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Fred Dacimo
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NL-13-052

May 7, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Reply to Request for Additional Information Regarding the License Renewal Application
Indian Point Nuclear Generating Unit Nos. 2 & 3
Docket Nos. 50-247 and 50-286
License Nos. DPR-26 and DPR-64

REFERENCE:

1. NRC letter, "Request for Additional Information for the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application, SET 2013-01" dated February 6, 2013.

2. Entergy Letter, NL-12-140, "Reply to Request for Additional Information Regarding the License Renewal Application, Indian Point Nuclear Generating Unit Nos. 2 and 3, Docket Nos. 50-247 and 50-286, License Nos. DPR-26 and DPR-64," October 17, 2012.

Dear Sir or Madam:

Entergy Nuclear Operations, Inc is providing, in Attachment 1, a reply to the additional information requested in Reference 1 pertaining to NRC review of the License Renewal Application (LRA) for Indian Point 2 and Indian Point 3.

On review of the information requested in RAI 15a, Entergy has determined that it will rely on the Fatigue Monitoring Program (FMP) to manage the effects of aging due to fatigue on the reactor internals through the PEO rather than relying on the Reactor Vessel Internals (RVI) inspection program as described in Reference 2. Therefore a revised response to RAI 15 is also included in Attachment 1.

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NRR

The revised response to RAI 15 also includes new Commitment 49 that addresses the review of reactor vessel internals for environmentally assisted fatigue. The response to RAI 11a includes a revision to the implementation date for Commitment 47. These new and revised commitments are included in the latest list of regulatory commitments provided in Attachment 2.

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

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 7, 2013.

Sincerely,

FRD/rw

Attachment: 1. Reply to NRC Request for Additional Information Regarding the License Renewal Application

2. License Renewal Application IPEC List of Regulatory Commitments Revision 21.

cc: Mr. William Dean, Regional Administrator, NRC Region I
Mr. Sherwin E. Turk, NRC Office of General Counsel, Special Counsel
Mr. Dave Wrona, NRC Branch Chief, Engineering Review Branch I
Mr. Nathaniel Ferrer, NRC Project Manager, Division of License Renewal
Mr. Douglas Pickett, NRR Senior Project Manager
Ms. Bridget Frymire, New York State Department of Public Service
NRC Resident Inspector's Office
Mr. Francis J. Murray, Jr., President and CEO NYSERDA

ATTACHMENT 1 TO NL-13-052

REPLY TO NRC REQUEST FOR ADDITIONAL INFORMATION

REGARDING THE

LICENSE RENEWAL APPLICATION

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

INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3
LICENSE RENEWAL APPLICATION (LRA)
REQUESTS FOR ADDITIONAL INFORMATION (RAI)

NRC RAI 11a (RVI Program and combined effects of embrittlement)

Background

In request for additional information (RAI) 11, the staff requested additional information on the approach to be used for the plant-specific evaluation of the cast austenitic stainless steel (CASS) lower support column bodies. The applicant's response indicates it plans to use a screening approach using the screening criteria for thermal aging embrittlement susceptibility from the Nuclear Regulatory Commission (NRC) staff's May 19, 2000 letter (Reference 1). The applicant provided a table of the screening criteria based on chemistry, casting method, and delta ferrite content identical to Table 2 of Reference 1.

Issue

However, Reference 1 also recommends that to account for a potential synergistic effect on loss of fracture toughness due to the combined effects of thermal embrittlement (TE) and neutron irradiation embrittlement (IE), a component-specific assessment should be performed for components that will experience neutron fluence of $1x10^{17}$ neutrons per square centimeter (n/cm^2) or greater. Supplemental inspections would be recommended for those components that are potentially susceptible to TE and IE, that are also subject to significant tensile loadings under any normal operating or design basis condition. Per Table 4-6 of MRP-191 (Reference 2), the screening value of the neutron fluence for the lower support column bodies for Westinghouse-designed reactor vessel internals (RVI) is $1x10^{22}$ to $5x10^{22}$ n/cm^2. This is significantly greater than the $1x10^{17}$ n/cm^2 threshold value provided in Reference 1.

