NRR-PMDAPEm Resource

From: Buckberg, Perry
Sent: Wednesday, January 13, 2016 10:23 AM
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Cc: Klett, Audrey; 'Katzman, Eric'
Subject: St. Lucie RAIs (RVI Aging Management Plan) MF6777 and MF6778
Attachments: RAIs - St. Lucie RVI AMP MF6777 MF6778 EVIB 1-13-2016.pdf

Ken,

By letter dated September 28, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15300A574), Florida Power & Light Company (the licensee) submitted descriptions of how license renewal commitment Nos. 4 & 5 and Unit 1 extended power uprate commitment No. 12 will be addressed.

The U.S. Nuclear Regulatory Commission Staff reviewed the submittal and identified areas where it needs additional information and clarification to complete its review. Attached are 10 Requests for Additional Information (RAIs) regarding the St. Lucie commitment plan submittal of 9/28/2015. The NRC requests that the licensee respond to these RAIs within 45 days of this email.

Thanks,

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REQUEST FOR ADDITIONAL INFORMATION
ST. LUCIE PLANT UNITS 1 AND 2
REACTOR VESSEL INTERNALS AGING MANAGEMENT PLAN
DOCKET NOS. 50-335 AND 50-389
CAC NOS. MF6777 AND MF6778

Background

By letter dated September 28, 2015 (Ref. 1), Florida Power & Light (FPL, the licensee) submitted a document entitled, "St. Lucie Units 1 and 2 Reactor Vessel Internals Aging Management Plan," (RVI AMP). The RVI AMP was submitted in response to Commitment No. 12 from the extended power uprate (EPU) safety evaluation report (SER) for St. Lucie Plant Unit 1 (Ref. 2) and the fourth in a series of commitments from the SER related to the EPU for St. Lucie Plant Unit 2 (Ref. 3). Both EPU commitments stated FPL would adopt MRP-227-A in place of its previously accepted RVI Inspection Program. The commitments made in the EPU SERs superseded Commitment No. 4 from NUREG-1779, "Safety Evaluation Report Related to the License Renewal of St. Lucie, Units 1 and 2, (Ref. 4)," which required that FPL submit a report summarizing the aging effects applicable to the RVI, including a description of the inspection plan, prior to the end of the initial period of operation for St. Lucie Plant Unit 1.

Commitment No. 5 of NUREG-1779 required that FPL perform a one-time inspection of the reactor vessel internals. In the September 28, 2015 letter, FPL stated that its June 25, 2014 letter discussed and reaffirmed FPL's adoption of MRP-227-A, which requires the implementation of periodic inspections for St. Lucie Plant Units 1 and 2 (St. Lucie Plant), and supersedes the prior commitment for a one-time inspection.

In the September 28, 2015 letter, FPL stated that the attached RVI AMP summarizes the revised St. Lucie Plant Units 1 and 2 RVI Inspection Program, which is based upon MRP-227-A. The staff is reviewing the revised RVI AMP and Inspection Program to determine whether it implements a program based on MRP-227-A in an acceptable manner to verify fulfillment of FPL's commitments, and requires additional information to complete its review, as detailed below.

RAI-MF6777/MF6778-EVIB-01

Table 1 of the RVI AMP notes in the "Applicability " column for the Core Support Barrel Assembly - Lower flange weld, and the Lower Support Structure - Core support plate, that no inspections are required for these components in St. Lucie Plant, Units 1 and 2 as a time-limited aging analysis (TLAA) exists. The staff notes that for these components, MRP-227-A, Table 4-2 states under "Examination Method/Frequency" that if fatigue life cannot be demonstrated by TLAA, enhanced visual examination is required no later than 2 refueling outages from the beginning of the license renewal period, with subsequent examinations on a 10-year interval. TLAA's are analyses that must meet six criteria as defined in Title 10 of the *Code of Federal Regulation* (10 CFR) 54.3, one of which is that the analyses are "contained or incorporated by reference in the current licensing basis." However, the license renewal application and NUREG-1779 do not identify TLAA's related to fatigue of the lower support structure – lower flange weld and lower support structure - core support plate. Therefore, these analyses are apparently new analyses or did not meet the criteria for a TLAA at the time FPL applied to renew the St. Lucie Plant licenses. The staff therefore needs more information in

order to review the licensee's determination that the fatigue analyses adequately manage the aging effect of cracking due to fatigue. The staff therefore requests the licensee:

1. Clarify whether these analyses were previously part of the current licensing basis for St. Lucie Plant, or whether they are new analyses,

2. Describe the methodology and results of the fatigue analyses, including the cumulative usage factor (CUF) obtained from these calculations.

