

November 8, 2016

Mr. Tim Hanley
Senior Vice President West Operations, Exelon
Chairman, BWR Vessel and Internals Project
3420 Hillview Avenue
Palo Alto, CA 94304-1395

SUBJECT: FINAL SAFETY EVALUATION, "APPENDIX B TO BWRVIP-139-A: BWR VESSEL AND INTERNALS PROJECT, STEAM DRYER INSPECTION AND FLAW EVALUATION GUIDELINES" (TAC NO. ME2188)

Dear Mr. Hanley:

By letter dated February 21, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14071A468), the Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review, topical report (TR), "Appendix B To BWRVIP-139-A: BWR Vessel And Internals Project, Steam Dryer Inspection And Flaw Evaluation Guidelines." The original submittal was supplemented by a letter from the BWRVIP dated October 21, 2015 (ADAMS Accession No. ML15299A216), in response to requests from NRC staff for additional information.

By letter dated June 29, 2016 (ADAMS Accession No. ML16098A355), an NRC draft safety evaluation (SE) was provided for your review and comment. By letter dated September 27, 2016 (ADAMS Accession No. ML16277A105), the BWRVIP provided comments on the NRC draft SE. The comments provided by the BWRVIP were related to the identification of proprietary information in the draft SE and some recommendations to change conditions to plant-specific actions that the staff accepted. The NRC staff's disposition of BWRVIP's comments on the draft SE is documented in the final SE enclosed with this letter.

The NRC staff has found that Appendix B to BWRVIP-139-A is acceptable for referencing in licensing applications for nuclear power plants to the extent specified and under the limitations delineated in the TR and in the enclosed final SE. The final SE defines the basis for our acceptance of the TR.

Our acceptance applies only to material provided in the subject TR. We do not intend to repeat our review of the acceptable material described in the TR. When the TR appears as a reference in licensing action requests, our review will ensure that the material presented applies to the specific plant involved. Requests for licensing actions that deviate from this TR will be subject to a plant-specific review in accordance with applicable review standards.

In accordance with the guidance provided on the NRC website, we request that the BWRVIP publish approved proprietary and non-proprietary versions of Appendix B to BWRVIP-139-A within 6 months of receipt of this letter. The approved versions shall incorporate this letter and the enclosed final SE after the title page. Also, they must contain historical review information, including NRC requests for additional information and your responses. The approved versions shall include an "-A" (designating approved) following the TR identification symbol.

As an alternative to including the RAIs and RAI responses behind the title page, if changes to the TR were provided to the NRC staff to support the resolution of RAI responses, and if the NRC staff reviewed and approved those changes as described in the RAI responses, there are two ways that the accepted version can capture the RAIs:

1. The RAIs and RAI responses can be included as an Appendix to the accepted version.
2. The RAIs and RAI responses can be captured in the form of a table (inserted after the final SE) which summarizes the changes as shown in the approved version of the TR. The table should reference the specific RAIs and RAI responses, which resulted in any changes, as shown in the accepted version of the TR.

If future changes to the NRC's regulatory requirements affect the acceptability of this TR, the BWRVIP will be expected to revise the TR appropriately or justify its continued applicability for subsequent referencing. Licensees referencing this TR would be expected to justify its continued applicability or evaluate their plant using the revised TR.

Sincerely,

/RA/

Kevin Hsueh, Chief
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 704

Enclosure:
Final SE (Non-Proprietary)

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Sincerely,

/RA/

Kevin Hsueh, Chief
Licensing Processes Branch
Division of Policy and Rulemaking
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Enclosure:

Final SE (Non-Proprietary)

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SAFETY EVALUATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
EPRI TR NO. 1018794, "BWRVIP-139-A: VESSEL AND INTERNALS PROJECT,
BWR STEAM DRYER INSPECTION AND FLAW EVALUATION GUIDELINES."
APPENDIX B, "DEMONSTRATION OF COMPLIANCE WITH
THE TECHNICAL INFORMATION REQUIREMENTS
OF THE LICENSE RENEWAL RULE [10 CFR 54.21]"
PROJECT NO. 704

1.0 INTRODUCTION AND BACKGROUND

1.1 Background Information

By letter dated May 11, 2005, the Electrical Power Research Institute (EPRI) Boiling Water (BWR) Reactor Vessel and Internals Project (BWRVIP) submitted Proprietary EPRI Technical Report (TR) No. 1018794, "BWRVIP-139-A: BWR Vessel and Internals Project Steam Dryer Inspection and Flaw Evaluation Guidelines," to the U.S. Nuclear Regulatory Commission (NRC or Commission). This report provides a set of staff-approved inspection criteria that may be used for early detection of cracking in BWR steam dryer assembly designs. The guidelines in the TR identify the critical locations in the steam dryer assemblies that are susceptible to cracking. The TR also provides recommendations for inspecting these locations and for evaluating any cracking that may be detected in these steam dryer assembly locations. The staff's safety evaluation (SE) endorsing the augmented inspection and flaw evaluation (I&E) guidelines in TR No. BWRVIP-139-A was issued in an SE dated July 30, 2008.

On February 21, 2014, the BWRVIP submitted proprietary Appendix B to the BWRVIP-139 report. This appendix provides the BWRVIP's basis for using the methodology in the BWRVIP-139-A report to comply with the license renewal requirements that are specified in Part 54 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 54 or the license renewal (LR) Rule).

1.2 Summary of Technical Information in BWRVIP-139 and Appendix B of the Report

The BWRVIP-139 report is based on a proprietary I&E methodology for the inspection, monitoring, and evaluation of BWR steam dryer components. Appendix B of the BWRVIP-139 report contains a generic evaluation of the aging effects that are applicable to BWR steam dryer components, and proposes applicable condition monitoring (inspection-based monitoring) and evaluation methods for these components so that the impacts of the applicable aging effects on the intended functions of the steam dryer components will be adequately managed during the period of extended operation for the BWR facility.

Enclosure

The BWRVIP identifies that the evaluation in Appendix B of the BWRVIP-139 report applies to BWR applicants who: (a) have committed to implementing BWRVIP-139-A as part of the augmented I&E bases for their BWR steam dryer assemblies, and (b) have found that it is appropriate to incorporate the BWRVIP-139 report and Appendix B of the report by reference into the BWR reactor vessel internals (RVI) aging management program (AMP) that will be used to manage the effects of aging in the steam dryer assembly components during the period of extended operation. Specifically, the BWRVIP addresses how the BWRVIP-139 methodology may be used for compliance with the aging management requirements in the LR Rule.

As such, BWRVIP-139-A, Appendix B accomplishes the following general objectives with respect to compliance with the LR Rule:

- describes the steam dryer and its intended functions
- describes the steam dryer components that are subject to an aging management review (AMR)
- describes the aging effects that may be applicable to the steam dryers in BWR Model 2–6 reactor designs
- addresses and discusses the topic of time-limited aging analysis (TLAA) for BWR steam dryers
- addresses and discusses the topic of regulatory exemptions for BWR steam dryers
- addresses and discusses the topic of identifying applicable technical specification changes that would be needed for aging management of BWR steam dryers
- addresses and discusses activities that would be needed to comply with the Commission's LR applications (LRA) decision criteria requirements in 10 CFR 54.29

The BWRVIP has identified that some of information in BWRVIP-139, Appendix B constitutes trade secrets (i.e., proprietary information) that need to be withheld from disclosure to the general public in accordance with the "privileged information" withholding requirements in 10 CFR 2.390.

