Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

TVA-WBN-TS-01-09

NOV 2 8 2001

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of) Docket No.50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - TECHNICAL SPECIFICATION (TS) CHANGE NO. WBN-TS-01-09 - ICE CONDENSER ICE WEIGHT REDUCTION - MINOR CORRECTIONS (TAC NO. MB 2969)

The purpose of this letter is to correct a minor error identified in TVA's September 7, 2001, letter concerning the subject technical specification change. This error was discussed with the NRC Project Manager J. Goshen, on November 15, 2001.

The identified error resulted from the use of an incorrect input assumption in the amount of hydrogen gas added to containment in the analysis discussed in Section 3.2 of the Westinghouse WCAP-15699, Revision 1, "Containment Integrity Analyses for Ice Weight Optimization Engineering Report." Westinghouse has revised the analysis and has issued corrected pages to the WCAP which are provided in Enclosure 1. A revised marked up page of the Updated Final Safety Analysis Report in Appendix A of the WCAP is not provided. The change affects page 6.2.1-8 and its Insert. Based on the revised calculation, the maximum containment pressure has changed from 10.438 pounds per square inch gauge (psig) to 10.458 psig.

The slight increase in containment pressure is bounded by the safety analysis provided in TVA's September 7, 2001, letter. This slight increase does not change the conclusions of the No Significant Hazards Determination. The change in the maximum

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calculated containment pressure does not affect the revised parameters in Technical Specification 3.6.11, Ice Bed. However, this change does revise the maximum peak containment pressure parameter in the Technical Specification Bases 3.6.4, Containment Pressure and 3.6.6, Containment Spray System. These revised pages are provided in Enclosure 2.

This error was documented and the corrective actions are being tracked under Problem Evaluation Report (PER) 01-016360-000.

There are no regulatory commitments identified in this letter. If you have any questions about this change, please contact me at (423) 365-1824.

Sincerely,

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure
cc: See page 3

Subscribed and sworn to before me
on this 28 th day of November 2001

E. Jeannette Long
Notary Public

My Commission Expires May 21, 2005

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Enclosure
cc (Enclosure):

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
PROPOSED TECHNICAL SPECIFICATION CHANGE WBN-TS-01-09
WCAP-15699, REVISION 1

REVISED PAGE i (EXECUTIVE SUMMARY)
REVISED PAGE 26 (SECTION 3.2)
REVISED PAGE 28 (SECTION 3.4)
REVISED PAGE 29 (SECTION 3.6)
REVISED PAGE 38 (TABLE 3-6)

EXECUTIVE SUMMARY

Loss-of-Coolant Long-term Containment Mass and Energy Release and Containment Integrity Analyses have been performed to support ice weight optimization at the Watts Bar Nuclear Plant Unit 1. The objective of this effort was to provide revised containment mass and energy release data using current Watts Bar specific information and more realistic models to support ice weight reduction. The analyses conducted used the WCAP-10325-P-A mass and energy release model, which is a first time application to Watts Bar but has previously used on many other Westinghouse design PWRs including Sequoyah. The containment pressure calculation is consistent with current licensed methodology.

The analyses include LOCA long-term mass and energy releases to be used to support the analytical basis and subsequently used in the LOTIC-1 Computer Code in the containment integrity response analyses.

The objective of this effort was to obtain ice weight optimization, retain current time interval (approximately 150 seconds) relationship between containment spray switchover time and ice bed melt-out and provide for peak pressure margin to design pressure.

The results of the analysis support the following:

- An ice mass of 2.029375 x 10^6 lbms

- A calculated containment peak pressure of 10.458 psig occurring at 6,373.5 seconds

- Ice bed meltout occurred at 3625.5 seconds

  (Containment spray switchover is completed at 3447 seconds thus the containment spray switchover ice bed meltout relationship is 178.5 seconds.)

- Ice Bed Mass limited by the Spray Switchover time of 3447 seconds and the margin between spray swithcover and ice bed meltout of at least 150 seconds. Thus, the containment pressure margin does not translate into a further reduction in ice bed mass.

- The ice bed mass of 2.029375x10^6 Lbms equates to an average of 1044 Lbm per basket. This average value recognizes that all baskets may not have the same initial weight nor have the same sublimation rate. To ensure that a sufficient quantity of ice exists in each basket to survive the blowdown phase of a LOCA, a minimum amount of ice per basket to survive the blowdown would be approximately 313 Lbm, based on Table 3-4. To ensure that an adequate distribution of ice exists in the Ice Condenser to prevent early burn -through of a localized area, 313 Lbm of ice should be the minimum weight of ice per basket at any time while also ensuring that the average weight per basket remains above 1044 Lbm.

1. Minimum safeguards are employed in all calculations, e.g., one of two spray pumps and one of two spray heat exchangers; one of two RHR pumps and one of two RHR heat exchangers providing flow to the core; one of two safety injection pumps and one of two centrifugal charging pumps; and one of two air return fans.

