April 14, 2020
L-2020-041
10 CFR 50.46

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

Re: Florida Power & Light Company
Turkey Point Units 3 and 4, Docket Nos. 50-250, 50-251

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

NextEra Energy Seabrook, LLC
Seabrook Station, Docket No. 50-443

NextEra Energy Duane Arnold, LLC
Duane Arnold Energy Center, Docket No. 50-331

NextEra Energy Point Beach, LLC
Point Beach Units 1 and 2, Docket Nos. 50-266, 50-301

10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications

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 Florida Power & Light's Turkey Point Nuclear Plant, Units 3 and 4; and St. Lucie Nuclear Plant, Units 1 and 2; NextEra Energy Seabrook Station; NextEra Energy Duane Arnold; and NextEra Energy Point Beach Nuclear Plant, Units 1 and 2 are reported in the attachments to this letter. The data interval for this report is from January 1, 2019 through December 31, 2019.

Evaluations of each reported error have concluded that re-analysis was not required.

This letter contains no new or revised regulatory commitments.

Should you have any questions regarding this report, please contact Mr. Steve Catron, Fleet Licensing Manager, at (561) 304-6206.

Very truly yours,

William L. Parks
General Manager, Safety Assurance and Learning
Florida Power & Light Company

Attachments (5)

cc: USNRC Regional Administrator, Region I
USNRC Regional Administrator, Region II
USNRC Regional Administrator, Region III

USNRC Project Manager, Seabrook Station
USNRC Project Manager, St. Lucie Nuclear Plant
USNRC Project Manager, Turkey Point Nuclear Plant
USNRC Project Manager, Duane Arnold Energy Center
USNRC Project Manager, Point Beach Nuclear Plant

USNRC Senior Resident Inspector, Seabrook Station
USNRC Senior Resident Inspector, St. Lucie Nuclear Plant
USNRC Senior Resident Inspector, Turkey Point Nuclear Plant
USNRC Senior Resident Inspector, Duane Arnold Energy Center
USNRC Senior Resident Inspector, Point Beach Nuclear Plant

ATTACHMENT 1

Florida Power & Light Company
Turkey Point Units 3 and 4

Table 1:
Turkey Point Unit 3 & 4 Small Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Westinghouse, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054-P-A, August 1985 and Addendum 2, Revision 1, July 1997.

Evaluation Model PCT: 1231 °F (Reference 1)

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to 12/31/2018 (Reference 2)	0 °F	0 °F
10 CFR 50.46 Changes or Errors Corrections – year 2019		
UO_2 Fuel Pellet Heat Capacity Error	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Errors Corrections	0 °F	0 °F

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	**1231 °F < 2200 °F**

UO_2 Fuel Pellet Heat Capacity

An error was discovered in the UO_2 fuel pellet heat capacity described by Equation C-4 of WCAP-8301 for fuel rod heat-up calculations within the Appendix K Small Break LOCA evaluation model. The erroneous formulation results in an over-prediction of heat capacity that increases with fuel temperature. The corrected formulation results in a maximum decrease in heat capacity on the order of approximately 1.2% for existing analyses of record.

References:

1. Letter from M. Kiley to U.S. Nuclear Regulatory Commission, "License Amendment Request for Expended Power Uprate (LAR 205)," L-2010-113, October 21, 2010.
2. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," L-2019-057, March 19, 2019.

Table 2:
Turkey Point Unit 3 & 4 Large Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Westinghouse, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment Of Uncertainty Method (ASTRUM)," WCAP-16009-P-A, Revision 0, January 2005.

Evaluation Model PCT: 2152 °F (Reference 1)

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to 12/31/2018 (Reference 2)	-28 °F	80 °F
10 CFR 50.46 Changes or Errors Corrections – year 2019		
Error in Vapor Temperature Resetting Logic (Reference 3)	0 °F	0 °F
Error in the Implementation of the Vessel Interfacial Heat Transfer Limit (Reference 4)	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Errors Corrections	-28 °F	80 °F

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	**2124 °F < 2200 °F**

References:

1. Letter from M. Kiley to U.S. Nuclear Regulatory Commission, "Response to NRC Reactor Systems Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request No. 205 and Thermal Conductivity Degradation," L-2012-019, January 16, 2012.
2. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," L-2019-057, March 19, 2019.
3. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," L-2019-058, March 25, 2019.
4. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," L-2019-151, August 6, 2019.

ATTACHMENT 2

Florida Power & Light Company
St. Lucie Units 1 and 2

Table 1:
St. Lucie Unit 1 Small Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Framatome, "PWR Small Break LOCA Evaluation Model, S-RELAP5 Based," EMF-2328(P)(A) Revision 0 as supplemented by ANP-3000(P), Revision 0.

