RASE-374

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July 15, 2010

Lawrence G. McDade, Chairman
Dr. Richard E. Wardwell
Dr. Kaye D. Lathrop
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Docket: ***Entergy Nuclear Operations, Inc.*** **(Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-247-LR and 50-286-LR**

RE: **Notification of Entergy's Submittal of the Reactor Vessel Internals Program for Indian Point Units 2 and 3**

Dear Administrative Judges:

Entergy Nuclear Operations, Inc. ("Entergy") is providing this notice to the Atomic Safety and Licensing Board ("Board") and the parties regarding Entergy's submittal of the Reactor Vessel Internals Program for Indian Point Units 2 and 3 to the U.S. Nuclear Regulatory Commission ("NRC") on July 14, 2010. *See* NL-10-063, Letter from Fred Dacimo, Entergy, to NRC Document Control Desk, "Amendment 9 to License Renewal Application (LRA) – Reactor Vessel Internals Program" (July 14, 2010). A copy of NL-10-063 is attached for your reference. Counsel is providing this notification insofar as the Reactor Vessel Internals Program may be relevant and material to admitted contention NYS-25.

SECY-TEMPLATE=043

DS03

Respectfully submitted,

Paul Bessette

Kathryn M. Sutton, Esq.
Paul M. Bessette, Esq.

Counsel for Entergy Nuclear Operations, Inc.

CBM/als
Attachment
cc: Service List

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-247-LR and 50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.	)	
(Indian Point Nuclear Generating Units 2 and 3)	)	
	)	July 15, 2010

CERTIFICATE OF SERVICE

I hereby certify that copies of the letter entitled "Notification of Entergy's Submittal of the Reactor Vessel Internals Program for Indian Point Units 2 and 3," dated July 15, 2010, were served this 15th day of July, 2010 upon the persons listed below, by first class mail and e-mail as shown below.

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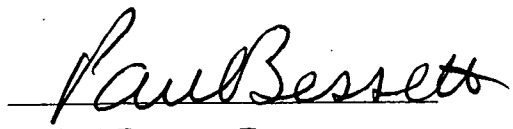
* Original and 2 copies provided to the Office of the Secretary.



Paul M. Bessette, Esq.
Counsel for Entergy Nuclear Operations, Inc.

DB1/65220145.1

Entergy

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Tel (914) 788-2055

Fred Dacimo
Vice President
License Renewal

NL-10-063

July 14, 2010

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

SUBJECT: Amendment 9 to License Renewal Application (LRA) - Reactor Vessel Internals Program
Indian Point Nuclear Generating Unit Nos. 2 & 3
Docket Nos. 50-247 and 50-286
License Nos. DPR-26 and DPR-64

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 9 to the License Renewal Application (LRA) regarding the Reactor Vessel Internals Program.

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 2-14-2010.

Sincerely,

FRD/dmt

Attachment: 1. Amendment 9 to License Renewal Application – Reactor Vessel Internals Program

cc: Mr. Samuel J. Collins, Regional Administrator, NRC Region I
Mr. Sherwin E. Turk, NRC Office of General Counsel, Special Counsel
Mr. John Boska, NRR Senior Project Manager
Ms. Kimberly Green, Project Manager
NRC Resident Inspector's Office
Mr. Paul Eddy, New York State Department of Public Service
Mr. Francis J. Murray, President and CEO, NYSERDA

ATTACHMENT 1 TO NL-10-063

Amendment 9 to License Renewal Application -
Reactor Vessel Internals Program

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 & 3
DOCKET NOS. 50-247 AND 50-286
LICENSE NOS. DPR-26 AND DPR-64

INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3
LICENSE RENEWAL APPLICATION (LRA)
AMMENDMENT 9

The LRA is revised as described below. (underline – added, strikethrough – deleted)

2.3.1.2 Reactor Vessel Internals

The reactor vessel internals for each unit are described in the reactor coolant system description (Unit 2, Reactor Vessel Internals; Unit 3, Reactor Vessel Internals).

For both units, the lower core support structure, the upper core support structure, and the incore instrumentation support structure are the three major parts of the reactor internals.

Lower Core Support Structure

The major member of the reactor vessel internals is the lower core support structure consisting of the following components included in this evaluation.

core baffle/former assembly: bolts
core baffle/former assembly: plates
core barrel assembly: bolts, screws
core barrel assembly: axial flexure plates (thermal shield flexures), flange, ring, shell, thermal shield, lower core barrel flange weld, upper core barrel flange weld
core barrel assembly: outlet nozzles
lower internals assembly: clevis insert bolt
lower internals assembly: clevis insert
lower internals assembly: intermediate diffuser plate
lower internals assembly: fuel alignment pin
lower internals assembly: lower core plate
lower internals assembly: lower core support plate column sleeves
lower internals assembly: lower core support column bolt
lower internals assembly, lower core support column castings: column cap, lower core support
lower internals assembly: radial key
lower internals assembly: secondary core support (energy absorbing device)
specimen guides (not subject to aging management review)
specimen plugs (installed in IP2 only; not subject to aging management review)

The lower core support structure is supported at its upper flange from a ledge in the reactor vessel. Within the core barrel are a core baffle and a lower core plate, both of which are attached to the core barrel wall. The lower core support structure provides passageways for the coolant flow. The lower core plate at the bottom of the core below the baffle plates provides support and orientation for the fuel assemblies. Fuel alignment pins (two for each assembly) are also inserted into this plate. Columns are placed between the lower core plate and core support casting in order to provide stiffness and to transmit the core load to the core support casting. Adequate coolant distribution is obtained through the use of the lower core plate and a diffuser plate.