2. $2.029375 * 10^6$ lbs. of ice initially in the ice condenser.

3. The blowdown, reflood, and post reflood mass and energy releases described in Section 2.5 are used.

4. The blowdown period mass and energy from Table 2-4 is conservatively compressed into a 10 second period in order to melt an amount of ice consistent with the Waltz Mill ice condenser test. (Reference 10)

5. Blowdown and post-blowdown ice condenser drain temperature of 190°F and 130°F are used. (These values are based on the Long-Term Waltz-Mill ice condenser test data described in Reference 10)

6. Nitrogen from the accumulators in the amount of 2251 lbs. is included in the calculations.

7. Hydrogen gas was added to the containment in the amount of 25,230.2 Standard Cubic Feet (SCF) over 24 hours. Sources accounted for were radiolysis in the core and sump post-LOCA, corrosion of plant materials (Aluminum, Zinc, and painted surfaces found in containment), reaction of 1% of the Zirconium fuel rod cladding in the core, and hydrogen gas assumed to be dissolved in the Reactor Coolant System water. (This bounds tritium producing core designs)

8. Essential service water temperature of 85°F is used on the spray heat exchanger and the component cooling heat exchanger.

9. The air return fan is effective, 10 minutes after the transient is initiated.

10. No maldistribution of steam flow to the ice bed is assumed. (This assumption is conservative, contributes to early ice bed melt out time.)

11. No ice condenser bypass is assumed. (This assumption depletes the ice in the shortest time and is thus conservative.)

12. The initial conditions in the containment are a temperature of 100°F in the lower and dead-ended volumes, 85°F in the upper volume and a temperature 15°F in the ice condenser. All volumes are at a pressure of 0.3 psig and a 10% relative humidity, except the ice condenser which is at 100% relative humidity.

3-2 and 3-3.

The heat transfer coefficient to the containment structure is based primarily on the work of Tagami [Reference 9]. When applying the Tagami correlations, a conservative limit was placed on the lower compartment stagnant heat transfer coefficients. They were limited to a steam-air ratio of 1.4 according to the Tagami correlation. The imposition of this limitation is to restrict the use of the Tagami correlation within the test range of steam-air ratios where the correlation was derived.

With these assumptions, the heat removal capability of the containment is sufficient to absorb the energy releases and still keep the maximum calculated pressure below the design pressure.

3.4 Analysis Results

The results of the analysis shows that the maximum calculated containment pressure is 10.458 psig, for the double-ended pump suction minimum safeguards break case, assuming an ice bed mass of 2.029375×10^6 Lbm. This pressure is less than the design pressure of 13.5 psig and therefore shows the acceptability of the reduced ice mass. The pressure peak occurred at approximately 6373.5 seconds, with ice bed meltout at approximately 3625.5 seconds. It is noted that the apparent containment pressure margin between 10.458 psig and the design pressure of 13.5 psig can not be used to further reduce the ice mass. The ice bed mass is limited by the Spray Switchover time of 3447 seconds and the margin between spray swithcover and ice bed meltout of at least 150 seconds.

The following plots show the containment integrity transient, as calculated by the LOTIC-1 code.

Figure 3-1, Containment Pressure Transient
Figure 3-2, Upper Compartment Temperature Transient
Figure 3-3, Lower Compartment Temperature Transient
Figure 3-4, Active and Inactive Sump Temperature Transient
Figure 3-5, Ice Melt Transient
Figure 3-6, Comparison of Containment Pressure VS Ice Melt Transients

Tables 3-4 and 3-5 give energy accountings at various points in the transient.

Tables 3-6 through 3-8 provide data points for Figures 3-1 through 3-6.

3.5 Relevant Acceptance Criteria

The LOCA mass and energy analysis has been performed in accordance with the criteria shown in the Standard Review Plan (SRP) section 6.2.1.3. In this analysis, the relevant requirements of General Design Criteria (GDC) 50 and 10 CFR Part 50 Appendix K have been included by confirmation that the calculated pressure is less than the design pressure, and because all available sources of energy have been included. These sources include: reactor power, decay heat, core stored energy, energy stored in the reactor vessel and internals, metal-water reaction

energy, and stored energy in the secondary system.

The containment integrity peak pressure analysis has been performed in accordance with the criteria shown in the SRP section 6.2.1.1.b, for ice condenser containments. Conformance to GDC's 16, 38, and 50 is demonstrated by showing that the containment design pressure is not exceeded at any time in the transient. This analysis also demonstrates that the containment heat removal systems function to rapidly reduce the containment pressure and temperature in the event of a LOCA.

