Entergy

Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
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November 30, 2001
Re: Indian Point Unit No. 2
Docket No. 50-247
NL 01-140

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

SUBJECT: Indian Point Nuclear Generating Unit No. 2 – Response to Request for Additional Information Regarding One-time Extension of Containment Integrated Leak Rate Test Frequency (TAC No. MB2414)

References:
1. Consolidated Edison letter (NL01-093) to NRC, "Indian Point 2 License Amendment Request: Containment Integrated Leakage Rate Testing Frequency," dated July 13, 2001
2. NRC letter (RA01-238) to Entergy Nuclear Operations, "Indian Point Nuclear Generating Unit No. 2 – Request for Additional Information Regarding One-Time Extension of Containment Integrated Leak Rate Test Frequency (TAC No. MB2414)," dated October 4, 2001

By letter dated July 13, 2001 (Ref. 1), Consolidated Edison Company of New York, Inc., (the previous licensee) submitted an application for an amendment to the Technical Specifications (TS) for Indian Point Unit No. 2 (IP2). The proposed amendment would allow a one-time extension of the frequency for the containment integrated leakage rate test. The U.S. Nuclear Regulatory Commission (NRC) staff reviewed this submittal, determined that additional information was required to complete its review, and requested that additional information in its letter of October 4, 2001 (Ref. 2). This letter submits the Entergy Nuclear Operations, Inc. (ENO – the current licensee) response to the NRC's request for additional information.

Attachment 1 to this letter provides the requested additional information. As a result of the request for additional information, ENO submits a revised TS page. The revised page is included in Attachment 2.

The assessment submitted in Ref. 1 that concluded that the proposed TS did not involve a significant hazards consideration is not affected by the additional information submitted herein in support of the application.

There are no commitments in this letter.

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Should you or your staff have any questions regarding this submittal, please contact Mr. John F. McCann, Manager, Nuclear Safety and Licensing at (914) 734-5074.

Very truly yours,

Fred Dacimo
Vice President – Operations
Indian Point 2

Attachments

cc:

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
ENTERGY NUCLEAR OPERATIONS, INC.	)	Docket No. 50-247
Indian Point Nuclear Generating Unit No. 2	)	

APPLICATION FOR AMENDMENT
TO OPERATING LICENSE

Pursuant to Section 50.90 of the Regulations of the Nuclear Regulatory Commission (NRC), Entergy Nuclear Operations, Inc., as holder of Facility Operating License No. DPR-26, hereby submits additional information to support the application for amendment of the Technical Specifications contained in Appendix A of this license submitted on July 13, 2001.

The specific additional information is set forth in Attachment 1 and a revised proposed TS page is submitted in Attachment 2. The assessment submitted on July 13, 2001 demonstrated that the proposed change does not involve a significant hazards consideration as defined in 10CFR50.92(c). That assessment is unchanged by the additional information.

As required by 10CFR50.91(b)(1), a copy of this submittal has been provided to the appropriate New York State official designated to receive such amendments.

BY: [signature]
Fred Dacimo
Vice President – Operations
Indian Point 2

Subscribed and sworn to
before me this 30th day
November, 2001.

Karen L. Lancaster
Notary Public

KAREN L. LANCASTER
Notary Public, State of New York
No. 60-4643659
Qualified In Westchester County
Term Expires 9/30/05

ATTACHMENT 1 TO NL 01-140

Response to Request for Additional Information Regarding Proposed One-Time Extension of the Containment Integrated Leakage Rate Test Frequency

ENTERGY NUCLEAR OPERATIONS, INC
INDIAN POINT UNIT NO. 2
DOCKET NO. 50-247

Request No. 1

The current wording in the TS surveillance Requirement (SR) 4.4.A.3 and the proposed change to this SR refer to the term "exemptions" when discussing modifications to the integrated leakage rate test requirements in Option B of Appendix J to 10CFR50. Since the proposed change is not an exemption to the stated regulation, revise the proposed changes to SR 4.4.A.3 to refer to "exceptions" as the method of modification.

