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10 CFR 50.46(a)(3)(ii)

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

Florida Power & Light Company  
St. Lucie Units 1 and 2  
Docket Nos. 50-335, 50-389

10 CFR 50.46 - Emergency Core Cooling 30-Day Report

In accordance with 10 CFR 50.46(a)(3)(ii), Florida Power & Light Company (FPL) is submitting this 30-day report of an error affecting the St. Lucie Nuclear Plant (PSL), Units 1 and 2 for the emergency core cooling system (ECCS) analysis performed by AREVA Incorporated.

FPL was informed by AREVA of an error affecting the oxidation calculation in the small break loss of coolant accident (SBLOCA) analyses of record. Enclosure 1 to this letter contains a description and impact of the error for Unit 1, and Enclosure 2 is provided for Unit 2.

Please contact Larry Nicholson at (561) 304-6224 should you have any questions regarding this submittal.

Sincerely,

A handwritten signature in black ink, appearing to read 'Larry Nicholson', is written over a faint circular stamp.

Larry Nicholson  
Director, Nuclear Licensing and Regulatory Compliance

Enclosures (2)

ADDZ  
NRR

## **Enclosure 1**

### **St. Lucie Unit 1**

#### 10 CFR 50.46 30-Day Report

Emergency core cooling system (ECCS) small break loss of coolant accident (SBLOCA) analysis for St. Lucie Unit 1 is performed by AREVA Inc. The following 30-Day report, pertaining to the application of the AREVA SBLOCA evaluation model, is provided pursuant to 10 CFR 50.46(a)(3)(ii). A summary of the model changes/errors and the estimated impact on the peak cladding temperature (PCT) for SBLOCA is provided in Table 1.

#### **1.0 SBLOCA Model Changes**

- o S-RELAP5 Calculations of Oxidation Due to High Temperature Metal-Water Reaction

AREVA determined that there is an error in the oxidation model related to high temperature metal-water reaction. In a LOCA event, the cladding can swell (and potentially rupture) due to high difference in pressure between the fuel and the system which causes the clad to thin. The clad radius increases, while the thickness decreases. It was discovered that the S-RELAP5 oxidation calculations used cold cladding dimensions and therefore did not fully account for the swelling phenomena. The error can lead to an under-prediction of the oxidation and heat from the metal-water reaction.

- The PCT impact of the oxidation error is estimated to be +2 °F for St. Lucie Unit 1.

Previous SBLOCA PCT changes are documented in Reference 2.1. Table 1 summarizes the estimated impact of the changes/errors on the St. Lucie Unit 1 SBLOCA PCT, along with the cumulative effect of absolute PCT changes.

The cumulative impact for the SBLOCA evaluation model PCT is 84 °F. The final PCT including all changes/errors, is 1852 °F, which maintains significant margin to the limit of 2200 °F.

#### **2.0 References**

- 2.1 L-2017-157, "St. Lucie Unit 1 Docket No. 50-335 Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors 10 CFR 50.46 30-Day Report," September 13, 2017. (ML17258A037)

**Enclosure 1**

**Table 1**

**St. Lucie Unit 1 SBLOCA Margin Summary Sheet – 30 Day Report**

**Plant Name:** St. Lucie Unit 1

**Utility Name:** NextEra Energy

**Evaluation Model:** EMF-2328(P)(A) Rev. 0 as supplemented by ANP-3000(P), Revision 0.

**Evaluation Model PCT:** 1828°F

		<b>Net PCT Effect</b>	<b>Absolute PCT Effect</b>
A	Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2016	+22 °F	82 °F
B	Prior 10 CFR 50.46 Changes or Error Corrections – Reported in Year 2017	0 °F	0 °F
C	10 CFR 50.46 Changes in Year 2017 Since Item B		
	Error in oxidation calculations due to high temperature metal-water reaction	+2 °F	2 °F
D	Sum of 10 CFR 50.46 Changes	+24 °F	84 °F

