Integrating the elements of the back end of the fuel cycle

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Guiding Principles

• **Above-ground storage is NOT an acceptable permanent solution for spent nuclear fuel**
  – Will eventually result in contamination
  – Need to keep our eyes on the prize: repository

• **Ethical responsibility to future generations to find a solution**

• **Waste generators not responsible for disposition of waste**

• **We have a broken system in the US currently**
What is integration?

Spent Fuel

Canisters
What is integration?

- **Technical**
  - Types of fuel, canisters
- **Logistical**
  - Planning for fuel moves
- **Social**
  - All interested parties participating
- **Regulatory**
  - Necessary rules in place for whole route
Current situation

- 80% of US nuclear power plants have dry storage
  - 71% of spent fuel in pools though
- Stranded fuel at 12 sites
  - More to come

Projected volume of spent fuel and HLW 2048, Sandia, 2016
Current situation

- Dry Storage
  - Majority in welded metal canisters inserted into concrete overpacks
  - Inventory is diverse
  - Trend toward higher capacity canisters
  - Thermal constraints will limit transportability for decades – up to 5 decades

[Graph showing heat load over time with different loading plans]

Courtesy Idaho National Lab
Current situation

- Current back end practices optimized for reactor operations
  - Reduced occupational dose
  - Efficient reactor operation
- Not optimized for transport & disposal
  - Package size, design and thermal load

US NRC, 2015
Regulatory Situation

• Continued Storage Rule, 2014
  – Generic evaluation of environmental impacts of storage of spent fuel beyond the licensed lifetime of reactors
  – Evaluated 3 time periods
    • Up to 60 y after license
    • Up to 160 y after license
    • indefinitely
Continued Storage Rule

• GEIS evaluates 20 categories of impact
  – Almost all were determined SMALL for all time periods

• Implications of Rule
  – No need for a repository if even indefinitely impacts are small
    • Assumes institutional controls continue forever
Impacts of the current situation

• Stalemate
  – **Congress**: waste safe now, next election important
  – **Dept of Energy**: no legal authority to solve it entirely
  – **Utilities**: Need to reduce costs – will do nothing
  – **Dept of Justice**: (Judgment Fund) – forces lowest cost option
  – **Nuclear Regulatory Commission**: no forcing mechanism in current regulations for action
Impacts of the current situation

• Technical issues
  – Variety of cask types already
  – Stranded sites
  – Thermal loads will drive extended on-site storage

• Who will pay for storage over long time frames?
  – Nuclear Waste Fund broken
  – Judgment Fund endless
Solutions?

• 3 Paths Forward
  – Repackage
    • At reactor
    • At centralized site
  – Work with what we have
    • Find a repository that will accept the current variety
  – Surface storage forever
    • unacceptable

CT Yankee dry storage
Solutions?

• Need funding reform
• Need Incentives for change
  – Industry, DOE, NRC, DoJ
  – *This is where YOU come in!*
  – Only way to make change is through political pressure on Congress and political system

US NRC, SONGS public meeting, 2013