2.0 REGULATORY EVALUATION

2.1 Applicable Requirements

The Commission's regulations for submitting LRAs are given in the LR Rule. The LR Rule includes (in part) requirements on the following topics:

- 10 CFR 54.4 – scoping of structures, systems and components
- 10 CFR 54.21(a)(1) – performance of an integrated plant assessment (IPA) and determination of structures, systems, and components subject to an AMR
- 10 CFR 54.21(a)(3) – management of applicable aging effects
- 10 CFR 54.21(c)(1) – identification of applicable analyses that conform to the definition of a TLAA in 10 CFR 54.3(a)

- 10 CFR 54.21(d) – Final Safety Analysis Report (FSAR), Updated Final Safety Analysis Report (UFSAR), or Updated Safety Analysis Report (USAR) supplement summary descriptions for each AMP and TLAA that is included in an LRA.

2.2 Applicable NRC and Industry Guidelines for Aging Management

Nuclear Energy Institute (NEI) Guideline No. NEI 95-10, Revision 6, “Industry Guidelines for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule,” provides guidelines for formatting LRAs submitted in accordance with 10 CFR Part 54. NEI 95-10, Revision 6, identifies that the AMPs in the Generic Aging Lessons Learned (GALL) Report may be adopted as the basis for managing the effects of aging in structures or components (SCs) that are required to be screened in for an aging management review in accordance with 10 CFR 54.21(a)(1); however, the staff permits applicants for license renewal to develop their own plant-specific AMPs for aging management.

The staff’s recommended guidelines for developing AMPs are given in Sections A.1.2.2 and A.1.2.3 of NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR), Appendix A.1, *Aging Management Review - Generic (Branch Technical Position RLSB-1)*. The AMPs provided in Chapter XI of NUREG-1801, Revision 2, “Generic Aging Lessons Learned (GALL) Report,” represent a set of generic staff-approved AMPs. These AMPs provide the recommended bases for satisfying the ten generic program elements recommended for AMPs in Branch Technical Position RLSB-1. The staff’s current AMP that is recommended for aging management of BWR RVI components (including those BWR steam dryer assemblies) is given in Chapter XI.M9, “BWR Vessel Internals,” of the GALL Report, Revision 2 (i.e., GALL AMP XI.M9). GALL AMP XI.M9 defines a set of generic program element criteria that, if implemented, would be acceptable to manage age-related degradation BWR RVI components. The “Scope of Program” program element in GALL AMP XI.M9 references the BWRVIP-139 report methodology as a valid BWRVIP I&E basis for managing age-related degradation that may develop in BWR steam dryer assembly components.

3.0 TECHNICAL EVALUATION

BWRVIP-139-A and Appendix B of the report provide a generic I&E methodology that may be used to manage the effects of aging applicable to BWR steam dryer components so that their intended functions will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. This evaluation applies to BWR applicants who have committed to implementing the BWRVIP-139 report and want to incorporate the report and Appendix B of the report by reference into the AMP that will be used to manage the effects of aging in the applicant’s BWR RVI components, including those in the plant’s steam dryer assembly components.

The methodology in BWRVIP-139-A was evaluated and accepted on July 30, 2008. The staff will focus this evaluation on how BWRVIP-139-A, as supplemented by information in Appendix B of the report, can be used as part of a plant-specific scoping assessment and IPA for

complying with the requirements in the LR Rule, and how this basis conforms to the recommended aging management guidance for BWR steam dryer components in Revision 2 of the GALL and SRP-LR reports.

The staff's endorsement of the BWRVIP-139 report in GALL AMP Chapter XI.M9 is based on the understanding that BWR license renewal applicants applying the report's methodology as the aging management bases for their steam dryer assembly components will address any limitations, conditions, or actions that are placed on the report's methodology as part of their LRAs. The staff's practice is to identify any limitations, conditions, or action items on the BWRVIP I&E report in its license renewal safety evaluation reports (LR-SERs) for the topical or technical reports. Section 4 of this LR-SER addresses the limitations, conditions, and action items that are relevant to the methodologies in BWRVIP-139-A and TR No. BWRVIP-139, Appendix B.

The methodology in BWRVIP-139 is referenced in GALL AMP XI.M9 as the current BWRVIP I&E methodology for managing age-related degradation that is applicable to steam dryer assembly components. Upon issuance of this LR-SER, the staff will use one of the following methods to update the specific references in GALL AMP XI.M9 for BWR steam dryer assembly I&E guidelines: (a) issue an interim staff guidance document report that will update the references to those in BWRVIP-139-A, and Appendix B of the report, or (b) update the references accordingly in the next update of the GALL report.

3.1 Proprietary Contents in BWRVIP-139, Appendix B

The report in BWRVIP-139, Appendix B, is designated by EPRI as containing proprietary information or trade secrets that should be protected from disclosure to members of the general public. For those portions of the report designated as constituting proprietary information or EPRI-defined trade secrets, EPRI requested that the information be withheld in accordance with the proprietary withholding requirements in 10 CFR 2.390.

The staff agreed that all proprietary information in BWRVIP-139, Appendix B, were trade secrets that should be withheld from public disclosure in accordance with the proprietary withholding requirements in 10 CFR 2.390, with the exception of the proprietary designations for specific contents in Sections B.3 (a) and (b) of the report, and specific proprietary statements in Section B.1 of the report which relate to 10 CFR 54.4 scope requirements. For these sections, the staff determined that the contents of the proprietary information did not meet the criteria for withholding in 10 CFR 2.390 because the information was either not of a type customarily withheld from members of the general public, or the information was already of a type that is available in the public domain. By letter dated October 21, 2015, EPRI responded to requests for additional information (RAIs), BWRVIP-139-Appendix B-1, BWRVIP-139-Appendix B-2, and BWRVIP-139-Appendix B-3, and stated that the proprietary version of BWRVIP-139-A Appendix B will be revised to reflect that the subject paragraphs are no longer considered "Trade Secrets" of EPRI. Since the revised proprietary report will be amended to designate the subject information as non-proprietary portions of the report, RAIs BWRVIP-139-Appendix B-1, BWRVIP-139-Appendix B-2, and BWRVIP-139-Appendix B-3 are resolved.

3.2 Scoping of BWR Steam Dryer Components for Application to BWR LRAs

The staff noted that, in BWRVIP-139, Appendix B, BWRVIP identifies that BWR steam dryers do not service any safety-related intended functions (as defined in 10 CFR 54.4(b)) that would require a BWR license renewal application to bring them to be within the scope of an LRA, as required by the scoping basis in either 10 CFR 54.4(a)(1)(i), (ii), or (iii). However, the BWRVIP identified that a failure of a steam dryer assembly component could result in a loose part that could potentially impact the ability of a safety-related component to achieve an intended safe shutdown or accident mitigation function. Therefore, the BWRVIP identified that BWR steam dryer assemblies and their components need to be within the scope of a BWR LRA because the dryers conform to the “scoping definition” for non-safety-related components in 10 CFR 54.4(a)(2). The BWRVIP also identifies that structural integrity is the license renewal intended function for BWR steam dryer components.

