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SUBJECT: Submits info required,per 10CFR50.46(a)(3)(ii) for plant re errors in ECCS evaluation models or in application of models.

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OCT 01 1997

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10 CFR 50.46

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
EMERGENCY CORE COOLING SYSTEM EVALUATION CHANGES

Dear Sir or Madam:

Carolina Power & Light Company (CP&L) hereby submits information required pursuant to 10 CFR 50.46(a)(3)(ii) for the Harris Nuclear Plant (HNP), regarding the estimated effect of changes or errors in Emergency Core Cooling System (ECCS) evaluation models or in the application of the models. This submittal satisfies CP&L's annual reporting of minor evaluation changes for HNP.

The HNP fuel vendor, Siemens Power Corporation (SPC), provided annual reports of changes and errors in ECCS evaluation models to the NRC by letters dated March 10, 1995, May 29, 1996 and September 2, 1997. These annual reports describe minor changes and errors in the loss of coolant accident (LOCA) evaluation models made or discovered during the time periods of February 1994 to March 1995, March 1995 to May 1996, and May 1996 to May 1997, respectively. The ECCS performance following postulated accidents continues to be calculated for HNP by SPC using the EXEM PWR Small Break LOCA Model for Small Break LOCAs (SBLOCAs), and the EXEM PWR Large Break LOCA Model for Large Break LOCAs (LBLOCAs). The effects of the minor changes and errors in these models on HNP peak fuel cladding temperature (PCT) are summarized in Tables 1 and 2.

By letter dated December 6, 1996, the NRC notified CP&L that the NRC evaluation of the computer compiler error and the critical heat flux (CHF) lockout would be addressed in a future letter. It is CP&L's understanding that the open issue is whether the elimination of the CHF lockout that occurred at the time the compiler error was corrected (reported in CP&L letter HNP-96-160, dated September 19, 1996) impacted the acceptability of the Dougall-Rohsenow correlation. As described in 10CFR50, Appendix K(C)(5)(c), a net 50°F reduction in overall conservatism from the reference calculation performed on October 17, 1988, would invalidate the Dougall-Rohsenow correlation. The initial LBLOCA evaluation performed for HNP by SPC using the EXEM PWR Evaluation Model did not include a spurious CHF lockout. By letter

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dated December 19, 1994 (HNP-94-102), CP&L reported a significant change in the LBLOCA evaluation where PCT increased from 1820°F to 2025°F, an increase of 205°F. Although not recognized at the time the letter was written, 115°F of the 205°F increase was due to the introduction of the spurious CHF lockout that subsequently was eliminated as reported in our September 19, 1996 letter. The introduction and subsequent elimination of the spurious CHF lockout occurred after October 17, 1988, resulting in a net PCT effect of zero. Therefore, the use of the Dougall-Rohsenow correlation remains valid for HNP.

Table 1: PCT Impact of Changes in Small Break LOCA Models

CHANGED CONDITION	PCT IMPACT (°F)
ANF-RELAP Code Conversion to HP Workstation	- 22.0 to + 14.0
ANF-RELAP Code Failure Problem Correction	no impact
ANF-RELAP Flow Regime Transition Change	no impact
ANF-RELAP Typo Correction in Input Processor	no impact
ANF-RELAP Loop Seal Clearing Correction	no impact
TOODEE2 Code Restructuring for Workstation Conversion	< + 5.0
TOODEE2 Hydraulic Diameter Correction	no impact
TOODEE2 Consistent Use of Constants	+ 0.1
TOODEE2 Added Check for Fuel Melt	no impact
TOODEE2 Minor Changes to Swelling and Rupture Model	+ 0.2
TOODEE2 Use of Avg. Nodal Quality	+ 0.2
TOODEE2 Weighted Avg. Heat Transfer Coefficient	+ 0.1
TOODEE2 Channel Temperature Solution Algorithm Changed	no impact
TOODEE2 Check of Clad Temperature for Heat Transfer Correlation	+ 0.1
TOODEE2 Added Warning if Power Produced in Clad	no impact
RODEX2 Code Transfer from CRAY to HP & DEC Alpha	no impact
RODEX2 Input Processor Upgraded	no impact
RODEX2 Correction of Swelling Model for High Density Pellets	no impact