<i>The sum of the PCT from the most recent analysis using an acceptable evaluation model and the estimates of PCT impact for changes and errors identified since this analysis</i>	<b>1852 °F &lt; 2200 °F</b>
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## **Enclosure 2**

### **St. Lucie Unit 2**

#### 10 CFR 50.46 30-Day Report

Emergency core cooling system (ECCS) small break loss of coolant accident (SBLOCA) analysis for St. Lucie Unit 2 is performed by AREVA Inc. The following 30-Day report, pertaining to the application of the AREVA SBLOCA evaluation model, is provided pursuant to 10 CFR 50.46(a)(3)(ii). A summary of the model changes/errors and the estimated impact on the peak cladding temperature (PCT) for SBLOCA is provided in Table 1.

#### **1.0 SBLOCA Model Changes**

##### ○ M5 LOCA Swelling and Rupture Model (SRM) Update

AREVA determined that certain aspects of the SRM model would be impacted when considering additional M5 cladding rupture test data since the model's approval by the NRC as part of M5 licensing. Following the same approach as the original model, an updated M5 SRM was developed to take into account the updated test database.

- The PCT impact of the updated model is estimated to be 0 °F for St. Lucie Unit 2.

##### ○ S-RELAP5 Calculations of Oxidation Due to High Temperature Metal-Water Reaction

AREVA determined that there is an error in the oxidation model related to high temperature metal-water reaction. In a LOCA event, the cladding can swell (and potentially rupture) due to high difference in pressure between the fuel and the system which causes the clad to thin. The clad radius increases, while the thickness decreases. It was discovered that the S-RELAP5 oxidation calculations used cold cladding dimensions and therefore did not fully account for the swelling phenomena. The error can lead to an under-prediction of the oxidation and heat from the metal-water reaction.

- The PCT impact of the oxidation error is estimated to be +57 °F for St. Lucie Unit 2.

##### ○ Change in Analysis HPSI Flow Assumption

In order to offset some of the impact of the aforementioned error, a change is made to the HPSI flow to credit some of the available conservatism in the HPSI flow, while still maintaining adequate margin to the pump test criteria.

- The PCT impact of the HPSI flow change is estimated to be -336 °F for St. Lucie Unit 2.

Previous SBLOCA PCT changes are documented in Reference 2.1. Table 1 summarizes the estimated impact of the changes/errors on the St. Lucie Unit 2 SBLOCA PCT, along with the cumulative effect of absolute PCT changes.

The cumulative impact for the SBLOCA evaluation model PCT is 393 °F. The final PCT including all changes/errors, is 1778 °F, which maintains significant margin to the limit of 2200 °F.

#### **2.0 References**

- 2.1 L-2017-056, "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 27, 2017. (ML17086A321).

**Enclosure 2**

**Table 1**

**St. Lucie Unit 2 SBLOCA Margin Summary Sheet – 30 Day Report**

**Plant Name:** St. Lucie Unit 2

**Utility Name:** NextEra Energy

**Evaluation Model:** EMF-2328(P)(A) Rev. 0

**Evaluation Model PCT:** 2057°F

		Net PCT Effect	Absolute PCT Effect
A	Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2016	0 °F	0 °F
B	Prior 10 CFR 50.46 Changes or Error Corrections – Reported in Year 2017	None	None
C	10 CFR 50.46 Changes in Year 2017 Since Item B		
	SRM Model Update due to new rupture test data	0 °F	0 °F
	Error in oxidation calculations due to high temperature metal-water reaction	+57 °F	57 °F
	Change in analysis HPSI flow assumption	-336 °F	336 °F
D	Sum of 10 CFR 50.46 Changes	-279°F	393 °F

<i>The sum of the PCT from the most recent analysis using an acceptable evaluation model and the estimates of PCT impact for changes and errors identified since this analysis</i>	<b>1778 °F &lt; 2200 °F</b>
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