UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 29, 2016

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO)
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: NINE MILE POINT NUCLEAR STATION, UNITS 1 AND 2– RELIEF REQUEST ALTERNATIVE RE: USE OF BOILING WATER REACTOR VESSEL AND INTERNALS PROJECT GUIDELINES IN LIEU OF SPECIFIC ASME CODE REQUIREMENTS (CAC NOS. MF6116 AND MF6117)

Dear Mr. Hanson:

By letter dated April 10, 2015, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15100A228), as supplemented by letter dated November 24, 2015, (ADAMS Accession No. ML15328A514), Exelon Generation (the licensee) submitted Relief Requests 1ISI-004 and 2ISI-013 for the inservice inspection (ISI) program at Nine Mile Point Nuclear Station, Units 1 and 2 (NMP1 and 2). These requests were submitted for the fourth and third 10-year ISI intervals at NMP1 and 2, respectively, and are applicable to the reactor vessel internal (RVI) components. The licensee proposed to use the Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) guidelines as an alternative to the requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for ISI of the reactor pressure vessel (RPV) interior surfaces, attachments, and core support structures at NMP1 and 2. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

The Nuclear Regulatory Commission (NRC) staff has reviewed the subject requests and concludes, as set forth in the enclosed SE, that the alternative proposed by the licensee will ensure that the integrity of the RPV interior surfaces, attachments, and core support structures is maintained and has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

All other requirements of ASME Code, Section XI for which the alternative has not been specifically requested remain applicable, including third party review by the Authorized Nuclear In-service Inspector. Any ASME Code, Section XI, RVI components that are not included in these requests for alternative will continue to be inspected in accordance with the ASME Code, Section XI requirements. The inspection and evaluation (I&E) guidelines addressed in the

relevant BWRVIP reports should be implemented for the non-ASME Code, Section XI, RVI components at NMP, Units 1 and 2.

If you have any questions, please contact Ms. Brenda Mozafari at 301-415-2020 or via e-mail at Brenda.Mozafari@nrc.gov.

Sincerely,

Travis L. Tate, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-220 and 50-410

Enclosure:
Safety Evaluation

cc w/encl: Distribution via ListServ

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SAFETY EVALUATION BY THE VESSELS & INTERNALS INTEGRITY BRANCH

INSERVICE INSPECTION PROGRAM RELIEF REQUEST FOR

ASME CODE ALTERNATIVE

EXELON GENERATION COMPANY, LLC

NINE MILE POINT NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-220 AND 50-410

1.0 INTRODUCTION

By letter dated April 10, 2015, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15100A228), as supplemented by letter dated November 24, 2015, (ADAMS Accession No. ML15328A514), Exelon Generation (the licensee) submitted Relief Requests 1ISI-004 and 2ISI-013 for the inservice inspection (ISI) program at Nine Mile Point Nuclear Station, Units 1 and 2 (NMP1 and 2). These requests were submitted for the fourth and third 10-year ISI intervals at NMP1 and 2, respectively, and are applicable to the reactor vessel internal (RVI) components. In this safety evaluation (SE), the term "RVI components" includes reactor pressure vessel (RPV) interior surfaces, interior attachments, and core support structures. The licensee proposed to use the Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) guidelines as an alternative to the requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for ISI of the RPV interior surfaces, attachments, and core support structures.

2.0 REGULATORY REQUIREMENTS

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g), except where specific relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(z), alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC if: (1) the proposed alternatives would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year ISI interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(a)(1)(ii), twelve months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b)(2).

The regulations in 10 CFR 50.55a(g)(4)(iv) state that inservice examination of components and system pressure tests may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in paragraph 10 CFR 50.55a(a), subject to the limitations and modifications listed in 10 CFR 50.55a(b) and subject to Commission approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met. NMP1 is currently in the fourth 10-year ISI interval, which began on August 23, 2009, and is scheduled to end on August 22, 2019. NMP2 is currently in the third 10-year ISI interval, which began on April 5, 2008, and is scheduled to end on April 4, 2018. The applicable ASME Code of record for the fourth and third 10-year ISI intervals at NMP1 and 2, is the ASME Code, Section XI, 2004 Edition at both units.

