February 18, 2010

Mr. Ashok Bhatnagar
Senior Vice President
Nuclear Generation Development
and Construction
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – SAFETY EVALUATION REGARDING GENERIC LETTER 1997-04, "ASSURANCE OF SUFFICIENT NET POSITIVE SUCTION HEAD FOR EMERGENCY CORE COOLING AND CONTAINMENT HEAT REMOVAL PUMPS" (TAC NO. MD6719)

Dear Mr. Bhatnager:

In a letter dated September 7, 2007 (see Agencywide Document Access and Management System Accession No. ML072570676), the Tennessee Valley Authority (TVA) submitted a response to U.S. Nuclear Regulatory Commission (NRC) Generic Letter 1997-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and containment Heat Removal Pumps," for Watts Bar Nuclear Plant, Unit 2.

The NRC staff has reviewed TVA's response. Enclosed is the NRC staff's safety evaluation. This completes the NRC staff's efforts regarding WBN Unit 2 for TAC No. MD6719.

Sincerely,

/RA/

L. Raghavan, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

Enclosure: Safety Evaluation

cc w/encl: Distribution via Listserv

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DATE	1/21/10	1/21/10	2/2/10	2 / 18 /10

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SAFETY EVALUATION BY THE

OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO

GENERIC LETTER 1997-04, "ASSURANCE OF SUFFICIENT

NET POSITIVE SUCTION HEAD FOR EMERGENCY CORE COOLING AND

CONTAINMENT HEAT REMOVAL PUMPS"

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-391

1.0 INTRODUCTION

In a letter dated September 7, 2007 (Agencywide Document Access and Management System Accession No. ML072570676), the Tennessee Valley Authority (TVA) submitted a response to U.S. Nuclear Regulatory Commission (NRC) Generic Letter (GL) 1997-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and containment Heat Removal Pumps," for Watts Bar Nuclear Plant (WBN), Unit 2.

2.0 REGULATORY EVALUATION

The general design criteria (GDC) establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems and components important to safety. The applicable GDC for GL 1997-04 are GDC 35, "Emergency core cooling," and GDC 38, "Containment heat removal."

GDC 35 and GDC 38 require that the emergency cooling and containment heat removal systems be capable of accomplishing their required safety functions assuming partial loss of installed capacity. The ability to accomplish these safety functions reliably depends, in part, on the proper performance of system pumps that, in turn, depends on the conditions under which the pumps must operate. One of these conditions is suction pressure.

Regulatory Guide (RG) 1.1, "Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps," describes a suitable relationship between increases in containment pressure caused by postulated loss of coolant accidents and the net positive suction head (NPSH) of emergency core cooling and containment heat removal system pumps that may be used to implement GDC 35 and GDC 38.

Enclosure

3.0 TECHNICAL EVALUATION

The NRC issued GL 1997-04, dated October 7, 1997, to confirm the adequacy of the net positive suction head (NPSH) available for emergency core cooling (including core spray and decay heat removal) and containment heat removal pumps under all design-basis accident scenarios.

In GL 97-04, the NRC staff specifically requested that licensees provide the information outlined below for each of their facilities.

1. Specify the general methodology used to calculate the head loss associated with the emergency core cooling system suction strainers.
2. Identify the required NPSH and the available NPSH.
3. Specify whether the current design-basis NPSH analysis differs from the most recent analysis reviewed and approved by the NRC for which a safety evaluation was issued.
4. Specify whether containment overpressure (i.e., containment pressure above the vapor pressure of the sump or suppression pool fluid) was credited in the calculation of available NPSH. Specify the amount of overpressure needed and the minimum overpressure available.
5. When containment overpressure is credited in the calculation of available NPSH, confirm that an appropriate containment pressure analysis was done to establish the minimum containment pressure.

In response to GL 97-04, TVA provided letters, dated November 4 (ML082460440) and December 22, 1997 (ML082460455), for WBN Unit 1. The NRC staff reviewed the TVA response and concluded that all requested information was provided; therefore, the staff considered GL 97-04 closed for WBN Unit 1 as documented in a letter, dated June 17, 1998 (ML073240231).

In a letter, dated September 7, 2007, TVA stated that WBN Unit 2 will utilize the same methodology as WBN Unit 1.

The NRC staff performed an audit of WBN Unit 1 regarding GL 2004-02, “Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors.” Regarding NPSH for containment sump recirculation, the NRC staff documented its audit results in a letter, dated February 7, 2007 (ML070380113). The NRC staff stated:

> The staff reviewed the analytical assumptions used to determine that the maximum sump pool temperature and accepts the estimated maximum temperature of 190°F as conservatively high. The staff noted that this maximum temperature was used in both the containment spray and RHR [residual heat removal] pump NPSH evaluations. . . .
>
> The staff noted the key conservatisms for these NPSH calculations were the conservatively high sump pool temperature of 190°F and no credit for containment overpressure.

> This review noted an inconsistency in calculating pressures in terms of feet of static water. . . .
>
> . . .However, even if this inconsistency is further confirmed, the 2.16 ft NPSH margin is still substantially greater than the maximum head loss measured in head loss testing. Therefore, this is not an open item.

The NRC staff has reviewed TVA's response, dated September 7, 2007, and confirmed that the required response for WBN Unit 2 is identical to WBN Unit 1. Since the WBN Unit 1 response was previously accepted by the NRC staff by letter, dated June 17, 1998 (ML073240231), and the same methodology is used for WBN Unit 2, the staff finds the response for WBN Unit 2 acceptable.

In its audit report, the NRC staff noted that to specify a pressure in static water head, both the depth of the water and either the density of the water or the water temperature are required. Typically, water static head is converted to water at the standard temperature of 60°F so that only the water depth is needed in feet. In the case of TVA's calculation for the NPSH available for the RHR pumps, all of the head numbers appeared to be based on a water temperature of 190°F. Therefore, the NPSH available of 23.17 feet should have been temperature adjusted to 60°F before subtracting the 19 feet of required NSH to get the NPSH margin. With this correction, the NPSH margin is reduced from the reported 4.17 feet to 3.42 feet at 60°F.

Similarly, TVA's calculation for the NPSH available for the containment spray pumps, the atmospheric pressure, vapor pressure, and the piping friction losses were all calculated assuming the standard 60°F water temperature. However, the static water height of 50.2 feet was not temperature corrected. Correcting the static water depth to 60°F water would result in a depth of 48.6 feet. This correction would reduce the available NPSH by 1.6 feet, resulting in 15.36 feet rather than 16.96 feet of available NPSH. Upon subtracting the required NPSH of 13.2 feet, an NPSH margin of 2.16 feet results rather than 3.76 feet. This potential inconsistency should be further evaluated by TVA. However, the NRC staff stated that even if this inconsistency is further confirmed, the 2.16 feet NPSH margin is still substantially greater than the maximum head loss measured in head loss testing. Therefore, this is not an open item.

4.0 CONCLUSION

Staff Requirements Memorandum (SRM), dated July 25, 2007 (ML072060688), for SECY-07-0096 – "Possible Reactivation of Construction and Licensing Activities for the Watts Bar Nuclear Plant Unit 2," stated:

> The Commission supports a licensing review approach that employs the current licensing basis for Unit 1 as the reference basis for the review and licensing of Unit 2.

In accordance with the SRM for SECY-07-0096, the NRC staff finds that TVA's responses for WBN Unit 2 regarding GL 1997-04 are acceptable for the issue of assurance of NPSH for emergency core cooling and containment heat removal pumps since TVA will use the same approved methodology as WBN Unit 1.

Principle Contributor: John G. Lamb
Date: February 18, 2010