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10 CFR 50.55a

NLS2021066
December 10, 2021

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to Nuclear Regulatory Commission's Request for Additional Information Regarding Alternative Request RI5-02, Revision 3
Cooper Nuclear Station, Docket No. 50-298, DPR-46

References:
1. Email from Thomas Wengert, U.S. Nuclear Regulatory Commission, to Linda Dewhirst, Nebraska Public Power District, dated November 10, 2021, "Cooper - Final RAI RE: Alternative Request RI5-02 Revision 3 (EPID L-2021-LLR-0045)"

2. Letter from John Dent, Jr., Nebraska Public Power District, to the U.S. Nuclear Regulatory Commission, dated June 21, 2021, "10 CFR 50.55a Relief Request RI5-02, Revision 3, and RR5-01, Revision 1"

Dear Sir or Madam:

The purpose of this letter is for the Nebraska Public Power District to respond to the Nuclear Regulatory Commission's request for additional information (RAI) (Reference 1) related to the Cooper Nuclear Station request for relief from certain 10 CFR 50.55a requirements (Reference 2).

The responses to the specific RAI questions are provided in Attachment 1 to this letter. Attachment 2 contains a standalone, updated version of RI5-02, Revision 3.

This letter does not contain any new regulatory commitments.

If you have any questions concerning this matter, please contact Linda Dewhirst, Regulatory Affairs and Compliance Manager, at (402) 825-5416.

Sincerely,

John Dent, Jr.
Vice President and
Chief Nuclear Officer

/dv

Attachments: 1. Response to Nuclear Regulatory Commission Request for Additional Information (RAI)

2. 10 CFR 50.55a Request No. RI5-02, Revision 3 Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

cc: Regional Administrator w/ attachments
USNRC - Region IV

Cooper Project Manager w/ attachments
USNRC - NRR Plant Licensing Branch IV

Senior Resident Inspector w/ attachments
USNRC - CNS

NPG Distribution w/ attachments

CNS Records w/ attachments

Attachment 1

Response to Nuclear Regulatory Commission Request for Additional Information (RAI)

Cooper Nuclear Station, Docket No. 50-298, DPR-46

The Nuclear Regulatory Commission (NRC) request for additional information regarding the Alternative Request RI5-02, Revision 3, is shown in italics. The Nebraska Public Power District (NPPD) response to the request is shown in normal font.

RAI-1

Issue

By letter dated February 17, 2016 (ADAMS Accession No. ML16034A479), the NRC authorized the use of the original relief request RI5-02 (Revision 0), which contains inspection requirements for reactor vessel internal components based on guidance in various BWRVIP [Boiling Water Reactor Vessel and Internal Project] topical reports at Cooper. By letter dated July 31, 2018 (ADAMS Accession No. ML18183A325), the NRC authorized the use of RR RI5-02, Revision 1, which provided an updated inspection history to include the fall 2016 refueling outage. By letter dated March 19, 2020 (ADAMS Accession No. ML20077L339), the NRC authorized the use of RR RI5-02, Revision 2, which requested to use BWRVIP-41, Revision 4-A and BWRVIP-94, Revision 3. The current proposed RR RI5-02, Revision 3 requests to use BWRVIP-25, Revision 1-A and BWRVIP-94, Revision 4. Relief Request RI5-02, Revision 3 does not contain all of the information that is typically contained in a relief request, such as affected components and applicable ASME Code requirements that were provided in Revision 0. As submitted, RI5-02, Revision 3 is not a standalone, independent document.

Request

Provide additional information for RI5-02, Revision 3 that includes all of the information in Revisions 0, 1 and 2, such that RI5-02, Revision 3 is a standalone, independent document.

NPPD Response:

Attachment 2 contains a standalone version of Revision 3 that incorporates the updated BWRVIP revisions from the previous NRC approved versions of RI5-02.

RAI-2

Issue

Section 3.5, page 3-2, of BWRVIP-94, Revision 4, states in part that "...In cases where inspection recommendations cannot be implemented and that situation is stated in the BWRVIP document transmitted to the NRC, the BWRVIP transmittal of the document to the NRC is considered the notification to the NRC that a BWRVIP recommendation is not implemented. In

such cases, utility notification to the NRC is not required... ". It is not clear whether the licensee will notify the NRC if an inspection recommendation will not be implemented.

