ENT000193
Submitted: March 29, 2012

Entergy

Entergy Nuclear Northeast
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249
Tel (914) 788-2055

Fred Dacimo
Vice President
License Renewal

June 11, 2008

Re: Indian Point Units 2 & 3
Docket Nos. 50-247 & 50-286
NL-08-092

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

SUBJECT: Entergy Nuclear Operations Inc.
Indian Point Nuclear Generating Unit Nos. 2 & 3
Docket Nos. 50-247 and 50-286
Amendment 5 to License Renewal Application (LRA)

REFERENCES:

1. Entergy Letter dated April 23, 2007, F. R. Dacimo to Document Control Desk, "License Renewal Application" (NL-07-039)

2. Entergy Letter dated April 23, 2007, F. R. Dacimo to Document Control Desk, "License Renewal Application Boundary Drawings (NL-07-040)

3. Entergy Letter dated April 23, 2007, F. R. Dacimo to Document Control Desk, "License Renewal Application Environmental Report References (NL-07-041)

4. Entergy Letter dated October 11, 2007, F. R, Dacimo to Document Control Desk, "License Renewal Application (LRA)" (NL-07-124)

5. Entergy Letter November 14, 2007, F. R, Dacimo to Document Control Desk, "Supplement to License Renewal Application (LRA) Environmental Report References" (NL-07-133)

Dear Sir or Madam:

In the referenced letters, Entergy Nuclear Operations, Inc. applied for renewal of the Indian Point Energy Center operating license.

This letter contains Amendment 5 of the License Renewal Application (LRA) which consists of three attachments. Attachment 1 consists of the annual update amendment to the LRA.

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Attachment 2 consists of an amendment for (a)(2) clarification. Attachment 3 consists of an amendment for reactor vessel clarification.

If you have any questions, or require additional information, please contact Mr. Robert Walpole at 914-734-6710.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 6/11/08.

Sincerely,

Fred R. Dacimo
Vice President
License Renewal

Attachments:

1. Annual Update Amendment
2. (A)(2) Clarification Amendment
3. Reactor Vessel Clarification Amendment

cc: Mr. Samuel J. Collins, Regional Administrator, NRC Region I
Mr. Sherwin E. Turk, NRC Office of General Counsel, Special Counsel
Mr. Kenneth Chang, NRC Branch Chief, Engineering Review Branch I
Mr. Bo M. Pham, NRC Environmental Project Manager
Mr. John Boska, NRR Senior Project Manager
Mr. Paul Eddy, New York State Department of Public Service
NRC Resident Inspector's Office
Mr. Paul D. Tonko, President, New York State Energy, Research, & Development Authority

ATTACHMENT 1 TO NL-08-092

Annual Update Amendment

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
ANNUAL UPDATE AMENDMENT

(Changes are shown as strikethroughs for ~~deletions~~ and underlines for additions)

LRA Section 2.3.2.2, Containment Spray System, System Description, Unit 2, second and third paragraphs, are revised as follows.

Long-term post-accident retention of iodine is assured by four ~~trisodium phosphate~~ sodium tetraborate baskets located in the containment at an elevation (46') that will be flooded under accident conditions, allowing the ~~trisodium phosphate~~ sodium tetraborate to dissolve into the fluid for pH control. The four ~~trisodium phosphate~~ sodium tetraborate baskets are included in the containment structural evaluation (summarized in Section 2.4.1) but are not discussed further as they have no license renewal intended function and are therefore not subject to aging management review.

The containment spray system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide means for rapid reduction of containment pressure and temperature by providing borated water from the RWST following a design basis LOCA or a steam line break accident inside containment.
- Distribute flow from the containment recirculation pumps or RHR pumps to the containment atmosphere during the recirculation phase of an accident.
- Provide for chemical additives (~~trisodium phosphate~~ sodium tetraborate) to increase the pH of post-accident fluids in the recirculation and containment sumps.
- Provide containment isolation capability for lines penetrating containment.

LRA Section 2.3.3.10, Control Room Heating, Ventilation and Cooling, System Description, Unit 2, second, third, and fifth paragraphs are revised as follows.

Unit 1 and Unit 2 share a central control room. The Unit 1 control room ventilation equipment for the central control room has been modified for recirculation mode only. ~~The Unit 1 control room ventilation equipment is not credited for cooling or filtration.~~

The central control room (CCR) HVAC system has the following intended function for 10 CFR 54.4(a)(1).

- Maintain a suitable environment in the main control room for operating personnel and safety-related equipment.
- ~~Provide filtration of incoming air and maintain a positive pressure in the control room.~~
- Provide a means to isolate the CCR to prevent the infiltration of toxic gas, and remove airborne radioactivity from the outside air intake during high radiation or safety injection conditions to ensure protection of the operators and CCR habitability.
- Provide a slight positive pressure in the CCR during accident conditions.

