IES UTILITIES INC.

March 25, 1994
NG-94-1118

Mr. William Russell, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Comments on Draft Report "Parametric Study of the Potential for BWR ECCS Strainer Blockage Due to LOCA Generated Debris"
Reference: Letter, R. Pulsifer (NRC) to L. Liu (IESUI), dated February 8, 1994
File: A-100

Dear Mr. Russell:

This letter provides our comments concerning the draft report entitled "Parametric Study of the Potential for BWR ECCS Strainer Blockage Due to LOCA Generated Debris." This report was transmitted via the referenced letter.

The report contains several factual errors which result in an incorrect modeling of the Duane Arnold Energy Center (DAEC). Overall, the report takes an extremely conservative approach in determining the potential for ECCS suction strainer fouling. Our specific comments are included as an attachment to this letter.

This letter contains no new commitments.

Should you have any questions, please contact this office.

Sincerely,

John F. Franz
Vice President, Nuclear

JFF/CJR

Attachment
cc: C. Rushworth
L. Liu
L. Root
R. Pulsifer (NRC-NRR)
J. Martin (Region III)
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COMMENTS ON SEA's PRELIMINARY DRAFT REPORT
ON DAEC ECCS SUCTION STRAINER FOULING

1. Section 2.2, page 2-5.

   - The report refers to RHR/HPCI when it should be RHR/LPCS.

2. Section 2.4, page 2-5.

   - The report states that the model described in NUREG-0897 was used to define a zone of insulation destruction. However, extending the zone of destruction to an L/D of 7 is not consistent with the guidance of NUREG-0897 for BWRs which states, "BWR jet expansion fields decay more rapidly" than PWR fields which extend to an L/D of 7.

3. Section 2.5, page 2-7.

   - The report states that suppression pool instabilities caused by chugging and steam condensing will cause further disintegration of the insulation debris and will cause the debris to remain suspended indefinitely. Testing at the Mark I containment Full Scale Test Facility, as discussed in NUREG-0661, demonstrated that the chugging phenomena is only associated with small breaks and that for large break LOCAs steam condensation oscillations take place for a maximum of 100 seconds. The assumption that these phenomena will continue to destroy the insulation in the pool and will keep the insulation suspended indefinitely is not consistent with Mark I test data or NUKON test data.

4. Section 3.2.1, page 3-3.

   - The report incorrectly states that HPCI injects into the B main steam line. HPCI injects into the A feedwater line. The HPCI steam supply line taps into the B main steam line.

   - The report incorrectly states that the HPCI steam supply line is normally depressurized.

   - It is not clear what actual reactor vessel level the report is referring to as Level 1 and Level 2. This should be clarified so that the initiation sequences can be properly verified.

5. Section 3.2.2, page 3-3.

   - ZS-1907 and ZS-2008 are position indications on normally open manual valves. These are not motor operated valves. This incorrect assumption resulted in the amount of pressurized piping used in the analysis being incorrect.

6. Section 3.2.3, page 3-3.

   - ZS-2142 and ZS-2143 are position indications on normally open manual valves, not motor operated valves. This error resulted in the length of pressurized core spray piping being incorrect.

7. Section 3.3.1, page 3-4.

   - The report states that MO-4629 is closed during normal operation. This is incorrect. MO-4629 and MO-4630 are open during normal operation to minimize thermal stresses on the bypass lines.

8. Section 3.3.2, page 3-7.

   - The feedwater piping material is incorrectly listed as 304SS. The actual piping material is carbon steel.

9. Section 3.5, page 3-18.

   - The torus diameter is incorrectly listed as 9.25 feet. The actual torus diameter is 25.67 feet.

10. Figure 3-15, page 3-20.

    - The table in the figure has the strainer velocities for RHR and CS reversed. RHR should be 1.46 and CS should be 1.6.

11. Section 3.6, page 3-21.

    - LPCI injects into the recirculation discharge lines rather than the suction lines.

    - The assumption that all ECCS pumps are required to mitigate a LOCA is incorrect. The note that this assumption is consistent with the DAEC IPE model for large break LOCAs is also incorrect. In accordance with the DAEC IPE model only one low pressure ECCS pump (RHR or LPCS) is required to provide adequate core cooling.

