Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

April 25, 2001

L-2001-99
10 CFR 50.46

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

Re: St. Lucie Unit 1
Docket Number 50-335
LBLOCA Evaluation Model
30-Day 10 CFR 50.46 Report

The attached report is submitted pursuant to 10 CFR 50.46(a)(3)(ii) to provide notification of a significant change to the calculated peak cladding temperature for the limiting loss of coolant accident evaluated for St. Lucie Unit 1. The large break loss of coolant accident (LBLOCA) has been analyzed for Cycle 17 and has resulted in an increase of greater than 50^0F over the last evaluation model peak cladding temperature (PCT). The new LBLOCA PCT is 2005^0F. Framatome-ANP (FRA-ANP) is the current fuel vendor for St. Lucie Unit 1, and performs the calculations to demonstrate that the Unit 1 emergency core cooling system (ECCS) performance conforms to 10 CFR 50.46. FRA-ANP employs an acceptable evaluation model consistent with 10 CFR 50, Appendix K. The small break loss of coolant accident analysis PCT remains unchanged.

Please contact us if you have any questions about this matter.

Very truly yours,

Rajiv S. Kundalkar
Vice President
St. Lucie Plant

RSK/GRM

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant

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Framatome-ANP (FRA-ANP) is the current fuel vendor for St. Lucie Unit 1, and performs the calculations to demonstrate that the Unit 1 emergency core cooling system (ECCS) performance conforms to 10 CFR 50.46. FRA-ANP employs an acceptable evaluation model consistent with 10 CFR 50, Appendix K. Re-analysis of the large break loss of coolant accident (LBLOCA) has resulted in a significant change to the calculated peak cladding temperature (PCT), and is being reported pursuant to 10 CFR 50.46(a)(3)(ii). The small break loss of coolant accident analysis PCT remains unchanged.

Nature of the Model Changes and Corrective Action

1) Cycle 17 Reload Analysis

The St. Lucie Unit 1 ECCS performance analyses PCTs applicable to the last operating cycle (Cycle 16) were previously reported in Reference 1. The LBLOCA analysis PCT was 1933^0F.

The LBLOCA has been analyzed as part of the Cycle 17 reload analysis using physics input changes which would bound Cycle 17 core design. The parameters modified include the local peaking factor, the gamma smearing factor, the initial fuel density, and the location of the hot pin. This analysis is performed with the acceptable evaluation model methodology, documented in Reference 2.

Impact of the Model Change

Analysis of the LBLOCA has resulted in a new PCT of 2005^0F (DECLG break with a 1.0 discharge coefficient). This PCT is an increase of 72^0F over the PCT of 1933^0F, reported in Reference 1, and becomes the limiting LBLOCA acceptable evaluation model PCT for St. Lucie Unit 1.

2) Inappropriate Use of Calculated Radiation Heat Transfer in TOODEE2

Description of Deviation

The TOODEE2 code, used in the LBLOCA analysis, calculates a radiation heat transfer coefficient, which is used during the refill period of the TOODEE2 calculation. In addition, after reflood begins, the radiation heat transfer coefficient at each node is used until the fuel cooling test facility (FCTF) reflood heat transfer becomes larger than the radiation heat transfer. Additionally, if at any point in the calculation, the radiation heat transfer coefficient becomes larger than the FCTF calculated value, the radiation model heat transfer coefficient is used. However, once a convective heat transfer coefficient is used in the calculation for an individual node, assumptions used in the radiation heat transfer model are no longer valid. This results in erroneous radiation sink temperatures being calculated and, thereby, the erroneous calculations of radiation heat

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transfer coefficients. It has been found that when extended calculations are run to evaluate maximum oxidation, the radiation model produces erroneous negative sink temperatures and large heat transfer coefficients, which exceed the FCTF predicted values. When this occurs, the erroneous heat transfer coefficient values are used.

The error was corrected in the TOODEE2 code with a modification to turn off the radiation model at each node once the convective heat transfer at the node exceeds the radiation value.

Impact of the Model Change

The PCT impact of this error correction is estimated to be 0^0F for St. Lucie Unit 1.

3) Potential Variability in End-of-Bypass Prediction by TEOBY

Description of Deviation

The time at end-of-bypass is based on the time of sustained flow reversal at the junction between the upper and lower downcomer or the junction between the broken cold leg and upper downcomer. The SEM/PWR-98 (Reference 2) methodology defines sustained flow reversal as reversal which occurs for 0.5 seconds or greater. It has been found that under certain circumstances, when a flow reversal occurs at the junction between the upper downcomer and the broken cold leg, a sustained flow reversal may begin between the upper and lower downcomer before 0.5 seconds has passed, which may cause a momentary positive flow from the upper downcomer to the broken cold leg. As a result, the end-of-bypass time is based on the flow reversal time for upper to lower downcomer junction instead of earlier reversal at the junction between the upper downcomer and the broken cold leg.

The methodology was modified to choose the earlier flow reversal at the break to define end-of-bypass time. The short period of positive flow is an artifact of the 1-dimensional homogenous equilibrium model used in the methodology and does not represent the resumption of bypass flow.

Impact of the Model Change

The PCT impact of this error correction is estimated to be 0^0F for St. Lucie Unit 1.

4) R4SS Overwrite of Junction Inertia

Description of Deviation

An error was identified in one of the junction inertia values used in the RELAP4 blowdown calculation for St. Lucie Unit 1. The error can occur for the broken loop steam generator tube-to-outlet plenum junction for Combustion Engineering type plants

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where, due to multiple outlet junctions to the outlet plenum volume flow area, it is necessary to specify an artificially large volume flow area. When using an artificially large volume flow area in RELAP4, it is necessary to specify, through input, the correct inertia in order to prevent the code from calculating the inertia using the artificially large volume flow area. The error is that an incorrect inertia value of 0.0 was used. The inertia value will be corrected, through input, in all future LBLOCA re-analysis.

Impact of the Model Change

The PCT impact of correcting this inertia error is estimated to be 0^0F for St. Lucie Unit 1.

References

1. FPL Letter L-2001-048, R. S. Kundalkar (FPL) to USNRC (DCD), "St. Lucie Units 1 and 2, Docket Nos. 50-335 and 50-389, Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors: 10 CFR 50.46 Annual Report," March 21, 2001

2. EMF-2087(P)(A), Revision 0, "SEM/PWR-98: ECCS Evaluation Model for PWR LBLOCA Applications," Siemens Power Corporation, June 1999

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St. Lucie Unit 1 LBLOCA PCT Summary	PCT
10 CFR 50.46 Annual Report PCT for Year 2000 (FPL Letter L-2001-048)	**1933^{0}F**
Cumulative change for the previously reported PCT (included in **1933^{0}F)**	4^{0}F
PCT impact due to the Cycle 17 analysis	**+72^{0}F**
New Evaluation Model LBLOCA PCT	**2005^{0}F**
Change due to inappropriate use of calculated radiation heat transfer in TOODEE2	0^{0}F
Change from potential variability in end-of-bypass prediction by TEOBY	0^{0}F
Change from R4SS overwrite of junction inertia	0^{0}F
Cumulative change	0^{0}F
Final LBLOCA PCT	**2005^{0}F**