Response to Request No. 1

A revised TS page referring to the proposed change as an exception is included in Attachment 2. The evaluation submitted in Ref. 1 that there were no significant hazards consideration is unchanged by this change to the proposed TS.

Request No. 2

It appears that the change in the large early release frequency (LERF) is the change in the frequency of Class 3B sequences. Therefore, provide a LERF estimate for the proposed change from a 10-year test interval to a 15-year test interval and the cumulative change from 3 tests at 10-year intervals to having one of the intervals be 15 years.

Response to Request No. 2

The risk impact associated with extending the ILRT interval involves the potential that a core damage event that normally would result in only a small radioactive release from containment could in fact result in a large release due to failure to detect a pre-existing containment leak during the relaxation period. For this evaluation, only Class 3 sequences have the potential to result in large releases if a pre-existing leak were present with Class 3b sequences being the limiting sequences. Therefore, the frequencies of Class 3b sequences (Ref. 1 Attachment 3 Tables 1, 4, and 5) are used as the LERF for IP2:

- The Class 3b LERF for 3 tests at ten-year intervals is 6.51E-7/yr (Table 1)
- The Class 3b LERF for 1 test at ten-year intervals is 7.16E-7/yr (Table 4)
- The Class 3b LERF for 1 test at fifteen-year intervals is 7.49E-7/yr (Table 5)

Based on the data shown above the following are estimated as:

1. The change of LERF going from 1 test in ten years to 1 test in fifteen years is:
   7.49E-7/yr-7.16E-7/yr = 3.3E-8/yr
2. The change of LERF going from 3 tests in ten years to 1 test in fifteen years is:
   7.49E-7/yr-6.51E-7/yr = 9.8E-8/yr.

Request No. 3

NRC Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," encourages the use of risk analysis techniques to help ensure and show that the proposed change is consistent with the defense-in-depth philosophy. Consistency with the defense-in-depth philosophy is maintained if a reasonable balance is preserved among the prevention of core damage, prevention of containment failure, and consequence mitigation. Therefore, provide an estimate of the change in the conditional containment failure probability for the proposed and cumulative changes.

Response to Request No. 3

In this response, the change in Conditional Containment Failure Probability (CCFP) for the proposed and cumulative changes is estimated as follows:

1. Estimate the CCFP for each test interval (i.e., 3 tests in ten years, 1 test in ten years, and 1 test in fifteen years).
2. Calculate the change in CCFP between the test intervals.

The Conditional Containment Failure Probability (CCFP) can be defined as:

[1 – (Class1 + Class3a)/CDF] ; where:
Class1 = Frequency per year of No Containment Failure.
Class3a = Frequency per year of Small Isolation Failure.

Using the above equation and the data from Ref. 1 Attachment 3 Table 1[1], the CCFP for 3 tests in ten years is:

$$1 - (2.385E\text{-}5 + 1.99E\text{-}6)/3.13E\text{-}5 = 1.744E\text{-}1$$

Using the above equation and the data from Ref. 1 Attachment 3 Table 4[2], the CCFP for 1 test in ten years is:

$$1 - (2.358E\text{-}5 + 2.19E\text{-}6)/ 3.13E\text{-}5 = 1.766E\text{-}1$$

Using the above equation and the data from Ref. 1 Attachment 3 Table 5[3], the CCFP for 1 test in fifteen years is:

$$1-(2.345E\text{-}5 + 2.29E\text{-}6)/3.13E\text{-}5 =1.776E\text{-}1$$

The change in CCFP going from 3-in-10 year test interval to 1-in-15 year interval is:

$$1.776E\text{-}1 - 1.744E\text{-}1= .0032 \text{ or } 0.32\%$$

The change in CCFP going from 1-in-10 year test interval to 1-in-15 year interval is:

$$1.776E\text{-}1 - 1.766E\text{-}1 = .001 \text{ or } 0.1\%.$$

[1] From Ref. 1 Attachment 3 Table 1 - The Class-1 frequency taken to third decimal is 2.385E-5. The Class 3a frequency is 1.99E-6. And, the CDF is 3.13E-5.
[2] From Ref. 1 Attachment 3 Table 4 - The Class 1 frequency taken to third decimal is 2.358E-5. The Class 3a frequency is 2.19E-6. And, the CDF is 3.13E-5.
[3] From Ref. 1 Attachment 3 Table 5 - The Class 1 frequency taken to third decimal is 2.345E-5. The Class 3a frequency is 2.29E-6. And the CDF is 3.13E-5.

