Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

December 27, 2011

L-2011-524
10 CFR 50.90

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

Re: St. Lucie Plant Unit 2
Docket No. 50-389
Renewed Facility Operating License No. NPF-16

Response to NRC Steam Generator Tube Integrity and Chemistry Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2011-021), "License Amendment Request for Extended Power Uprate," February 25, 2011, Accession No. ML110730116.

(2) Email from T. Orf (NRC) to C. Wasik (FPL), "St. Lucie 1 EPU - draft RAIs SG Tube Integrity and Chem. Engineering Branch (CSGB)," October 28, 2011.

By letter L-2011-021 dated February 25, 2011 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. NPF-16 and revise the St. Lucie Unit 2 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level. This represents an approximate increase of 11.85% and is therefore considered an extended power uprate (EPU).

By email from the NRC Project Manager dated October 28, 2011 [Reference 2], additional information related to Metamic™ inserts was requested by the NRC staff in the Steam Generator Tube Integrity and Chemical Engineering Branch (CSGB) to support their review of the St. Lucie Unit 1 EPU License Amendment Request (LAR). Subsequent conversations with the NRC Project Manager requested that the St. Lucie Unit 1 RAIs also be applied to the St. Lucie Unit 2 EPU LAR. The request for additional information (RAI) identified six questions. The response to these RAIs is provided in the attachment to this letter.

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NRR

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2011-021 [Reference 1].

This submittal contains no new commitments. However, the attachment to this letter contains a revision to the EPU LAR commitment pertaining to the spent fuel pool Metamic™ insert surveillance program. In accordance with the manufacturer's recommendations, FPL is revising the EPU LAR Attachment 5, Section 2.8.6.2.2.6 commitment related to physical measurement inspections. FPL will perform physical measurement inspections on coupons, not on the Metamic™ inserts as previously committed.

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the designated State of Florida official.

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-467-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on 27 - December - 2011

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachment

cc: Mr. William Passetti, Florida Department of Health

Response to NRC Steam Generator Tube Integrity & Chemical Engineering Branch Request for Additional Information

The following information is provided by Florida Power & Light Company (FPL) in response to the U. S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI). This information was requested to support the review of the Extended Power Uprate (EPU) License Amendment Request (LAR) for St. Lucie Unit 2 that was submitted to the NRC by FPL via letter L-2011-021 dated February 25, 2011 (Accession Number ML110730116).

In an email dated October 28, 2011 from T. Orf (NRC) to C. Wasik (FPL), Subject: St. Lucie 1 EPU - draft RAIs SG Tube Integrity and Chem. Engineering Branch (CSGB), the NRC staff requested additional information regarding FPL's request to implement the St. Lucie Unit 1 EPU. Subsequent conversations with the NRC Project Manager requested that the St. Lucie Unit 1 RAIs also be applied to the St. Lucie Unit 2 EPU LAR. The RAI consisted of six questions from the NRC's Steam Generator Tube Integrity & Chemical Engineering Branch (CSGB). These six RAI questions and the FPL responses are documented below.

CSGB-4

The letter submitted on November 22, 2010 cites Holtec Report HI-2043215, Source for Metamic Performance Assessment, Revision 1. Please provide this report.

Response

Holtec International (Holtec) has submitted Holtec Report HI-2043215 Revision 3, "Sourcebook for Metamic Performance Assessment" (Proprietary), directly to the NRC Document Control Desk via Holtec letter dated December 2, 2011. This is the latest revision and was used to support the EPU LAR as stated in FPL letter L-2011-466, "Revision to Extended Power Uprate License Amendment Request Proposed Technical Specification 5..6, Design Features – Fuel Storage – Criticality," November 4, 2011 (ML11314A111), Attachment 3, Holtec Report No. HI-2104753, Rev. 2, "St. Lucie Unit 2 Technical Specification Section 5.6 Design Features – Fuel Storage – Criticality Revision to Proposed Change Submitted by FPL Letter L-2011-021 Regarding Extended Power Uprate License Amendment Request," Section 10, Reference 18.

CSGB-5

Provide a description of how the Metamic ™ inserts will be manufactured:

a. **Specifically, will the inserts be a formed insert design, welded design, a combination design incorporating both techniques, or a separate technique from the ones listed.**

b. **Additionally, how will the surveillance program capture all of the areas of interest in the different design types of inserts used (i.e., base material, welds, heat affected zones, bend areas, galvanic coupling).**

Response

a. The inserts are a combination design. For each insert, a single Metamic™ panel is formed into a chevron cross-section with an inward-projecting top flange. No welding of or to Metamic™ is performed. A head piece (landing element) made from several aluminum parts is attached to the top flange of the formed Metamic™ using a pinned connection.