Request

Describe how the effects of neutron fluence, with respect to a potential synergistic effect of TE and IE, will be addressed in the plant-specific evaluation of the lower support column bodies. The applicant should propose modifications of the aging management requirements for the lower support column bodies as necessary to address the concern with a potential synergistic effect.

The staff notes that for CASS, different neutron fluence thresholds, above which the synergistic effect of TE and IE must be considered, have been proposed in various industry documents. If a threshold value greater than $1x10^{17}$ n/cm^2 is used in the applicant's evaluation of the potential synergistic effect, a technical justification should be included for the threshold value chosen. The technical justification should include a description of the material test data used as the basis for the threshold including material type(s), thermal aging time and temperature, neutron fluence, type of reactor in which the irradiation was conducted, and relevant mechanical testing results.

Response to NRC RAI 11a

The screening approach used to evaluate the CASS components at IP2 and IP3 is consistent with the methodology developed in MRP-227-A (Reference 1). The screening value for

irradiation embrittlement of CASS components is based on the values cited in MRP-227-A and originally identified with supporting information in MRP-191 (Reference 2). Both MRP-227-A and MRP-191 have been made available by the industry for several years and MRP-227-A has been the subject of a safety evaluation (SE) by the NRC. On this basis, the lower support columns screen in because the most irradiated regions of these components are expected to be exposed to fluences in the range of 1×10^{22} to 5×10^{22} n/cm^2 as reported in Table 4-6 of MRP-191. Since effects of embrittlement are only significant in the presence of pre-existing flaws (e.g. from the casting process) and tensile stresses capable of propagating these flaws, the screening analysis will identify regions of individual columns where thermal and irradiation effects could give rise to embrittled materials and would also be subjected to significant tensile stresses under design and service loadings. For such regions, a functionality assessment will be conducted to determine the impact of column fracture on the lower core support plate structure. Based on the lack of any documented history of fracture in the lower core support columns, it will be assumed that only a limited number of columns could actually contain flaws of significant size. The assessment will evaluate distributions of fractured columns that can be tolerated without the loss of critical core support function.

The screening-in value of fluence for thermal embrittlement of CASS depends on the chemistry and fabrication of the CASS. As noted in the NRC document "Thermal Aging Embrittlement of Cast Austenitic Steel Components" (Reference 3), embrittlement of the composite Austenite+Ferrite structure depends on the distribution of the Ferrite constituent in the microstructure. If the Ferrite is distributed so that "it forms a continuous phase surrounding the grain boundaries" the material will be "made susceptible to low energy fracture", i.e., the fracture of the material is controlled by the low energy fracture of the embrittled Ferrite. Conversely, thermally exposed CASS microstructures in which the potentially embrittled Ferrite constituent particles are isolated and surrounded by larger volumes of Austenite structures do not exhibit thermally embrittled behavior. In these cases, Austenite, which is not susceptible to thermal embrittlement, controls the overall fracture behavior. The microstructures that exhibit such differences in behavior are produced by different alloy chemistries and casting practices. These effects on CASS susceptibility to thermal embrittlement were summarized in Table 1 of Reference 3 as shown below.

Table 1 Thermal Aging Screening Criteria from Table 1 of Reference 3

Molybdenum (Wt%)	Casting Method	Delta-Ferrite %	NRC Susceptibility Evaluation
High 2.0-3.0	Static	>14%	Potentially Susceptible to TE
		= or< 14%	Not Susceptible to TE
	Centrifugal	>20%	Potentially Susceptible to TE
		= or< 20%	Not Susceptible to TE
Low 0.5 max	Static	>20%	Potentially Susceptible to TE
		= or< 20%	Not Susceptible to TE
	Centrifugal	All	Not Susceptible to TE