Evaluation Model PCT: 1828°F

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2018 (Reference 1)	+24 °F	84 °F
10 CFR 50.46 Changes or Error Corrections – Year 2019	None	None
Sum of 10 CFR 50.46 Changes or Error Corrections	+24 °F	84 °F

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*	**1852 °F < 2200 °F**

References:

1. Letter L-2019-057, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," 3/19/19 (ML19080A058).

Table 2:
St. Lucie Unit 1 Large Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Framatome, "Realistic Large Break LOCA Methodology for Pressurized Water Reactors," EMF-2103(P)(A) Revision 0 as supplemented by ANP-2903(P), Revision 1.

Evaluation Model PCT: 1788°F

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2018 (Reference 1)	+6 °F	6°F
10 CFR 50.46 Changes or Error Corrections – Year 2019		
Error in Cathcart-Pawel correlation implementation for Zirconium Metal Reacted	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Error Corrections	+6 °F	6°F

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*	**1794 °F < 2200 °F**

Error in Cathcart-Pawel Correlation Implementation

In the RLBLOCA methodology, the correlation for the rate of oxide thickness was used instead of the correlation for the rate of total oxygen consumed, which is the correct correlation to be used in the follow-on calculations in S-RELAP5. The correction of this error resulted in negligible impact on the RLBLOCA PCT (0°F).

References:

1. Letter L-2019-057, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," 3/19/19 (ML19080A058).

Table 3:
St. Lucie Unit 2 Small Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Framatome, "PWR Small Break LOCA Evaluation Model, S-RELAP5 Based," EMF-2328(P)(A) Revision.0.

Evaluation Model PCT: 2057°F

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2018 (Reference 1)	-279°F	393 °F
10 CFR 50.46 Changes or Error Corrections – Year 2019	None	None
Sum of 10 CFR 50.46 Changes or Error Corrections	-279°F	393 °F

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*	**1778 °F < 2200 °F**

References:

1. Letter L-2019-057, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," 3/19/19 (ML19080A058).

Table 4:
St. Lucie Unit 2 Large Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Framatome, "Realistic Large Break LOCA Methodology for Pressurized Water Reactors," EMF-2103(P)(A) Revision 0.

Evaluation Model PCT: 1732°F

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2018 (Reference 1)	0 °F	0 °F
10 CFR 50.46 Changes or Error Corrections – Year 2019		
Error in Cathcart-Pawel correlation implementation for Zirconium Metal Reacted	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Error Corrections	0 °F	0 °F

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*	**1732 °F < 2200 °F**

Error in Cathcart-Pawel Correlation Implementation

In the RLBLOCA methodology, the correlation for the rate of oxide thickness was used instead of the correlation for the rate of total oxygen consumed, which is the correct correlation to be used in the follow-on calculations in S-RELAP5. The correction of this error resulted in negligible impact on the RLBLOCA PCT (0°F).

References:

1. Letter L-2019-057, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," 3/19/19 (ML19080A058).

ATTACHMENT 3

NextEra Energy
Seabrook Station

Table 1:
Seabrook Unit 1 Small Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Westinghouse, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054-P-A, August 1985 and Addendum 2, Revision 1, July 1997.

Evaluation Model PCT: 1373 °F (Reference 1)

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to 12/31/2018 (Reference 2)	0 °F	00 °F
10 CFR 50.46 Changes or Errors Corrections – year 2019		
UO_2 Fuel Pellet Heat Capacity Error	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Errors Corrections	0 °F	0 °F

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	**1373 °F < 2200 °F**

UO_2 Fuel Pellet Heat Capacity

An error was discovered in the UO_2 fuel pellet heat capacity described by Equation C-4 of WCAP-8301 for fuel rod heat-up calculations within the Appendix K Small Break LOCA evaluation model. The erroneous formulation results in an over-prediction of heat capacity that increases with fuel temperature. The corrected formulation results in a maximum decrease in heat capacity on the order of approximately 1.2% for existing analyses of record.

References:

1. Letter from M. Warner to U.S. Nuclear Regulatory Commission, "License Amendment Request 04-03, Application for Stretch Power Uprate," NYN-04016, March 17, 2004.
2. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," L-2019-057, March 19, 2019.

Table 2:
Seabrook Unit 1 Large Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Westinghouse, "Code Qualification Document for Best Estimate LOCA Analysis," WCAP-12945-P-A, March 1998.

Evaluation Model PCT: 1784 °F (Reference 1)

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to 12/31/2018 (Reference 2)	155 °F	155 °F
10 CFR 50.46 Changes or Errors Corrections – year 2019		
Error in Vapor Temperature Resetting Logic (Reference 3)	0 °F	0 °F
Error in the Implementation of the Vessel Interfacial Heat Transfer Limit (Reference 4)	0 °F	0 °F
Error in the Core Barrel Wetted Perimeter (Reference 5)	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Errors Corrections	155 °F	155 °F

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	**1939 °F < 2200 °F**

References:

1. Letter from M. Warner to U.S. Nuclear Regulatory Commission, "License Amendment Request 04-03, Application for Stretch Power Uprate," NYN-04016, March 17, 2004.
2. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," L-2019-057, March 19, 2019.
3. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," L-2019-058, March 25, 2019.
4. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," L-2019-151, August 6, 2019.
5. Letter from W. Parks to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," L-2019-179, September 26, 2019.