b. As discussed in the EPU LAR Attachment 5, Section 2.8.6.2.2.6, the surveillance program consists of three major parts; visual inspection, physical measurements and neutron attenuation testing. The surveillance program is discussed in more detail in the response to RAI CSGB-7. The items listed in RAI question 5.b. are covered by the visual inspection program. Five inserts are selected for the visual inspection. The visual in-service inspection method will be a camera-aided visual examination of the insert base material, its edges, regions of the insert where base material has been formed (i.e., bent to shape), as well as any connection to the base metal. Non-welded connections will also be examined. Interior and exterior bend radii and front and back faces of the insert will be inspected. Visual examination is sufficient to detect evidence of galvanic coupling, cracking, corrosion pitting or other gross damage. As there are no welds to the Metamic material, there are no welds or heat affected zones requiring inspection.

CSGB-6

Specify the following:

a. **Material composition of the Metamic™ inserts (i.e. weight percent of boron carbide, type of aluminum alloy used in the Metamic™, and the areal density of the B-10),**

b. **Physical dimensions of the inserts,**

c. **Material of the landing element,**

d. **The weld material to be used to attach the Metamic™ panel to the landing element,**

e. **The type of weld used to attach the panel to the landing element.**

Response

a. The Metamic™ used for the inserts shall have a boron carbide weight percentage of 24.5% minimum. Alloy 6061 aluminum powder is used in the manufacture of Metamic™. The areal density of B-10 in the inserts shall be 0.0160 gm/cm^2 nominal and 0.0150 gm/cm^2 minimum.

b. The overall length of the inserts is approximately 156.5 inches. The cross-section width of the inserts is approximately 8.3 inches square. The Metamic™ panel thickness is nominally 0.070 inches thick.

c. The landing element material is constructed from 6061-series aluminum.

d. The formed Metamic™ panel is attached to the head piece (landing element) using a pinned connection. The top flange of the formed Metamic™ panel is sandwiched between upper and lower aluminum pieces. There are four aluminum pins, passing through holes in the top flange of the Metamic™ panel, which are welded to the upper and lower aluminum pieces. There is no welding of or to Metamic™.

e. The formed Metamic™ panel is attached to the head piece (landing element) using a pinned connection. There is no welding of or to Metamic™.

CSGB-7

For each element of the surveillance program (visual inspection, physical measurement, and neutron attenuation testing), provide details on how the results from the performance of that element will measure the expected material performance.

The details should include, at a minimum, the following:

a. **The number of inserts to be examined during each surveillance and the criterion for expansion of the number of inserts to be examined during that surveillance and future surveillances,**

b. **The selection criteria for the inserts inspected/measured and rationale for their selection,**

c. **Detailed description of how of each element will be performed,**

d. **Acceptance criteria and the bases for these criteria.**

Response

a. As described in EPU LAR Attachment 5, Section 2.8.6.2.2.6, the visual inspections will be at 4, 8, 12, 20, and 30 years after initial installation and the physical measurement inspections and neutron attenuation testing will be at 4, 12, 20 and 30 year intervals. FPL intends to schedule Metamic™ insert surveillance campaigns to avoid refueling intervals and periods when fresh fuel is stored in fuel pool racks in preparation for refueling.

   In-service inspections will be performed on installed Metamic™ inserts and coupons; with five inserts selected for visual inspection.

   In accordance with the manufacturer's recommendations, FPL is revising the EPU LAR Attachment 5, Section 2.8.6.2.2.6 commitment related to physical measurement inspections. FPL will perform physical measurement inspections on coupons, not on the Metamic™ inserts as previously committed. Two coupons will be used for both physical measurement inspections and neutron attenuation testing.

   Should insert anomalies be noted on the visual inspections, then an additional set of five inserts will be inspected. Issues identified during the visual inspections will be included in the FPL corrective action program for investigation and resolution.

   Should physical measurement inspections of the coupons result in a failure to meet acceptance criteria for thickness, then an additional two coupons will be inspected. Issues identified during physical measurements inspection will be included in the FPL corrective action program for investigation and resolution.

   Should a coupon failure to meet acceptance criteria during neutron attenuation testing, then an additional two coupons will be tested. Issues identified during neutron attenuation testing will be included in the FPL corrective action program for investigation and resolution.

   Should Metamic™ inserts no longer be required for control of neutron multiplication within the spent fuel pool (e.g., as a result of vacating the fuel pool to dry storage), insert surveillance and inspections may be terminated.

b. Metamic™ inserts inspected as part of the initial surveillance campaign will be selected by considering the following criteria and generally selecting the most challenging conditions:

- Results of pre-installation inspections (e.g., select inserts that have pre-existing conditions),
- Experience gained during installation (e.g., select inserts that required higher insertion or removal forces),
- Spatial variations in cooling water flow within the pool, specifically considering effects of the fuel pool cooling system suction and discharge piping,
- Storage arrangements and the characteristics of fuel assemblies adjacent to each insert, especially heat generation rates,
- Noteworthy or unique aspects of St Lucie fuel pool-related operating experience during the in-service interval, such as atypical water chemistry or impact by a foreign object, and
- Relevant operating experience from other plants.

