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RBG-47827

February 13, 2018

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
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SUBJECT: Request for Alternative in Accordance with 10 CFR 50.55a(z)(1) Use of Boiling Water Reactor Vessel and Internals Project (BWRVIP) Guidelines in Lieu of Specific ASME Code Requirements (RR- RBS-ISI-019)
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

Dear Sir or Madam:

Pursuant to 10 CFR 50.55a(z)(1), Entergy Operations, Inc (Entergy) hereby requests an alternative to specific portions of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," on the basis that the proposed alternative provides an acceptable level of quality and safety. Specifically, this proposed alternative requests the use of the Boiling Water Reactor Vessel and Internals Project (BWRVIP) guidelines in lieu of specific ASME Code Section XI Requirements.

Attachment 1 provides the Request for Alternative; Attachment 2 provides a comparison of ASME Code Section XI examination requirements to BWRVIP examination requirements; and Attachment 3 provides the reactor vessel internal inspection history for River Bend Station through the latest refueling outage.

Entergy requests approval of this request by November 30, 2018, in order to support refueling outage twenty (RF-20) scheduled for January 2019.

There are no regulatory commitments contained in this submittal. If you require additional information, please contact Mr. Tim Schenk at (225)-381-4177 or tschenk@entergy.com.

Sincerely,

TAS/alc

Attachments:
1. Request for Alternative - Use of BWRVIP Guidelines in Lieu of Specific ASME Code Section XI Requirements
2. Comparison of ASME Code Section XI Examination Requirements to BWRVIP Examination Requirements
3. RBS Reactor Vessel Internal Inspection History

cc: (with Enclosure)

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RBF1-18-0015
LAR-2018-04

ATTACHMENT 1
RBG-47827

REQUEST FOR ALTERNATIVE

USE OF BWRVIP GUIDELINES IN LIEU OF SPECIFIC ASME CODE SECTION XI REQUIREMENTS

RBS-ISI-019

River Bend Station – Unit 1
Use of Boiling Water Reactor Vessel and Internals Project (BWRVIP) Guidelines in Lieu of Specific ASME Code Requirements
Fourth Interval Inservice Inspection (ISI) Program Request No. RBS-ISI-019

Proposed Alternative Request in Accordance with 10 CFR 50.55a(z)(1) – Acceptable Level of Quality and Safety –

1. ASME Code Component(s) Affected

Code Class:	American Society of Mechanical Engineers (ASME) Code Class 1
Examination Category:	B-N-1 (Interior of Reactor Vessel), B-N-2 (Welded Core Supports Structures and Interior Attachments to Reactor Vessel)
Item Number(s):	B13.10 (Vessel Interior), B13.20 (Interior Attachments within Beltline Region), B13.30 (Interior Attachments beyond Beltline Region), and B13.40 (Core Support Structure)
Unit / Inspection Interval Applicability:	River Bend Station, Unit 1, (RBS), Fourth (4^{th}) 10-Year ISI Interval starting December 1, 2017 and ending on November 30, 2027

2. Applicable Code Requirement(s)

The Code of Record for the Fourth 10-Year ISI Interval at RBS is ASME Section XI, 2007 Edition through the 2008 Addenda, Reference 1. This Code of Record requires the examination of components, within the Reactor Pressure Vessel. These examinations are included in Table IWB-2500-1, Examinations Categories B-N-1 and B-N-2 and identified with the following Item Numbers:

- Item No. B13.10 – Examine accessible areas of the reactor vessel interior each period by the VT-3 method (B-N-1)
- Item No. B13.20 – Examine accessible interior attachment welds within the beltline region each interval by the VT-1 method (B-N-2)
- Item No. B13.30 – Examine the accessible interior attachment welds beyond the beltline region each interval by the VT-3 method (B-N-2)
- Item No. B13.40 – Examine accessible surfaces of the welded core support structure each interval by the VT-3 method (B-N-2)

These examinations are performed to assess the structural integrity of the reactor vessel interior, its welded attachments and the welded core support structure within the boiling water reactor pressure vessel.

3. Reason for Request

Entergy is requesting NRC authorization of this proposed alternative to the ASME Section XI requirements provided above on the basis that the use of the BWRVIP guidelines discussed below will provide an acceptable level of quality and safety.

The BWRVIP Inspection and Evaluation (I&E) guidelines have recommended aggressive specific inspections by BWR operators to completely identify material condition issues with BWR components. A wealth of inspection data has been gathered during these inspections across the BWR industry. The BWRVIP I&E guidelines focus on specific and susceptible components, specify appropriate inspection methods capable of identifying real anticipated degradation mechanisms, and required reexamination at conservative intervals. In contrast, the ASME Section XI requirements were prepared before the BWRVIP initiative and have not evolved with BWR inspection experience.

4. Proposed Alternative and Basis for Use

Proposed Alternative

Pursuant to 10 CFR 50.55a(z)(1), Entergy requests authorization to utilize the alternative requirements of BWRVIP Guidelines in lieu of the requirements of ASME Section XI. The proposed alternative is detailed in Attachment 1, Table 1, "Comparison of ASME Section XI Table IWB-2500-1 Examination Category B-N-1 and B-N-2 Requirements to BWRVIP Guidance Requirements," that shows a comparison between the existing ASME Section XI and BWRVIP requirements that will be used under this alternative.

Specifically, Entergy will satisfy the Examination Category B-N-1 and B-N-2 requirements at RBS as described in Attachment 1, Table 1 in accordance with BWRVIP guidelines in lieu of the associated ASME Section XI requirements, including examination method, examination volume, frequency, training, successive and additional examinations, flaw evaluations, and reporting.

Not all of the components addressed by the BWRVIP guidelines are components that require ASME Section XI examinations, but the particular guidelines that are applicable to ASME Section XI components are listed below along with the BWRVIP-94 Administrative Guide, Reference 2, that RBS will use to implement this alternative.

BWRVIP Guidelines Used for Section XI Code Components (Part of this Request)	
BWRVIP-94	"BWR Vessel and Internals Project "Program Implementation Guide", Reference 2
BWRVIP-03	"BWR Vessel and Internals Project, Reactor Pressure Vessel and Internal Examination Guidelines", Reference 3
BWRVIP-18-R2-A	"BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines", Reference 4
BWRVIP-25	"BWR Core Plate Inspection and Flaw Evaluation Guidelines, Reference 5
BWRVIP-26-A	"BWR Top Guide Inspection and Flaw Evaluation Guidelines, Reference 6
BWRVIP-27-A	"BWR Standby Liquid Control System/Core Plate dP Inspection and Flaw Evaluation Guidelines", Reference 7
BWRVIP-38	"BWR Shroud Support Inspection and Flaw Evaluation Guidelines", Reference 8
BWRVIP-41-R3	"BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines, Reference 9
BWRVIP-47-A	"BWR Lower Plenum Inspection and Flaw Evaluation Guidelines, Reference 20
BWRVIP-48-A(1)	"Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines", Reference 11
BWRVIP-76-R1-A(2)	"BWR Core Shroud Inspection and Flaw Evaluation Guidelines", Reference 12
BWRVIP-100-A(2)	"Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds", Reference 13

Notes:

(1) Currently, there are no existing BWRVIP guidelines or ASME Section XI Code requirements regarding the feedwater spargers except for BWRVIP-48-A which governs inspection of reactor vessel internal attachment welds, namely the feedwater sparger brackets. RBS will continue to use NUREG-0619, Reference 14 on the feedwater sparger piping, spacer brackets, pins, end brackets, flow holes and sparger tee welds outside of this request.

