UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 4, 2015

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
NextEra Energy
P.O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: ST. LUCIE PLANT, UNIT NO. 2 - REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST AND EXEMPTION REQUEST REGARDING THE TRANSITIONING TO AREVA FUEL (TAC NOS. MF5494 AND MF5495)

Dear Mr. Nazar:

By letter dated December 30, 2014, as supplemented by letters dated March 23, 2015; June 2, 2015; and July 30, 2015 (Agencywide Documents Access and Management System Accession Nos. ML15002A091, ML15084A011, ML15161A316, and ML15219A184, respectively), Florida Power & Light Company (FPL, the licensee) requested an amendment to the Technical Specifications (TSs) of Renewed Facility Operating License No. NPF-16 and asked for an exemption from the regulation for St. Lucie Plant, Unit No. 2 (SL-2). The proposed amendment would revise the TSs to allow the use of AREVA fuel at SL-2. Additionally, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.12, FPL requests an exemption from the provisions of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems [ECCSs] for light-water nuclear power reactors," and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," to allow the use of M5 fuel rod cladding in future core reload applications for SL-2.

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing your submittal and has determined that additional information is needed to complete our evaluation of the proposed change. The request for additional information (RAI) is included with this letter as Enclosure 1, and a redacted version of this RAI is included with this letter as Enclosure 2.

On July 30, 2015, and July 31, 2015, drafts of these questions were sent to Mr. William Cross and Mr. Ken Frehafer to ensure that the questions were understandable, the regulatory basis was clear, there was no additional proprietary or sensitive information contained in the draft RAIs that should be withheld from the public and that was not already marked, and to determine if the information was previously docketed. On August 10, 2015, a clarifying conference call was held with the licensee. During a call on August 21, 2015, Mr. William Cross indicated that FPL will submit a response by October 2, 2015.

NOTICE: Enclosure 1 to this letter contains Proprietary Information. Upon separation from Enclosure 1, this letter is DECONTROLLED.

The NRC staff understands that timely responses to RAIs help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources. Please note that if you do not respond to this letter by the agreed upon date or provide an acceptable alternate date in writing, we may deny your application for amendment under the provisions of Title 10 of the *Code of Federal Regulations*, Section 2.108. Please also note that review efforts on this task are continuing and additional RAIs may be forthcoming.

The NRC staff has determined that Enclosure 1 to this letter contains proprietary information pursuant to 10 CFR 2.390. Accordingly, the staff has prepared a redacted, publicly available, non-proprietary version (Enclosure 2).

If you have any questions, please contact Robert L. Gladney at 301-415-1022 or Robert.Gladney@nrc.gov.

Sincerely,

Robert L. Gladney for

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-389

Enclosures:
1. Request for Additional Information (non-public)
2. Request for Additional Information (public)

cc w/Enclosures 1 and 2: Addressee only

cc w/Enclosure 2: Distribution via Listserv

<u>REQUEST FOR ADDITIONAL INFORMATION</u>

<u>REGARDING LICENSE AMENDMENT REQUEST AND EXEMPTION REQUEST</u>

<u>TO ALLOW THE TRANSITION TO AREVA FUEL</u>

<u>FLORIDA POWER & LIGHT COMPANY</u>

<u>ST. LUCIE PLANT, UNIT NO. 2</u>

<u>DOCKET NO. 50-389</u>

Proprietary information pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.390 has been redacted from this document.

Redacted information is identified by blank space enclosed within double brackets.

Enclosure 2

REQUEST FOR ADDITIONAL INFORMATION

REGARDING LICENSE AMENDMENT REQUEST AND EXEMPTION REQUEST

TO ALLOW THE TRANSITION TO AREVA FUEL

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT, UNIT NO. 2

DOCKET NO. 50-389

By letter dated December 30, 2014, as supplemented by letters dated March 23, 2015; June 2, 2015; and July 30, 2015 (Agencywide Documents Access and Management System Accession Nos. ML15002A091, ML15084A011, ML15161A316, and ML15219A184, respectively), Florida Power & Light Company (FPL, the licensee) requested an amendment to the Technical Specifications (TSs) of Renewed Facility Operating License No. NPF-16 and asked for an exemption from the regulation for St. Lucie Plant, Unit No. 2 (SL-2). The proposed amendment would revise the TSs to allow the use of AREVA fuel at SL-2. Additionally, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.12, FPL requests an exemption from the provisions of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems [ECCSs] for light-water nuclear power reactors," and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," to allow the use of M5 fuel rod cladding in future core reload applications for SL-2.