3. Did the fatigue analyses consider the effects of the reactor water environment of the CUF? If so, describe how the effects of the environment were considered.

4. Describe how these analyses are documented at St. Lucie Plant (for example, in the UFSAR, design calculation, engineering report, appendix to the RVI AMP, etc.).

RAI-MF6777/MF6778-EVIB-02

The staff evaluated the licensee's description of the ten elements of its RVI AMP using the criteria of License Renewal Interim Staff Guidance LR-ISG-2011-04: "Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized Water Reactors (Ref. 6)," which represents the most current U.S. Nuclear Regulatory Commission (NRC) guidance on aging management of RVI. The staff found a few instances in which the licensee's descriptions of the AMP elements did not address certain items from the guidance of LR-ISG-2011-04. Therefore, the staff requests the licensee:

1. Confirm that the Administrative Controls element of the RVI AMP is governed by the site's 10 CFR 50, Appendix B quality assurance program.

2. With respect to the Confirmation Process, Administrative Controls, and Operating Experience elements of the AMP, discuss how the RVI AMP meets the NEI 03-08 implementation requirements for MRP-227-A.

RAI-MF6777/MF6778-EVIB-03

Applicant/Licensee Action Item (A/LAI) 1 essentially requires an applicant or licensee to verify the applicability of the MRP-227-A guidelines to its plant. One of the issues for plant-specific applicability is assurance that the assessment of susceptibility to stress corrosion cracking (SCC) in MRP-227-A is bounding for the plant. This assessment is predicated on the stainless steel components meeting certain criteria for cold work and stress.

As discussed in the enclosure to MRP Letter 2013-025 (Ref. 7) entitled "MRP-227-A Applicability Guidelines for Combustion Engineering and Westinghouse Pressurized Water Reactor Designs," do St. Lucie Plant Units 1 and 2 have non-weld or bolting austenitic stainless steel components with 20 percent cold work or greater, and, if so, do the affected components have operating stresses greater than 30 kilopounds-per-square inch? If St. Lucie Plant has such components, provide a plant-specific aging management recommendation for SCC of these components.

RAI-MF6777/MF6778-EVIB-04

In the licensee's response to A/LAI 1, the licensee stated that St. Lucie Plant RVI component materials are consistent, or nearly equivalent to the materials identified in MRP-191, Table 4-5. The licensee also stated that where differences exist, that either there is no impact due to the differences, or the components are being managed by an alternate AMP.

The staff requests that the licensee:

1. Identify the components fabricated from different materials than assumed in MRP-191, Table 4-5. Identify the material type/grade (e.g., Type 316 stainless steel) used for these components at St. Lucie Plant.
2. Provide a justification for the determination that there is no impact on the categorization of these components.
3. Identify the alternate AMP(s) that will be used to manage aging of certain RVI components with materials that differ from MRP-191. Explain how these components are adequately managed by the alternate program(s).

RAI-MF6777/MF6778-EVIB-05

In the licensee's response to A/LAI 1, the licensee stated that an 11.85% EPU was performed on St. Lucie Plant, and that evaluations performed by Westinghouse determined that the associated changes in temperature, fluence, and loading on the RVI components did not affect the bounding assumptions or applicability of MRP-227-A. For St. Lucie Plant Unit 1, the response to RAI CVIB-5 related to the EPU (Ref. 8) stated that a detailed fluence analysis of the reactor pressure vessel (from the interior of the core shroud plates through the vessel wall around the mid-plane) was used to determine fluence through the various RVI components, and that the fluence calculation adhered to the requirements of Regulatory Guide 1.190 with regard to method and uncertainty.

For St. Lucie Plant Unit 2, the EPU Licensing Report (Ref. 9) also implies that a detailed neutron fluence analysis was performed similar to that for St. Lucie Plant Unit 1. The staff therefore requests that the licensee describe how the fluence analysis of the St. Lucie Plant Unit 2 RVI was performed in support of the EPU, or confirm the methodology used was the same as for St. Lucie Plant Unit 1.

