High Burnup Spent Fuel Data Project

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High Burnup Spent Fuel Data Project

Objectives

- **Involves**
  - Loading a commercial TN-32B storage cask with high burn-up fuel in a utility storage pool
    - Well characterized fuel (using Zircaloy-4, Zirlo, and M5-clad high burnup fuels)
    - Cask outfitted with additional instrumentation for monitoring
    - License amendment required for lid design, high burnup fuel and additional heat load
  - Drying of the cask contents using typical process
  - Cask will be housed at the utility’s dry cask storage site
    - Gas sampling will be performed and externals of the cask inspected before moving to the pad
  - The issue of where and how the cask will be opened after the storage period will be solved at a later date.

This is where the cask will be held at North Anna for 2 weeks after it is loaded.
A contract was awarded to EPRI on April 16, 2013

National Labs are performing the technical evaluations of the data

- AREVA Federal Services
- AREVA Transnuclear
- AREVA Fuels
- Sandia National Laboratories
- Idaho National Laboratory
- Pacific Northwest National Laboratory
- Argonne National Laboratory
- Oak Ridge National Laboratory
- Savannah River National Laboratory
Activities for the EPRI Contract
2013-2018

- Acquire the cask
- Modify the cask lid for instrumentation
- Develop a design and licensing basis document
- Submit License Amendment Request
- Extract sister rods
- Plan the fuel loading
- Ship sister rods
- Secure the license amendment
- Load fuel in the cask
- Store the cask at North Anna
- Begin monitoring the cask and take internal gas samples

Note: Blue font indicates completed activities
Next Contract Activities
2018 to 2027

- Ship the cask to a DOE facility
  - Eliminates the need to re-wet the cask and fuel
- In 2027, open the cask and pull some fuel rods
- Perform testing on the rods for comparison to previously tested sister rods
- Prepare report on the effects on the fuel that can be attributed to dry storage operations
Process for Monitoring the Cask

- Cask cavity data acquisition will begin before the cask is drained
  - Thermocouple data recorded on a data logger at regular intervals
- After backfill and pressurizing, the cask will remain in cask prep bay for 2-3 weeks for cavity temperature, pressure, and gas composition monitoring
- Periodic cavity gas samples will be obtained and analyzed
  - Fission gas
  - Hydrogen content
  - Oxygen content
  - Moisture data will provide immediate valuable insight to cask drying method
Cask to be loaded is a TN-32B cask

- Initially fabricated and certified to meet CoC 72-1021 requirements
- Cask is capable of storing high burnup fuels, but storage of high burnup fuel wasn’t a priority at the time this cask was originally licensed

Dominion will seek a license amendment to North Anna’s site specific ISFSI license

The Design and Licensing Basis Document provides the analytical bases and conclusions for departures from the existing approved analyses in the General License TN-32 FSAR

- New lid design completed
- New criticality safety analysis (including poison rod assemblies) completed
- New thermal analysis completed
- New radiological analysis completed

North Anna License Amendment Request (LAR) submitted
Both INL and ORNL Transportation routes have been approved by NRC

Areva rods pulled January 2015

Westinghouse rods pulled June 2015
  • Nine AREVA M5™ rods
  • Nine Westinghouse Zirlo™ rods
  • Four Westinghouse Low-tin Zircaloy-4 rods
  • Three Westinghouse standard Zircaloy-4 rods

Draft Sister Rod Test Plan is being completed and will be shared with others.

License Amendment was submitted to the NRC by Dominion in August, 1015

NRC has docketed the LAR and is continuing to review the document. Draft SER is expected summer of 2016
June 30, 2014: Fuel Selection was finalized based on the following priorities:

1. Get temperatures as close to 400C as possible.
2. Keep the total cask heat load below the temperature limit on the neutron resin material (149C)
3. Put one of each of the four kinds of PWR cladding in the center four slots
4. Surround 4 HBU assemblies in center with lower burnup, fresher fuel to drive up heat.
5. Put one higher BU, shorter cooling time M5 in a middle corner to try to get a wide variation in storage temperature over the prolonged storage period.
6. Thermocouple lance positions: 4 in middle; 3 in periphery; keep some area clear on the lid for the helium overpressure tank et al.
TN32B Cask is being Prepared

TN 32B cask leaving Precision Custom Components in York, PA

TN 32B cask being placed in Columbiana Hi Tech Building in Greensboro, NC
Current Project Schedule

High Level Milestones

- **12/31/14**: TN completes DLBD
- **1/31/15**: Phase 1 sister rods extracted
- **6/30/15**: Phase 2 sister rods extracted
- **7/31/15**: Dominion submits LAR to NRC
- **1Q 2016**: Sister rod shipment
- **1/31/17**: Expected NRC review completion
- **3/15/17**: Cask Delivered to North Anna
- **6/30/17**: Dry run and functional tests complete
- **7/31/17**: Cask loading complete – begin initial monitoring
- **8/21/17**: Cask emplaced at pad/Begin at-pad monitoring