



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 4, 2015

Vice President, Operations
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3, LICENSE RENEWAL APPLICATION, SET 2015-01 (TAC NOS. MD5407 AND MD5408)

Dear Sir or Madam:

By letter dated April 23, 2007, as supplemented by letters dated May 3, 2007, and June 21, 2007, Entergy Nuclear Operations, Inc. (Entergy), submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3, for review by the U.S. Nuclear Regulatory Commission (NRC). The NRC staff documented its findings in the Safety Evaluation Report (SER) related to the license renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3, which was issued August 11, 2009 and supplemented August 30, 2011 (SER Supplement 1), and November 6, 2014 (SER Supplement 2).

Subsequent to the issuance of SER Supplement 1, the staff identified additional operating experience at several nuclear power plants regarding recurring internal corrosion, corrosion occurring under insulation, and managing aging effects for fire water system components. To address this operating experience, on November 22, 2013, the NRC staff issued interim staff guidance (ISG) document LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation."

By letter dated April 1, 2014, the NRC staff requested additional information as to how Entergy planned to manage the effects of aging as described in LR-ISG-2012-02. By letter dated December 16, 2014, Entergy responded to the NRC staff's request for additional information (RAI). Based on its review of the information contained in Entergy's letter, the NRC staff RAI as described in the enclosure.

This RAI was discussed with Mr. Richard Louie, and a mutually agreeable date for Entergy's response is within 90 days from the date of this letter.

- 2-

If you have any questions, please contact me at 301-415-6459, or by email at
michael.wentzel@nrc.gov.

Sincerely,

/RA/

Michael Wentzel, Project Manager
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosure:
As stated

cc w/encl: Listserv

- 2-

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REQUEST FOR ADDITIONAL INFORMATION, SET 2015–01
RELATED TO INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3
LICENSE RENEWAL APPLICATION
DOCKET NOS. 50-247 AND 50-286
REGARDING LR-ISG-2012-02

RAI 3.0.3–3

Background

Entergy Nuclear Operations Inc. (Entergy), in a letter dated December 16, 2014, responds to request for additional information (RAI) 3.0.3-1 and addresses the issues contained in LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." Regarding LR-ISG-2012-02, Section A, "Recurring Internal Corrosion," the response states that reviews of past plant-specific operating experience identified recurring internal corrosion due to general, pitting, and crevice corrosion that resulted in through-wall leaks at least once in each of three refueling cycles in the last 10 years for both units. For the service water system, the response states that minor corrosion issues still occur, but these "do not compromise the intended functions of the service water system." In discussing through-wall leaks for cement-line carbon steel piping or stainless steel and copper alloy piping, the response also states that "based on operating experience, such leaks have no impact on system performance and have not threatened the structural integrity of the piping or the safety function of nearby equipment."

Issue

During its review, the staff identified plant-specific operating experience which appears to indicate that corrosion issues did compromise the intended function of the service water system. In this regard, Licensee Event Report (LER) 286/2011-003, "Technical Specification Required Shutdown and a Safety System Functional Failure for a Leaking Service Water Pipe Causing Flooding in the SW [service water] Valve Pit Preventing Access for Accident Mitigation," dated April 25, 2011, states: "After further evaluation, it was concluded there was a loss of safety function," and "It was concluded that this condition was a safety system functional failure." Based on the 2011 LER, the statement in the December 2014 response, regarding "no impact of system performance," appears to be unfounded.

In addition, LER 286/2002-001, "Operation in a Condition Prohibited by Technical Specifications Due to an Inoperable Service Water Pipe Caused by a Leak that Exceeded the Allowable Outage Time," dated July 5, 2002, states, "Engineering evaluation of data collected concluded that the leaking pipe did not provide sufficient structural integrity for the piping to meet code allowables for pipe thinning and through wall leaks and therefore was inoperable." Although this LER is beyond the 10-year operating experience review window conducted for RAI 3.0.3-1, the staff notes that this operating experience was not included in the license renewal application (LRA) in the discussion for the operating experience of the Service Water Integrity Program. Also, the staff notes that by letter dated June 5, 2008, Entergy responded to RAI AUX-1, which relates to the staff's questions on the operating experience summaries for several aging management programs (AMPs), including the Service Water Integrity Program. For "IP3 service water degradation," the 2008 response discusses the detection of loss of material during inspections from 2001 to 2004 and states that "these conditions did not result in a loss of system intended function. Engineering review of external corrosion and a pinhole leak did not result in any operability concerns." Based on LER 286/2002-001, the significance of past

operating experience, regarding structural integrity and operability, may not have been adequately characterized by the statements made in the 2008 RAI response.