Request

Discuss whether the licensee will notify the NRC if an inspection recommendation at Cooper cannot be implemented, if RR RI-02 is authorized.

NPPD Response:

NPPD will continue the practice of notifying the NRC when inspection recommendations cannot be implemented as stated in the applicable BWRVIP documents subject to this Relief Request, Revisions 0, 1, 2, and 3. In cases where inspection recommendations cannot be implemented and those cases are stated in the BWRVIP document and that document has been transmitted to the NRC, the BWRVIP considers in this case that the NRC has been notified and a separate notification by the utility is not required.

RAI-3

Issue

Section 3.5, Page 3-2, of BWRVIP-94, Revision 4, states in part that "...Deviations from BWRVIP guidelines do not need to be submitted to the NRC for approval unless specifically required by the BWRVIP guideline document or other utility commitments..."

Appendix B, General Consideration Section, Item No. 4 of BWRVIP-94, Revision 4 states in part that "... In no case shall any deviation to the vessel and internals program allow a change to a plant's licensing basis without the approvals required by regulation..."

Based on the above, the NRC staff requests clarification regarding deviations from BWRVIP guidance.

Request

Clarify the specific circumstances under which the licensee would submit deviations to the NRC for approval. Provide specific examples of deviations needing and not needing prior NRC approval. The examples can be hypothetical if actual cases do not exist.

NPPD Response:

BWRVIP-94 is an administrative document that outlines the process for utilities when "needed" or "mandatory" guidance contained in the BWRVIP Inspection and Evaluation (I&E) guidelines cannot be met. The BWRVIP process requires plants to submit deviation disposition documents to the BWRVIP and to separately notify the NRC when the utility cannot implement the BWRVIP I&E guidelines. The BWRVIP assists the utility by reviewing the deviation disposition to ensure the BWRVIP process is met but does not formally "approve" the deviation

disposition. Rather, the utility executive is responsible for approval of the deviation disposition. The BWRVIP process outlined in BWRVIP-94, Revision 4 remains consistent with Revision 3 by directing the utility to notify the NRC when the utility approves a deviation disposition internally. The BWRVIP guidance emphasizes that the BWRVIP guidance does not supersede or replace applicable NRC regulatory requirements without formal relief via the 10CFR50.55a process.

In general, the inspection and evaluation guidance contained in the BWRVIP guidelines is considered required guidance. The BWRVIP distinguishes the "required" guidance as either "needed" or "mandatory." When "needed" or "mandatory" guidance as defined by the various BWRVIP documents cannot be met by a utility, the utility is required by the BWRVIP to document the exceptions via a deviation disposition.

Example of a BWRVIP deviation requiring NRC notification:

An example where a deviation disposition may be required is if a plant cannot perform an examination on a designated frequency prescribed in the applicable I&E guideline. If a certain examination is required on a 10-year frequency but due to unforeseen circumstances or failures of the inspection equipment, the utility may need to extend the inspection frequency from 10 years to 12 years. In this example, a deviation disposition would need to be generated that provides a technical justification why it is acceptable to extend the frequency in accordance with the BWRVIP-94 process. Another example may be if a I&E guideline requires examinations to be performed on a component that is inaccessible for inspections, then a deviation disposition would be required if the examination cannot be performed. The BWRVIP guidance, similar to American Society Mechanical Engineers (ASME) Section XI, typically does not require portions of the vessel to be disassembled beyond what is needed for routine refueling operations in order to conduct an inspection.

In summary, the guidance in BWRVIP-94, Rev. 4 regarding reporting of deviations supersedes the reporting requirements in individual BWRVIP I&E guidelines. BWRVIP-94, Rev. 4 currently requires only NRC notification of deviations. As such, BWRVIP guidance does not currently include any case that would require submittal of a deviation to NRC for approval. Although not common, hypothetically a licensee could have a plant-specific commitment to submit specific BWRVIP deviations to NRC for approval. NPPD does not currently have a commitment of this nature.

RAI-4

Issue

Appendix B, Introduction Section of BWRVIP-94, Revision 4, states in part that "...Deviation dispositions do not need to be submitted to the NRC. However, the NRC shall be notified of any deviation from BWRVIP guidelines transmitted to the NRC as described in Section 3.5..."

Appendix B, General Consideration Section, Item No. 2 of BWRVIP-94, Revision 4 states in part that "For planned deviation dispositions, the utility shall notify the NRC and the BWRVIP within 45 days of the utility executive concurrence with the deviation disposition..."