Upper Core Support Structure

The "top hat with deep beam features" upper core support structure consists of the following components included in this evaluation.

upper internals assembly, rod control cluster assembly (RCCA) guide tube assembly: bolts
upper internals assembly, RCCA guide tube assembly: guide tube (including lower flange weld), guide plates
upper internals assembly, RCCA guide tube assembly: support pin
upper internals assembly: core plate alignment pin
upper internals assembly: head/vessel alignment pin
upper internals assembly: hold-down spring
upper internals assembly: support column
upper internals assembly, mixing devices: support column orifice base, support column mixer
upper internals assembly: upper core plate, fuel alignment pin
upper internals assembly: support assembly (including ring), upper support plate
upper internals assembly: upper support column bolt

The support columns establish the spacing between the upper support assembly and the upper core plate and are fastened at top and bottom to these plates and beams.

The RCCA guide tube assemblies shield and guide the control rod drive shafts and control rods. They are fastened to the upper support and are guided by pins in the upper core plate for proper orientation and support. Additional guidance for the control rod drive shafts is provided by the control rod shroud tube which is attached to the upper support plate and guide tube.

In-Core Instrumentation Support Structure

The in-core instrumentation support structures consist of the following components included in this evaluation.

thermocouple conduit
flux thimble guide tube
bottom mounted instrumentation column

An upper system (thermocouple conduit) is used to convey and support thermocouples penetrating the vessel through the head, and a lower system (flux thimble guide tube) is used to convey and support flux thimbles penetrating the vessel through the bottom.

The upper system utilizes the reactor vessel head penetrations. Instrumentation port columns are slip-connected to in-line columns that are in turn fastened to the upper support plate. These port columns protrude through the head penetrations. The thermocouples are carried through these port columns and the upper support plate at positions above their readout locations. The thermocouple conduits are supported from the columns of the upper core support system.

Table 2.3.1-2-IP2 and Table 2.3.1-2-IP3 list the mechanical components subject to aging management review and component intended functions for the reactor vessel internals.

Table 3.1.2-2-IP2 and Table 3.1.2-2-IP3 provide the results of the aging management review for the reactor vessel internals.

Table 2.3.1-4-IP2
Reactor Vessel Internals
Components Subject to Aging Management Review

Component Type	Intended Function
Lower Core Support Structure	
Core baffle/former assembly •bolts	Structural support
Core baffle/former assembly •plates	Structural support Flow distribution Shielding
Core barrel assembly •bolts and screws	Structural support
~~Core barrel assembly~~ ~~•axial flexure plates~~ ~~•flange~~ ~~•ring~~ ~~•shell~~ ~~•thermal shield~~	~~Structural support~~ ~~Flow distribution~~ ~~Shielding~~
Core barrel assembly • axial flexure plates (thermal shield flexures)	Structural support
Core barrel assembly • flange	Structural support
Core barrel assembly • ring • shell • thermal shield	Structural support Flow distribution Shielding
Core barrel assembly • lower core barrel flange weld • upper core barrel flange weld	Structural support

Core barrel assembly •outlet nozzles	Flow distribution
Lower internals assembly •clevis insert bolt •clevis insert •fuel alignment pin •lower core support plate column sleeves •lower core support plate column bolt •radial key	Structural support
Lower internals assembly •intermediate diffuser plate	Flow distribution
Lower internals assembly •lower core plate •lower core support castings •column cap •lower core support •secondary core support	Structural support Flow distribution
Upper Core Support Structure—Upper Internals Assembly	
~~RCCA guide tube assembly~~ ~~•bolt~~ ~~•guide tube~~ ~~•support pin~~	~~Structural support~~
RCCA guide tube assembly •bolt	Structural support
RCCA guide tube assembly •guide tube (including lower flange welds)	Structural support
RCCA guide tube assembly •guide plates	Structural support
RCCA guide tube assembly •support pin	Structural support

Core plate alignment pin	Structural support
Head / vessel alignment pin	Structural support
Hold-down spring	Structural support
Mixing devices •support column orifice base •support column mixer	Structural support Flow distribution
Support column	Structural support
Upper core plate, fuel alignment pin	Structural support Flow distribution
Upper support plate, support assembly (including ring)	Structural support
Upper support column bolt	Structural support
Incore Instrumentation Support Structure	
Bottom mounted instrumentation column	Structural support
Flux thimble guide tube	Structural support
Thermocouple conduit	Structural support

3.1.2.1.2 Reactor Vessel Internals

Materials

Reactor vessel internals components are constructed of the following materials.

- cast austenitic stainless steel
- nickel alloy
- stainless steel

Environment

Reactor vessel internals components are exposed to the following environments.

- neutron fluence
- treated borated water
- treated borated water > 140°F
- treated borated water > 482°F

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel internals require management.

- change in dimensions
- cracking
- cracking – fatigue
- loss of material
- loss of material – wear
- loss of preload
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for reactor vessel internals components.