- Provide ventilation, supervisory control panel emergency by-pass fan, to remove heat from the supervisory panel whenever the fan in the air conditioning unit is not available.
- Provide cooling as required to maintain acceptable temperatures inside the CCR during accident conditions.

The CCR HVAC system has the following intended function for 10 CFR 54.4(a)(3).

- Provide ventilation system isolation (via dampers ~~operability~~) as required during an Appendix R event ~~(10 CFR 50.48)~~.
- Maintain the CCR in a safe, habitable environment during an Appendix R Event and Station Blackout.

LRA Table 2.4-1, Containment Building, Components Subject to Aging Management Review, is revised as follows.

~~Sump liner and penetrations~~	~~Pressure boundary~~ ~~Shelter or protection~~ ~~Support for Criterion (a)(1) equipment~~
Sump screens, strainer, barriers, annulus trash racks, grating, and flow barriers	Shelter or protection Support for Criterion (a)(1) equipment

LRA Table 3.5.2-1, Containment Building Structural Components and Commodities (IP2 and IP3), is revised as follows.

~~Sump liner and penetrations~~	~~EN, PB, SSR~~	~~Carbon steel~~	~~Exposed to fluid environment~~	~~Loss of material~~	~~CII-IWE Containment Leak Rate~~			~~G~~
~~Sump screens, strainer and flow barriers~~	~~EN, SSR~~	~~Carbon steel~~	~~Air – indoor uncontrolled~~	~~Loss of material~~	~~Structures Monitoring~~	~~III.A1-12 (T-11)~~	~~3.5.1-25~~	~~C~~
Sump screens, strainer, barriers, annulus trash racks, grating, and flow barriers	EN, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C
Sumps	PB, SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring			I, 501

LRA Section A.2.1.17, Inservice Inspection – Inservice Inspection (ISI) Program, third paragraph, is revised as follows.

On ~~July~~ March 1, 2007~~1994~~, ~~the plant~~ IP2 entered the ~~third~~ fourth ISI interval. The ASME code edition and addenda used for the ~~third~~ fourth interval is the ~~1989~~2001 Edition with ~~no~~2003 addenda.

LRA Section B.1.8, Containment Inservice Inspection, Program Description, is revised as follows.

The Containment Inservice Inspection (CII) Program is an existing program encompassing ASME Section XI Subsection IWE and IWL requirements as modified by 10 CFR 50.55a. The IP2 program uses the ASME Boiler and Pressure Vessel Code, Section XI, ~~1992~~ 2001 Edition, ~~1992~~ 2003Addenda. The IP3 program uses the ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition, no Addenda. Every 10 years, each unit's program is updated to the latest ASME Section XI code edition and addenda approved by the Nuclear Regulatory Commission in 10 CFR 50.55a.

LRA Section B.1.18, Inservice Inspection, Program Description, seventh paragraph, is revised as follows.

On ~~July~~ March 1, 2007~~1994~~, IP2 entered the ~~third~~ fourth ISI interval and on July 21, 2000, IP3 entered the third ISI interval. The ASME code edition and addenda used for the IP2 fourth interval is the 2001 Edition with 2003 addenda. The ASME code edition and addenda used for the IP3 third interval ~~for both units~~ is the 1989 Edition with no addenda.

LRA Section B.1.18, Inservice Inspection, Element 4, eighth paragraph, is revised as follows.

For ~~both~~ IP2 ~~and IP3~~, Article IWF of ASME Section XI, ~~1989 Edition~~ 2001 Edition and 2003 Addenda, does not contain any specific exemption criteria for component supports. For IP3, ~~C~~components exempt from examination are in accordance with the criteria contained in Code Case N-491-2, Alternate Rules for Examination of Class 1, 2, 3 and MC Component Supports of Light-Water Cooled Power Plants, Section XI, Division 1, IWF-1230.

Additional LRA Clarification

LRA Section 4.3.3, Effects of Reactor Water Environment on Fatigue Life, is revised to delete the tenth paragraph as follows.

~~For those locations with CUFs less than 1.0, the TLAA has been projected through the period of extended operation per 10CFR54.21(c)(1)(ii).~~

LRA Section A.2.1.20, Nickel Alloy Inspection Program, last paragraph, is revised as follows. (Refer to RAI 3.0.3.3.5-2 response in letter NL-08-051 dated March 12, 2008)

~~The site will continue to implement commitments associated with (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff accepted industry guidelines.~~

<u>The site commits to comply with future applicable NRC Orders. In addition, IPEC commits to implement applicable (1) Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines associated with nickel alloys.</u>

LRA Section A.3.1.20, Nickel Alloy Inspection Program, last paragraph, is revised as follows. (Refer to RAI 3.0.3.3.5-2 response in letter NL-08-051 dated March 12, 2008)

