

# North Anna ISFSI

## High Burnup Dry Storage Confirmatory Data Project TN-32 Storage Cask

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# Agenda

- Meeting Purpose
- Project Background
- Technical Approach
  - Dominion
    - Special Considerations
    - Proposed Schedule
  - Transnuclear (*proprietary*)
  - Areva (*proprietary*)
  - Preliminary Results (*proprietary*)
- Questions

# Meeting Purpose

- Describe the Confirmatory Data Program
  - Dominion's role
- Describe technical aspects regarding Dominion's implementation of the program
- Discuss licensing/regulatory perspectives
- Describe high level schedule



# **North Anna ISFSI Confirmatory Data Project Background**

- **Storage of a TN-32 cask with high burnup fuel**
  - **North Anna ISFSI**
  - **Cask monitoring to provide valuable data for storage of high burnup fuel (>45,000 MWd/MtU)**





# **North Anna ISFSI Confirmatory Data Project Background**

- **Storage of a TN-32 cask with high burnup fuel**
- **Data to be monitored**
  - Fuel cladding temperature (indirect via thermocouple lances)
  - Cavity gas
    - Temperature
    - Composition
      - Fission gases
      - Moisture
      - Hydrogen
      - Oxygen
  - Pressure



# **North Anna ISFSI Confirmatory Data Project Background**

- **Storage of a TN-32 cask with high burnup fuel**
  - **Sister rods**
    - Some fuel rods (25 or less) will be shipped offsite to a hot cell (location TBD) for baseline rod characteristic (pre-storage) data
      - Will use existing licensed transportation cask and will not require additional licensing approvals
    - Anticipate using some rods from sister assemblies and some rods from assemblies stored in TN-32



# **North Anna ISFSI Confirmatory Data Project Background**

- **Storage of a TN-32 cask with high burnup fuel**
- **Ultimate goal**
  - Ship the cask and its payload to an offsite facility for continued monitoring and fuel characteristic examinations
  - Ideally, prevents re-wetting the fuel
  - Transportation of the TN-32 is not addressed in initial licensing actions, however, consideration for future transportation will be addressed in storage design



## **North Anna ISFSI Confirmatory Data Project**

- **Cask and Fuel**
  - **TN-32 cask initially fabricated to CoC 72-1021 requirements**
    - TN-32B cask fabricated and certificate of conformance issued by TN
    - Not initially licensed for high burnup fuel
  - **Lid to be modified for instrumentation**
    - (Transnuclear to discuss during proprietary portion)
  - **32.7 kW total payload decay heat power limit will be maintained**
    - Individual assembly decay heat power limit of 1.02 kW may need to be modified





## **North Anna ISFSI Confirmatory Data Project**

- **Planned fuel for storage (all 17x17)**
  - **Westinghouse with Zirlo™ cladding**
  - **Westinghouse with low tin Zircaloy-4 cladding**
  - **Westinghouse with standard Zircaloy-4 cladding**
  - **Areva Advanced Mark BW with M5™ cladding**



## **North Anna ISFSI Confirmatory Data Project**

- **Planned fuel for storage**
- **Some storage assemblies will also provide sister rods**
  - **Open fuel rod locations will be filled by solid stainless dummy rod**



# North Anna ISFSI Confirmatory Data Project

Table of Candidate Fuel Assembly Types

Cladding Material	Burnup Range (GWD/MTU)	Number of Assemblies Available	Last Irradiation	Manufacturer	Assembly Type
Standard Zircaloy-4	53-58	3	1989	Westinghouse	Lo-Par
Zirlo	51 – 55	20	2004 – 2007	Westinghouse	V5H
M5	52 – 67	11	2001-2010	AREVA	AMBW
Low-tin Zircaloy-4	49 – 50	3	1994	Westinghouse	V5H



## **North Anna ISFSI Confirmatory Data Project**

- **Licensing Considerations**
- **Proposed license amendment to SNM-2507**
  - North Anna's site specific ISFSI with TN-32 storage casks
- **27 TN-32 casks currently on pad**
  - All low-burnup – last cask emplaced January 2007
- **Pad space exists for additional cask**



## **North Anna ISFSI Confirmatory Data Project**

- **TN will develop Design and Licensing Basis Document (DLBD)**
  - **Will address the changes to the technical analyses that were previously approved in the general license TN-32 FSAR**
  - **The DLBD and the TN-32 FSAR, by reference, will form the licensing basis for the cask in Dominion's LAR**
  - **New closure lid design**



## **North Anna ISFSI Confirmatory Data Project**

- **The DLBD will be submitted with the LAR  
(proprietary submittal)**
- **Other materials in storage**
  - Thermocouple lances
  - Thermocouple/fuel assembly interface guides
  - Possible use of borated stainless steel rodlets in guide tubes (needed for future transportation)