RAI-MF6777/MF6778-EVIB-06

In the staff's safety evaluation related to the EPU for St. Lucie Plant Unit 1 (Ref. 2), the staff concluded that it has reviewed the licensee's evaluation of the effects of the proposed EPU on the susceptibility of RVI to known degradation mechanisms and concludes that the licensee has identified appropriate degradation management programs to address the effects of changes in operating temperature and neutron fluence on the integrity of these components. The staff reached a similar conclusion in its safety evaluation related to the EPU for St. Lucie Plant Unit 2. However, the staff notes that in its evaluation of RVI aging considering EPU, the licensee determined that some components are susceptible to certain aging mechanisms, which were screened out in the development process of MRP-227-A. For example, the EPU Licensing Reports for St. Lucie Plant Unit 1 (Ref. 10) and St. Lucie Plant Unit 2 (Ref. 9) list the fuel alignment plate, upper guide structure support plate, control element assembly (CEA) shroud tubes, and CEA shroud bolts and locking bars as susceptible to loss of fracture toughness due

to irradiation embrittlement (IE), while MRP-191 screened out these components for IE. The EPU licensing reports also identified the CEA flow channel parts as susceptible to IE, which are a plant-specific component. There is no equivalent generic component in MRP-191. Similarly, the EPU Licensing Report for St. Lucie Plant Unit 1, and St. Lucie Plant Unit 2, list the fuel alignment plate, upper guide structure support plate, CEA shrouds (lower part), and CEA shroud bolts and locking bars as components susceptible to irradiation assisted stress corrosion cracking (IASCC), while MRP-191 screened out these components for IASCC. The staff therefore requests the licensee:

1. Provide the fluence screening criteria it used for IE and IASCC, if different than the screening criteria of MRP-191.
2. Confirm whether the components listed above actually exceed the MRP-191 fluence screening criteria.
3. If any of the components listed above exceed the MRP-191 fluence screening criteria, provide the estimated fluence for those components considering EPU at the end of life.
4. If the components do exceed the screening criteria, explain how MRP-227-A is bounding (provides for appropriate aging management) for St. Lucie Plant Units 1 and 2, considering that the fluences for these components exceed the MRP-191 screening limits.
5. Finally, if MRP-227-A is not bounding for any specific components, provide a plant-specific aging management recommendation for such components.

RAI-MF6777/MF6778-EVIB-07

A/LAI 2 essentially requires an applicant or licensee to identify any plant-specific RVI components and modify its program as necessary to manage aging of such components. In its response to A/LAI 2, the licensee identified the CEA shroud flow bypass inserts as a plant-specific component for St. Lucie Plant Unit 2. The licensee indicated that it categorized the St. Lucie Plant Unit 2 CEA shroud flow bypass inserts consistently with the categorization of the generic CEA shroud components in MRP-191 as Category A. The licensee stated that it therefore categorized the Unit 2 flow bypass inserts consistently, making them “No Additional Measures Components.” Thus, the licensee stated no further action is required for managing aging of these RVI components.

The staff needs to verify that the CEA flow bypass inserts are categorized consistently with the generic CEA shroud components.

The staff therefore requests the licensee provide details on the failure modes, effects, and consequences analysis of the CEA flow bypass inserts, including the component functions, material, screened-in degradation mechanisms, consequences of failure, likelihood of failure, and likelihood of damage (conditional core damage likelihood).

RAI-MF6777/MF6778-EVIB-08

A/LAI 5 requires applicants/licensees to identify plant-specific acceptance criteria to be applied when performing the physical measurements required by MRP-227-A for several components, including for distortion in the gap between the top and bottom core shroud segments in CE units with core barrel shrouds assembled in two vertical sections (such as St. Lucie Plant Units 1 and 2). A/LAI 5 further requires that the applicant/licensee shall include its proposed acceptance criteria and an explanation of how the proposed acceptance criteria are consistent with the plants' licensing basis and the need to maintain the functionality of the component being inspected under all licensing basis conditions of operation as part of their submittal to apply MRP-227-A.

In its response to A/LAI 5, the licensee stated that core shroud gap acceptance criteria have been developed for St. Lucie Plant Units 1 and 2 that are resolvable using the specified VT-1 inspection method of MRP-227-A. The licensee further stated that plant-specific details are proprietary and not typically released publicly, but if the NRC requests additional details, the calculation can be made available for review. The licensee concluded that this satisfies the requirements of A/LAI 5.

The licensee provided no detail on the methodology or results of the analysis used to develop the core shroud gap acceptance criteria for St. Lucie Plant Units 1 and 2. The staff therefore requests that the licensee make the calculation available for review by the staff, either by submitting it on the docket, or making it available for an audit. If made available for audit only, it is possible that the staff will need to issue a follow-up RAI to request specific information from the calculation be submitted on the docket.