~~The site will continue to implement commitments associated with (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff accepted industry guidelines.~~

<u>The site commits to comply with future applicable NRC Orders. In addition, IPEC commits to implement applicable (1) Bulletins and Generic Letters associated with nickel alloys and (2) staff accepted industry guidelines associated with nickel alloys.</u>

LRA Section B.1.21, Nickel Alloy Inspection, Program Description, last paragraph, is revised as follows. (Refer to RAI 3.0.3.3.5-2 response in letter NL-08-051 dated March 12, 2008)

~~IPEC will continue to implement commitments associated with (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff accepted industry guidelines.~~

<u>IPEC commits to comply with future applicable NRC Orders. In addition, IPEC commits to implement applicable (1) Bulletins and Generic Letters associated with nickel alloys and (2) staff accepted industry guidelines associated with nickel alloys.</u>

LRA Section B.1.12, Fatigue Monitoring, Exceptions to NUREG-1801, is revised as follows.

The Fatigue Monitoring Program is consistent with the program described in NUREG-1801, Section X.M1, Metal Fatigue of Reactor Coolant Pressure Boundary~~, with the following exception~~.

~~Attributes Affected~~	~~Exceptions~~
~~4. Detection of Aging Effects~~	~~NUREG-1801 specifies periodic updates of fatigue usage calculations. The IPEC program updates fatigue usage calculations when the number of actual cycles approach the analyzed number of cycles.~~ [1]

~~Exception Notes~~

~~[1] Updates of fatigue usage calculations are not necessary unless the number of accumulated fatigue cycles approaches the number of analyzed design cycles. The IPEC program provides for periodic assessment of the number of accumulated cycles. If any transient approaches its number of analyzed cycles, corrective action is taken which may include update of the fatigue usage calculation.~~

ATTACHMENT 2 TO NL-08-092

(A)(2) Clarification Amendment

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
AMENDMENT FOR (a)(2) CLARIFICATION

During the NRC regional inspection and audits, specific questions by the staff prompted further review of nonsafety-related systems, structures and components that could affect components that perform a safety function. This review resulted in the following changes to the LRA section 3.3.2-19 tables. These section 3.3.2-19 table changes only impacted the periodic surveillance and preventive maintenance program by adding one new inspection activity for the condensate pump suction system as described below. (underline – added, strikethrough – deleted)

LRA Table 3.3.2-19-4-IP2, Condensate System, is revised as follows.

Table 3.3.2-19-4-IP2: Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302

Table 3.3.2-19-4-IP2: Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-4 (SP-16)	3.4.1-16	A, 314
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-4 (SP-16)	3.4.1-16	A, 314
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Tank	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314

Table 3.3.2-19-4-IP2: Condensate System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-4 (SP-16)	3.4.1-16	A, 314
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-4 (SP-16)	3.4.1-16	A, 314
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C

Table 3.3.2-19-4-IP2: Condensate System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-4 (SP-16)	3.4.1-16	A, 314

LRA Table 3.3.2-19-5-IP2, Chemical and Volume Control System, is revised as follows.

Table 3.3.2-19-5-IP2: Chemical and Volume Control System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-16 (AP-18)	3.3.1-99	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1-17 (AP-79)	3.3.1-91	A
Heat exchanger housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-16 (AP-18)	3.3.1-99	A

Table 3.3.2-19-5-IP2: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1-17 (AP-79)	3.3.1-91	E

LRA Table 3.3.2-19-17-IP2, Heating, Ventilation, and Air Conditioning System, is revised as follows.

Table 3.3.2-19-17-IP2: Heating, Ventilation, and Air Conditioning System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1-2 (A-10)	3.3.1-56	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C, 309
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-11 (S-10)	3.4.1-4	C, 314

LRA Table 3.3.2-19-24-IP2, Miscellaneous System, is revised as follows.

Table 3.3.2-19-24-IP2: Miscellaneous System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E

Table 3.3.2-19-24-IP2: Miscellaneous System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.B-1 (E-25)	3.2.1-32	E

LRA Table 3.3.2-19-31-IP2, Radiation Monitoring System, is revised as follows.

Table 3.3.2-19-31-IP2: Radiation Monitoring System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Pump casing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-5 (SP-17)	3.4.1-14	C, 314
Pump casing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-4 (SP-16)	3.4.1-16	C, 314
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.C2-10 (A-52)	3.3.1-50	B
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I-8 (A-77)	3.3.1-58	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1-19 (A-38)	3.3.1-76	E

Table 3.3.2-19-31-IP2: Radiation Monitoring System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J-15 (AP-17)	3.3.1-94	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-40 (S-13)	3.4.1-6	C, 314

LRA Table 3.3.2-19-33-IP2, Station Air System, is revised as follows.

