Watts Bar Nuclear Plant

Unit 2 Ice Weight Technical Specification Change

November 9, 2016

Agenda

- **Introductions / Opening Remarks**
- **Background**
- **Intent**
- **Technical Basis**
- **Schedule**
- **Closing Remarks**

Opening Remarks

Background

Tech Spec SR 3.6.11.2

- Specific to ice condenser containments
- Verifies sufficient ice mass to mitigate LOCA/MSLB accidents
- Different value for each Watts Bar unit

Tech Spec Required Ice Mass	
Unit 1	2,404,500 lbm
Unit 2	2,750,700 lbm

Background (continued)

Difference

Unit 1

- Originally licensed with WCAP-10325-P-A, “Westinghouse LOCA Mass and Energy (M&E) Release Model for Containment Design” (circa 1983)
- NRC Amendment 62 dated 7/25/2006 approved the increase in the ice mass to 2,404,500 lbm due to the additional energy associated with the replacement steam generators based on WCAP-10325-P-A
- Adopted WCAP-17721-P-A (WCOBRA/TRAC) as Analysis of Record (AOR) in 2015
  - Addressed NSAL-11-5 and other methodology issues
  - Results demonstrated containment pressure was significantly below design pressure
  - Analysis did not require a change to the Unit 1 ice mass

Unit 2

- Analysis was already under staff review prior to WCAP-17721-P-A approval
- Licensed WCAP-10325-P-A as AOR
  - Model was based on Unit 2 (Model D3 steam generators)
  - Methodology issues could be absorbed in initial ice load
  - Simplified initial licensing of Unit 2

Intent

Apply the current Unit 1 (WCOBRA/TRAC) analysis documented in Engineering Report WCAP-17834-P (ML15254A564) to Unit 2

Aligns the Unit 2 Tech Spec SR 3.6.11.2 to match Unit 1 value

- Achieves roughly 350,000 lbm reduction in required ice weight
- TVA would like to apply the revised ice mass for Unit 2 during the first refueling outage in October 2017 in order to align maintenance activities for both units
- See proposed Tech Spec changes on following slide

Proposed Tech Spec Changes

- Revises SR 3.6.11.2 to reduce the Tech Spec required total ice mass

- Revises SR 3.6.11.3 to reduce the average ice weight in the sample baskets

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.6.11.2	Verify total weight of stored ice is greater than or equal to ~~2,750,700~~2,404,500 lb by: a. Weighing a representative sample of ≥ 144 ice baskets and verifying each basket contains greater than or equal to ~~1415~~1237 lb of ice; and b. Calculating total weight of stored ice, at a 95 percent confidence level, using all ice basket weights determined in SR 3.6.11.2.a.	18 months
SR 3.6.11.3	Verify azimuthal distribution of ice at a 95 percent confidence level by subdividing weights, as determined by SR 3.6.11.2.a, into the following groups: a. Group 1-bays 1 through 8; b. Group 2-bays 9 through 16; and c. Group 3-bays 17 through 24. The average ice weight of the sample baskets in each group from radial rows 1, 2, 4, 6, 8, and 9 shall be greater than or equal to ~~1415~~1237 lb.	18 months
SR 3.6.11.4	Verify, by visual inspection, accumulation of ice on structural members comprising flow channels through the ice bed is less than or equal to 15 percent blockage of the total flow area for each safety analysis section.	18 months

(continued)

TVA

Proposed Tech Spec Bases Changes

- Revises Bases 3.6.11 to reduce the Tech Spec required total ice mass

Ice Bed
B 3.6.11

B 3.6 CONTAINMENT SYSTEMS

B 3.6.11 Ice Bed

BASES

BACKGROUND

The ice bed consists of over ~~2,750,700~~2,404,500 lbs of ice stored in 1944 baskets within the ice condenser. Its primary purpose is to provide a large heat sink in the event of a release of energy from a Design Basis Accident (DBA) in containment. The ice would absorb energy and limit containment peak pressure and temperature during the accident transient. Limiting the pressure and temperature reduces the release of fission product radioactivity from containment to the environment in the event of a DBA.

