FPL

10 CFR 50.90
L-2006-259
NOV 28 2006

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington D. C. 20555

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
License Amendment Request No. 178 - Spent Fuel Pool Boraflex Remedy
Response to NRC Request for Additional Information

By letter L-2005-247 dated January 27, 2006, Florida Power and Light Company (FPL) submitted a license amendment request to revise the Turkey Point Unit 3 and 4 Technical Specifications (TS). The change would eliminate the need to credit Boraflex™ neutron absorbing material for reactivity control in the spent fuel pools by the use of analyzed new spent fuel storage patterns and the use of Metamic™ rack inserts.

By letters dated August 8, 2006 and October 24, 2006, Nuclear Regulatory Commission (NRC) staff issued requests for additional information (RAI) to support the license amendment request review. Attached is the FPL reply to those RAIs. The original No Significant Hazards Consideration Determination remains valid with the information provided herein and no revision of the requested TS changes is involved.

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

Should there be any questions concerning the information contained herein, please contact James Connolly at (305) 246-6632.

I declare under penalty of perjury that the foregoing is true and correct.

Very truly yours,

NOV 28, 2006
Executed on

Terry O. Jones
Vice President
Turkey Point Nuclear Plant

Attachments: 1) Response to NRC RAI dated August 8, 2006
2) Response to NRC RAI dated October 24, 2006

cc: Regional Administrator, Region II, USNRC
USNRC Turkey Point Project Manager
Senior Resident Inspector, USNRC, Turkey Point
W. A. Passetti, Florida Department of Health

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Attachment 1
Florida Power and Light Company (FPL) Response to
NRC Request for Additional Information Dated August 8, 2006
Regarding License Amendment Request No. 178
Spent Fuel Pool Boraflex Remedy

NRC Question:

1. Section 2.1, "Technical Specification Changes," of Attachment 1, page 8 of 36, describes the addition of Surveillance Requirement (SR) 4.9.14.2 to perform visual inspection of representative sample of Metamic™ inserts. Specifically, Attachment 5, "Retyped Technical Specifications," page 3/4 9-15, SR 4.9.14.2, states:

> A representative sample of inservice Metamic™ inserts shall be visually inspected in accordance with the Metamic™ Surveillance Program described in UFSAR [Updated Final Safety Analysis Report] Section 16.2. The surveillance program ensures that the performance requirements of Metamic™ are met over the surveillance interval.

Based on the staff's safety evaluation dated June 17, 2003 (ML031681432), the use of Metamic™ in the spent fuel pool is conditioned upon a coupon sampling program to ensure consistent performance with that described in Holtec Report HI-2022871, "Use of Metamic™ in Fuel Pool Applications." SR 4.9.14.2 indicates that a Metamic™ Surveillance Program will visually inspect a sample of the Metamic™ inserts used in the spent fuel storage racks.

a. Provide the details of this program ensuring expected material performance. The details should include, at a minimum, the following:

- the selection criteria for the inserts inspected,
- the methods of inspection and its basis,
- the surveillance schedule and the basis for the frequency of the surveillance,
- the acceptance criteria and the bases for these criteria, and
- the actions to be taken as a result of not meeting the acceptance criteria.

FPL Response:

The staff's safety evaluation dated June 17, 2003 (ML031681432) conditions the use of Metamic in the spent fuel pool upon a coupon sampling program to ensure consistent performance with that described in Holtec Report HI-2022871, "Use of Metamic in Fuel Pool Applications." The Holtec report describes various tests on Metamic; demonstrating its viability as a neutron poison material in wet storage applications. The following were concluded from these tests:

- Physical properties including material appearance, dimensional stability, material density, boron-10 areal density, and mechanical properties (e.g., tensile strength and hardness) were essentially unaffected following short-term and long-term exposure to elevated temperatures.

- In-service corrosion resistance of Metamic was dependent on the amount of post-manufacture surface contamination. Some minor surface pitting was noted due to the presence of surface contaminants introduced during manufacture or welding. Proper surface preparation via glass-beading or chemical cleaning was recommended to prevent surface pitting.

