Entergy

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Fred Dacimo
Vice President
License Renewal

November 6, 2008

Re: Indian Point Units 2 & 3
Docket Nos. 50-247 & 50-286

NL-08-169

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

SUBJECT: **Additional Information Regarding License Renewal Application – Operating Experience Clarification**

Dear Sir or Madam:

Entergy Nuclear Operations, Inc is providing, in Attachment I, an Operating Experience clarification pertaining to the License Renewal Application for Indian Point 2 and Indian Point 3. The additional information provided in this transmittal provides clarifications and additional information to previously submitted information in response to staff and audit questions.

There are no new commitments identified in this submittal. If you have any questions or require additional information, please contact Mr. R. Walpole, Licensing Manager at (914) 734-6710.

I declare under penalty of perjury that the foregoing is true and correct. Executed on November 6, 2008.

Sincerely,

Patrick W. Conroy for

Fred R. Dacimo
Vice President
License Renewal

A128
NRR

Attachment:

1. Operating Experience Clarification

cc: Mr. Bo M. Pham, NRC Environmental Project Manager
Ms. Kimberly Green, NRC Safety Project Manager
Mr. John P. Boska, NRC NRR Senior Project Manager
Mr. Samuel J. Collins, Regional Administrator, NRC Region I
Mr. Sherwin E. Turk, NRC Office of General Counsel, Special Counsel
IPEC NRC Senior Resident Inspectors Office
Mr. Robert Callender, Vice President, NYSERDA
Mr. Paul Eddy, New York State Dept. of Public Service

ATTACHMENT I TO NL-08-169

OPERATING EXPERIENCE CLARIFICATION

REGARDING

LICENSE RENEWAL APPLICATION

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

INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3
LICENSE RENEWAL APPLICATION (LRA)
OPERATING EXPERIENCE CLARIFICATION

Clarification: Unit 2 Refueling Cavity Action Plan

The Unit 2 refueling cavity (RC) remains operable since the concrete under the liner has sufficient cover to protect the reinforcing bars. The liner itself remains attached to the concrete by embedded studs and does not serve as a structural component; just a leak tight device. Therefore, there are no structural concerns. To minimize contamination and ALARA issues caused by continued cavity leakage, an action plan has been developed to mitigate the refueling cavity leak. The action plan is as follows.

2008 / 2009 - Research available technologies to repair leaks in the refueling cavity.

Spring 2010 refueling outage – Repair area of north wall weld seams in the vicinity of the Ceramoloy patch and south wall along area of disbonded Ceramoloy patch.

Spring 2012 refueling outage – Repair east wall where large Ceramoloy patch has disbonded and area around access ladder on northwest corner.

Spring 2014 refueling outage – Repair areas of lower cavity where Ceramoloy patches have disbonded, and miscellaneous areas observed as suspect from past inspections.

During each of the preceding outages, areas not permanently repaired will be temporarily repaired by the application of Instacote. Beginning in the refueling outage in Spring 2016, no Instacote will be applied to determine if repairs have successfully stopped the leakage. If not, additional areas will be repaired in subsequent outages until the leakage is corrected.

Clarification: Unit 2 Spent Fuel Pool Pit Walls

Summary:

IPEC analyzed the capability of the east spent fuel pool pit wall and the south spent fuel pool pit wall to resist the design basis loads considering potential concrete and reinforcement steel degradation due to observed leakage of fluids through these walls. Finite Element models for both the east and south walls were developed to determine the actual forces in the walls due to loading resulting from the design basis earthquake, hydrostatic forces and dead weight. Due to the symmetry of the spent fuel pit structure, results from the evaluation of these two walls are applicable to the remaining north and west walls. The following summarizes the results and conclusions from these two analyses.

East Wall Evaluation

The capacity of the east wall was evaluated in response to possible degradation due to an observed leak in 1992. It was determined that work in the spent fuel pool in 1990 initiated the leak by inadvertently creating a small hole in the stainless steel liner. This condition was repaired in 1992. A total of 20 core bores were taken from 5 locations on the east wall in the vicinity of the observed leakage to determine the condition of the concrete following exposure to borated water leakage. At each of the 5 locations, 4 individual cores 4" in diameter and 15" in length were taken, resulting in a total depth of penetration into the wall of 60". In addition, several windows in the outer surface of the wall were created to allow inspection of the outer layer of reinforcing steel. Of the 20 cores taken, all but one had compressive strengths that exceeded the design strength of 3000 psi. This one core outlier had a measured compressive strength of 2400 psi.