- Inservice Inspection
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)
- Reactor Vessel Internals
- Water Chemistry Control – Primary and Secondary

3.1.2.2.6 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement and Void Swelling

Loss of fracture toughness due to neutron irradiation embrittlement and change in dimensions (void swelling) ~~could occur~~ in stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux will be managed by the Reactor Vessel Internals (RVI) Program. The RVI Program will implement the EPRI Pressurized Water Reactor Internals Inspection and Evaluation Guidelines, MRP-227. The RVI Program will use nondestructive examinations (NDE) and other inspection methods to manage aging effects for reactor vessel internals. ~~To manage loss of fracture toughness in vessel internals components, IPEC will (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval. This commitment is included in the UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~

3.1.2.2.9 Loss of Preload due to Stress Relaxation

Loss of preload due to thermal stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F) as stated in the ASME Code, Section II, Part D, Table 4. No IPEC internals components operate at > 700°F. Therefore, loss of preload due to thermal stress relaxation (creep) is not an applicable aging effect for the reactor vessel internals components. However, irradiation-enhanced creep (irradiation creep) or irradiation enhanced stress relaxation (ISR) is an athermal process that depends on the neutron fluence and stress; and, on void swelling if present. ~~Nevertheless~~ Therefore, loss of preload of stainless steel and nickel alloy reactor vessel internals components will be managed by the Reactor Vessel Internals (RVI) Program. The RVI Program will implement the EPRI Pressurized Water Reactor Internals Inspection and Evaluation Guidelines, MRP-227. The RVI Program will use nondestructive examinations (NDE) and other inspection methods to manage aging effects for reactor vessel internals. ~~to the extent that industry developed reactor vessel internals aging management programs address these aging effects. The IPEC commitment to these RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~

3.1.2.2.15 Changes in Dimensions due to Void Swelling

Changes in dimensions due to void swelling ~~could occur~~ in stainless steel and nickel alloy reactor internal components exposed to reactor coolant will be managed by the Reactor Vessel Internals (RVI) Program. The RVI Program will implement the EPRI Pressurized Water Reactor Internals Inspection and Evaluation Guidelines, MRP-227. The RVI Program will use nondestructive examinations (NDE) and other inspection methods to manage aging effects for reactor vessel internals. ~~To manage changes in dimensions of vessel internals components, IPEC will (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as~~

~~applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval. This commitment is included in the UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~

3.1.2.2.17 Cracking due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

Cracking due to stress corrosion cracking (SCC), primary water stress corrosion cracking (PWSCC), and irradiation-assisted stress corrosion cracking (IASCC) ~~could occur~~ in PWR stainless steel and nickel alloy reactor vessel internals components will be managed by the Reactor Vessel Internals (RVI) Program. The RVI Program will implement the EPRI Pressurized Water Reactor Internals Inspection and Evaluation Guidelines, MRP-227. The RVI Program will use nondestructive examinations (NDE) and other inspection methods to manage aging effects for reactor vessel internals. ~~To manage cracking in vessel internals components, IPEC maintains the Water Chemistry Control – Primary and Secondary Program and will (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval. The IPEC commitment to these RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~

Table 3.1.1
Summary of Aging Management Programs for the Reactor Coolant System
Evaluated in Chapter IV of NUREG-1801

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-22	Stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment to be confirmed	~~Consistent with NUREG-1801.~~ Loss of fracture toughness of stainless steel and nickel alloy reactor vessel internals components will be managed by the Reactor Vessel Internals Program. ~~aging management programs. The commitment to these RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~ See Section 3.1.2.2.6.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-27	Stainless steel and nickel alloy reactor vessel internals screws, bolts, tie rods, and hold-down springs	Loss of preload due to stress relaxation	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment to be confirmed	Loss ~~of preload due to stress relaxation (creep) is a concern for applications at temperatures higher than those of IPEC reactor vessel and internals components. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for the reactor vessel internals components. Nevertheless, loss~~ of preload of stainless steel and nickel alloy reactor vessel internals components will be managed by the Reactor Vessel Internals Program. ~~consistent with industry developed reactor vessel internals aging management programs. The commitment to these RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~ See Section 3.1.2.2.9.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-30	Stainless steel reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube (CRGT) assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures)	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment needs to be confirmed	~~Consistent with NUREG-1801.~~ Cracking of stainless steel reactor vessel internals components will be managed by the Water Chemistry Control – Primary and Secondary Program and either the Reactor Vessel Internals Program or the Inservice Inspection Program. ~~by other RVI aging management programs. The commitment to these other RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~ See Section 3.1.2.2.12.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-33	Stainless steel and nickel alloy reactor vessel internals components	Changes in dimensions due to void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment to be confirmed	~~Consistent with NUREG-1801.~~ Changes in dimensions of stainless steel and nickel alloy reactor vessel internals components will be managed by the Reactor Vessel Internals Program. ~~RVI aging management programs. The commitment to these RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~ See Section 3.1.2.2.15.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-37	Stainless steel and nickel alloy reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Lower internal assembly, CEA shroud assemblies, Core shroud assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but licensee commitment needs to be confirmed	~~Consistent with NUREG-1801.~~ Cracking of stainless steel and nickel alloy reactor vessel internals components will be managed by the Water Chemistry Control – Primary and Secondary Program and either the Reactor Vessel Internals Program or the Inservice Inspection Program. ~~by other RVI aging management programs. The commitment to these other RVI programs is included in UFSAR Supplement, Appendix A, Sections A.2.1.41 and A.3.1.41.~~ See Section 3.1.2.2.17.

Table 3.1.1: Reactor Coolant System, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-63	Steel reactor vessel flange, stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly)	Loss of material due to wear	Inservice Inspection (IWB, IWC, and IWD)	No	The Inservice Inspection Program and the Reactor Vessel Internals Program manages loss of material due to wear of the steel reactor vessel flange and stainless steel and nickel alloy reactor vessel internals components.