- Testing demonstrated that physical properties such as dimensional stability, boron-10 areal density, and important mechanical properties were essentially unaffected by radiation.

Based on the above, corrosion pitting was the only noted impact on the Metamic samples. Therefore, the FPL surveillance program will focus on identifying and mitigating corrosion pitting on the Metamic inserts. Rather than relying upon Metamic coupons as surrogates for surveillance, in-service inspections will be performed on installed Metamic inserts. A response to each of the requested details is provided below.

- the selection criteria for the inserts inspected,

  It is anticipated that Metamic™ rack inserts will be installed at each Turkey Point nuclear unit. Based on this expectation, at least five inserts will be inspected during each surveillance campaign conducted at a particular unit. Metamic rack 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 site receipt and pre-installation inspections (e.g., select inserts that have more pre-existing conditions),

  - Experience gained during installation (e.g., select inserts that required higher insertion or removal forces),

- Post-installation, the spatial distribution of inserts in Region II racks and within the individual storage rack modules,
- 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 proximate to each insert, especially heat generation rates,
- Noteworthy or unique aspects of Turkey Point fuel pool-related operating experience during the in-service interval, such as atypical water chemistry or impact by a foreign object,
- Relevant operating experience from other plants.

Development of follow-on inspection campaigns will be determined by results from this initial in-service inspection. Unless there are extenuating circumstances, at least some of the same sample of inserts will be included in future in-service inspections.

- the methods of inspection and its basis,

The 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 Metamic-to-Metamic or Metamic-to-aluminum welds. Non-welded connections made to facilitate fabrication will also be examined. Both interior and exterior bend radii and the insert's front and back faces will be examined by a VT-1 qualified inspector. 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.

As noted in the Holtec and EPRI reports, the B_4C in Metamic is contained within a solid (fully densified) and stable matrix that was demonstrated to be unaffected by the spent fuel pool environment. The only concern dealt with surface corrosion potentially due to surface impurities. As such, visual inspection is adequate to detect evidence of corrosion pitting as well as cracking or gross damage.

- the surveillance schedule and the basis for the frequency of the surveillance

The initial post-installation surveillance campaign to assess Metamic inserts will occur after approximately four years[1] of in-pool service. Separate follow-on inspection campaigns will be undertaken at each Turkey Point unit with inspection dates keyed to the installation of inserts at that unit. The inspections will be at 4, 8, 14, 20, and 30 years after initial installation. Should Metamic inserts no longer be required for control of neutron multiplication within either spent fuel pool (e.g., as a result of vacating the fuel pool to dry storage), insert inspections may be terminated.

Per the EPRI Technical Report on "Qualification of METAMIC for Spent-Fuel Storage Application", Metamic had undergone accelerated corrosion testing of up to 9020-hours at 195°F resulting in minimal impact on mill finished Metamic coupons. The 9020-hours of accelerated corrosion testing is estimated to be equivalent to approximately 20 years at 80°F in a typical wet storage scenario. Based on the cleaned, mill-finish on the proposed Metamic inserts, a conservative initial inspection interval of four years was selected[2].

- the acceptance criteria and the bases for these criteria, and

Visual examination of Metamic inserts shall consider acceptance criteria of no through-wall corrosion or damage and general structural soundness (e.g., no cracks in base material or welds). As discussed in FPL's license amendment submittal, analyses of damaged insert conditions that bound this acceptance criteria have been performed as described below:

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1 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.

2 Section 3.8.2 of the license amendment request identified a four year initial surveillance interval based on a three-year long experimental study simulating limiting environmental conditions in wet and dry storage with no anomalous behavior observed. Upon further review it was noted that while there was a three-year long program consisting of many tests of shorter durations, there was no continuous test extending for the period of three-years. However, the EPRI accelerated corrosion testing provides sufficient basis for the four-year initial surveillance interval.

