From: <sarvers@firstenergycorp.com>
To: <ljb@nrc.gov>
Date: 8/13/01 12:38PM
Subject: Hot Leg switchover RAI response

Please find attached the FENOC response to the RAI concerning hot leg switchover received via email on 8/2/01. If you have any questions, or require anything additional on this item, please free to contact us.

(See attached file: confirmsrxb-response.doc)

CC: <sepelakb@firstenergycorp.com>

LOCA-RELATED ANALYSES

Hot Leg Switchover

Another aspect of long-term cooling is to ensure boric acid (H_3BO_3) accumulation will not prevent core cooling. Consequently, we assessed the licensee's evaluation model for analysis of boric acid accumulation and determination of the time available for switchover to hot leg injection following a loss-of-coolant accident. We understand the licensee's evaluation model is based on the following assumptions:

1. All boric acid entering the core / upper plenum volume of the reactor vessel remains in that volume prior to initiation of hot leg injection.

2. The water in the core / upper plenum volume is well mixed by the boiling process.

3. The upper plenum collapsed water level is at the level of the bottom of the hot leg flow area at the reactor vessel.

4. The bottom of the well mixed core / upper plenum volume is at the level of the top of the lower core support plate. (The lower plenum volume is not included in the core / upper plenum volume.)

5. The water in the downcomer, lower plenum, and at the top surface of the upper plenum water is at 212 ˚F.

6. The boric acid concentration limit is the experimentally determined boric acid saturation concentration with a four weight percent uncertainty factor. There is no allowance for increase in boric acid solubility due to other solutes such as sodium hydroxide.

7. The decay heat generation rate is based on the draft 1971 ANS Standard for three years operating time.

8. The decay heat generation includes a suitable multiplier to address instrumentation uncertainty as identified by Section I.A of Appendix K. This factor is either a 1.02 power multiplier or a value that has been acceptably demonstrated to account for uncertainties due to power level instrumentation erro r.

9. The containment contains the maximum deliverable water volumes at the maximum allowable boric acid concentration.

10. The potential boric acid dilution sources, such as from the spray additive tank, are neglected.

11. The calculation neglects any elevation of boiling temperature due to concentration of boric acid in the core or any backpressure from containment.

12. The barrel/baffle region volume has been neglected.

The licensee's analysis is consistent with Reference 1, which we understand represents the approach generally used by licensee's of Westinghouse-designed nuclear power systems.

Reference 1

Letter from C. L. Case to T. M. Novak, Chief, Reactor Systems Branch, NRC, from Manager, Safeguards Engineering, Westinghouse Corporation Power Systems, CLC-NS-309, April 1, 1975.

Response:

Westinghouse Comments on NRC-Supplied Text Regarding the HLSO Evaluation for the 1.4% Uprating for Beaver Valley Units 1 and 2

LOCA-RELATED ANALYSES

Westinghouse confirms the validity of the following text except as noted in the comments (bold Italics).

Hot Leg Switchover

Another aspect of long-term cooling is to ensure boric acid (H_3BO_3) accumulation will not prevent core cooling. Consequently, we assessed the licensee's evaluation model for analysis of boric acid accumulation and determination of the time available for switchover to hot leg injection following a loss-of-coolant accident. We understand the licensee's evaluation model is based on the following assumptions:

1. All boric acid entering the core / upper plenum volume of the reactor vessel remains in that volume prior to initiation of hot leg injection.
2. The water in the core / upper plenum volume is well mixed by the boiling process.
3. The upper plenum collapsed water level is at the level of the bottom of the hot leg flow area at the reactor vessel.
4. The bottom of the well mixed core / upper plenum volume is at the level of the top of the lower core support plate. (The lower plenum volume is not included in the core / upper plenum volume.)

The Beaver Valley Units 1 and 2 Hot Leg Switchover calculations conservatively ignore the mixing volume between the top of the lower core plate and the bottom of the active fuel region. While this volume was not used in the Beaver Valley Units 1 and 2 Hot Leg Switchover calculations, standard Westinghouse HLSO methodology considers the use of this volume appropriate.

5. The water in the downcomer, lower plenum, and at the top surface of the upper plenum water is at 212^{o}F.
6. The boric acid concentration limit is the experimentally determined boric acid saturation concentration with a four weight percent uncertainty factor. There is no allowance for increase in boric acid solubility due to other solutes such as sodium hydroxide.
7. The decay heat generation rate is based on the draft 1971 ANS Standard for three years operating time.

Standard Westinghouse HLSO methodology uses a 1971 ANS Standard Decay Heat based on "Finite" operation. This decay heat is calculated using 3 core regions with 8000, 16,000, and 24,000 hours operating time respectively.

8. The decay heat generation includes a suitable multiplier to address instrumentation uncertainty as identified by Section I.A of Appendix K. This factor is either a 1.02 power multiplier or a value that has been acceptably demonstrated to account for uncertainties due to power level instrumentation error.
9. The containment contains the maximum deliverable water volumes at the maximum allowable boric acid concentration.
10. The potential boric acid dilution sources, such as from the spray additive tank, are neglected.

The Beaver Valley Units 1 and 2 Hot Leg Switchover calculations credit the spray additive tank (CAT at Beaver Valley) as a dilution source using a minimum volume assumption. Standard Westinghouse

HLSO methodology typically ignores this dilution source as the effect is on the order of a 5 minute change to the switchover time.

11. The calculation neglects any elevation of boiling temperature due to concentration of boric acid in the core or any backpressure from containment.
12. The barrel/baffle region volume has been neglected.

The licensee's analysis is consistent with Reference 1, which we understand represents the approach generally used by licensee's of Westinghouse-designed nuclear power systems.

Reference 1

Letter from C. L. Case~~c~~***o*** to T. M. Novak, Chief, Reactor Systems Branch, NRC, from Manager, Safeguards Engineering, Westinghouse Corporation Power Systems, CLC-NS-309, April 1, 1975.

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Recipients

nrc.gov
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