~~NOTES FOR TABLES 3.1.2-1-IP2 THROUGH 3.1.2-4-IP3~~

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

101. This component, material, environment and aging effect combination is considered in the Reactor Vessel Internals Program. As documented in MRP-227, the basis for the RVI Program, this combination warrants no additional aging management. ~~NUREG-1801, Section XI.M16 states: "No further aging management review is necessary if the applicant provides a commitment in the FSAR supplement to (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval." IPEC commitment can be found in Appendix A (UFSAR supplement) of the license renewal application.~~

102. This item is considered a match to NUREG-1801 even though the environments are different because the aging effect of cracking due to fatigue is independent of the environment.

103. These components are subject to cracking due to fatigue as identified in the generic entry in the first line of this table.

104. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

105. The original inconel guide tube support pins (split pins) were replaced in both units with X-750 pins. The IP3 X-750 split pins, in service since 1987, were replaced in 2009 with stainless steel pins. The IP2 X-750 pins, installed in 1995, remain in service. Future pin replacements will be based on the pin design, industry experience, manufacturer recommendations and plant specific considerations.

Table 3.1.2-2-IP2
Reactor Vessel Internals
Summary of Aging Management Review

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Reactor vessel internals components	Structural support	Stainless steel, CASS, nickel alloy	Treated borated water	Cracking – fatigue	TLAA – metal fatigue	IV.B2-31 (R-53)	3.1.1-5	A
Lower Core Support Structure								
Core baffle/former assembly • bolts	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-4 (R-126)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-10 (R-125)	3.1.1-30	E ~~A~~, ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-5 (R-129)	3.1.1-27	E ~~A~~, 101
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-6 (R-128)	3.1.1-22	E ~~A~~, 101
Core baffle/former assembly • plates	Structural support Flow distribution Shielding	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-1 (R-124)	3.1.1-33	E ~~A, 101~~
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-2 (R-123)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-3 (R-127)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • bolts and screws	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-4 (R-126)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-10 (R-125)	3.1.1-30	E ~~A,~~ ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-5 (R-129)	3.1.1-27	E ~~A~~, 101
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-6 (R-128)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • axial flexure plates (thermal shield flexures)	Structural support ~~Flow distribution Shielding~~	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Reactor Vessel Internals	IV.B2-26 (R-142)	3.1.1-63	E
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-9 (R-122)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • flange	Structural support ~~Flow distribution Shielding~~	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-34 (R-115)	3.1.1-63	E
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-9 (R-122)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • ring • shell • thermal shield	Structural support Flow distribution Shielding	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-9 (R-122)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • lower core barrel flange weld • upper core barrel flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals	IV.B2-7 (R-121)	3.1.1-33	E, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals	IV.B2-8 (R-120)	3.1.1-30	E
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals	IV.B2-9 (R-122)	3.1.1-22	E, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • outlet nozzles	Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • clevis insert bolt	Structural support	Nickel alloy	Treated borated water	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-15 (R-134)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-16 (R-133)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-14 (R-137)	3.1.1-27	E ~~A~~, 101
			Treated borated water Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-17 (R-135)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • clevis insert	Structural support	Nickel alloy	Treated borated water	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-26 (R-142)	3.1.1-63	E

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • intermediate diffuser plate	Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • fuel alignment pin	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-15 (R-134)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-16 (R-133)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-17 (R-135)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary ~~RVI commitment~~ Inservice Inspection	IV.B2-20 (R-130)	3.1.1-37	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-26 (R-142)	3.1.1-63	E
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-18 (R-132)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • lower core support castings - column cap - lower core support column bodies	Structural support Flow distribution	CASS	Treated borated water > 482°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-23 (R-139)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-24 (R-138)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B2-21 (R-140)	3.1.1-80	A

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • lower core support plate column bolt	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-15 (R-134)	3.1.1-33	E A, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-16 (R-133)	3.1.1-37	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-25 (R-136)	3.1.1-27	E A, 101
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-17 (R-135)	3.1.1-22	E A, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • lower core support plate column sleeves	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-23 (R-139)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-24 (R-138)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-22 (R-141)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • radial key	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-26 (R-142)	3.1.1-63	E

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • secondary core support	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Upper Core Support Structure - Upper Internals Assembly								
RCCA guide tube assembly • bolt	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-27 (R-119)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-28 (R-118)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-38 (R-114)	3.1.1-27	E ~~C~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
RCCA guide tube assembly • guide tube (including lower flange welds)	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-29 (R-117)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-30 (R-116)	3.1.1-30	E ~~A~~, ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
RCCA guide tube assembly • guide plates	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals	IV.B2-29 (R-117)	3.1.1-33	E
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals	IV.B2-30 (R-116)	3.1.1-30	E
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Reactor Vessel Internals	IV.B2-34 (R-115)	3.1.1-63	E

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
RCCA guide tube assembly • support pin	Structural support	~~Nickel alloy~~, Stainless steel	Treated borated water	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-27 (R-119)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-28 (R-118)	3.1.1-37	E, 105 ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core plate alignment pin	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-39 (R-113)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-40 (R-112)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-34 (R115)	3.1.1-63	E

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Head / vessel alignment pin	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-41 (R-107)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-42 (R-106)	3.1.1-30	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-34 (R115)	3.1.1-63	E

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hold-down spring	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-41 (R-107)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-42 (R-106)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-38 (R-114)	3.1.1-27	E ~~A~~, ~~101~~