3.0 LICENSEE'S EVALUATION

Components for Which an Alternative is Requested

The licensee proposed an alternative to the requirements of the ASME Code, Section XI for the Class 1 RVI components at NMP1 and 2. The subject RVI components are identified in Table IWB-2500-1 of ASME Code, Section XI, Examination Categories B-N-1 and B-N-2, and include the following Code item numbers:

- B13.10, RPV Interior (Category B-N-1);
- B13.20, RPV Interior Attachments within the Beltline Region (Category B-N-2);
- B13.30, RPV Interior Attachments beyond the Beltline Region (Category B-N-2); and
- B13.40, Core Support Structure (B-N-2).

Examination Requirements for Which an Alternative is Requested

The ASME Code, Section XI requires visual examination (VT) of the above RVI components. The specific examination requirements, as specified in Table IWB-2500-1 of ASME Code, Section XI, Examination Categories B-N-1 and B-N-2, are identified below:

- B13.10 – Examine accessible areas of the RPV interior surfaces each inspection period using a technique which meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI (Category B-N-1).

- B13.20 – Examine RPV interior attachment welds within the beltline region each inspection interval using a technique which meets the requirements for a VT-1 examination as defined in paragraph IWA-2211 of the ASME Code, Section XI (Category B-N-2).

- B13.30 – Examine RPV interior attachment welds beyond the beltline region each inspection interval using a technique which meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI (Category B-N-2).

- B13.40 – Examine surfaces of the core support structure each inspection interval using a technique which meets the requirements for a VT-3 examination, as defined in paragraph IWA-2213 of the ASME Code, Section XI (Category B-N-2).

These examinations are performed to assess the structural integrity of the RVI components.

Licensee's Reason for Requesting an Alternative

The licensee proposed to use the BWRVIP Inspection and Evaluation (I&E) guidelines as an alternative to the examination requirements of the ASME Code, Section XI for ISI of the Categories B-N-1 and B-N-2 RVI components (RPV interior surfaces, interior attachments, and core support structures). The licensee stated that implementation of this alternative inspection program will maintain an adequate level of quality and safety for the affected components and will not adversely impact the health and safety of the public. As part of its justification for requesting the alternative, the licensee stated that BWRs now examine these RVI components in accordance with the BWRVIP I&E guidelines. The licensee stated that the proposed alternative covers examination methods, examination volume, frequency, training, successive and additional examinations, flaw evaluations, and reporting criteria. The licensee indicated that the BWRVIP I&E guidelines have been written to address the examination of safety significant RVI components using appropriate methods and re-inspections at conservative intervals.

Licensee's Proposed Alternative and Basis for Use

The licensee's submittal for Requests 1ISI-004 and 2ISI-013 cited the BWRVIP reports listed below as the basis for its alternative inspection of the subject RVI components. The BWRVIP reports listed below include BWRVIP I&E guidelines that are applicable to the Category B-N-1 and B-N-2 RVI components, as well as BWRVIP I&E guidelines for additional RVI components that are not traditionally within the scope of Category B-N-1 and B-N-2 components.

- BWRVIP-03, "BWRVIP Reactor Pressure Vessel and Internals Examination Guidelines"
- BWRVIP-18, Revision 1-A, "BWRVIP Core Spray Internals Inspection and Flaw Evaluation Guidelines"
- BWRVIP-25, "BWRVIP Core Plate Inspection and Flaw Evaluation Guidelines"
- BWRVIP-26-A, "BWRVIP Top Guide Inspection and Flaw Evaluation Guidelines"
- BWRVIP-27-A, "BWRVIP BWR Standby Liquid Control System/Core Plate Delta P Inspection and Flaw Evaluation Guidelines"
- BWRVIP-38, "BWR Shroud Support Inspection and Flaw Evaluation Guidelines"

- BWRVIP-41, Revision 3, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines"
- BWRVIP-42, Revision 1, "Low Pressure Coolant Injection System (LPCI) Coupling Inspection and Flaw Evaluation Guidelines"
- BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines"
- BWRVIP-48-A, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines"
- BWRVIP-76, Revision 1, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines"
- BWRVIP-94, Revision 2, "BWRVIP Program Implementation Guide"
- BWRVIP-138, Revision 1-A, "BWRVIP Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines"
- BWRVIP-180, Access Hole Cover Inspection and Flaw Evaluation Guidelines"
- BWRVIP-183, "BWRVIP, Top Guide Grid Beam Inspection and Flaw Evaluation"

The licensee stated that inspection services by an Authorized Inspection Agency will be applied to the proposed alternative. The licensee further indicated that the BWRVIP has established a reporting protocol for examination results and deviations. The licensee stated that any revised version of a BWRVIP report used to satisfy this alternative will meet or exceed the I&E guidelines of its original version, and if it does not meet this criterion, staff approval is mandatory prior to its implementation, consistent with the requirements of BWRVIP-94.