## **North Anna ISFSI Confirmatory Data Project**

- **Planning to perform “Dry Run” of loading activities not typically performed with TN-32**
  - **Transfer of cask with water to cask prep bay**
  - **Thermocouple loading**
- **Separate Technical Specifications**
  - **Anticipate separate Tech Specs related to this R&D cask**



## **North Anna ISFSI Confirmatory Data Project**

- **Thermal soak period**
  - **Conducted during “Loading Operations,” prior to final leak testing**
  - **Estimated to be two to three weeks after drying and helium backfill for cask and contents to come to thermal equilibrium**
  - **Cask will remain in cask prep bay with cask cavity pressure monitoring in place**
  - **Data logger will record thermal performance data for entire thermal soak period**





## **North Anna ISFSI Confirmatory Data Project**

- **Post loading**
  - **Thermal soak period**
    - **Periodic cavity gas samples will be obtained and analyzed**
      - **Fission gas**
      - **Hydrogen content**
      - **Oxygen content**
      - **Moisture**



## **North Anna ISFSI Confirmatory Data Project**

- **Post loading**
  - **Thermal soak period**
  - **Moisture data will provide valuable insight to cask drying method**
  - **Sensitive moisture measurement technology needed**
    - **Very low moisture levels for detection (on the order of 0.6 mg/liter)**



## **North Anna ISFSI Confirmatory Data Project**

- **Final leak testing will be performed after thermal soak period**
- **Post transfer to pad**
  - **Start of “Storage Operations”**
  - **Tech Spec monitoring equipment (Over Pressure (OP) system and pressure switches) will be connected**
    - **Same pressure switch functional check frequency and monitoring as the other 27 TN-32 casks**



## **North Anna ISFSI Confirmatory Data Project**

- **Post transfer to pad**
  - Data logger will be connected and powered up
  - Data logger and monitored data are not Tech Spec related
  - Cask fuel and cavity thermal monitoring
    - Data polled on regular basis (e.g. twice daily)
    - Data downloaded and reported on periodic basis (e.g., quarterly)

## **North Anna ISFSI Confirmatory Data Project**

- **Cavity gas sampling during “Storage Operations”**
  - **Conducted at the pad**
  - **Same analyses as thermal soak testing, but will add internal cask pressure measurement**
    - **Fission gas**
    - **Cavity pressure**
    - **Hydrogen content**
    - **Oxygen content**
    - **Moisture**

## **North Anna ISFSI Confirmatory Data Project**

- **Cavity gas sampling**
  - LAR will address obtaining gas samples at the pad
  - Proposed method is to pull vent port cover and fill gas bomb(s) for analysis at site lab
  - Will reset the vent port cover using a new o-ring of same design as originally installed for final leak tests using same design bolts, lubricant, and torque technique



## **North Anna ISFSI Confirmatory Data Project**

- **Cavity gas sampling**
  - Cannot meet same leak test acceptance criterion as initially performed
  - Will perform helium sniff test around port cover post-torque
  - We've established that the cover/o-ring/bolt & lube/torque pattern combination initially provided acceptable leak test
    - It's reasonable to expect
- The port continues to be monitored for leaks via the Tech Spec pressure monitoring system



## **North Anna ISFSI Confirmatory Data Project**

- **Cavity gas sampling**
  - **Pulling the cavity gas sample will be conducted in a monitored enclosure similar to this Surry enclosure**







## **North Anna ISFSI Confirmatory Data Project**

- **Cavity gas sampling**
  - **Enclosure will have continuous air monitoring for any effluent release while obtaining cavity sample**
  - **Enclosure is temporary**
  - **Only placed over the cask during gas sampling activity**



## **North Anna ISFSI Confirmatory Data Project**

- **Cavity gas sampling**
  - Gas samples will be obtained and analyzed periodically during the storage program at North Anna
  - Samples obtained every three to five years
  - Method is what needs to be licensed...not the frequency

## **North Anna ISFSI Confirmatory Data Project**

- **Other licensing actions for consideration**
  - Post seismic location of casks and spacing
    - Recently addressed with NRC
  - North Anna ISFSI license renewal
    - License renewal application due in June 2016
      - Will potentially have one cask with high burnup fuel, and 27 cask with low burnup fuel
- **Amendment will not change allowable MTU storage limit**



**Dominion**

## **North Anna ISFSI Confirmatory Data Project**

- **High Level Milestone Schedule**
  - **12/31/14: TN completes DLBD**
  - **7/31/15: Dominion submits LAR to NRC**
  - **1/31/17: Dominion receives approved SER**
  - **6/30/17: Dry run and functional tests complete**
  - **7/31/17: Cask loading complete – begin thermal soak period**
  - **8/21/17: Cask emplaced at pad**

# Questions

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