Based on the above two statements, it is not clear to the NRC staff whether deviation dispositions will or will not be submitted to the NRC.

Request

Clarify the specific circumstances or criteria for when the licensee would notify the NRC of deviations and deviation dispositions.

NPPD Response:

As stated in BWRVIP-94, the utility is required to notify the NRC when deviations or deviation dispositions are generated and submitted to the BWRVIP. The deviation disposition shall provide the basis for determining that the proposed deviation meets the same objective and intent, or level of conservatism exhibited by the BWRVIP guidelines. The utility is required under the BWRVP process to notify the NRC whenever the utility generates deviation dispositions to the "needed" or "mandatory" elements in the applicable BWRVIP I&E guidelines in accordance with BWRVIP-94, Revision 3 and similarly with Revision 4. The specific BWRVIP guidelines listed in RI5-02, Revisions 0, 1, 2, and 3 contain specific sections that are considered "needed." "Needed" guidance is interpreted as "required" BWRVIP guidance. If the "needed" guidance cannot be followed, BWRVIP-94 requires the utility to generate a deviation disposition, submit the deviation disposition to the BWRVIP, and notify the NRC.

The intent of the BWRVIP process as outlined in BWRVIP-94 is for plants to submit the deviation disposition documents to the BWRVIP and to separately notify the NRC. The BWRVIP process does allow plants to forgo the separate letter to the NRC if the issue in question was previously transmitted by the BWRVIP to the NRC (typically in more generic cases that may affect multiple plants).

RAI-5

Issue

Section 3.5, page 3-2 bottom and top of page 3-3, of BWRVIP-94, Revision 4, states in part that "...Licensees shall forward a copy of the IVVI [in-vessel visual inspection] and volumetric final reports for reactor internals inspections provided by the utilities' inspection vendors within 120 days following completion of an outage..." It is not clear to the NRC staff where or to whom licensees will forward a copy of the inspection report, as indicated in this quoted statement.

Request

Clarify whether Cooper will submit the IVVI report and volumetric final reports to the NRC (i.e., as part of the routine 90-day inservice inspection report that licensees submit to the NRC after

the completion of refueling outages for information in accordance with the ASME Code, Section XI, IWA-6230, Owner's Activity Report (Forms OAR-1 and/or NIS-1, or a separate submittal).

NPPD Response:

RI5-02, Revisions 1 and 2 are NRC approved alternatives to the ASME Section XI code requirements for ASME Section Category B-N-1 and B-N-2. As stated in the "Proposed Alternative and Basis for Use" of RI5-02, Revision 1, the relief proposed to utilize the reporting requirements identified in the applicable BWRVIP guidelines in lieu of the associated Code requirements. The BWRVIP process for reporting does not require the utility to provide the IVVI report and volumetric reports to the NRC, but rather requires the utility to submit those reports to the BWRVIP. The BWRVIP subsequently compiles the utility inspection summary reports and submits an annual inspection report to the NRC on behalf of the utilities. These BWRVIP summary reports are alternatives to the ASME Section XI reporting requirements that may be typically provided in the NIS-1 or OAR-1 summary reports.

The most recent in-vessel inspection summary for the Cooper Nuclear Station (CNS) reactor vessel internals was provided to the NRC via email of BWRVIP letter 2021-092, BWRVIP Docket No. 99902016 – BWRVIP 2020 Inspection Summaries, from Debbie Rouse, BWRVIP, Technical Assistant to Joseph Holonich, NRC on November 29, 2021.

RAI-6

Issue

Section 3.5, page 3-3, of BWRVIP-94, Revision 4, states in part that "...Flaw evaluations performed in accordance with the guidance in BWRVIP reports for the acceptance of inspection results do not require transmittal to, or approval by, the NRC..." The code of record for the fifth ISI interval at Cooper is the 2007 Edition and 2008 Addenda of the ASME Code, Section XI. Subarticles IWB-3134(b), IWB-3144(b), and IWB-3640 of the 2007 Edition specify that analytical evaluation of inspection results shall be submitted to the regulatory authority (i.e., the NRC). The above statement in BWRVIP-94, Revision 4 appears to conflict with the requirements of the ASME Code, Section XI.

Request

Considering the above ASME Code, Section XI requirements, clarify whether Cooper will transmit the flaw evaluations to the NRC after the ISI is performed on reactor vessel internal components.