Request

Explain and reconcile the information related to loss of safety function contained in the December 2014 response to RAI 3.0.3-1 and LER 286/2011-003. In addition, explain and reconcile the information related to the structural integrity and operability in the 2008 response to RAI AUX-1 and LER 286/2002-001.

RAI 3.0.3-4

Background

Entergy letter dated December 16, 2014, responds to RAI 3.0.3-1 and addresses the issues contained in LR-ISG-2012-02. Regarding LR-ISG-2012-02, Section A, "Recurring Internal Corrosion," the response states that reviews of past plant-specific operating experience identified at least one through-wall leak in each of three refueling cycles in the last 10 years for both units due to general, pitting, and crevice corrosion. For the service water system, the response states that minor corrosion issues still occur, but these "do not compromise the intended functions of the service water system." In discussing through-wall leaks for cement-line carbon steel piping or stainless steel and copper alloy piping, the response also states that "based on operating experience, such leaks have no impact on system performance and have not threatened the structural integrity of the piping or the safety function of nearby equipment." The response subsequently includes an enhancement to the Service Water Integrity Program "to incorporate the actions used to manage the minor corrosion issues in the service water system." The enhancement, to be implemented by 2019, consists of revising procedures to evaluate through-wall leaks under the corrective action program and to inspect portions of the buried service water by robotic crawler or manual crawl-through.

Recent LERs (286/2014-002, 247/2013-004, and 286/2011-003) discuss additional leaks in the service water system piping. The first LER (286/2014-002) states that Procedure 3-PT-R185B (Primary Auxiliary Building SW Piping and Valve Flush) was developed specifically to address recurring problems with leaks in stagnant vent and drain piping and that the procedure is the "main line of defense for preventing future leaks in small bore carbon steel piping socket welds." The staff notes that the initial Service Water Integrity Program previously included periodic flushing of infrequently used loops to manage loss of material in service water components. The second LER (247/2013-004) discusses replacement of certain portions of Series 300 stainless steel piping (which replaced the original carbon steel piping) in the service water system with highly corrosion resistant material. The replacement plan was developed after deficiencies were identified in 2008. The third LER (286/2011-003) discusses the loss of safety function for a portion of the service water system and states that the Generic Letter (GL) 89-13 program (the basis for the Service Water Integrity Program) will be revised to prioritize inspection frequencies of service water welds.

The significance of the degradation identified in the third LER (286/2011-003) prompted the staff to review the responses to GL 89-13 for IP2 and IP3. The staff noted a difference between the current licensing basis for the two responses. The February 2, 1990, response for IP2 discussed an in-place "QA radiographic program" that randomly inspects 10 percent of the service water piping welds annually, whereas the September 9, 1992, response for IP3 includes ultrasonic inspections of non-cement lined portions and visual inspections using a robotic

crawler with a high resolution camera. The staff notes that a 1991 status update for IP2 on various Action Items for GL 89–13 states: “We have initiated an internal visual inspection program for underground service water piping. This program utilizes pipe crawling video equipment to inspect and record the condition of the cement-lined underground pipe.”

Issue

Given the enhancements to the Service Water Integrity Program proposed in the December 16, 2014 letter, the current details of the program implementation are unclear to the staff. Since the IP2 and IP3 responses to GL 89-13 both refer to using remote crawlers and one response specifically addresses underground service water piping, it is not clear to the staff how the current enhancement for internally inspecting buried service water piping (to be implemented prior to 2019) differs from the program that (based on the current licensing basis) was previously in place. In addition, regarding the other currently proposed enhancement to the Service Water Integrity Program (evaluating leakage under the corrective action program), the need for revised procedures to evaluate through-wall leaks under the corrective action program implies that leakage currently may not be evaluated under the corrective action program. In this regard, too, it is not clear to the staff how the proposed enhancement differs from the program that was previously in place, given that LRA Section B.0.3 states the “corrective action controls of the Entergy (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities.”

Based on the operating experience discussed in the above LERs, enhancements to the Service Water Integrity Program have been implemented beyond the version of the program that was evaluated by the staff in NUREG-1930, “Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3.” For LER 286/2011-003, the program apparently did not adequately manage the effects of aging because an intended function of the system was not maintained consistent with the current licensing basis. SRP-LR Section A.1.2.3.10 states that a past failure would not necessarily invalidate an aging management program because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. In that regard, it is not clear to the staff what changes have been made to the program over the years as a result of past operating experiences or what changes have been made to the prior commitments for GL 89–13.