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Mixing devices • support column orifice base • support column mixer	Structural support Flow distribution	CASS	Treated borated water > 482°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-35 (R-110)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-36 (R-109)	3.1.1-30	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B2-37 (R-111)	3.1.1-80	A

Table 3.1.2-2-IP2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Support column	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-35 (R-110)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-36 (R-109)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
Upper core plate, fuel alignment pin	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-39 (R-117)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-40 (R-112)	3.1.1-37	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
Upper support plate, support assembly (including ring)	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-41 (R-107)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Inservice Inspection ~~RVI commitment~~	IV.B2-42 (R-106)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Upper support column bolt	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-39 (R-113	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-40 (R-112)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-38 (R-114)	3.1.1-27	E ~~A~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Incore Instrumentation Support Structure								
Bottom mounted instrumentation column	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-11 (R-144)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-12 (R-143)	3.1.1-30	E ~~A,~~ ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flux thimble guide tube	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-11 (R-144)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-12 (R-143)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
Thermocouple conduit	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-11 (R-144)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-12 (R-143)	3.1.1-30	E ~~C~~, 101

Table 3.1.2-2-IP2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3
Reactor Vessel Internals
Summary of Aging Management Review

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Reactor vessel internals components	Structural support	Stainless steel, CASS, nickel alloy	Treated borated water	Cracking – fatigue	TLAA – metal fatigue	IV.B2-31 (R-53)	3.1.1-5	A
Lower Core Support Structure								
Core baffle/former assembly • bolts	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-4 (R-126)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-10 (R-125)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-5 (R-129)	3.1.1-27	E ~~A~~, 101
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-6 (R-128)	3.1.1-22	E ~~A~~, 101
Core baffle/former assembly • plates	Structural support Flow distribution Shielding	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-1 (R-124)	3.1.1-33	E ~~A, 101~~
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-2 (R-123)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-3 (R-127)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core barrel assembly • bolts and screws	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-4 (R-126)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-10 (R-125)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-5 (R-129)	3.1.1-27	E ~~A~~, 101
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-6 (R-128)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core barrel assembly • axial flexure plates (thermal shield flexures)	Structural support ~~Flow distribution Shielding~~	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Reactor Vessel Internals	IV.B2-26 (R-142)	3.1.1-63	E
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-9 (R-122)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core barrel assembly • flange	Structural support ~~Flow distribution Shielding~~	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-34 (R-115)	3.1.1-63	E
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-9 (R-122)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core barrel assembly • ring • shell • thermal shield	Structural support Flow distribution Shielding	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-9 (R-122)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Core barrel assembly • lower core barrel flange weld • upper core barrel flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals	IV.B2-7 (R-121)	3.1.1-33	E, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals	IV.B2-8 (R-120)	3.1.1-30	E
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals	IV.B2-9 (R-122)	3.1.1-22	E, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core barrel assembly • outlet nozzles	Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-7 (R-121)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-8 (R-120)	3.1.1-30	E ~~A~~, ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • clevis insert bolt	Structural support	Nickel alloy	Treated borated water	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-15 (R-134)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-16 (R-133)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-14 (R-137)	3.1.1-27	E ~~A~~, 101
			Treated borated water Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-17 (R-135)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • clevis insert	Structural support	Nickel alloy	Treated borated water	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-26 (R-142)	3.1.1-63	E

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • intermediate diffuser plate	Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • fuel alignment pin	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-15 (R-134)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-16 (R-133)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-17 (R-135)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary ~~RVI commitment~~ Inservice Inspection	IV.B2-20 (R-130)	3.1.1-37	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-26 (R-142)	3.1.1-63	E
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-18 (R-132)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • lower core support castings - column cap - lower core support column bodies	Structural support Flow distribution	CASS	Treated borated water > 482°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-23 (R-139)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-24 (R-138)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B2-21 (R-140)	3.1.1-80	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • lower core support plate column bolt	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-15 (R-134)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-16 (R-133)	3.1.1-37	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-25 (R-136)	3.1.1-27	E ~~A~~, 101
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-17 (R-135)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • lower core support plate column sleeves	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-23 (R-139)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-24 (R-138)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-22 (R-141)	3.1.1-22	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Lower internals assembly • radial key	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-26 (R-142)	3.1.1-63	E

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Lower internals assembly • secondary core support	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-19 (R-131)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-20 (R-130)	3.1.1-37	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Upper Core Support Structure - Upper Internals Assembly								
RCCA guide tube assembly • bolt	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-27 (R-119)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-28 (R-118)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-38 (R-114)	3.1.1-27	E ~~C~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
RCCA guide tube assembly • guide tube (including lower flange welds)	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-29 (R-117)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-30 (R-116)	3.1.1-30	E ~~A~~, ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
RCCA guide tube assembly • guide plates	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals	IV.B2-29 (R-117)	3.1.1-33	E
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals	IV.B2-30 (R-116)	3.1.1-30	E
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Reactor Vessel Internals	IV.B2-34 (R-115)	3.1.1-63	E

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
RCCA guide tube assembly • support pin	Structural support	~~Nickel alloy~~, Stainless steel	Treated borated water	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-27 (R-119)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-28 (R-118)	3.1.1-37	E, 105 ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Core plate alignment pin	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-39 (R-113)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-40 (R-112)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-34 (R115)	3.1.1-63	E

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Head / vessel alignment pin	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-41 (R-107)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-42 (R-106)	3.1.1-30	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of material – wear	Inservice Inspection	IV.B2-34 (R115)	3.1.1-63	E