(2) If flaw evaluations are required for BWRVIP-76-R1-A examinations, the fracture toughness values of BWRVIP-100-A will be utilized.

BWRVIP Guidelines Used for Other Than Section XI Code Components[1] (Not Part of This Request Information Only)	
BWRVIP-138	"BWRVIP Updated Jet Pump Beam Inspection and Flaw Evaluation"
BWRVIP-139	"BWR Vessel Internals Project, Steam Dryer Inspection and Flaw Evaluation Guidelines"
BWRVIP-183	"BWR Vessel Internals Project, Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines"
Note: (1) Although these BWRVIP guidelines are not part of this request they are used at RBS.	

Attachment 1, Table 1 compares current ASME Section XI, Table IWB-2500-1, Examination Category B-N-1 and B-N-2 requirements with the above current BWRVIP guideline requirements, as applicable, to RBS.

In addition to the items in Attachment 1, Table 1 a detailed Table 2, "Vessel Attachment Welds – Fabricated Either from E-308/E-309 (Furnace Sensitized) Austenitic Stainless Steel or Inconel 182 Material," lists specific vessel attachment welds, fabricated with these materials, that have an increased concern for cracking, with inspection results, and that are currently examined under Examination Category B-N-2 / BWRVIP and will meet the inspection strategy found in Section 3 of BWRVIP-48-A and BWRVIP-38.

When implementing the guidance of BWRVIP-94 as requirements to use this request, RBS will meet the following paragraph:

> "When BWRVIP guidelines are approved by the Executive Committee and are initially distributed, or subsequently revised, each utility shall modify their vessel and internals program documentation to reflect the new requirements and implement the guidance within two refueling outages, unless a different schedule is identified by the BWRVIP at the time of document distribution. Implementation means not only incorporating the requirements into the utility program, but also performing the initial or baseline inspection and evaluation requirements. As a minimum, the BWRVIP guidelines listed in Section 3.2.21 of BWRVIP -94, which have been reviewed and approved by the BWRVIP Executive Committee will be implemented within two refueling outages of the approval date of the Executive Committee, unless a different schedule is identified by the BWRVIP at the time of document distribution. Changes to NRC approved BWRVIP guidelines that are less conservative than those approved by the NRC shall be implemented only after NRC approves the changes. "NRC approved" generally means publication of a "-A" document or equivalent."

Therefore, where the revised version of a BWRVIP inspection guideline continues to also meet the requirements of the version of the BWRVIP inspection guideline that forms the safety basis for the NRC authorized proposed alternative to the requirements of 10 CFR 50.55a, it may be implemented. Otherwise, the revised guidelines will only be implemented

after NRC approval of the revised BWRVIP guidelines or a plant-specific request for an alternative has been approved. Attachment 1, Table 1 represents the most current comparison at the time of this request.

Any deviations from the referenced BWRVIP guidelines for the duration of the proposed alternative will be appropriately documented and communicated to the NRC, per the BWRVIP Deviation Disposition Process.

In the event that conditions are identified that require repair or replacement and the component is within the jurisdiction of ASME Section XI (welded attachments to the RPV or Core Support Structure), the repair or replacement activities will be performed in accordance with ASME Section XI, Article IWA-4000. Subsequent examinations will be in accordance with the applicable BWRVIP guideline.

Basis for Use

BWRs now examine reactor internals in accordance with BWRVIP guidelines. These guidelines have been written to address the safety significant vessel internal components and to examine and evaluate the examination results for these components using appropriate methods and reexamination frequencies. The BWRVIP has established a reporting protocol for examination results and deviations. The NRC has agreed with the BWRVIP approach in principle and has issued Safety Evaluations for many of these guidelines (References 3 – 13).

In support of this request, RBS employs an Online NobleChem™ (OLNC) for mitigating IGSCC in BWR Internals. The most current cycle to date Electrochemical Potential (ECP) is shown here as follows:

Cycle = 20: Date: as of 7/21/17 the average ECP mV(SHE) is –473.5 with a minimum of -475 mV(SHE) and a maximum of –455 mV(SHE).

RBS does not measure molar ratio, but calculates the value using BWRVIP-202, BWRVIA, for Radiolysis and ECP Analysis, Version 3.1. Three values are developed at the beginning of the cycle; BOC (Beginning of Cycle), MOC (Middle of Cycle), and EOC (End of Cycle). The values selected are from the upper downcomer location which is considered the most conservative location by the BWRVIP and thus the values are:

BOC Molar Ratio = 5.8
MOC Molar Ratio = 6.3
EOC Molar Ratio = 5.7

Since RBS uses OLNC, catalyst loading is not applicable and the availability of HWC/HWC+NMCA during normal operation is listed below as it was recorded for the 3rd 10-Year Interval:

3rd Interval (Normal Operation)	
Cycle	Month/Day/Year to Month/Day/Year
17	98.0%
18	97.9%
19	96.9%
20	96.5% through 6/30/17

For specific activities that are required related to leakage assessment in BWRVIP-18-R2-A Section 5.1.3, BWRVIP-41-R3 Section 5.1.3, and BWRVIP-76-R2, a plant-specific integrated leakage assessment was not required for known or assumed cracks as no known flaws or cracks related to leakage in the Core Spray and LPCI welds or Jet Pump welds are identified in Attachment 3, "RBS Reactor Vessel Internal Inspection History" and no through-wall cracking was observed in the core shroud welds.

Any reduction in core cooling flow (whether as a result of leakage through cracks or for any other reason) may result in an increase in the Peak Cladding Temperature (PCT). In order to implement BWRVIP inspection guidelines, plant specific allowable leakage limits must be identified based on not exceeding the PCT limits. The tolerable leakage is a function of acceptable increase in the calculated value of PCT, which is part of the RBS LOCA analysis. The RBS LOCA Analysis assumed 0 gpm leakage from LPCI, HPCS, LPCS, the Jet Pumps, and the Core Shroud. [Ref. CEXO2008-00322] Because of this, an alternate methodology than that described in the BWRVIP guidance documents will be used to determine the maximum allowable leakage through these areas.

Allowable leakage for the High Pressure Core Spray (HPCS), Low Pressure Core Spray (LPCS), and Low Pressure Coolant Injection (LPCI) will be determined based on the difference between the Tech Spec 3.5.1 minimum ECCS flow rates and the relaxed ECCS flow rates used in the LOCA analysis [Ref. G13.18.2.7-114]. This will ensure that the ECCS flow rates will not be reduced below the relaxed ECCS flow rates used in the LOCA analysis, ensuring that the PCTs determined by the LOCA analysis will not be affected.