The staff noted that, although the steam dryer assembly does not fulfill any of the safety-related functions defined in paragraph 54.4(a)(1) of the LR Rule, the BWRVIP’s scoping basis is in conformance with the scoping requirements in 10 CFR 54.4(a)(2). Based on this review, the staff finds that the BWRVIP has defined an acceptable scoping basis for steam dryer assembly components because the staff has verified that the BWRVIP’s basis is in compliance with the requirement in 10 CFR 54.4(a)(2).

3.3 Screening of BWR Steam Dryer Components for Application to BWR LRAs

Appendix B of the BWRVIP-139 report includes Section B.2, “Steam Dryer Components Subject to Aging Management Review.” The regulation in 10 CFR 54.21(a)(1) identifies that the SCs subject to an AMR are those SCs that have been scoped in for license renewal in accordance with 10 CFR 54.4 and that: (a) do not involve moving parts or changes in configuration, and (b) are not subject to replacement based on a qualified life or specified time period.

The staff refers to the SCs that are required to be screened in for an AMR as “passive, long lived” SCs for the LRA. It was not evident whether the BWRVIP was making a determination that all steam dryer components would need to be within the scope of an AMR or whether only those steam dryer components that are defined as “passive, long-lived” components would need to be within the scope of an AMR.

By letter dated March 11, 2015, the staff issued RAI No. BWRVIP-139-Appendix B-4 to address this issue. In this RAI, the staff asked the BWRVIP to clarify whether the quoted paragraph above is intended to mean that all BWR steam dryer components need to be the subject of an AMR, or whether only those steam dryer components that are defined as being “passive, long lived” need to be the subject of an AMR.

The BWRVIP responded to RAI No. BWRVIP-139-Appendix B-4 in a letter dated October 21, 2015. In this letter, the BWRVIP clarified that the statement in RAI No. BWRVIP-139-Appendix B-4 applies to all steam dryer assembly components that are passive and long-lived. The BWRVIP clarified that all steam dryer assembly components would be subject to an AMR, as

none of the components are subject to moving parts or subject to replacement based on a specified frequency or qualified life. Based on this clarification, the staff noted that the BWRVIP's basis would define all steam dryer assembly components as being within the scope of AMR. The staff finds this basis to be acceptable because it is in compliance with the AMR screening requirements that are defined in 10 CFR 54.21(a)(1). RAI No. BWRVIP-139-Appendix B-4 is resolved.

Based on this review, the staff finds that the BWRVIP has defined appropriate AMR screening basis for steam dryer assembly components that are in compliance with the AMR screening criteria given in 10 CFR 54.21(a)(1).

3.4 Aging Effects Requiring Management (AERMs) for Steam Dryer Assembly Components

Section B.3.(a) of Appendix B of the BWRVIP-139 discusses the aging effects and mechanisms that may be generically applicable to the steam dryer assembly components in BWR Model 2–6 reactors, and that require AERMs. The staff noted that the BWRVIP's statements form a basis that BWR license renewal applicants adopting the BWRVIP-139, Appendix B, document may use to identify those aging effects and mechanisms that are applicable to an applicant's steam dryer components, and would need to be managed in accordance with the requirements in 10 CFR 54.21(a)(3). The staff evaluates the BWRVIP's AERM-identification bases in the subsections that follow:

Cracking

The staff determined that the BWRVIP had provided an acceptable basis for concluding that crack initiation and growth (as induced by stress corrosion cracking, fatigue, or cyclic loading mechanisms) was an applicable AERM because the statement was consistent with industry cracking experience reported for steam dryer cracking in the U.S. BWR industry. Based on this review, the staff concludes that a BWR license renewal applicant may apply the BWRVIP-139, Appendix B report to its design basis, and use the report as the basis for concluding that cracking is an applicable AERM for the steam dryer assembly components at their facility.

Loss of Fracture Toughness due to Thermal Embrittlement

The staff determined that the BWRVIP had provided an acceptable basis for concluding that loss of fracture toughness due to thermal aging embrittlement is not an applicable AERM for these components because the methodology assumes that the steam dryer components in the U.S. BWR industry are not fabricated from any types of stainless steel grades (e.g., cast austenitic stainless steel materials, or martensitic or precipitation-hardened stainless steel materials) that may be susceptible to a potential thermal aging embrittlement mechanism. However, Section IX.F of GALL, Revision 2, identifies that loss of fracture toughness may occur in components made from cast austenitic stainless steel materials as a result of thermal aging embrittlement. In addition, other EPRI documents, such as EPRI TR No. MRP-227-A have identified that loss of fracture toughness due to thermal aging embrittlement may occur in other

types of materials as well, such as some of the martensitic stainless steel grades of material or precipitation hardened martensitic stainless steel grades of material.

Therefore, staff acceptance of the BWRVIP thermal aging embrittlement assessment is predicated on the assumption that the plant-specific design of an applicant's steam dryer assembly is consistent with the design assumptions (including assumptions for materials of fabrication) for the corresponding BWR model assessed in BWRVIP-139 report, or that there has not been any operating experience (OE) that would otherwise indicate that loss of fracture toughness due to thermal aging embrittlement is an AERM for a given steam dryer assembly component.

Plant-specific design differences or plant-specific or generic OE that may impact these AERM conclusions are addressed later in this evaluation. Refer to the evaluation in the SER subsection entitled "Aging Effects and Mechanisms Not Assessed or Managed in TR No. BWRVIP-139, Appendix B – Plant-Specific Design Differences or Operating Experience Considerations."

Aging Effects Induced by Irradiation

The staff found that the BWRVIP had provided an acceptable basis for concluding that aging effects induced or assisted by irradiation effects (e.g., cracking induced by irradiation-assisted stress corrosion, irradiated stress relaxation in bolted steam dryer connections, or loss of fracture toughness due to neutron irradiation) are not applicable AERMs because the steam dryers are typically located above the reactor core regions and the flux fields at such locations are not sufficiently high enough to induce these types of radiation induced aging effects in any stainless steel or nickel alloy materials used for fabrication of the steam dryer assemblies and their components.

Loss of Material due to Pitting Corrosion or Crevice Corrosion and Loss of Material due to Wear

The staff noted that the BWRVIP concluded that loss of material due to pitting corrosion or crevice corrosion was not an AERM for steam dryer components, at least from a BWRVIP-139 I&E methodology perspective. The staff noted that this type of basis was not consistent with the position taken in NUREG-1800, Revision 2, Appendix A.1 (Branch Position RLSB-1), which states that:

An aging effect should be identified as applicable for license renewal even if there is a prevention or mitigation program associated with that aging effect. For example, water chemistry, a coating, or use of cathodic protection could prevent or mitigate corrosion, but corrosion should be identified as applicable for license renewal, and the AMR should consider the adequacy of the AMP referencing water chemistry, coating, or cathodic protection.