Table 3.3.2-19-33-IP2: Station Air System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
~~Compressor housing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Air – indoor (ext)~~	~~Loss of material~~	~~External Surfaces Monitoring~~	~~VII.D-3 (A-80)~~	~~3.3.1-57~~	~~A~~
~~Compressor housing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Treated water (int)~~	~~Loss of material~~	~~Water Chemistry Control – Closed Cooling Water~~	~~VII.C2-14 (A-25)~~	~~3.3.1-47~~	~~D~~

LRA Table 3.3.2-19-9-IP3, Condensate Pump Suction System, is revised as follows.

Table 3.3.2-19-9-IP3: Condensate Pump Suction System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1-7 (A-17)	3.3.1-11	E
Expansion joint	Pressure boundary	Elastomer	Treated water (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.A4-1 (A-16)	3.3.1-12	E

Table 3.3.2-19-9-IP3: Condensate Pump Suction System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Elastomer	Treated water (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.A4-1 (A-16)	3.3.1-12	E

LRA Table 3.3.2-19-16-IP3, Emergency Diesel Generator System, is revised as follows.

Table 3.3.2-19-16-IP3: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Cooling Water	VII.H2-23 (A-25)	3.3.1-47	B

LRA Table 3.3.2-19-27-IP3, Heater Drain / Moisture Separator Drains / Vents System, is revised as follows.

Table 3.3.2-19-27-IP3: Heater Drain / Moisture Separator Drains / Vents System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-29 (SP-16)	3.4.1-16	A, 314

Table 3.3.2-19-27-IP3: Heater Drain / Moisture Separator Drains / Vents System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	C, 314
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-29 (SP-16)	3.4.1-16	A, 314
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and	VIII.E-29 (SP-16)	3.4.1-16	A, 314

Table 3.3.2-19-27-IP3: Heater Drain / Moisture Separator Drains / Vents System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
					Secondary			
Pump casing	Pressure boundary	Carbon steel	~~Steam (int)~~ Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	~~VIII.A-16 (S-06)~~ VIII.E-34 (S-10)	~~3.4.1-2~~ 3.4.1-4	~~C, 314~~ A, 314
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	Periodic surveillance and preventive maintenance	VIII.B1-10 (S-08)	3.4.1-1	E
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C

Table 3.3.2-19-27-IP3: Heater Drain / Moisture Separator Drains / Vents System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-29 (SP-16)	3.4.1-16	A, 314
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-34 (S-10)	3.4.1-4	A, 314
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E-30 (SP-17)	3.4.1-14	A, 314
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E-29 (SP-16)	3.4.1-16	A, 314

LRA Table 3.3.2-19-45-IP3, Reheat Steam System, is revised as follows.

Table 3.3.2-19-45-IP3: Reheat Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C-7 (S-10)	3.4.1-4	A, 314
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C-7 (S-10)	3.4.1-4	A, 314
Steam trap	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Steam trap	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C-7 (S-10)	3.4.1-4	A, 314
Strainer Housing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Strainer Housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C-7 (S-10)	3.4.1-4	A, 314
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and	VIII.C-7 (S-10)	3.4.1-4	A, 314

Table 3.3.2-19-45-IP3: Reheat Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
					Secondary			
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.C-2 (SP-17)	3.4.1-14	A, 314
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 302
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C-1 (SP-16)	3.4.1-16	A, 314
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C-7 (S-10)	3.4.1-4	A, 314

LRA Table 3.3.2-19-48-IP3, Station Air System, is revised as follows.

Table 3.3.2-19-48-IP3: Station Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
~~Compressor housing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Air – indoor (ext)~~	~~Loss of material~~	~~External Surfaces Monitoring~~	~~VII.D-3 (A-80)~~	~~3.3.1-57~~	~~A~~
~~Compressor housing~~	~~Pressure boundary~~	~~Carbon steel~~	~~Treated water (int)~~	~~Loss of material~~	~~Water Chemistry Control – Closed Cooling Water~~	~~VII.C2-14 (A-25)~~	~~3.3.1-47~~	~~D~~
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D-3 (A-80)	3.3.1-57	A
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.D-2 (A-26)	3.3.1-53	E

LRA Section A.1.28, Periodic Surveillance and Preventive Maintenance Program, second paragraph, twenty-ninth bullet is revised as follows.

- chlorination, circulating water, city water makeup, condensate pump suction, emergency diesel generator, floor drain, gaseous waste disposal, instrument air, liquid waste disposal, nuclear equipment drain, river water, station air piping, steam generator sampling, and secondary plant sampling piping components, and piping elements

LRA Section B.1.29, Periodic Surveillance and Preventive Maintenance, Program Description, Nonsafety-related systems affecting IP3 safety-related systems, is revised to add the following task.

Use visual or other NDE techniques to inspect inside and outside surfaces of a representative sample of condensate pump suction system elastomer components to manage loss of material and cracking and change in material properties.