The lower value was attributed to its close proximity to a known concrete sub-surface delamination in the wall and was not considered to be representative of the general condition of the wall. Analysis of the concrete matrix showed that the borated water had little or no effect on the concrete itself. Little or no corrosion was observed in the rebar except at a location in the wall where spalling had occurred exposing rebar to the elements. Analysis of the rust particles showed high chloride content and low boron concentration indicating that rainwater was the primary cause of the observed corrosion. To determine the available margin in the east wall, moments were calculated using a finite element plate model. The results of the analysis showed the east wall was capable of resisting the applicable forces without any reinforcing steel and would incur little or no cracking as a result of the design loading. Conservatively assuming that the concrete would crack and the bending moments would be carried by the reinforcing steel, the following minimum margins exist with respect to the ultimate moment capacity of the wall. In other words, the load bearing capability of the wall is at least 31% greater than the required load bearing capability.

Northeast Corner ¼ to ½ wall depth: 31%
Mid Span ¼ to ½ wall depth: 43%

South Wall Evaluation

An evaluation determined the margins in the south wall due to possible rebar degradation as a result of observed fluid emanating from a crack discovered in the west corner during excavation for the dry cask storage project. The reinforcing steel in the area of the observed leak was exposed for inspection. The condition of the reinforcing steel was good with little or no corrosion. To determine the actual forces in the south wall due to the design basis loads, a finite element model of the wall was developed. Based on the resulting moments from the analysis, the margins in the south wall with respect to the ultimate moment capacity of the concrete section are as noted below:

Section with Horizontal Steel at Wall Center: 45%
Section with Horizontal Steel at Crack Location: 51%
Section with Vertical Steel at Crack Location: 57%
Section with Vertical Steel at Base: 25%

Conclusion:

The available margins in the east and south walls of the spent fuel pool pit with respect to the as-designed condition range from a low of 25% at the base of the wall for the vertical steel to a high of 57% for the vertical steel at the crack location in the west corner of the wall. The margins for the horizontal rebar at wall mid span range from 43%-45% and up to 51% in the vicinity of the observed crack.

Clarification: IPEC Containment Spalling Locations

Spalling of concrete has been observed on IP2 containment exterior surface. The affected areas are the vertical wall.

The containment structure is designed to withstand seismic, wind, deadweight, pressure, and temperature forces caused by natural phenomena and accident conditions. In addition, the integrated leak rate test is periodically performed on the containment which imposes an internal nominal pressure of 47 psi.

Margin is defined as the difference between the Code allowable forces/stresses and the actual forces/stresses in the structure caused by the most severe loading condition. Meeting the Code provides margin in the form of a safety factor that requires the design strength of the structure to be a multiple of the strength necessary to prevent failure under maximum load conditions. Over and above the safety factor established by meeting Code requirements is margin between actual strength and the strength required to just meet the Code.

All areas of the spalled concrete on the containment structure exceed the strength required to meet Code requirements. The margin available over and above the Code requirements is shown in the following table. As the surface concrete is not credited for tensile strength of the structure, the spalling has no impact on the available margins.

Elevation (ft above ground)	Margin above Code allowable (%)	
	Vertical rebar	Horizontal rebar
191.0	51	32
117	58	38
64	52	51
45.7	37	100

Since the design of the IP3 containment is similar to the IP2 containment design, the margins developed for IP2 are applicable to IP3.

