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SUBJECT: Reports significant changes in LOCA evaluation model & applications for ECCS recirculation cooling after large break LOCA & small break LOCA at plant.

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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
REPORT OF A SIGNIFICANT CHANGE
IN THE LOSS-OF-COOLANT ACCIDENT
MODEL FOR RECIRCULATION COOLING

Gentlemen:

Carolina Power & Light (CP&L) Company is reporting significant changes in the Loss of Coolant Accident (LOCA) evaluation model (EM) and EM applications for Emergency Core Cooling System (ECCS) recirculation cooling after a Large Break LOCA (LBLOCA) and a Small Break LOCA (SBLOCA) at the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2. The EM calculates the Peak Cladding Temperature (PCT) associated with transfer of cold leg Safety Injection (SI) to long term recirculation. The change in the LOCA EM for ECCS recirculation cooling after a LBLOCA and SBLOCA was from an EM described by Westinghouse in CP&L letter to the NRC dated October 4, 1991 (i.e., Westinghouse EM), to Siemens Power Corporation (SPC) Small Break (SB) LOCA EMs. The changes in EM applications included changes to assumptions as discussed in the following paragraphs.

The Westinghouse EM, as described in CP&L letter dated October 4, 1991, assumed for the LBLOCA that one (1) Residual Heat Removal (RHR) pump and one (1) SI pump are running during SI from the Refueling Water Storage Tank (RWST). When the RWST reaches a level of 27%, the RHR pump is assumed to be secured and the SI pump assumed to continue to flow into the core while the RHR pump is aligned for recirculation from the ECCS sump. After another 21 minutes, the RWST is assumed to reach a level of 9%, the SI pump is assumed to be secured, the RHR pump is assumed to be restarted, and the RHR pump is assumed to flow from the ECCS sump to the core for at least one (1) minute. After one (1) minute, the RHR pump is assumed to refill the downcomer, and ECCS flow is stopped for an assumed

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maximum of three (3) minutes while the SI pump suction is aligned to receive suction from the discharge of the RHR pump (i.e., piggyback mode). The resulting second PCT during the SI pump suction transfer was evaluated to be 1380°F.

The Westinghouse EM assumed for the SBLOCA that one SI pump is running during cold leg SI. When the RWST reaches 27%, the RHR pump is assumed to be aligned for recirculation from the ECCS sump. When the RWST reaches 9%, ECCS flow is assumed to be stopped for a maximum of ten (10) minutes while the SI pump suction is aligned to the RHR pump discharge for the piggyback mode. The resulting second PCT during the SI pump suction transfer was evaluated to be 1936°F.

In January 1992, a new evaluation of ECCS recirculation cooling for both the LBLOCA and SBLOCA was performed using the Westinghouse EM. The assumptions in the evaluation for the LBLOCA were changed to eliminate the alignment of the suction of the SI pumps to the piggyback mode. By eliminating the piggyback mode in response to a LBLOCA, no interruption of flow into the core occurs during the cold leg injection phase. For the SBLOCA, the assumption was changed from ten (10) minutes to three (3) minutes for the maximum time required to stop ECCS flow and align the SI pump to the piggyback mode. No specific evaluation of the effect of the change on PCT as a result of the new application of the Westinghouse EM was performed for the LBLOCA. The effect of the changes on PCT as a result of the new application of the Westinghouse EM on the SBLOCA was to reduce the PCT that occurred during transfer of the SI pump suction to the piggyback mode from 1936°F to 1090°F. The NRC was briefed on these changes to the Westinghouse EM on January 31, 1992, as summarized in NRC letter dated February 20, 1992. The changes in application of the Westinghouse EM were not identified to the NRC as significant changes in the application of an acceptable EM at that time in accordance with 10 CFR 50.46(a)(3)(ii).