ECCS PUMP	**TECH SPEC 3.5.1 (gpm)**	**RELAXED LOCA (gpm)**	**MAXIMUM ALLOWABLE LEAKAGE (gpm)**
HPCS	5010	4900	110
LPCS	5010	4950	60
LPCI (per pump)	5050	4470	580

The relaxed LOCA analysis flow rates at 0 psid RPV-DW differential pressure for HPCS and LPCS and RPV-DW differential pressure at 20 psid were used for LPCI as they provide the most conservative allowable leakage values. Leakage for HPCS and LPCS should take into account known and assumed leakage through the Jet Pump Welds and the Core Shroud as these can be conservatively related to a loss of ECCS flow rate. This allowable leakage ensures that ECCS flow rates will not drop below the relaxed LOCA analysis parameters so that PCT values will not be affected.

Leakage through Jet Pump welds or through the Core Shroud may be conservatively related to a loss of ECCS flow because the coolant lost through these areas would be at a higher temperature than ECCS coolant and would have a lower capacity for cooling the core. The ECCS LOCA analysis confirmed that the limiting break is the maximum recirculation suction line break (DBA) with a LPCS-DG failure. However due to the lower leakage margin for LPCS and HPCS the limiting single failure related to allowable leakage is the LPCI-DG. The maximum allowable leakage through the Jet Pump welds and the Core Shroud should be no more than sum of the remaining leakage margin of the HPCS and LPCS systems. This will ensure that PCT temperatures determined by the RBS LOCA analysis are unaffected.

As additional justification, Attachment 2, "Comparison of ASME Section XI Code Examination Requirements to BWRVIP Examination Requirements," provides specific examples that compare the inspection requirements of ASME Section XI Code Item Numbers B13.10, B13.20, B13.30, and B13.40 in Table IWB-2500-1, to the inspection requirements in the BWRVIP documents. Specific BWRVIP documents are provided as examples. This comparison also includes a discussion of the inspection methods and where they are applied.

Therefore, based on the Safety Evaluations of many of the guidelines and the comparisons performed demonstrating the use of these guidelines above, Entergy concludes that this alternative request to the subject ASME Section XI requirements will avoid unnecessary inspections, while in some cases conserving radiological dose, because the inspections will now be focused on the most recent and actual BWR experience available. Thus, this request when authorized will provide an acceptable level of quality and safety and will not adversely impact the health and safety of the public.

5. Duration of Proposed Alternative

Upon authorization by NRC, this request for an alternative to use the BWRVIP Guidelines in lieu of ASME Section XI Code requirements will be implemented during the 4th 10-Year ISI Interval beginning on December 1, 2017 and ending on, November 30, 2027, (which will include a portion of the period of extended operation when approved by NRC from August 30, 2025 to the end of the 4th Interval).

6. Precedents

The NRC Staff has authorized similar requests for the following licensees and also for the RBS 3rd 10-Year ISI Interval.

- Cooper Nuclear Station, SER Docket No. 50-298, CAC No. ME6366, February 16, 2016 (ADAMS Accession No. ML16034A479)

- River Bend Nuclear Station, SER Docket No. 50-458, TAC No. MF1867, May 30, 2014, Supplemented with SER Correction on November 13, 2014 (ADAMS Accession No. ML14183A086)

- Grand Gulf Nuclear Station, Unit 1, SER Docket No. 50-416, TAC No. MF3678, August 1, 2014 (ADAMS Accession No. ML14184A782)

7. References

1. ASME Code Section XI, Rules for Inservcie Inspection of Nuclear Power Plant Components, Division 1, 2007 Edition through the 2008 Addenda

2. "BWR Vessel and Internals Project "Program Implementation Guide" BWRVIP-94, Revision 2, dated September 2011, Technical Report 1024452, Transmitted [BWRVIP-94NP (Non Proprietary Version)] for information only to NRC on September 22, 2011 (ADAMS Accession No. ML11271A058)

3. Letter USNRC to BWRVIP, dated June 30, 2008 (ML081500814), "Final Safety Evaluation for Electric Power Research Institute Boiling Water Reactor Vessel and Internals Project Technical Report 105696, BWRVIP-03, Revision 6: Later revisions will include and comply with this Safety Evaluation

4. Letter USNRC to BWRVIP, dated February 22, 2016 (ML16011A190), "Final Safety Evaluation for Electric Power Research Institute Topical Report "BWRVIP-18, Revision 2: Boiling Water Reactor Vessel and Internals Project, Boiling Water Reactor Vessel Core Spray Internals Inspection and Flaw Evaluation Guidelines" (TAC No. MF8809)

5. Letter USNRC to BWRVIP, dated December 19, 1999, "Safety Evaluation of BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25)," (ADAMS Accession Nos. ML993620267 and ML993620274)

6. Letter USNRC to BWRVIP, dated August 29, 2005, "NRC Approval Letter of BWRVIP-26-A, "BWR Vessel and Internals Project Boiling Water Reactor Top Guide Inspection and Flaw Evaluation Guidelines"

7. Letter USNRC to BWRVIP, dated June 10, 2004, Proprietary Version of NRC Staff Review of BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines"

8. Letter USNRC to BWRVIP, dated July 24, 2000, "Final Safety Evaluation of the "BWR Vessel and Internals Project, BWR Shroud Support Inspection and Flaw Evaluation Guidelines (BWRVIP-38)," EPRI Report TR-108823 (TAC NO. M99638)"

9. Letter USNRC to BWRVIP, dated February 4, 2001, "Final Safety Evaluation of the "BWR Vessel and Internals Project, BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines (BWRVIP-41)," (TAC NO. M99870)"

10. Letter USNRC to BWRVIP, dated September 1, 2005, "NRC Approval Letter of

BWRVIP-47-A, "BWR Vessel and Internals Project Boiling Water Reactor Lower Plenum Inspection and Flaw Evaluation Guidelines""

11. Letter USNRC to BWRVIP, dated July 25, 2005, "NRC Approval Letter of BWRVIP- 48-A, "BWR Vessel and Internals Project Vessel ID Attachment Weld Inspection and Flaw Evaluation Guideline""

12. Letter USNRC to BWRVIP, dated July 28, 2006, "Safety Evaluation of the "BWR Vessel and Internals Project, BWR Core Shroud Weld Inspection and Evaluation Guidelines (BWRVIP-76)"

13. Letter USNRC to BWRVIP, dated November 1, 2007, "NRC Approval Letter with Comment for BWRVIP-100-A, BWR Vessel and Internals Project, Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds," (ADAMS Accession No. ML073050135)

14. NUREG 0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking", dated November 1980, (ADAMS Accession No. ML031600712)

TABLE 1 – Comparison of ASME Section XI Table IWB-2500-1 Examination Category B-N-1 and B-N-2 Requirements to BWRVIP Guidance Requirements (1)