The microstructural distribution of Austenite and Ferrite within CASS has a similar but not identical effect on irradiation embrittlement. When irradiated, both Ferrite and Austenite can embrittle. However, the degree to which embrittlement is incurred and the onset of embrittled behavior occurs at different fluences for the two phases. Ferrite embrittles at a much lower

fluence than Austenite. Also, even after saturation embrittlement, the remaining toughness of Austenite is still significantly higher than that of embrittled Ferrite. U. S. Nuclear Regulatory Commission reports indicate that embrittlement of pure austenite occurs in the regime of 3.5 $x10^{21}$ to 5.6 $x10^{21}$ n/cm^2 (References 4 and 5). Even in the presence of small amounts of Ferrite distributed within the CASS, it has been reported that the onset of this form of embrittlement only occurs at fluences above 6.7 x 10^{20} n/cm^2 (References 5 and 6). Since Austenite does not thermally embrittle, there cannot be synergistic effects when only small amounts of Ferrite are present.

In the case that the Ferrite forms continuous grain boundary constituents, it is expected that the CASS will embrittle at much lower fluences. The fluence that would impart irradiation embrittlement to this form of CASS is that at which the Ferrite phase undergoes irradiation embrittlement. The RAI has proposed that this level should be as low as 1 x 10^{17} n/cm^2. While there are several reasons why a higher value may be more appropriate for the embrittlement of Ferrite within CASS structures (viz., the elemental composition of this Ferrite can be significantly different from that which has been shown to exhibit embrittlement at such low fluences as observed in certain low alloy pressure vessel steels and particularly their welds), it is not necessary to consider this behavior for the CASS in Indian Point 2 and 3 since the CASS component regions that will be exposed to potentially embrittling cumulative fluences will also have been sufficiently thermally exposed to render full embrittlement of the Ferrite. The materials will, therefore, have already been screened-in on the basis of susceptibility to thermal embrittlement. Thus there is no need to consider irradiation embrittlement or synergistic action.

Based on the foregoing, the screening criteria for thermal and irradiation embrittlement of the CASS in the Indian Point Plants 2 and 3 may be summarized as:

Table 2 Thermal Aging and Irradiation Embrittlement Screening Criteria for CASS

Molybdenum (Wt%)	Casting Method	Delta-Ferrite %	Thermal Susceptibility	Irradiation Susceptibility Screening Fluence n/cm^2
High 2.0-3.0	Static	>14%	Screen-In as Potentially Susceptible to TE	
		= or< 14%	Not Susceptible to TE	Screen–In if Fluence > 6.7 x 10^{20}
	Centrifugal	>20%	Screen-In as Potentially Susceptible to TE	
		= or< 20%	Not Susceptible to TE	Screen–In if Fluence > 6.7 x 10^{20}
Low 0.5 max	Static	>20%	Screen-In as Potentially Susceptible to TE	
		= or< 20%	Not Susceptible to TE	Screen–In if Fluence > 6.7 x 10^{20}
	Centrifugal	All	Not Susceptible to TE	Screen–In if Fluence > 6.7 x 10^{20}

Commitment 47 – revision to implementation date

The implementation date for commitment 47 for IP2 is being revised from September 28, 2013 to March 1, 2015 based on the following:

In accordance with MRP-227-A, the lower support column bodies are identified as Expansion Components at IP2. They are only required to be inspected if surface-breaking indications are detected in two or more control rod guide tube (CRGT) lower flange welds, which are the Primary Components that are linked to the lower support column bodies as Expansion Components. The initial inspections for the CRGT lower flange welds are required to be performed no later than 2 refueling outages from the beginning of the license renewal period, which for IP2 is March 2016.

As indicated in Section 3.3.7 of the SER for MRP-227, the purpose of the analysis is to demonstrate that the MRP-227 recommended inspections will ensure functionality of the set of components between scheduled inspections. Changing the implementation schedule for the IP2 lower support column bodies analysis from September 28, 2013 to March 1, 2015 still ensures the analyses in Commitment 47 are completed prior to the first required MRP-227-A inspection in 2016, which is consistent with MRP-227-A and the associated NRC safety evaluation.