In October 1993, a change was made from the Westinghouse EM for the SBLOCA during recirculation cooling to a Siemens Power Corporation (SPC) Small Break (SB) LOCA EM[1] analysis. The SPC SBLOCA analysis included the same assumptions for alignment of the SI pump for piggy back mode as the January 1992 Westinghouse evaluation. The effect of the change on PCT as a result of the new application of the SBLOCA EM for ECCS recirculation cooling after a SBLOCA decreased the calculated PCT from 1090°F as discussed with the NRC on January 31, 1992, to no discernible increase in PCT. The change in the SBLOCA EM was not reported to the NRC as a significant change in the application of an acceptable EM at that time in accordance with 10 CFR 50.46(a)(3)(ii).

In September 1994, a change was made from the Westinghouse EM for the switchover portion of the LBLOCA to a Siemens Power Corporation (SPC) Small Break (SB) LOCA EM[2] analysis

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1 "Exxon Nuclear Company Evaluation Model Exem PWR Small Break Model," XN-NF-82-49(P)(A), Revision 1, Siemens Power Corporation, June 1986.

2. "Exxon Nuclear Company Evaluation Model Revised Exem PWR Small Break Model," XN-NF-82-49(P), Revision 1, Supplement 1, Siemens Power Corporation, May 1992.

and included a change in assumptions during switchover to recirculation cooling. The analysis assumed that the RHR pump was secured when the level in the RWST reaches 27%. SI is assumed to be maintained with one SI pump running for a maximum of 30.5 minutes, rather than the previously assumed 21 minutes, while the RHR pump suction is aligned to the ECCS sump for recirculation cooling. The RHR pump is then restarted in the ECCS recirculation mode. The change in the LBLOCA EM for ECCS recirculation cooling after a LBLOCA increased the calculated PCT from approximately 1380°F as provided to the NRC by letter dated October 4, 1991, to a value of 2102°F. The change in PCT as a result of the change in the LBLOCA EM for ECCS recirculation cooling after a LBLOCA was not reported to the NRC as a significant change in the application of an acceptable EM at that time in accordance with 10 CFR 50.46(a)(3)(i).

The most limiting PCT in September 1994 was 2134°F for the LBLOCA analysis during the injection phase. The PCT value of 2134°F was reported to the NRC by letter dated May 20, 1993. By letter dated June 28, 1995, a reduction in calculated PCT from 2134°F to 2006°F was reported to the NRC for the LBLOCA during the injection phase. This report did not include information regarding the PCT associated with application of the LOCA EM for ECCS recirculation cooling after a LBLOCA. By letter dated April 24, 1996, an increase in calculated PCT from 2006°F to 2064°F was reported to the NRC for the LBLOCA during the injection phase. This report did not include information regarding the PCT associated with application of the LOCA EM for ECCS recirculation cooling after a LBLOCA. By letters dated October 14, 1996, and October 25, 1996, the reported limiting PCT for the LBLOCA was raised from 2064°F to 2128°F, and the reported limiting PCT has remained above the PCT for ECCS recirculation cooling after a LBLOCA since that time. By letter dated October 6, 1997, CP&L reported an increase in PCT from 1820°F to 1978°F for a significant error in the application of the SBLOCA EM for the injection phase. Therefore, during the time period from June 28, 1995, and October 14, 1996, the most limiting PCT from a LOCA analysis was not adequately reported to the NRC.

The current PCTs associated with LOCAs are listed below.

Event	PCT (°F)
LBLOCA ECCS Injection Mode	2114
LBLOCA Transfer to Recirculation Mode	2102
SBLOCA ECCS Injection Mode	1978
SBLOCA Transfer to Recirculation Mode	No Heatup During Switch-over

Since this letter reports an EM change for the LOCA analysis for ECCS recirculation cooling, and there is no error involved in the analysis performed, no further reanalysis is needed to show compliance with 10 CFR 50.46.

If you have any questions concerning this matter, please contact me or Mr. Harold Chernoff of my staff at (803) 857-1437.

Very truly yours,

Terry M. Wilkerson

T. M. Wilkerson
Manager - Regulatory Affairs

ALG/alg

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