ASME Item No. Table IWB-2500-1	Component	ASME Exam Scope	ASME Exam Type	ASME Frequency	Applicable BWRVIP Document	BWRVIP Exam Scope	BWRVIP Exam Type	BWRVIP Frequency
B13.10	Reactor Vessel Interior	Areas of the RPV above and below the core made accessible during a normal refuel.	VT-3	Each Period	None	While there is not a specific BWRVIP Guideline that addresses the scope of B-N-1, the examinations performed by BWRVIP-18, 25, 26, 27, 41, 47, 138 provide a general overview of the reactor interior which may be considered representative of the B-N-1 scope..		
B13.20	Interior Attachments within Beltline - Riser Braces	Accessible Welds	VT-1	Each 10-Year Interval	BWRVIP-48-A, Table 3-2	Riser Brace Attachment	EVT-1	100% in first 12 years, 25% during each subsequent 6 years
	Lower Surveillance Specimen Holder Brackets				BWRVIP-48-A, Table 3-2	Bracket Attachment	VT-1	Each 10-Year Interval
B13.30	Interior Attachments beyond Beltline - Steam Dryer Hold-down Brackets	Accessible Welds	VT-3	Each 10-Year Interval	BWRVIP-48-A, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Guide Rod Brackets				BWRVIP-48-A, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Steam Dryer Support Brackets				BWRVIP-48-A, Table 3-2	Bracket Attachment	EVT-1	Each 10-Year Interval
	Feedwater Sparger Brackets				BWRVIP-48-A, Table 3-2	Bracket Attachment	EVT-1	Each 10-Year Interval
	Core Spray Piping Brackets				BWRVIP-48-A, Table 3-2	Bracket Attachment	EVT-1	Every 4 Refueling Cycles

ASME Item No. Table IWB-2500-1	Component	ASME Exam Scope	ASME Exam Type	ASME Frequency	Applicable BWRVIP Document	BWRVIP Exam Scope	BWRVIP Exam Type	BWRVIP Frequency
	Upper Surveillance Specimen Holder Brackets				BWRVIP-48-A, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Shroud Support (Weld H9)				BWRVIP-38, 3.1.3.2, Figures 3-2 and 3-5	Weld H-9	EVT-1 or UT	Maximum of 6 years for EVT-1, Maximum of 10 years for UT
B13.40	Integrally Welded Core Support Structure	Accessible Surfaces	VT-3	Each 10-Year Interval	BWRVIP-38, 3.1.3.2, Figures 3-2 and 3-5	Shroud support welds H8 and H9 (2) including gussets	EVT-1 or UT	Based on as-found conditions, to a maximum 6 years for one side EVT-1, 10 years for UT where accessible
	Core Shroud Horizontal Welds				BWRVIP-76-R1-A, 2.2	Welds H1-H7 as applicable	UT or EVT-1	Based on as-found conditions, to a maximum of 10 years for UT when inspected from both sides of the welds
	Core Shroud Vertical Welds				BWRVIP-76-R1-A, 2.3	Vertical Welds as applicable	EVT-1 or UT	Maximum 10 years for UT based on inspection of horizontal welds
	Core Shroud Repairs (3)				BWRVIP-76-R1-A, 3.5	Tie-Rod Repair	VT-3	In accordance with designer recommendations per BWRVIP-76 R1

ASME Item No. Table IWB-2500-1	Component	ASME Exam Scope	ASME Exam Type	ASME Frequency	Applicable BWRVIP Document	BWRVIP Exam Scope	BWRVIP Exam Type	BWRVIP Frequency

Notes:

(1) This table provides only an overview of the requirements. For more details, refer to ASME Section XI, Table IWB-2500-1 and the appropriate BWRVIP Document.
(2) In accordance with Appendix A of BWRVIP-38, a site specific evaluation will determine the minimum required weld length to be examined.
(3) No repairs have been performed on the core shroud.

TABLE 2 – Vessel Attachment Welds – Fabricated Either from E-308/E-309 (Furnace Sensitized) Austenitic Stainless Steel or Inconel 182 Material

Vessel Attachment Welds (Weld No.'s)	Weld Filler Material	Inspection Performed to date Code B-N-2 / BWRVIP-48-A and -38 (1)	Results
Guide Rod Bracket	182	B-N-2 / BWRVIP-48-A	No cracking identified.
Steam Dryer Support Bracket	182	B-N-2 / BWRVIP-48-A	No cracking identified.
Core Spry Bracket	182	B-N-2 / BWRVIP-48-A	No cracking identified.
Feedwater Sparger Bracket	182	B-N-2 / BWRVIP-48-A	No cracking identified.
Shroud Support (weld H9)	182	B-N-2 / BWRVIP-38	No cracking identified.
Shroud Support Legs (weld H12)	182	B-N-2 / BWRVIP-38	No cracking identified.

Notes:

(1) No additional augmented inspections are performed on the Alloy 182 welds outside of that defined in BWRVIP-48-A and BWRVIP-38.

ATTACHMENT 2
RBG-47827

Comparison of ASME Section XI Examination Requirements to BWRVIP Examination Requirements

The following discussion provides a comparison of the examination requirements provided in ASME Section XI Item Numbers B13.10, B13.20, B13.30, and B13.40 in Table IWB-2500-1, to the examination requirements in the BWRVIP guidelines. Specific BWRVIP guidelines are provided as examples for comparisons. This comparison also includes a discussion of the examination methods.

1. Code Requirement - B13.10 - Reactor Vessel Interior Accessible Areas (B-N-1)

   ASME Section XI requires a VT-3 examination of reactor vessel accessible areas, which are defined as the spaces above and below the core made accessible during normal refueling outages. The frequency of these examinations is specified as the first refueling outage, and at intervals of approximately 3 years, during the first inspection interval, and each period during each successive 10-Year Inspection Interval. Typically, these examinations are performed every other refueling outage of the Inspection Interval. This examination requirement is a non-specific requirement that is a departure from the traditional Section XI examinations of welds and surfaces. As such, this requirement has been interpreted and satisfied differently across the domestic fleet. The purpose of the examination is to identify relevant conditions such as distortion or displacement of parts, loose, missing, or fractured fasteners; foreign material, corrosion, erosion, or accumulation of corrosion products, wear, and structural degradation.

   Portions of the various examinations required by the applicable BWRVIP Guidelines require access to accessible areas of the reactor vessel during each refueling outage. Examination of Core Spray Piping and Spargers (BWRVIP-18-R2-A), Top Guide (BWRVIP-26-A), Jet Pump Welds and Components (BWRVIP-41-R3), Interior Attachments (BWRVIP-48-A), Core Shroud Welds (BWRVIP-76-R1-A), Shroud Support (BWRVIP-38) and Lower Plenum Components (BWRVIP-47-A) provides such access. Locating and examining specific welds and components within the reactor vessel areas above, below (if accessible), and surrounding the core (annulus area) entails access by remote camera systems that essentially performs equivalent VT-3 examination of these areas or spaces as the specific weld or component examinations are performed. This provides an equivalent method of visual examination on a more frequent basis than that required by the ASME Section XI. Evidence of wear, structural degradation, loose, missing, or displaced parts, foreign materials, and corrosion product buildup can be, and has been observed during the course of implementing these BWRVIP examination requirements.