1. a scenario where multiple Metamic inserts sustained localized damage (i.e., a 3-inch through-wall hole within each panel),

2. a scenario where multiple inserts experience damage such as might result from corrosion over a large fraction of each panel's surface area (i.e., panel thickness reductions equivalent to a total loss of 1 cubic inch of Metamic per panel), and

3. a scenario involving more typical insert damage such as might result from an unsatisfactory cell insertion or withdrawal evolution (i.e., a 0.25 inch wide through-wall gouge the full length of the panel).

Analyses of the above three damaged insert configurations in an infinite array resulted in negligible impact on fuel pool reactivity. The proposed inspection interval is sufficient to ensure that corrosion damage to the extent described in the first two scenarios will not occur. Limitations on insertion and removal forces would preclude damage as described in the third scenario. The visual acceptance criteria are set to bound the analyzed conditions. This defense-in-depth ensures that there will always be margin to the reactivity criterion. Therefore, failure to meet the acceptance criteria would have negligible impact on fuel pool reactivity.

- the actions to be taken as a result of not meeting the acceptance criteria.

Should a Metamic insert fail to meet the visual inspection acceptance criteria, it will be promptly removed from service and a replacement will be inserted. The damaged insert will be examined and if necessary, tested to determine the cause of failure. The sample population will be expanded pending determination of the failure cause (see response to item 3(c) of the supplemental RAI). As discussed above, analyses of damaged insert configurations have resulted in negligible impact on fuel pool reactivity. As the acceptance criteria are set significantly below the analyzed conditions, this defense-in-depth ensures that there will always be margin to the reactivity criterion.

b. Provide a copy, if available, of the proposed UFSAR Section 16.2 that will describe this program.

The proposed UFSAR section is not currently available. This section is usually prepared as part of our Plant Change Modification (PC/M) package once the license amendment has been approved. This ensures that all the requirements and conditions stipulated within the NRC Safety Evaluation Report are incorporated. The Metamic surveillance program will be incorporated in the UFSAR.

NRC Question:

2. Based on the following information in the submittal, it appears that the design of the rack insert has not been finalized.

   - The second bullet on page 35 of 36 in Section 3.8.2, "Metamic Surveillance Program," of Attachment 1, states, "If the manufacture process includes welding, the entirety of each weld is available for examination instead of inferring behavior from small coupon welds..."

   - The last sentence on page 2-7 of Attachment 9, Holtec Report HI-043149 (Proprietary), "Boraflex Remedy at Turkey Point Nuclear Plant for FPL," states, "The Metamic inserts may be manufactured by forming operations or by welding contiguous panels and the landing element as shown in Figure 2.5.1."

   Please provide the following information:

   a. Clarify that the amendment request is for review and approval of applying either rack insert design (i.e., mill-finished formed panels of Metamic™ or mill-finished Metamic™ panels welded to a landing element).

   b. Specify the following:

      (1) weight percent of boron carbide in the Metamic panels,
      (2) material of the landing element,
      (3) the weld material to be used to attach the Metamic™ panel to the landing element, and
      (4) the type of weld used to attach the panel to the landing element.

   c. Discuss how the elements of the Metamic Surveillance Program will differ with respect to the rack insert design (e.g., inspection of welded joint) and provide details in concert with Question 1.

d. Discuss the results of testing completed on "formed" or bent specimens to demonstrate that the stresses induced will not impact the integrity or functionality of the material. If test data are not available, discuss how the elements of the Metamic Surveillance Program account for this design.

e. Discuss the results of testing completed on the welded specimens, similar to the proposed design, to demonstrate that the elements of the Metamic Surveillance Program are sufficient to ensure adequate material performance. If test data are not available, discuss how the elements of the Metamic Surveillance Program account for this design.

FPL Response:

FPL has successfully manufactured the welded version of the Metamic insert. The ability to fabricate the inserts was a prerequisite for submitting the license amendment request. During fabrication, welding of Metamic was noted to be a difficult and slow process. Other techniques such as forming via hot bending have recently been identified and are being developed for fabrication of Metamic inserts. FPL believes it is prudent to proceed with a remedy for the Boraflex degradation to ensure adequate fuel pool storage capacity while specific details of the manufacturing process are being optimized. A response to each of the requested details is provided below.

a. Clarify that the amendment request is for review and approval of applying either rack insert design (i.e., mill-finished formed panels of Metamic^{TM} or mill-finished Metamic^{TM} panels welded to a landing element).