References

1. Materials Reliability Program : Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A) EPRI, Palo Alto, CA: 2011. TR-1022863
2. Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191). EPRI, Palo Alto, CA: 2006. TR-1013234
3. U S Nuclear Regulatory Commission "Thermal Aging Embrittlement of Cast Austentic Stainless Steel Components," License Renewal Issue N 98-0030, C.I.Grimes, U S Nuclear Regulatory Commission, May 19th 2000 – availability ADAMS Doc base ML003717179.
4. O. K. Chopra, "Degradation of LWR Core Internal Materials due to Neutron Irradiation," NUREG/CR-7027, U S Nuclear Regulatory Commission (December 2010).
5. O. K. Chopra and W. L. Shack, "Crack Growth Rates and Fracture Toughness of Irradiated Austenitic Stainless Steels in BWR Environments," NUREG/CR-6960, US Nuclear Regulatory Commission (March 2008).
6. Westinghouse Report WCAP-17141-NP, Rev. 0, "Thermal and Irradiation Embrittlement of Cast and Welded Austenitic Stainless Steel Reactor Internals," September 2009.

NRC RAI 15a (RVI program and Fatigue)

Background

In its response to RAI 15, Question 1, by letter dated October 17, 2012 (Reference 3), the applicant revised its response to RAI 12 to indicate that it intends to use the RVI Program to manage the cracking-fatigue aging effect for RVI components that have a time-limited aging analysis (TLAA) that determined a cumulative usage factor (CUF). The applicant provided a list of the RVI components that have a CUF analysis, a table cross-indexing

these components with the equivalent component name in MRP-227-A, along with the inspection requirements, and a justification for each component with a CUF that the inspection requirements are adequate to manage the cumulative fatigue damage aging effect.

Part 5 of Action Item 8 of the staff's final safety evaluation (SE) of MRP-227-A contains two requirements that must be fulfilled by licensees that intend to use the RVI Program to manage the cracking-fatigue aging effect for components with a TLAA for fatigue:

1. For those CUF analyses that are TLAAs, the applicant may use the pressurized-water reactor (PWR) Vessel Internals Program as the basis for accepting these CUF analyses in accordance with 10 CFR 54.21(c)(1)(iii) only if the RVI components in the CUF analyses are periodically inspected for fatigue-induced cracking in the components during the period of extended operation.
2. The periodicity of the inspections of these components shall be justified to be adequate to resolve the TLAA.

Many of the RVI components with TLAA analyses for both Indian Point (IP) Units 2 and 3 (IP2 and IP3) are either "existing programs" or "no additional measures" components under MRP-227-A, which are inspected under the ASME Section XI, Inservice Inspection Program and are thus only subject to a VT-3 visual examination. Those components categorized as "expansion" may or may not be inspected under the RVI Program based on the findings of the RVI Inspection Program examinations of the linked "primary" component(s). Additionally, a VT-3 visual examination may not be adequate for all components for detecting fatigue cracking prior to the occurrence of structurally significant cracking, although the staff notes that VT-3 examination is used for some components that were determined to be primary components for fatigue (such as thermal shield flexures and baffle-edge bolts).

In general, a justification for the inspection periodicity was not provided in the response to RAI 15. The default inspection periodicity for most "primary" inspection category components in MRP-227-A is every ten years following the initial inspection.

All of the CUFs for RVI components provided in Tables 4.3-5 and 4.3-6 of the IP2 & IP3 license renewal application (LRA) are less than 1.0. However, these CUFs were determined without the application of an environmental correction factor (F_{en}) to account for the effects of the reactor coolant environment. However, it is reasonable to conclude that if the reactor coolant environment affects the fatigue usage of other components in the reactor coolant system and reactor pressure vessel, then it would affect the RVI components similarly. The F_{en} for the reactor pressure vessel (RPV) components and reactor coolant system given in Section 4.3.4 of the LRA range from 2.45 to 15.35. Application of F_{en} in this range could cause the CUF of some RVI components to exceed 1.0. This would affect the required periodicity of inspection. For a very high environmentally-adjusted CUF, even a 10-year inspection interval may not be adequate.

