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NL-17-061

May 24, 2017

U.S. Nuclear Regulatory Commission
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SUBJECT: Reply to Requests for Additional Information for the Review of the Indian Point License Renewal Application RAI SET 2017-04 (CAC Nos. MD5407 and MD5408)
Docket Nos. 50-247 and 50-286
License Nos. DPR-26 and DPR-64

REFERENCES: 1) NRC letter dated April 25, 2017, "Requests for Additional Information for the Review of the Indian Point License Renewal Application RAI SET 2017-04 (CAC Nos. MD5407 and MD5408)," (ML17103A418)

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. (Entergy) is providing in Attachment 1, the additional information requested by the U.S. Nuclear Regulatory Commission (NRC) pertaining to the review of the License Renewal Application (LRA) for Indian Point Energy Center (IPEC) Unit Nos. 2 and 3 (Reference 1).

Revised Section 6.2 of the Reactor Vessel Internals (RVI) Inspection Plan is provided in Attachment 2.

If you have any questions, or require additional information, please contact Mr. Robert Walpole at 914-254-6710.

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

May 24, 2017.

Sincerely,

AJV/gd

A128
NRR

Attachments:

1. Reply to NRC Request for Additional Information Regarding the License Renewal Application
2. Revised Section 6.2, Reactor Vessel Internals (RVI) Inspection Plan

cc: Mr. Daniel H. Dorman, Regional Administrator, NRC Region I
Mr. Sherwin E. Turk, NRC Office of General Counsel, Special Counsel
Mr. William Burton, NRC Senior Project Manager, Division of License Renewal
Mr. Richard V. Guzman, NRR Senior Project Manager
Ms. Bridget Frymire, New York State Department of Public Service
Mr. John B. Rhodes, President and CEO NYSERDA
NRC Resident Inspector's Office

ATTACHMENT 1

to NL-17-061

**REPLY TO NRC REQUEST FOR ADDITIONAL INFORMATION
REGARDING THE
LICENSE RENEWAL APPLICATION**

**ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 & 3
DOCKET NOS. 50-247 AND 50-286**

Section 54.21(a)(3) of Title 10 of the Code of Federal Regulations (10 CFR) requires the applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. As described in the SRP-LR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL Report and when evaluation of the matter in the GALL Report applies to the plant.

RAI 3.0.3.3.9-1

Section 6.2 of the revised Reactor Vessel Internals (RVI) Inspection Plan for Indian Point, Unit Nos. 2 and 3 (IP2 and IP3) lists five specific actions to be taken with regard to baffle-former bolts (BFBs). The third and fourth item state:

3. Entergy will also perform general visual inspection to identify anomalies in the baffle structure at IP2 and IP3 during each subsequent refueling outage.
4. Entergy will perform an ultrasonic test (UT) inspection of inservice replaced (new) bolts if the general visual inspections performed in accordance with paragraph 3, above identify degraded new bolts.

For replacement BFBs, based on Items 3 and 4, UT examination will not be performed during future refueling outages unless a general visual examination of the baffle structure reveals anomalies. The staff is concerned because the applicant did not provide sufficient detail about these general visual examinations for the staff to determine whether the visual examinations would be capable of detecting degraded replacement BFBs. The applicant also did not specify the timing for the UT examination of replacement bolts if the visual examination reveals degraded replacement BFBs. The staff therefore requests the following information:

RAI 3.0.3.3.9-1, Request a

Describe the examination coverage and method (e.g. VT-1, VT-3) of the general visual inspection of the baffle structure discussed in Item 3.

Response

Entergy will perform a VT-3 of the baffle assembly, including the baffle plates, the edge bolts and the replacement baffle former bolts during each subsequent refueling outage.

RAI 3.0.3.3.9-1, Request b

Clarify what is meant by "anomalies." What conditions observed during the visual examination would trigger a UT examination of replacement BFBs?