Consistent with this branch position statement, GALL AMR Item IV.B1.RP-26 identifies that: (a) loss of material due to pitting or crevice corrosion may be an applicable AERM for stainless

steel or nickel alloy BWR RVI components (including those in steam dryer assemblies), and (b) BWR applicants may use a combination of AMPs that correspond to the AMPs in GALL AMP XI.M1, "ASME Section XI Inservice Inspection," Subsections IWB, IWC, and IWD, and GALL AMP XI.M2, "Water Chemistry," to manage loss of material that may initiate in stainless steel or nickel alloy BWR RVI components as a result of pitting or crevice corrosion aging mechanisms. Thus, the staff found that the BWRVIP statements on this matter were contradictory because the BWRVIP stated that loss of material due to corrosion is not an AERM requiring management, but acknowledged that this AERM would be managed through implementation of the AMP that implements the BWR Water Chemistry Guidelines in EPRI TR No. BWRVIP-190. Although the staff acknowledges that BWR steam dryers are not ASME Section XI components for the CLB, the staff did not understand why the BWRVIP would not conservatively credit implementation of an applicant's BWR primary water chemistry program (either by itself or in conjunction with the implementation of the BWRVIP-139 guidelines, as implemented as part of the applicant's BWR RVI management program) to manage loss of material due to pitting corrosion or crevice corrosion.

Instead, the staff determined that the AERM basis should have identified that loss of material due to pitting or crevice corrosion was an applicable AERM for stainless steel or nickel alloy BWR steam dryer components and that the AMPs corresponding to GALL AMP X.M2, "Water Chemistry," and GALL AMP XI.M9, "BWR Vessel Internals," will be used to monitor and manage any loss of material that could be occurring in the components as a result of pitting or crevice corrosion mechanisms. The staff determined that, under these programs, the existing water chemistry guidelines in BWRVIP TR No. BWRVIP-190 and visual inspection methods implemented in accordance with BWRVIP TR No. BWRVIP-139 would be sufficient to identify any loss of material that could be occurring in the BWR steam dryer components as a result of these aging mechanisms.

The staff also noted that the BWRVIP-139, Appendix B, report does not identify loss of material due to wear as an aging effect and mechanism of concern for steam dryer assembly components. The BWRVIP's basis for drawing this conclusion is that any wear in U.S. BWR steam dryers has been negligible. However, in the BWRVIP-139-A report, the BWRVIP

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Based on OE reflecting licensee actions to address steam dryer wear, the staff noted that the methodology in TR No. BWRVIP-139, Appendix B, should be amended to identify loss of material due to wear (or similar mechanical mechanisms, such as flow induced vibrations, abrasion, or erosion) as an additional applicable aging effect/mechanism that may occur in BWR steam dryer assemblies and their subcomponents during the period of extended operation. The staff also noted that specific "detection of aging effect," "monitoring and trending," "acceptance criteria," and "corrective action" program element recommendations should be established in BWRVIP-139, Appendix B, to manage this aging effect/mechanism combination.

By letter dated March 11, 2015, the staff issued RAI No. BWRVIP-139-Appendix B-5 to address this issue. Specifically, in light of the applicable OE with steam dryer wear at the [] facilities, the staff asked the BWRVIP to provide its basis why loss of material due to wear was an applicable aging effect requiring management for BWR steam dryer assemblies and their subcomponents. In addition, the staff asked the BWRVIP to provide its basis (i.e., justify) why the BWRVIP had not credited either []

would be entered into a BWR applicants corrective action program and assessed for its impact on both the safety related components at the plants and the applicant's bases (i.e., program element criteria) for implementing the BWRVIP-139-A guidelines under the scope of the licensee's BWR Vessel Internals program.

The BWRVIP responded to RAI No. BWRVIP-139-Appendix B-5 in a letter dated October 21, 2015. In this letter, the BWRVIP concluded that loss of material due to wear does not need to be identified as an AERM for BWR steam dryer assembly components. The applicant's response used the following factors as the main basis for drawing this conclusion:

- The steam dryer assembly does not perform a safety function and is not required to prevent or mitigate the consequences of accidents.
- Although the steam dryer is not a safety related component, the steam dryer is designed to withstand design basis events without the generation of loose parts—the ability to shut down the reactor (control rod insertion), provide adequate core cooling, and the ability to isolate the main steam lines must be assured, and this requirement can be met by assuring that the dryer support ring and dryer skirt remain intact.
- BWR steam dryer assembly components would be adequately monitored for wear through the implementation of other AMPs or inspection programs, such as inspections of reactor vessel steam dryer lugs or support brackets performed in accordance with GALL AMP XI.M4, BWR ID Attachment Welds, or ASME Section XI Code inspections.

In the RAI response, the BWRVIP states that the visual inspections implemented under the BWRVIP-139 methodology would be capable of detecting and demonstrating the presence of any wear indications that may be occurring in steam dryer assembly components. Therefore, the staff noted that loss of material due to wear should have been identified as an applicable AERM for BWR steam dryer assembly components based on the following arguments:

- The BWRVIP-139-A inspection methods are capable of detecting wear indications.
- Some licensees have reported the occurrence of wear in their steam dryer assemblies.

¹ VT-1 and VT-3 visual examination methods are defined in designated Editions and Sections of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Division 1, and constitute ASME copyrighted material. Reference to these types of inspection techniques is being done with the permission of ASME International.

- The licensees reporting the wear-related operating experience dispositioned the wear indications in the steam dryer assembly components through implementation of their plant-specific corrective action programs.
- The current BWR licensee basis for detecting, managing, and dispositioning loss of material due to wear in BWR steam dryer assembly components relies on condition monitoring that is consistent with the implementation of program elements in GALL AMP XI.M9, BWR Vessel Internals.

The staff also noted that the BWRVIP basis was inconsistent with the actual basis used by licensees in the BWR industry to monitor and detect indications of wear and to disposition any wear indications through implementation of the licensee's corrective action program. Therefore, based on this review, the staff concludes that loss of material induced by wear or flow-induced vibrations should be included and addressed as an applicable AERM in the BWRVIP-139, Appendix B report.

The staff requests that the BWRVIP-139, Appendix B, report be amended to identify loss of material due to wear as an applicable AERM for BWR steam dryer assembly components, and to credit the existing BWRVIP-139 visual examination methods as the basis for monitoring, detecting, and managing loss of material that may be induced in BWR steam dryer assembly components as a result of this aging effect and mechanism combination. This is Technical Report Condition Item (TRCI) No. 1 on the BWRVIP-139, Appendix B methodology.

Aging Effects and Mechanisms Not Assessed or Managed in TR No. BWRVIP-139, Appendix B—Plant-Specific Design Differences or Operating Experience Considerations

The staff also observed that the aging effect statements in Section B.3 of Appendix B of the BWRVIP-139 report could lead to a conclusion that an applicant applying for license renewal of its BWR facility would not need to identify aging effect/mechanism combinations if they were not reported as AERMs in Section B.3 of the report. The staff noted that this may be too limiting of a basis for identifying AERMS because the AERM identification basis was not entirely consistent with the LR Rule, or the recommended bases for identifying potential aging effects in Branch Technical Position RLSB-1 (i.e., in Section A.1.2.1 of NUREG-1800, Revision 2, Appendix A.1).