SL-2 plans to transition to AREVA fuel beginning with Cycle 23. SL-2 is currently operating in Cycle 21 and uses Westinghouse Combustion Engineering (CE) 16x16 fuel. The proposed amendment would allow SL-2 to transition to AREVA CE 16x16 HTP fuel design. Transitioning to AREVA CE 16x16 HTP fuel requires TS changes. The proposed changes include the use of M5 fuel rod cladding, which needs to be included in the specification of fuel assembly design, removal of a linear heat rate surveillance requirement when operating on the excore detector monitoring system, and the inclusion of AREVA's U.S. Nuclear Regulatory Commission's (NRC's)-approved analysis methods in TS 6.9.1.11, "Core Operating Limits Report (COLR)," to support operation with the AREVA fuel. These analysis methods will be used for neutronics, fuel mechanical, thermal-hydraulics, and reload safety analyses.

The NRC staff is reviewing FPL's submittal and has determined that additional information is needed to complete its evaluation of the proposed change. The following provides the request for additional information (RAI).

SNPB

The Nuclear Performance and Code Review Branch (SNPB) has reviewed the following documents:

- L-2014-366, Letter to USNRC, "Application for Technical specification Change and Exemption Request Regarding the Transitioning to AREVA Fuel," FPL, December 30, 2014. (Enclosure 1: Attachment 1, Attachment 2, Attachment 3, Attachment 4 and Attachment 5).
- ANP-3352P, Revision 0, "St. Lucie Unit 2 Fuel Transition License Amendment Request – Technical Report," AREVA Inc., December 2014.
- ANP-3347P, Revision 0, "St. Lucie Unit 2 Fuel Transition Chapter 15 Non-LOCA [Loss-of-Coolant Accident] Summary Report," AREVA, Inc., December 2014, (Sections 2.0, 4.6, 4.18, 4.19, and 4.25).
- ANP-3345P, Revision 0, "St. Lucie Unit 2 Fuel Transition Small Break Summary Report," AREVA, December 2014.

The following RAI for the license amendment request (LAR) is based on several regulatory and technical requirements, as well as NRC's review criteria, which are listed as follows:

1. 10 CFR 50.36, "Technical Specifications," establishes regulatory requirements related to the content of the TSs to include items such as safety limits, limiting safety system settings, limiting conditions of operation, surveillance requirements, design features, and administrative controls.
2. General Design Criteria (GDC) 10, "Reactor Design," as it relates to assuring that the specified acceptable fuel design limits (SAFDL) are not exceeded during any condition of normal operation, including anticipated operating occurrences (AOOs).
3. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapters 4.2, 4.3, 4.4, and 15.

SNPB RAI-2

Section 2.1 of ANP-3352P indicates that AREVA CE-16 HTP fuel design is compatible with the co-resident fuel in the SL-2 core. Provide details of the compatibility analysis and evaluations that assure acceptable fit-up with SL-2 reactor core internals, fuel handling equipment, fuel storage racks, and co-resident fuel.

SNPB RAI-3

AREVA has used CE-16 HTP lead test assemblies (LTAs) at Palo Verde Nuclear Generating Station, Unit 1 (Palo Verde), and completed a lifetime irradiation before discharge and inspection. Provide the details of the inspection results as to their performance of these LTAs at Palo Verde.

SNPB RAI-4

Section 2.3.1 of ANP-3352P reports that the AREVA fuel design is compatible with the reactor components and the co-resident fuel in the core.

(a) Provide a detailed summary of the analysis results that confirms the mechanical and thermal compatibility of the AREVA fuel design with the co-resident fuel and the core internals. Hydraulic compatibility analysis should include the assessment of the impact of AREVA fuel on core flow distribution. Thermal compatibility analysis should evaluate the impact on departure from nuclear boiling ratio calculations due to the introduction of AREVA fuel.

(b) Provide summary results of the additional mechanical compatibility evaluations of the upper tie plate, the lower tie plate, and the center and corner guide tubes of the AREVA fuel assembly while in the SL-2 core.