ATTACHMENT 3 TO NL-08-092

Reactor Vessel Clarification Amendment

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
AMENDMENT FOR REACTOR VESSEL CLARIFICATIONS

Based on response to RAI 4.2.1-1 documented in letter NL-07-140 dated November 28, 2007 and clarified in letter NL-08-014 dated January 17, 2008, the following LRA amendments are required. (strikethroughs – deleted, underlines – added)

LRA Section 4.2, Reactor Vessel Neutron Embrittlement, second paragraph, is revised as follows.

> The IPEC current licensing basis analyses evaluating reduction of fracture toughness of the reactor vessel for 40 years are TLAA. The reactor vessel neutron embrittlement TLAA for each unit is summarized below. Forty-eight effective full-power years (EFPY) are conservatively projected for the end of the period of extended operation (60 years) based on actual capacity factors from the start of commercial operation until 2005 and ~~an~~ IP2 and IP3 average capacity factors of 99~~5~~% and >100% respectively from 2005 until~~l~~ the end of the period of extended operation.

LRA Section A.2.2.1, Reactor Vessel Neutron Embrittlement, is revised as follows

> The current licensing basis analyses evaluating reduction of fracture toughness of the reactor vessel for 40 years are TLAA. The reactor vessel neutron embrittlement TLAA is summarized below. Forty-eight effective full-power years (EFPY) are conservatively projected for the end of the period of extended operation (60 years) based on actual capacity factors from the start of commercial operation until 2005 and an average capacity factor of 99~~5~~% from 2005 to the end of the period of extended operation.

LRA Section A.3.2.1, Reactor Vessel Neutron Embrittlement, is revised as follows

> The current licensing basis analyses evaluating reduction of fracture toughness of the reactor vessel for 40 years are TLAA. The reactor vessel neutron embrittlement TLAA is summarized below. Forty-eight effective full-power years (EFPY) are conservatively projected for the end of the period of extended operation (60 years) based on actual capacity factors from the start of commercial operation until 2005 and an average capacity factor of ~~95~~>100% from 2005 to the end of the period of extended operation.

Consistent with LRA Section 4.2.4, Appendix A of the LRA will be revised to include discussion of PORV (LTOP) setpoint updates with the discussion of P-T limits.

LRA Section A.2.2.1.2, Pressure-Temperature Limits, third paragraph is revised as follows.

> ~~The site~~ IP2 will submit additional P-T curves as 10 CFR 50, Appendix G requires prior to the period of extended operation as part of the Reactor Vessel Surveillance Program. LTOP (PORV) setpoints will be re-evaluated when pressure/temperature curves are submitted.

LRA Section A.3.2.1.2, Pressure-Temperature Limits, third paragraph is revised as follows.

> ~~The site~~ IP3 will submit additional P-T curves as 10 CFR 50, Appendix G requires prior to the period of extended operation as part of the Reactor Vessel Surveillance Program. LTOP (PORV) setpoints will be re-evaluated when pressure/temperature curves are submitted.

The following provides additional reactor vessel information.

RAI 4.2.2-2 in letter NL-07-140 dated November 28, 2007 requested the following IP2 information.

> Table 3-1 in WCAP-13587, Revision 1 indicates the Westinghouse 4-loop plant J-R applied values are applicable for reactor vessels with a thickness of 8.5 inches and an inner radius of 86.5 inches and subject to Level A, B, C, and D conditions specified in Section 3.0 of the WCAP. Compare the wall thickness and inner radius of the IP2 reactor vessel at its beltline to the values used in the Westinghouse 4-loop plant analysis. Compare the Level A, B, C, and D conditions specified in Section 3.0 of the WCAP to the Level A, B, C and D conditions for IP2. Explain why the Westinghouse 4-loop plant analysis in WCAP-13587, Revision 1 is applicable to IP2.

A similar comparison is provided below for IP3.

> Compare the wall thickness and inner radius of the IP3 reactor vessel at its beltline to the values used in the Westinghouse 4-loop plant analysis
>
> The IP3 reactor vessel is 86.5" inner radius with an 8.625" nominal wall thickness. Therefore the 86.5" inner radius and the 8.5" minimal wall thickness dimensions used in WCAP-13587 bound the IP3 reactor vessel dimensions since these values result in conservative pressure stresses and have no significant impact on the through wall thermal stresses.
>
> Compare the Level A, B, C, and D conditions specified in Section 3.0 of the WCAP to the Level A, B, C and D conditions for IP3
>
> The Level A and B condition used in WCAP-13587 was a cool down rate of 100 degrees F per hour. This cool down rate is the same as the cool down rate for IP3.
>
> The Level C conditions used in WCAP-13587 correspond to a small steam line break with the pressure and temperature time histories provided in Figure 3-1. These conditions were reviewed against the analyses provided in Chapter 14 of the IP3 FSAR. The IP3 FSAR conditions were bounded by the conditions analyzed in the WCAP.
>
> The Level D conditions used in the WCAP analysis were associated with the large steam line break and are provided in figure 3-2. These conditions were compared to the conditions provided in Chapter 14 of the IP3 FSAR. The conditions provided in the FSAR are bounded by the conditions used in the WCAP analysis.