Section 2.1 of this LR-SER discusses the requirements for performing plant-specific IPAs as part of a BWR applicant's LRA review proceeding, as mandated by the requirements in Paragraph 54.21(a)(1) of the LR Rule (i.e., 10 CFR 54.21(a)(1)). Paragraph 54.21(a)(1) of the LR Rule requires the IPA for a license renewal applicant's facility to be performed on a plant-specific basis, based on a comparison to the CLB, and current design basis for the facility. The information in the BWRVIP-139, Appendix B of the report, cannot be used as the sole basis for performing this IPA since that IPA must be performed by the applicant based on a comparison to the applicant's CLB, which includes the current design basis for the facility.

In relation to AERM identification criteria, Section A.1.2.1 of the SRP-LR (in Branch Technical Position RLSB-1) makes the following statement relative to the identification of postulated aging effects:

The applicable aging effects to be considered for license renewal include those that could result from normal plant operation, including plant/system operating transients and plant shutdowns.

This SRP-LR statement bases its AERM identification basis on the expectation of aging effects and mechanisms that are reasonably postulated to occur during normal plant operations. Thus, lack of past OE with a given aging effect and mechanism combination is not by itself a sufficient basis for concluding that a given aging effect and mechanism combination does not need to be identified as an applicable AERM.

Specifically, the staff noted that there could be additional OE that has yet to be assessed by the ERPI BWRVIP for its impact on AERM statements and conclusions stated in Section B.3 of the BWRVIP-139, Appendix B report. The staff also noted that there could be specific differences in the design of a given steam dryer component from that assumed for the applicable BWR model (i.e., BWR-2 – BWR 6 model) in either BWRVIP-139 or Appendix B of the report, such that the design differences would render the BWRVIP AERM conclusions invalid. Thus, for incoming LRAs, these types of considerations would need to be assessed to determine whether additional AERMs would need to be identified on a plant-specific basis, and if so, how the additional AERMs would be managed in accordance with the requirement in 10 CFR 54.21(a)(3). Therefore, the staff concludes that the following plant-specific applicant/licensee action item (A/LAI) is needed to resolve this issue on a plant-specific basis:

- a. BWR applicants for license renewal are requested to perform a review of the CLB and design basis of their facilities to determine whether there are any design differences in their steam dryer designs or steam dryer-related OE that is applicable for their BWR design. Specifically, BWR applicants for license renewal are requested to perform a review of the CLB and design basis of their facilities to determine whether there are any additional aging effects that might be applicable to the designs of their BWR steam dryer assemblies in addition to those that are mentioned as being applicable aging effects/mechanisms requiring management (AERMs) in BWRVIP-139, Appendix B.
- b. For those BWR license renewal applicants that identify additional AERMs beyond those listed in BWRVIP-139, Appendix B, the applicants should include applicable GALL-based or plant-specific AMR items in the LRAs that identify the additional aging effects that are applicable to their steam dryer designs, and should identify and justify the AMP or TLAA that will be used to manage those aging effects during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This is A/LAI No. 1, Parts a. and b.

3.5 Use of inspection and flaw evaluation (I&FE) Methodology in BWRVIP-139-A for Management of Aging in BWR Steam Dryer Assemblies and Their Components

Relationship of TR No. BWRVIP-139, Appendix B, to AMP X.M9, "BWR Vessel Internals"

The program in GALL AMP XI.M9, "BWR Vessel Internals," provides an acceptable AMP that may be used to manage those aging effects that may occur in RVI components in BWR designs. This includes those aging effects that may occur in the steam dryer assemblies and their subcomponents. The staff noted that, currently, GALL AMP XI.M9, invokes the current methodology in TR No. BWRVIP-139-A as the basis for managing aging that may occur in BWR steam dryer assemblies and their components.

By letter dated March 11, 2015, the staff issued RAI No. BWRVIP-139-Appendix B-6. In this RAI, the staff asked the BWRVIP to provide its basis why the BWRVIP-139, Appendix B report methodology did not contain any applicable guidelines regarding the relationship between the AMP that will be applied to an applicant's BWR RVI components, and the methodology in BWRVIP-139-A that will be applied to the BWR steam dryer components. Specifically, the staff asked the BWRVIP to provide the basis why BWRVIP-139, Appendix B, does not establish that: (a) the methodology in BWRVIP-139-A will need to be incorporated into the scope of the plant-specific or GALL-based AMP that will be applied to an applicant's BWR RVI components, and (b) the methodology in BWRVIP-139-A will be applied to the steam dryer assemblies and their components as part of the procedural controls for implementing the applicable AMP during a proposed period of extended operation (including proposed subsequent license renewal periods).

The BWRVIP responded to RAI No. BWRVIP-139-Appendix B-6 in a letter dated October 21, 2015. In this letter, the BWRVIP stated that the BWRVIP-139, Appendix B report will be revised to state the following:

Should a utility chose to implement the steam dryer inspection guidance described in BWRVIP-139-A as part of either a GALL-based or plant specific AMP that will be applied to an applicant's BWR steam dryer components, the BWRVIP-139-A methodology will be applied as part of procedural controls for implementing the applicable AMP during a proposed period of extended operation (including proposed subsequent license renewal periods).

Based on this review, the staff finds that BWRVIP-139, Appendix B will include the proper criteria for BWRVIP-139 – AMP relationships. RAI No. BWRVIP-139-Appendix B-6 is resolved.

Adequacy of the BWRVIP-139-A Inspection and Flaw Evaluation Methods During Extended Power Uprate Operating Conditions

The staff found the I&FE methodology in TR No. BWRVIP-139-A would be capable of detecting and managing any cracking or loss of material that may be detected in BWR steam dryer assemblies or their components, with the following exception that the staff determined was in

need of resolution by the BWRVIP. Specifically, the staff noted that some of the BWR plants have been approved by the NRC to implement as much as 20 percent increased power uprate conditions (i.e., 20 percent extended power uprates (EPUs), as proposed by GE-Hitachi as constant pressure power uprates (CPPUs) for the GE BWR fleet) or have requested approval of these types of EPUs as part of their 10 CFR 50.90 license amendment process and are awaiting the staff's final decision on the EPU license amendment requests.

The staff noted that, in the BWRVIP-139-A report, the BWRVIP [

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However, the staff has noted that recent plant experience indicates that cracking may develop very rapidly in existing dryers and replacement steam dryers during operations at full-EPU or partial-EPU power levels (Refer to events summarized in NRC Information Notice (IN) 2013-10, "Programs for Monitoring Boiling-Water Reactor Steam Dryer Integrity." Thus, the staff determined that the BWRVIP would need to provide further justification as to why the current inspection methods, sample sizes, and frequencies in TR No. BWRVIP-139-A were considered to be adequate for aging management when operating under these type of 20 percent EPU conditions.

By letter dated March 11, 2015, the staff issued RAI No. BWRVIP-139-Appendix B-7 to address this matter. Specifically, given the information in IN 2013-10, the staff asked the BWRVIP to provide the basis why the previous visual inspection methods and frequencies in BWRVIP-139-A for detecting and managing cracking would still be adequate to manage fatigue, induced cracking, and intergranular stress-corrosion cracking (IGSCC) in BWR steam dryer components during a proposed period of extended operation, when considered both at partial-EPU and full-EPU operating conditions.