NPPD Response:

Relief RI5-02 provides a technical basis as an alternative to the ASME Section XI requirements for the evaluation and reporting of flaws discovered as a result of conducting BWRVIP in-vessel examinations. Consistent with BWRVIP-94, Revision 3 approved for use in relief RI5-02, Revision 2 and similarly with BWRVIP-94, Revision 4, NPPD does not intend to transmit flaw

evaluations of the reactor vessel internals to the NRC unless specifically requested to do so or unless required by a specific BWRVIP I&E guideline as noted in the NPPD response to RAI 3 above. This position is consistent with previous revisions of this relief as well as the precedents referenced in RI5-02. Relief Request RI5-02 provides the basis to utilize the BWRVIP inspection and evaluation guidelines, including the reporting requirements as alternatives to the ASME Section XI inspection and related requirements associated with ASME Section XI Category B-N-1 and B-N-2 components.

It should be noted that the NRC conducts periodic inspections of the CNS inservice inspection program each refueling outage that includes BWRVIP related activities using inspection module IP 71111.08. These NRC inspection activities provide the NRC with additional opportunities to review flaw evaluations of reactor vessel internals as requested.

Attachment 2

10 CFR 50.55a Request No. RI5-02, Revision 3
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2
Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Acceptable Level of Quality and Safety

ASME Code Component(s) Affected

Code Class:	ASME Section XI Code Class 1
Examination Category:	B-N-1, B-N-2
Item Number(s):	B13.10, B13.20, B13.30, and B13.40
Component Numbers:	Various

Applicable Code Edition and Addenda

ASME Section XI, 2007 Edition through the 2008 Addenda

Applicable Code Requirements

Table IWB-2500-1, Examination Categories "B-N-2, Welded Core Support Structures and Interior Attachments to Reactor Vessels," "B-N-3, Removable Core Support Structures" requires examinations based on the following Item Numbers:

B13.10 Examine accessible areas of the reactor vessel interior (B-N-1) each period by the VT-3, visual examination method; includes only those spaces above and below the core made accessible by removal of components during normal refueling outages.

B13.20 Examine accessible interior welded attachments within the beltline region each interval by the VT-1, visual examination method (B-N-2)

B13.30 Examine accessible interior welded attachments beyond the beltline region each interval by the VT-3, visual examination method (B-N-2)

B13.40 Examine the accessible surfaces of welded core support structures each interval by the VT-3, visual examination 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.

10 CFR 50.55a Request No. RI5-02, Revision 3 (continued)
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

Reason for Request

In accordance with 10 CFR 50.55a(z)(1), NPPD is requesting NRC approval of a proposed alternative to the Code requirements provided above on the basis that the use of the BWRVIP guidelines discussed below provide an acceptable level of quality and safety.

The BWRVIP Inspection and Evaluation Guidelines recommend specific inspection by BWR owners to identify material degradation with BWR components. A wealth of inspection data has been gathered during these inspections across the BWR industry. The BWRVIP Inspection and Evaluation Guidelines focus on specific and susceptible components, specify appropriate inspection methods capable of identifying known or potential degradation mechanisms, and require re-examination at appropriate intervals. The scope of the BWRVIP Inspection and Evaluation Guidelines exceed that of ASME Section XI and in most instances include components that are not part of the ASME Section XI jurisdiction.

Use of this proposed alternative will maintain an adequate level of quality and safety and avoid duplicate or unnecessary inspections, while conserving radiological dose.

Revision 1 updated the BWRVIP-18 reference to Revision 2-A and provides an updated inspection history to include the Fall 2016 (RE29) refueling outage. Revision 1 of this Relief was approved by the NRC on July 31, 2018 (ML18183A325).

Revision 2 updated the BWRVIP-41, Revision 3 reference to Revision 4-A and updates the BWRVIP-94, Revision 2 reference to BWRVIP-94NP, Revision 3. Revision 2 of this Relief was approved by the NRC on March 19, 2020 (ML20077L339).

Revision 3 updates the BWRVIP-25, Revision 0 reference to Revision 1-A and updates the BWRVIP-94NP, Revision 3 reference to BWRVIP-94, Revision 4. The inspection history is not included as it is provided by the BWRVIP annually in separate correspondence to NRC.

Proposed Alternative and Basis for Use

Proposed Alternative

NPPD requests authorization to utilize the alternative requirements of the BWRVIP Guidelines in lieu of the requirements of ASME Code Section XI.