SNPB RAI-5

Section 2.4.3.1 of ANP-3352P states that AREVA has developed correction factors to be incorporated into evaluations using the approved legacy code, RODEX2, to account for fuel thermal conductivity degradation with exposure effects. Provide details of the use of RODEX2 with correction factors (NRC-approved Reference 4 of ANP-3352P) for all applicable non-LOCA and LOCA analyses.

SNPB RAI-6

It is customary that for a mixed core such as SL-2 transition cores, the licensee performs a mixed core analysis if there are geometry differences between the resident and co-resident fuel designs. Provide details of the mixed core analysis that show that the resident fuel is compatible with the new fuel, despite geometrical differences between them.

SNPB RAI-7

Provide details of the relative axial positions between CE 16x16 and AREVA's CE 16x16 fuel bundles such as locations of spacer grids and straps and bottom/top of active fuel length.

SNPB RAI-8

Section 4.5.3 of ANP-3352P states that the impact of rod bow on the minimum departure from nucleate boiling ratio and peak linear heat rate was evaluated using the rod bow methodology described in Reference 27, which is XN-75-32(P)(A), Supplements 1,2, 3 and 4, "Computational Procedure for Evaluating Fuel Rod Bowing," October 1983.

(a) Considering the updates to rod bow analysis described in Section 3.9 of Topical Report (TR) BAW-10227P-A (February 2000) and Section 6.16 of TR BAW-10240(P)-A (May 2004), determine whether the legacy methodology above is still appropriately applicable to the AREVA's CE 16x16 fuel design with M5 cladding in analyzing rod bow impact on thermal margin analysis and provide an explanation.
(b) Explain how the rod bow analysis is performed for the transition mixed core at SL-2, specifically with the resident CE 16x16 fuel.

SNPB RAI-9

The following questions are related to the seismic and seismic/LOCA evaluations of AREVA CE 16x16, HTP, co-resident CE 16x16, and mixed core at SL-2 associated with its request for introduction of the new fuel. They are based on the relevant sections of ANP-3352P and ANP-3396P that were submitted to the NRC.

(a) ANP-3396P, Section 3.2 indicates that, "for St. Lucie Unit 2, the events were analyzed for a full core of the current fuel design, a full core of the AREVA CE 16x16 HTP fuel, and for a wide range of mixed core configurations, in order to verify that the limiting loads and deflections remain within acceptable fuel design limits." Provide a summary of the results from the above-mentioned analyses for the three different configurations of the SL-2 core.

(b) TR BAW-10133(P)(A) originally modeled a Mark-C fuel assembly for seismic and LOCA analyses. The licensee claims that Addenda 1 and 2 of this TR has demonstrated its acceptability for other generic pressurized-water reactor fuel assembly designs, including the CE 16x16 HTP fuel design. Table 3.1 of ANP-3396P for Nominal Beginning of Life Mechanical Design Data Comparison indicates significant differences in several listed parameters for CE 16x16 HTP and Mark-C fuel designs. Therefore, explain in detail how the differences are accounted for in the components testing.

(c) ANP-3396P states that additional testing and evaluations are included in the analyses to address this NRC Information Notice (IN) 2012-09. Provide detailed information on testing performed in response to IN 2012-09.

(d) Provide a detailed description of both the **[[** **]]** that are mentioned in the ANP-3396P report. Provide the results from the analysis that used the **[[** **]]** and explain in detail.

<u>SNPB RAI-10</u>
Section 2.8 of ANP-3347P, "St. Lucie Unit 2 Fuel Transition Chapter 15 Non-LOCA Summary Report," states that the RODEX2 code was used to establish the fuel centerline melt linear heat generation rate as a function of exposure and a penalty to address thermal conductivity degradation with burnup was applied where applicable. Provide details of the penalty applied and indicate which fuel performance, mechanical, and thermal models were affected.

The following questions, SNPB RAI-11 through SNPB RAI-20, regard ANP-3345P, "St. Lucie Unit 2 Fuel Transition Small Break LOCA Summary Report," and are needed to conclude whether or not this LAR provides acceptable results governed by 10 CFR 50.46; GDC 36 and 38; and NUREG-800, Chapter 15.