The BWRVIP responded to RAI No. BWRVIP-139-Appendix B-7 in a letter dated October 21, 2015. In this letter, the BWRVIP provided a proprietary RAI response that explained how the proprietary process in BWRVIP-139-A for implementing BWR steam dryer inspections would be capable of detecting and managing cracking in BWR steam dryer assemblies, even under proposed GE CPPU conditions. The staff noted that under this basis, the inspection-based program would be appropriately adjusted if cracking were detected in the components during uprated power conditions. Based on this assessment, the staff finds that the inspection process in BWRVIP-139-A is sufficient to address and manage cracking in BWR steam dryer components, even for plants that have been approved to implement GE CPPUs. RAI No. BWRVIP-139-Appendix B-7 is resolved.

3.6 Referencing of the BWRVIP-139-A Report and Appendix B of the Report in the FSAR, UFSAR, or USAR Supplement

Paragraph 54.21(d) of 10 CFR Part 54 (the LR Rule) requires a license renewal applicant to include a final safety analysis report (FSAR, as may have been updated to a UFSAR or USAR) supplement summary description for each AMP and TLAA that is credited for aging management of the applicant's facility. The LR Rule does not require a BWR license renewal

applicant to include an FSAR, UFSAR, or USAR supplement summary description for each BWRVIP report that is within the scope of an applicant's BWR RVI management program. BWR license renewal applicants that will be applying the BWRVIP-139 report and Appendix B of the report to manage age-related degradation in the BWR steam dryers are requested to describe or reference in the FSAR, UFSAR, or USAR supplement summary description for the BWR RVI management program how the BWRVIP-139 report and Appendix B of the report will be used to manage age-related degradation in the plant's steam dryer during the period of extended operation. This is A/LAI No. 2.

3.7 Identification of TLAAAs that are Applicable to BWR Steam Dryer Components

License renewal applicants are required by 10 CFR 54.21 to identify all analyses in the CLB that conform to the six criteria for defining TLAAAs in 10 CFR 54.3(a). If the CLB does include a steam dryer analysis, which conforms to the definition of a TLAA, the applicant is required to:

- a. include the TLAA in the LRA in accordance with the requirements in 10 CFR 54.21(c)(1);
- b. demonstrate that the TLAA will be acceptable for the period of extended operation in accordance with one of three criteria for accepting TLAAAs in 10 CFR 54.21(c)(1)(i), (ii), or (iii); and
- c. include an FSAR, UFSAR or USAR supplement summary description for the TLAA in the LRA, in accordance with 10 CFR 54.21(d).

These bases are consistent with the guidelines for formatting LRAs in NEI 95-10, Revision 6. This is A/LAI No. 3.

3.8 Special Design Considerations in Need of Assessment - U.S. BWR Steam Dryer Designs Not Assessed in BWRVIP-139-A

The owners of some BWR plants approved for 20 percent CPPU conditions (i.e., a type of EPU designed by the General Electric Company (GE or GE-Hitachi)) have replaced or are planning to replace their existing GE-designed steam dryers with steam dryers that were designed by the Westinghouse Electric Company (i.e., Westinghouse Nordic steam dryers that use hexagonal or orthogonal design symmetries).

The staff noted that the scope of the previous inspection and evaluation methodology in BWRVIP-139-A does not include evaluations of cracking and loss of material due to wear in Westinghouse-design steam dryer components. In addition, the use of Westinghouse-design steam dryers has only been implemented recently in this country. Therefore, the staff noted that the U.S. BWR industry has yet to report any domestic OE with respect to crack-induced or wear-induced failures of Westinghouse steam dryer designs in the USA, especially under full-EPU or partial-EPU operating conditions.

The staff determined that the scope and applicability of the BWRVIP-139-A report, and of BWRVIP-139, Appendix B, only apply to the types of GE-designed steam dryer designs assessed in the BWRVIP-139-A report. The scope and applicability of the BWRVIP-139-A

report and BWRVIP-139, Appendix B, do not apply to U.S. BWRs with Westinghouse Nordic steam dryers or other steam dryer assemblies whose designs are outside of the scope of the designs assessed in the BWRVIP-139-A report. BWR license renewal applicants or licensees whose steam dryer designs differ from those assessed in the BWRVIP-139-A report will need to address aging management of their BWR steam dryer designs on a plant-specific basis. This is Limitation No. 1.

4.0 LIMITATIONS AND CONDITIONS

This LR-SER contains one limitation regarding application of the BWRVIP-139-A report and Appendix B of the report in the design basis for a BWR-designed light water reactor facility. Refer to Section 4.1 of this LR-SER.

This LR-SER contains one TRCI that will require amendment or adjustment of the regulatory and technical criteria in TR No. BWRVIP-139, Appendix B, in order to comply with the NRC's requirements in 10 CFR Part 54, or to conform to applicable aging management guidance in the GALL or SLR-LR reports. Refer to Section 4.2 of this LR-SER.

This LR-SER also contains three Applicant/Licensee Action Items (A/LAIs). BWR license renewal applicants applying the report as part of the aging management protocols for their steam dryer assemblies will need to address these A/LAIs in their LRAs. Refer to Section 4.3 of these LR-SER.

4.1 Limitation – U.S. BWR Steam Dryer Designs Not Assessed in BWRVIP-139-A

The scope and applicability of the BWRVIP-139-A report and BWRVIP-139, Appendix B, only apply to the types of BWR steam dryer designs assessed in the BWRVIP-139-A report. The scope and applicability of the BWRVIP-139-A report and of BWRVIP-139, Appendix B, do not apply to U.S. BWRs with Westinghouse Nordic steam dryers or other steam dryer assemblies whose designs are outside of the scope of the designs assessed in the BWRVIP-139-A report. BWR license renewal applicants or licensees whose steam dryer designs differ from those assessed in the BWRVIP-139-A report will need to address aging management of their BWR steam dryer designs on a plant-specific, case-by-case basis. This is Limitation No. 1.

4.2 Technical Report Condition Item (TRCI)

Consistent with the evaluation that has been provided in Section 3.4 of this LR-SER under the heading "Loss of Material due to Pitting Corrosion or Crevice Corrosion and Loss of Material due to Wear," the staff requests that Section B.3 of the BWRVIP-139, Appendix B, report be amended to: (a) identify loss of material due to wear or flow-induced vibrations as an applicable AERM for BWR steam dryer assembly components, and (b) credit the existing BWRVIP-139 visual examination methods as the basis for monitoring, detecting, and managing loss of material that may be induced in BWR steam dryer assembly components as a result of these aging mechanisms. This is TRCI No. 1.

4.3 Applicant/Licensee Action Items (A/LAIs)

4.3.1 Aging Effects and Mechanisms Not Assessed or Managed in TR No. BWRVIP-139, Appendix B—Plant-Specific Design Differences or Operating Experience Considerations

The regulation in 10 CFR 54.21(a)(3) requires a license renewal applicant to manage all aging effects that are applicable to those plant components that have been scoped in for license renewal in accordance with 10 CFR 54.4 and have been screened in for an AMR in accordance with 10 CFR 54.21(a)(1). Guidelines for identifying applicable aging effects are given in Section A.1.2.1 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR, with the current version being Revision 2 of the report), and in TR No. NEI 95-10 (current NRC-endorsed version of the report is Revision 6 of the NEI report).