Unit	Approximate Location: Elevation (feet)/Azimuth(degree)	Size Dimensions: Length, Width & Depth	Calc design margin	Comment
2	46/315	9" long	100 %	Exposed Cadweld sleeve
2	43/290	Vertical rebar 9" on center at 10 locations	37 %	Surface corrosion
2	55/225		51 %	Exposed Cadweld sleeve
2	60/230		51 %	Exposed Cadweld sleeve
2	70/190		38 %	Exposed Cadweld sleeve
2	100/170	4"	38 %	Exposed rebar
2	105/165	8" long	38 %	Exposed Cadweld sleeve
2	115/280	9" long	38 %	Exposed Cadweld sleeve
2	125/225	8" long	32 to 38 %	Exposed Cadweld sleeve
2	112/170	1.5" long	32 to 38 %	2 exposed rebar
2	117/175	8" long	32 to 38 %	Exposed Cadweld sleeve
2	119/170	1" long	32 to 38 %	2 exposed Cadweld sleeves separated 9" apart
2	123/170	1" long	32 to 38 %	Exposed rebar (Cadweld sleeve)
2	125/185	9" long	32 to 38 %	Exposed Cadweld sleeve
2	130/350	6" long	32 to 38 %	Exposed Cadweld sleeve
2	135/355	2" long	32 to 38 %	Exposed rebar
2	138/260		32 to 38 %	Exposed Cadweld sleeve
2	140/265		32 to 38 %	Exposed Cadweld sleeve
2	130/310		32 to 38 %	Exposed Cadweld sleeve
2	140/220		32 to 38 %	Exposed Cadweld sleeve
2	138/225		32 to 38 %	Exposed Cadweld sleeve
2	133/225		32 to 38 %	Exposed Cadweld sleeve
2	145/160	2" long	32 to 38 %	Exposed Cadweld sleeve
2	145/135	4" long	32 to 38 %	Exposed Cadweld sleeve
2	143/45		32 to 38 %	2 small pop outs exposing rebar

Unit	Location: Height & Distance from major opening	Size Dimensions: Length, Width & Depth	Calc design margin	Comment
2	164/340		32 to 38 %	3 exposed Cadweld sleeves
2	150/255		32 to 38 %	Exposed Cadweld sleeve
2	150/310		32 to 38 %	Exposed Cadweld sleeve
2	145/310		32 to 38 %	Exposed Cadweld sleeve
2	160/225		32 to 38 %	2 small spots of exposed steel
2	155/160	3”	32 to 38 %	Pop out exposing rebar
2	150/100		32 to 38 %	Rebar exposed
2	150/45	9” long	32 to 38 %	Cadweld sleeve with surface corrosion
2	155/40	1 to 3 “ long	32 to 38 %	Rebar (Cadweld sleeve) exposure at 3 locations
2	175/265		32 to 38 %	Small areas exposed steel due to pop outs
2	180/200	1” long	32 to 38 %	Exposed steel
2	183/220	9” long	32 to 38 %	Exposed Cadweld sleeve
2	188/225	9” long	32 to 38 %	Exposed Cadweld sleeve
2	178/40	9” long	32 to 38 %	Exposed Cadweld sleeve
2	180/35	9” long	32 to 38 %	Exposed Cadweld sleeve
2	198/255	2” spall	41 %	Exposed rebar due to spall

Indian Point 3

Unit	Location: Height & Distance from major opening	Size Dimensions: Length, Width & Depth	Calc design margin	Comment
3	75/225		38 %	Small void
3	78/30		38 %	Small void with exposed rebar tip
3	98/30		38 %	Small pop-outs
3	118/275	1 to 3” long and ½ wide	38 %	Spalls exposing rebar
3	118/225	6” long, ½ wide	38 %	Rebar (cadweld sleeve)
3	115/25		38 %	Exposed rebar tip and embedded pipe
3	140/220	1.5” by 1”	38 %	Exposed rebar tip

LRA Section 3.5.2.2

(Part 1)
During a telephone call on September 3, 2008, the staff asked the applicant to clarify a citation to American Concrete Institute (ACI)-318 in LRA Section 3.5.2.2. The staff noted that this standard is also referenced in other subsection in LRA Section 3.5. Specifically, LRA Section 3.5.2.2 states, "Water/cement ratios were in accordance with requirements of the version of ACI 318 used in IPEC construction, which allows a ratio of up to 0.576 for concrete with the compressive strength specified for IPEC concrete." The staff questioned whether that the correct ratio value for citation should be 0.465. The applicant stated that it would clarify the value used in the application, and it will provide additional information to substantiate how it meets ACI-318-63.

