power
- Current inventory of commercial spent nuclear fuel: 60,000 Metric tons of heavy metals (MTHM) stored in 39 states.

# U.S. Spent Nuclear Fuel

- There are 104 operating reactors and 21 new applications to the NRC for 31 units of reactors.
- Spent nuclear fuel is projected to be 140,000 MTHM by 2040.
- Now about 12,000 MTHM in dry storage and estimated to increase to 75,000 MTHM by 2040.

# U.S. Spent Nuclear Fuel Management-- Background

- Disposal of spent nuclear fuel was mandated by the Congress in 1982's Nuclear Waste Policy Act
  - Final disposal in a deep geologic repository
  - Department of Energy responsible for implementation
  - Nuclear Regulatory Commission responsible for licensing
  - Environmental Protection Agency responsible for radiation standard
  - Utilities responsible for funding

# U.S. Spent Nuclear Fuel Management -- Background

- Nuclear Waste Policy Act also dictates detailed site selection process and a schedule
- In 1985, Congress selected Yucca Mountain among the five sites being investigated for further site characterization.
- After over 20 years of scientific studies, in June 2008, DOE submitted the license application to the NRC for construction authorization at Yucca Mountain

# Recent Development

- Early this year, the new Obama administration and the Department of Energy announced that Yucca Mountain repository will not be an option for the U.S. spent nuclear fuel.
- Funding for the Yucca Mountain was reduced significantly
- Secretary of Energy Steve Chu wants ‘innovative alternative solutions’ for spent nuclear fuel

# Recent Development

- Secretary Chu intends to appoint a “Blue Ribbon Panel” to evaluate alternatives to Yucca Mountain
- Rumors that DOE will stop all license defense activities by December of 2009, and close the Yucca Mountain program in FY 2011.

# Recent Development

- DOE/NE recently established program goals:
  - *Minimization of risks associated with nuclear energy can be achieved in part through developing a sustainable fuel cycle from perspectives of public acceptance, economics, safety and environment.*
  - *Understand and avoid proliferation risks*



# DOE's Fuel Recycling Programs

- During Bush administration, initiated the Global Nuclear Energy Partnership (GNEP), exploring deployment of recycling technologies with industries and internationally.
- DOE this year changed the program to “Fuel Cycle Research and Development”

# New Direction from DOE on Recycling

- Seeking long-term, science-based, transformation, technical breakthrough solutions
- DOE hopes to fund long-term, high-risk, high-reward R&D.
- New technologies with fresh ideas and creative thinking

# DOE's Closed Fuel Cycle Demonstration Vision

- By 2050, the Fuel Cycle R&D program will demonstrate the technologies to allow commercial deployment of a solution for the sustainable management of used nuclear fuel that is safe, economic, and secure and widely acceptable to American society

# Recycling Technologies

- R&D carried out by national laboratories:
  - Advanced aqueous reprocessing
  - Pyro processing (electrochemical separation)
- Innovative ideas are encouraged by DOE
  - Expect new initiatives
- FY 2010 funding \$ 190 M

# Implications of Recent Changes

- If Yucca Mountain program is abandoned, Nuclear Waste Policy Act needs to be amended officially
- A policy decision needs to be made on all the spent nuclear fuel in storage
  - Status quo
  - Consolidate into a few centralized interim storage
  - Recycling of spent fuel
  - New solution proposed by the Blue Ribbon Panel

# Implications of Recent Changes

- Legal and financial obligations from the U.S government:
  - Breach of contract with utility companies
  - Utilities have been contributing to the Nuclear Waste Fund (\$0.001 per kw-hr)
- New Reactor Builds:
  - NRC's Waste Confidence Rulemaking tied to licensing of new plants

# Implications

- DOE's own high-level waste:
  - 53 million gallons of liquid waste in 177 tanks at the Hanford Site waiting to be treated and sent to Yucca Mountain
    - Waste Treatment Plant (vitrification plant) under construction
    - Vitrification will be operating from 2019 – 3040
  - All waste acceptance criteria were developed under the assumption that Yucca Mountain would be the disposal site.

# Implications

- Current spent fuel onsite storage is not intended for extended period of time
  - New extended licensing requirements need to be developed
- Even with recycling of spent nuclear fuel, a repository most likely be still needed
  - Start all over again with the search of a site



# Conclusion

- Many unanswered questions and uncertainties
- No legal framework for new disposal policy
- Long term storage of spent nuclear fuel is inevitable
- Recycling of used fuel will take decades to accomplish – public acceptance will still be an issue