In Table 2 of its April 10, 2015, submittal, the licensee provided a comparison of examination requirements for the ASME Code, Section XI, Category B-N-1 and B-N-2 RVI components to the BWRVIP inspection criteria. In Attachment 2 of the submittal, the licensee provided a discussion of how the BWRVIP inspections of specific RVI components result in more comprehensive examination coverage of the RPV interior surfaces, attachments, and core support structures compared to the ASME Code, Section XI, Category B-N-1 and B-N-2 examinations.

The licensee stated that by implementing the BWRVIP inspection guidelines, aging degradation of the RPV interior surfaces, attachments, and core support structures can be identified in a timely manner so that proper corrective action can be taken to ensure the integrity of the affected RVI component. Therefore, the licensee concluded that implementation of the BWRVIP inspection guidelines for the NMP1 and 2 RVI components will provide an acceptable level of quality and safety. The licensee also provided BWRVIP inspection summaries for NMP1 and 2 (ADAMS Accession Nos. ML14125A303 dated April 11, 2014, and ML13176A003 dated June 19, 2013, for NMP1 and 2, respectively), which summarize the inspection methods used for examining the RVI components, the inspection dates, the results of the inspection, and corrective actions related to the inspection findings – these inspection summaries address RVI inspections through the spring 2013 refueling outage for NMP1 and the spring 2012 refueling outage for NMP2.

4.0 STAFF EVALUATION

The staff reviewed the information provided by the licensee in its submittal regarding its proposed alternative to the ASME Code, Section XI, Category B-N-1 and B-N-2 examination requirements for the RPV interior surfaces, attachments, and core support structure and the technical basis for the licensee's proposed alternative. The staff agrees with the licensee's conclusions provided in Attachment 2 of the April 10, 2015, letter in that BWRVIP I&E guidelines generally require more frequent and more comprehensive inspections for the RVI components than the ASME Code, Section XI, Categories B-N-1 and B-N-2. The staff reviewed the status of each of the referenced BWRVIP guidance documents and noted that the BWRVIP did not submit the BWRVIP-180 inspection guidelines for the access hole covers to the staff for review and approval. However, even though the staff did not review BWRVIP-180, the licensee may choose to implement the enhancements described in BWRVIP-180. These enhancements (if chosen) may be implemented because they bound the inspection requirements of the ASME Code, Section XI for the Category B-N-1 and B-N-2 components. In addition, BWRVIP-183 addresses the I&E guidelines for the top guide, which is currently under review by the staff. However, the licensee may choose to implement I&E guidelines that are consistent with the staff approved BWRVIP-26-A report for the top guide components in lieu of BWRVIP-183. The staff found the remaining referenced BWRVIP reports to be acceptable for use, provided that any conditions associated with each BWRVIP report are followed. The conditions are contained in the corresponding staff SE for each report.

Staff Requests for Additional Information

The NRC staff identified some questions associated with the Requests 1ISI-004 and 2ISI-013 that required additional information from the licensee. The following paragraphs address the NRC staff's requests for additional information (RAIs), which were transmitted to the licensee by email correspondence dated October 15, 2015 (ADAMS Accession No. ML15288A565). By letter dated November 24, 2015 (ADAMS Accession No. ML15328A514), the licensee provided its responses to the staff's RAIs. The issues raised in the NRC staff's RAIs and the resolution of these issues are addressed below.

RAI-1

Based on its review of the information in the BWRVIP inspection summaries for NMP1 and 2 (ADAMS Accession Nos. ML14125A303 and ML13176A003, respectively), the staff requested that the licensee identify whether there are any furnace-sensitized stainless steel (SS) RPV attachments at NMP1 and 2. The staff also requested that the licensee state the previous BWRVIP inspections that were performed for this type of RPV attachment material, and provide the inspection results.