The coupon selection criteria is discussed in the response to CSGB-8.

Development of follow-on inspection campaigns will be determined by results from this initial in-service inspection. Some of the same sample of inserts/coupons may be included in future in-service inspections.

c. The visual in-service inspection method will be a camera-aided visual examination of the insert base material, its edges, regions of the insert where base material has been formed (i.e., bent to shape), as well as any connection to the base metal. Non-welded connections will also be examined. Interior and exterior bend radii and front and back faces of the insert will be inspected. Visual examination is sufficient to detect evidence of cracking, corrosion pitting or other gross damage. Inspections may be performed on inserts underwater, after they have been removed from their storage rack cell location, or inserts may be temporarily removed from the fuel pool water, if radiation and surface contamination levels permit.

Physical measurement inspections (length, width, thickness, and weight) and neutron attenuation testing will be performed on the Metamic™ coupons. In accordance with manufacturer's recommendations, two coupons will be inspected at each surveillance interval.

d. The acceptance criteria and the bases for these criteria include the following:

- As discussed in the EPU LAR Attachment 5, Section 2.8.6.2.2.6, visual inspection of Metamic™ inserts is performed to assess the physical condition of the material. Key goals of these inspections are to identify any surfaced-based abnormalities, such as, through-wall corrosion/damage, bubbling, blistering, corrosion pitting, cracking, or flaking.
- Of the physical measurement inspections (length, width, thickness, and weight), the most important is the thickness measurement as a monitor of potential swelling. The acceptance criterion is based on manufacturer's recommendations and is that an increase in thickness at any point should not exceed 25% of the initial thickness at that point. The remaining measurement parameters (length, width, and weight) serve a supporting role and should be examined for early indications of the potential onset of

neutron absorber degradation, if any, that would suggest the need for further attention and possibly a change in the measurement schedule. This is consistent with manufacturer's recommendations.

- The acceptance criteria for neutron attenuation testing specified in the proposed Technical Specifications (TS). Proposed TS 5.6.1.a.6 contains the acceptance criteria for neutron attenuation testing and states that B-10 areal density is to be greater than or equal to 0.015 grams B-10 per square centimeter as stated in FPL letter L-2011-466, "Revision to Extended Power Uprate License Amendment Request Proposed Technical Specification 5.6, Design Features – Fuel Storage – Criticality," November 4, 2011 (ML11314A111).

Failure to meet the acceptance criteria for either of these two physical measurement parameters (coupon thickness or B-10 areal density) requires investigation and engineering evaluation and early retrieval and measurement of two additional coupons to provide corroborative evidence that the indicated change(s) is real. If the deviation is determined to be real, an engineering evaluation shall be performed to identify further testing or any corrective action that may be necessary.

CSGB-8

Provide the location(s) in the spent fuel pool where the Metamic™ coupons will be placed and a rationale for that location.

Response

The coupon surveillance program will monitor how the Metamic™ absorber material properties change over time under the radiation, chemical and thermal environment found in the spent fuel pool (SFP) to ensure that the physical and chemical properties of Metamic™ behave in a similar manner as that found in the Metamic™ qualification data.

A coupon tree will be installed that holds 10 coupons in the SFP. The coupons are identical in composition and manufacturing process as the Metamic™ inserts. The coupon tree will be placed in a SFP cell in a location that will ensure a representative dose to the coupons. In addition, this location will simulate the flow characteristics, and pool chemistry that the Metamic™ inserts placed in the SFP will experience. The cell location will be in Region 2 of the SFP which typically has highly burned permanently discharged fuel.

CSGB-9

Provide details about baseline examinations that will be performed on the Metamic™ inserts prior to being placed in the spent fuel pool (i.e. areal density, dimensional measurements, weight, visual inspections, and photographs). In addition, discuss whether the baseline inspections will be performed at the fabrication facility, at the site, or at both locations.

Response

Baseline examinations will be performed at the fabrication facility and include determination of B_4C weight percentage, dimensional measurements, weight measurement, visual examination for any Metamic™ panel defects (inclusions, cracks, etc.), and operability checks (interface with handling tool). The following physical measurements are made:

Dimensional Measurement	Information Recorded
Insert length	As-Found Values
Metamic™ panel width	As-Found Values
Metamic™ thickness	As-Found Values
Metamic™ panel longitudinal bend radius	Pass/Fail
Metamic™ panel bend angle	Pass/Fail

A panel map is made to document any observed panel defects. Results of all baseline examinations are recorded in the inserts documentation package for future availability.