Request No. 4

The July 13, 2001 application references a Con Edison letter to the NRC that submitted a report titled "Indian Point, Unit 2, 2000 Refueling Outage Inservice Inspection Program Summary Report," dated April 2, 2001. Based on its review of Attachment 3 to this letter, the staff understands that the licensee is using the 1992 Edition and the 1992 Addenda of Subsections IWE and IWL of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for containment ISI. However, it is not clear to what extent areas of the corroded liner plate and penetrations have been defined as requiring augmented inspections (IWE-1240) during subsequent inspection periods. Please describe any such areas.

Response to Request No. 4

The minor corrosion noted on the penetrations during the IWE inspections were characterized as non-aggressive surface corrosion caused by degradation of the applied coating. No significant loss of material was observed and it was concluded that no augmented inspections were required.

Corrosion on the Vapor Containment (VC) liner plate was observed in the general area around the circumference at the 46 foot elevation. The corrosion was limited to an area of the liner approximately 1 foot above and 4 inches below the intersection of the liner with the concrete base mat. This area of the liner is currently planned for re-examination during the 2002 refueling outage.

Request No. 5

Attachment 3 to the April 2 Con Edison letter also indicates that liner corrosion and penetration coating degradation were found at various locations on the containment inside surfaces. ASME Code, Section XI, paragraphs IWE-3122.4 and IWE-3512.3 require users to limit the corrosion to 10 percent of the nominal thickness. If the licensee has determined that more than this limit of corrosion is acceptable now (or in the future), please provide a basis for such determination. Discuss how the degraded containment areas have been addressed in the licensee's risk assessment (See also Question 8 below.)

Response to Request No. 5

The minimum remaining general area thickness of the liner degradation observed in the vicinity of the 46 foot elevation (See Response to Request No. 4.) of the VC is 0.36 inch. These readings were obtained using the ultrasonic examination method. This is more than 10% below the 0.5 inch nominal thickness but is still within the design limit (0.34 inch) as set forth by Raytheon in the report "Design Margins of the IP2 Containment Steel Liner." Additional analyses were performed by Sargent and Lundy to determine the expected corrosion rate and minimum required liner thickness to maintain leak tight function. These analyses predicted a corrosion rate of 0.0011[4] inches/year and a minimum liner thickness of 0.125 inch.[5]. Using the predicted corrosion rate of 0.0011 inches/year, it would take a minimum of 18 years to reach the conservatively calculated

[4] This is the corrosion rate expected for exposure of the liner to a dry containment atmosphere. The previous corrosion was caused by long-term liner exposure to moisture. During several events, significant quantities of water leaked to the containment floor. The moisture barrier that protects the liner from floor moisture was locally degraded, allowing seepage to the liner in the vicinity of the corrosion. The moisture barrier was repaired in the 2000 outage and will be maintained in the future.

[5] The minimum liner thickness evaluation was based on strain criteria using a maximum allowable strain of 0.5%.

design limit thickness of 0.34 inch and 214 years to reach the strain based thickness of 0.125 inch.

See response to Question 8 below for a discussion of how degraded containment areas have been addressed in the risk assessment.

Request No. 6

In Attachment 3 to the April 2 Con Edison letter, the concrete/reinforcing bar degradations have been divided into three distinct zones: Red, Yellow, and Green. Discuss whether the licensee plans to repair the 'red," and "yellow" areas or accept the reinforcing bar cross section reductions and the associated concrete degradations without repair and factor them into the containment capacity analysis.