This license amendment request is for review and approval of a formed insert design, a welded design, and a design incorporating both techniques[3] (i.e., formed and welded). These inserts will utilize mill-finished Metamic panels as the neutron poison material. Functionally, these designs place Metamic material in an "L" shaped chevron in between the fuel assembly and the cell wall. Coverage of active fuel will be identical with all designs. These designs rest passively on top of the fuel assembly. There is no functional difference between any of these insert designs. Analyses were performed to qualify the welded design for use in the spent fuel pool. While welding of Metamic lowers the

[3] Reference to fabrication techniques, such as welding or forming, applies to operations on the Metamic material.

material tensile strength as compared to the base material, there was more than sufficient strength for the low seismic and operational loads required for an insert. A formed insert is inherently stronger than its welded counterpart and so it is also adequate for this low stress application. In licensing these designs, FPL can utilize the most efficient and economical method for manufacturing.

b. Specify the following:

(1) weight percent of boron carbide in the Metamic panels,

FPL proposes to license a nominal boron-10 areal density of 0.016 g/cm^2 (0.015 g/cm^2 minimum) for use in Metamic inserts at Turkey Point. These values ensure conformance with criticality analysis assumptions. For a Metamic panel having a nominal thickness of 0.073 inch, a B_4C loading of 22.5 weight percent would satisfy areal density requirements. Other combinations of B_4C loadings and Metamic panel thicknesses could also meet the boron-10 areal density requirements. As necessary, FPL may vary the panel thickness and the corresponding B_4C loading to facilitate manufacturing, while continuing to meet analysis requirements. Regardless of any variation, FPL will not exceed the 31 weight percent boron carbide limitation specified within the Staff's safety evaluation dated June 17, 2003 (ML031681432).

(2) material of the landing element,

The landing element (head piece) of the welded Metamic insert is an aluminum strip with three aluminum attachment blocks. The head piece is constructed of Al 6061 material. The Metamic panels are welded to the aluminum head piece.

(3) the weld material to be used to attach the Metamic™ panel to the landing element, and

ER4043 filler material is used to weld the Metamic panel to the attachment strip and the attachment blocks to the strip. ER4043 is recommended for welding 6061 aluminum which is the primary constituent of Metamic.

(4) the type of weld used to attach the panel to the landing element.

Manual Gas Tungsten-Arc Welding (GTAW) is used for welding on Metamic material. Full penetration grooved welds 1-5/8 in. long spaced 3-1/2 in. apart are used to attach the Metamic panel to attachment strip.

c. Discuss how the elements of the Metamic Surveillance Program will differ with respect to the rack insert design (e.g., inspection of welded joint) and provide details in concert with Question 1.

Generally, the Metamic Surveillance Program for the formed inserts will be the same as the program for welded inserts, except there will be no welds to inspect, as the formed design replaces welds with a number of small radius bends. In a formed design, material near both interior and exterior bend radii will be visually examined for cracking, deformation, corrosion pitting and other surface-based defects. With a welded design, areas near welds on external surfaces[4] will be inspected for cracking or voids, excessive discoloration, corrosion pitting and other surface-based flaws. As earlier noted, the surfaces, edges and relevant hardware attachments of a sample of installed Metamic inserts will be periodically examined as part of a camera-aided visual inspection program; these aspects are unaffected by the insert's welded or formed characteristics. Anomalies identified during inspection will be noted on a log sheet, field sketch or added to a photographic record.

Features of an insert having both formed and welded aspects will each be subjected to the appropriate inspection.

d. Discuss the results of testing completed on "formed" or bent specimens to demonstrate that the stresses induced will not impact the integrity or functionality of the material. If test data are not available, discuss how the elements of the Metamic Surveillance Program account for this design.