Based on the above, the evaluations provided in WCAP-13587 are applicable to the IP3 reactor vessel.

Since the equivalent margin analysis performed in WCAP-13587 was based on draft Reg Guide DG-1023 and ASME Code Case N-512, IPEC compared the methodology used in WCAP-13587 to Reg Guide 1.161, Evaluation of Reactor Pressure Vessels with Charpy Upper Shelf Energy Less Than 50 ft-lbs and ASME Code Section XI, Appendix K.
IPEC concluded that WCAP-13587 did not deviate from the methods and formulas cited in the regulatory guide and ASME Code.

The IP2 chemistry factor used to determine the axial weld RTpts values shown in LRA Table 4.2-3 (updated per letter NL-08-014, dated January 17, 2008) was derived using surveillance data from IP2, IP3, and HB Robinson Unit 2. The surveillance welds operate at different temperatures and contain different amounts of copper and nickel. The methods used to determine an accurate chemistry factor from the surveillance data are shown in the attached excerpt from a site-approved calculation for updated IP2 pressure-temperature curves.

WCAP-16752, IP2 Heatup and Cooldown Limit curves for Normal Operation

Excerpt from WCAP-16752, IP2 Heatup and Cooldown Limit Curves for Normal Operation

Fracture toughness properties

The fracture-toughness properties of the ferritic materials in the reactor coolant pressure boundary are determined in accordance with the NRC Standard Review Plan [Reference 4]. The beltline material properties of the Indian Point Unit 2 reactor vessel are presented in Table 2-1.

Best estimate copper (Cu) and nickel (Ni) weight percent values used to calculate chemistry factors (CF) in accordance with Regulatory Guide 1.99, Revision 2, are provided in Table 2-1. Additionally, surveillance capsule data is available for four capsules (Capsules V, Z, Y and T) already removed from the Indian Point Unit 2 reactor vessel. The fluence data for the surveillance capsules is presented in Table 2-2 and is used to calculate CF values per Position 2.1 of Regulatory Guide 1.99, Revision 2. It should be noted that in addition to Indian Point Unit 2, surveillance weld data from Indian Point Unit 3 and H.B. Robinson Unit 2 was used in the determination of CF. In addition, all the surveillance data has been determined to be credible, with exception of surveillance plate B-2002-2.

The chemistry factors were calculated using Regulatory Guide 1.99 Revision 2, Positions 1.1 and 2.1. Position 1.1 uses the Tables from the Reg. Guide along with the best estimate copper and nickel weight percents. Position 2.1 uses the surveillance capsule data from all capsules withdrawn to date, including those capsules from Indian Point Unit 3 and H.B. Robinson Unit 2. The measured ΔRT_{NDT} values for the weld data were adjusted for the temperature difference between differing plants and for chemistry using the ratio procedure given in Position 2.1 of Regulatory Guide 1.99, Revision 2. Table 2-3 contains the T_{cold} operating temperatures at Indian Point Units 2 and 3 and H.B. Robinson Unit 2. Table 2-4 details the calculation of the surveillance material chemistry factors. A summary of the resulting CF values for all of the vessel and surveillance materials is presented in Table 2-5.

TABLE 2-1
Summary of the Best Estimate Cu and Ni Weight Percent and Initial RT_{NDT} Values for the Indian Point Unit 2 Reactor Vessel Materials

Material Description	Cu (%)	Ni (%)	Initial RT_{NDT}[(a)]
Closure Head Flange	---	---	60°F
Vessel Flange	---	---	60°F
Intermediate Shell Plate B-2002-1[(e)]	0.19 (0.21)	0.65 (0.62)	34°F
Intermediate Shell Plate B-2002-2[(e)]	0.17 (0.15)	0.46 (0.44)	21°F
Intermediate Shell Plate B-2002-3[(e)]	0.25 (0.20)	0.60 (0.59)	21°F
Lower Shell Plate B-2003-1	0.20	0.66	20°F
Lower Shell Plate B-2003-2	0.19	0.48	-20°F
Intermediate & Lower Shell Longitudinal Weld Seams (Heat # W5214)[(b, d)]	0.21	1.01	-56°F
Intermediate to Lower Shell Girth Weld (Heat # 34B009) [(c, d)]	0.19	1.01	-56°F
Indian Point Unit 2 Surveillance Weld (Heat # W5214)[(b, d)]	0.20	0.94	---
Indian Point Unit 3 Surveillance Weld (Heat # W5214)[(b, d)]	0.16	1.12	---
H.B. Robinson Unit 2 Surveillance Weld (Heat # W5214)[(b, d)]	0.32	0.66	---

Notes:

(a) The Initial RT_{NDT} values are measured values, with exception to the weld materials.