<u>Issue</u>

1. Most of the RVI components with a fatigue TLAA analysis are not "Primary" inspection category components under the RVI Program, thus may be subject to no inspection other than a VT-3 visual examination under the ASME Section XI, Inservice Inspection Program, since "Expansion" category component inspections

are only triggered in the event of degradation of the linked "Primary" inspection category component(s).

2. The licensee did not justify the adequacy of the periodicity of the RVI Program inspections performed on RVI components that have fatigue TLAA analyses.

3. The staff considers the inspection techniques required by MRP-227-A for components in the "Primary," "Expansion," or "Existing Programs" categories, for which fatigue is a screened-in aging mechanism, adequate to detect cracking due to fatigue if the RVI Program is credited for managing a fatigue TLAA. However, those components that fall into the "No Additional Measures" category under MRP-227-A have no specified examination techniques, periodicity, coverage, and acceptance criteria in MRP-227-A.

Requested Information

1. For those RVI components having fatigue TLAA analyses for which the cumulative fatigue damage aging effect is to be managed by the RVI Inspection Program, but which are classified as "Expansion," "Existing Programs," or "No Additional Measures" inspection category components, provide a modification to the RVI Inspection Program to re-categorize these components as "Primary" inspection category components. If any such components are to remain in the "Expansion" category, provide a technical justification for potentially never inspecting these components. Discuss your plans to re-categorize these components as "Primary" inspection category components.

2. For those RVI components having fatigue TLAA analyses for which the cumulative fatigue damage aging effect is to be managed by the RVI Inspection Program, provide a quantitative justification that the periodicity of inspections for fatigue is adequate, either in terms of the calculated CUF (considering the effects of the environment on the CUF analysis), or by using a flaw tolerance approach.

3. For those RVI components having fatigue TLAA analyses for which the cumulative fatigue damage aging effect is to be managed by the RVI Inspection Program and which are classified as "No Additional Measures" components under MRP-227-A, identify the examination technique, coverage, periodicity, and acceptance criteria (i.e., provide the equivalent information to that provided in Tables 4-3 and 5-3 of MRP-227-A). In addition, provide the information requested in Parts 1 and 2 of this RAI for these components.

References

1. U.S. Nuclear Regulatory Commission Letter, "License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components," May 19, 2000 (NRC ADAMS Accession No. ML003717179)
2. MRP-191 Revision 0, "Materials Reliability Program: Screening, Categorization and Ranking of Reactor Internals of Westinghouse and Combustion Engineering PWR Designs," ADAMS Accession Number ML091910130
3. Letter from F. Dacimo to NRC dated October 17, 2012, Subject: Indian Point Nuclear Generating Unit Nos. 2 & 3 - Reply to Request for Additional Information

Regarding the License Renewal Application. (ADAMS Accession No. ML12300A391)

Response to RAI 15a

In Reference 1 Entergy responded to NRC RAI 15 which requested clarification on how Entergy planned to address RVI locations with existing CUFs as described in the Fatigue Monitoring Program (FMP). In the response to RAI 15, Entergy indicated that it planned to use the RVI Inspection (MRP-227) program rather than the FMP because the inspections provided in the RVI program were sufficient to ensure that the effects of aging due to fatigue would be adequately managed.

In Reference 2 (NRC letter transmitting RAI 15a) the NRC requested additional justification to demonstrate that the inspection plan and inspection frequency provided in the IPEC RVI inspection program were sufficient to ensure that the effects of aging due to fatigue on those internals locations with existing CUFs would be adequately managed during the period of extended operation (PEO) including either consideration of the environmental effects from the reactor coolant environment or a flaw tolerance evaluation.

On review of the information requested in RAI 15a, Entergy has determined that it will rely on the FMP to manage the effects of fatigue on the reactor internals during the PEO rather than the RVI inspection program as previously indicated in Reference 1. The revised response to the original RAI 15 is provided below.