Prototype testing of "formed" or bent Metamic inserts has not been performed. The critical attribute of the "formed" or bent insert is to provide a tight radius in the longitudinal bend. This is required to fit the insert between the fuel assembly and the cell walls. Bending of this nature could induce cracks and fractures within the base material. Therefore, qualification of the "forming" or bending process will require non-destructive examination (NDE) of the inside and outside of bend area to verify the absence of cracks

[4] As discussed here, external surfaces are those that can be observed without disassembly or destructive examination of the insert.

or fractures. The bend radii of Metamic tabs facilitating the means for attachment are less restrictive and therefore have lower induced stress. However, NDE of all bend areas will be performed to verify the absence of cracks or fractures. During production, critical bend areas in all formed Metamic inserts will be verified to be free of cracks and fractures prior to release. Analyses have shown that operational and seismic loads on Metamic inserts are very low. Therefore, the initiation or propagation of cracks and fractures is unlikely. As described in the response to item 1 above, visual examination of the sample population of Metamic inserts will be performed to verify the absence of cracks or fractures. Other than verification of the forming process, no other prototype testing is anticipated.

e. Discuss the results of testing completed on the welded specimens, similar to the proposed design, to demonstrate that the elements of the Metamic Surveillance Program are sufficient to ensure adequate material performance. If test data are not available, discuss how the elements of the Metamic Surveillance Program account for this design.

Prototype testing of welded specimens similar to the proposed design has not been performed. However, individual aspects of the proposed welded design have been successfully tested. Qualification testing of the Metamic welds demonstrated that the strength of the resultant bond was more than adequate for the analyzed operational and seismic loads. While specific corrosion testing of the Metamic welds has not been performed, the corrosion resistance of 6061 aluminum is widely known and was demonstrated during the EPRI and Holtec testing. Corrosion resistance of welds involving Metamic is highly dependent on the presence of surface contamination. The manufacturing of Metamic inserts specify cleaning of all welds by stainless steel brush, aluminum oxide sanding disk/grinding wheel, and/or organic cleaning solvents, as necessary to remove weld and surface residue. The surveillance program for Metamic inserts includes visual inspection of all Metamic welds within the sample population. The surveillance interval is more than sufficient to detect corrosion issues prior to weld failure. No additional prototype testing of welded specimens is anticipated.

Attachment 2
Florida Power and Light Company Response to
NRC Request for Additional Information Dated October 24, 2006
Regarding License Amendment Request No. 178
Spent Fuel Pool Boraflex Remedy

By letter dated January 27, 2006 (ML060900250), Florida Power and Light Company (the licensee) submitted a request for review and approval of an amendment to the Turkey Point Unit 3 Operating License (DPR-31) and Turkey Point Unit 4 Operating License (DPR-41). The proposed amendments would revise Technical Specification Section 3/4.9.1-Boron Concentration. 3/4.9.14-Spent Fuel Storage, and 5.5.1-Criticality, to include new spent fuel storage patterns and the use of Metamic™ rack inserts. A request for additional information (RAI) dated August 8, 2006 (ML062180074), was forwarded to the licensee. The NRC staff has subsequently identified a need for the following additional information that was not included in the August 8, 2006 RAI.

1. The license amendment request proposes use of formed, welded, or a combination of formed and welded inserts. Is this correct for the staff to assume that a combination of formed and welded inserts means that a number of welded inserts and a number of formed inserts may be used? However, if this means that an inset design may consist of welding and forming, please provide a schematic of this insert design.

FPL Response:

FPL's response to item 2(a) of the initial RAI states that this license amendment is intended to obtain approval of a formed insert design, a welded design, and a "combination" design incorporating both techniques (i.e., with formed and welded features). The description of formed and/or welded applies to fabrication techniques involving Metamic material. Methods used to attach the Al 6061 head piece to the Metamic panel include welding and other mechanical means[5]. Inserts whose design relies exclusively on welding would be fabricated by longitudinal welding of Metamic panels to form the chevron, with an Al 6061 head piece welded to one end of the chevron. Designs reliant on forming would be fabricated by bending Metamic panels to create the longitudinal chevron shape, with selective bends added at one end to create tabs for handling. Inserts having both formed and welded features (combination-type) might be fabricated by using a longitudinal bend to create the chevron shape, after which a top piece, designed to interface with remote tooling, is welded or otherwise mechanically attached. FPL

