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NL-17-155

December 14, 2017

U.S. Nuclear Regulatory Commission
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SUBJECT: Re-Submittal of Supplemental Information Regarding the Service Water Integrity Aging Management Program for the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application (LRA)
(CAC Nos. MD5407 and MD5408)
Docket Nos. 50-247 and 50-286
Licenses Nos. DPR-26 and DPR-64)

REFERENCES:
1) Entergy Letter, "Supplemental Information Regarding the Service Water Integrity Aging Management Program for the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application (LRA) (CAC Nos. MD5407 and MD5408)," dated November 8, 2017 (NL-17-127)
2) USNRC Letter, "Service Water Integrity Aging Management Program Audit Report for the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application (CAC Nos. MD5407 and MD5408)," dated September 20, 2017 (ML17250A244)
3) USNRC Letter, "Summary of Telephone Conference Call Held on September 6, 2017, Between the U.S. Nuclear Regulatory Commission and Entergy Nuclear Operations, Inc. Concerning Next Actions from the Site Audit Held from August 1-3, 2017, Pertaining to the Indian Point, License Renewal Application (TAC. NOS. MD5407/MD5408)," dated September 25, 2017 (ML17256A286)
4) Entergy Letter, "Reply to Request for Additional Information for the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application, SET 2017-01(CAC Nos. MD5407 and MD5408)," dated May 8, 2017 (NL-17-052) (ML17132A175)
5) Entergy Letter, "Amendment to License Renewal Application – Reflecting Shortened License Renewal Terms for Units 2 and 3," dated February 8, 2017 (NL-17-019) (ML17044A005)

Dear Sir or Madam:

From August 1 - 3, 2017, the U.S. Nuclear Regulatory Commission (NRC) staff conducted a supplemental, on-site regulatory audit to gain a better understanding of Entergy Nuclear

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Operations, Inc.'s (Entergy) response to the request for additional information (RAI), submitted by letter dated May 8, 2017 and new plant-specific operating experience related to the Service Water Integrity Aging Management Program. Following the completion of the audit, the NRC staff issued an audit report, which identified several areas where the aging management activities for the Service Water System warrant additional clarification or further information.

By letter dated November 8, 2017 (Reference 1), Entergy provided supplemental information regarding the Service Water Integrity Aging Management Program in response to the August 1 – 3, 2017 on-site regulatory audit. On November 30, 2017, a conference call was held between the NRC and Entergy to clarify Entergy's responses for Audit Items 3 and 6 as discussed in Reference 1. Attachment 1 provides additional information to clarify the areas identified in the audit report (References 2 and 3). Since this letter revises our previous responses to Audit Items 3 and 6, it replaces Reference 1 in its entirety.

Changes to the LRA sections resulting from the information provided in Attachment 1 and other administrative changes are provided in Attachment 2. Changes to the List of Regulatory Commitments are provided in Attachment 3.

By Reference 5, Entergy informed the NRC of its expectation to cease electric-generating operations at IP2 by April 30, 2020, and at IP3 by April 30, 2021, respectively, subject to potential operating extensions through, but not beyond, 2024 and 2025, under very limited circumstances. Accordingly, Entergy believes that the additional information and enhancements to the Service Water Integrity Aging Management Program described in Attachment 1 provide more than reasonable assurance that the Service Water System will continue to perform its intended functions for the limited remaining operating times of IP2 and IP3.

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 12-14-17, 2017.

Sincerely,

AJV/rl

Attachments:
1. Supplemental Information Regarding the License Renewal Application Service Water Integrity Program
2. License Renewal Application Changes As a Result of Supplemental Information
3. License Renewal Application IPEC List of Regulatory Commitments Revision 36

cc: Mr. David C. Lew, Acting Regional Administrator, NRC Region I
Mr. William Burton, Senior Project Manager, NRC DLR
Mr. Richard V. Guzman, Senior Project Manager, NRC NRR DORL
Ms. Bridget Frymire, New York State Department of Public Service
Ms. Alicia Barton, President and CEO NYSERDA
NRC Resident Inspector's Office

ATTACHMENT 1

to NL-17-155

SUPPLEMENTAL INFORMATION

REGARDING THE

LICENSE RENEWAL APPLICATION

SERVICE WATER INTEGRITY PROGRAM

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

1. NRC AUDIT REPORT ITEM

Installation of External Carbon Fiber Wrap on Zurn Strainer Pit Service Water Piping. Based on information provided by NRC regional and resident staff members, the applicant had applied a nonstructural external coating of composite (carbon fiber epoxy) material on portions of the service water piping in the Zurn strainer pits. According to the applicant, this was done to protect the pipe from mechanical damage or loss of material due to external corrosion. The applicant recognized the potential that with installation of the external coating, leakage as a result of internal corrosion might not be evident through the external coating. The applicant had previously sponsored a test to show that leakage from a small hole in the pipe would be detectable through the coating. The staff was concerned that some of the Service Water Integrity program's periodic visual inspections would no longer be effective if leakage could be masked by the coating, because a significant precursor to loss of structural integrity would be lost.

In order to evaluate the coating's effect on visual inspection effectiveness, the staff reviewed the associated test report, IP-RPT-14-00022, "External Lining for Safety Related Service Water Piping." The test included: (a) two test pieces with either a 0.375 inch or a 0.500 inch drilled hole; (b) a single layer of unidirectional carbon fiber material applied with primer, wet-out, and top coat epoxies; (c) a 24 hour curing time; (d) a beginning hydrostatic test pressure of 70 pounds per square inch gauge (psig), with increases in 10 psig increments up to 100 psig; and (e) periodic observations looking for loss of hydrostatic test pressure. The test report indicated that leakage from the 0.500 inch hole occurred between 8 hours and 23 hours, and leakage from the 0.375 inch hole occurred after approximately 12 days. The leak path for both tests was identified not as penetrating through the coating itself but as extending from the drilled holes along the axis of the pipe to the edge of the coating.

During discussions, the plant staff acknowledged that the operating pressure, at locations where the carbon fiber material was installed, is lower than the pressure (100 psig) at which leakage occurred during the test. In addition, during its walkdown of the installations, the NRC staff noted that some overlapping of the carbon fiber material occurred on elbows, such that it was no longer a single layer of material. The NRC staff also noted that the installed length of the coating in some cases appeared to be greater than the coating length in the test. In addition, because it took considerably longer for leakage to be detected from the 0.375-inch hole compared to the 0.500-inch hole, the ability to detect leakage from much smaller holes (which have provided the bulk of the past operating experience where structural integrity has not been challenged) is uncertain.

Based on the above, it was not clear to the staff that the test parameters bounded the parameters of the installed coating locations and configurations. As a result, the staff questioned whether the effectiveness of the Service Water Integrity program's visual inspections was substantially diminished by the installation of the external, nonstructural carbon fiber coating. In order to address the potential masking effect of the carbon fiber coating, the staff needs additional information describing alternative inspection techniques, including the quantity, frequency, and extent, to compensate for the inability to credit periodic visual inspections.

RESPONSE:

In the carbon fiber-wrapped portions of the system located in the Zurn strainer pits, leakage as a result of internal corrosion occurs at or near welded joints due to designed gaps in the cement lining. As an alternative to performing visual inspections for leakage at the subject carbon fiber-wrapped locations in the service water strainer pits, Entergy will perform volumetric NDE, such as radiography of the affected welds during the period of extended operation (PEO). Entergy will perform the NDE at IP2 and IP3 during each unit's respective refueling outage interval. The total number of inspections to be performed will be 20 percent of the total affected weld population, up to a maximum of 25 during each 10-year operating interval. Radiography will provide sufficient data to allow detection of piping degradation.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

2. NRC AUDIT REPORT ITEM

Installation of External Carbon Fiber Repair on Service Water Pipe Weld PAB-204. The staff reviewed engineering change (EC) 61654 and noted that the repair of the non-safety-related pipe was "designed to act as the original piping should the weld fail and structural integrity compromised." The EC specified that the installation include: (a) seven layers of wrap, (b) a 6 inch overlap, and (c) a minimum total wrap length of 6 feet upstream and downstream of the weld. The staff reviewed WO 00404774-01 and noted that, except for the specified overlap at the elbow, all installation parameters were met. For the overlap at the elbow, the staff reviewed ECN 72788 for allowing the field to fit up the carbon fiber wrap with additional layers to compensate for the inability to uniformly obtain a 6 inch overlap.

Because the credited piping material changed from carbon steel to a nonmetallic composite, Entergy may need to address different aging effects with different inspection requirements. In addition Entergy may need alternate inspection techniques, because the inability to detect leakage through the composite material may not allow the detection of ongoing internal corrosion at locations where structural integrity is needed at the carbon steel-to-nonmetallic composite interface. To address the issues introduced by this repair, the staff needs additional information regarding: a) the aging effects that need to be managed for the nonmetallic composite material (with associated aging management program, if applicable) and b) confirmation that degradation of cement-lined service water piping has not occurred at locations other than at welds (e.g. mid-span between welds) such that alternate inspection requirements would be needed to confirm the structural integrity near the carbon steel to nonmetallic composite interface locations.

RESPONSE:

A section of IP3 24-inch diameter service water return piping, including an elbow, was overlaid with carbon fiber-reinforced epoxy at elevation 41 feet in the primary auxiliary building due to corrosion adjacent to the downstream elbow to pipe weld. The carbon fiber-reinforced epoxy overlay provides strength and design characteristics equivalent to the original piping. The piping was prepared prior to application to ensure that the carbon fiber-reinforced epoxy material properly adheres to the pipe.

Aging effects that could occur for the carbon fiber-reinforced epoxy were evaluated.

The carbon fiber-reinforced epoxy material is a bidirectional carbon fiber fabric saturated with epoxy resin. Because the internal surface of the carbon fiber-reinforced epoxy coating is tightly adhered to the carbon steel surface of the piping, no aging effects requiring management could occur without a through-wall leak in the underlying carbon steel piping. The minimum wall thickness of the piping was 0.121 inches in January, 2015, after approximately 40 years of operation. This corresponds to a corrosion rate of approximately 0.006 inches per year. At IP3, the assumed service water piping corrosion rate is 0.012 inches per year. Using a corrosion rate of just less than 0.012 inches per year instead of the calculated corrosion rate, localized corrosion would not be through-wall by April 30, 2025. As discussed in Reference 5, Entergy has filed an amendment to the IPEC License Renewal Application (LRA) changing the end date of the proposed term of the renewed license for IP3 to April 30, 2025. Based on this, the internal surface of the carbon fiber-reinforced epoxy is not expected to be in contact with raw water prior to the end of the renewed license term. Therefore, a line item with an internal environment for the carbon fiber-reinforced epoxy is not necessary in revised LRA Table 3.3.2-2-IP3.