NRC RAI 15

The response to RAI 12 states that, for RVI components that are not covered by a time-limited aging analysis, Entergy will use the RVI Program to manage the effects of aging due to fatigue on the reactor vessel internals. The response also states that, as provided in Section 3.5.1 of the NRC's safety evaluation for MRP-227-A, for locations with a fatigue time-limited aging analysis, Entergy will manage the effects of aging due to fatigue through its Fatigue Monitoring Program in accordance with 10 CFR 54.21(c)(1)(iii).

In its response, the applicant also stated that the Fatigue Monitoring Program as described in LRA Section B.1.12 provides assurance that the cumulative usage factors (CUFs) remain below the allowable limit of 1.0 and that, consistent with Section 3.5.1 of the safety evaluation for MRP-227-A, prior to entering the period of extended operation, Entergy will review the existing RVI fatigue calculations to evaluate the effects of the reactor coolant system water environment on the CUF. Specifically, under Commitment 43, Entergy stated that it will review the units' 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 IP2 and IP3. The applicant stated that this review will also include ASME Code Class 1 fatigue evaluations for reactor vessel internals. Based on this review, if more limiting locations are identified, Entergy will evaluate the most limiting location for the effects of the reactor coolant environment on fatigue usage. The applicant's response is not clear regarding how the "ASME Code Class 1 fatigue evaluations for reactor vessel internals" will account for the effects of the reactor coolant environment, nor what actions will be taken if CUF's for RVI components exceed 1.0.

Requested Information

1. Clarify whether, as a result of the review described in the response to RAI 12, CUF calculations for RVI components that incorporate environmental factors (F_{en}) will be performed in response to Applicant/Licensee Action Item 8 of the Staff SE of MRP-227-A. If such calculations will not be performed, discuss how the effects of the reactor water environment on the existing CUF analyses for RVIs will be evaluated in response to Applicant/Licensee Action Item 8 of the Staff SE of MRP-227-A.

2. Clarify what action(s) will be taken if the consideration of environmental effects results in a CUF exceeding 1.0 for any RVI component.

3. Since ASME Code Class 1 components are designed to ASME Section III, Subsection NB (i.e., reactor coolant pressure boundary components, not reactor vessel internals), provide necessary revisions to clarify the term "ASME Code Class 1 fatigue evaluations for reactor vessel internals" and any inconsistency in the response to RAI 12.

4. For the purposes of clarity, provide a new commitment and an associated new UFSAR Supplement to address the review of reactor vessel internals for environmentally-assisted fatigue as part of the Fatigue Monitoring Program in response to Applicant/Licensee Action Item 8 of the Staff SE of MRP-227-A, in lieu of your proposal to use Commitment 43.

Revised Response to RAI 15

1. As part of the review described in response to RAI 12, Entergy will recalculate the limiting reactor vessel internals CUFs provided in section 4.3 of the License Renewal Application (LRA) to include the effects of the reactor coolant environment. Entergy will use the environmental correction factors (F_{en}) provided in NUREG/CR-5704, "Effects of LWR Coolant Environments on the Fatigue Design Curves of Austenitic Stainless Steels" or NUREG/CR-6909, "Effects of LWR Coolant Environments on the Fatigue of Reactor Materials" for austenitic stainless steel components. Entergy will use the environmental correction factors (Fen) provided in NUREG/CR-6909, "Effects of LWR Coolant Environments on the Fatigue of Reactor Materials" for nickel alloy components.

2. 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. Analysis methods may include finite element analyses (FEA) or other appropriate methods using actual plant operating parameters and the number of cycles expected through the end of the PEO.

3. Term "Class 1" was inadvertently included in the response to RAI12. The phrase "ASME Code Class 1 fatigue evaluations for reactor vessel internals" is changed to read "ASME Code Subsection NG fatigue evaluations for reactor vessel internals."

4. Entergy provides the following commitment for including the reactor coolant environmental effects in the existing CUFs for the RVI.

Commitment 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.

The following changes (identified by strikethrough) are made to LRA Section A.2.2.2 and A.3.2.2.