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hold-down spring	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-41 (R-107)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-42 (R-106)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-38 (R-114)	3.1.1-27	E ~~A, 101~~

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Mixing devices • support column orifice base • support column mixer	Structural support Flow distribution	CASS	Treated borated water > 482°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-35 (R-110)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-36 (R-109)	3.1.1-30	E ~~C~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
			Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	IV.B2-37 (R-111)	3.1.1-80	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Support column	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-35 (R-110)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-36 (R-109)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
Upper core plate, fuel alignment pin	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-39 (R-117)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-40 (R-112)	3.1.1-37	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
Upper support plate, support assembly (including ring)	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-41 (R-107)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Inservice Inspection ~~RVI commitment~~	IV.B2-42 (R-106)	3.1.1-30	E ~~A, 101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Upper support column bolt	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-39 (R-113	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-40 (R-112)	3.1.1-37	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
				Loss of preload	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-38 (R-114)	3.1.1-27	E ~~A~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Incore Instrumentation Support Structure								
Bottom mounted instrumentation column	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-11 (R-144)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-12 (R-143)	3.1.1-30	E ~~A~~, ~~101~~
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

Table 3.1.2-2-IP3: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flux thimble guide tube	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-11 (R-144)	3.1.1-33	E ~~A~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-12 (R-143)	3.1.1-30	E ~~A~~, 101
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A
Thermocouple conduit	Structural support	Stainless steel	Treated borated water > 140°F	Change in dimensions	Reactor Vessel Internals ~~RVI commitment~~	IV.B2-11 (R-144)	3.1.1-33	E ~~C~~, 101
				Cracking	Water Chemistry Control – Primary and Secondary Reactor Vessel Internals ~~RVI commitment~~	IV.B2-12 (R-143)	3.1.1-30	E ~~C~~, 101

Table 3.1.2-2-IP3: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2-32 (RP-24)	3.1.1-83	A

A.2.1.41 Reactor Vessel Internals Aging Management Activities

The Reactor Vessel Internals (RVI) Program is a new plant specific program to manage aging effects of reactor vessel internals using the guidance from the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP). The MRP inspection and evaluation (I&E) guidelines for managing the effects of aging on pressurized water reactor vessel internals are presented in MRP-227, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines." The MRP also developed inspection requirements specific to the inspection methods delineated in MRP-227, as well as requirements for qualification of the nondestructive examination (NDE) systems used to perform those inspections. These inspection requirements are presented in MRP-228, "Materials Reliability Program: Inspection Standard for PWR Internals."

MRP-227 and MRP-228 provide the basis of the IPEC Reactor Vessel Internals (RVI) Program. Revisions to MRP-227 and MRP-228, including any changes resulting from the NRC review of the documents (issued as MRP-227-A and MRP-228-A) will be incorporated into the IPEC RVI Program. The RVI Program will monitor the effects of aging degradation mechanisms on the intended function of the internals through periodic and conditional examinations. The RVI Program will detect and evaluate cracking, loss of material, reduction of fracture toughness, loss of preload and dimensional changes of vessel internals components in accordance with MRP-227 inspection requirements and evaluation acceptance criteria.

The IPEC RVI Program will be implemented and maintained in accordance with the guidance in NEI 03-08 [Addenda], Addendum A, "RCS Materials Degradation Management Program Guidelines." Any deviations from mandatory, needed, or good practice implementation requirements established in MRP-227 or MRP-228, will be dispositioned in accordance with the NEI 03-08 implementation protocol. The RVI Program will be implemented prior to the period of extended operation. ~~To manage loss of fracture toughness, cracking, change in dimensions (void swelling), and loss of preload in vessel internals components, the site will (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval~~.

A.3.1.41 Reactor Vessel Internals Aging Management Activities

The Reactor Vessel Internals (RVI) Program is a new plant specific program to manage aging effects of reactor vessel internals using the guidance from the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP). The MRP inspection and evaluation (I&E) guidelines for managing the effects of aging on pressurized water reactor vessel internals are presented in MRP-227, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines." The MRP also developed inspection requirements specific to the inspection methods delineated in MRP-227, as well as requirements for qualification of the nondestructive examination (NDE) systems used to perform those inspections. These inspection requirements are presented in MRP-228, "Materials Reliability Program: Inspection Standard for PWR Internals."

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Section B.1.42 of the LRA is completely new.

B.1.42 Reactor Vessel Internals Program

Program Description

The Reactor Vessel Internals Program is a new plant-specific program. Revision 1 of NUREG-1801 includes no aging management program description for PWR reactor vessel internals. NUREG-1801, Section XI.M16, PWR Vessel Internals, instead defers to the guidance provided in Chapter IV line items as appropriate. The Chapter IV line item guidance recommends actions to:

> ". . .(1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval."

The industry programs for investigating and managing aging effects on reactor internals are part of the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP). The MRP developed inspection and evaluation (I&E) guidelines for managing the effects of aging on pressurized water reactor vessel internals. These guidelines are presented in MRP-227, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines." The I&E guidelines include:

- summary descriptions of PWR internals and functions;
- summary of the categorization and aging management strategy development of potentially susceptible locations, based on the safety and economic consequences of aging degradation;
- direction for methods, extent, and frequency of one-time, periodic, and conditional examinations and other aging management methodologies;
- acceptance criteria for the one-time, periodic, and conditional examinations and other aging management methodologies; and
- methods for evaluation of aging effects that exceed the examination acceptance criteria.