The external surface of the carbon fiber-reinforced epoxy is exposed to a cool indoor air environment with low light exposure, conditions that minimize the potential for aging effects due to temperature or ultraviolet light. In addition, the raw discharge water (service water) flowing through the piping is heated from the numerous loads that it cools, thereby reducing the potential for condensation. Although aging effects would be minimized due to these operating conditions, operating experience relative to long-term aging effects of carbon fiber-reinforced epoxy installations at nuclear plants is limited. As a result, aging effects will conservatively be identified for the carbon fiber-reinforced epoxy. Since the carbon fiber-reinforced epoxy entails fibrous material similar to fiberglass and both utilize epoxy, aging effects applicable to fiberglass are deemed potential aging effects. Cracking, blistering, and loss of material are conservatively identified as aging effects for the carbon fiber-reinforced epoxy external surface. Visual inspection performed in accordance with the Periodic Surveillance and Preventive Maintenance Program will manage these aging effects.

Entergy reviewed relevant OE of the service water system for the period of 2004-2016 and did not find relevant examples of leakage of the concrete lined piping at locations "mid-span" of the carbon steel welds. Therefore, no alternate inspection requirements are needed to confirm structural integrity near the carbon steel to nonmetallic composite interface locations.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

3. NRC AUDIT REPORT ITEM

Use of 6 Percent Molybdenum Stainless Steel (AL-6XN).

LER 247/2013-004 addresses pitting corrosion of 300 series stainless steel service water piping that was replaced with 6 percent molybdenum stainless steel (AL-6XN). Based on industry operating experience, the staff noted that, because AL-6XN has a more positive corrosion potential than 300 series stainless steels, the introduction of AL-6XN can increase the susceptibility of carbon steel to galvanic corrosion. During a breakout session, the applicant noted that the service water system contains dissimilar-metal flanged joints between carbon steel and AL-6XN, as well as 300 series stainless steel. Consequently, the staff questioned whether AL-6XN flanged components should be considered as a unique population within the Service Water Integrity program. During discussions, the plant staff stated that AL-6XN is sufficiently similar to 300 series stainless steels that components made from AL-6XN do not need to be considered as unique populations; however, the plant staff noted that the similarity is based on whether the surfaces of the stainless steel components have been passivated and the grade of 300 series stainless steel.

During its subsequent review of the Service Water Piping Specification (9321-01-248 35), the staff noted that the applicant had previously removed the requirement for the use of insulating kits on dissimilar-metal flanged joints. Because the absence of insulating kits increases the susceptibility of carbon steel to loss of material due to galvanic corrosion, it was not clear to the staff that the condition or absence of insulating kits on dissimilar-metal flanged joints could be disregarded. In order address the issues introduced by these changes, the staff needs additional information to determine whether current inspection of dissimilar-metal flanged connections can be credited by the Service Water Integrity program and whether AL-6XN needs to be considered as a unique population for these activities. The information needed by the staff includes: a) the difference in the corrosion potential of the stainless steel alloy(s) used in the service water system and the corrosion potential of AL-6XN, b) the environment in the vicinity of the 300 series stainless steel/carbon steel and AL-6XN/carbon steel joints, c) the coatings in the vicinity of the 300 series stainless steel/carbon steel and AL-6XN/carbon steel joints, and d) whether current inspections account for greater susceptibility to galvanic corrosion when insulating kits are not used.

RESPONSE:

An overall response is provided below, after the NRC's specific questions a) through d) are addressed.

Item a) the difference in the corrosion potential of the stainless steel alloy(s) used in the service water system and the corrosion potential of AL-6XN.

Response a):

AL-6XN tested in seawater has a 0 volts assignment.[1] The 300-series stainless steels voltage is approximately 0.0 to -0.13 volts.[2]

[1] AL-6XN ATI Technical brochure

Item b) the environments in the vicinity of the 300 series stainless steel/carbon steel and AL-6XN/carbon steel joints.

Response b):

As delineated in the LRA, the Service Water System has the following environments:

- Raw water (internal and external)
- Condensation (external)
- Treated water (internal and external)
- Air - indoor (internal and external)
- Air - outdoor (external)
- Soil (external)

The majority of the joints between carbon steel and AL-6XN or between carbon steel and stainless steel have an internal environment of raw water and an external environment of air or condensation.

Item c) the coatings in the vicinity of the 300 series stainless steel/carbon steel and AL-6XN/carbon steel joints.

Response c):

Generally, carbon steel piping 2" or greater in diameter is internally coated with cement. Cement lining repairs are made using internal coatings such as Waterplug, Enecon, or Belzona. The 300-series stainless steel grades, AL-6XN, and Avesta 254 SMO are not internally coated.[3] The faces of some 300-series stainless steel and carbon steel flanges may be coated, in whole or in part, with Enecon and/or Belzona products for corrosion repair and/or prevention purposes.

Item d) Whether current inspections account for greater susceptibility to galvanic corrosion when insulating kits are not used.

Response d):

Past Service Water Integrity Program inspections have not accounted for greater susceptibility to galvanic corrosion when insulating kits are not installed. The program focuses on the inspection of piping and pipe welds, which include dissimilar metal flange carbon steel butt welds.

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[2] DBI Galvanic Table

[3] IP3 Specification, "Specification For Service Water Piping and Piping Components," TS-MS-027, Revision 5, dated April 25, 2017 and IP2 Specification, "Specification For Service Water Piping," 9321-01-248, Revision 8, dated December 2, 2013

Overall Conclusion:

Entergy staff previously determined that insulating kits were not necessary and subsequently revised design specifications for IP2 and IP3 to remove the requirement for insulating kits. Therefore, the Service Water System contains dissimilar metal flanged joints both with and without insulating kits.

In addition to 6 percent molybdenum AL-6XN, another alloy, Avesta 254 SMO is used at IPEC. Although AL-6XN and Avesta 254 SMO have slightly different chemical compositions, they are considered equivalent materials. As an example, AL-6XN contains approximately 6 to 7 percent molybdenum, while Avesta 254 SMO contains 6 to 6.5 percent molybdenum.

The galvanic potential of AL-6XN is similar to the galvanic potential of 300-series stainless steels. Avesta 254 SMO has a material composition similar to AL-6XN and is expected to have a similar galvanic potential. Because of the similar galvanic potentials, galvanic corrosion rates are also expected to be similar when these materials are in contact with carbon steel. Therefore, Entergy will perform inspections for indications of galvanic corrosion from a combined population of joints where carbon steel is connected to AL-6XN or Avesta 254 SMO or 300-series stainless steel.

In order to ensure that loss of material due to galvanic corrosion is not affecting the ability of the Service Water System to perform its intended function, the following enhancement will be implemented.

Revise the Service Water Integrity Program procedures to perform internal and external visual inspections where feasible of flanged connections (including flange faces, bolting, and welds) where carbon steel is in contact with AL-6XN, Avesta 254 SMO, or 300-series stainless steel. The inspection population will be limited to dissimilar metal joints without galvanic insulating kits. Inspections will focus on the bounding or lead components most susceptible to galvanic corrosion based on time in service and severity of operating conditions. Inspections will monitor for evidence of loss of material due to galvanic corrosion on a representative sample consisting of 20 percent of the population up to a maximum of 25 inspections during each 10-year period of the period of extended operation. If significant loss of material is identified by the visual inspections, additional volumetric NDE will be performed to characterize the extent of the degradation.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

4. NRC AUDIT REPORT ITEM

Assessment of Through-Wall Leak Discussed in Relief Request 3-43. The staff had previously asked about changes made to the Service Water Integrity program as a result of situations like relief request 3-43, where the applicant's predictive monitoring methodology did not appear to be conservative. In its response dated May 8, 2017, the applicant stated that a contributing cause of the leak associated with relief request 3-43 was a less than adequate repair of a

previous leak. The applicant also stated that it had recently implemented a program improvement to prevent recurrence of events related to inadequate repairs through the development of engineering report IP-RPT-16-00046, "IPEC Service Water Piping Weld Repair Process and Re-Inspection Frequency Guidelines." (See below for the staff's review of this document.)

As part of its responses to RAIs for relief request 3-43, by letter dated October 3, 2007, (ADAMS Accession No. ML072890132) the applicant stated that a "final assessment of why a new through-wall leak developed near the area of the prior repair has not been completed." The staff requested a copy of the referenced assessment in order to determine whether changes to the program addressed all of the potentially non-conservative aspects of the predictive monitoring methodology associated with the relief request. However, the applicant could not locate the referenced assessment while the audit team was on site. During breakout sessions, the applicant indicated that changes made to the program since the 2007 event, including the recently issued engineering report IP-RPT-16-00046, have addressed all of the issues related to the event. It was not clear to the staff whether additional changes to the program were warranted based on the circumstances surrounding the relief request, without additional information from the applicant to support its position.

RESPONSE:

Entergy has developed a comprehensive approach for dealing with future issues such as the one described in relief request (RR) 3-43. Engineering report IP-RPT-16-00046, "IPEC Service Water Piping Weld Repair Process and Re-Inspection Frequency Guidelines" provides consistent repair methods and guidelines for subsequent re-inspections during the PEO. The guidelines of this report, which the NRC staff reviewed during its August 2017 on-site audit, provide reasonable assurance that future losses of function as described in the subject relief request will be prevented. It provides clear direction and utilizes engineering expertise and operating experience to ensure future repairs will be performed adequately. It also provides specific guidance on determining the appropriate times for re-inspection to ensure that when degradation is found, a scheduled follow-up will occur based on an official calculation by the engineering department. Entergy will add instructions to Service Water Integrity Program implementing procedures to implement the guidelines of report IP-RPT-16-00046. Based on this information, there is reasonable assurance that the issue described in relief request RR 3-43 will not recur during the PEO.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

5. NRC AUDIT REPORT ITEM

Review of Service Water Piping Weld Repair Process and Re Inspection Frequency Guideline, (IP-RPT-16-00046). In its RAI response dated May 8, 2017, the applicant stated that, as a program improvement to prevent recurrence of events related to inadequate repairs, it had recently implemented IP-RPT-16-00046. As part of the audit, the staff reviewed the cited guideline and noted that the document provides guidance related to:

- ensuring ultrasonic inspection data sufficiently characterizes the extent of degradation (e.g., extent of readings, grid size) through coordination between inspection personnel and design engineers,
- developing formal calculations in accordance with EN-CS-S-008-MULTI to determine the extent of repairs and the timing of follow on inspections,
- determining the number and extent of required repairs,
- considering the impact of welding on the integrity of the pipe internal lining, and
- determining the re-inspection interval based on weld repair configuration (e.g., full penetration weld, partial penetration weld, weld overlay), minimum wall thickness requirements, and corrosion allowance.