A.2.2.2 Metal Fatigue

A.2.2.2.1 Class 1 Metal Fatigue

Class 1 components evaluated for fatigue and flaw growth include the reactor pressure vessel (RPV), reactor vessel internals, pressurizer, steam generators, reactor coolant pumps, control rod drive mechanisms, regenerative letdown heat exchanger, and Class 1 piping and in-line components.

The Fatigue Monitoring Program will assure that the analyzed number of transient cycles is not exceeded. The program requires corrective action if the analyzed number of transient cycles is approached. Consequently, the effects of aging related to these TLAA (fatigue analyses) based on those transients will be managed by the Fatigue Monitoring Program in accordance with 10 CFR 54.21(c)(1)(iii).

~~As indicated in EPRI MRP-227-A, the effects of aging due to fatigue were considered in determining the necessary inspections for reactor vessel internals components. Consistent with MRP-227-A, during the period of extended operation, component inspections performed under the Reactor Vessel Internals Program and the Inservice Inspection Program will manage the effects of aging due to fatigue of reactor vessel internals components in accordance with 10 CFR 54.21(c)(1)(iii).~~

A.3.2.2 Metal Fatigue

A.3.2.2.1 Class 1 Metal Fatigue

Class 1 components evaluated for fatigue and flaw growth include the reactor pressure vessel (RPV), reactor vessel internals, pressurizer, steam generators, reactor coolant pumps, control rod drive mechanisms, regenerative letdown heat exchanger, and Class 1 piping and in-line components.

The Fatigue Monitoring Program will assure that the analyzed number of transient cycles is not exceeded. The program requires corrective action if the analyzed number of transient cycles is approached. Consequently, the effects of aging related to these TLAA (fatigue analyses) based on those transients will be managed by the Fatigue Monitoring Program in accordance with 10 CFR 54.21(c)(1)(iii).

~~As indicated in EPRI MRP-227-A, the effects of aging due to fatigue were considered in determining the necessary inspections for reactor vessel internals components. Consistent with MRP-227-A, during the period of extended operation, component inspections performed under the Reactor Vessel Internals Program and the Inservice Inspection Program will manage the effects of aging due to fatigue of reactor vessel internals components in accordance with 10 CFR 54.21(c)(1)(iii).~~

References

1. Entergy Letter, NL-12-140, "Reply to Request for Additional Information Regarding the License Renewal Application, Indian Point Nuclear Generating Unit Nos. 2 and 3, Docket Nos. 50-247 and 50-286, License Nos. DPR-26 and DPR-64," October 17, 2012

2. NRC letter, "Request for Additional Information for the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application, SET 2013-01" dated February 6, 2013

ATTACHMENT 2 TO NL-13-052

LICENSE RENEWAL APPLICATION
IPEC LIST OF REGULATORY COMMITMENTS

Rev. 21

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

List of Regulatory Commitments

Rev. 21

The following table identifies those actions committed to by Entergy in this document.

Changes are shown as strikethroughs 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: September 28, 2013 IP3: December 12, 2015	NL-07-039	A.2.1.1 A.3.1.1 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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 NL-09-106 NL-09-111 NL-11-101	A.2.1.5 A.3.1.5 B.1.6 Audit Item 173

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
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%. 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.	IP2: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 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
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: September 28, 2013 IP3: December 12, 2015	NL-07-039	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	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: September 28, 2013 IP3: December 12, 2015	NL-07-039	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 NL-08-014	A.2.1.13 A.3.1.13 B.1.14 Audit Items 105, 106

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
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: September 28, 2013 IP3: December 12, 2015	NL-07-039	A.2.1.15 A.3.1.15 B.1.16

#	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 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	

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
12	Enhance the Masonry Wall Program for IP2 and IP3 to specify that the IP1 intake structure is included in the program.	IP2: September 28, 2013 IP3: December 12, 2015	NL-07-039	A.2.1.18 A.3.1.18 B.1.19
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 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: September 28, 2013 IP3: December 12, 2015	NL-07-039	A.2.1.21 A.3.1.21 B.1.22