(b) The weld material in the Indian Point Unit 2 surveillance program was made of the same wire and flux as the reactor vessel intermediate shell longitudinal weld seams (Wire Heat No. W5214 RACO3 + Ni200, Flux Type Linde 1092, Flux Lot No. 3600). The lower shell longitudinal weld seam also had the same heat and flux type but different flux lot. Indian Pt. Unit 3 and H.B. Robinson Unit 2 also contain surveillance material of this heat.

(c) The intermediate to lower shell circ. weld material was made of Wire Heat No. 34B009 RACO3 + Ni200, Flux Type Linde 1092, Flux Lot No. 3708.

(d) The weld best estimate copper and nickel weight percents were obtained from CE Reports NPSD-1039, Rev. 2 and/or NPSD-1119, Rev. 1. The values from the CE Report NPSD-1119, Rev. 1 for the Indian Point 2 vessel axial and circ. welds match those in the NRC database RVID2. The values were rounded to two decimal points.

(e) Copper and Nickel Values were obtained from WCAP-12796, which in turn used Southwest Research Report 17-2108 (Capsule V Analysis). This report calculated a best estimate Copper/Nickel weight percent excluding values that appeared to be outliers. If all data were considered, then the best estimate would match the RVID2 values shown in parentheses. The data above for the intermediate shell plates are conservative with exception to plate data (See Tables 2-4 & 2-5) is used to provide a Position 2.1 chemistry factor of 114°F. Intermediate shell plate B-2002-3 is more limiting than B-2002-1 even if the highest CF were used for B-2002-1. Values from WCAP-12796 will be used herein.

TABLE 2-2

Calculated Integrated Neutron Exposure of the Surveillance Capsules @ Indian Point Unit 2, Indian Point Unit 3 and H.B. Robinson Unit 2

Capsule	Fluence
Indian Point Unit 2	
T	2.53×10^{18} n/cm², (E > 1.0 MeV)
Y	4.55×10^{18} n/cm², (E > 1.0 MeV)
Z	1.02×10^{19} n/cm², (E > 1.0 MeV)
V	4.92×10^{18} n/cm², (E > 1.0 MeV)
Indian Point Unit 3	
T	2.63×10^{18} n/cm², (E > 1.0 MeV) [(a)]
Y	6.92×10^{18} n/cm², (E > 1.0 MeV) [(a)]
Z	1.04×10^{19} n/cm², (E > 1.0 MeV) [(a)]
X	8.74×10^{18} n/cm², (E > 1.0 MeV) [(a)]
H.B. Robinson Unit 2	
S	4.79×10^{18} n/cm², (E > 1.0 MeV) [(a)]
V	5.30×10^{18} n/cm², (E > 1.0 MeV) [(a)]
T	3.87×10^{19} n/cm², (E > 1.0 MeV) [(a)]
X	4.49×10^{18} n/cm², (E > 1.0 MeV) [(a)]

(a) Fluence values have been adjusted to be consistent with the methodology of Regulatory Guide 1.190

TABLE 2-3
Inlet (T_{cold}) Operating Temperatures

Indian Point Unit 2	Indian Point Unit 3	H.B. Robinson Unit 2
543°F (Cycle 1)	540°F (Capsule T)	547°F (Capsule S)
543°F (Cycle 2)	540°F (Capsule Y)	547°F (Capsule T)
522.5°F (Cycle 3)	540°F (Capsule Z)	547°F (Capsule X)
522.5°F (Cycle 4)	540°F (Capsule X)	
522.8°F (Cycle 5)		
522.8°F (Cycle 6)		
522.8°F (Cycle 7)		
522.5°F (Cycle 8)	- - -	- - -
528°F (Average)[(a)]	**540°F (Average)**	**547°F (Average)**

(a) The temperatures listed above are consistent with historical treatment in previous Pressure-Temperature WCAP's, but are slightly conservative compared to measured operating history.

TABLE 2-4
Calculation of Chemistry Factors using Indian Point Unit 2 Surveillance Capsule Data

