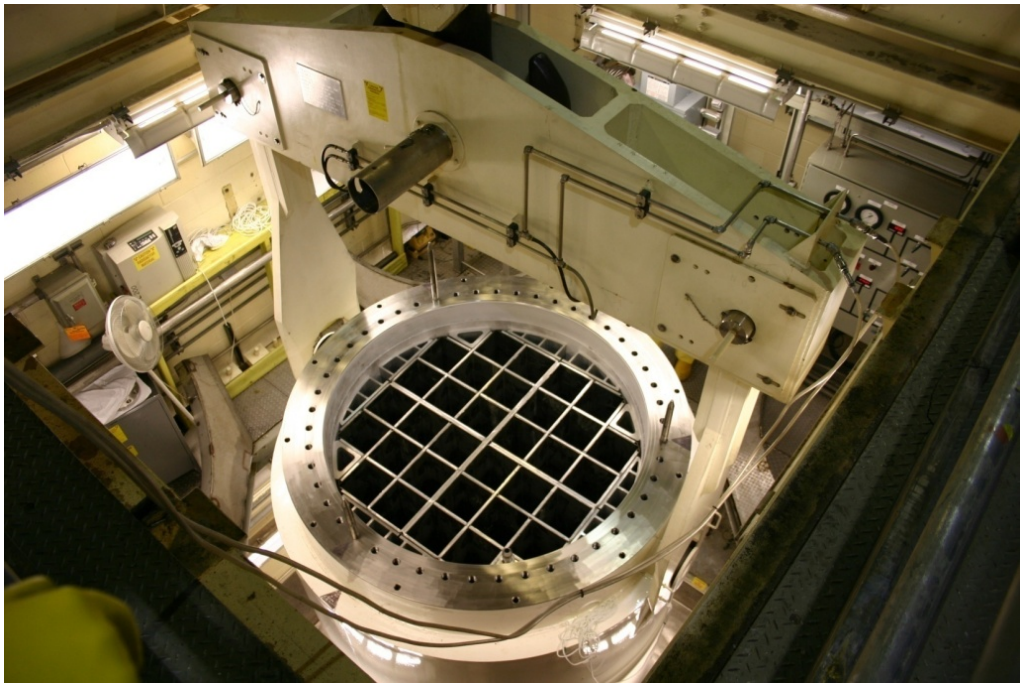
Dominion Work Related to High Burn-up Fuel Demonstration Project



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Rich Ridder

Dominion

May 2013

HBU Fuel Demonstration Project

- Begin storage of high burnup (>45GWd/mtU) fuel under representative conditions at a host utility
- Select and ship “sister” rods, comparable to those in the Demo cask, to lab for destructive examination to acquire baseline physical characteristics of the fuel
- Seek approval to ship the Demo cask to a new dry transfer and aging facility
    - Examine rods from Demo cask and compare with baseline sister rod data
    - Dry transfer/aging facility needed in order to retrieve contents

Experience with Demonstration Projects

- DOE/EPRI dry storage demonstration project, 1985 (Surry)
  - Fuel selection and characterization
  - Loading of TN-8L shipping cask
- Hot cell shipments
  - ZIRLO® fuel rods, 2001 (North Anna)
  - M5 ® fuel rods and guide thimble segments, 2005 (North Anna)
  - Fuel assembly structural cage, 2011 (Millstone 3)
- Experience working with both PWR fuel vendors to extract individual fuel rods