RAI-MF6777/MF6778-EVIB-09

A/LAI 7 requires an applicant or licensee to provide an evaluation demonstrating that cast austenitic stainless steel (CASS) RVI components will maintain their functionality throughout the period of extended operation (PEO), considering the potential loss of fracture toughness due to both thermal embrittlement (TE) and IE.

In its response to A/LAI 7, the licensee identified the RVI components that are fabricated from CASS as St. Lucie Plant Unit 1 core support columns, the CEA shroud tubes for both units, and the St. Lucie Plant Unit 2 flow bypass inserts. The licensee indicated that all but one of the Unit 1 core support columns screen in for TE based on the assumption that the columns have ferrite > 20%, since certified material test reports could not be located for these columns.

The licensee then concluded that the results of this evaluation do not conflict with strategy for aging management of RVI provided in MRP-227-A. The licensee stated that it is concluded that continued application of the strategies in MRP-227-A and the St. Lucie Plant Units 1 and 2 RVI Inspection Program will meet the requirements for managing age-related degradation of St. Lucie Plant Units 1 and 2, CASS and martensitic stainless steel RVI components. However, the licensee did not provide any justification for its position that the MRP-227-A aging management requirements (which require no inspections of the core support columns) are sufficient, considering the potential for loss of fracture toughness due to two mechanisms, and the susceptibility to cracking of the columns. The staff notes that the core support column welds, which are visible from above the core support plate, are inspected as Primary components, but MRP-227-A and the St. Lucie Plant Unit 1 RVI AMP require no expansion to the columns if degradation is detected in the welds.

Since the St. Lucie Plant Unit 1 core support columns (except one) are screened in for TE, and are also susceptible to IE and several cracking mechanisms, the staff requests the licensee provide an evaluation for St. Lucie Plant Unit 1, demonstrating that the core support columns will remain functional during the PEO considering the potential combined loss of fracture toughness due to TE plus IE, along with the potential for cracking in the columns.

RAI-MF6777/MF6778-EVIB-10

The Expansion Link column in Table 1 of the RVI AMP, "CE Plants Primary Components," lists the lower cylinder axial welds as the expansion link for the core support column welds. However, this appears to be an error because Table 4 of the AMP, "CE Plant Examination Acceptance and Expansion Criteria," has "none" in the Expansion Link column for the same component, and MRP-227-A specifies no expansion link for the core support column welds for CE plants. The staff requests the licensee correct this error. If not an error, justify the plant-specific expansion link.

References

1. Letter from Christopher Constanzo, FPL to NRC, License Renewal Commitments Reactor Vessel Internals Aging Management Plan, dated September 28, 2015 (ADAMS Accession No. ML15399A574)
2. St. Lucie Plant, Unit 1 - Issuance of Amendment Regarding Extended Power Uprate (Redacted), July 9, 2012 (ADAMS Accession No. ML12181A019)
3. St. Lucie Plant, Unit 2 - Issuance of Amendment Regarding Extended Power Uprate, September 24, 2012 (ADAMS Accession No. ML12235A463)
4. NUREG-1779, Safety Evaluation Report Related to License Renewal of St. Lucie Plant, Units 1 & 2, September 30, 2003, (ADAMS Accession No. ML032940205)
5. St. Lucie Plant Units 1 and 2, Reactor Vessel Internals Inspection Program Plans and Inspection Dates, June 25, 2014 (ADAMS Accession No. ML14205A442)
6. License Renewal Interim Staff Guidance LR-ISG-2011-04: Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized Water Reactors, May 28, 2013 (ADAMS Accession No. ML12270A251)
7. MRP-227-A Applicability Guidelines for Combustion Engineering and Westinghouse Pressurized Water Reactor Designs, Enclosure to MRP Letter 2013-025, October 14, 2013, transmitted via email from K. Amberge to J. Holonich, November 15, 2013 (ADAMS Accession No. ML13322A454)
8. St. Lucie Plant Unit 1, Response to NRC Vessels & Internals Integrity Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request, May 17, 2011 (ADAMS Accession No. ML11139A167)
9. St. Lucie Plant Unit 2 - License Amendment Request for Extended Power Uprate, Attachment 5; Licensing Report February 25, 2011 (ADAMS Accession No. ML110730299)
10. St. Lucie Plant Unit 1 - License Amendment Request for Extended Power Uprate, Attachment 5; Licensing Report, December 15, 2010 (ADAMS Accession No. ML103560429)