   Therefore, the specified BWRVIP Guideline requirements meet or exceed the subject Code requirements for examination method and frequency of the interior of the reactor vessel. Accordingly, these BWRVIP examination requirements provide an acceptable level of quality and safety as compared to the subject ASME Section XI requirements.

2. Code Requirement - B13.20 - Interior Attachments Within the Beltline (B-N-2)

   The ASME Section XI requires a VT-1 examination of accessible reactor interior surface attachment welds within the beltline each 10-Year Interval. In the boiling water reactor, this includes the jet pump riser brace welds-to-vessel wall and the lower surveillance

specimen support bracket welds-to-vessel wall. In comparison, the BWRVIP requires the same examination method and frequency for the lower surveillance specimen support bracket welds, and requires an EVT-1 examination on the remaining attachment welds in the beltline region in the first 12 years, and then 25% during each subsequent 6 years.

The jet pump riser brace examination requirements are provided below to show a comparison between the ASME Section XI and the BWRVIP examination requirements.

Comparison to BWRVIP Requirements - Jet Pump Riser Braces (BWRVIP-41-R-3 and BWRVIP-48-A)

- The ASME Section XI requires a 100% VT-1 examination of the jet pump riser brace-to-reactor vessel wall pad welds each 10-Year interval.

- The BWRVIP requires an EVT-1 examination of the jet pump riser brace-to-reactor vessel wall pad welds the first 12 years and then 25% during each subsequent 6 years.

- BWRVIP-48-A specifically defines the susceptible regions of the attachment that are to be examined.

The ASME Section XI VT-1 examination is conducted to detect discontinuities and imperfections on the surfaces of components, including such conditions as cracks, wear, corrosion, or erosion. The BWRVIP Enhanced VT-1 (EVT-1) is conducted to detect discontinuities and imperfections on the surface of components and is additionally specified to detect potentially very tight cracks characteristic of fatigue and inter-granular stress corrosion cracking (IGSCC), the relevant degradation mechanisms for these components. General wear, corrosion, or erosion although generally not a concern for inherently tough, corrosion resistant stainless steel material, would also be detected during the process of performing a BWRVIP EVT-1 examination.

The ASME Section XI 2007 Edition through the 2008 Addenda, VT-1 visual examination method requires that a letter character with a height of 0.044 inches can be read. The BWRVIP EVT-1 visual examination method requires the same 0.044 inch resolution on the examination surface and additionally the performance of a cleaning assessment and cleaning as necessary. While the jet pump riser brace configuration varies depending on the vessel manufacturer, BWRVIP-48-A includes diagrams for each configuration and prescribes examination for each configuration including RBS.

The calibration standards used for BWRVIP EVT-1 exams utilize the same ASME Section XI characters, thus assuring at least equivalent resolution compared to the Code. Although the

BWRVIP examination may be less frequent, it is a more comprehensive method. Therefore, the enhanced flaw detection capability of an EVT-1, with a less frequent

examination schedule provides an acceptable level of quality and safety to that provided by the ASME Section XI requirements.

3. Code Requirement - B13.30 - Interior Attachment Beyond the Beltline Region (B-N-2)

The ASME Section XI requires a VT-3 examination of accessible reactor interior surface attachment welds beyond the beltline each 10-Year Interval. In the boiling water reactor, this includes the core spray piping primary and supplemental support bracket welds-to-vessel wall, the upper surveillance specimen support bracket welds-to-vessel wall, the feedwater sparger support bracket welds-to-reactor vessel wall, the steam dryer support and hold-down bracket welds-to-reactor vessel wall, the guide rod support bracket weld-to-reactor vessel wall, the shroud support plate-to-vessel wall, and shroud support gussets. BWRVIP-48-A requires as a minimum the same VT-3 examination method as the Code for some of the interior attachment welds beyond the beltline region, and in some cases specifies an enhanced visual examination technique EVT-1 for these welds. For those interior attachment welds that have the same VT-3 method of examination, the same scope of examination (accessible welds), the same examination frequency (each 10 year interval) and ASME Section XI flaw evaluation criteria, the level of quality and safety provided by the BWRVIP requirements are equivalent to that provided by the ASME Section XI requirements.

For the Core Spray support bracket attachment welds, the steam dryer support bracket attachment welds, the feedwater sparger support bracket attachment welds, and the shroud support plate-to-vessel welds, as applicable, the BWRVIP Guidelines require an EVT-1 examination at the same frequency as the ASME Section XI Code, or at a more frequent rate. Therefore, the BWRVIP requirements provide the same level of quality and safety to that provided by the ASME Section XI requirements.

The Core Spray piping bracket-to-vessel attachment weld is used as an example for comparison between the Code and BWRVIP examination requirements as discussed below.

Comparison to BWRVIP Requirements - Core Spray piping Bracket Welds (BWRVIP-48-A)

- The ASME Section XI examination requirement is a VT-3 examination of each weld every 10 years.

- The BWRVIP examination requirement is an EVT-1 for the core spray piping bracket attachment welds with each weld examined every four cycles (8 years for units with a two year fuel cycle). The BWRVIP examination method EVT-1 has superior flaw detection and sizing capability, the examination frequency is greater than the ASME Section XI requirements, and the same flaw evaluation criteria are used.

- The ASME Section XI VT-3 examination is conducted to detect component structural integrity by ensuring the components general condition is acceptable. An enhanced EVT-1 is conducted to detect discontinuities and imperfections on the examination surfaces, including such conditions as tight cracks caused by IGSCC or fatigue, the relevant degradation mechanisms for BWR internal attachments.

Therefore, with the EVT-1 examination method, the same examination scope (accessible welds), an increased examination frequency (8 years instead of 10 years) in some cases, the same flaw evaluation criteria (Section XI), the level of quality and safety provided by the BWRVIP criteria is superior than that provided by the ASME Section XI requirements.

4. Code Requirement - B13.40 - Integrally Welded Core Support Structures (B-N-2)

The ASME Section XI Code requires a VT-3 examination of accessible surfaces of the welded core support structure each 10-Year Interval. In the boiling water reactor, the welded core support structure has primarily been considered the shroud support structure, including the shroud support plate (annulus floor) the shroud support ring, the shroud support welds, the shroud support gussets. In later designs, the shroud itself is considered part of the welded core support structure. Historically, this requirement has been interpreted and satisfied differently across the industry. The proposed alternate examination replaces this ASME Section XI Code requirement with specific BWRVIP guidelines that examine susceptible locations for known relevant degradation mechanisms.

Comparison to BWRVIP Requirements – BWR Shroud Support (BWRVIP-38)

- The ASME Section XI Code requires a VT-3 of accessible surfaces each 10-Year Interval.

- The BWRVIP requires as a minimum the same examination method (VT-3) as the ASME Section XI Code for integrally welded Core Support Structures, and for specific areas, requires either an enhanced visual examination technique (EVT-1) or volumetric examination (UT).