- a. BWR applicants for license renewal are requested to perform a review of the CLB and design basis of their facilities to determine whether there are any design differences in their steam dryer designs or steam dryer-related OE that is applicable for their BWR design. Specifically, BWR applicants for license renewal are requested to perform a review of the CLB and design basis of their facilities to determine whether there are any additional aging effects/mechanisms that might be applicable to the designs of their BWR steam dryer assemblies, in addition to those that are mentioned as being applicable aging effects/mechanisms requiring management (AERMs) in BWRVIP-139, Appendix B.
- b. For those BWR license renewal applicants that identify additional AERMs beyond those listed in BWRVIP-139, Appendix B, the applicants should include applicable GALL-based or plant-specific AMR items in the LRAs that identify the additional aging effects that are applicable to their steam dryer designs, and should identify and justify the AMP or TLAA that will be used to manage those aging effects during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This is A/LAI No. 1, Parts a. and b.

4.3.2 Referencing of the BWRVIP-139-A Report and Appendix B of the Report in the FSAR, UFSAR, or USAR Supplement

For demonstration of the requirement in 10 CFR 54.21(d), BWR license renewal applicants applying the BWRVIP-139 report and Appendix B of the report to manage age-related degradation in their BWR steam dryer assemblies shall describe or reference in the applicable FSAR, UFSAR, or USAR supplement summary description for the AMP how the BWRVIP-139 report and Appendix B of the report will be used to manage aging in the plant's steam dryer assembly components during the period of extended operation. This is A/LAI No. 2.

4.3.3 Identification of Time Limited Aging Analyses

License renewal applicants are required by 10 CFR 54.21(c)(1) to identify all analyses in the CLB that conform to the six criteria in 10 CFR 54.3(a) for defining an analysis as a TLAA. For those BWR license renewal applicants that confirm that the CLB includes a steam dryer analysis and the analysis conforms to the definition of TLAA, the applicants shall:

- a. include the TLAA in the LRA in accordance with the requirements in 10 CFR 54.21(c)(1)
- b. demonstrate that the TLAA will be acceptable for the period of extended operation in accordance with one of three criteria for accepting TLAAs in 10 CFR 54.21(c)(1)(i), (ii), or (iii), and
- c. include a FSAR, UFSAR or USAR supplement summary description for the TLAA in the LRA, in accordance with 10 CFR 54.21(d).

These bases are consistent with the guidelines for formatting LRAs in NEI 95-10, Revision 6. This is A/LAI No. 3.

5.0 USE AND REFERENCING OF THE TOPICAL REPORT

License renewal applicants for BWR facilities that confirm that the BWRVIP-139-A report is applicable to the design of their steam dryers may use the report, and Appendix B of the report, as the basis for managing age-related degradation in their steam dryers during the period of extended operation. In this case, the applicant may reference the BWR-139-A and BWRVIP-139, Appendix B, reports as part of the set of NRC-endorsed BWRVIP reports that form the basis of their BWR RVI management programs and may rely on these reports to demonstrate compliance with sections 54.4 and 54.21 of the LR Rule. Under such circumstances, the staff intends to rely on the evaluation in this LR-SER and the staff's review of a BWR license renewal applicant's responses to the A/LAIs that are identified in Section 4.3 of this LR-SER to make the findings required by 10 CFR 54.29 with respect to a particular LRA.

6.0 CONCLUSION

The staff has reviewed the BWRVIP-139 report, as supplemented by information that was submitted by the BWRVIP in Appendix B of the report. With the exception of the limitation stated in LR-SER Section 4.1, and the TRCI that needs to be addressed for staff endorsement of the BWRVIP-139, Appendix B, methodology, the staff concludes that the BWRVIP-139-A and BWRVIP-139, Appendix B, reports provide an acceptable basis for demonstrating that the aging effects for steam dryer assembly designs in the scope of the reports will be adequately managed during the period of extended operation (including subsequent license renewal periods).

For BWR steam dryer assemblies that conform to one of the designs assessed in the BWRVIP-139-A report, a BWR licensee may reference the BWRVIP-139-A and BWRVIP-139, Appendix B, reports in a license renewal application (LRA) and use the methodology as part of its basis for complying with the requirements in the LR Rule (10 CFR Part 54). Applicants

applying the reports to their LRAs are requested to respond to the applicant/licensee action items (A/LAIs) that has been identified in LR-SER Section 4.4 and to include the A/LAI response in their LRAs.

When taken in conjunction with a BWR license renewal applicant's basis for conforming to the conditions in this LR-SER, and the staff's review of the applicant's response to the A/LAIs, the staff concludes that the applicant's BWR RVI management AMP and the referencing of the applicable BWRVIP reports in the AMP should provide the staff with sufficient information to determine whether aging management of the applicant's steam dryer assembly has been done in compliance with 10 CFR 54.21(a)(3). Consistent with the recommendations of the Nuclear Energy Institute TR No. NEI 95-10, Revision 6, BWR license renewal applicants referencing these reports may provide their responses to the applicable A/LAIs in Appendix C of their LRAs.

As stated in LR-SER Section 4.1, this LR-SER does not apply to steam dryers designed by Westinghouse Nordic Company, or to specific steam dryer assembly designs not assessed in the BWRVIP-139-A report. For plants with steam dryer assemblies that are outside of the scope of the designs assessed in BWRVIP-139-A, the licensees or applicants are requested to address the aging management needs of their steam dryer assemblies on a plant-specific, case-by-case basis.

7.0 REFERENCES

1. NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," December 2010. (ADAMS Accession No. ML103490036) ²
2. NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," December 2010. (ML103490041)
3. Title 10 of the *Code of Federal Regulations*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
4. Nuclear Energy Institute Technical Report No. NEI-95-10, Revision 6, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule," June 2005. (ML051860406)
5. NUREG-1800, Revision 2, Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RLSB-1)," December 2010. (ML103490036)
6. Electric Power Research Institute Proprietary Technical Report No. 1018794, "BWRVIP-139-A: BWR Vessel and Internals Project Steam Dryer Inspection and Flaw Evaluation Guidelines," April 30, 2010. (ML101270122 and ML101270123 for the publicly available cover letter and publicly available, redacted version of the report, and

² Henceforth, any ADAMS accession numbers in this reference list will be listed solely by their ML designations.