[5] Mechanical methods of attachment may prove useful in connecting the head piece to formed panels without having to weld to Metamic. Rivets are only one example of a non-welded mechanical means for attaching the head piece. Materials utilized in mechanical attachments will be compatible with Metamic.

has successfully demonstrated the welded fabrication process and has manufactured a number of initial prototypes. However, FPL desires to improve product yield and is continuing to seek a more efficient production method via the formed or combined fabrication process. Regardless of the fabrication technique, all three insert designs are functionally identical in providing Metamic coverage over active fuel. Figure 2.5.1 of Holtec Report HI-2043149 (included in the FPL license amendment request as Attachments 9 and 10) provides graphic images of both the welded and formed inserts. The combined insert design will look more like the welded image in this figure, but with the longitudinal edge formed instead of being welded.

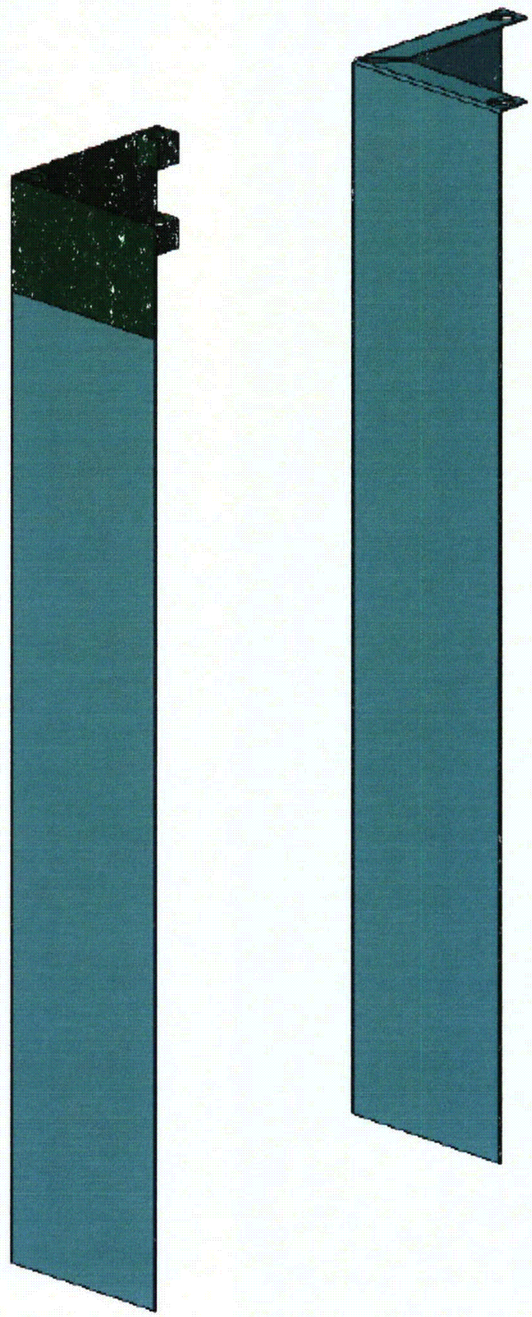

Figure 2.5.1: METAMIC INSERT

As FPL is proposing to use potentially all of the fabrication processes discussed above and welded prototypes have been fabricated, FPL is also proposing to use a mixture of welded, formed and combination-type Metamic inserts in each spent fuel pool.

> In addition, you indicated that the surveillance program will not vary with insert design, however, areas of interest in different designs should be documented in the surveillance program (i.e., base material, welds, heat affected zones, bend areas).

FPL Response:

FPL's response to item 2(c) of the initial RAI states that the surveillance program will not vary with insert design. The methods of inspection, frequency of inspection, sample size, acceptance criteria, etc. of the surveillance program will remain the same regardless of the type of inserts used. Specific areas of interest will vary based on the fabrication technique used. To ensure that all critical areas are visually examined, the inspection process will be clarified to include all Metamic base material, welds (including the adjacent heat affected zones), mechanical attachments (including rivets or other non-welded means), and bend area, as applicable.