Response

The VT-3 examination discussed in the response to RAI 3.0.3.3.9-1, Request a will be capable of detecting baffle bolt anomalies similar to those previously detected at other Westinghouse four-loop downflow plants (i.e. Tier 1a plants as defined in Westinghouse NSAL 16-1). Examples of baffle bolt anomalies include missing or protruding bolt heads, missing or protruding lock bars, cracked lock bar welds, or other signs of bolt damage or unthreading. For the replacement baffle former bolts, the anomalies include deformed, protruding or cracked locking cups, damaged, protruding or cracked bolt heads and/or other signs of bolt unthreading. Identification of these anomalies on the replacement baffle bolts would trigger a UT examination of the replacement bolts during the same refueling outage.

RAI 3.0.3.3.9-1, Request c

Justify that the general visual inspection will be capable of detecting any and all visually degraded replacement BFBs.

Response

The general visual inspection is intended to identify the baffle assembly anomalies described above. The general visual inspection is not intended to identify cracking located below the replacement bolt head. UT inspections performed every 10 years will be capable of detecting bolt cracking below the head. A 10-year UT inspection interval is appropriate for the replacement bolts based on the aging management program specified in the EPRI Technical Report MRP-227-A, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines" (MRP). Baffle bolt degradation is caused primarily by neutron fluence accrued during plant operation. MRP-227-A and the corresponding MRP baffle bolt interim guidance specify the first baffle bolt inspection between 25 and 35 EFPY and subsequent re-inspections at a frequency based on a plant-specific evaluation of at least once per 10 years. Although neither the MRP-227-A nor the MRP interim guidance provide re-inspection frequencies for new replacement baffle bolts, adopting a UT inspection interval not to exceed 10 years for new replacement bolts is conservative because of the improved features of the replacement bolts and the fact that they have not been exposed to sufficient neutron fluence to cause significant radiation damage. If the MRP under NEI 03-08 issues re-inspection guidance for replacement bolts, Entergy will apply that new MRP guidance for re-inspection of IP2 and IP3 replacement bolts.

RAI 3.0.3.3.9-1, Request d

If the general visual examination reveals degraded replacement BFBs, when will the UT examination of the replacement bolts be performed? Justify the timing of this examination, if not performed during the same refueling outage as the discovery of the degraded replacement BFBs.

Response

Entergy will perform volumetric examination of the replacement bolts during the same refueling outage in which the general visual inspection identifies degraded replacement bolts.

RAI 3.0.3.3.9-2

Operating experience from D.C. Cook, Unit 2, during Fall, 2016 suggests that replacement BFBs and baffle-edge bolts may be susceptible to degradation if a large number of clustered original degraded bolts are present near the replacement bolts.

The staff therefore requests the following information:

If clustering of degraded original BFBs is found at IP2 or IP3 during future refueling outages:

RAI 3.0.3.3.9-2, Request a

Will UT examination be performed on replacement BFBs installed during previous outages? If so, describe the scope and schedule of these examinations.

Response

The operating experience (OE) from other Tier 1a plants indicates that if clusters of failed original bolts are not replaced in a timely manner they could result in failure of adjacent replacement bolts after several cycles of operation. Because both IP2 and IP3 have performed a 100% UT examination of all original bolts and have replaced all degraded bolts plus additional re-enforcing bolts, Entergy does not believe that the above referenced OE directly applies to IP2 or IP3. If clusters of failed original bolts are observed during future examinations, Entergy procedures require entering the condition into the Indian Point Corrective Action Program. An evaluation would determine if UT examination of the adjacent replacement bolts is warranted. If this evaluation indicates that the clusters could have resulted in damage to replacement bolts (i.e. an overstress condition), then a UT examination of the replacement bolts will be performed during the same refueling outage. Additionally, if the MRP under NEI 03-08 issues new guidance addressing the impact of clusters of failed original bolts on replacement bolts, then Entergy will apply that new MRP guidance.

RAI 3.0.3.3.9-2, Request b

Will baffle-edge bolts be examined? If so, describe the method, scope and schedule of these examinations.

Response

As described in the response to RAI 3.0.3.3.9-1, Request a, the edge bolts will be examined during the general visual inspection of the baffle assembly during each future refueling outage. If degraded edge bolts are identified, the Indian Point Corrective Action Program requires that they be evaluated to determine if any corrective actions are necessary prior to returning them to service. Because edge bolts are not credited in the structural analyses of the baffle assembly, a volumetric examination of the edge bolts is not necessary. If the MRP under NEI 03-08 issues guidance addressing edge bolts, then Entergy will apply the MRP guidance for the IP2 and IP3 edge bolts.