Although the staff did not identify any issues with this new guidance, the staff noted that the current version of the Service Water Integrity program, which was issued prior to the new guidance, does not cite IP-RPT-16-00046. During subsequent discussions, the applicant acknowledged that the program should be enhanced to credit the newly implemented guidance.

RESPONSE

As discussed above in response to NRC audit report Item 4, Entergy will add instructions to Service Water Integrity Program implementing procedures to implement the guidelines of report IP-RPT-16-00046.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

6. NRC AUDIT REPORT ITEM

Corrective Actions for Inoperable Containment Due to Leaks in Service Water Piping. In its RAI response dated May 8, 2017, the applicant addressed LERs 247/2015-001, 247/2015 004, 247/2016-010, and 286/2016-001 that all relate to inoperable containment due to leaks in service water system fan cooler unit piping. For the two Unit 2 events in 2015, the applicant stated that flow rates were higher than necessary leading to flow-accelerated corrosion at the weld joint, and the program was not changed because the issues did not involve deficiencies in the Service Water Integrity program.

Since service water systems are not susceptible to flow-accelerated corrosion, but are susceptible to erosion, and because the Service Water Integrity program includes inspections for erosion, it was not clear to the staff that the Unit 2 events did not involve deficiencies in the program.

The staff reviewed Report No. F15565-R-001, "Evaluation of Wall Thinning of Fan Cooler Unit Elbow, Indian Point Unit 2," that determined the nature and root cause of the associated leaks. The report concludes that the "leakage of the elbow occurred as a result of flow accelerated corrosion attack as a direct consequence of high flow rates and turbulence created by the sharp ridge on the inner surface at the intrados of the elbow." The staff noted that the loss of material occurred only on the side of the elbows.

As part of its review, the staff independently noted that industry guidance in NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program," excludes systems with high levels of dissolve oxygen (greater than 1000 ppb) such as service water systems because they are not susceptible to flow-accelerated corrosion. Consequently, the staff did not agree with the root cause report's conclusion that the leak was caused by flow-accelerated corrosion. In addition, based on the leak locations (on the sides of the elbows), the staff noted the similarity with re-circulation cavitation, which appear to be associated with the broader issues addressed in LR ISG 2012-01, "Wall Thinning Due to Erosion Mechanisms."

The applicant's RAI response dated May 8, 2017, describes the corrective actions for the leak as adjusting system flow rates to lower the fluid velocity in the affected piping. The staff agrees that this change to the system operating parameter would reduce the loss of material rate, but as noted in the above cited LR ISG, the effectiveness of the corrective actions, which eliminate the source of an erosion mechanism, should be verified. During the audit, the applicant acknowledged that additional activities would be needed to verify that the reduced flow rates resolve the loss of material issue.

For the Unit 3 event in 2016, corrective actions specified in LER 286/2016-001 included revising the Generic Letter 89-13 program to include a requirement to conduct a definitive number of volumetric inspection for welds made of 904L material each pre-outage interval. Although specified in the LER (dated December 21, 2016), the applicant's RAI response discussing this LER (dated May 8, 2017), did not include any information about this change to the program.

During its review of the associated corrective action document (CR-IP3-2016-03607, CA No. 27), the staff noted that the applicant will inspect 13 of the 904L welds each pre outage interval. However, the corrective action document also states that the acceptance criteria for the selected sample will be that specified in ASME Code Case N-513-3. As previously discussed in RAI 3.0.3-10-2a (see Entergy's RAI response dated May 8, 2017), loss of structural integrity, which is the basis for the Code Case N 513 3 acceptance criteria, may not be an appropriate acceptance criteria for all situations.

Given that the service water system leak causing the containment to be inoperable apparently met structural integrity criteria, it was not clear to the staff that criteria from Code Case N-513-3 would be appropriate acceptance criteria for the periodic inspections of 904L welds. Since Code Case N-513-3 allows leakage and specifically does not address the consequences of leakage, the specified acceptance criteria for the periodic sample of 904L welds would not maintain intended functions consistent with the current licensing basis. In order to complete its review of the Service Water Integrity program, the staff needs additional information that clarifies the adequacy of the acceptance criteria for the 904L weld inspections.

In a related area, the staff noted that in its RAI response dated May 8, 2017, the applicant described the cause of pin-hole leaks in LER 247/2013-004 as "improper material use." As clarified by its letter dated June 27, 2017 (ADAMS Accession No. ML17187A140), the applicant stated that the term was intended to refer to the inability to characterize degradation associated with the configuration of socket welded fittings. The applicant also stated that 300 series stainless steel material remains in use in the service water system and the "requirements for

NDE [non-destructive examination] of 300 series stainless steel piping are already included in the scope of the Service Water Integrity program."

The staff notes that, while stainless steel piping is included within the scope of the program, the program's only NDE "requirements" would be periodic visual inspections of the piping looking for leakage. Similar to the previous discussion for the 904L welds, if there is stainless steel service water piping inside containment, then the detection of aging effects by only using visual inspections (based on past operating experience) would not maintain intended functions consistent with the current licensing basis. In order to complete its review, the staff needs additional information to clarify whether the Service Water Integrity program includes sufficient non-destructive requirements of stainless steel piping where leakage due to localized corrosion (e.g., pitting) can cause a loss of intended function.

RESPONSE

With respect to the erosion issues noted in the copper-nickel material service water piping elbows at IP2, the corrective action of reducing the flow rates through the elbows was implemented in 2016. Based on the service time with the previous flow rates that resulted in the erosion observed in 2015, it is expected that at least 15 years of operation at the reduced flow rate would be necessary to cause appreciable wall thinning in the replaced elbows. The requested end date for the IP2 renewed license is 2024, which is eight years from when corrective action to reduce flow velocity was implemented in 2016. Therefore, further activities to verify effectiveness of the reduced flow rates are not warranted prior to the end of the requested term of the renewed license.

For the IP3 event in 2016, corrective actions specified in LER 286/2016-001 included revising the Generic Letter 89-13 program to include a requirement to conduct a definitive number of volumetric inspections for welds made of 904L material each pre-outage interval. This change will be delineated in the SWIP and will be added to the program document as an enhancement. The change, which only affects IP3 since IP2 does not use 904L stainless steel material, will require that 20 percent of the total welds up to a maximum of 25 be volumetrically inspected in each 10-year interval in the PEO. This enhancement will provide reasonable assurance that future losses of function similar to those described in the referenced LER's will not occur.

In addition, Entergy has developed an engineering report (IP-RPT-17-00062) related to small leaks that occur on the subject piping inside the containment buildings. This report establishes a leak rate threshold below which a leak would not result in a conclusion of a loss of safety function. Previously, any leak in the service water piping inside the containment building was considered a loss of containment safety function since Service Water piping within containment is a closed system. With this engineering report, that will no longer be the case for small leaks. Thus, this report provides the acceptance criteria for maintaining containment integrity for small through-wall flaws within containment at both units. As all piping within the containments are ISI Class 3, in conjunction with this new report, ASME Code Case N-513-3 will continue to be used for the evaluation and acceptance of piping structural integrity, as well for extent of condition requirements. Entergy will add instructions to Service Water Integrity Program implementing documents to incorporate the guidance of report IP-RPT-17-00062 regarding evaluation of containment operability based on the service water piping leak rate.

For the issue related to 300-series SS piping material, Entergy has conducted a review of the service water system piping material inside the containment buildings for both Unit 2 and 3. The review determined that the 300-series SS is not installed in those locations and no further actions are necessary.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

7. NRC AUDIT REPORT ITEM

Service Water Integrity Program Extent of Condition Inspections. The staff reviewed SEP-SW-IPC-001, "NRC Generic Letter 89-13 Service Water Program," and noted that scope expansion (extent of condition) inspections used qualitative criteria. Examples include: engineering judgment, previous inspection history, materials, etc. The staff noted that the previous enhancement to the Service Water Integrity program, regarding minimum numbers of welds to be inspected, including extent of condition inspections, only applied to cement-lined piping. (See Entergy letter dated December 2, 2016, ADAMS Accession No. ML16350A005). Other types of materials in the service water system were not addressed in the enhancement. The staff noted that extent of condition inspections should be conducted whenever inspection results do not meet acceptance criteria. In order to obtain the information necessary to verify whether the Service Water Integrity program extent of condition inspections will be adequate to provide reasonable assurance that the service water system will meet its intended function, the staff requires the following information:

- The specific number of increased inspections that will be conducted when degraded conditions are detected; or
- The criteria for determining the number of increased inspections based on the degree of degradation detected during inspections.

RESPONSE

Entergy will revise the Service Water Integrity Program procedures to require a minimum of 25 NDE volumetric inspections each refueling interval per unit. These inspections will include carbon steel and other types of materials in the Service Water systems. In addition, Entergy will revise the Service Water Integrity Program to provide for five extent-of-condition inspections for each inspection that discovers wall thickness that when projected to the end of the period of extended operation is less than the minimum allowable wall thickness. This applies to degradation of in-scope piping, regardless of its material or safety class. For portions of the system found degraded that are not covered by ASME Code Case N-513, volumetric inspection will be required unless those portions are configured in a manner that does not support NDE (e.g. socket welds or fillet welds). These enhancements will provide reasonable assurance that each service water system will continue to meet its intended function through the period of extended operation.

The LRA is revised as shown in Attachment 2 with additions underlined and deletions lined through.

ATTACHMENT 2

to NL-17-155

LICENSE RENEWAL APPLICATION CHANGES

AS A RESULT OF

SUPPLEMENTAL INFORMATION

Deletions are shown with strike-through and additions are underlined.

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

3.3.2.1.2 Service Water

Materials

Service water system components are constructed of the following materials.

- Aluminum bronze
- carbon fiber-reinforced epoxy
- carbon steel
- copper alloy
- copper alloy > 15% zinc
- copper alloy > 15% zinc (inhibited)
- glass
- gray cast iron
- Metal with internal coating
- nickel alloy
- stainless steel
- titanium
- plastic

Environment

Service water system components are exposed to the following environments.

- air – indoor
- condensation
- raw water
- soil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the service water system require management.