ATTACHMENT 4

NextEra Energy
Duane Arnold

Table 1:
Duane Arnold GNF2 LOCA PCT
2019 Annual Report

Evaluation Methodology:

General Electric, "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of Coolant Accident: Volume III – SAFER/GESTR Application Methodology," NEDE-23785-1-PA, February 1985.

Global Nuclear Fuel, Licensing Topical Report, "The PRIME Model for Analysis of Fuel Rod Thermal-Mechanical Performance," Technical Bases - NEDC-33256P-A, Qualification - NEDC-33257P-A, and Application Methodology - NEDC-33258P-A, September 2010.

General Electric-Hitachi, "Duane Arnold Energy Center GNF2 ECCS-LOCA Evaluation," Engineering Report #0000-0133-6901-R0, DRF 0000-0133-6885-R0, August 2012.

Evaluation Model PCT: **1730 °F**

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to 12/31/2018 (Reference 1)	-10 °F	70 °F
10 CFR 50.46 Changes or Error Corrections – 2019		
SAFER Lower Limit on Differential Pressure for Bypass Leakage (Reference 2)	0 °F	0 °F
Sum of 10 CFR 50.46 Changes or Errors Corrections	-10 °F	70 °F

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*	1720 °F < 2200 °F

References:

1. Letter from W. Parks (Florida Power & Light Company) to USNRC, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," L-2019-057, March 19, 2019.

2. Letter from W. Parks (Florida Power & Light Company) to USNRC, "10 CFR 50.46 - Emergency Core Cooling System LOCA 30-Day Report," L-2019-202, November 19, 2019.

ATTACHMENT 5

NextEra Energy
Point Beach Units 1 and 2

Table 1:
Point Beach Units 1 and 2 Small Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Westinghouse, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054-P-A, August 1985 and Addendum 2, Revision 1, July 1997.

Evaluation Model PCT (Unit 1/Unit 2): 1049°F/1103°F

	Net PCT Effect	Absolute PCT Effect
Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2018 (Reference 1)	0°F/0°F	0°F/0°F
10 CFR 50.46 Changes or Error Corrections – Year 2019		
Error in implementation of UO_2 fuel pellet heat capacity	0°F/0°F	0°F/0°F
Sum of 10 CFR 50.46 Changes or Error Corrections	0°F/0°F	0°F/0°F

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*	**1049°F/1103**°F **< 2200 °F**

Error in Implementation of UO_2 Fuel Pellet Heat Capacity

An error was discovered in the implementation of the UO_2 fuel pellet heat capacity described in Equation C-4 of WCAP-8301 for fuel rod heat-up calculations within the Appendix K Small Break LOCA evaluation model. The erroneous formulation results in an over-prediction of heat capacity that increases with fuel temperature. Small over-prediction in UO_2 fuel pellet heat capacity has been evaluated to have a negligible effect on small break LOCA analysis results leading to an estimated PCT impact of 0°F.

References:

1. Letter L-2019-057, "10 CFR 50.46 Annual Reporting of Changes to, or Errors in Emergency Core Cooling System Models or Applications," 3/19/2019 (ML19080A058).

Table 2:
Point Beach Units 1 and 2 Large Break LOCA PCT
2019 Annual Report

Evaluation Methodology:

Westinghouse, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," WCAP-16009-P-A, January 2005.

Westinghouse, "Application of Best Estimate Large Break LOCA Methodology to Westinghouse PWRs with Upper Plenum Injection," WCAP-14449-P-A Revision 1, October 1999.

Evaluation Model PCT (Unit 1/Unit 2): 1975°F/1810°F

		Net PCT Effect Unit 1/Unit 2	Absolute PCT Effect Unit 1/Unit 2
Prior 10 CFR 50.46 Changes or Error Corrections – up to Year 2018 (Reference 1)		+210°F/+248°F	210°F/340°F
10 CFR 50.46 Changes or Error Corrections – Year 2019			
	Error in Vapor Temperature Resetting Logic (Reference 2)	0°F/0°F	0°F/0°F
	Error in the Implementation of the Vessel Interfacial Heat Transfer Limit (Reference 3)	0°F/0°F	0°F/0°F
Sum of 10 CFR 50.46 Changes or Error Corrections		+210°F/+248°F	210°F/340°F

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*	**2185°F/2058**°F **< 2200 °F**

References:

1. Letter L-2019-057, "10 CFR 50.46 Annual Reporting of changes to, or Errors in Emergency Core Cooling System Models or Applications," 3/19/2019 (ML19080A058).

2. Letter L-2019-058, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," 3/25/2019 (ML19087A118).

3. Letter L-2019-151, "10 CFR 50.46 – Emergency Core Cooling System LBLOCA 30-Day Report," 8/6/2019 (ML19220A049).