(Part 2)
In addition, in the same section of the LRA, the applicant states, "IPEC concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same American Society for Testing and Material (ASTM) standards for selection, application and testing of concrete." The staff requested clarification, in that the fact that the two documents use the same ASTM standard does not necessarily mean that the concrete meets a later edition of a standard. The applicant stated that it will clarify the reference to ACI 201.2R-77.

(Part 3)
In LRA Section 3.5.2.2.1, the applicant states, "For Unit 2 containment during normal operation, areas are maintained below a bulk average temperature of 130ºF. Piping penetrations through the containment cylinder wall associated with pipes carrying hot fluid are cooled using air-to-air heat exchangers and the pipes are insulated to maintain the temperature in the adjoining concrete below 250°F. NUREG-1801 allows for concrete temperatures higher than 200°F for local areas if tests or calculations are provided to evaluate the reduction in strength. Concrete associated with the Unit 2 hot piping penetrations has been evaluated and determined acceptable at temperatures up to 250°F." The staff asked that if the temperatures are greater than 200°F in localized areas, what will be the effects on the properties of concrete during the period of extended operation. The applicant stated that it will look at the calculations and provide a response.

Clarification: LRA Section 3.5.2.2 (Part 1)

The design of the concrete mix for containment structures at IPEC was in accordance with ACI 318-63, "building Code requirements for reinforced Concrete". ACI 318-63 provides two methods (method 1 and 2) for determination of proportions of cement, aggregate, and water (i.e., water/cement ratio) to obtain the required concrete strength (ref. ACI 318-63, section 502). Method 1 uses the water-cement ratios to determine acceptability of the concrete mixture. If using method 1, the correct value for water-cement ratio would be 0.465. Method 2 involves testing concrete trial mixes of varying water-cement ratios to establish a ratio that provides the required concrete quality. The concrete specifications for IPEC containment invoke ACI 318-63, method 2. The IPEC containment concrete mixture was established based on tests of concrete trial mixtures in accordance with method 2. The actual test reports for IPEC containment concrete show the compressive strength was well above the required 3000 psi.

The LRA citations to ACI 318 in Section 3.5.2.2.1.1 and in Section 3.5.2.2.2.1 are revised to read as follows. Deletions are shown by strikethrough and additions are underlined.

"Water/cement ratios were in accordance with requirements of the version of ACI 318 used in IPEC construction, which ~~allows a ratio of up to 0.576 for~~provides for testing of trial mixes to ensure concrete with the compressive strength specified for IPEC concrete was acheived. Although ~~specified~~ water/cement ratios fall outside the established range of 0.35 to 0.45 provided in the guidance of NUREG-1801, IPEC concrete meets the specifications of ACI to ensure acceptable quality concrete is obtained."

Clarification: LRA Section 3.5.2.2 (Part 2)

IPEC containment structure concrete was designed and constructed in accordance with the requirements of ACI 318-63, "Building Code for Reinforced Concrete". The original construction specification for IPEC containment structure requires 3000 psi strength air-entrained concrete.

ACI 318-63 provides the recommendations for selection of cement, aggregates, air-entraining admixture, water-cement ratio, and reinforcing bar to attain a workable, consistent concrete mix in order to produce a quality durable concrete structure with the required compressive strength. It requires these material and their tests conform to the material specifications provided in applicable ASTM standards (e.g., concrete aggregates shall conform to "Specifications for concrete aggregates" ASTM C 33, Portland cement shall conform to "Specifications for Portland cement" ASTM C 150, Air-entraining admixtures shall conform to "Specifications for air-Entraining Admixtures for Concrete" ASTM C260). It also provides concrete testing methods, and requirements for placing and curing the concrete to ensure the required quality, durability, and strength of the concrete for each application.