- change in material properties
- cracking
- blistering
- fouling
- loss of coating integrity
- loss of material
- loss of material – wear

Aging Management Programs

The following aging management programs manage the aging effects for the service water system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- Coating Integrity
- External Surfaces Monitoring
- Heat Exchanger Monitoring
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Cooling Water
- Water Chemistry Control – Primary and Secondary

Table 3.3.2-2-IP3
Service Water System
Summary of Aging Management Review

Table 3.3.2-2-IP3: Service Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon fiber-reinforced epoxy	Air – indoor (ext)	Cracking, blistering, loss of material	Periodic Surveillance and Preventive Maintenance	-	-	F

A.3.1.28 Periodic Surveillance and Preventive Maintenance Program

The Periodic Surveillance and Preventive Maintenance Program is an existing program that includes periodic inspections and tests that manage aging effects not managed by other aging management programs. In addition to specific activities in the plant's preventive maintenance program and surveillance program, the Periodic Surveillance and Preventive Maintenance Program includes enhancements to add new activities. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations.

Surveillance testing and periodic inspections using visual or other non-destructive examination techniques verify that the following components are capable of performing their intended function.

- reactor building cranes (polar and manipulator), crane rails, and girders, and refueling platform
- containment spray system sodium hydroxide tank
- recirculation pump motor cooling coils and housing
- city water system components
- charging pump casings
- plant drain components
- station air containment penetration piping
- HVAC duct flexible connections
- HVAC stored portable blowers and flexible trunks
- EDG exhaust components
- EDG duct flexible connections
- EDG air intake and aftercooler components
- EDG air start components
- EDG cooling water makeup supply valves
- security generator exhaust components
- security generator radiator tubes
- Appendix R diesel generator exhaust components
- Appendix R diesel generator radiator
- Appendix R diesel generator aftercooler
- Appendix R diesel generator starting air components
- Appendix R diesel generator crankcase exhaust components
- diesel fuel oil trailer transfer tank and associated valves
- auxiliary feedwater components
- containment cooling duct flexible connections
- containment cooling fan units internals
- control room HVAC condensers and evaporators
- control room HVAC ducts and drip pans
- control room HVAC duct flexible connections
- chlorination, circulating water, city water makeup, condensate pump suction, emergency diesel generator, floor drain, gaseous waste disposal, instrument air, liquid waste disposal, nuclear equipment drain, river water, station air piping, steam generator sampling, and secondary plant sampling piping components, and piping elements

- pressurizer relief tank
- main steam safety valve tailpipes
- atmospheric dump valve silencers
- auxiliary steam and condensate return system sight glass housings
- condensate transfer system sight glass housings
- heater drain/moisture separator drains/vents systems sight glass housings
- carbon fiber-reinforced epoxy overlay on service water line 405 in primary auxiliary building

The Periodic Surveillance and Preventive Maintenance Program will be enhanced as follows.

- Program activity guidance documents will be developed or revised as necessary to assure that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

- A representative sample of at least 25 inspections of city water piping will be performed at least every five years. In the event that the frequency of internal corrosion meets the criteria for recurring internal corrosion, the frequency of the representative sample of 25 inspections will be increased as follows:

  - If >1 and <5 degraded locations are found in the five year interval, then as a minimum, 10 additional volumetric examinations of system welds will be performed during the following refueling interval.
  - If >5 degraded locations are found, then a minimum of 15 additional volumetric examinations will be performed during the following refueling interval.

  In addition to the above, for areas of piping that are found degraded and returned to service, the remaining service life will be calculated and the piping will be re-examined prior to the end of calculated life.

- The Periodic Surveillance and Preventive Maintenance Program procedures will be revised to ensure city water piping that exhibits leaks will be locally repaired and restored to service on an interim basis presuming ultrasonic test data reflects adequate structural integrity to support interim operation. The affected piping segment will be entered into the 12-week work control schedule for replacement.

- The Periodic Surveillance and Preventive Maintenance Program procedures will be revised to ensure city water piping segments that exhibit indications of selective seam corrosion will be entered into the routine 12-week work control schedule and processed on an accelerated replacement basis.

Enhancements will be implemented prior to ~~the period of extended operation~~ December 31, 2018

A.2.1.33 Service Water Integrity Program

The Service Water Integrity Program is an existing program that relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the service water system are managed through the period of extended operation. The program includes component

inspections for erosion, corrosion, and biofouling to verify the heat transfer capability of safety-related heat exchangers cooled by service water and monitoring of the silt levels in the intake bays. Chemical treatment using biocides and sodium hypochlorite and periodic cleaning and flushing of infrequently used loops are methods used to control fouling within the heat exchangers and to manage loss of material in service water components. Scheduling of nonsafety-related piping examinations is determined by trending of examination results. Selection of large bore service water pipe points for volumetric inspection is based on piping configuration, results from previous inspections, consideration of follow-ups to previous repairs, and condition assessments when components are opened during preventive maintenance activities. Scope expansion for indications found by program inspections of nonsafety-related piping is based on engineering analysis, judgment and program experience. The factors that are considered include piping location, severity of use, piping materials, previous inspection results, and repair history.

The Service Water Integrity Program will be enhanced to include the following.

- Revise the appropriate procedures to incorporate actions to manage corrosion issues.
    - When through-wall leaks are detected, the leakage is evaluated under the corrective action program, which includes operability or functionality assessment of structural integrity and determination of appropriate corrective action.
    - Accessible portions of safety-related buried service water piping will be internally inspected by robotic crawler or manual crawl-through once during the first 10 years of the period of extended operation.
- Revise Service Water Integrity Program procedures by December 31, 2017 to address the following:

    a) Perform a minimum of 25 volumetric NDE inspections each refueling interval per unit ~~number of volumetric weld examinations~~ for ~~safety-related~~ SW piping. The volumetric examinations will determine the extent of wall thinning.

    ~~o Perform a minimum of 10 volumetric weld examinations for cement-lined piping on the IP2 SW system during each refueling interval.~~

    ~~o If >1 and <5 degraded locations are found in a specific refueling interval, then 10 additional volumetric examinations of system welds will be performed during the following refueling interval.~~

    ~~o If >5 degraded locations are found, then 15 additional volumetric examinations will be performed during the following refueling interval.~~

    b) For areas of piping that are found degraded and returned to service, the remaining service life will be calculated and the piping will be re-examined prior to the end of calculated life.

c) Require a minimum of 5 additional volumetric weld examinations if a through-wall leak is discovered in non-safety related portions of the SW system that are within the scope of license renewal for 10 CFR 54.4(a)(2).

d) Increase the frequency of internal robotic inspections on the system headers at both units from once during the first 10 years of the period of extended operation to also include once during the second 10 years of the period of extended operation.

e) Review the SW system to identify areas where leakage from nonsafety-related SW piping could result in unacceptable flooding and ensure the nonsafety-related piping that can cause flooding concerns is clearly identified in the program documents. Specify volumetric examination of at least 20 percent of (up to a maximum of 25) non-safety related welds located in areas subject to flooding of safety-related equipment within each 10-year period of the PEO.

f) Specify a yearly OE review to identify any effects of aging reported on the SW system, specifically including any conditions that may have occurred in the prior year related to inadequate cement liner repairs.

g) Include guidance for lay-up of the SW process radiation monitoring system to minimize exposure of susceptible tubing to stagnant conditions.

h) Establish recurring internal corrosion goals for stagnant vent and drain connection piping. If these recurring internal goals are not met, the frequency for flushing stagnant vent and drain connection piping will be increased.

- The Service Water Integrity Program procedures will be revised to conduct and document a 100 percent internal lining visual inspection of the IP2 three inch fan cooler units (FCU) spool pieces when removed during FCU coil refueling outage preventive maintenance activities.

- The Service Water Integrity Program procedures will be revised to include generic flaw evaluation acceptance criteria based on ensuring structural integrity and leakage concerns. Program procedures will also be revised include generic Containment integrity leak rate acceptance criteria, depending on the location of a flaw. This will take the form of acceptance curves for flaw size to meet structural integrity versus pipe size, a curve for leak rate versus pipe size, and an acceptance curve for Containment integrity considering flaw size versus leak location. The intent is to provide for a rapid and easily performed assessment (i.e., operability determination) of a leak in the service water system within containment in either unit.

- The Service Water Integrity Program procedures will be revised to perform a formal review of a leak that causes a loss of function. This will include examining the cause of the leak and to determine if the aging management program remains adequate. If a new aging mechanism is found, it will also evaluate if a failure of the aging management program plan has occurred.

- The Service Water Integrity Program procedures will be revised to prioritize future inspections based on plant area susceptible to flooding concerns.

- Revise Service Water Integrity Program procedures to perform volumetric NDE, such as radiography, of the carbon fiber-wrapped welds in the service water strainer pits during the period of extended operation. The number of inspections will be 20 percent of the total affected weld population, up to a maximum of 25, during each 10-year operating interval.

- Revise Service Water Integrity Program procedures to perform internal visual inspections of flanged connections where carbon steel is in contact with AL-6XN, Avesta 254 SMO, or 300-series stainless steel. The inspection population will be dissimilar metal joints without galvanic insulating kits. Inspections will focus on the bounding or lead components most susceptible to galvanic corrosion based on time in service and severity of operating conditions. Inspections will monitor for evidence of loss of material due to galvanic corrosion on a representative sample consisting of 20 percent of the population, up to a maximum of 25 inspections, during each 10-year period of the period of extended operation. If significant loss of material is identified by the visual inspections, additional volumetric NDE will be performed to characterize the extent of the degradation.

- Revise Service Water Integrity Program procedural guidance to implement the guidelines of reports IP-RPT-16-00046 and IP-RPT-17-0062.

- Revise Service Water Integrity Program procedures to require five extent-of-condition inspections whenever inspections discover wall thickness that when projected to the end of the period of extended operation is less than the minimum allowable wall thickness. This applies to degradation of in-scope piping, regardless of its material or safety class. For portions of the system found degraded that are not covered by ASME Code Case N-513, volumetric inspection will be required unless those portions are configured in a manner that does not support NDE (e.g. socket welds, fillet welds, etc.).

The enhancements will be implemented prior to ~~December 31, 2016~~ December 31, 2018.

A.3.1.33 Service Water Integrity Program

The Service Water Integrity Program is an existing program that relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the service water system are managed through the period of extended operation. The program includes component inspections for erosion, corrosion, and biofouling to verify the heat transfer capability of safety-related heat exchangers cooled by service water and monitoring of the silt levels in the intake bays. Chemical treatment using biocides and chlorine and periodic cleaning and flushing of infrequently used loops are methods used to control fouling within the heat exchangers and to manage loss of material in service water components. Scheduling of nonsafety-related piping examinations is determined by trending of examination results. Selection of large bore service water pipe points for volumetric inspection is based on piping configuration, results from previous inspections, consideration of follow-ups to previous repairs, and condition

assessments when components are opened during preventive maintenance activities. Scope expansion for indications found by program inspections of nonsafety-related piping is based on engineering analysis, judgment and program experience. The factors that are considered include piping location, severity of use, piping materials, previous inspection results, and repair history.