    - Continuous ECCS flow of 25,000 gpm is not required to provide adequate core cooling in accordance with the DAEC licensing basis.

12. Figure 3-17, page 3-23.

    - The figure states that a value of 10 feet was conservatively chosen for CS required NPSH. The actual value chosen and the correct value is 15 feet.

13. Section 4.2.1.3, page 4-6.

    - The assumption that the main steam and feedwater welds have the same break frequency as 22" recirculation system welds is overly conservative and is not consistent with the guidance in NUREG-4792. These are carbon steel systems, not stainless steel, and have an analytical break frequency no higher than 1.0E-10/Rx-yr. This piping is not susceptible to IGSCC.

14. Section 4.2.1, page 4-6.

 - No credit is given for the mitigation of IGSCC that is provided by Induction Heating Stress Improvement (IHSI) and Hydrogen Water Chemistry (HWC). This is contrary to the guidance contained in NUREG-0313 and Generic Letter 88-01.

15. Table 4-3, page 4-10.

 - The total pipe break frequency estimate for the main steam system is added incorrectly. The total should be 1.8E-05, not 1.8E-04.

16. Section 5.2.2, page 5-4.

 - Extending region I to an L/D of 3 to account for possible destruction to a pressure of 5 bar is overly conservative and is not supported by testing conducted on jacketed NUKON insulation at HDR (Heissdampfreaktor) and CEESI (Colorado Engineering Experiment Station, Inc).

 - The region III outerbound at an L/D of 7 was originally established for break pressures of 150 bar and for unjacketed insulation. Experiments conducted at HDR and CEESI and the guidance contained in NUREG-0897 show that this is overly conservative for BWRs with jacketed insulation.

17. Section 5.2.2, page 5-6.

 - The fractions of transportable debris generated which are used in the study for regions I, II, and III are conservative and are not supported by experimental data using jacketed NUKON insulation.

18. Section 5.2.3.1, page 5-6.

 - The assumption that only the pipe in which the break occurs is targeted by the jet may be nonconservative.

19. Section 5.2.3, page 5-7.

 - Neglecting the effects of "shadowing" may result in the assumed generation of overly conservative amounts of insulation debris.

20. Tables 5-1, 5-2, and 5-3.

 - Numerous target lengths which are listed in these tables are not physically possible due to the plant layout (i.e. it is not possible for the piping to fall within the 90 degree cone or the piping does not exist.) This results in assuming that conservative amounts of insulation debris are generated.

21. Section 5.3.1, page 5-15.

- The statement that the transport models proposed in USI A-43 are not applicable to BWRs is incorrect. These transport models can be used to analyze the debris flow and settling on the drywell floor to the vents and in the suppression pool during the recirculation phase.

22. Section 5.3.1, page 5-17.

- The values which are used for the debris transport fractions are estimates which are not backed up by experimental data or the event at Barseback and may be excessively conservative. A reduction of these fractions by only 5% will reduce the conditional blockage probability by over 40%.

23. Section 5.4, page 5-18.

- The chugging phenomena is not associated with large break LOCAs. Also, steam condensation oscillations take place for a maximum of 100 seconds.

- The assumption that all of the debris within the pool is deposited on the strainers is grossly conservative. The NUKON insulation has a negative buoyancy and suppression pool velocities during the recirculation phase will not be large enough to transport all insulation debris to the strainers.

24. Section 5.5.3, page 5-24.

- The draft report states that the sensitivity analysis is documented in section 10.2.3. The report does not contain a section 10.2.3.

25. Section 5.6, page 5-24.

- The report states that the available NPSH using atmospheric pressure and a 120 degree pool temperature is about 24 and 32 feet of water for LPCI and CS respectively. These values are incorrect for a 120 degree pool temperature. For example, when the pool temperature is 120 degrees, the NPSH available for LPCI is about 34 feet and for CS is about 36 feet.

26. Section 5.6, page 5-25.

- The assumption that adequate core cooling is lost when strainer head loss equals 14 feet is incorrect since the core spray pumps have an NPSH margin of 17 feet and one core spray pump can provide adequate core cooling after the core is initially reflooded.