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 NL-11-032 NL-11-096 NL-11-101	A.2.1.22 A.3.1.22 B.1.23 Audit item 173
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	A.2.1.24 A.3.1.24 B.1.25 Audit item 173

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-11-101	A.2.1.25 A.3.1.25 B.1.26
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	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: September 28, 2013 IP3: December 12, 2015	NL-07-039	A.2.1.28 A.3.1.28 B.1.29

#	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: September 28, 2013 IP3: December 12, 2015	NL-07-039	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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	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: September 28, 2013 IP3: December 12, 2015	NL-07-039	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) • new station security building (IP2)	IP2: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153 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
	• 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) • superheater stack • 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 identify cracking and change in material properties and for inspection of aluminum vents and louvers to identify loss of material.		NL-13-077	

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
	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.		NL-08-127	Audit Item 360
	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.			Audit Item 358
	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-11-032 NL-11-101	
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 NL-07-153	A.2.1.36 A.3.1.36 B.1.37 Audit item 173

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
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: September 28, 2013 IP3: December 12, 2015	NL-07-039 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: September 28, 2013 IP3: December 12, 2015	NL-07-039 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: September 28, 2013	NL-07-039	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: September 28, 2011 IP3: December 12, 2013 Complete	NL-07-039 NL-11-107	A.2.1.41 A.3.1.41
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: September 28, 2013 IP3: December 12, 2015	NL-07-039	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: December 12, 2015	NL-07-039 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: September 28, 2011 IP3: December 12, 2013 Complete	NL-07-039 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.	April 30, 2008 Complete	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: September 28, 2013 IP3: December 12, 2015	NL-08-127 NL-11-101 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: September 28, 2013	NL-08-127 NL-11-101 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: September 28, 2013 IP3: December 12, 2015	NL-08-127	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: September 28, 2013 IP3: December 12, 2015	NL-08-143	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: September 28, 2013 IP3: December 12, 2015	NL-09-106	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	IPEC will inspect steam generators for both units to assess the condition of the divider plate assembly. The examination technique used will be capable of detecting PWSCC in the steam generator divider plate assembly. The IP2 steam generator divider plate inspections will be completed within the first ten years of the period of extended operation (PEO). The IP3 steam generator divider plate inspections will be completed within the first refueling outage following the beginning of the PEO.	IP2: After the beginning of the PEO and prior to September 28, 2023 IP3: Prior to the end of the first refueling outage following the beginning of the PEO.	NL-11-032 NL-11-074 NL-11-090 NL-11-101	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: Prior to March 2024 IP3: Prior to the end of the first refueling outage following the beginning of the PEO. IP2: Between March 2020 and March 2024 IP3: Prior to the end of the first refueling outage following the beginning of the PEO.	NL-11-032 NL-11-074 NL-11-090 NL-11-096	N/A
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: Prior to September 28, 2013 IP3: Prior to December 12, 2015	NL-11-032 NL-11-101	4.3.3

#	COMMITMENT	IMPLEMENTATION SCHEDULE	SOURCE	RELATED LRA SECTION / AUDIT ITEM
44	IPEC will include written explanation and justification of any user intervention in future evaluations using the WESTEMS "Design CUF" module.	IP2: Prior to September 28, 2013 IP3: Prior to December 12, 2015	NL-11-032 NL-11-101	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: Prior to September 28, 2013 IP3: Prior to December 12, 2015	NL-11-032 NL-11-101	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: Prior to September 28, 2013	NL-11-032 NL-11-074	N/A
47	IPEC will perform and submit analyses that demonstrate that the lower support column bodies will maintain their functionality during the period of extended operation considering the possible loss of fracture toughness due to thermal and irradiation embrittlement. The analyses will be consistent with the IP2/IP3 licensing basis.	IP2: Prior to ~~September 28, 2013~~ March 1, 2015 IP3: Prior to December 12, 2015	NL-12-089 NL-13-052	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: Prior to September 28, 2013 IP3: Prior to December 12, 2015	NL-12-174	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: Prior to September 28, 2013 IP3: Prior to December 12, 2015	NL-13-052	A.2.2.2 A.3.2.2