The Service Water Integrity Program will be enhanced to include the following.

- Revise the appropriate procedures to incorporate actions to manage corrosion issues.
    - When through-wall leaks are detected, the leakage is evaluated under the corrective action program, which includes operability or functionality assessment of structural integrity and determination of appropriate corrective action.
    - Accessible portions of safety-related buried service water piping will be internally inspected by robotic crawler or manual crawl-through once during the first 10 years of the period of extended operation.
- Revise Service Water Integrity Program procedures by December 31, 2017 to address the following:

    a) Perform a minimum <u>of 25 volumetric NDE inspections each refueling interval per unit</u> ~~number of volumetric weld examinations~~ for ~~safety-related cement-lined~~ SW piping. The volumetric examinations will determine the extent of wall thinning.

    ~~o Perform a minimum of 10 volumetric weld examinations for cement-lined piping on the IP3 SW system during each refueling interval.~~
    ~~o If >1 and <5 degraded locations are found in a specific refueling interval, then 10 additional volumetric examinations of system welds will be performed during the following refueling interval.~~
    ~~o If >5 degraded locations are found, then a minimum of 15 additional volumetric examinations will be performed during the following refueling interval.~~

    b) For areas of piping that are found degraded and returned to service, the remaining service life will be calculated and the piping will be re-examined prior to the end of calculated life.

    c) Require a minimum of 5 additional volumetric weld examinations if a through-wall leak is discovered in non-safety related portions of the SW system that are within the scope of license renewal for 10 CFR 54.4(a)(2).

    d) Increase the frequency of internal robotic inspections on the system headers at both units from once during the first 10 years of the period of extended operation to also include once during the second 10 years of the period of extended operation.

    e) Review the SW system to identify areas where leakage from nonsafety-related SW piping could result in unacceptable flooding and ensure the nonsafety-related piping that can cause flooding concerns is clearly identified in the program documents. Specify volumetric examination of at least 20 percent of (up to a

maximum of 25) non-safety related welds located in areas subject to flooding of safety-related equipment within each 10-year period of the PEO.

f) Specify a yearly OE review to identify any effects of aging reported on the SW system, specifically including any conditions that may have occurred in the prior year related to inadequate cement liner repairs.

g) Include guidance for lay-up of the SW process radiation monitoring system to minimize exposure of susceptible tubing to stagnant conditions.

i) Establish recurring internal corrosion goals for stagnant vent and drain connection piping. If these recurring internal goals are not met, the frequency for flushing stagnant vent and drain connection piping will be increased.

- The Service Water Integrity Program procedures will be revised to include generic flaw evaluation acceptance criteria based on ensuring structural integrity and leakage concerns. Program procedures will also be revised include generic Containment integrity leak rate acceptance criteria, depending on the location of a flaw. This will take the form of acceptance curves for flaw size to meet structural integrity versus pipe size, a curve for leak rate versus pipe size, and an acceptance curve for Containment integrity considering flaw size versus leak location. The intent is to provide for a rapid and easily performed assessment (i.e., operability determination) of a leak in the service water system within containment in either unit.
- The Service Water Integrity Program procedures will be revised to perform a formal review of a leak that causes a loss of function. This will include examining the cause of the leak and to determine if the aging management program remains adequate. If a new aging mechanism is found, it will also evaluate if a failure of the aging management program plan has occurred.
- The Service Water Integrity Program procedures will be revised to prioritize future inspections based on plant area susceptible to flooding concerns.
- Revise Service Water Integrity Program procedures to perform volumetric NDE, such as radiography, of the carbon fiber-wrapped welds in the service water strainer pits during the period of extended operation. The number of inspections will be 20 percent of the total affected weld population, up to a maximum of 25, during each 10-year operating interval.
- Revise Service Water Integrity Program procedures to perform internal visual inspections of flanged connections where carbon steel is in contact with AL-6XN, Avesta 254 SMO, or 300-series stainless steel. The inspection population will be dissimilar metal joints without galvanic insulating kits. Inspections will focus on the bounding or lead components most susceptible to galvanic corrosion based on time in service and severity of operating conditions. Inspections will monitor for evidence of loss of material due to galvanic corrosion on a representative sample consisting of 20 percent of the population up to a maximum of 25 inspections during each 10-year period of the period of extended operation. If significant loss of material is identified by the visual inspections, additional volumetric NDE will be performed to characterize the extent of the degradation.

- Revise Service Water Integrity Program procedural guidance to implement the guidelines of reports IP-RPT-16-00046 and IP-RPT-17-0062.

- Revise Service Water Integrity Program procedures to specify a definitive number of volumetric inspections for welds made of 904L material. The number of inspections will be 20 percent of the total affected weld population, up to a maximum of 25, during each 10-year operating interval.

- Revise Service Water Integrity Program procedures to require five extent-of-condition inspections whenever inspections discover wall thickness that when projected to the end of the period of extended operation is less than the minimum allowable wall thickness. This applies to degradation of in-scope piping, regardless of its material or safety class. For portions of the system found degraded that are not covered by ASME Code Case N-513, volumetric inspection will be required unless those portions are configured in a manner that does not support NDE (e.g. socket welds, fillet welds, etc.).

The enhancement will be implemented prior to ~~December 31, 2019~~ December 31, 2018.

B.1.29 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

The Periodic Surveillance and Preventive Maintenance Program is an existing program that includes periodic inspections and tests that manage aging effects not managed by other aging management programs. In addition to specific activities in the plant's preventive maintenance program and surveillance program, the Periodic Surveillance and Preventive Maintenance Program includes enhancements to add new activities. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. Credit for program activities has been taken in the aging management review of the following systems and structures. All activities are new unless otherwise noted.

Service water system	Visually inspect the surface of the carbon fiber-reinforced epoxy overlay on line 405 in the Unit 3 primary auxiliary building to manage cracking, blistering, and loss of material. The inspection will be performed each operating cycle.

The following enhancements will be implemented prior to ~~the period of extended operation~~ December 31, 2018.

Attributes Affected	Enhancements
1. Scope of Program 3. Parameters Monitored or Inspected 4. Detection of Aging Effects 6. Acceptance Criteria	Program activity guidance documents will be developed or revised as necessary to assure that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.34 Service Water Integrity

Program Description

The Service Water Integrity Program is an existing program that relies on implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the service water system are managed through the period of extended operation. The program includes component inspections for erosion, corrosion, and biofouling to verify the heat transfer capability of safety-related heat exchangers cooled by service water and monitoring of the silt levels in the intake bays. Chemical treatment using biocides and sodium hypochlorite and periodic cleaning and

flushing of infrequently used loops are methods used to control fouling within the heat exchangers and to manage loss of material in service water components. Prioritization of internal examinations of SW piping is based on safety classification. Scheduling of nonsafety-related piping examination is determined by trending of examination results. Selection of large bore service water pipe points for volumetric inspection is based on piping configuration, results from previous inspections, consideration of follow-ups to previous repairs, and condition assessments when components are opened during preventive maintenance activities. Scope expansion for indications found by program inspections of nonsafety-related piping is based on engineering analysis, judgment and program experience. The factors that are considered include piping location, severity of use, piping materials, previous inspection results, and repair history.

NUREG-1801 Consistency

The Service Water Integrity Program is consistent with the program described in NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to December 31, 2018.

Attributes Affected	Enhancements
4. Detection of Aging Effects	• Perform a minimum of 25 volumetric NDE inspections each refueling interval per unit ~~number of volumetric weld examinations~~ for ~~safety-related cement-lined~~ SW piping. The volumetric examinations will determine the extent of wall thinning. ➢ ~~Perform a minimum of 10 volumetric weld examinations for cement-lined piping on each unit's SW system during each refueling interval.~~ ➢ ~~If >1 and <5 degraded locations are found in a specific refueling interval, then 10 additional volumetric examinations of system welds will be performed during the following refueling interval.~~ ➢ ~~If >5 degraded locations are found, then 15 additional volumetric examinations will be performed during the following refueling interval.~~ • Revise Service Water Integrity Program procedures to perform volumetric NDE, such as radiography, of the carbon fiber-wrapped welds in the service water strainer pits during the period of extended operation.

Attributes Affected	Enhancements
	The number of inspections will be 20 percent of the total affected weld population, up to a maximum of 25, during each 10-year operating interval. • Revise the Service Water Integrity Program procedures to perform internal visual inspections of flanged connections where carbon steel is in contact with AL-6XN, Avesta 254 SMO, or 300-series stainless steel. The inspection population will be dissimilar metal joints without galvanic insulating kits. Inspections will focus on the bounding or lead components most susceptible to galvanic corrosion based on time in service and severity of operating conditions. Inspections will monitor for evidence of loss of material due to galvanic corrosion on a representative sample consisting of 20 percent of the population, up to a maximum of 25 inspections, during each 10-year period of the period of extended operation. If significant loss of material is identified by the visual inspections, additional volumetric NDE will be performed to characterize the extent of the degradation. • Revise IP3 Service Water Integrity Program procedures to include provisions to specify a definitive number of volumetric inspections for welds made of 904L material. The number of inspections will be 20 percent of the total affected weld population, up to a maximum of 25, during each 10-year operating interval. • Revise Service Water Integrity Program procedures to require five extent-of-condition inspections whenever inspections discover wall thickness that when projected to the end of the period of extended operation is less than the minimum allowable wall thickness. This applies to degradation of in-scope piping, regardless of its material or safety class. For portions of the system found degraded that are not covered by ASME Code Case N-513, volumetric inspection will be required unless those portions are configured in a manner that does not support NDE (e.g. socket welds, fillet welds, etc.).

Attributes Affected	Enhancements
7. Corrective Actions	• Revise Service Water Integrity Program procedural guidance to implement the guidelines of reports IP-RPT-16-00046 and IP-RPT-17-0062.

ATTACHMENT 3

to NL-17-155

LICENSE RENEWAL APPLICATION

IPEC LIST OF REGULATORY COMMITMENTS

Rev. 36

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

List of Regulatory Commitments

Rev. 36

The following table identifies those actions committed to by Entergy in this document. Changes are shown as strike-through for ~~deletions~~ and underlines for additions.