RAI 3.0.3.3.9-2, Request c

If the UT examination of replacement BFBs and examination of edge bolts will not be performed if clustered degraded original bolts are found, justify not performing these examinations.

Response

As described in the response to RAI 3.0.3.3.9-2, Request a, if clusters of degraded original bolts are found adjacent to replacement bolts and there is no visual evidence of degraded replacement bolts, Entergy will evaluate the potential impact of the failed bolts on the adjacent replacement bolts. If this evaluation concludes that the failed bolts could have resulted in damage (i.e. an overstress condition) to adjacent replacement bolts, then a UT examination will be performed on the replacement bolts. As stated above, because edge bolts are not credited in the structural analysis of the baffle assembly, a volumetric examination of the edge bolts is not necessary. Additionally, if the MRP under NEI 03-08 issues guidance addressing this condition, Entergy will apply the guidance for IP2 and IP3.

Summary

Attachment 2 shows the revisions to the five specific actions related to baffle-former bolts identified in Section 6.2 of the revised Reactor Vessel Internals (RVI) Inspection Plan for IP2 and IP3.

ATTACHMENT 2

to NL-17-061

REVISED SECTION 6.2

REACTOR VESSEL INTERNALS (RVI) INSPECTION PLAN

Changes are shown as strikethroughs for deletions and underlines for additions

**ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 & 3
DOCKET NOS. 50-247 AND 50-286**

6.0 OPERATING ~~ON~~ EXPERIENCE AND ADDITIONAL CONSIDERATIONS

6.1 Internal and External Operating Experience

Operating experience related to degradation of reactor internal components covered in this program will be reviewed on a periodic basis. This review will include both domestic and international experience and will be documented in accordance with the Entergy operating experience process. Worldwide operating experience through 2009 is summarized in Reference 5. Results of reactor internal components inspected in accordance with MRP-227 will be summarized in the biannual MRP Inspection Data Survey, MRP-219 [7].

6.2 Spring 2016 Operating Experience

In the spring of 2016, during IP2 outage 2R22, ultrasonic (UT) and/or visual inspections of all 832 baffle former bolts (bolts) were performed in accordance with the NRC approved guidelines in MRP-227-A. Visual inspection of the baffle plates and bolts identified 31 degraded bolts. The UT inspections identified indications on 182 bolts and also determined that 14 bolt locations were not testable. The locations that were not testable were conservatively assumed to possess bolts that failed to meet the acceptance criteria. As a result of the inspection findings, all 227 bolts (31+182+14) with actual and assumed indications were replaced. An additional 51 bolts were replaced to reduce the probability of future failures as well as minimize the probability of clusters of failed bolts. Therefore, during 2R22, a total of 278 bolts (227+51) were replaced.

As a result of the IP2 inspection findings and other industry Operating Experience (OE) indicating a significant number of failed bolts at other similarly-designed PWR plants, the IPEC PWR Vessel Internals Program is being revised. In view of the 2R22 inspection findings, Entergy arranged for the fractographic examination of eight baffle former bolts removed from the IP2 baffle structure during the Spring 2016 outage at Westinghouse Electric Company's hot cell laboratory in Churchill, PA. The results of those fractographic examinations are documented in Westinghouse Report MCOE-TR-16-18, Revision 0, "Fractography of Indian Point Unit 2 Baffle Former Bolts" (Nov. 30, 2016). Industry-sponsored metallurgical analysis and materials property testing of additional baffle former bolt specimens from IP2 and other PWRs is still in progress.

Based on as-found conditions and current industry knowledge, including the results of the fractographic examinations of the eight IP2 baffle former bolts discussed in Westinghouse Report MCOE-TR-16-18, IPEC concludes that performing a volumetric examination (i.e., UT) of the required original bolts during each refueling outage, and replacing those bolts found to be degraded until none of the remaining original bolts is required to be credited for the baffle structure to be capable of performing its intended safety function, is a reasonable and acceptable approach. Accordingly, IPEC plans to take the actions specified in paragraphs 1-5 below. These actions are subject to possible revision per the OE program based on the results of ongoing and planned future testing of baffle former bolt specimens from IP2 and other PWR plants. Any findings that result from the following actions will be input to the Corrective Action Program.

