

# CATEGORY 1

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SUBJECT: Forwards summary of any change to or error discovered in evaluation models for ECCS or application of such models, that affect fuel cladding temp calculations for Unit 1 & 2, per 10CFR50.46(a)(3)(ii).

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March 1, 1999

L-99-049  
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 through December 31, 1998.

Please note that a data point from 1999 is also identified and included in this report to ensure compliance with the 30-day notification requirement of 10 CFR 50.46(a)(3)(i).

Should there be any questions, please contact us.

Very truly yours,

J. A. Stall  
Vice President  
St. Lucie Plant

JAS/RLD

Attachment

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

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ADD 1/1

Emergency core cooling system (ECCS) analyses for St. Lucie Unit 1 and St. Lucie Unit 2 are performed by Siemens Power Corporation (SPC) and Asea Brown Boveri-Combustion Engineering (ABB-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 through December 31, 1998\*.

## 1.0 ST. LUCIE UNIT 1

1.1 The previously reported PCT for the SBLOCA was 1953°F. No modeling changes or errors were identified during 1998. The limiting SBLOCA PCT remains at 1953°F.

1.2 Several errors/issues were identified impacting the LBLOCA PCT. The errors not previously reported in References 3.1 and 3.2 are summarized below. Table 1 provides the estimated impact of these errors/issues on the St. Lucie Unit 1 LBLOCA calculated PCT. These estimates are obtained using the "Revised Model" for PWR LBLOCA evaluation, submitted by SPC to the NRC for review in August 1998. The limiting PCT with the estimated effect of the changes is 2058°F.

RDX2LSE Gadolinia Conductivity Model: An error was discovered in the gadolinia-bearing fuel conductivity equation used in the PWR LOCA analyses. The conductivity equation described in XN-NF-79-56 (P)(A) was not replaced upon the approval of the gadolinia-bearing fuel conductivity equation described in XN-NF-85-92 (P)(A). The impact of incorporating the currently approved conductivity equation in the RDX2LSE code is to reduce significantly the calculated PCT for gadolinia rods. Since gadolinia rods are not limiting rods for St. Lucie Unit 1 LOCA analyses, the impact of this error on the limiting PCT is 0°F.

PREFILL Subcode of RFPAC: The RFPAC code was discovered to calculate negative values for low pressure safety injection (LPSI) and high pressure safety injection combined flow rates when there was a time gap between termination of safety injection tank flow and initiation of LPSI flow. The error is found to occur only when the time gap is sufficient for the cold leg liquid to fall below 10% full. The impact of the RFPAC code correction on the limiting PCT is estimated to be 0°F.

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\* Notification of the error identified as "Corrosion Model in RODEX2 (SPC CR 6792)" was received in February 1999, but is contained in this report to satisfy the 30-day reporting requirement pursuant to 10 CFR 50.46(a)(3)(i), i.e., the adjustment of PCT from the last acceptable evaluation model due to a cumulation of the absolute magnitude of changes remains greater than 50°F.

TOODEE2 Axial Nodalization: An error was discovered during the development of new LBLOCA methodology regarding the calculation of an unrealistically high PCT in the region at the upper extremity of the core when 3-inch axial nodes are modeled in that region in TOODEE2. The unrealistically high PCT is caused by the unrealistically low heat transfer coefficients predicted by the FCTF heat transfer correlation above the 10.5-foot elevation. To assure a bounding PCT, SPC has decided to conservatively use increased nodalization at the top of the core. The impact of this change on the limiting PCT is estimated to be 0°F.

RDX2LSE Gadolinia Fuel Weight Calculation: An error was identified in the density correlation for gadolinia rods in the RDX2LSE code. An evaluation of the impact for gadolinia rods showed a reduction in the calculated PCT for gadolinia rods. Since gadolinia rods are not limiting rods for St. Lucie Unit 1 LOCA analyses, the impact of this error on the limiting PCT is 0°F.

