High Burn-up Used Nuclear Fuel Extended Storage and Transportation Demo

Industry Perspectives

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High Burn-up Demonstration Project

- **Why do we need a demo?**
- **What should the demo do?**
- **When do we need to do it?**

Why we need a demo

- **Waste Confidence / Extended Storage**
  - **The cessation of Yucca Mountain has placed regulatory and public focus on industry's ability to safely manage UNF for the long term. The resulting impact on nuclear plant licensing and operations is near-term and likely to be significant**
- **Industry needs real data, on real high burn-up fuel, in real casks (and we need it real soon)**
- **Prior demo at INL successfully provided key support to low burn-up cask license renewals**

Why we need a demo

- **Licensing challenges**
  - **Condition of high burn up fuel after time in storage**
  - **Transportability of high burn up fuel after time in storage**
- **Work on confirmatory data project will support**
  - **Aging management plans for >20 year extensions**
  - **Satisfying lead times for >60 year extensions**
  - **Assuring transportation readiness ahead of consolidated interim storage**

Why we need a demo – background

- **Licenses for high burn-up fuel storage to be renewed over next few years**
  - **2012 Prairie Island-TN-40, Calvert Cliffs-NUHOMS[1]**
  - **2015 Transnuclear-NUHOMS 1004**
  - **2020 NAC-UMS; Holtec-Hi-STORM**
- **Storage of high burn-up fuel is relatively recent**
  - **9 years – Maine Yankee[2] (since 2003) up to 49.5 GWd/MTU**
  - **7 years – Robinson (since 2005) up to 56.9 GWd/MTU**
  - **6 years – Oconee (since 2006) up to 55 GWd/MTU**
  - **5 years – Surry/North Anna (since 2007) up to 56.1 GWd/MTU**
  - **<4 years for most – up to 53.8 GWd/MTU**
- **~ 200 loaded-casks contain high burn-up fuel**
- **Most fuel being loaded now is high burn-up**

1) Since 1992, allowable burn-up to 47 GWd/MTU, since 2010, up to 52 GWd/MTU
2) All high burn-up fuel is in canisters

What should the demo do

- **Full scale confirmatory data project would enable data collection as part of 3 phase program**
  1. **Characterize fuel**
  2. **Load instrumented casks with high burn-up fuel at reactor site**
  3. **Develop hot cell facility to receive, inspect, and open casks to examine fuel after storage. (10 to 15 years)***
  - **Program would constitute a necessary and complementary addition to existing modeling & separate effects testing at National Labs**
- **Project should build on what has worked before – INL Dry Storage Characterization Project opened cask stored from 1985 to 1999**
  - **Verified "long-term storage has not caused detectable degradation of the spent fuel cladding or the release of gaseous fission products"**

*Activity does not need to be defined at project initiation

What should the demo do

- **Two years of government/industry coordination has established a well defined path**
- **Key activities include**
  - **Identify fuel**
  - **Find a willing host utility**
  - **Design and license a specially instrumented cask**
  - **Load fuel at utility to start demo**
  - **Collect real time data**
  - **Set aside and characterize "sister rods"**
  - **Prepare an R&D site w/dry transfer capability to receive cask***
  - **Ship loaded casks to R&D site to open and examine fuel***
- **Existing knowledge is sufficient to begin**

*Activity does not need to be defined at project initiation

When do we need to do it

- **Now**

When do we need to do it – the importance of timeliness

- **The following processes are ongoing**
  - **NRC response to recent court order remanding and vacating the waste confidence rule**
  - **High burn-up license renewals**
  - **Consolidated Interim Storage Development**
- **Each of these processes would benefit significantly if data collection on high burn-up fuel in storage were also ongoing**
  - **Must find a way to get started that does not require large up front cost or face politically sensitive critical path obstacles**

Conclusion

- **Confirmatory data on high burn-up fuel in storage and transportation is urgently needed**
- **An appropriately designed program will be vital to answering regulatory and public questions**
- **This project should receive DOE's highest priority**