NPPD will satisfy the Examination Category B-N-1 and B-N-2 requirements as described in Table 1 in accordance with BWRVIP guideline requirements. This relief request proposes to utilize the identified BWRVIP guidelines in lieu of the associated Code requirements, including examination method, examination volume, frequency, training, successive and additional examinations, flaw evaluations, and reporting.

10 CFR 50.55a Request No. RI5-02, Revision 3 (continued)
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

Not all of the components addressed by these guidelines are Code components. The proposed alternative includes:

For Examination Category B-N-1:

As an alternative to meeting ASME Section XI and performing a VT-3 examination of the RPV interior above and below the core made accessible by a normal refuel outage, NPPD will implement the BWRVIP Guidelines listed below and as outlined in Table 1. By this request for alternative the BWRVIP Guidelines will be used as an alternative to the requirements of ASME Section XI.

- BWRVIP-03, Revision 17, "Reactor Pressure Vessel and Internals Examination Guidelines"
- BWRVIP-18, Revision 2-A, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines"
- BWRVIP-25, Revision 1-A, "BWR Core Plate Inspection and Flaw Evaluation Guidelines"
- BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines"
- BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines"
- BWRVIP-41, Revision 4-A, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines"
- BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines"
- BWRVIP-138 Revision 1-A, "Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines"

For Examination Category B-N-2:

As an alternative to meeting ASME Section XI and performing a VT-1 or VT-3, as required by ASME Section XI, examination of the RPV welded attachments and welded core support structures, NPPD will implement the BWRVIP Guidelines listed below and as outlined in Table 1. By this request for alternative the BWRVIP Guidelines will be used as an alternative to the requirements of ASME Section XI.

- BWRVIP-03, Revision 17, "Reactor Pressure Vessel and Internals Examination Guidelines"
- BWRVIP-38, "BWR Shroud Support Inspection and Flaw Evaluation Guidelines"
- BWRVIP-48-A, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines"
- BWRVIP-76, Revision 1-A, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines"
- BWRVIP-100-A, "Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds"

10 CFR 50.55a Request No. RI5-02, Revision 3 (continued)
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

Note: If flaw evaluations are required for BWRVIP-76, Revision 1-A examinations, the fracture toughness values of BWRVIP-100-A will be utilized.

When a BWRVIP Guideline refers to ASME Section XI, the technical requirements of ASME Section XI as described by the BWRVIP Guideline will be met, but the examination is under the auspices of the BWRVIP program as defined by BWRVIP-94 Revision 4, "BWR Vessel and Internals Project Program Implementation Guide".

The NPPD reactor vessel internals inspection programs have been developed and implemented to satisfy the requirements of BWRVIP-94. It is recognized that the BWRVIP executive committee periodically revises the BWRVIP guidelines to address industry operating experience, include enhancements to inspection techniques, and add or adjust flaw evaluation methodologies. BWRVIP-94 states that where guidance in existing BWRVIP documents has been supplemented or revised by subsequent correspondence approved by the BWRVIP Executive Committee, the vessel and internals program shall be modified to reflect the new requirements and implement the guidance within two refueling outages, unless a different schedule is specified by the BWRVIP.

However, if new guidance approved by the Executive Committee includes changes to NRC approved BWRVIP guidance that are less conservative than those approved by the NRC, the less conservative guidance shall be implemented only after NRC approves the changes, which 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 approved by the NRC, 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 alternative has been approved. Table 1 below only represents the most current comparison.

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.

Note that other regulatory commitments (i.e., NUREG-0619) are still being implemented separately from the ASME Section XI Program or this request for alternative.

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.

10 CFR 50.55a Request No. RI5-02, Revision 3 (continued)
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

Basis for Use

As part of the BWRVIP initiative, the BWR reactor internals and attachments were subjected to a safety assessment to identify those components that provide a safety function and to determine if long-term actions were necessary to ensure continued safe operation. The safety functions considered are those associated with (1) maintaining a coolable geometry, (2) maintaining control rod insertion times, (3) maintaining reactivity control, (4) assuring core cooling and (5) assuring instrumentation availability. The results of the safety assessment are documented in BWRVIP-06, Revision 1-A, "BWR Vessel and Internals Project Safety Assessment of BWR Reactor Internals" which has been approved by the NRC. As a result of BWRVIP-06, Revision 1-A, component specific BWRVIP guidelines were developed providing appropriate examination and evaluation requirements to address the specific component safety function and potential degradation mechanism.