In its November 24, 2015, RAI response, the licensee provided the requested information concerning the furnace-sensitized SS RPV attachments at NMP1. The licensee also stated that there are no furnace-sensitized SS RPV attachments at NMP2.

The NRC staff's review of the licensee's RAI response determined that the licensee appropriately identified the furnace-sensitized SS RPV attachments and appear to have conducted inspections consistent with the BWRVIP criteria. Therefore, the staff believes the

BWRVIP inspections have been effective in identifying cracking in the furnace-sensitized SS RPV attachments at NMP1. The NRC staff also reviewed the licensee's disposition of the indications in the furnace-sensitized SS attachment components and confirmed that these indications have been adequately evaluated in accordance with the BWRVIP criteria. Furthermore, the NRC staff determined that the information provided by the licensee in its RAI response demonstrates with reasonable assurance that future BWRVIP inspections of the furnace-sensitized SS RPV attachments would identify any active aging degradation in a timely manner so that proper corrective actions can be taken by the licensee. Therefore, the staff determined that the integrity and functionality of the furnace-sensitized SS RPV attachments at NMP1 is adequately ensured through the continued implementation of the BWRVIP guidelines.

RAI-2

The NRC staff noted that welds fabricated from nickel base alloy Inconel 182 welding electrodes (Alloy 182, or Alloy 82/182 welds) are more susceptible to intergranular stress corrosion cracking (IGSCC) than austenitic SS welds. Therefore, the NRC staff requested that the licensee identify whether there are any Alloy 182 welds for the RVI components that are within the scope of the BWRVIP I&E guidelines at NMP1 and 2, state the previous BWRVIP inspections that were performed for this type of weld material, and provide the inspection results.

In its November 24, 2015, RAI response, the licensee stated that the NMP1 RPV attachment welds use Alloy 82/182 with the exception of the surveillance specimen holder brackets, which use Type 308 SS weld filler metal. The licensee stated that the NMP2 RPV attachment welds also use Alloy 82/182. For the Alloy 82/182 shroud support attachment welds at NMP1, the licensee indicated that the BWRVIP inspection summary has documented cracking in the "H-9" attachment weld. The licensee referenced the NRC staff's March 20, 2003, SE (ADAMS Accession No. ML030790512) for the baseline inspection of this attachment weld. The licensee stated that the last inspection performed in 2011 showed no significant change in the condition of the "H-9" shroud support attachment weld compared to the baseline inspection performed in 2001. The licensee stated that no other indications have been identified for the Alloy 82/182 welds at NMP1 and 2 based on the BWRVIP inspections.

The NRC staff determined that the licensee's RAI response, related to inspection results for the identified welds, demonstrates with reasonable assurance that BWRVIP inspections have been effective in identifying cracking in the Alloy 82/182 welds for the RVI components at NMP1 and 2. The NRC staff also determined that the indications identified by the licensee in the Alloy 82/182 "H-9" shroud support attachment weld at NMP1 have been adequately evaluated and monitored since 2001, with no significant change to these indications based on volumetric examination (UT) exams between 2001 and 2011. Furthermore, the NRC staff determined that the information provided by the licensee in its RAI response demonstrates with reasonable assurance that future BWRVIP inspections of the Alloy 82/182 welds would identify any active aging degradation in a timely manner so that proper corrective actions can be taken by the licensee. Therefore, the staff determined that the integrity and functionality of this type of weld metal will be adequately ensured through the continued implementation of the BWRVIP guidelines.

RAI-3

NUREG-0619, Revision 1, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking," dated November 1980 (ADAMS Accession No. ML031600712) describes the NRC staff position on BWR feedwater nozzle and other feedwater component inspections. This document includes required provisions for visual inspection of the feedwater sparger tee welds and piping brackets, which are RVI component inspections that predate the BWRVIP guidelines. The staff requested information concerning whether the licensee implements the provisions NUREG-0619, Revision 1 for inspection of the feedwater sparger tee welds and piping brackets at NMP 1 and 2. In its November 24, 2015, RAI response, the licensee confirmed that visual inspections of these feedwater sparger components at NMP 1 are performed in accordance NUREG-0619, Revision 1 and will continue to performed under the ISI program for NMP 1 following implementation of the proposed alternative. For NMP 2, the licensee provided a reference to a 1990 NRC SE, wherein the NRC staff accepted the position that these specific inspections are not required for the NMP 2 ISI program. The staff determined that the licensee's implementation of the NUREG-0619, Revision 1 inspection criteria for the feedwater sparger components at NMP 1 ensures an acceptable level of quality and safety for these components, following implementation of the licensee's proposed alternative