3.6 Conclusions

Based upon the information presented in this report, it may be concluded that operation with an ice weight of 2.029375 million pounds for the Watts Bar Nuclear Plant is acceptable. Operation with an ice mass of 2.029375 million pounds results in a calculated peak containment pressure of 10.458 psig, as compared to the design pressure of 13.5 psig. Further, the ice bed mass of 2.029375×10^6 Lbms equates to an average of 1044 Lbm per basket. This average value recognizes that all baskets may not have the same initial weight nor have the same sublimation rate. To ensure that a sufficient quantity of ice exists in each basket to survive the blowdown phase of a LOCA, a minimum amount of ice per basket to survive the blowdown would be approximately 313 Lbm, based on Table 3-4. To ensure that an adequate distribution of ice exists in the Ice Condenser to prevent early burn-through of a localized area, 313 Lbm of ice should be the minimum weight of ice per basket at any time while also ensuring that the average weight per basket remains above 1044 Lbm.

Thus, the most limiting case has been considered, and has been demonstrated to yield acceptable results.

TABLE 3-6 (Cont'd)

WATTS BAR NUCLEAR PLANT UNIT 1

CONTAINMENT PRESSURE AND ICE MELT MASS

TIME	PRESSURE	MELTED ICE
(SEC)	(PSIG)	(LBM)
3603.01	6.84	2027240.50
3611.26	6.85	2028158.50
3619.51	7.00	2028948.25
3627.75	7.43	2029375.00
3635.92	7.59	2029375.00
3710.42	8.21	2029375.00
3793.42	8.67	2029375.00
3967.17	9.21	2029375.00
4133.92	9.53	2029375.00
4299.92	9.76	2029375.00
4630.92	10.04	2029375.00
5376.91	10.37	2029375.00
6373.50	10.458	2029375.00
6494.13	10.44	2029375.00
10628.81	9.96	2029375.00
15123.68	9.76	2029375.00
21705.14	9.26	2029375.00
27087.07	9.05	2029375.00
32841.95	8.69	2029375.00
33765.09	8.70	2029375.00
40026.00	8.25	2029375.00
62455.47	7.61	2029375.00
79723.44	7.25	2029375.00
101896.87	6.91	2029375.00
155842.67	6.36	2029375.00
199199.81	6.07	2029375.00

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
PROPOSED TECHNICAL SPECIFICATION CHANGE WBN-TS-01-09
REVISED PAGE B 3.6-28
REVISED PAGE B 3.6-37

B 3.6 CONTAINMENT SYSTEMS

B 3.6.4 Containment Pressure

BASES

BACKGROUND

The containment pressure is limited during normal operation to preserve the initial conditions assumed in the accident analyses for a loss of coolant accident (LOCA) or steam line break (SLB). These limits also prevent the containment pressure from exceeding the containment design negative pressure differential (-2.0 psid) with respect to the shield building annulus atmosphere in the event of inadvertent actuation of the Containment Spray System or Air Return Fans.

Containment pressure is a process variable that is monitored and controlled. The containment pressure limits are derived from the input conditions used in the containment functional analyses and the containment structure external pressure analysis. Should operation occur outside these limits coincident with a Design Basis Accident (DBA), post accident containment pressures could exceed calculated values.

APPLICABLE SAFETY ANALYSES

Containment internal pressure is an initial condition used in the DBA analyses to establish the maximum peak containment internal pressure. The limiting DBAs considered, relative to containment pressure, are the LOCA and SLB, which are analyzed using computer pressure transients. The worst case LOCA generates larger mass and energy release than the worst case SLB. Thus, the LOCA event bounds the SLB event from the containment peak pressure standpoint (Ref. 1).

The initial pressure condition used in the containment analysis was 15.0 psia. This resulted in a maximum peak pressure from a LOCA of 10.46 psig. The containment analysis (Ref. 1) shows that the maximum allowable internal containment pressure, P_a (15.0 psig), bounds the calculated results from the limiting LOCA. The maximum containment pressure resulting from the worst case LOCA, does not exceed the containment design pressure, 13.5 psig.

(continued)

BASES

BACKGROUND (continued)

and water from a DBA. During the post blowdown period, the Air Return System (ARS) is automatically started. The ARS returns upper compartment air through the divider barrier to the lower compartment. This serves to equalize pressures in containment and to continue circulating heated air and steam through the ice condenser, where heat is removed by the remaining ice and by the Containment Spray System after the ice has melted.

The Containment Spray System limits the temperature and pressure that could be expected following a DBA. Protection of containment integrity limits leakage of fission product radioactivity from containment to the environment.

APPLICABLE SAFETY ANALYSES

The limiting DBAs considered relative to containment OPERABILITY are the loss of coolant accident (LOCA) and the steam line break (SLB). The DBA LOCA and SLB are analyzed using computer codes designed to predict the resultant containment pressure and temperature transients. No two DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed, in regard to containment ESF systems, assuming the loss of one ESF bus, which is the worst case single active failure, resulting in one train of the Containment Spray System, the RHR System, and the ARS being rendered inoperable (Ref. 2).

The DBA analyses show that the maximum peak containment pressure of 10.46 psig results from the LOCA analysis, and is calculated to be less than the containment design pressure. The maximum peak containment atmosphere temperature results from the SLB analysis. The calculated transient containment atmosphere temperatures are acceptable for the DBA SLB.

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