



March 21, 2001

L-2001-048
10 CFR 50.46

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

Re: 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

Pursuant to 10 CFR 50.46(a)(3)(ii), the nature of any change to or error discovered in the evaluation models for emergency core cooling systems (ECCS), or in the application of such models, that affect the fuel cladding temperature calculations for St. Lucie Units 1 and 2 is reported in the attachment to this letter. The estimated effect from any such change or error on the limiting ECCS analysis for each unit is also addressed. The data interval for the report is from January 1, 2000 through December 31, 2000.

Should there be any questions, please contact us.

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

AC001

St. Lucie Units 1 and 2
10 CFR 50.46 Annual Report

Emergency core cooling system (ECCS) analyses for St. Lucie Unit 1 and St. Lucie Unit 2 are performed by Siemens Power Corporation (SPC) and Westinghouse-Combustion Engineering (W-CE), respectively. The following information pertaining to the evaluation models for small break loss of coolant accidents (SBLOCA) and large break loss of coolant accidents (LBLOCA), and the application of such models to each St. Lucie unit, is provided pursuant to 10 CFR 50.46(a)(3)(ii). A summary of calculated peak cladding temperature (PCT) changes is provided in Table 1. The data interval for this report is from January 1, 2000 through December 31, 2000.

1.0 ST. LUCIE UNIT 1

- 1.1** One error/issue was identified related to the SBLOCA ECCS performance analysis. This error/issue, not previously reported in Reference 3.1, is described below. Table 1 summarizes the estimated impact of this error/issue on the St. Lucie Unit 1 SBLOCA PCT. The limiting PCT with the estimated effect of the change remains at 1767°F.

Variability in SBLOCA Analysis

An issue related to the variability in SBLOCA was identified by SPC while performing SBLOCA calculations for a CE plant to evaluate the effects of minor errors in the RODEX2 input. A small change in gap dimensions was made to increase the average fuel temperature in ANF-RELAP to agree with RODEX2 results, consistent with the SBLOCA methodology (Reference 3.3). This change should have little or no effect on the calculated SBLOCA system behavior; however, for one calculation of one break size, the number of loop seals calculated to clear changed and consequently, the SBLOCA calculated PCT changed dramatically due to this change in input.

The potential for excessive variability in SBLOCA analyses has long been recognized and SPC modified its SBLOCA model in 1996 (Reference 3.4) to produce more conservative and consistent results. The 1996 modification consisted of biasing the broken loop to plug and the code was allowed to determine if any other loops would plug. The following changes were made in the year 2000 to avoid or correct the identified anomalous results from this model:

- (1) The loop seal on the broken loop and one intact loop is biased to be one-foot below the actual geometry to promote conservative loop seal clearing behavior. Such biasing is similar to that prescribed in the current methodology for the crossflow resistance sensitivity calculations. The biasing applies to all calculations including the break spectrum.

- (2) In the event that one loop seal is calculated to clear for a CE 2 loop by 4 pump plant SBLOCA for a break size of 0.03 ft² or larger, this case will be recalculated with a minor adjustment to allow the conservative behavior of clearing two loop seals to be calculated. Typical minor adjustments may include: a) reducing calculation time step sizes during the time period when loop seal clearing is calculated to occur, or b) initiating the transient calculation from a different time from the steady state run. To date, such small changes have always caused the anomalous results to revert back to the consistent result of clearing two loop seals.
- (3) For the larger of the SBLOCA cases, the number of loop seals which clear will eventually increase even with the conservative biasing recommended in item (1). If this behavior is predicted as a transition occurring as a function of break size, the results will be acceptable. However, if the behavior is anomalous within the spectrum, the calculation will be repeated with the minor adjustments.

The St. Lucie Unit 1 SBLOCA analysis of record has two loops plugged in the SBLOCA calculations and does not exhibit the random behavior of three loops plugging for the small break sizes. Therefore, the change in PCT associated with this modification is estimated to be 0°F for St. Lucie Unit 1.

- 1.2 Several errors/issues were identified impacting the LBLOCA PCT. The errors not previously reported in Reference 3.1 are described below. Table 1 summarizes the estimated impact of these errors/issues on the St. Lucie Unit 1 LBLOCA PCT. The limiting PCT with the estimated effect of the changes is 1933°F.