RAI-4

Based on the NRC staff's review of the NMP1 and 2 BWRVIP inspection summaries, the staff requested that the licensee provide additional information concerning specific inspection findings and the status of relevant indications for several RVI components at NMP1 that are not specifically addressed in the NMP1 BWRVIP inspection summary. The staff determined that the NMP2 BWRVIP inspection summary adequately addresses BWRVIP inspection findings and status of relevant indications for all NMP2 RVI components; thus the NRC staff's request only applies to NMP1. In its November 24, 2015, RAI response, the licensee provided the requested BWRVIP inspection information for NMP1.

The NRC staff's review of the RAI response determined that the licensee provided the requested information in its RAI response concerning the specific inspection findings and the status of relevant indications for the RVI components of concern at NMP1. The NRC staff also confirmed that the licensee's evaluation of the relevant indications identified in the RAI response demonstrates that aging management is being conducted in accordance with the BWRVIP guidelines for each of these RVI components, and the licensee's flaw evaluation results demonstrate that the indications are acceptable for continued service. Furthermore, the staff determined that, based on its review of the status of the above relevant indications reported by the licensee in its RAI response, there is reasonable assurance that the integrity and functionality of these RVI components is adequately ensured through the continued implementation of the BWRVIP guidelines.

RAI-5

The licensee's BWRVIP inspection summaries address RVI inspections through the spring 2013 refueling outage for NMP1 and the spring 2012 refueling outage for NMP2. Therefore, the NRC staff requested that the licensee address whether the latest BWRVIP RVI inspections at NMP1

for calendar year 2015 and at NMP2 for calendar year 2014 resulted in any new relevant indications or significant changes to previous indications. For any new relevant indications or changes to indications, the NRC staff requested that the licensee briefly summarize the results of the evaluation.

In its November 24, 2015, RAI response, the licensee provided the requested information concerning the latest BWRVIP inspection results. The NRC staff reviewed the licensee's response and determined that the licensee addressed the status of the relevant indications associated with the most recent BWRVIP inspections. Based on its review of these recent BWRVIP inspection results, the staff confirmed that the licensee's aging management activity for these RVI components is being conducted in accordance with the BWRVIP guidelines, and determined with reasonable assurance that the integrity and functionality of these RVI components is adequately ensured through the implementation of the BWRVIP guidelines.

RAI-6

Hydrogen water chemistry (HWC) or HWC plus noble metal chemical addition (NMCA) are reactor cooling water chemistry methods used to mitigate IGSCC in BWR RVI components. The effective implementation of these methods is important for demonstrating that the licensee's proposed alternative to implement the BWRVIP guidelines in lieu of the ASME Code, Section XI examination requirements for the RVI components will provide an acceptable level of quality and safety. Therefore, the staff requested that the licensee state whether HWC, HWC plus NMCA, or HWC plus on-line noble chemical addition (OLNC) are currently implemented at NMP1 and 2. The staff also requested that the licensee provide details concerning the effectiveness of these methods, as applicable to NMP1 and 2, based on the latest measurements of electro-chemical potential (ECP), reactor coolant hydrogen/oxygen molar ratio, and catalyst loading (if NMCA is applicable at the units). Finally, the staff requested that the licensee describe the availability of HWC or HWC plus NMCA/OLNC and identify when these methods were first implemented at NMP1 and 2.

In its November 24, 2015, RAI response, the licensee stated that NMP1 and 2 currently implement HWC and OLNC to mitigate IGSCC. The licensee indicated that HWC and OLNC mitigate IGSCC when ECP values are less than (<) -230 millivolts (mV), based on the standard hydrogen electrode (SHE). For NMP1 and 2, the licensee identified that a measured ECP < -230 mV (SHE) when the reactor coolant hydrogen/oxygen molar ratio is ≥ 2 indicates sufficient catalyst loading. For NMP1 at the end of September 2015, the licensee identified that the ECP for the current fuel cycle (Cycle 22) is -425 mV (SHE), the HWC availability is currently 99%, and the average molar ratio is 248. For NMP2 at the end of September 2015, the ECP for the current fuel cycle (Cycle 15) is -495 mV (SHE), the HWC availability is currently 99%, and the average molar ratio is 105.