Table 2: PCT Impact of Changes in Large Break LOCA Models

CHANGED CONDITION	PCT IMPACT (°F)
RELAP4 Code Conversion from CRAY to DEC Alpha	≤ + 10.0
RELAP4 CRAY Compiler Error (Reported in 30-day report: 09-19-96)	- 6.0
RELAP4 Spurious CHF Lockout Eliminated (Reported in 30-day report: 09-19-96)	- 115.0
RFPAC Code Conversion from CRAY to DEC Alpha	no impact
RFPAC Variable Initialization Correction	< + 1
TOODEE2 Code Conversion from CRAY to DEC Alpha	< + 1
TOODEE2 Use of Pre-1991 Reflood Heat Transfer Coefficient (Reported in 30-day report: 09-19-96)	+ 78.0
TOODEE2 Use of Conservative Reflood Heat Transfer Coefficient by Linear Interpolation between 1.0 and 1.77 inches per second **(Note 1)**	no impact
TOODEE2 Z-Equivalent Model Correction **(Note 2)**	+ 6.0
RODEX2 Code Transfer from CRAY to HP & DEC Alpha	no impact
RODEX2 Input Processor Upgraded	no impact
RODEX2 Correction of Swelling Model for High Density Pellets	no impact
Plant Input Change in RHR Flow Distribution **(Note 3)**	+ 5.0

Note 1: TOODEE2 is the code used to calculate the hot rod heatup in the LBLOCA Evaluation Model. The reflood heat transfer correlation in TOODEE2 was rejected by the NRC in October, 1996, and an estimate of the impact of the error was generated. The error had no effect on the Harris PCT, because the limiting PCT occurred prior to the time when the reflood heat transfer correlation is non-conservative. Until SPC receives NRC approval for a revised TOODEE2 model, Harris will use a conservative approximation of the reflood heat transfer coefficient generated by linearly interpolating the heat transfer coefficients between reflood rates of 1.0 and 1.77 inches per second. Because the change did not affect the PCT, there was no impact on the use of the Dougall-Rohsenow correlation as described in 10 CFR 50, Appendix K(C)(5)(c).

Note 2: Another change was made to the TOODEE2 code to correct a previously reported error in the Z-equivalent model. The impact of the error was an increase of 6°F (from 1982°F to 1988°F) in the PCT for the limiting case, which is the 0.8 DECLG break with an MOC axial power shape and the loss of one Residual Heat Removal (RHR) pump (equivalent to a Low Head Safety Injection pump) as the single failure. The limiting PCT occurred at 58.2 seconds with a reflood rate of 2.2 inches per second, and the reflood rate did not drop below 1.77 inches per second until 74.8 seconds. Because the PCT increased, there was no loss of conservatism in the model that would impact the use of the Dougall-Rohsenow correlation as described in 10 CFR 50, Appendix K(C)(5)(c).

Note 3: A plant application change was made to the design input data to reflect an increase in the assumed loss of flow from the RHR pump through the affected loop. This plant data change resulted in an increase of 5°F (from 1988°F to 1993°F) in the PCT for the limiting case, which is the 0.8 DECLG break with an MOC axial power shape and the loss of one Residual Heat Removal (RHR) pump (equivalent to a Low Head Safety Injection pump) as the single failure. The limiting PCT occurred at 58.7 seconds with a reflood rate of 2.2 inches per second, and the reflood rate did not drop below 1.77 inches per second until 72.3 seconds. This has no impact on the use of the Dougall-Rohsenow correlation as described in 10 CFR 50, Appendix K(C)(5)(c).

The cumulative impact on the HNP PCT for the SBLOCA changes reported in Table 1 (range of -16.3°F to + 19.7°F) is estimated to be zero, resulting in a PCT of 1953.3°F (reported to the NRC on November 9, 1995). The cumulative impact on the HNP PCT for the LBLOCA changes reported in Table 2 is - 20.0°F, of which + 11.0°F was introduced since the previous PCT of 1982°F (reported to the NRC on September 19, 1996). The new LBLOCA analysis results in a PCT of 1993°F. Since the PCT value is less than 2200°F for both the SBLOCA and LBLOCA analyses, HNP remains in compliance with the requirements specified in 10 CFR 50.46(b).

Questions regarding this matter may be referred to Mr. J. H. Eads at (919) 362-2646.

Sincerely,

for WRR

AEC/aec

c: Mr. J. B. Brady (NRC Senior Resident Inspector, HNP)
Mr. L. A. Reyes (NRC Regional Administrator, Region II)
Mr. V. L. Rooney (NRR Project Manager, HNP)