1. The IP3 baffle bolt inspections that were previously scheduled to be performed in 3R20 (Spring 2019) will be performed in 3R19 (Spring 2017). Visual and UT inspections on 100% of all accessible baffle former bolts, and a visual inspection of the baffle-edge bolts and baffle former assembly, will be performed in 3R19.
2. Entergy will perform a UT inspection of 100% of the original bolts at IP2 and IP3 during each of the subsequent refueling outages if any of the original bolts are required to remain structurally capable of carrying their design load to ensure structural integrity of the baffle structure during all design conditions.
3. Entergy will also perform a general visual inspection (VT-3) to identify anomalies in of the baffle structure at IP2 and IP3 during each subsequent refueling outage. The inspection will cover the baffle plates, the edge bolts and the replaced baffle former bolts. For the edge bolts, the inspection will be capable of detecting missing or protruding bolt heads, missing or protruding lock bars, cracked lock bar welds, or other signs of bolt damage or unthreading. For the replacement baffle former bolts, the inspection will be capable of identifying deformed, protruding or cracked locking cups, damaged, protruding or cracked bolt heads and other signs of bolt damage or unthreading.
4. Entergy will perform a UT inspection of inservice replaced (new) bolts during the same refueling outage if the general visual inspections performed in accordance with paragraph 3 above identify degraded new replaced bolts.
5. If clusters of failed original bolts are observed during future examinations, an evaluation will determine if UT examination of the adjacent replacement bolts is warranted. If this evaluation indicates that the clusters could have resulted in damage to replacement bolts (i.e. an overstress condition), then Entergy will perform a UT examination of the replacement bolts during the same refueling outage.
6. Entergy will replace all bolts with indications that are needed to remain structurally capable of carrying their design load to ensure structural integrity of the baffle structure during all design conditions. Additional "good" or anti-cluster bolts will also be replaced to ensure that sufficient margin is maintained to accommodate the same failure rate until the next inspection as the failure rate identified during the current refueling outage. This margin will ensure compliance with the intent of the guidelines provided in WCAP-17096, Revision 2, "Reactor Internals Acceptance Criteria Methodology and Data Requirements."

Response

As described in the response to RAI 3.0.3.3.9-1, Request a, the edge bolts will be examined during the general visual inspection of the baffle assembly during each future refueling outage. If degraded edge bolts are identified, the Indian Point Corrective Action Program requires that they be evaluated to determine if any corrective actions are necessary prior to returning them to service. Because edge bolts are not credited in the structural analyses of the baffle assembly, a volumetric examination of the edge bolts is not necessary. If the MRP under NEI 03-08 issues guidance addressing edge bolts, then Entergy will apply the MRP guidance for the IP2 and IP3 edge bolts.

RAI 3.0.3.3.9-2, Request c

If the UT examination of replacement BFBs and examination of edge bolts will not be performed if clustered degraded original bolts are found, justify not performing these examinations.

Response

As described in the response to RAI 3.0.3.3.9-2, Request a, if clusters of degraded original bolts are found adjacent to replacement bolts and there is no visual evidence of degraded replacement bolts, Entergy will evaluate the potential impact of the failed bolts on the adjacent replacement bolts. If this evaluation concludes that the failed bolts could have resulted in damage (i.e. an overstress condition) to adjacent replacement bolts, then a UT examination will be performed on the replacement bolts. As stated above, because edge bolts are not credited in the structural analysis of the baffle assembly, a volumetric examination of the edge bolts is not necessary. Additionally, if the MRP under NEI 03-08 issues guidance addressing this condition, Entergy will apply the guidance for IP2 and IP3.

Summary

Attachment 2 shows the revisions to the five specific actions related to baffle-former bolts identified in Section 6.2 of the revised Reactor Vessel Internals (RVI) Inspection Plan for IP2 and IP3.