The licensee stated that at NMP1, HWC, NMCA, and OLNC were implemented in April 2000, May 2000, and December 2006, respectively. At NMP2, HWC, NMCA, and OLNC were implemented in February 2001, September 2000, and December 2007, respectively.

The NRC staff reviewed the licensee's RAI response and determined that the licensee provided the requested information concerning its implementation of HWC and OLNC at NMP1 and 2. The staff also found that the licensee's plant-specific values for the ECP and reactor coolant

hydrogen/oxygen molar ratio are in conformance with the staff-approved report, BWRVIP-62NP-A, "BWR Vessel Internals Project, Technical Basis for Inspection Relief for BWR Internal Components with Hydrogen Injection," (dated January 31, 2011, ADAMS Accession No. ML11137A193). Based on its review of the HWC and OLNC parameters reported by the licensee for NMP1 and 2, the staff determined that the licensee is adequately implementing these BWR corrosion mitigation programs to help ensure that the implementation of the BWRVIP I&E guidelines in lieu of the ASME Code, Section, Category B-N-1 and B-N-2 requirements will provide reasonable assurance of structural integrity for the RVI components at NMP1 and 2.

RAI-7

BWRVIP-18 (core spray), BWRVIP-41 (jet pump assembly), BWRVIP-42 (low pressure coolant injection system), and BWRVIP-76 (core shroud) require a plant-specific integrated leakage assessment, which accounts for leakage from all RVI components that impact the ability to cool the core and maintain peak clad temperature within allowed limits during postulated loss-of-coolant accidents (LOCAs). Therefore, the staff requested that the licensee address whether a plant-specific integrated leakage assessment was performed as required by these BWRVIP guidelines. The staff also requested that the licensee provide a summary of all RVI components included in the leakage assessment, along with a summary of the number and length of all cracks detected and evaluated for the leakage assessment, and the calculated leak rate from each crack evaluated in the leakage assessment.

In its November 24, 2015, RAI response, the licensee stated that the leakage criteria required by BWRVIP-76 were established for the NMP1 core shroud repairs to ensure the required subcooling for the recirculation pump inlet. The licensee referenced the NRC staff's 1999 SE, which concluded that the leakage criteria were acceptable for all operating conditions, including emergency core cooling system (ECCS) performance. The licensee noted that BWRVIP-41 and BWRVIP-42 do not apply to NMP1, and no BWRVIP-18 core spray piping flaw indications exist that require a core spray leakage assessment. For NMP2, the licensee stated that there is no cracking associated with the core spray components, jet pump assembly, low pressure coolant injection system, or core shroud that require a leakage assessment to determine impact on core cooling to maintain peak clad temperature within allowable limits during postulated LOCAs.

The NRC staff determined that the licensee adequately addressed how leakage criteria were established for the NMP1 core shroud repairs based on bounding leakage assumptions to ensure the necessary cooling required for LOCA conditions. Based on its review of the licensee's RAI-7 response, the staff also noted that the NMP1 core shroud and associated repairs is the only leakage assessment required for either unit since no other indications of cracking exist that require a leakage assessment in accordance with the subject BWRVIP guidelines (or the subject BWRVIP guidelines are not applicable at the unit). Therefore, the staff determined with reasonable assurance that the licensee has adequately evaluated leakage for the NMP1 and 2 RVI components for postulated LOCA conditions in accordance with the BWRVIP guidelines.

RAI-8

The staff noted that the Request 2ISI-013 for NMP2 references a deviation from the BWRVIP-25 inspection guidelines for the core plate. The staff identified that this same deviation has been submitted for a number of other BWRs, based on the lack of practicable UT or enhanced visual examination technique (EVT-1) examination methods for the core plate hold-down bolts. Therefore, the staff requested that the licensee identify whether lateral restraint wedges are installed to prevent lateral displacement of the core plate if there is a loss of preload for the core plate hold-down bolts. If lateral restraint wedges are not installed, the staff requested that the licensee provide justification for not performing other inspections (e.g., VT-3 exams) of the core plate hold-down bolts at NMP2 since calendar year 2000 (if VT-3 exams have not been performed).