Response to Request No. 6

A visual inspection of the IP2 concrete containment structure was performed by Sargent and Lundy to satisfy the current regulatory requirement mandated by 10CFR50.55a. Prior to the initiation of the concrete inspections, Raytheon Engineers and Constructors developed a report containing the visual acceptance criteria for the in-service inspection of the IP2 concrete containment structure. Included in this report was the margin available in the existing concrete reinforcing steel to resist the design basis forces when compared to the allowable code stresses. To capture the variations in the actual stresses and resulting margins within the reinforcing steel at various locations in the containment structure, the Raytheon evaluation divided the containment into three distinct zones:

- Red Zone: Areas where small margin exists in the existing rebar. This area is located in the cylinder portion of the containment near transition areas such as the equipment hatch, personnel air lock, large mechanical/electrical penetrations, and the intersection of the containment cylinder to the base-mat.
- Green Zone: All areas in the cylindrical portion of the containment structure with the exception of the areas contained in the red zone. The reinforcing steel in this zone contains large margins. Concrete irregularities such as cracking and spalling can be tolerated in this region.
- Yellow Zone: Dome portion of the containment. This area also has large margins for the reinforcing steel and can tolerate concrete irregularities such as cracking and spalling. The difference between the yellow and green zones is the amount of available margins. The yellow zone has slightly less margin than the green zone.

After a review and evaluation of the IWL inspection observations (32 total indications), it was determined that none of these indications represent a structural concern for the containment structure. Furthermore, these indications do not reduce the structural capacity or ability of the containment structure to perform its safety function. This was concluded as follows:

- Some corrosion was exhibited where rebar and or cadwelds[6] were exposed to the environment as a result of concrete spalling. However, no flaking or aggressive corrosion processes were observed. The exposed areas of cadweld splices and reinforcing steel were approximately four inches by three inches.
- Of the Sargent and Lundy inspection zones (45) recorded during the IWL examination of the concrete containment structure, only two zones (IWL-043-002 and IWL-088-004) were located within the red zone.
  - Within inspection zone IWL-043-002, delaminations were found near the floor line and penetrations but no evidence of staining or exposure of reinforcing steel was observed. Per the Raytheon acceptance criteria report, the reinforcing steel provides the structural strength to the concrete containment and is the primary concern. Staining of the concrete is the primary sign of possible corrosion of the reinforcing steel and is the first screening criteria for acceptance. Since no staining was observed, the reinforcing steel has not degraded in this area and the structural capacity of the VC wall in this location is not degraded.
  - Inspection zone IWL-088-004 is marginally located in the red zone and contained exposed steel that was identified as a cadweld splice. The exposed cadweld splices are located in the upper end of the inspection zone that borders the green stress zone. Based on the corrosion evaluation performed by Raytheon in their acceptance criteria report, ongoing corrosion for 40 years would only result in a decrease of 10% in the reinforcing steel cross-section. Since these indications are located on the border between the red and green stress zones, sufficient margins exist in the reinforcing steel in the green zone to allow for redistribution of forces if required. In addition, the location of this indication is removed from the personnel air lock penetration that was the main area of concern in the Raytheon acceptance criteria report. Also, no significant loss of wall section was observed by Sargent and Lundy for the exposed cadweld splice in this area. These conclusions were discussed in detail with both the Responsible Professional Engineer for the IWL program and the Sargent and Lundy Project Engineer. Both agreed that no further analysis is required.
- The remaining Sargent and Lundy IWL inspection zones with exposed steel are located in the green and yellow stress zones as defined in the Raytheon acceptance criteria report. For indications in the green and yellow stress zones, the maximum postulated reduction in reinforcing steel cross-section based on 40 years of corrosion will not result in any overstress conditions in the reinforcing steel. As a result, corrosion of reinforcing steel in the green and yellow zones due to spalling or localized cracking of concrete will not affect the structural integrity of the containment structure.
- All of the concrete findings were isolated conditions and were not grouped in any one location. The total area of each exposed cadweld splice was very small, each being approximately four inches by three inches, when compared to the total surface area of the containment structure.