The MRP also developed inspection procedure requirements specific to the inspection methods delineated in MRP-227, as well as requirements for qualification of the nondestructive examination (NDE) systems used to perform those inspections. These inspection procedure requirements are presented in MRP-228, "Materials Reliability Program: Inspection Standard for PWR Internals."

MRP-227 and MRP-228 provide the basis of the IPEC Reactor Vessel Internals (RVI) Program. Revisions to MRP-227 and MRP-228, including any changes resulting from the NRC review of the documents (issued as MRP-227-A and MRP-228-A), will be incorporated into the IPEC RVI Program.

The RVI Program will monitor the effects of aging on the intended function of the internals through periodic and conditional examinations. The RVI Program will detect and evaluate cracking, loss of material, reduction of fracture toughness, loss of preload and dimensional changes of vessel internals components in accordance with MRP-227 inspection recommendations and evaluation acceptance criteria.

IPEC will implement and maintain the RVI Program in accordance with the guidance in NEI 03-08 [Addenda], Addendum A, "RCS Materials Degradation Management Program Guidelines." Any deviations from mandatory, needed, or good practice implementation activities established in MRP-227 or MRP-228, will be managed in accordance with the NEI 03-08 implementation protocol.

Evaluation

1. Scope of Program

MRP-227 guidelines are applicable to reactor internal structural components. The scope does not include consumable items such as fuel assemblies and reactivity control assemblies which are periodically replaced based on neutron flux exposure. The scope does not include welded attachments to the reactor vessel which are considered part of the vessel, or nuclear instrumentation (flux thimble tubes) which forms part of the reactor coolant pressure boundary. Other programs manage the effects of aging on these components.

MRP-227 separates PWR internals components into four groups depending on (1) their susceptibility to and tolerance of aging effects, and (2) the existence of programs that manage the effects of aging. These groupings include:

- Primary – those internals components that are highly susceptible to the effects of at least one aging mechanism (identified in Table 4-3 of MRP-227);
- Expansion – those internals components that are highly or moderately susceptible to the effects of at least one aging mechanism, but for which functionality assessment has shown a degree of tolerance to those effects (identified in Table 4-6 of MRP-227);
- Existing Programs – those internals components that are susceptible to the effects of at least one aging mechanism and for which generic and plant-specific existing AMP elements are capable of managing those effects (identified in Table 4-9 of MRP-227); and
- No Additional Measures – those internals components for which the effects of aging mechanisms are below the MRP-227 screening criteria (internals components not included in Tables 4-3, 4-6 or 4-9 of MRP-227).

The categorization of internals components for Westinghouse PWRs, as presented in MRP-227, applies to IPEC Unit 2 and Unit 3 vessel internals. The component inspections identified in MRP-227, Tables 4-3 and 4-6 for primary and expansion group components, define the scope of the IPEC RVI Program inspections. Those components subject to aging management by existing programs, as delineated in MRP-227, Table 4-9, are included in

the scope of those programs, and are not part of the RVI Program inspections. Components that are not included in Tables 4-3, 4-6 or 4-9 are considered to be within the scope of the program, but require no specific inspections.

2. Preventive Actions

The Reactor Vessel Internals Program is a condition monitoring program that does not include preventive actions. However, primary water chemistry is maintained in accordance with EPRI guidelines by the Water Chemistry Control - Primary and Secondary Program, which minimizes the potential for stress corrosion cracking (SCC) and irradiation assisted stress corrosion cracking (IASCC).

Plant operations also influence aging of the vessel internals. The general assumptions about plant operations used in the development of the MRP-227 guidelines are applicable to the IPEC units. The units are base loaded and implemented low leakage core loading patterns within the first 30 years of operation. IPEC has implemented no design changes to reactor vessel internals beyond those identified in general industry guidance or recommended by Westinghouse.

3. Parameters Monitored or Inspected

The RVI Program will monitor the effects of aging on the intended function of the internals through periodic and conditional examinations and other aging management methods, as required. As described in MRP-227, the program contains elements that will monitor and inspect for the parameters that indicate the progress of each of these effects. The program will use NDE techniques to detect loss of material through wear, identify distortion of components, and locate cracks.

Visual examinations (VT-3) will be used to detect wear. Visual examinations (VT-3) will also detect distortion or cracking through indications such as gaps or displacement along component joints and broken or damaged bolt locking systems. Direct measurements of spring height will be used to detect distortion of the internals hold down spring. Visual examinations (EVT-1) will be used to detect crack-like surface flaws of components and welds. Volumetric (ultrasonic) examinations will be used to locate cracking of bolting. (MRP-227, Tables 4-3 and 4-6)

4. Detection of Aging Effects

The RVI Program will detect cracking, loss of material reduction of fracture toughness, loss of preload and dimensional changes (distortion) of vessel internals components in accordance with MRP-227. The NDE systems (i.e., the combinations of equipment, procedure, and personnel) used to detect these aging effects will be qualified in accordance with MRP-228. The RVI Program will conduct inspections of primary group components as follows (MRP-227, Table 4-3):

- Periodic visual examinations (VT-3) will detect loss of material due to wear from control rod guide tube guide plates and thermal shield flexure plates.
- Periodic visual examinations (VT-3) of the baffle former assembly plates and edge bolts will detect symptoms of distortion due to void swelling or cracking from IASCC. These symptoms include abnormal interactions with fuel assemblies, gaps or displacement along component joints, broken or damaged bolt locking systems, and failed or missing bolts.
- Direct measurements of spring height will detect distortion of the internals hold down spring due to a loss of stiffness. Measurements will be taken periodically, as needed to determine the life of the spring.
- Periodic visual examinations (EVT-1) will detect crack-like surface flaws of the control rod guide tube assembly lower flange welds and the upper core barrel to flange weld.
- Volumetric (UT) examinations will locate cracking of baffle former bolting. Baseline and subsequent measurements will be used to confirm the stability of the bolting pattern.