Request

- 1) Provide a description and chronological history of any enhancements that have been made to the Service Water Integrity Program, from the version of the program reviewed by the staff as documented in NUREG–1930, as a result of Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) site-specific operating experience. If no enhancements have been made, then discuss the meaning of the statement in LER 286/2011-003 regarding changes that will be made to the GL 89-13 program. In addition, clarify whether Procedure 3-PT-R185B was revised as a result of the extent of condition review discussed in LER 286/2014-002, and if it was not revised, discuss how the “recurring problems with leaks developing in stagnant vent and drain connection piping and valves” (identified in the extent of condition review) are being addressed.
- 2) Clarify whether (and if so, when) any changes have been made to previously docketed licensing commitments for the IP2 and IP3 responses to GL 89–13, and provide information as to whether (and if so, when) that the NRC has been informed of any changes.

- 3) For the two proposed enhancements in the response to RAI 3.0.3-1, clarify the differences between the new enhancement activities and the activities in the previously implemented program.
- 4) Provide the following details for the current Service Water Integrity Program:
 - a) the amount and timing of any past (and if they are to be credited, any planned) service water system piping replacements;
 - b) trend data from the past 10 years for the number of leaks caused by age-related degradation;
 - c) the number and frequency of volumetric inspections being performed to both track known degradation locations and identify additional degradation locations;
 - d) the type (internal or external), amount, and frequency of visual inspections being performed;
 - e) the criteria used to determine locations for and adjustments to the number and frequency of volumetric and visual inspections, including any predictive methodology. In responding to Request No. 1 and Request No. 4, parts c, d, and e, state whether these actions will continue during the timely renewal period and period of extended operation; and revise the Service Water Integrity Program and corresponding Updated Final Safety Analysis Report supplement accordingly.

RAI 3.0.3-5

Background

The response to RAI 3.0.3 1 dated December 16, 2014, states that the fire protection water and city water systems have experienced recurring internal corrosion (RIC), as defined in LR-ISG-2012-02. With regard to the fire protection water system, the response states, “[l]ocalized corrosion has resulted in minor through-wall leaks that have no impact on system performance and do not threaten the structural integrity of the piping or the safety function of nearby equipment.” No changes were proposed to the Fire Water System Program to address RIC. With regard to the city water system, the response states, “[h]owever, based on past operating experience, they [through wall leaks] do not compromise the intended functions of these or any other system, and do not warrant aging management program activities beyond those provided by established aging management programs and the corrective action program.”

Issue

Past performance does not provide reasonable assurance that throughout the period of extended operation, internal general corrosion will be revealed by a through-wall leak prior to the general corrosion potentially impacting the structural integrity of the system. Nor does it provide reasonable assurance that larger through-wall flaws sufficient to challenge the pressure boundary function will not occur. It is also unclear to the staff that a sufficient representative sample exists for the carbon steel piping to demonstrate that general corrosion is progressing slowly enough that it will not prevent an in-scope component from performing its current licensing basis intended function during the period of extended operation.

Although to date through-wall leaks have not affected the safety function of nearby equipment, the staff lacks sufficient information to conclude with reasonable assurance that this will be the case throughout the period of extended operation.

Request

- 1) State the basis and justification for concluding that existing inspection data are sufficient to demonstrate that general corrosion is progressing slowly enough that it will not prevent an in-scope component from performing its current licensing basis intended function during the period of extended operation.
- 2) State the basis and justification for concluding that through-wall leaks will not impact the safety function of nearby equipment throughout the period of extended operation.
- 3) Provide the staff with sufficient quantitative data for it to reach the same conclusion.
Alternatively, propose periodic inspections in response to SRP-LR Section 3.3.2.2.8, "Loss of Material due to Recurring Internal Corrosion."

RAI 3.0.3-6

Background

As amended by letter dated December 16, 2014, LRA Section B.1.14 states an exception to the "detection of aging effects" program element. This exception states that adhesion testing will not be conducted on the internal surfaces of fire water storage tanks in accordance with ASTM D 3359, "Standard Test Methods for Measuring Adhesion by Tape Test," as required by NFPA 25 Section 9.2.7. The justification for the exception states in part that holiday testing and wall thickness measurements are conducted. It also states that adhesion testing, in accordance with ASTM D 3359, would not be conducted because the recommended type of adhesion testing is destructive and test results are variable.

Issue

An alternative to adhesion testing was not proposed.

Request

State how potential peeling, delamination, or blistering, or the extent of these aging mechanisms, would be detected by holiday testing or ultrasonic wall thickness measurements, or propose an alternative to the adhesion testing cited in NFPA 25.