Corrosion Model in RODEX2: Two deficiencies were identified in the cladding corrosion calculation in RODEX2. There was an error in the MATPRO coding and an error in the value of corrosion enhancement factor. The impact of the two deficiencies on the limiting PCT is estimated to be -2°F.

RDX2LSE Fission Gas Release Calculation for Gadolinia: The fission gas release model in RDX2LSE was found to be incorrect for gadolinia rods. The fission gas release calculations for gadolinia rods used the theoretical density for UO<sub>2</sub> rods, resulting in an over prediction of gadolinia rod fission gas release. The correction of this error will result in increased gap conductance and lower PCT for gadolinia rods. Since gadolinia rods are not limiting rods for St. Lucie Unit 1 LOCA analyses, the impact of this error on the limiting PCT is 0°F.

ICECON Coding Errors: ICECON coding errors were identified by SPC during the verification of ICECON. The errors are related to containment heat transfer, which could potentially impact the containment pressure. Scoping calculations performed by SPC estimated the impact on PCT for dry containment plants to be 0°F.

## 2.0 ST. LUCIE UNIT 2

In 1998, ABB-CE made no changes to and discovered no errors in the ABB-CE ECCS performance evaluation models. The peak cladding temperature for the analysis of record remains at 1915 °F for SBLOCA, and 2171 °F for LBLOCA.

## 3.0 REFERENCES

- 3.1 FPL Letter L-98-158, J. A. Stall to USNRC (DCD), Re: St. Lucie Unit 1, Docket 50-335; LBLOCA Evaluation Model, 30 Day 10 CFR 50.46 Report; June 15, 1998.
- 3.2 FPL Letter L-98-194, J. A. Stall to USNRC (DCD), Re: St. Lucie Unit 1, Docket 50-335, LBLOCA Evaluation Model, 30 Day 10 CFR 50.46 Report; July 24, 1998

**Table 1: 1998 St. Lucie Units 1 and 2 SBLOCA and LBLOCA PCT Summary**

Unit 1 SBLOCA Summary	PCT °F
1997 10 CFR 50.46 Annual Report	1953
Change during 1998	0
1998 10 CFR 50.46 Annual Report	1953

Unit 1 LBLOCA Summary	PCT °F
1997 10 CFR 50.46 Annual Report	2040
RELAP4 excessive variability (SPC CR 6169) estimate -28°F. Reference 3.1	**
Change from ICECON code issue (SPC CR 6680). References 3.1 and 3.2	0
Change from RDX2LSE calculations of gas release fraction and pellet-cladding contact pressure, and asymptotic fuel density input (SWMDEN) to RODEX2 (SPC CR 6655). Note: Change in PCT previously estimated < 20°F in Reference 3.2.	+2
Change from RELAP4 decay heat re-normalization (SPC CR 6578). Reference 3.2	+15
Change from RELAP4/RELAX fuel average temperature (SPC CR 6581). Reference 3.2	+1
Change from RODEX2 gap calculation (SPC CR 6574). Reference 3.2	+2
Change from RDX2LSE gadolinia conductivity model (SPC CR 6419)	0
Change from error in PREFILL subcode of RFPAC (SPC CR 6809)	0
Change from TOODEE2 axial nodalization (SPC CR 6580)	0
Change from RDX2LSE gadolinia fuel weight calculation (SPC CR 6442)	0
Change from RODEX2 corrosion model (SPC CR 6792)	-2
Change from RDX2LSE fission gas release calculation for gadolinia (SPC CR 7087)	0
Change from ICECON code errors (SPC CR 7083)	0
1998 10 CFR 50.46 Annual Report	2058

Unit 2 SBLOCA Summary	PCT °F
1997 10 CFR 50.46 Annual Report	1915
Change during 1998	0
1998 10 CFR 50.46 Annual Report	1915

Unit 2 LBLOCA Summary	PCT °F
1997 10 CFR 50.46 Annual Report	2171
Change during 1998	0
1998 10 CFR 50.46 Annual Report	2171

\*\* The impact of this error is conservatively not included in the limiting PCT value (Reference 3.1).