As a result, these concrete findings do not adversely affect the ability of the concrete containment structure to meet the design basis requirements. The observations/findings resulting from the IWL

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[6] Cadwelds are heavy walled cylinders used to splice together two pieces of rebar. Molten metal is injected into the cadweld cylinder to fuse together the two ends of rebar. These splices typically have a diameter twice that of the rebar they are joining.

inspection will be monitored to track any potential changes to the observations noted. No repairs are anticipated to be required at this time.

Request No. 7

The stainless steel bellows have been found to be susceptible to trans-granular stress corrosion cracking, and the leakages through them are not readily detectable by Type B testing (See NRC Information Notice 92-20). If applicable, please provide information regarding the inspection and testing of the bellows at IP2, and how the potential bellows degradation has been factored into the licensee's risk assessment.

Response to Request No. 7

NRC Information Notice 92-20, "Inadequate Local leak Rate Testing," discussed the inadequate local leak rate testing of two-ply stainless steel bellows. IP2 has no such bellows that act as part of the containment boundary.

Request No. 8

Inspections of some reinforced and steel containments have indicated degradation for the uninspectable (embedded) side of the steel shell and steel liner of the concrete containments. These degradations can only be found by VT-3 or VT-1 examinations if they are through the thickness of the shell or liner or by periodic ultrasonic examination of 100 percent of the uninspectable surfaces. Please discuss how the potential leakage due to age-related degradation mechanisms described above as well as the unrepaired corrosion of the containment components (as indicated in Questions 5 and 6 above) are factored into the risk assessment related to the extension of the containment integrated leakage rate test interval.

Response to Request No. 8

The potential for containment leakage due to failure of the containment liner from unexpected acceleration of known degradation or any other known or unforeseen degradation mechanism is explicitly included in the risk assessment provided in Ref. 1 Attachment 3. By definition, the intact containment cases (Class 1) evaluated in the risk assessment include a large leakage term (2 L_a) that is independent of the source of the leak. Also by definition, the small and large containment breach cases (Classes 3a and 3b) evaluated in the risk assessment include even larger leakage terms (up to 35 L_a) that are independent of the source of the leak. The risk assessment shows that, even with the potential to have a significant undetected containment flaw or leak path, the increase in risk is insignificant.

ATTACHMENT 2 TO NL 01-140

TECHNICAL SPECIFICATION PAGES IN

STRIKEOUT/SHADOW FORMAT

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Added text is shown as shaded.

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e. Closure of the containment isolation valves for the purpose of the test shall be accomplished by the means provided for normal operation of the valves.

2. Acceptance Criteria

The As Found measured leakage rate shall be less than 1.0 L_a where L_a is equal to 0.1 w/o per day of containment steam air atmosphere at 47 psig and 271°F, which are the peak accident pressure and temperature conditions. Prior to entering a mode where containment integrity is required, the As Left leakage rate shall not exceed 0.75 L_a.

3. Frequency

The integrated leakage rate test frequency shall be performed in accordance with 10 CFR 50 Appendix J, Option B as modified by approved exemptions and in accordance with guidelines contained in Regulatory Guide 1.163, dated September 1995, with the following exceptions:

Exception 1: The Type A testing frequency specified in NEI 94-01 paragraph 9.2.3 as at-least-once-per-10 years based on acceptable performance history is changed to allow a Type A testing frequency of at-least-once-per-15 years based on acceptable performance history. This is a one-time-only exception that applies only for the interval following the Type A test performed in June 1991.

B. SENSITIVE LEAKAGE RATE

1. Test

A sensitive leakage rate test shall be conducted with the containment penetrations, weld channels, and certain double-gasketed seals and isolation valve interspaces at a minimum pressure of 52 psig and with the containment building at atmospheric pressure.

2. Acceptance Criteria

The test shall be considered satisfactory if the leak rate for the containment penetrations, weld channel and other pressurized zones is equal to or less than 0.2% of the containment free volume per day.

3. Frequency

A sensitive leakage rate test shall be performed at every Refueling Interval (R##).