<u>SNPB RAI-11</u>
The analysis assumed symmetric injection into all four emergency core cooling (ECC) lines for the evaluation of the spectrum of cold leg breaks. Surveillance records routinely show that the ECC lines are rarely balanced symmetrically. As such, the line containing the maximum high pressure safety injection delivery rate is connected to the broken loop. Demonstrate that a perfect symmetry in ECC delivery rates to the ECC lines is valid for SL-2. Show that the delivery to the ECC lines supports the latest surveillance ECC flow measurement data. Also, verify that the appropriate error is applied to the head and flow conditions describing the ECC flow delivery curves.

SNPB RAI-12
As stated on page 3-5, [[ ]]. Describe how this is accomplished. Is this dynamically calculated by the code or is the broken loop suction leg forced to clear? Explain and show if any residual water is retained in the broken loop suction leg.

SNPB RAI-13
Show the secondary steam generator two-phase level versus time for the limiting 2.7 inch small break. Indicate the top of the tube bundle elevation in the plots. Does the auxiliary feedwater flow match system boil-off upon actuation? If not, and the bundle is exposed to vapor, does the model account for this potential behavior? Provide an explanation.

SNPB RAI-14
Provide the transient plots for the 2.6 and 2.8 inch breaks.

SNPB RAI-15
What charging flow is assumed and which loops are injecting in the break spectrum analyses?

SNPB RAI-16
Provide the heat transfer coefficient and steam temperature at the hot spot versus time for the 2.7 inch break. Also, show these plots for the 2.6 and 2.8 inch breaks.

SNPB RAI-17
What is the minimum Reactor Coolant System (RCS) pressure achieved for the 2.7 inch break around the 1,900 to 2,500 second time frame? [[ ]]. Provide an explanation.

SNPB RAI-18
Provide the moderator density feedback curve used in the analysis.

SNPB RAI-19
Provide the analysis of the effect of reactor coolant pump (RCP) operation on the limiting small break loss of coolant accident (SBLOCA) and identify the Emergency Operating Plan (EOP) timing for tripping RCPs following a SBLOCA.

SNPB RAI-20
Show the axial core void distribution at the time of peak clad temperature (PCT) for the 2.7 inch break. Also, provide this information for the 2.6 and 2.8 inch breaks.

SRXB

The following RAIs are from the Reactor Systems Branch (SRXB).

SRXB-RAI-1

Section 50.46 of 10 CFR requires that ECCS performance be calculated in accordance with an acceptable evaluation model, and uncertainty must be accounted for such that there is a high level of probability that the criteria would not be exceeded. The licensee provided ANP-3346P, Revision 0, "St. Lucie Unit 2 Fuel Transition Realistic Large Break LOCA [RLBLOCA] Summary Report," which does not contain the information needed by the staff to confirm that the AREVA RLBLOCA methodology has been implemented as described in TR EMF-2103(P)(A), "Realistic Large Break LOCA Methodology for Pressurized Water Reactors." Please provide, preferably in a table, the statistically sampled conditions, input data, etc. for the following parameters for all of the sampled break sizes:

1. Case number
2. Peak clad temperature (PCT)
3. Case end time
4. PCT elevation
5. Hot rod
6. Assembly burnup
7. Core power
8. Peak linear heat generation rate
9. Axial skew
10. Axial shape index
11. Break type
12. One sided break size
13. Minimum temperature (T min)
14. Initial stored energy
15. Decay heat multiplier
16. Film boiling heat transfer coefficient (HTC)
17. Dispersed flow film boiling HTC
18. Condensation interphase HTC
19. Initial RCS flow rate
20. Initial T cold
21. Pressurizer pressure
22. Pressurizer level
23. Safety injection tank (SIT) temp
24. SIT pressure
25. SIT liquid volume
26. Start of broken loop SIT injection
27. Start of intact loop SIT injection
28. Broken loop SIT empty time
29. Intact loop SIT empty time
30. Start of high pressure safety injection flow
31. Start of low pressure safety injection flow
32. Beginning of refill time
33. End of refill time/start of reflood
34. Beginning of bypass time

35. Time of annulus downflow/end of bypass
36. Containment pressure at time of PCT
37. Containment volume
38. Refueling water storage tank temperature

Principal Contributors: M. Panicker
J. Whitman

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Sincerely,

/RA by RGladney for/

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-389

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2. Request for Additional Information (public)

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DATE	9/4/15	9/4/15	9/4/15

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