Along with the component specific guidelines, the BWRVIP has established a reporting protocol for examination results and deviations. The NRC has agreed with the BWRVIP approach in principal and has issued Safety Evaluations for many of these guidelines (see References).

As additional justification, Table 1, "Comparison of ASME Code Section XI Examination Requirements to BWRVIP Examination Requirements," provides specific examples which compare the inspection requirements of ASME Code Section XI Table IWB-2500-1, Item Numbers B13.10, B13.20, B13.30 and B13.40 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.

Therefore, use of the BWRVIP guidelines as an alternative to ASME Section XI, as shown by the comparison provides an acceptable level of quality and safety.

Duration of Proposed Alternative

This proposed alternative will be used for the Fifth Ten-Year Interval of the Inservice Inspection Program for CNS.

Precedents

Similar Request for Alternatives has been previously approved for the following other licensees.

1. US NRC Letter to Entergy Operations, "Grand Gulf Nuclear Station, Unit 1 - Request for Relief GG-ISI-017, Alternative to Use Boiling Water Reactor Vessel and Internals Project Guidelines in Lieu of Specific ASME Code Requirements" (TAC No. MF2357), dated June 30, 2014 (ML14148A262).

10 CFR 50.55a Request No. RI5-02, Revision 3 (continued)
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

2. US NRC Letter to Entergy Operations, "River Bend Station, Unit 1 - Request for Relief No. RBS-ISI-019, Alternative to Use Boiling Water Reactor Vessel and Internals Project Guidelines in Lieu of ASME Code, Section XI Requirements for the Fourth 10-Year Inservice Inspection Interval" (TAC No. MF1867), dated May 30, 2014 (ML14127A327).

3. US NRC Letter to Exelon Generation Company, LLC, "Dresden Nuclear Power Station, Units 2 and 3 - Safety Evaluation in Support of Request for Relief Associated With the Fifth 10-Year Inservice Inspection Interval Program" (TAC Nos. ME9682, ME9683, ME9684, ME9685, ME9686, ME9687, ME9688, ME9689, ME9690, ME9691, ME9692, ME9693, ME9694, ME9695, ME9696, and ME9697), dated September 30, 2013 (ML13260A585).

4. US NRC Letter to Exelon Generation Company, LLC, "Quad Cities Nuclear Power Station Units 1 and 2 - Safety Evaluation in Support of Request for Relief Associated With the Fifth 10 Year Interval Inservice Inspection Program" (TAC Nos. ME9668, ME9669, ME9670, ME9671, ME9672, ME9674, ME9675, ME9676, ME9677, ME9678, ME9679, ME9680, ME9681), dated September 30, 2013 (ML13267A097).

5. US NRC Letter to Exelon Nuclear, "Oyster Creek Nuclear Generating Station - Relief from the Requirements of the ASME Code Relief Request No. I5R-01" (TAC No. ME9490) dated August 5, 2013 (ML13169A062).

References

1. US NRC Letter to BWRVIP, "Safety Evaluation by the Office of Nuclear Reactor Regulation Topical Report, BWRVIP-06-A: BWR (Boiling Water Reactor) Vessel and Internals Project (BWRVIP), Safety Assessment of BWR Reactor Internals, Revised Section 4.0: Consideration of Loose Parts" (TAC No. MC7448) dated July 29, 2008 (ML082030758).

2. Letter from NRC to BWRVIP, "Final Safety Evaluation for Electric Power Research Institute Boiling Water Reactor Vessel and Internals Project Technical Report 3002008089, "BWRVIP-18, Revision 2-A: BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (TAC No. ME2189)," dated February 22, 2016 (ML16011A199).

3. US NRC Letter to BWRVIP, "Final Safety Evaluation of BWRVIP Vessel and Internals Project, BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25)", EPRI Report TR-107284, December 1996 (TAC No. M97802)," dated December 19, 1999.

4. US NRC Letter to BWRVIP, "NRC Approval Letter of BWRVIP-26-A, BWR Vessel and Internals Project Boiling Water Reactor Top Guide Inspection and Flaw Evaluation Guidelines," dated August 29, 2005 (ML052490550).