BWRVIP recommended examinations of integrally welded core support structures are focused on the known susceptible areas of this structure, including the welds and associated weld heat affected zones. As a minimum, the same or superior visual examination technique is required for examination at the same frequency as the ASME Section XI examination requirements. In many locations, the BWRVIP guidelines require a volumetric examination of the susceptible welds at a frequency identical to the ASME Section XI Code requirements.

For other integrally welded core support structure components, the BWRVIP requires an EVT-1 or UT of core support structures. The core shroud is used as an example for

comparison between the ASME Section XI Code and BWRVIP examination requirements as shown below.

Comparison to BWRVIP Requirements - BWR Core Shroud Examination and Flaw Evaluation Guideline (BWRVIP-76-R1-A)

- The ASME Section XI Code requires a VT-3 examination of accessible surfaces every 10 years.

- The BWRVIP requires an EVT-1 examination from the inside and outside surface where accessible or ultrasonic examination of each core shroud circumferential weld that has not been structurally replaced with a shroud repair at a calculated "end of interval" (EOI) that will vary depending upon the amount of flaws present, but not to exceed ten years.

The BWRVIP recommended examinations specify locations that are known to be vulnerable to BWR relevant degradation mechanisms rather than "all accessible surfaces". The BWRVIP examination methods (EVT-1 or UT) are superior to the ASME Section XI Code required VT-3 examination for flaw detection and characterization. The BWRVIP examination frequency is equivalent to or more frequent than the examination frequency required by the ASME Section XI. The superior flaw detection and characterization capability, with an equivalent or more frequent examination frequency and the comparable flaw evaluation criteria, results in the BWRVIP criteria providing a level of quality and safety equivalent to or superior to that provided by the ASME Section XI requirements.

ATTACHMENT 3
RBG-47827

RBS REACTOR VESSEL INTERNAL INSPECTION HISTORY

RBS Reactor Vessel Internal Inspection History

Component	Inspection Date	Type	Inspection Results
Core Shroud	1994	VT-1 / VT-3	Partial inspection during forced outage. Welds H-3 thru H-7, Limited vertical weld inspection. No indications.
	1996 (RF06)	VT-3	ASME XI inspection of accessible areas including the grid. No indications.
	1997 (RF07)	UT	UT from OD. Welds H3, H4, H6A, H7. No indications.
	Oct 2004 (RF12)	UT	UT From OD. Welds H6A and H7. No indications.
	Jan 2008 (RF14)	UT	H3 - 76.6% inspected. No indications. H4 - 92.7% inspected. Indications - 9% weld flawed.
	Feb 2011 (RF16)	UT	H6a and H7. No indications.
	Feb 2017 (RF19)	UT	UT from OD: H1, H2, H3, H4, H5, H6A, H6B, H7, V11, V12, V13 and V14 Weld Coverage Flaws Notes H1 51.7% 0% H2 51.7% 0% H3 54.5% 0% Lower side only H4 57.4% 55.4% H5 19.3% 0% H6a 17.2% 0% H6b 27.6% 9.7% Lower side only H7 27.1% 0% V11 84.8% 0% V12 86.2% 2.8% V13 93.7% 0.9% V14 93.7% 0%
Shroud Support	1994	VT-1 / VT-3	Inspection of accessible areas during forced outage. Access Hole Cover; VT. No indications.
	1996 (RF06)	VT-3	Access Hole Cover. No indications.
	April 1999 (RF08)	VT-1	Access Hole Cover. No indications.
	March 2000 (RF09)	EVT-1	Shroud Support to Shroud. No Indications. Support Plate to Shroud. No indications.
	Oct 2001 (RF10)	VT-1	Access Hole Cover. No indications.
	Oct 2004 (RF12)	VT-1 / UT	Access Hole Cover. No indications. UT From Bio-shield wall H8 & H9. No indications.
	Jan 2008 (RF14)	VT-1	Access Hole Cover. NRI.

Component	Inspection Date	Type	Inspection Results
	Feb 2011 (RF16)	EVT-1	Access Hole Cover. No indications.
	March 2015 (RF18)	UT	UT From Bio-shield wall H8 & H9. No indications.
	Feb 2017 (RF19)	EVT-1	Access Hole Cover. NRI.
Core Spray Piping	1987 to 1997	VT-1 / VT-3	Piping and welds in annulus, every other cycle, starting 1994 every cycle. No indications.
	1997 (RF07)	EVT-1 / MVT-1	BWRVIP-018 (Baseline Inspection). No indications.
	April 1999 (RF08)	EVT-1 / MVT-1	BWR VIP-018. No Indications.
	March 2000 (RF09)	EVT-1 / MVT-1	BWR VIP-018. No Indications.
	Oct 2001 (RF10)	UT	12 welds examined. No Indications.
	March 2003 (RF11)	EVT-1	17 welds examined. No Indications.
	Oct 2004 (RF12)	UT	8 welds examined. No indications.
	April 2006 (RF13)	EVT-1	8 welds examined. No indications.
	Jan 2008 (RF14)	EVT-1	8 piping welds and 4 brackets examined. No indications.
	Oct 2009 (RF15)	EVT-1	20 welds examined. No indications.
	Jan 2011 (RF16)	EVT-1	8 welds examined. No indications.
	Feb 2013 (RF17)	EVT-1	18 welds examined. No indications.
	March 2015 (RF18)	EVT-1	12 welds examined. No indications.
	Feb 2017 (RF19)	EVT-1	22 welds examined. No indications.
Core Spray Sparger	1987-1997	VT-1 / VT-3	Nozzles, end caps, support (guides), every other outage. Selected Tee (welds) every other outage. All tee (welds), end caps and nozzles each outage starting 1996.
	1997 (RF07)	EVT-1 / MVT-1	BWRVIP-018 (Baseline Inspection). No indications.
	April 1999 (RF08)	EVT-1 / MVT-1	BWRVIP-018. No Indications.
	March 2000 (RF09)	EVT-1 / MVT-1	BWRVIP-018. No Indications.
	Oct 2001 (RF10)	EVT-1 / VT-1	BWRVIP-018. No Indications.
	March 2003 (RF11)	EVT-1 / VT-1	36 welds examined. No indications

Component	Inspection Date	Type	Inspection Results
	Oct 2004 (RF12)	EVT-1 / VT-1	32 items examined. No indications
	April 2006 (RF13)	EVT-1 / VT-1	15 items examined. No indications
	Jan 2008 (RF14)	EVT-1 / VT-1	42 items examined. Includes spare brackets pin/pads and pads only – one indication identified on alignment pin.
	Oct 2009 (RF15)	EVT-1 / VT-1	28 items examined. One of two tack welds cracked on alignment pin @ the 276 AZ annulus side.
	Feb 2011 (RF16)	EVT-1 / VT-1	34 items examined. No indications.
	Feb 2013 (RF17)	EVT-1 / VT-1	40 items examined. No indications.
	March 2015 (RF18)	EVT-1 / VT-1	36 items examined. No indications.
	Feb 2017 (RF19)	EVT-1 / VT-1	52 items examined. No indications.
Top Guide (Rim, etc.)	1987 to 1997	VT-3	100% per Interval (Hold down studs, nuts and keeper). No indications.
	Jan 2008 (RF14)	VT-3	ASME examination – No indications
	March 2015 (RF18)	EVT-1	4 cells and 2 rim areas examined. No indications.
	Feb 2017 (RF19)	VT-3	ASME examination – No indications
Core Plate (Rim, etc.)	Jan 2008 (RF14)	VT-3	8 exams (Jet Pump disassembled)
SLC	Oct 2004 (RF12)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	April 2006 (RF13)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	Jan 2008 (RF14)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	Oct 2009 (RF15)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	Feb 2011 (RF16)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	March 2013 (RF17)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	March 2015 (RF18)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.
	Feb 2017 (RF19)	Enhanced VT-2	VT-2 inspection of N11 nozzle during RPV System Leakage Test. No leakage observed.