Dry Storage Cask Experience

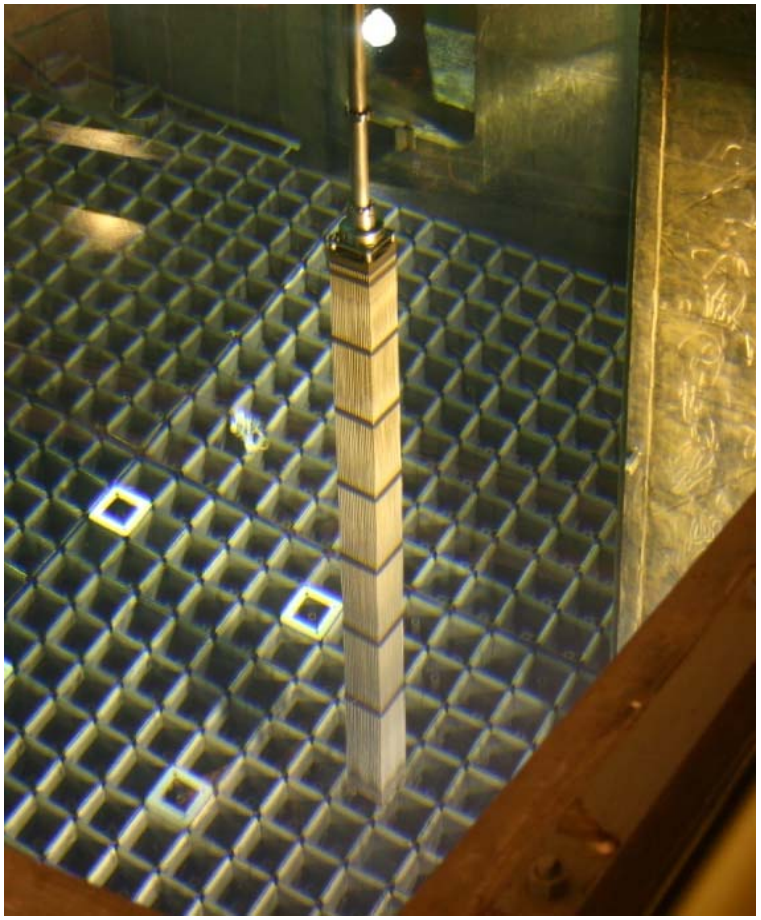
- Extensive operating experience with bolted lid casks, including TN-32s
  - 53 TN-32s in service at North Anna and Surry
  - Loaded and transferred as recently as 2007
  - Handling equipment and procedures
  - Experience unloading bolted casks
- North Anna TN-32 pad has space available to accommodate the Demo cask

Initial Dominion Workscope

- EPRI Contract with AFS/TN/Dominion
  - Scope and select possible fuel payload
  - Propose sister rods based on fuel payload
  - Evaluate TN-32 cask as-built condition
  - Assess interfaces with North Anna TN-32 handling equipment
  - Scope monitoring and instrumentation
  - Outline licensing strategy for storage and transportation
  - Provide input for ROM budgetary estimate
- Complete this summer

Fuel Payload Options

- Characterize Fuel Payload for Demo Cask
  - 3 cladding types and fuel assembly designs
  - Range of burnups 50-67.7 GWd/mtU (assembly average)
  - Confirm no “issues” - leakers, damage, debris, excessive crud, etc.



Fuel Details

- North Anna PWR fuel and cladding types:

Fuel Type (all 17x17)	**Cladding Type**	**Number of Assemblies**	**Assembly Average Burnup (MWd/MtU)**	**Discharge Date**	**Cooling Time to January 1, 2017 (Years)**
Westinghouse 17x17 LOPAR *	Zirc-4	3	58,000	1989	27.9
Westinghouse Vantage 5H	Zirc-4	3	50,000	1994	22.3
Westinghouse Vantage 5H	ZIRLO	20	53-55,000	2000-2005	11.3 - 16.8
AREVA Advanced Mk BW LTA	M4, M5	1	67,700	2004	12.7
AREVA Advanced Mk BW LTA	M5	2	53,000	2001	15.4
AREVA Advanced Mk BW	M5	7+	53,000	3/8/2009 and after	≤ 7.7

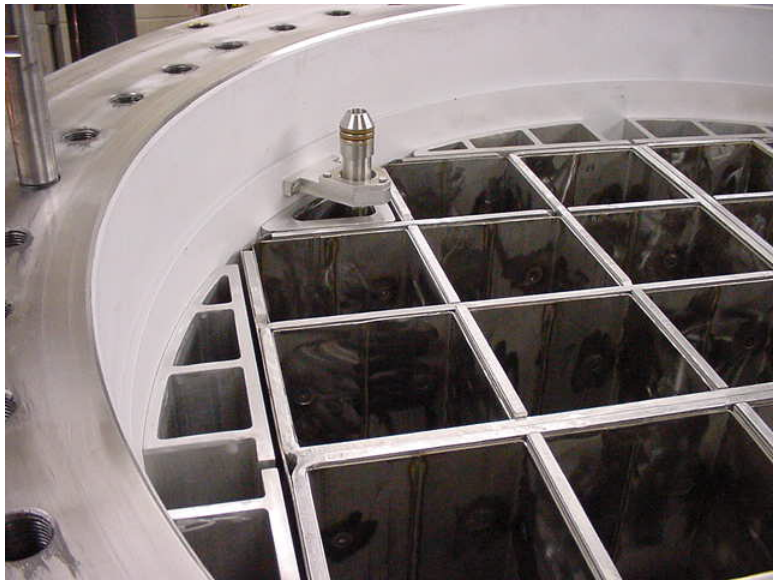
* welded top nozzle assemblies

Sister Rod Selection

- Based on specific fuel assemblies selected
- Review individual rod power histories and burnups
- Determine if any previous hot cell PIE data is available and can be shared
- Confirm retrievability from fuel assembly
- Quantity TBD (~8-12)