2. Given that spent fuel pool (SFP) conditions may vary between Unit 3 and Unit 4, please confirm that the Metamic™ insert surveillance applies to both Unit 3 and Unit 4.

FPL Response:

A Metamic insert surveillance program will be implemented for each Turkey Point spent fuel pool. The initial post-installation surveillance campaign to assess Metamic inserts will occur after approximately four years[6] of in-pool service. Separate follow-on inspection campaigns will be undertaken at each Turkey Point unit at the intervals noted below (see response to item 3(b)), with dates keyed to the installation of inserts at that unit.

3. Please provide the following details regarding the surveillance program:

   a. Baseline examinations that will be performed on the Metamic™ inserts prior to being placed in the SFP (i.e., areal density, dimensional measurements, weight, visual inspections, photographs). In addition, discuss whether the baseline

[6] 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.

inspection will be performed at the fabrication facility or at the site.

FPL Response:

Baseline inspections will be performed at the factory following fabrication. These post-fabrication inspections may utilize photography on a sampling-type basis. Baseline inspections will include, as a minimum, dimensional checks against design drawings and visual inspections for inclusions, porosity, and cracking in the base material and welds. To establish a baseline for comparison, the B^{10} areal density for inserts will use the fabrication features, qualification and acceptance testing values for Boron-10 provided by the manufacturer. A separate, smaller-scope receipt inspection will be performed at the Turkey Point site prior to installation. Generally, the receipt inspection will not involve photographing inserts. Anomalies observed during the subsequent surveillance campaigns will be recorded using photographs, video tape or some similar media.

b. The frequency of Metamic™ insert surveillances and its justification for each unit. This discussion should include the length of each interval. Rationale and criteria by which decreasing/increasing intervals are determined, and the maximum length of time for the interval.

FPL Response:

As discussed in FPL's response to item 1(a) of the initial RAI, the initial post-installation surveillance campaign to assess Metamic inserts will commence after approximately four years of service. Separate follow-on inspection campaigns will be undertaken at each Turkey Point unit with inspection dates keyed to the installation of inserts at that unit. The inspections will be at 4, 8, 14, 20, and 30 years after initial installation. Should an adverse result be discovered during inspections, FPL will evaluate, based on the cause of failure, whether adjustments to the inspection interval are required (i.e., to either shorten or to maintain the prescribed inspection interval). When Metamic inserts are no longer required for control of neutron multiplication within either spent fuel pool (e.g., as a result of vacating the fuel pool to dry storage), insert inspections may be terminated.

c. The number of inserts to be examined during each surveillance and the rationale and criteria for making changes in the number of inserts to be examined during that surveillance and future surveillances.

FPL Response:

At least five inserts will be inspected during each in-service inspection campaign conducted at a particular unit. The selection criteria are described in FPL's response to item 1(a) of the initial RAI questions. Should any of these inserts exceed the acceptance criteria (see response to item 1(a) of the initial RAI), the sample size will initially be doubled (i.e., an initial sample of 5 inserts will be increased to a total of 10 inserts) to determine the extent of condition. If more than one additional insert is found to exceed the acceptance criteria, then an inspection of all in-service Metamic inserts at that unit will be performed. Inserts not meeting acceptance criteria will be removed from service. Regardless of whether any of the acceptance criteria may have been exceeded, FPL may elect to perform in-service inspections of additional Metamic inserts beyond that of the designated sample population or remove any insert from service for additional inspection or refurbishment (e.g., removal of minor corrosion blemishes).

d. The details of visual examination that will be performed during each surveillance to ensure the acceptability of the Metamic™ absorber material. This discussion should also include the criteria that will be used to determine if additional testing and /or re-evaluation of the examination results is necessary.