10 CFR 50.55a Request No. RI5-02, Revision 3 (continued)
Implementation of BWRVIP Documents in Lieu of B-N-1 and B-N-2

5. US NRC Letter to BWRVIP, "Non-Proprietary Version of NRC Staff Review of BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines," dated June 9, 2004 (ML041700446).

6. US NRC Letter to BWRVIP, "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)," dated July 24, 2000 (ML003735498).

7. US NRC Letter to BWRVIP, "Final Safety Evaluation of the "BWR Vessel and Internals Project, BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines (BWRVIP-41)," (TAC No. M99870)," dated February 4, 2001 (ML010460111).

8. US NRC Letter to BWRVIP, "NRC Approval Letter of BWRVIP-47-A, "BWR Vessel and Internals Project Boiling Water Reactor Lower Plenum Inspection and Flaw Evaluation Guidelines," dated September 1, 2005 (ML052490537).

9. US NRC Letter to BWRVIP, "NRC Approval Letter of BWRVIP-48-A, "BWR Vessel and Internals Project Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines," dated July 25, 2005 (ML052130284).

10. US NRC Letter to BWRVIP, "Final Safety Evaluations of the Boiling Water Reactor Vessel and Internals Project 76, Rev. 1 Topical Report, "Boiling Water Reactor Core Shroud Inspection and Flaw Evaluation Guidelines" (TAC No. ME8317)," dated November 12, 2014.

11. Letter from Chairman, BWR Vessel and Internals Project to NRC, "Project No. 704 - BWRVIP Program Implementation Guide (BWRVIP-94NP, Revision 2)," dated September 22, 2011 (ML11271A058).

12. US NRC Letter to BWRVIP, "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," dated November 1, 2007 (ML073050135).

13. US NRC Letter to BWRVIP, "Electric Power Research Institute Final Safety Evaluation for Technical Report 1016574 "BWRVIP-138, Revision 1: BWR [Boiling Water Reactor] Vessel and Internals Project 'Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines' (TAC No. ME2191)," dated May 14, 2012 (ML1208A139).

14. US NRC letter to Nebraska Public Power District, "Cooper Nuclear Station - Request for Relief RI5-02, Alternative to Use Boiling Water Reactor Vessel and Internals Project

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Guidelines in Lieu of Specific ASME Code Requirements", dated February 17, 2016 (ML16034A479).

15. US NRC Letter to BWRVIP, "Final Proprietary Safety Evaluation for "BWRVIP-25, Revision 1: BWR Vessel and Internals Project, BWR Core Plate Inspection and Flaw Evaluation Guidelines" (CAC No. MF4887; EPID L-2014-TOP-0008), March 23, 2020. (ML19290G755 (Package)).

16. US NRC Letter to BWRVIP, "Final Proprietary Safety Evaluation for Electric Power Research Institute Topical Report BWRVIP-41, Revision 4, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines" (CAC No. MF4887; EPID L-2014-TOP-0008), dated June 26, 2018 (Letter ML18130A050, SE ML18129A054).

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Table 1 Comparison of ASME Examination Category B-N-1 and B-N-2 Requirements with BWRVIP Guidance Requirements (Note 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	Accessible Areas (Non-specific)	VT-3	Each Period	BWRVIP-18, 25, 26, 38, 41, 47, 48, 76, 138	Overview examinations of components during BWRVIP examinations are performed to satisfy Code VT-3 inspection requirements.		
B13.20	Interior Attachments within Beltline - Riser Brace pad to vessel wall welds	Accessible Welds	VT-1	Each 10-year Interval	BWRVIP-48 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, 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, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Guide Rod Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval
	Steam Dryer Support Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	EVT-1	Each 10-Year Interval
	Feedwater Sparger Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	EVT-1	Each 10-Year Interval
	Core Spray Piping Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	EVT-1	Every 4 Refueling Cycles
	Upper Surveillance Specimen Holder Brackets				BWRVIP-48, Table 3-2	Bracket Attachment	VT-3	Each 10-Year Interval

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	Shroud Support (Weld H9) including gussets				BWRVIP-38, 3.1.3.2, Figures 3-2 and 3-5	Weld H-9 including gussets	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 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
	Shroud Horizontal Welds				BWRVIP-76, 2.3	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
	Shroud Vertical Welds				BWRVIP-76, 2.5	Vertical Welds as applicable	EVT-1 or UT	Maximum 10 years for UT based on inspection of horizontal welds

Note:

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.