In its November 24, 2015, RAI response, the licensee stated that no lateral restraint wedges are installed at NMP2, and the BWRVIP-25 deviation establishes the basis for not performing the specified core plate bolt inspections. The licensee noted that a summary of the technical justification is provided in its March 30, 2011, BWRVIP-25 deviation letter (ADAMS Accession No. ML110960415). The licensee also identified that a baseline VT-3 examination of a sample of the upper portion of the core plate bolts was performed in accordance with vendor recommendations in 1998 with no anomalies noted. The licensee indicated that during the 2012 inspections, access to the below core plate region was provided at selected locations, and the core plate inspection scope included verification that the core plate hex nuts remain in place. The licensee noted that the VT-3 examinations were able to identify that the bolt hex nuts remained in place at the locations where access existed.

The NRC staff reviewed the licensee's RAI response and determined that the licensee adequately described its aging management activities for the core plate hold-down bolts at NMP2. The staff also reviewed the licensee's March 2011, BWRVIP-25 deviation letter and determined that the justification contained therein for not performing the specified UT or EVT-1 exams is consistent with that provided in other BWRVIP-25 deviation letters for other BWRs of a similar core plate design as NMP2. Specifically, the deviation letters indicate that these bolts cannot be inspected by UT due to configuration issues, and it was determined that EVT-1 exams due not provide meaningful results. The deviation letters also identify that this bolting has a relatively low susceptibility to cracking and a very high flaw tolerance, and postulated flaws would not grow to a size that significantly reduces the bolt preload over the life of the plant. The staff noted that this BWRVIP deviation is acceptable provided that licensees for these BWR plants perform limited scope VT-3 exams of a sample of bolts to determine that bolting components have not rotated, thereby demonstrating that loss of bolt preload and cracking has not occurred. The staff found that the licensee's description of its VT-3 exams of the core plate bolts demonstrates that this is the case, and there is reasonable assurance that core plate bolt integrity and functionality is maintained. The staff also noted these VT-3 examinations of accessible areas are at least as comprehensive as the ASME Code, Section XI, Category B-N-2 requirements for core support structure components. Therefore, the staff determined that the licensee's aging management activity for the core plate bolts at NMP2 will provide reasonable assurance of structural integrity for these RVI components.

RAI-9

The NRC staff is aware of several GE-Hitachi (GEH) Safety Communications (SCs) that were issued to BWR licensees informing them of potential non-conservatisms in the analysis of loading conditions on the RPV and internals. In June 2013, the BWRVIP informed the NRC about the following four SCs:

- SC 09-01, "Annulus Pressurization Loads Evaluation,"
- SC 09-03, "Shroud Screening Criteria Reports," including Revision 2,
- SC 11-07, "Impact of Inertial Loading and Potential New Load Combination from Recirculation Suction Line Break Acoustic Loads," and
- SC 12-20, "Error in Method of Characteristics Boundary Conditions Affecting Acoustic Loads Analyses."

The NRC staff noted that the issues raised in the SCs concerning the methodologies used for analyzing applied loads may lead to increased loads on the RPV and internals components, which could potentially invalidate the I&E criteria of some of the BWRVIP guidelines. In light of this concern, the staff requested that the licensee describe how the latest revisions of the above SCs and other related SCs have been or will be addressed for NMP1 and 2, and identify whether the loads on the RPV internals have been revised based on these SCs.

The licensee's provided a discussion of the GEH SCs and their potential impact on the validity of the BWRVIP I&E guidelines for adequate aging management of the RVI components. The licensee identified that for those SCs that are applicable to the RVI component design at NMP1 and 2, the applied loading conditions were evaluated based on the information provided in the SCs. For those RVI components that required revisions to the loading conditions based on the SCs (with the exception of SC 11-07), the licensee stated that corrected loads were applied to the applicable RVI components, as directed in the SCs. For SC 11-07, and the LOCA-condition acoustic loading issue raised therein, the licensee stated that resolution of this potential issue for NMP1 and 2 is addressed through ongoing BWR Owner Group (BWROG) efforts.