Indications from EVT-1 or UT inspections may result in additional inspections of expansion group components, as determined by expansion criteria delineated in MRP-227, Table 5-3. The relationships between primary group component inspection findings and additional inspections of expansion group components are as follows.

- Indications from the EVT-1 inspections of the control rod guide tube assembly lower flange welds may result in EVT-1 inspections of the lower support column bodies and VT-3 inspections of bottom mounted instrumentation column bodies to detect cracking.
- Indications from the EVT-1 inspection of the upper core barrel to flange weld may result in EVT-1 inspections of the remaining core barrel welds
- Indications from the UT inspections of baffle former bolting may result in UT inspections of the lower support column bolts and the barrel former bolts for cracking.

5. Monitoring and Trending

The RVI Program uses the inspection guidelines for PWR internals in MRP-227. Inspections in accordance with these guidelines will provide timely detection of aging effects. In addition to the inspections of primary group components, expansion group components have been defined should the scope of examination and re-examination need to be expanded beyond the primary group. Records of inspection results are maintained allowing for comparison with subsequent inspection results.

IPEC will share inspection results with the industry in accordance with the good practice recommendations of MRP-227. The IPEC-specific results will be incorporated into an overall industry report that will track industry progress and will aid in evaluation of potentially significant issues, identification of fleet trends, and determination of any needed revisions to MRP-227 guidelines.

6. Acceptance Criteria

The RVI Program acceptance criteria are from Section 5 of MRP-227. Table 5-3 of MRP-227 provides the acceptance criteria for inspections of the primary and expansion group components. The criteria for expanding the examinations from the primary group components to include the expansion group components are also delineated in MRP-227, Table 5-3. The examination acceptance criteria include: (i) specific, descriptive relevant conditions for the visual (VT-3) examinations; (ii) requirements for recording and dispositioning surface breaking indications that are detected and sized for length by the visual (EVT-1) examinations; and (iii) requirements for system-level assessment of bolted assemblies with unacceptable volumetric (UT) examination indications that exceed specified limits.

7. Corrective Action

Conditions adverse to quality; such as failures, malfunctions, deviations, defective material and equipment, and nonconformances; are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the nonconformance is determined and that corrective action is taken to preclude recurrence. In addition, the cause of the significant condition adverse to quality and the corrective action implemented is documented and reported to appropriate levels of management. The Entergy (10 CFR Part 50, Appendix B) Quality Assurance Program, including relevant corrective action controls, applies to the RVI Program.

Any detected condition that does not satisfy the examination acceptance criteria must be processed through the corrective action program. Example methods for analytical disposition of unacceptable conditions are discussed or referenced in Section 6 of MRP-227. These methods or other demonstrated and verified alternative methods may be used. The alternative of component repair and replacement of PWR internals is subject to the applicable requirements of the ASME Code Section XI.

8. Confirmation Process

This attribute is discussed in Section B.0.3.

9. Administrative Controls

This attribute is discussed in Section B.0.3.

10. Operating Experience

Relatively few incidents of PWR internals aging degradation have been reported in operating U.S. commercial PWR plants. However, PWR internals aging degradation has been observed in European PWRs, specifically with regard to cracking of baffle-former bolting. For this reason, the U.S. PWR owners and operators created a program to inspect the baffle-former bolting to determine whether similar aging degradation might be expected to occur in U.S. plants. A benefit of this decision was the experience gained with the UT examination techniques used in the inspections.

In addition, the industry began laboratory testing projects to gather the materials data necessary to support future inspections and evaluations. Other confirmed or suspected material degradation concerns that the industry has identified for PWR components are wear in thimble tubes, potential wear in control rod guide tube guide plates, and cracking in some high-strength bolting. The industry has addressed the last concern primarily through replacement of high-strength bolting with bolt material that is less susceptible to cracking and by improved control of pre-load.

The RVI Program established in accordance with the MRP-227 guidelines is a new program. Accordingly, there is no direct programmatic history for IPEC. However, program inspections will use qualified techniques similar to those successfully used at IPEC and throughout the industry for ASME Section XI Code inspections. Internals inspections (VT-3) have been conducted at IPEC in accordance with ASME Section XI Code requirements, with no indications of component degradation. IPEC has appropriately responded to industry operating experience for reactor vessel internals. For example, guide tube support pins (split pins) have been replaced in both units on the basis of industry experience. As with other U.S. commercial PWR plants, cracking of baffle former bolts is recognized as a potential issue for the IPEC units. As a result, IPEC has monitored industry developments and recommendations regarding these components.

Development of the MRP-227 guidelines is based upon industry operating experience, research data, and vendor evaluations. Reactor vessel internals aging degradation incidents in both U.S. and foreign plants were considered in the development of the MRP-227 guidelines. As implemented, this program will account for applicable future operating experience during the period of extended operation.

Conclusion

The RVI Program will be effective at managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls in accordance with MRP-227 and MRP-228 guidelines and current IPEC programs. The RVI Program will provide reasonable assurance that the effects of aging are managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.