Incorrect Containment Material Properties Identifier

The material property identifier for one of the heat structures in the St. Lucie Unit 1 LBLOCA model that represents miscellaneous stainless steel masses inside containment was incorrectly set so that the material properties for concrete were used. The impact of this deviation on the St. Lucie Unit 1 limiting LBLOCA PCT is estimated to be +4°F.

SIT/Accumulator Line Losses

The safety injection tank (SIT) line losses used in the St. Lucie Unit 1 LBLOCA analysis deviated from the current SPC practice to set the line losses to nominal values. A scoping calculation was performed setting the line losses to the average of the maximum and the minimum values. This calculation yielded no change to the limiting PCT. The impact on the limiting LBLOCA PCT is estimated to be 0°F.

TEOBY Calculation Error

Deficiencies were identified in the TEOBY code used for determination of the LBLOCA end of bypass time. The errors could result in the end of bypass time being incorrectly

predicted. The impact of these errors on the St. Lucie Unit 1 limiting LBLOCA PCT is estimated to be 0°F.

PWR LBLOCA Split Modeling

A deficiency was identified in the modeling of the split break configuration which could result in a non-physical high pressure in the broken cold leg volume and the downcomer, which could cause an early end of bypass time to be predicted for split breaks for PWR LBLOCA analyses. For St. Lucie Unit 1 LBLOCA analysis, the limiting breaks are Double Ended Guillotine breaks. The correction of the error did not result in the split break becoming limiting, and thus the impact on the limiting LBLOCA PCT is estimated to be 0°F.

2.0 ST. LUCIE UNIT 2

- 2.1** No errors were found in W-CE's SBLOCA analysis impacting the PCT previously reported in Reference 3.2. The peak cladding temperature for the analysis of record remains at 2055°F.
- 2.2** No errors were found in W-CE's LBLOCA analysis impacting the PCT previously reported in Reference 3.2. The peak cladding temperature for the analysis of record remains at 2150°F.

3.0 REFERENCES

- 3.1** FPL Letter L-2000-058, R. S. Kundalkar 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 6, 2000.
- 3.2** FPL Letter L-2000-130, R. S. Kundalkar to USNRC (DCD), St. Lucie Unit 2, Docket No. 50-389, SBLOCA and LBLOCA Evaluation Models, 30-Day 10 CFR 50.46 Report; June 12, 2000.
- 3.3** XN-NF-82-49(P)(A) Revision 1, Supplement 1, "Exxon Nuclear Company Evaluation Model EXEM PWR Small Break Model," December 1994.
- 3.4** Letter, H. Donald Curet (SPC) to Document Control Desk (NRC), "96/97 – Annual Reporting of Changes and Errors in ECCS Evaluation Models," HDC:97:092, September 2, 1997.

Table 1
2000 St. Lucie Units 1 and 2 SBLOCA and LBLOCA PCT Summary

Unit 1 SBLOCA Summary		PCT
1999 10 CFR 50.46 Annual Report		1767°F
Change from Variability in SBLOCA Analysis		0 °F
2000 10 CFR 50.46 Annual Report		1767°F

Unit 1 LBLOCA Summary		PCT
1999 10 CER 50.46 Annual Report		1929°F
Change from Incorrect Containment Material Properties Identifier		+4°F
Change from SIT/Accumulator Line Losses		0°F
Change from TEOBY Calculation Error		0°F
Change from PWR LBLOCA Split Modeling		0°F
2000 10 CFR 50.46 Annual Report		1933 °F

Unit 2 SBLOCA Summary		PCT
1999 10 CFR 50.46 Annual Report		1915°F
30-Day 10 CFR 50.46 Report (L-2000-130) (New Evaluation Model PCT)		2055°F
Changes during 2000 Since L-2000-130		0°F
2000 10 CFR 50.46 Annual Report		2055°F

Unit 2 LBLOCA Summary		PCT
1999 10 CFR 50.46 Annual Report		2171°F
30-Day 10 CFR 50.46 Report (L-2000-130) (New Evaluation Model PCT)		2150°F
Changes during 2000 Since L-2000-130		0°F
2000 10 CFR 50.46 Annual Report		2150°F