The ice condenser is an annular compartment enclosing approximately 300° of the perimeter of the upper containment compartment, but penetrating the operating deck so that a portion extends into the lower containment compartment. The lower portion has a series of hinged doors exposed to the atmosphere of the lower containment compartment, which, for normal plant operation, are designed to remain closed. At the top of the ice condenser is another set of doors exposed to the atmosphere of the upper compartment, which also remain closed during normal plant operation. Intermediate deck doors, located below the top deck doors, form the floor of a plenum at the upper part of the ice condenser. These doors also remain closed during normal plant operation. The upper plenum area is used to facilitate surveillance and maintenance of the ice bed.

The ice baskets contain the ice within the ice condenser. The ice bed is considered to consist of the total volume from the bottom elevation of the ice baskets to the top elevation of the ice baskets. The ice baskets position the ice within the ice bed in an arrangement to promote heat transfer from steam to ice. This arrangement enhances the ice condenser's primary function of condensing steam and absorbing heat energy released to the containment during a DBA.

Proposed Tech Spec Bases Changes

- Revises SR 3.6.11.2 bases to reduce the average ice weight in the sample baskets

Ice Bed
B 3.6.11

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.11.2

The weighing program is designed to obtain a representative sample of the ice baskets. The representative sample shall include 6 baskets from each of the 24 ice condenser bays and shall consist of one basket from radial rows 1, 2, 4, 6, 8, and 9. If no basket from a designated row can be obtained for weighing, a basket from the same row of an adjacent bay shall be weighed.

The rows chosen include the rows nearest the inside and outside walls of the ice condenser (rows 1 and 2, and 8 and 9, respectively), where heat transfer into the ice condenser is most likely to influence melting or sublimation. Verifying the total weight of ice ensures that there is adequate ice to absorb the required amount of energy to mitigate the DBAs.

If a basket is found to contain less than ~~1415~~1237 lb of ice, a representative sample of 20 additional baskets from the same bay shall be weighed. The average weight of ice in these 21 baskets (the discrepant basket and the 20 additional baskets) shall be greater than or equal to ~~1415~~1237 lb at a 95% confidence level. [Value does not account for instrument error.]

Weighing 20 additional baskets from the same bay in the event a Surveillance reveals that a single basket contains less than ~~1415~~1237 lb ensures that no local zone exists that is grossly deficient in ice. Such a zone could experience early melt out during a DBA transient, creating a path for steam to pass through the ice bed without being condensed. The Frequency of 18 months was based on ice storage tests and the allowance built into the required ice mass over and above the mass assumed in the safety analyses. Operating experience has verified that, with the 18 month Frequency, the weight requirements are maintained with no significant degradation between surveillances.

Technical Basis

Westinghouse Evaluation

Westinghouse performed a full-spectrum review

Demonstrates that Watts Bar Unit 1 bounds Unit 2 from a LOCA M&E / Containment Integrity perspective

- Unit 1 and Unit 2 share many common NSSS design features (reactor, fuel, loop configuration, containment design)
- Unit 1 bounds Unit 2 for a key design feature
  - Unit 1 replacement steam generator primary volume is larger than the Unit 2 original steam generators (approximately 1,038 ft^3 total NSSS volume)
  - Replacement steam generators contain more stored metal energy (approximately 224,000 lb total NSSS mass)

WEC LOCA M&E and Containment Integrity Evaluation

Westinghouse has determined that the current Watts Bar Unit 1 AOR is bounding relative to Unit 2

- Containment peak pressure is a function of containment design and mass and energy releases
  - Evaluation has shown that the containment design is virtually identical (e.g. heat slabs, containment cooling functions)
  - RCS designs are virtually identical, with the exception of the steam generator design
  - The current M&Es calculated with the model 68AXP steam generator design would bound M&Es calculated with the model D3
  - Results of this evaluation will be provided with TVA submittal

TVA

Schedule

Date	Milestone
Late Nov 2016	Westinghouse completes reconciliation analysis
Mid-Dec 2016	TVA submits License Amendment Request
Mid-Jan 2017	Post-Submittal follow-up discussion
Sept 2017	NRC issues SER
Oct 2017	Unit 2 refueling outage begins

Closing Remarks

Questions?

TVA