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
1	Enhance the Aboveground Steel Tanks Program for IP2 and IP3 to perform thickness measurements of the bottom surfaces of the condensate storage tanks, city water tank, and fire water tanks once during the first ten years of the period of extended operation. Enhance the Aboveground Steel Tanks Program for IP2 and IP3 to require trending of thickness measurements when material loss is detected.	IP2: Complete	NL-07-039 NL-13-122	A.2.1.1 A.3.1.1 B.1.1
	Implement LRA Sections, A.2.1.1, A.3.1.1 and B.1.1, as shown in NL-14-147.	IP2 & IP3: December 31, 2019	NL-14-147	A.2.1.1 A.3.1.1 B.1.1
	Implement LRA Sections, A.2.1.1 and B.1.1, as shown in NL-15-092	IP2 & IP3: December 31, 2019	NL-15-092	A.2.1.1 B.1.1
2	Enhance the Bolting Integrity Program for IP2 and IP3 to clarify that actual yield strength is used in selecting materials for low susceptibility to SCC and clarify the prohibition on use of lubricants containing MoS_2 for bolting. The Bolting Integrity Program manages loss of preload and loss of material for all external bolting.	IP2: Complete IP3: Complete	NL-07-039 NL-07-153 NL-13-122	A.2.1.2 A.3.1.2 B.1.2 Audit Items 201, 241, 270

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
3	Implement the Buried Piping and Tanks Inspection Program for IP2 and IP3 as described in LRA Section B.1.6. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.M34, Buried Piping and Tanks Inspection. Include in the Buried Piping and Tanks Inspection Program described in LRA Section B.1.6 a risk assessment of in-scope buried piping and tanks that includes consideration of the impacts of buried piping or tank leakage and of conditions affecting the risk for corrosion. Classify pipe segments and tanks as having a high, medium or low impact of leakage based on the safety class, the hazard posed by fluid contained in the piping and the impact of leakage on reliable plant operation. Determine corrosion risk through consideration of piping or tank material, soil resistivity, drainage, the presence of cathodic protection and the type of coating. Establish inspection priority and frequency for periodic inspections of the in-scope piping and tanks based on the results of the risk assessment. Perform inspections using inspection techniques with demonstrated effectiveness.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121 NL-09-106 NL-09-111 NL-11-101	A.2.1.5 A.3.1.5 B.1.6 Audit Item 173
4	Enhance the Diesel Fuel Monitoring Program to include cleaning and inspection of the IP2 GT-1 gas turbine fuel oil storage tanks, IP2 and IP3 EDG fuel oil day tanks, IP2 SBO/Appendix R diesel generator fuel oil day tank, and IP3 Appendix R fuel oil storage tank and day tank once every ten years. Enhance the Diesel Fuel Monitoring Program to include quarterly sampling and analysis of the IP2 SBO/Appendix R diesel generator fuel oil day tank, IP2 security diesel fuel oil storage tank, IP2 security diesel fuel oil day tank, and IP3 Appendix R fuel oil storage tank. Particulates, water and sediment checks will be performed on the samples. Filterable solids acceptance criterion will be less than or equal to 10mg/l. Water and sediment acceptance criterion will be less than or equal to 0.05%.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121 NL-08-057	A.2.1.8 A.3.1.8 B.1.9 Audit items 128, 129, 132, 491, 492, 510

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	Enhance the Diesel Fuel Monitoring Program to include thickness measurement of the bottom of the following tanks once every ten years. IP2: EDG fuel oil storage tanks, EDG fuel oil day tanks, SBO/Appendix R diesel generator fuel oil day tank, GT-1 gas turbine fuel oil storage tanks, and diesel fire pump fuel oil storage tank; IP3: EDG fuel oil day tanks, EDG fuel oil storage tanks, Appendix R fuel oil storage tank, and diesel fire pump fuel oil storage tank. Enhance the Diesel Fuel Monitoring Program to change the analysis for water and particulates to a quarterly frequency for the following tanks. IP2: GT-1 gas turbine fuel oil storage tanks and diesel fire pump fuel oil storage tank; IP3: Appendix R fuel oil day tank and diesel fire pump fuel oil storage tank. Enhance the Diesel Fuel Monitoring Program to specify acceptance criteria for thickness measurements of the fuel oil storage tanks within the scope of the program. Enhance the Diesel Fuel Monitoring Program to direct samples be taken and include direction to remove water when detected. Revise applicable procedures to direct sampling of the onsite portable fuel oil contents prior to transferring the contents to the storage tanks. Enhance the Diesel Fuel Monitoring Program to direct the addition of chemicals including biocide when the presence of biological activity is confirmed.			
5	Enhance the External Surfaces Monitoring Program for IP2 and IP3 to include periodic inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject systems will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(2).	IP2: Complete	NL-07-039 NL-13-122	A.2.1.10 A.3.1.10 B.1.11

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	Implement LRA Sections A.2.1.10, A.3.1.10 and B.1.11, as shown in NL-14-147.	IP2 & IP3: December 31, 2019	NL-14-147	A.2.1.10 A.3.1.10 B.1.11
6	Enhance the Fatigue Monitoring Program for IP2 to monitor steady state cycles and feedwater cycles or perform an evaluation to determine monitoring is not required. Review the number of allowed events and resolve discrepancies between reference documents and monitoring procedures. Enhance the Fatigue Monitoring Program for IP3 to include all the transients identified. Assure all fatigue analysis transients are included with the lowest limiting numbers. Update the number of design transients accumulated to date.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.11 A.3.1.11 B.1.12, Audit Item 164
7	Enhance the Fire Protection Program to inspect external surfaces of the IP3 RCP oil collection systems for loss of material each refueling cycle. Enhance the Fire Protection Program to explicitly state that the IP2 and IP3 diesel fire pump engine sub-systems (including the fuel supply line) shall be observed while the pump is running. Acceptance criteria will be revised to verify that the diesel engine does not exhibit signs of degradation while running; such as fuel oil, lube oil, coolant, or exhaust gas leakage. Enhance the Fire Protection Program to specify that the IP2 and IP3 diesel fire pump engine carbon steel exhaust components are inspected for evidence of corrosion and cracking at least once each operating cycle. Enhance the Fire Protection Program for IP3 to visually inspect the cable spreading room, 480V switchgear room, and EDG room CO_2 fire suppression system for signs of degradation, such as corrosion and mechanical damage at least once every six months.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-15-121	A.2.1.12 A.3.1.12 B.1.13

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
8	Enhance the Fire Water Program to include inspection of IP2 and IP3 hose reels for evidence of corrosion. Acceptance criteria will be revised to verify no unacceptable signs of degradation. Enhance the Fire Water Program to replace all or test a sample of IP2 and IP3 sprinkler heads required for 10 CFR 50.48 using guidance of NFPA 25 (2002 edition), Section 5.3.1.1.1 before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the extended period of operation to ensure that signs of degradation, such as corrosion, are detected in a timely manner. Enhance the Fire Water Program to perform wall thickness evaluations of IP2 and IP3 fire protection piping on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function. Enhance the Fire Water Program to inspect the internal surface of foam based fire suppression tanks. Acceptance criteria will be enhanced to verify no significant corrosion.	IP2: Complete	NL-07-039 NL-13-122 NL-07-153 NL-08-014	A.2.1.13 A.3.1.13 B.1.14 Audit Items 105, 106
	Implement LRA Sections, A.2.1.13, A.3.1.13 and B.1.14, as shown in NL-14-147.	IP2 & IP3: December 31, 2019	NL-14-147	A.2.1.13 A.3.1.13 B.1.14
	Implement LRA Sections A.2.1.13, A.3.1.13 and B.1.14, as shown in NL-15-019	IP2 & IP3: December 31, 2019	NL-15-019	A.2.1.13 A.3.1.13 B.1.14
	Implement LRA Sections A.2.1.13, A.3.1.13 and B.1.14, as shown in NL-15-092	IP2 & IP3: December 31, 2019	NL-15-092	A.2.1.13 A.3.1.13 B.1.14

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	Implement LRA Sections A.2.1.13, A.3.1.13 and B.1.14, as shown in NL-16-122[4]	IP2 & IP3: December 31, 2017	NL-16-122	A.2.1.13 A.3.1.13 B.1.14
	Implement LRA Sections A.2.1.13, A.3.1.13, and B.1.14, as shown in NL-17-052	IP2 & IP3: December 31, 2017	NL-17-052	A.2.1.13 A.3.1.13 B.1.14
9	Enhance the Flux Thimble Tube Inspection Program for IP2 and IP3 to implement comparisons to wear rates identified in WCAP-12866. Include provisions to compare data to the previous performances and perform evaluations regarding change to test frequency and scope. Enhance the Flux Thimble Tube Inspection Program for IP2 and IP3 to specify the acceptance criteria as outlined in WCAP-12866 or other plant-specific values based on evaluation of previous test results. Enhance the Flux Thimble Tube Inspection Program for IP2 and IP3 to direct evaluation and performance of corrective actions based on tubes that exceed or are projected to exceed the acceptance criteria. Also stipulate that flux thimble tubes that cannot be inspected over the tube length and cannot be shown by analysis to be satisfactory for continued service, must be removed from service to ensure the integrity of the reactor coolant system pressure boundary.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-15-121	A.2.1.15 A.3.1.15 B.1.16

[4] This commitment erroneously deleted in NL-17-052

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
10	Enhance the Heat Exchanger Monitoring Program for IP2 and IP3 to include the following heat exchangers in the scope of the program. • Safety injection pump lube oil heat exchangers • RHR heat exchangers • RHR pump seal coolers • Non-regenerative heat exchangers • Charging pump seal water heat exchangers • Charging pump fluid drive coolers • Charging pump crankcase oil coolers • Spent fuel pit heat exchangers • Secondary system steam generator sample coolers • Waste gas compressor heat exchangers • SBO/Appendix R diesel jacket water heat exchanger (IP2 only) Enhance the Heat Exchanger Monitoring Program for IP2 and IP3 to perform visual inspection on heat exchangers where non-destructive examination, such as eddy current inspection, is not possible due to heat exchanger design limitations. Enhance the Heat Exchanger Monitoring Program for IP2 and IP3 to include consideration of material-environment combinations when determining sample population of heat exchangers. Enhance the Heat Exchanger Monitoring Program for IP2 and IP3 to establish minimum tube wall thickness for the new heat exchangers identified in the scope of the program. Establish acceptance criteria for heat exchangers visually inspected to include no indication of tube erosion, vibration wear, corrosion, pitting, fouling, or scaling.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121 NL-09-018	A.2.1.16 A.3.1.16 B.1.17, Audit Item 52
11	Deleted		NL-09-056 NL-11-101	
12	Enhance the Masonry Wall Program for IP2 and IP3 to specify that the IP1 intake structure is included in the program.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122	A.2.1.18 A.3.1.18 B.1.19