Material	Capsule	Capsule f[a]	FF[b]	ΔRT_{NDT}[c]	FF*ΔRT_{NDT}	FF^2
Intermediate Shell Plate B-2002-1	T	0.253	0.627	55.0	34.49	0.393
	Z	1.02	1.006	125.0	125.75	1.012
				SUM:	160.24	1.405
	$CF_{B\text{-}2002\text{-}1} = \Sigma(FF * RT_{NDT}) \div \Sigma(FF^2) = (160.24) \div (1.405) =$ **114.0°F**					
Intermediate Shell Plate B-2002-2	T	0.253	0.627	95.0	59.57	0.393
	Z	1.02	1.006	120.0	120.72	1.012
	V	0.492	0.802	77.0	61.75	0.643
				SUM:	242.04	2.048
	$CF_{B\text{-}2002\text{-}2} = \Sigma(FF * RT_{NDT}) \div \Sigma(FF^2) = (242.04) \div (2.048) =$ **118.2°F**					
Intermediate Shell Plate B-2002-3	T	0.253	0.627	115.0	72.11	0.393
	Y	0.455	0.781	145.0	113.25	0.610
	Z	1.02	1.006	180.0	181.08	1.012
				SUM:	366.44	2.015
	$CF_{B\text{-}2002\text{-}2} = \Sigma(FF * RT_{NDT}) \div \Sigma(FF^2) = (366.44) \div (2.015) =$ **181.9°F**					
Surveillance Weld Material[d]	Y (IP2)	0.455	0.781	208.7 (195)	162.9	0.610
	V (IP2)	0.492	0.802	218.3 (204)	175.1	0.643
	T (IP3)	0.263	0.637	183.2(151.6)	116.7	0.405
	Y (IP3)	0.692	0.897	206.1(172.0)	184.8	0.804
	Z (IP3)	1.04	1.011	270.1 (229.2)	273.1	1.022
	X(IP3)	.874	.962	229.8 (193.2)	221.1	0.926
	V(HBR2)	0.530	0.823	248.9(209.3)	204.7	0.677
	T(HBR2)	3.87	1.349	334.8 (288.2)	451.6	1.820
	X(HBR2)	4.49	1.381	310.6 (265.9)	428.8	1.906
				SUM:	2218.9	8.813
	$CF_{Surv.\ Weld} = \Sigma(FF * RT_{NDT}) \div \Sigma(FF^2) = (2218.9°F) \div (8.813) =$ **251.8°F**					

<u>Notes:</u>

(a) f = fluence. See Table 2-3, (x 10^{19} n/cm^2, E > 1.0 MeV).

(b) FF = fluence factor = $f^{(0.28 - 0.1*\log f)}$.

(c) ΔRT_{NDT} values are the measured 30 ft-lb shift values taken from the following documents:
- Indian Point Unit 2 Plate and Weld...WCAP-12796 (Refers back to the original Southwest Research Institute Report for each capsule.)
- Indian Point Unit 3 Weld...WCAP-11815
- H.B.Robinson Unit 2...Letter Report CPL-96-203

(d) Per Table 2 Indian Point Unit 3 operates with an inlet temperature of approximately 540°F, H.B. Robinson Unit 2 operates with an inlet temperature of approximately 547°F, and Indian Point Unit 2 operates with an inlet temperature of approximately 528°F. The measured ΔRT_{NDT} values from the Indian Point Unit 3 surveillance program were adjusted by adding 12°F to each measured ΔRT_{NDT} and the H.B. Robinson Unit 2 surveillance program values were adjusted by adding 19°F to each measured ΔRT_{NDT} value before applying the ratio procedure. The surveillance weld metal ΔRT_{NDT} values have been adjusted by a ratio factor of:

Ratio IP2 = 230.2 ÷ 214.3 = 1.07 for the Indian Point Unit 2 data.
Ratio IP3 = 230.2 ÷ 206.2 = 1.12 for the Indian Point Unit 3 data.
Ratio HBR2 = 230.2 ÷ 210.7 = 1.09 for the H.B. Robinson Unit 2 data.

Refer to Table 2-5 for the longitudinal weld seam CF of 230.2°F.
(The pre-adjusted values are in parenthesis.)

TABLE 2-5
Summary of the Indian Point Unit 2 Reactor Vessel Beltline Material Chemistry Factors

Material	Reg. Guide 1.99, Rev. 2 Position 1.1 CF's	Reg. Guide 1.99, Rev. 2 Position 2.1 CF's
Intermediate Shell Plate B-2002-1	144°F	114
Intermediate Shell Plate B-2002-2	115.1°F	118.2
Intermediate Shell Plate B-2002-3	176°F	181.9
Lower Shell Plate B-2003-1	152°F	- - -
Lower Shell Plate B-2003-2 [a]	128.8°F	- - -
Intermediate & Lower Shell Longitudinal Weld Seams (Heat # W5214)	230.2°F	251.8
Intermediate to Lower Shell Girth Weld Seam (Heat # 34B009)	220.9°F	- - -
Indian Point Unit 2 Surveillance Weld (Heat # W5214)	214.3°F	- - -
Indian Point Unit 3 Surveillance Weld (Heat # W5214)	206.2°F	- - -
H.B. Robinson Unit 2 Surveillance Weld (Heat # W5214)	210.7°F	- - -

(a) The 128.8°F CF listed here differs from previous analyses that used an excessively conservative CF of 142°F for this material. If the 142°F CF had been used in this analysis, this material would still not be limiting.