RAI 3.0.3-7

Background

As amended by letter dated December 16, 2014, LRA Section B.1.14 states an exception to the "detection of aging effects" program element. The exception states that preaction valve testing is not conducted with the control valve fully open for the electric tunnels as specified by NFPA 25 Section 13.4.3.2.3.

Issue

The staff lacks sufficient information to conclude that adequate flow to detect potential flow blockage will be achieved during the test. The staff also noted that NFPA 25 Section 13.4.3.2.2.5 allows air to be used as a test medium when the nature of the protected property is such that water cannot be discharged.

Request

State and justify the basis for why flow rates sufficient to detect flow blockage will be achieved during preaction valve testing.

RAI 3.0.3-8

Background

As amended by letter dated December 16, 2014, an enhancement to LRA Section B.1.14 was revised to state that the acceptance criteria used during the internal inspection of foam based fire suppression tanks will be signs of abnormal corrosion.

Issue

The staff lacks sufficient information to complete its evaluation of the acceptance criteria portion of this enhancement because abnormal corrosion is not described.

Request

State the magnitude of corrosion that would be considered unacceptable during the inspection of internal surfaces of foam based fire suppression tanks.

RAI 3.0.3-9

Background

As amended by letter dated December 16, 2014, an enhancement to LRA Section B.1.14 states that sprinkler heads will be replaced if they show signs of abnormal corrosion, excessive loading, leakage, or if the glass bulb heat responsive element is empty. LRA Section B.1.14 was also amended to state that charcoal filter unit nozzles will be inspected for abnormal corrosion when the charcoal is replaced.

Issue

The staff notes that NFPA 25, Sections 5.2.1.1.2(2) and 5.2.1.1.4 state that sprinklers that exhibit corrosion, not "abnormal corrosion" should be replaced.

Request

- a) Describe the degree of corrosion that would be found acceptable during a visual inspection of a sprinkler and justify why this degree of corrosion would not impact the performance of the sprinkler (e.g., water distribution).
- b) Describe the degree of corrosion that would be found acceptable during a visual inspection of charcoal filter nozzles and justify why this degree of corrosion would not impact the performance of the charcoal filter deluge system.

RAI 3.0.3-10

Background

As amended by letter dated December 16, 2014, an enhancement to LRA Section B.1.14 states that air flow testing will be conducted during each refueling outage through the foam system open head nozzles to ensure there is no blockage. It also states that if blockage is detected, the system will be cleaned and retested.

Issue

The staff notes that LR ISG 2012 02 AMP 27, Table 4a recommends that an operational discharge pattern test be conducted annually in accordance with NFPA 25 Section 11.3.2.6, Table 4a footnote 6 states that, “[w]here the nature of the protected property is such that foam cannot be discharged, the nozzles or open sprinklers shall be inspected for correct orientation and the system tested with air to ensure that the nozzles are not obstructed.” A justification was not provided for testing every refueling outage in lieu of annual testing.

Request

Provide a justification as to why the frequency for testing the foam system open head nozzles every refueling outage in lieu of annually is acceptable.

RAI 3.0.3-11

Background

As amended by letter dated December 16, 2014, an enhancement to LRA Section B.1.14 states that in buildings' with multiple wet piping systems, one third of the systems will be inspected every five years such that all systems will be inspected during each 15 year period.

Issue

A justification was not stated for inspecting one third of the systems where there are multiple wet pipe systems in lieu of every other system as cited in NFPA 25 Section 14.2. In addition, the enhancement does not state whether all the systems in a building will be inspected if foreign organic or inorganic material is found in any system in that building.

Request

Provide a justification as to why testing one third of the systems every 5 years and not testing all the systems in a building when foreign organic or inorganic material is found in any system in that building is sufficient to provide reasonable assurance that the wet fire water system piping and piping components will meet their current licensing basis intended functions during the period of extended operation.

RAI 3.0.3-12

Background

As amended by letter dated December 16, 2014, LRA Section B.1.14 states, “[i]n addition to NFPA codes, portions of the water-based fire protection system (a) that are normally dry but periodically subject to flow (e.g., dry-pipe or preaction sprinkler system piping and valves) and (b) that cannot be drained or allow water to collect are subject to augmented testing and inspections.”

Issue

LRA Sections A.1.14 and B.1.14 do not state what augmented testing will be conducted. In addition, the staff noted that there were no enhancements associated with this program requirement.

Request

- a) State what augmented testing and inspections will be conducted for fire protection water systems that are normally dry but periodically subject to flow (e.g., dry-pipe or preaction sprinkler system piping and valves) that cannot be drained or allow water to collect.
- b) State whether an enhancement is necessary to incorporate these augmented tests and inspections.
- c) Revise the LRA Section A.1.14 or B.1.14 as necessary.