ML101270119, ML101270120, ML101270121, ML101270124, and ML101270125 for the non-publicly available, proprietary version of the report)

7. Letter from M.J. Maxim, Acting Deputy Director, Division of Policy and Rulemaking, Office of Nuclear Reactor Regulation (USNRC) to R. Libra (Exelon), Chairman, EPRI Boiling Water Reactor Vessel and Internals Project, Submitting the NRC Safety Evaluation (SE) on Electric Power Research Institute Boiling Water Reactor Vessel and Internals Project (BWRVIP) Topical Report (TR) "BWRVIP-139: BWR Vessel and Internals Project Steam Dryer Inspection and Flaw Evaluation Guidelines," July 30, 2008. (ML080810172 for the publicly available cover letter, ML082070332 for the publicly, available, redacted version of the SE, and ML082040417 for the non-publicly available, proprietary version of the SE)
8. Electric Power Research Institute Proprietary Technical Report No. 1018794, "BWRVIP-139-A: BWR Vessel and Internals Project Steam Dryer Inspection and Flaw Evaluation Guidelines," Appendix B, *BWR Steam Dryer, Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule [10 CFR 54.21]*, February 21, 2014. (ML14071A468 for the publicly available cover letter and publicly available, redacted version of the report, and ADAMS ML14071A469 for the non-publicly available, proprietary version of the report)
9. Letter for Joseph P. Holonich (NRC) to Timothy Hanely (Chairman BWRVIP), Request for Additional Information for License Renewal Appendix to "BWRVIP-139: BWR Vessel and Internals Project, Steam Dryer Inspection and Flaw Evaluation Guidelines," March 11, 2015. (ML15015A118 for the publicly available cover letter, ML14349A076 for the publicly, available, redacted version of the RAIs, and ML14349A079 for the non-publicly available, proprietary version of the SE)
10. BWR Vessel and Internals Project (BWRVIP) Letter Entitled "Project No. 704 – BWRVIP Response to NRC Request for Additional Information on Appendix B to BWRVIP-139-A, October 21, 2015. (ML15299A216 for publicly available cover letter and publicly available, redacted version of the RAI responses, and ML15299A217 for the non-publicly available, proprietary version of the RAI responses)
11. NRC Information Notice 2013-10, "Programs for Monitoring Boiling-Water Reactor Steam Dryer Integrity," June 14, 2013. (ML13003A049)

Principle Contributors: James Medoff, NRR/DLR/RARB
Chakrapani Basavaraju, NRR/DE/EMCB
Ganesh Cheruvenki, NRR/DE/EVIB

Date: November 2016

BWRVIP Comment Summary Table

Comment No.	Draft SE Location	Comment Type	Comment	NRC's Response
1	Pg. 5, Section 3.3, first sentence of the fourth para.	Clarification	Do not know what "Non-PS #1" means. There is no such term or section in the BWRVIP's response to RAI B-4. Please clarify.	Non-PS #1 was the initial RAI number reference for the initial draft RAI. Will change referenced RAI number from "Non-PS #1" to RAI No. BWRVIP-139-Appendix B-4
2	Pg. 5, Section 3.3, third sentence of the fourth para.	Editorial	Sentence does not read well. Suggest inserting "that" in front of "would" such that it reads, "...includes all steam dryer assembly components that would be ..."	Sentence will be amended to read: "The BWRVIP clarified that this includes all steam dryer assembly components would be subject to an AMR, as none of the components are subject to moving parts, nor are any of the components or subject to replacement based on a specified frequency or qualified life."
3	Section 3.4, Pg. 7, first para.	Editorial	Suggest changing "OpE" here, and throughout, to the more common acronym, "OE", that is used throughout the industry.	The staff will make a generic change to amend any use of acronym from "OpE" to "OE".
4	Section 3.4, Pg. 9, second para., third bullet	Accuracy	The GALL AMP reference is incorrect. XI.M8 is for BWR penetrations. The correct GALL AMP reference for BWR vessel ID attachment welds is XI.M4.	The staff will correct the referenced AMP to XI.M4, 'BWR Vessel ID Attachment Welds.'
5	Sections 3.6 & 3.7, and 4.2.1 & 4.2.2, Conditions 1 and 2	Clarification	The BWRVIP believes the issues identified as Conditions 1 and 2 are not conditions to place on the use of BWRVIP-139-A and Appendix B. The described requirements are LR Rule requirements that apply specifically to licensees. Thus, these issues should be identified as Applicant/Licensee Action Items (A/LAIs).	The staff will change the regulatory criteria for including an appropriate FSAR Supplement Summary Description for the AMP and for identifying potential Time-Limited Aging Analyses from stated conditions on use of the report to applicant/licensee action items.
6	Section 4.3, TRCI #1	Clarification	The BWRVIP understands that the TRCI is only applicable to the Dryer itself, not the in-vessel support lugs/brackets (which would be covered by BWRVIP-48-A and ASME Section XI Category B-N inspections) and that no other actions besides revising Section B.3 as stated in the TRCI are expected.	That is the understanding of the staff as well. GALL AMP XI.M9 and BWRVIP-139 does not apply to these types of interior attachment welds. Any reactor vessel support lugs or brackets that are attached to the interior of the vessel using interior attachment welds would be subject to inservice inspection in accordance with 10 CFR 50.55a and ASME Section XI Category B-N-2 requirements. AMP XI.M4 and BWRVIP-48-A would be used to implement these ASME code ISI requirements.

7	Section 4.4, identified A/LAIs	Clarification	Other than exhibiting the NRC's safety evaluation in the "-A" version of the BWRVIP-139-A, License Renewal (LR) appendix, no changes to the LR appendix will be made to state the need for compliance with the identified A/LAI. Addressing A/LAIs is the responsibility of licensees separate from the NEI 03-08 requirements of the topical report and its LR appendix	<p>The conditions in SE Section 4.2 have been redefined as applicant/licensee actions items (A/LAIs) and deleted from the scope of the SE for BWRVIP-139 Appendix B report. The Topical Report Condition Item in Section 4.3 has been renumbered to Section 4.2 of the SE and the Section containing the A/LAIs in the draft version of SE, Section 4.4 have been renumbered to Section 4.3. The conditions for FSAR supplements and TLAAs previously given SE Section 4.2 are now addressed as A/LAI Nos. 2 and 3, and have been moved and addressed in new SE Sections 4.3.2 and 4.3.3, respectively. They have also been re-identified as A/LAIs in Sections 3.6 and 3.7 of the SE. Section 4.0 of the SE has been modified accordingly.</p> <p>The staff agrees that the BWRVIP-139, Appendix B, report does not need to be modified to define how an applicant would respond to the A/LAIs that apply to the BWRVIP-139, Appendix B methodology. That is already covered by a different NEI document, and specifically by the criteria in NEI Report No. 95-10, Revision 6 (and not NEI 03-08). Thus, consistent with the NEI document, the staff agrees that this is the responsibility of any BWR applicant requesting license renewal of its facility and proposing to use AMP XI.M9 and BWRVIP-139 and BWR-139, Appendix B for aging management of its steam dryer assembly.</p> <p>However, the SE continues to include Technical Report Condition Item (TRCI) No. 1, which requests that the EPRI BWRVIP amend Section B.3 of the BWRVIP-139, Appendix B, to: (a) identify loss of</p>
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				<p>material due to wear or flow-induced vibrations as an applicable AERM for BWR steam dryer assembly components, and</p> <p>(b) credit the existing BWRVIP-139 visual examination methods as the basis for monitoring, detecting, and managing loss of material that may be induced in BWR steam dryer assembly components as a result of these aging mechanisms.</p> <p>Thus, the staff does expect Section B.3 of BWRVIP-139, Appendix B, to be appropriately adjusted in the –A version of the methodology per the request in TRCI No.1.</p>
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