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
13	Enhance the Metal-Enclosed Bus Inspection Program for IP2 and IP3 to visually inspect the external surface of MEB enclosure assemblies for loss of material at least once every 10 years. The first inspection will occur prior to the period of extended operation and the acceptance criterion will be no significant loss of material. Enhance the Metal-Enclosed Bus Inspection Program to add acceptance criteria for MEB internal visual inspections to include the absence of indications of dust accumulation on the bus bar, on the insulators, and in the duct, in addition to the absence of indications of moisture intrusion into the duct. Enhance the Metal-Enclosed Bus Inspection Program for IP2 and IP3 to inspect bolted connections at least once every five years if performed visually or at least once every ten years using quantitative measurements such as thermography or contact resistance measurements. The first inspection will occur prior to the period of extended operation. The plant will process a change to applicable site procedure to remove the reference to "re-torquing" connections for phase bus maintenance and bolted connection maintenance.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121 NL-08-057 NL-13-077	A.2.1.19 A.3.1.19 B.1.20 Audit Items 124, 133, 519
14	Implement the Non-EQ Bolted Cable Connections Program for IP2 and IP3 as described in LRA Section B.1.22.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-15-121	A.2.1.21 A.3.1.21 B.1.22
15	Implement the Non-EQ Inaccessible Medium-Voltage Cable Program for IP2 and IP3 as described in LRA Section B.1.23. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E3, Inaccessible Medium-Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121 NL-11-032 NL-11-096 NL-11-101	A.2.1.22 A.3.1.22 B.1.23 Audit item 173

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
16	Implement the Non-EQ Instrumentation Circuits Test Review Program for IP2 and IP3 as described in LRA Section B.1.24. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E2, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.23 A.3.1.23 B.1.24 Audit item 173
17	Implement the Non-EQ Insulated Cables and Connections Program for IP2 and IP3 as described in LRA Section B.1.25. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.E1, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.24 A.3.1.24 B.1.25 Audit item 173
18	Enhance the Oil Analysis Program for IP2 to sample and analyze lubricating oil used in the SBO/Appendix R diesel generator consistent with the oil analysis for other site diesel generators. Enhance the Oil Analysis Program for IP2 and IP3 to sample and analyze generator seal oil and turbine hydraulic control oil. Enhance the Oil Analysis Program for IP2 and IP3 to formalize preliminary oil screening for water and particulates and laboratory analyses including defined acceptance criteria for all components included in the scope of this program. The program will specify corrective actions in the event acceptance criteria are not met. Enhance the Oil Analysis Program for IP2 and IP3 to formalize trending of preliminary oil screening results as well as data provided from independent laboratories.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-11-101 NL-15-121	A.2.1.25 A.3.1.25 B.1.26

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
19	Implement the One-Time Inspection Program for IP2 and IP3 as described in LRA Section B.1.27. This new program will be implemented consistent with the corresponding program described in NUREG-1801, Section XI.M32, One-Time Inspection.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.26 A.3.1.26 B.1.27 Audit item 173
20	Implement the One-Time Inspection – Small Bore Piping Program for IP2 and IP3 as described in LRA Section B.1.28. This new program will be implemented consistent with the corresponding program described in NUREG-1801, Section XI.M35, One-Time Inspection of ASME Code Class I Small-Bore Piping.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.27 A.3.1.27 B.1.28 Audit item 173
21	Enhance the Periodic Surveillance and Preventive Maintenance Program for IP2 and IP3 as necessary to assure that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-15-121	A.2.1.28 A.3.1.28 B.1.29
	Implement LRA Sections A.2.1.28, A.3.1.28 and B.1.29, as shown in NL-16-122[5]	IP2 & IP3: December 31, 2017	NL-16-122	A.2.1.28 A.3.1.28 B.1.29
	Implement LRA Sections A.2.1.28, A.3.1.28 and B.1.29, as shown in NL-17-052	IP2 & IP3: December 31, 2017	NL-17-052	A.2.1.28 A.3.1.28 B.1.29
	Implement LRA Sections A.2.1.28, A.3.1.28 and B.1.29, as shown in NL-17-155	IP2 & IP3: December 31, 2018	NL-17-155	A.2.1.28 A.3.1.28 B.1.29

[5] This commitment erroneously deleted in NL-17-052

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
22	Enhance the Reactor Vessel Surveillance Program for IP2 and IP3 revising the specimen capsule withdrawal schedules to draw and test a standby capsule to cover the peak reactor vessel fluence expected through the end of the period of extended operation. Enhance the Reactor Vessel Surveillance Program for IP2 and IP3 to require that tested and untested specimens from all capsules pulled from the reactor vessel are maintained in storage.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-15-121	A.2.1.31 A.3.1.31 B.1.32
23	Implement the Selective Leaching Program for IP2 and IP3 as described in LRA Section B.1.33. This new program will be implemented consistent with the corresponding program described in NUREG-1801, Section XI.M33 Selective Leaching of Materials.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.32 A.3.1.32 B.1.33 Audit item 173
24	Enhance the Steam Generator Integrity Program for IP2 and IP3 to require that the results of the condition monitoring assessment are compared to the operational assessment performed for the prior operating cycle with differences evaluated.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122	A.2.1.34 A.3.1.34 B.1.35
25	Enhance the Structures Monitoring Program to explicitly specify that the following structures are included in the program. • Appendix R diesel generator foundation (IP3) • Appendix R diesel generator fuel oil tank vault (IP3) • Appendix R diesel generator switchgear and enclosure (IP3) • city water storage tank foundation • condensate storage tanks foundation (IP3) • containment access facility and annex (IP3) • discharge canal (IP2/3) • emergency lighting poles and foundations (IP2/3) • fire pumphouse (IP2) • fire protection pumphouse (IP3) • fire water storage tank foundations (IP2/3) • gas turbine 1 fuel storage tank foundation • maintenance and outage building-elevated passageway (IP2)	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121 NL-08-057 NL-13-077	A.2.1.35 A.3.1.35 B.1.36 Audit items 86, 87, 88, 417

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	• new station security building (IP2) • nuclear service building (IP1) • primary water storage tank foundation (IP3) • refueling water storage tank foundation (IP3) • security access and office building (IP3) • service water pipe chase (IP2/3) • service water valve pit (IP3) • transformer/switchyard support structures (IP2) • waste holdup tank pits (IP2/3) Enhance the Structures Monitoring Program for IP2 and IP3 to clarify that in addition to structural steel and concrete, the following commodities (including their anchorages) are inspected for each structure as applicable. • cable trays and supports • concrete portion of reactor vessel supports • conduits and supports • cranes, rails and girders • equipment pads and foundations • fire proofing (pyrocrete) • HVAC duct supports • jib cranes • manholes and duct banks • manways, hatches and hatch covers • monorails • new fuel storage racks • sumps Enhance the Structures Monitoring Program for IP2 and IP3 to inspect inaccessible concrete areas that are exposed by excavation for any reason. IP2 and IP3 will also inspect inaccessible concrete areas in environments where observed conditions in accessible areas exposed to the same environment indicate that significant concrete degradation is occurring. Enhance the Structures Monitoring Program for IP2 and IP3 to perform inspections of elastomers (seals, gaskets, seismic joint filler, and roof elastomers) to		NL-14-146 NL-13-077	

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	identify cracking and change in material properties and for inspection of aluminum vents and louvers to identify loss of material. Enhance the Structures Monitoring Program for IP2 and IP3 to perform an engineering evaluation of groundwater samples to assess aggressiveness of groundwater to concrete on a periodic basis (at least once every five years). IPEC will obtain samples from at least 5 wells that are representative of the ground water surrounding below-grade site structures and perform an engineering evaluation of the results from those samples for sulfates, pH and chlorides. Additionally, to assess potential indications of spent fuel pool leakage, IPEC will sample for tritium in groundwater wells in close proximity to the IP2 spent fuel pool at least once every 3 months. Enhance the Structures Monitoring Program for IP2 and IP3 to perform inspection of normally submerged concrete portions of the intake structures at least once every 5 years. Inspect the baffling/grating partition and support platform of the IP3 intake structure at least once every 5 years. Enhance the Structures Monitoring Program for IP2 and IP3 to perform inspection of the degraded areas of the water control structure once per 3 years rather than the normal frequency of once per 5 years during the PEO. Enhance the Structures Monitoring Program to include more detailed quantitative acceptance criteria for inspections of concrete structures in accordance with ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures" prior to the period of extended operation.		NL-08-127 NL-11-032 NL-11-101	Audit Item 360 Audit Item 358

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
26	Implement the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program for IP2 and IP3 as described in LRA Section B.1.37. This new program will be implemented consistent with the corresponding program described in NUREG-1801, Section XI.M12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-15-121	A.2.1.36 A.3.1.36 B.1.37 Audit item 173
27	Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program for IP2 and IP3 as described in LRA Section B.1.38. This new program will be implemented consistent with the corresponding program described in NUREG-1801 Section XI.M13, Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153	A.2.1.37 A.3.1.37 B.1.38 Audit item 173
28	Enhance the Water Chemistry Control – Closed Cooling Water Program to maintain water chemistry of the IP2 SBO/Appendix R diesel generator cooling system per EPRI guidelines. Enhance the Water Chemistry Control – Closed Cooling Water Program to maintain the IP2 and IP3 security generator and fire protection diesel cooling water pH and glycol within limits specified by EPRI guidelines.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-08-057	A.2.1.39 A.3.1.39 B.1.40 Audit item 509
29	Enhance the Water Chemistry Control – Primary and Secondary Program for IP2 to test sulfates monthly in the RWST with a limit of <150 ppb.	IP2: Complete	NL-07-039 NL-13-122	A.2.1.40 B.1.41
30	For aging management of the reactor vessel internals, IPEC will (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-11-107	A.2.1.41 A.3.1.41

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
31	Additional P-T curves will be submitted as required per 10 CFR 50, Appendix G prior to the period of extended operation as part of the Reactor Vessel Surveillance Program.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-15-121	A.2.2.1.2 A.3.2.1.2 4.2.3
32	As required by 10 CFR 50.61(b)(4), IP3 will submit a plant-specific safety analysis for plate B2803-3 to the NRC three years prior to reaching the RT_{PTS} screening criterion. Alternatively, the site may choose to implement the revised PTS rule when approved.	IP3: Approximately 6 years after entering the PEO	NL-07-039 NL-07-140 NL-08-014 NL-08-127	A.3.2.1.4 4.2.5