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Comparison of ASME Code Section XI Examination Requirements to BWRVIP Examination Requirements

The following provides a comparison of the examination requirements provided in ASME Code Section XI Table IWB-2500-1, Examination Category B-N-1 and B-N-2, Item Numbers B13.10, B13.20, B13.30, and B13.40, 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.

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

The ASME Section XI Code 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 licensees, and vendors of this inspection service. Based on the acceptance criteria specified in IWB-3520.2, 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-R4-A), 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 perform 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 Code. 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 requirements specified by the BWRVIP Guidelines 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 Code requirements.

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

The ASME Section XI Code requires a VT-1 examination of accessible reactor interior surface attachment welds within the beltline each 10-year interval. In the BWR, this includes the Jet Pump Riser Brace Weld-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 as specified in the CNS ASME Section XI Program.

The Jet Pump Riser Brace examination requirements are provided below to show a comparison between the Code and the BWRVIP examination requirements.

Comparison to BWRVIP Requirements - Jet Pump Riser Braces (BWRVIP-41-R4-A and BWRVIP-48-A)

- The ASME Code requires a 100% VT-1 examination of the Jet Pump Riser Brace pad-to-Reactor Vessel Wall welds each 10-year Interval.
- BWRVIP-48-A requires an EVT-1 baseline examination of 100% of the Jet Pump Riser Brace pad-to-Reactor Vessel Wall welds in the first 12 years with at least 50% being inspected in the first 6 years. Reinspection consists of 25% during each subsequent 6 year period.
- BWRVIP-48-A specifically defines the susceptible regions of the attachment that are to be examined.
- BWRVIP-41-R4-A requires EVT-1 of the jet pump riser leaf to vessel pad welds 25% every 12 years.

The Code 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 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 Intergranular 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 Code visual examination method requires (depending on applicable ASME Edition) 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. The calibration standards used for BWRVIP EVT-1 examinations utilize the same Code characters, thus assuring at least equivalent resolution compared to the Code. Although the

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BWRVIP examination may be less frequent, it is a more comprehensive method. Therefore, the BWRVIP guidance provides an acceptable level of quality and safety to that provided by the ASME Code.

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

The ASME Section XI Code 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, 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 Welds, 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 Code.

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:

<u>Comparison to BWRVIP Requirements - Core Spray Piping Bracket Welds relative to BWRVIP-48-A</u>

- The Code 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 2 year fuel cycle)

The BWRVIP examination method EVT-1 has superior flaw detection and sizing capability than the Code VT-3, the examination frequency is greater than the Code requirements, and the same flaw evaluation criteria are used.

The Code VT-3 examination is conducted to detect component structural integrity by ensuring the component's 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 and the relevant degradation mechanisms for BWR internal attachments. Additionally, BWRVIP-48-A guidance recommends indications detected by an EVT-1 to be examined by ultrasonics to determine if the indication has propagated into the reactor vessel base material.

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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, and the same flaw evaluation criteria (ASME Code Section XI), the level of quality and safety provided by the BWRVIP criteria is superior to that provided by the ASME Code.

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

The ASME 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, and the shroud support gussets. In later designs, the shroud itself is considered part of the welded core support structure as designated at Cooper. Historically, this requirement has been interpreted and satisfied differently across the industry. The proposed alternate examination replaces this ASME requirement with specific BWRVIP guidelines that examine susceptible locations for known relevant degradation mechanisms.

- The 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 Code for integrally welded Core Support Structures, and for specific areas, requires either an enhanced visual examination technique (EVT-1) or volumetric examination using ultrasonic testing techniques (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 Code examination requirements. In many locations, the BWRVIP guidelines require a volumetric examination of the susceptible welds at a frequency identical to the Code requirement. 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 Code and BWRVIP examination requirements as shown below.

<u>Comparison to BWRVIP Requirements - BWR Core Shroud Examination and Flaw Evaluation Guideline (BWRVIP-76)</u>

- The 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" that will vary depending upon the amount of flaws present, but not to exceed ten years.

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The BWRVIP recommended examinations specify locations that are known to be vulnerable to BWR relevant degradation mechanisms rather than "all surfaces." The BWRVIP examination methods (EVT-1 or UT) are superior to the Code required VT-3 for flaw detection and characterization. The BWRVIP examination frequency is equivalent to or more frequent than the examination frequency required by the Code. 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 Code requirements.