Component	Inspection Date	Type	Inspection Results
Jet Pump Assembly	1987 to 1997	VT-1 / VT-3	Twenty pumps, 1/3 inspected each period first Interval [Diffuser Assembly, Riser Assembly, Riser Braces, inlet suction area, riser brace, wedge assembly, Hold down beam (bolt keeper and tack welds)]. Wedges, adjusting screws (tack welds), sensing lines receive VT per various SILs. Jet Pump Beams replaced 1994. VT of complete assemblies in 1994 forced outage.
	1997 (RF07)	EVT-1 / MVT-1	Jet Pump Riser Elbow Welds. Jet Pump Riser Brace Welds (6 of 10). No indications.
	April 1999 (RF08)	EVT-1	Restrainer Assembly (6 of 10). No movement.
	Oct 2001 (RF10)	EVT-1	Riser Pipe to Transition Piece (Limited Access) No indications (5 ea.) Inlet elbow to sleeve weld, inlet sleeve to nozzle weld, restrainer bracket wedge, riser pipe of the upper brace and lower brace attachment yoke welds (6 welds inspected).
	March 2003 (RF11)	EVT-1	RB welds: 14 welds examined - JP-11 thru 20. No indications. RS-3 weld: 5 welds examined - JP-11 thru 20. No indications. RS-6 weld: 10 welds examined - JP-11 thru 20. No indications. RS-7 weld: 10 welds examined - JP-11 thru 20. No indications. RS-8 weld: 5 welds examined - JP-11 thru 20. No indications. RS-9 weld: 10 welds examined - JP-1 thru 20. One indication found JP-19/20 riser brace. IN-1/IN-2 weld: 10 welds each examined - JP-11 thru 20. No indications. DF-1, DF-2, DF-3A, and DF-3B weld: 10 welds each examined - JP-11 thru JP-20. No indications. AD-2 weld 10: welds examined - JP-11 thru JP-20. No indications. WD-1 weld: 6 welds examined - JP-11, 12, 13, 14, 19 and 20. No indications.
	Oct 2004 (RF12)	EVT-1 / VT-1	RS-9: previous crack found in RF11 (Qty 1) & RS-8 (Qty 1) & WD-1 (Qty 1).
	April 2006 (RF13)	EVT-1	RS-9: reinspection of previous crack & RS-8.
	Jan 2008 (RF14)	EVT-1 / VT-1 UT	JP-19/20 – RS-8 & 9 AD-1, AD-2, DF-3a, b, IN-1 & 2, WD-1, DF-1, 2 (Jet Pump disassembly) and JP-1 thru 20 RB-1a, b, c, d. No indications except for previously reported RS-9 indication. 18 Jet Pump Beams (two replaced with new beams).

Component	Inspection Date	Type	Inspection Results
	Oct 2009 (RF15)	EVT-1 / VT- 1 / VT-3 / UT	VT-3 -JP-1 thru 20 sensing lines at welded attachment & penetration. JP 1 thru 10 - 140 welds and 10 expanded scope of the AD-2 welds. AD-2 indication at JP 4, UT was performed at the AD-2 from inside and indication was found non-relevant VT-1 of WD-1 wedges at JP 19/20.
	Jan 2011 (RF16)	EVT-1 / VT-1	Examined RS-8 and RS-9 welds as required by OE from Laguna Verde. Qty-30 welds No indications, also examined WD-1 (wedges) on all 20 Jet pumps.
	Feb 2013 (RF17)	UT	UT of group 2 Jet Pump Beams, JP 1 thru 18 – no indications
	March 2015 (RF18)	EVT-1 / VT-1	EVT-1 on welds DF-1, DF-2, DF-3a, DF-3b, IN-1 & IN-2 in JP 11 thru 15. EVT-1 on weld RS-3 on JP 11 thru 20. EVT-1 on weld RS-6 on JP 11, 13 & 15. EVT-1 on weld RS-7 on JP 12, 14 & 16. VT-1 & EVT-1 on weld RB-1a on JP 2 & 4. VT-1 & EVT-1 on weld RB-1b on JP 1 & 3. VT-1 & EVT-1 on welds RB-1d, RB-2b & RB-2d on JP 1. VT-1 & EVT-1 on weld RB-1c on JP 2. EVT-1 on weld RB-2a on JP 2 & 4. EVT-1 on weld RB-2c on JP 2. EVT-1 on weld RB-2b on JP 3. No indications
	Feb 2017 (RF19)	EVT-1 / VT-1	EVT-1 on weld RS-1 on JP 11-12, 13-14, 15-16. EVT-1 on weld RS-2 on JP 11-12, 13-14, 15-16. EVT-1 on weld RS-8 on JP 1-2, 3-4, 5-6. EVT-1 on weld RS-9 on JP 1-2, 3-4, 5-6. EVT-1 on weld AD-2 on JP 1, 2, 3, 4, 5. VT-1 on weld WD-1 on JP 1, 5, 9, 13, 17. No indications
CRD Guide Housings	March 2003 (RF11)	EVT-1 / VT-3	Inspected 15 control rod drive tubes – No indications observed.
	Jan 2008 (RF14)	VT-3	Viewed to the extent possible the CRDHs within view through JP19 & 20 to examine the cap to tube assembly weld (CRDH-1), tube to tube assembly weld (CRDH-4), and tube to reactor pressure vessel weld (CRDH/RPV-1). No indications observed.
	Feb 2017 (RF19)	VT-3	Cell: 24-25 below core plate exam included CRD housings. NRI
In-Core	1992 (RF04)	VT-1	No indications

