Progress Energy

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SERIAL: HNP-10-054
10 CFR 50.46(a)(3)(ii)

U. S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

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

Ladies and Gentlemen:

In accordance with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," paragraph (a)(3)(ii), Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc., is submitting the Harris Nuclear Plant (HNP) annual report regarding changes to and errors discovered in an acceptable Loss-of-Coolant Accident (LOCA) evaluation model for the Emergency Core Cooling System (ECCS).

The HNP ECCS performance following a Large Break Loss of Coolant Accident (LBLOCA) is calculated for HNP by AREVA NP using the SEM/PWR-98 ECCS Evaluation Model for PWR LBLOCA Applications. The ECCS performance following a Small Break Loss of Coolant Accident (SBLOCA) is calculated for HNP by AREVA NP using the EXEM PWR Small Break Model.

The previous HNP 10 CFR 50.46 annual report to the NRC, dated April 17, 2009 (Serial: HNP-09-048), documented a SBLOCA peak clad temperature (PCT) of 1586°F and a LBLOCA PCT of 2081°F. Since that report, no errors or changes in the LOCA models or results have been made that would require a 30-day report per 10 CFR 50.46(a)(3).

Enclosure 1 provides HNP's PCT information for the SBLOCA and LBLOCA evaluations since the April 2009 report.

Enclosure 2 contains the assessment notes which provide a detailed description for each change associated with the SBLOCA and the LBLOCA models since the April 2009 report.

The Enclosures indicate no net change in PCT associated with HNP's LBLOCA model and an 8 °F increase in PCT relative to HNP's SBLOCA model.

This document contains no regulatory commitments.

Please refer any questions regarding this submittal to me at (919) 362-3137.

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Harris Nuclear Plant
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NRR

Sincerely,

David H. Corlett
Supervisor - Licensing/Regulatory Programs
Harris Nuclear Plant

DHC/kms

Enclosures:
1. Loss-of-Coolant Accident Margin Summary Sheet – Annual Report
2. Annual 10 CFR 50.46 Report Assessment Notes

cc: Mr. J. D. Austin, NRC Senior Resident Inspector, HNP
Mr. L. A. Reyes, NRC Regional Administrator, Region II
Ms. M. G. Vaaler, NRC Project Manager, HNP

HARRIS NUCLEAR PLANT (HNP) UNIT 1
LOSS-OF-COOLANT ACCIDENT MARGIN SUMMARY
SHEET - ANNUAL REPORT

SBLOCA Peak Clad Temperature Summary
Evaluation Model: XN-NF-82-49(P)(A), Revision 1 Supplement 1, *Exxon Nuclear Company Evaluation Model Revised EXEM PWR Small Break Model*, Siemens Power Corporation, December 1994

SBLOCA Peak Clad Temperature Value reported 04/17/2009	1586 °F
Idaho National Lab correction of error	Δ PCT = 8 °F
RODEX code pellet thermal conductivity	Δ PCT = 0 °F
Total PCT change from current assessments	Σ ΔPCT = 8 °F
New SBLOCA PCT Value	1594 °F

LBLOCA Peak Clad Temperature Summary
ECCS Evaluation Model: EMF-2087(P)(A), *SEM/PWR-98: ECCS Evaluation Model for PWR LBLOCA Applications*, Siemens Power Corporation, June 1999

LBLOCA Peak Clad Temperature Value reported 04/17/2009	2081 °F
RODEX code pellet thermal conductivity	Δ PCT = 0 °F
RELAX code conversion	Δ PCT = 0 °F
Total PCT change from current assessments	Σ ΔPCT = 0 °F
New LBLOCA PCT Value	2081 °F

ANNUAL 10 CFR 50.46 REPORT ASSESSMENT NOTES

SBLOCA Model

Two errors were discovered in the RELAP5 code, used in the Harris Nuclear Plant (HNP) SBLOCA methodology, by Idaho National Laboratory (INL). In 2007, INL informed AREVA NP that the programming of the reactor kinetics equation in RELAP5, which is part of the HNP's SBLOCA method, contained an error that resulted in the over prediction of reactor power (reference AREVA NP Condition Report (CR) 2007-5220). This original error, which occurred in the development of the RELAP5 software at INL, resulted in an estimated 8 °F reduction of the peak clad temperature (PCT), as reported in HNP's May 28, 2008, annual 10 CFR 50.46 report (Serial: HNP-08-058). Based on INL's recent announcement that the previous error corrections were incorrect, AREVA NP determined that no error correction was required and the - 8 °F change should be withdrawn. Therefore, the PCT change estimate is being retracted.

At approximately the same time as this point kinetics error was retracted, a separate error in the heat conduction model was discovered by INL. The code uses an incorrect heat capacity when evaluating the right boundary mesh point. Rather than using the heat capacity for the last mesh, the heat capacity for the next to last mesh is used. The use of a close mesh spacing at the left and right boundaries minimizes the effect of this error in the SBLOCA analysis. The estimated change in SBLOCA PCT is 0 °F and the total estimated change for both INL errors is +8 °F.

AREVA NP notified Progress Energy that the RODEX2 computer code, used to predict fuel pellet temperatures, did not properly account for a change in pellet thermal conductivity due to fuel burnup. The code may under-predict the fuel pellet temperatures at burnup beyond approximately 20 GWd/MTU and therefore may under-predict the stored energy initial condition for LOCA analyses. Since sufficient excess cooling capacity exists during the blowdown phase of the transient to effectively remove any excess initial stored energy prior to the extended heatup period when PCT occurs, PWR SBLOCA analyses are insensitive to initial stored energy. Therefore, the estimated change in the SBLOCA PCT is 0 °F.

LBLOCA Model

AREVA NP notified Progress Energy that the RODEX2 computer code, used to predict fuel pellet temperatures, did not properly account for a change in pellet thermal conductivity due to fuel burnup. The code may under predict the fuel pellet temperatures at burnup beyond approximately 20 GWd/MTU and therefore may under predict the stored energy initial condition for LOCA analyses. The HNP LBLOCA limiting case has a BOC stored energy combined with an MOC axial shape. Although HNP's analysis did not account for this degradation, the impact to PCT is estimated to be +0 °F, since the limiting case uses a stored energy early in the cycle.

AREVA reported that during conversion of the RELAX computer code from the DEC Alpha platform to Linux, it found that several data arrays were defined incorrectly and others were incorrectly written. AREVA corrected the RELAX software and reanalyzed the limiting HNP LOCA cases to confirm zero PCT impact.