RAI 3.0.3-13

Background

As amended by letter dated December 16, 2014, LRA Sections A.2.1.13 and A.3.1.13 state that the enhancements to the Fire Water System Program will be implemented by December 31, 2019.

Issue

As stated in RAI 3.0.3 12, it is not clear whether an enhancement is necessary to address augmented testing for fire protection water systems that are normally dry but periodically subject to flow (e.g., dry-pipe or preaction sprinkler system piping and valves) that cannot be drained or allow water to collect. SRP LR Table 3.0 1, as amended by LR ISG 2-12 02, states that the augmented testing should commence 5 years prior to the period of extended operation. Given that IP2 is beyond the expiration of its initial license (September 2013) and IP3 will be beyond

its initial license period in December 2015, the staff questions why the augmented testing would not commence sooner than December 31, 2019.

Request

State and justify the basis for why the augmented testing for fire protection water systems that are normally dry but periodically subject to flow (e.g., dry-pipe or preaction sprinkler system piping and valves) that cannot be drained or allow water to collect will not commence until December 31, 2019.

RAI 3.0.3-14

Background

By letter dated December 16, 2014, the Aboveground Steel Tanks Program was enhanced to develop or revise program implementation documents to incorporate the inspection details that are tabulated in the program description. The tabulated tank inspection techniques and frequencies are provided for each applicable material, environment, and aging effect. The enhancement will be implemented prior to December 31, 2019. An exception was also added to the program stating that the timing of the inspections will not be consistent with the guidance in LR-ISG-2012-02. The exception noted that the implementation schedule for the inspections could not be consistent with LR-ISG-2012-02 because of the date that the guidance was issued. The enhancement will be implemented prior to December 31, 2019. The initial operating license for Unit 2 expired in September of 2013. The initial operating license for Unit 3 will expire in December of 2015.

LR-ISG-2012-02 was issued in November of 2013. The implementation schedule in SRP LR Table 3.0 1, as amended by LR ISG 2-12 02, for GALL Report AMP XI.M29 states that the program is implemented and inspections begin 10 years before the period of extended operation. Additionally, Table 4a, in GALL Report AMP XI.M29, as amended by LR ISG 2012 02, provides inspection frequencies that begin 10 years prior to the period of extended operation.

Issue

LRA Sections A.2.1.1, A.3.1.1, and B.1.1 state that the program enhancements will be implemented prior to December 31, 2019. Given that the inspections recommended to be performed prior to entering the period of extended operation have not occurred, IP2 is beyond the expiration of its initial license (September 2013), and IP3 will be beyond its initial license period in December 2015, it is unclear to the staff why the inspections in the enhancement might not be implemented until late 2019 rather than earlier.

Request

State the basis and justify why implementation of inspections described in the program description do not need to be implemented until December 31, 2019.

RAI 3.0.3-15

Background

By letter dated December 16, 2014, LRA Table 3.3.2-14-IP2, "City Water, Summary of Aging Management Review," was revised. The table includes an AMR item for steel tanks exposed to an internal environment of treated water that was revised to manage the aging effect of loss of material using the Aboveground Steel Tanks Program instead of the Periodic Surveillance and Preventative Maintenance Program. This AMR item cites generic note G and plant specific note 305. Plant specific note 305 states that "This treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in NUREG-1801 that will support a useful comparison for this line" item.

Section IX.D, "Selected Definitions & Use of Terms for Describing and Standardizing Environments," of GALL Report, revision 2, provides descriptions of treated water and raw water. Treated water includes demineralized water or water containing corrosion inhibitors. Raw water includes potable water and water used for drinking or other personal use.

GALL Report AMP XI.M29, "Aboveground Metallic Tanks," as amended by LR-ISG-2012-02 provides different guidance for managing the loss of material for steel tanks exposed to treated water and raw water. The differences are illustrated in Table 4a, "Tank Inspection Reconditions," and AMR line items 3.3.1-129 and 3.3.1-137.

Issue

The environment of city water is being categorized as treated water; however, city water appears to more closely resemble raw water. The aging management of loss of material for steel tanks exposed to treated water is not equivalent to that exposed to raw water in that steel exposed to treated water may use a one time inspection to verify aging effects, whereas for steel exposed to raw water it is recommended that periodic inspections be conducted.

Request

State the basis and justify why city water is being categorized as treated water instead of raw water. Additionally, state the basis and justify why steel tanks exposed to city water are being managed for loss of material in accordance with LR-ISG-2012-02 inspection guidance for treated water instead of raw water.