ACI 201.2R-77, "Guide to Durable Concrete" was published after construction of IPEC structures and provides recommendations for concrete durability address degradation processes, such as, weathering action, chemical attack, and abrasion. ACI 201.2R-77 recommends the selection of appropriate materials of suitable composition, and processing them correctly under the existing environmental conditions as being essential to achieving concrete that is resistant to deleterious effects of water, aggressive solutions and extreme temperatures. IPEC concrete structures designed in accordance with ACI 318 align with many of the recommendations in ACI 201.2R-77 to provide for good durability. NUREG-1801 recommends no aging management program for inaccessible concrete that meets the guidance of ACI 201.2R-77. IPEC credits aging management programs for monitoring all in-scope concrete structures. This includes periodic inspection of accessible concrete that is constructed to the same specifications as inaccessible concrete. In addition, inaccessible concrete is inspected when opportunities arise for such inspections.

Clarification: LRA Section 3.5.2.2 (Part 3)

NUREG-1801 and ACI 349 allow local area concrete temperature greater than 200 °F provided reduction in strength of concrete has been evaluated and determined acceptable. Engineering evaluation of effect of 250 °F temperature on IP2 hot piping penetrations concrete was performed. The evaluation determined a 15% reduction in the strength of concrete could be expected when reaching temperatures of 250 °F, and found it to be acceptable (when considering the concrete compressive strength tests that showed an actual strength more than

15% higher than the design strength of 3000 psi). So, essentially no aging effect or reduction in design strength of IP2 concrete is realized due to 250 °F temperature.

The evaluation that the concrete still meets the design requirement remains valid for period of extended operation. Subsequently, IP2 UFSAR was updated to indicate local areas are allowed to have increased temperatures not to exceed 250 °F.

Clarification to RAI 4.7.2-8

Below is a list of Alloy 82/182 weld material used in the Primary Coolant System Loop Piping that has been approved for LBB. The list has been revised to show that all of the 27 ½ " pipe sizes are Inlet Nozzles. All of the 29" pipe sizes are Outlet Nozzles.

IP2	Primary Coolant Loop 21 Rx Vessel Outlet Nozzle	29" I.D.	RPVS-21-1A
IP2	Primary Coolant Loop 21 Rx Vessel Inlet ~~Outlet~~ Nozzle	27 ½" I.D.	RPVS-21-14A
IP2	Primary Coolant Loop 22 Rx Vessel Outlet Nozzle	29" I.D.	RPVS-22-1A
IP2	Primary Coolant Loop 22 Rx Vessel Inlet ~~Outlet~~ Nozzle	27 ½" I.D.	RPVS-22-14A
IP2	Primary Coolant Loop 23 Rx Vessel Outlet Nozzle	29" I.D.	RPVS-23-1A
IP2	Primary Coolant Loop 23 Rx Vessel Inlet ~~Outlet~~ Nozzle	27 ½" I.D.	RPVS-23-14A
IP2	Primary Coolant Loop 24 Rx Vessel Outlet Nozzle	29" I.D.	RPVS-24-1A
IP2	Primary Coolant Loop 24 Rx Vessel Inlet ~~Outlet~~ Nozzle	27 ½" I.D.	RPVS-24-14A
IP3	Primary Coolant Loop 31 Rx Vessel Outlet Nozzle	29" I.D.	INT-1-4100-1(DM)
IP3	Primary Coolant Loop 31 Rx Vessel Inlet Nozzle	27 ½" I.D.	INT-1-4100-16(DM)
IP3	Primary Coolant Loop 32 Rx Vessel Outlet Nozzle	29" I.D.	INT-1-4200-1(DM)
IP3	Primary Coolant Loop 32 Rx Vessel Inlet Nozzle	27 ½" I.D.	INT-1-4200-16(DM)
IP3	Primary Coolant Loop 33 Rx Vessel Outlet Nozzle	29" I.D.	INT-1-4300-1(DM)
IP3	Primary Coolant Loop 33 Rx Vessel Inlet Nozzle	27 ½" I.D.	INT-1-4300-16(DM)
IP3	Primary Coolant Loop 34 Rx Vessel Outlet Nozzle	29" I.D.	INT-1-4400-1(DM)
IP3	Primary Coolant Loop 34 Rx Vessel Inlet Nozzle	27 ½" I.D.	INT-1-4400-16(DM)