Watts Bar Unit 2

Tritium Production License Amendment
Pre-Application Meeting
Spent Fuel Pool Criticality Analysis

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September 26, 2017

Agenda

- ❑ Introduction and Background
- ❑ Overview of Current Analysis
- ❑ Overview of New Analysis
- ❑ Technical Specification Changes
- ❑ Neutron Absorber Material Monitoring

Introduction and Background

Watts Bar (WBN) Spent Fuel Pool (SFP) Racks

- WBN SFP contains a single type of BORAL™ racks containing flux traps
- Installed in WBN SFP in 1997
  - Originally resided in Sequoyah Nuclear Plant (SQN) SFP from 1980-1995
  - Original design had seal welded cavity for BORAL™
  - BORAL™ cavity vented during WBN installation
  - No monitoring program required at time of licensing (either at SQN or WBN)

Overview of Current Analysis

- Performed by Holtec in 2000 using Kopp guidance
- SFP Criticality Analysis credits
  - Storage cell spacing, i.e., flux traps between storage cells
  - Fixed neutron absorbers: BORAL™ panels
  - Burnup using Burnup - Enrichment Curves
    - Addressed TPBARs in depletion analysis
  - Integral Fuel Burnable Absorber (IFBA) in New Fuel
  - Administrative Controls (Loading Patterns)

Overview of New Analysis (1/2)

- Performed by Holtec
- Follows ISG 2010-01 and NEI 12-16 Guidance
- SFP Criticality Analysis credits
  - Storage cell spacing, i.e., flux traps between storage cells
  - Fixed neutron absorbers: BORAL™ panels
  - Soluble Boron (500ppm)

Overview of New Analysis (2/2)

- Criticality calculations qualify the BORAL™ storage racks uniformly loaded with fresh fuel assemblies with an initial enrichment up to 5 wt% ^{235}U
  - Bounding fuel density of all types of fuel assemblies is considered
  - Bounding approach provides analysis simplicity and adequate margin
  - Neutron absorber monitoring program will be implemented following the NRC-approved guidance in NEI 16-03-A

Comparison of Current and Proposed New Analyses

Parameter	Current Analysis	Proposed New Analysis	Impact
Burnup Credit	Burnup versus enrichment curves	Not used - Fresh fuel only	Simplifies implementation by reduction of administrative controls
IFBA Credit for Fresh Fuel	Minimum number of IFBA rods required	Not used	Simplifies implementation by reduction of administrative controls
Soluble Boron Credit	Not Used	500 ppm	Now credited at all times
Boral™ Monitoring Program	None	Propose to Implement NEI 16-03-A	Increased ability to determine material performance
Boral™ Blister Impact	Not addressed	Assumes void on every panel over entire panel surface	Bounds Boral™ blistering
Analytical Guidance	Kopp Memo guidance used	Consistent with DSS-ISG-2010-01 and NEI 12-16	Analysis consistent with industry best practices

Technical Specification Changes (1/2)

- Proposed change revises the Units 1 and 2 TSs affected by the new spent fuel rack criticality analysis
  - TS 3.7.15, “Spent Fuel Assembly Storage,” **revised** to simplify the fuel storage limitations on fuel assemblies by eliminating burnup–related criteria
  - TS 3.7.18, “Fuel Storage Pool Boron Concentration,” **added** to specify minimum fuel storage pool boron concentration when fuel is stored in the pool
  - TS 3.9.9, “Spent Fuel Pool Boron Concentration,” **revised** to modify the minimum fuel storage pool boron concentration during refueling operations when fuel is stored in the pool

Technical Specification Changes (2/2)

- Proposed change revises the Units 1 and 2 TSs affected by the new spent fuel rack criticality analysis (continued)
  - TS 4.3, “Fuel Storage,” **revised** to replace the storage limitations on fuel assembly initial enrichment, burnup, and storage location limitations with a single requirement to maintain a specified boron concentration in the spent fuel pool
  - TS 5.7.2.21, “Spent Fuel Storage Rack Neutron Absorber Monitoring Program,” **added** to incorporate the NRC-approved NEI 16-03-A guidance

Neutron Absorber Monitoring Program (1/4)

Current

- WBN Spent Fuel Storage Racks have never had Boral™ coupons
- Monitoring industry OE including SQN and BFN
- Participating in Industry Groups
- Monitoring Fuel Movements for Issues
- Monitoring SFP chemistry
  - pH
  - Aluminum

Neutron Absorber Monitoring Program (2/4)

Future

- Implement Boral™ Monitoring Program per NEI 16-03-A
- NEI 16-03-A Options
  - In-situ testing (BADGER)
  - Coupon program
- Continue to monitor SFP chemistry

Neutron Absorber Monitoring Program (3/4)

Future (cont'd)

IF TVA decides on a coupon program, the following are issues to resolve

- ❑ Generate coupons from existing rack panels
  - ➢ Harvest enough coupons for life of plant plus life extension
  - ➢ Use rack periphery panel
  - ➢ Circular coupons - approximately 4 inch diameter
- ❑ Pre-characterize coupons
  - ➢ For ^{10}B areal density use actual panel data (if available) or neutron attenuation testing

Neutron Absorber Monitoring Program (3/3)

Future (cont'd)

IF TVA decides on a coupon program, the following are issues to resolve (cont'd)

- ❑ Place coupons on "coupon tree" in SFP
- ❑ Accelerate exposure
- ❑ Perform periodic Areal Density Measurements per NEI 16-03-A
- ❑ Re-insert coupons, when applicable

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