Component	Inspection Date	Type	Inspection Results
Housings	Feb 2008 (RF14)		Best effort attempt to examine the ICH within view through JP19 & 20 on the in-core housing to reactor pressure vessel weld (ICH/RPV-1). No indications observed.
	Feb 2017 (RF19)	VT-3	Cell: 24-25 below core plate exam included CRD housings. NRI
In-Core Dry Tubes	1992 (RF04)	VT-3	8 IRM/SRM dry tubes inspected. No indications.
	1996 (RF06)	VT-3	12 IRM/SRM dry tubes inspected. No indications
	April 1999 (RF08)	VT-1	5 IRM/SRM dry tubes inspected. No indications.
	March 2003 (RF11)	VT-1	IRM/SRM dry tubes QTY 10 inspected No indications.
	Jan 2008 (RF14)	VT-1	Inspected 7 IRM Dry Tubes – 3 with recordable indications. Inspected 4 SRM Dry Tubes – 2 with recordable indications.
	Oct 2009 (RF15)	VT-1	Examined Qty-1 IRM and Qty 9 LPRM's No indications. Replaced 5 dry tubes with indications found in RF-14.
	Jan 2011 (RF16)	VT-1	Examined QTY-10 LPRM's no indications. 10 dry tubes were replaced.
	March 2013 (RF17)	VT-1	Inspected 18 dry tubes. Two dry tubes had crack indications and three dry tubes had wear. 4 dry tubes were replaced.
	March 2015 (RF18)	VT-1	Inspected 4 dry tubes. No indications. Replaced 10 dry tubes.
	Feb 2017 (RF19)	VT-1	Inspected 3 dry tubes. No new indications. Replaced 10 dry tubes.
Instrument Penetrations	1994	VT-3	Inspected penetration at vessel during forced outage. No indications noted.
Vessel ID Brackets	1987 to Present	VT-1 / VT-3	Section XI inspections once per interval. VT-3 or VT-1 if in beltline region. No indications noted.
	Jan 2008 (RF14)	VT-3 / EVT-1	Feedwater brackets, Core Spray brackets, Steam Dryer brackets NRI.
	Feb 2017 (RF19)	VT-3 / EVT-1	Feedwater brackets, Core Spray brackets, Steam Dryer brackets, Guide Rod brackets and Surveillance Specimens. NRI

Component	Inspection Date	Type	Inspection Results
Vessel Interior	Oct 2004 (RF12)	VT-3	Vessel cladding area as required by section XI. No indications
	Jan 2008 (RF14)	VT-3	Vessel Cladding - NRI
	Jan 2011 (RF16)	VT-3	Vessel Cladding - NRI
LPCI Coupling	1989, 92	VT-3	Two of three lines in 1989 and two of three lines in 1992. No indications.
	APR 1999 (RF08)	MVT-1	No Indications (1 ea.)
	March 2000 (RF09)	EVT-1	No Indications (2 ea.)
	Oct 2004 (RF12)	EVT-1	9 welds inspected. No indications
	Oct 2009 (RF15)	VT-3	7 welds inspected. No indications
	Feb 2013 (RF17)	EVT-1	8 welds inspected. No indications
	March 2015 (RF18)	EVT-1	1 weld examined. No indications
	Feb 2017 (RF19)	EVT-1	9 welds inspected. No indications
Steam Dryer	March 2000 (RF09)	EVT-1	Indications identified CR-RBS-0686
	Oct 2001 (RF10)	EVT-1	Indications less than 4.5 inches
	March 2003 (RF11)	EVT-1	Indications less than 4.5 inches
	Oct 2004 (RF12)	VT-3	Indications less than 4.5 inches
	April 2006 (RF13)	EVT-1	New Indication identified dryer shirt ¾"long Ref. CR-RBS-2006-01770, indications identified in RF9 less than 4.5"
	Jan 2008 (RF14)	VT-1	BWRVIP-139 exam – identified 2 cracks requiring repair. Upper support ring had one indication 5" and another 5.25" long.
	Oct 2009 (RF15)	VT-1	Re-examined indications and repaired welds on upper support ring, V-14 and V-27 from RF-14 No change noted.
	Jan 2011 (RF16)	VT-1	Support Ring indications - No change.
	Feb 2013 (RF17)	VT-1	Support Ring indications - No change.
	Feb 2017 (RF19)	VT-1	BWRVIP-139 re-examination. New ¾"long indication identified in dryer end plate near 214°

Component	Inspection Date	Type	Inspection Results
Feedwater Sparger	1997 (RF07)	VT-1	Repair areas, No Indications
	APR 1999 (RF08)	VT-1	Repair areas, No Indications
	March 2000 (RF09)	VT-1	Repair areas, No Indications
	Oct 2001 (RF10)	VT-1	Repair areas, No Indications
	March 2003 (RF11)	VT-1	Repair areas, No Indications
	Oct 2004 (RF12)	EVT-1	Repair areas, No Indications
	April 2006 (RF13)	EVT-1	Repair areas, No Indications
	Jan 2008 (RF14)	EVT-1 / VT-3	Qty-8 Brackets to vessel and end brackets - End brackets had wear on pins
	Oct 2009 (RF15)	VT-1	Re-inspected Feedwater brackets and the repair areas. No change noted.
	Jan 2011 (RF16)	VT-1	Reinspection of Feedwater end brackets and the repair areas. No change noted also examined Flow Holes no indications noted.
	Feb 2013 (RF17)	VT-1	Reinspection of Feedwater end brackets and the repair areas. No change noted.
	March 2015 (RF18)	VT-1	Re-inspected feedwater end bracket at 183 azimuth no changes noted
	Feb 2017 (RF19)	VT-1	Re-inspected feedwater end brackets and the repair areas. Changes were noted on 5 End Pins and bracket interfaces
SHASM Retaining Pin	March 2003 (RF11)	VT-3	No Wear Noted
	Oct 2004 (RF12)	VT-3	No Wear Noted Qty 12 inspected
	April 2006 (RF13)	VT-3	No Wear Noted Qty 12 inspected
	Jan 2008 (RF14)	VT-3	No Wear Noted Qty 12 inspected
	Oct 2009 (RF15)	VT-3	No Wear Noted Qty 12 inspected
	Jan 2011 (RF16)	VT-3	No Wear Noted Qty 12 inspected
	Feb 2013 (RF17)	VT-3	No Wear Noted Qty 12 inspected
	March 2015 (RF18)	VT-3	Qty 4 examined. Pin wear noted in Bolts 5 and 23

Component	Inspection Date	Type	Inspection Results
	Feb 2017 (RF19)	VT-3	Qty 4 examined. Pin wear noted in Bolts 7 and 12
Steam Separator Gussets	March 2015 (RF18)	VT-1	8 gussets examined. No indications
Below Core Plate	Jan 2008 (RF14)	VT-3	QTY 16 items examined. NRI.
	Feb 2017 (RF19)	VT-3	Cell: 24-25 including bottom of core plate, CRD housing, bottom head, bottom head drain, ICM housing and stabilizers. NRI
IGSCC Category "C" DM Welds (containing Alloy 82/182 weld material)	Jan 2008 (RF14)	Automated	Completed qualified ASME Section XI, Appendix VIII, Supplement 10 examinations on: (1) Remaining seventeen welds (2) No Flaws were identified (3) No overlays were required
DM Welds (BWRVIP-75-A)	Oct 2004 (RF12)	UT (PDI)	Inspection: Qty – 10 (N2)
	Feb 2008 (RF14)	UT (PDI)	Inspection: Qty – 17 (N1 Qty-2, N4 Qty-3, N5 Qty-4, N6 Qty-6, N9 Qty-2)
	Feb 2011 (RF16)	UT (PDI)	Inspection: QTY - 2 (N4)
	Feb 2017 (RF19)	UT (PDI)	Inspection: QTY - 2 (N5)