The NRC staff determined that the licensee's RAI response adequately described how it has addressed or is addressing the applied loading issues (as raised in the GEH SCs) on the NMP1 and 2 RVI components. Regarding BWR licensees' responses to SC 11-07, SC 12-20, Revision 1, SC 13-08, "Shroud Support Plate-to-Vessel Evaluation for [Acoustic] Loads," and SC 14-03, "Acoustic Load Pressure Difference on Access Hole Cover," the NRC is currently pursuing resolution of these outstanding loading issues on a generic basis with the BWROG and the BWRVIP, and therefore the final evaluation to resolve these issues is not necessary for staff authorization of BWR licensee's plant-specific requests for alternatives to implement BWRVIP guidelines in lieu of the ASME Code, Section XI, Category B-N-1 and B-N-2 examination requirements. The staff found that the licensee's RAI response provides reasonable assurance that NMP1 and 2 are appropriately engaged in the ongoing efforts to resolve the RVI applied loading issues raised in the SCs.

SUMMARY

In summary, the staff finds that the BWRVIP I&E guidelines require more frequent and more comprehensive inspections of the RVI components for aging effects than those required by the ASME Code, Section XI, Category B-N-1 and B-N-2. Therefore, subsequent inspections of the RVI components per the applicable BWRVIP I&E guidelines will provide reasonable assurance that any emerging aging effects will be identified in a timely manner. In addition, the more frequent inspections of the RVI components in accordance with these BWRVIP guidelines will enable the licensee to effectively monitor the existing aging degradation in the RPV interior surfaces, attachments, and core support structures. Consistent with the determination that was made in the staff's SEs that approved each of the cited BWRVIP inspection requirements, the licensee's proposed alternative will therefore comprehensively identify and evaluate aging degradation of the RVI components at NMP1 and 2. Accordingly, the staff finds that the implementation of the inspection requirements specified in the licensee's proposed alternative will ensure that the integrity of the RVI components at NMP1 and 2 will be maintained with an acceptable level of quality and safety.

If the licensee wishes to take exceptions to, or deviations from, the staff-approved BWRVIP inspection guidelines authorized in this ASME Code alternative, the licensee must revise and resubmit its request for authorization to use the proposed alternative under 10 CFR 50.55a.

The staff acknowledges that the BWRVIP Executive Committee periodically revises the BWRVIP guidelines to include enhancements to inspection techniques and flaw evaluation methodologies. While the licensee may choose to implement enhancements described in a revised version of a BWRVIP inspection guideline, the licensee must also continue to meet the requirements of the version of the BWRVIP inspection guideline that forms the safety basis for the staff-authorized alternative to the requirements of the ASME Code, Section XI, under 10 CFR 50.55a(z). The licensee may, of course, also choose to return to complying with the inspection requirements of the ASME Code of Record for NMP1 and 2.

5.0 CONCLUSION

Based on its review of the information provided in the licensee's April 10, 2015, submittal for Requests 1ISI-004 and 2ISI-013, as supplemented by its November 24, 2015, RAI response, the staff concludes that the licensee's proposed alternative to implement the BWRVIP I&E guidelines in lieu of the ASME Code, Section XI, Category B-N-1 and B-N-2 examination requirements will ensure that the integrity of the RPV interior surfaces, attachments, and core support structure is maintained with an acceptable level of quality and safety.

Therefore, pursuant to 10 CFR 50.55a(z)(1), the licensee's proposed alternative is authorized for the fourth and third ten-year ISI intervals at NMP1 and 2, respectively, with the condition that in the event the licensee wishes to take exceptions to, or deviations from, the staff-approved BWRVIP I&E guidelines authorized in this alternative, the licensee must revise and resubmit its request for authorization to use the proposed alternative under 10 CFR 50.55a.

All other requirements of the ASME Code, Section XI, for which an alternative has not been specifically requested, remain applicable, including third party review by the Authorized Nuclear In-service Inspector. Any ASME Code, Section XI, RVI components that are not included within

the scope of this request for alternative shall continue to be inspected in accordance with the ASME Code, Section XI requirements, and the I&E guidelines addressed in the applicable BWRVIP reports shall continue to be implemented for the non-ASME Code, Section XI, RVI components at NMP1 and 2.

Principle Contributor: Christopher Sydnor

Date: April 29, 2016

relevant BWRVIP reports should be implemented for the non-ASME Code, Section XI, RVI components at NMP, Units 1 and 2.

If you have any questions, please contact Ms. Brenda Mozafari at 301-415-2020 or via e-mail at Brenda.Mozafari@nrc.gov.

Sincerely,

/RA/

Travis L. Tate, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-220 and 50-410

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