Evaluate Existing TN-32 Cask Design

- Compatibility with handling equipment
  - Trunnions
  - Lid lifting attachments
- Operating interfaces
  - Lid port connections
  - O-ring grooves
  - Overpressure system connections
  - Protective cover access plate
  - NEMA box valve, pressure switch
- Fuel interface dimensions
  - North Anna fuel slightly larger than fuel originally planned for this cask



Evaluate TN-32 Cask As-builts

- Transnuclear with Dominion
  - QA documentation/pedigree
    - Review doc package for completeness
    - Acceptance test results
      - Size/length of fuel cell functional gage
      - Weld NDE
    - Fabrication & material nonconformances (e.g. weld repairs)
      - Confirm appropriate disposition
  - Cleanliness/condition
    - Corrosion
    - Coating integrity
- (Later) Basket cell condition
    - Fusion welds, visuals

Monitoring and Instrumentation

- Determine key monitoring parameters (with EPRI et al)
  - Temperature profiles
  - Initial gas sampling after vacuum drying most meaningful
  - Evaluate capabilities (remote?)

- Evaluate lid instrumentation concepts (with TN, industry, labs)
  - Thermocouple penetrations and locations
  - Practicality with lid installation/removal process

Outline Licensing Strategy

- A Design and Licensing Analyses Document would be used for a North Anna License Amendment Request
  - Address high burnup fuel storage
  - Address instrumentation requirements for the cask
  - Include Technical Specifications applicable to the North Anna cask
  - NRC input from review of test plan should aid in licensing
- Apply for Part 71 shipping license during cask aging period (TN with Dominion)
  - TN-32 designed for shipment, but shipping license never pursued
  - Consider transportation requirements when developing licensed payload
  - Benchmark TN-40 transportation license

Challenges – Dominion's Perspective

- Licensing cask for high burnup storage
  - considered to be low risk for TN-32 at North Anna
- Licensing cask for transportation
  - already designed for transport, and have TN-40 as example
- Lid instrumentation/installation
  - new to Dominion
  - carefully evaluate designs and capabilities
- Project
  - "scope creep" - needs to fit in power station operations schedule (cask loading targeted for 2017)
  - cask ownership/title a potential issue

Summary

- Experience and capability to support the project
- Initial work on fuel selection and TN-32 assessment is underway
- Decisions must consider licensing
- Carefully manage scope to ensure success

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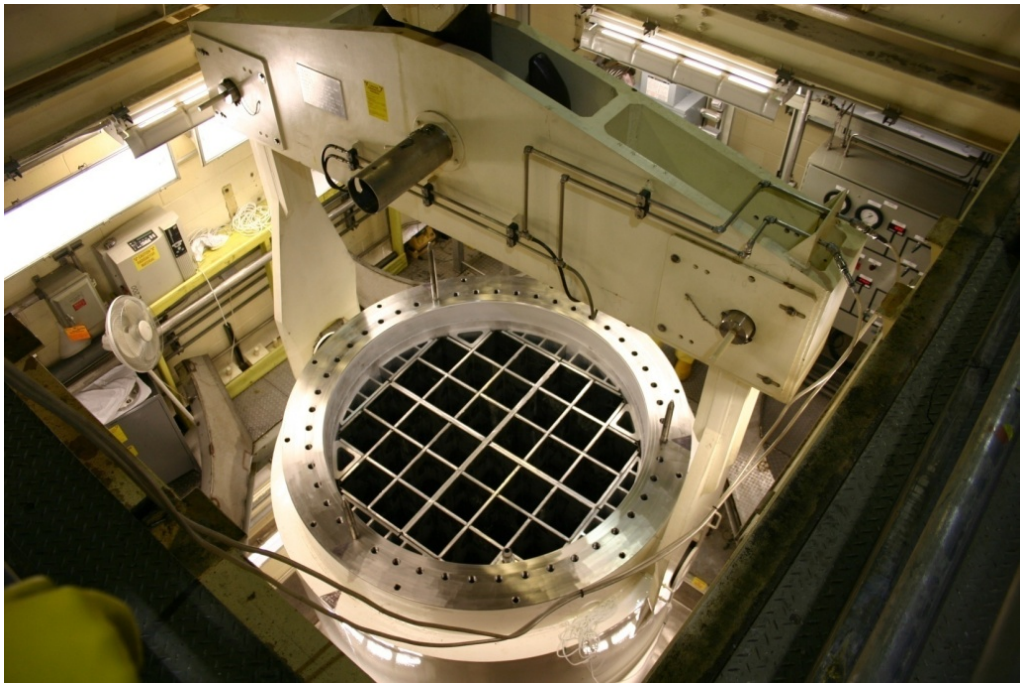

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