FPL Response:

As discussed in FPL's response to item 1(a) of the initial RAI questions, the 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 Metamic-to-Metamic or Metamic-to-aluminum welds. Non-welded connections made to facilitate fabrication of inserts will also be examined. Both interior and exterior bend radii and the insert's front and back faces will be examined by a VT-1 qualified inspector. As noted above, a visual examination is sufficient to detect evidence of cracking, corrosion pitting, component separation 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. The acceptance criteria were also described in FPL's response to item 1(a) of the initial RAI questions. Should an insert be determined to exceed the acceptance criteria, it will be removed from service for additional testing to determine the cause for failure. The additional testing will include measuring the weight and dimensions of inserts, using equipment available within the Fuel Handling Building. If necessary to determine the cause of failure, destructive testing via metallurgical analysis, chemical analysis and neutron attenuation testing will be employed. The results of any failure analysis will be evaluated to determine if changes to the inspection process and acceptance criteria are required. Regardless of whether any of the acceptance criteria may have been exceeded, FPL may elect to perform in-service inspections of additional Metamic inserts beyond that of the designated sample population.

e. Plans to perform examinations to validate your visual examinations (i.e., weight measurements, dimensional measurements (length, width, and thickness), Boron content measurement, neutron attenuation testing) and at what frequency these validations examinations will be performed.

FPL Response:

The Metamic surveillance program also includes the validation of the visual examination results. Periodically one Metamic insert will be extracted from the spent fuel pool for dimensional checks (i.e., length, width, and thickness) and weight measurements; values obtained will be compared to those from design drawings. The acceptance criteria for this validation effort are:

- Metamic panel length has increased by no more than 1 inch, and the insert width has changed by no more than ± 0.5 inch from nominal values (a hypothetical 1 inch increase in length would represent about 0.7% change from nominal)
- No change of thickness exceeding +0.010/-0.004 inch, referenced to the nominal value. To assess compliance with this requirement, thickness values will be determined at multiple points (typically 10 or more) on each panel.
- No change in insert weight greater than ±10% of nominal

The validation inspection described above will be performed at each Turkey Point unit as part of alternate surveillance campaigns (e.g., at the 8 and 20 year in-service intervals).

No boron content measurement or neutron attenuation testing is anticipated as part of this validation effort, as prior testing performed by Holtec and EPRI had demonstrated that the Boron-10 areal density in Metamic remained unchanged following radiation testing.

As noted in response to item 3 (d) above, FPL may elect to perform neutron attenuation testing as part of the failure analysis for inserts which do not meet in-service inspection acceptance criteria.

While the NRC staff has generally indicated a preference for neutron attenuation testing as part of Metamic in-service surveillance campaigns, the proposed design and application of the Metamic rack insert to be used at Turkey Point (welded, formed, or with a combination of features) makes it very difficult to perform this testing without a significant expense or dose impact. As discussed herein and throughout our license amendment request, the Metamic rack insert is an "L-shaped" chevron over twelve (12) feet long. Limitations of test facilities would require the destruction of inserts to produce samples for neutron attenuation testing. Alternatives such as in-pool neutron attenuation testing within a fuel storage rack (i.e., BADGER testing) would be difficult as test results would be masked by the residual Boraflex remaining in the existing rack or by the Boral present in the cask pit rack. Testing above the fuel racks or in the transfer canal would result in significant radiation exposure to the test crew. Considering the reported stability of the sintered boron carbide/aluminum matrix, FPL proposes to refrain from performing neutron attenuation testing unless it is determined necessary for failure analysis or to quantify some unexpected, adverse interaction or phenomena. Visual inspections are more than adequate to detect potential issues prior to exceeding any criteria involving reactivity or neutron multiplication.

f. Reporting requirements for adverse insert test results.

Response:

As discussed in FPL's response to item 1(a) of the initial RAI questions, the in-service inspection acceptance criteria provides significant margin beyond the analyzed condition and the design criteria. However, should some unforeseen, adverse reaction be identified, FPL will evaluate its impact on the existing criticality analyses. If applicable, FPL will report via one or more of the following avenues:

- 10 CFR 50.72
- 10 CFR 50.73
- 10 CFR 21