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
33	At least 2 years prior to entering the period of extended operation, for the locations identified in LRA Table 4.3-13 (IP2) and LRA Table 4.3-14 (IP3), under the Fatigue Monitoring Program, IP2 and IP3 will implement one or more of the following: (1) Consistent with the Fatigue Monitoring Program, Detection of Aging Effects, update the fatigue usage calculations using refined fatigue analyses to determine valid CUFs less than 1.0 when accounting for the effects of reactor water environment. This includes applying the appropriate Fen factors to valid CUFs determined in accordance with one of the following: 1. For locations in LRA Table 4.3-13 (IP2) and LRA Table 4.3-14 (IP3), with existing fatigue analysis valid for the period of extended operation, use the existing CUF. 2. Additional plant-specific locations with a valid CUF may be evaluated. In particular, the pressurizer lower shell will be reviewed to ensure the surge nozzle remains the limiting component. 3. Representative CUF values from other plants, adjusted to or enveloping the IPEC plant specific external loads may be used if demonstrated applicable to IPEC. 4. An analysis using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) may be performed to determine a valid CUF. (2) Consistent with the Fatigue Monitoring Program, Corrective Actions, repair or replace the affected locations before exceeding a CUF of 1.0.	IP2: Complete IP3: Complete	NL-07-039 NL-13-122 NL-07-153 NL-08-021 NL-10-082	A.2.2.2.3 A.3.2.2.3 4.3.3 Audit item 146
34	IP2 SBO / Appendix R diesel generator will be installed and operational by April 30, 2008. This committed change to the facility meets the requirements of 10 CFR 50.59(c)(1) and, therefore, a license amendment pursuant to 10 CFR 50.90 is not required.	Complete	NL-13-122 NL-07-078 NL-08-074 NL-11-101	2.1.1.3.5

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
35	Perform a one-time inspection of representative sample area of IP2 containment liner affected by the 1973 event behind the insulation, prior to entering the period of extended operation, to assure liner degradation is not occurring in this area. Perform a one-time inspection of representative sample area of the IP3 containment steel liner at the juncture with the concrete floor slab, prior to entering the period of extended operation, to assure liner degradation is not occurring in this area. Any degradation will be evaluated for updating of the containment liner analyses as needed.	IP2: Complete IP3: Complete	NL-08-127 NL-13-122 NL-11-101 NL-15-121 NL-09-018	Audit Item 27
36	Perform a one-time inspection and evaluation of a sample of potentially affected IP2 refueling cavity concrete prior to the period of extended operation. The sample will be obtained by core boring the refueling cavity wall in an area that is susceptible to exposure to borated water leakage. The inspection will include an assessment of embedded reinforcing steel. Additional core bore samples will be taken, if the leakage is not stopped, prior to the end of the first ten years of the period of extended operation. A sample of leakage fluid will be analyzed to determine the composition of the fluid. If additional core samples are taken prior to the end of the first ten years of the period of extended operation, a sample of leakage fluid will be analyzed.	IP2: Complete	NL-08-127 NL-11-101 NL-13-122 NL-09-056 NL-09-079	Audit Item 359
37	Enhance the Containment Inservice Inspection (CII-IWL) Program to include inspections of the containment using enhanced characterization of degradation (i.e., quantifying the dimensions of noted indications through the use of optical aids) during the period of extended operation. The enhancement includes obtaining critical dimensional data of degradation where possible through direct measurement or the use of scaling technologies for photographs, and the use of consistent vantage points for visual inspections.	IP2: Complete IP3: Complete	NL-08-127 NL-13-122	Audit Item 361

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
38	For Reactor Vessel Fluence, should future core loading patterns invalidate the basis for the projected values of RTpts or C_VUSE, updated calculations will be provided to the NRC.	IP2: Complete IP3: Complete	NL-08-143 NL-13-122 NL-15-121	4.2.1
39	Deleted		NL-09-079	
40	Evaluate plant specific and appropriate industry operating experience and incorporate lessons learned in establishing appropriate monitoring and inspection frequencies to assess aging effects for the new aging management programs. Documentation of the operating experience evaluated for each new program will be available on site for NRC review prior to the period of extended operation.	IP2: Complete IP3: Complete	NL-09-106 NL-13-122 NL-15-121	B.1.6 B.1.22 B.1.23 B.1.24 B.1.25 B.1.27 B.1.28 B.1.33 B.1.37 B.1.38
41	Deleted		NL-17-005	N/A

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
42	IPEC will develop a plan for each unit to address the potential for cracking of the primary to secondary pressure boundary due to PWSCC of tube-to-tubesheet welds using one of the following two options. Option 1 (Analysis) IPEC will perform an analytical evaluation of the steam generator tube-to-tubesheet welds in order to establish a technical basis for either determining that the tubesheet cladding and welds are not susceptible to PWSCC, or redefining the pressure boundary in which the tube-to-tubesheet weld is no longer included and, therefore, is not required for reactor coolant pressure boundary function. The redefinition of the reactor coolant pressure boundary must be approved by the NRC as a license amendment request. Option 2 (Inspection) IPEC will perform a one-time inspection of a representative number of tube-to-tubesheet welds in each steam generator to determine if PWSCC cracking is present. If weld cracking is identified: a. The condition will be resolved through repair or engineering evaluation to justify continued service, as appropriate, and b. An ongoing monitoring program will be established to perform routine tube-to-tubesheet weld inspections for the remaining life of the steam generators.	IP2: Complete IP3: Complete IP2: Not Applicable IP3: Not Applicable	NL-11-032 NL-11-074 NL-11-090 NL-11-096 NL-17-005	N/A

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
43	IPEC will review design basis ASME Code Class 1 fatigue evaluations to determine whether the NUREG/CR-6260 locations that have been evaluated for the effects of the reactor coolant environment on fatigue usage are the limiting locations for the IP2 and IP3 configurations. If more limiting locations are identified, the most limiting location will be evaluated for the effects of the reactor coolant environment on fatigue usage. IPEC will use the NUREG/CR-6909 methodology in the evaluation of the limiting locations consisting of nickel alloy, if any.	IP2: Complete IP3: Complete	NL-11-032 NL-13-122 NL-11-101 NL-15-121	4.3.3
44	IPEC will include written explanation and justification of any user intervention in future evaluations using the WESTEMS "Design CUF" module.	IP2: Complete IP3: Complete	NL-11-032 NL-11-101 NL-13-122 NL-15-121	N/A
45	IPEC will not use the NB-3600 option of the WESTEMS program in future design calculations until the issues identified during the NRC review of the program have been resolved.	IP2: Complete IP3: Complete	NL-11-032 NL-11-101 NL-13-122 NL-15-121	N/A
46	Include in the IP2 ISI Program that IPEC will perform twenty-five volumetric weld metal inspections of socket welds during each 10-year ISI interval scheduled as specified by IWB-2412 of the ASME Section XI Code during the period of extended operation. In lieu of volumetric examinations, destructive examinations may be performed, where one destructive examination may be substituted for two volumetric examinations.	IP2: Complete	NL-11-032 NL-11-074 NL-13-122	N/A
47	Deleted.		NL-14-093	N/A

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
48	Entergy will visually inspect IPEC underground piping within the scope of license renewal and subject to aging management review prior to the period of extended operation and then on a frequency of at least once every two years during the period of extended operation. This inspection frequency will be maintained unless the piping is subsequently coated in accordance with the preventive actions specified in NUREG-1801 Section XI.M41 as modified by LR-ISG-2011-03. Visual inspections will be supplemented with surface or volumetric non-destructive testing if indications of significant loss of material are observed. Consistent with revised NUREG-1801 Section XI.M41, such adverse indications will be entered into the plant corrective action program for evaluation of extent of condition and for determination of appropriate corrective actions (e.g., increased inspection frequency, repair, replacement).	IP2: Complete IP3: Complete	NL-12-174 NL-13-122 NL-15-121	N/A
49	Recalculate each of the limiting CUFs provided in section 4.3 of the LRA for the reactor vessel internals to include the reactor coolant environment effects (F_{en}) as provided in the IPEC Fatigue Monitoring Program using NUREG/CR-5704 or NUREG/CR-6909. In accordance with the corrective actions specified in the Fatigue Monitoring Program, corrective actions include further CUF re-analysis, and/or repair or replacement of the affected components prior to the CUF_{en} reaching 1.0.	IP2: Complete IP3: Complete	NL-13-052 NL-13-122 NL-15-121	A.2.2.2 A.3.2.2
50	Replace the IP2 split pins during the 2016 refueling outage (2R22).	IP2: Complete IP3: N/A	NL-13-122 NL-14-067	A.2.1.41 B.1.42
51	Enhance the Service Water Integrity Program by implementing LRA Sections A.2.1.33, A.3.1.33 and B.1.34, as shown in NL-14-147.	IP2 & IP3: December 31, 2017	NL-14-147	A.2.1.33 A.3.1.33 B.1.34
	Implement LRA Sections A.2.1.33, A.3.1.33 and B.1.34, as shown in NL-16-122	IP2 & IP3: December 31, 2017	NL-16-122	A.2.1.33 A.3.1.33 B.1.34

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	Implement LRA Sections A.2.1.33, A.3.1.33 and B.1.34, as shown in NL-17-052	IP2 & IP3: December 31, 2017	NL-17-052	A.2.1.33 A.3.1.33 B.1.34
	Implement LRA Sections A.2.1.33, A.3.1.33 and B.1.34, as shown in NL-17-155	IP2 & IP3: December 31, 2018	NL-17-155	A.2.1.33 A.3.1.33 B.1.34
52	Implement the Coating Integrity Program for IP2 and IP3 as described in LRA Section B.1.42, as shown in NL-15-019.	IP2 & IP3: December 31, 2024	NL-15-019	A.2.1.42 A.3.1.42 B.1.43
53	Revise Bolting Integrity Program to include visual inspection of a representative sample of closure bolting (bolt heads, nuts, and threads) from components with an internal environment of a clear gas, such as air or nitrogen. A representative sample will be 20 percent of the population (for each bolting material and environment combination) up to a maximum of 25 fasteners during each 10-year period of the period of extended operation. The inspections will be performed when the bolting is removed to the extent that the bolting threads and bolt heads are accessible for inspections that cannot be performed during visual inspection with the threaded fastener installed.	May 31, 2018	NL-17-053	A.2.1.2 A.3.1.2 B.1.2
54	Enhance the Steam Generator Integrity Program as follows. • Revise applicable procedures to specify a general visual inspection of the steam generator channel head.	December 31, 2017	NL-17-060	A.2.1.34 A.3.1.34 B.1.35
55	Revise the Buried Piping and Tanks Inspection Program for IP2 and IP3 to incorporate the changes shown in LAR Sections A.2.1.5 and A.3.1.5 in letter NL-17-084.	December 31, 2017	NL-17-084	A.2.1.5 A.3.1.5