

December 21, 2009

Document Control Desk  
U. S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Rockville, MD 20852

Attention: Michael McCoppin

Subject: Project No. 704 – Proprietary Information in NRC Draft Safety Evaluation of BWRVIP-182

Reference: Letter from Stacey L. Rosenberg (NRC) to Rick Libra (Chairman, BWR Vessel and Internals Project) “Draft Safety Evaluation for Boiling Water Reactor Vessel and Internals Project Topical Report 1016166, “BWR Vessel and Internals Project, Guidance for Demonstration of Steam Dryer Integrity for Power Uprate (BWRVIP-182)” (TAC NO. MD9427),” dated November 23, 2009

The purpose of this letter is to respond to the requests in the NRC letter referenced above to identify proprietary information and provide comments on any factual errors or clarity concerns in the NRC draft Safety Evaluation (SE) of the BWRVIP document entitled “BWRVIP-182: BWR Vessel and Internals Project, Guidance for Demonstration of Steam Dryer Integrity for Power Uprate.”

Attachment 1 to this letter is the NRC draft SE of BWRVIP-182 transmitted to the BWRVIP by the NRC letter referenced above with EPRI proprietary information identified by yellow shading, vertical bars in the margin and the letters “TS” in the margin. TS signifies that the information is EPRI proprietary and is considered “trade secrets” in accordance with 10CFR2.390.

Attachment 2 is a non-proprietary version of Attachment 1 that deletes the EPRI proprietary information. Attachment 2 is identical to Attachment 1 except the EPRI proprietary information has been deleted.

The BWRVIP has not identified any factual errors or clarity concerns with the enclosed draft SE. Thus, the BWRVIP has no comments on the enclosed draft SE.

Attachment 1 contains EPRI proprietary information. Therefore, a letter requesting that the report be withheld from public disclosure and an affidavit describing the basis for withholding this information are provided as Attachment 3.

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BWRVIP 2009-372

If you have any questions on this subject please call Chuck Wirtz (FirstEnergy, BWRVIP Integration Committee Technical Chairman) at 440.280.7665.

Sincerely,

A handwritten signature in black ink that reads "Rick Libra". The signature is written in a cursive style with a prominent dot over the 'i' in "Libra".

Rick Libra  
Exelon  
Chairman, BWR Vessel and Internals Project

**Attachment 2**  
**Non-Proprietary Version**

**“Safety Evaluation (SE) by the Office of Nuclear Reactor Regulation Boiling Water  
Reactor (BWR) Vessel and Internals Project (BWRVIP) Topical Report 1016166.  
BWRVIP-182: BWR Vessel and Internals Project, Guidance for Demonstration of Steam  
Dryer Integrity for Power Uprate”**

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
BOILING WATER REACTOR VESSEL AND INTERNALS PROJECT  
TOPICAL REPORT "BWRVIP-182: [EPRI REPORT NO. 1016166, JANUARY 2008]  
GUIDANCE FOR DEMONSTRATION OF STEAM DRYER INTEGRITY  
FOR POWER UPRATE" (TAC NO. MD9427)  
PROJECT NO. 704

## 1.0 INTRODUCTION

### 1.1 Background

Recent experience with steam dryers at operating Boiling Water Reactors (BWRs), particularly those operating at extended power uprate (EPU) conditions associated with increased steam line flow velocities, have shown significant degradation in the steam dryers caused by acoustic resonance induced loads. As a result of inspections performed on steam dryers, repairs and modifications have been required at some plants. In some cases, the observed damage has been so extensive that replacement dryers have been installed. Therefore, the Boiling Water Reactor Vessel and Internals Project (BWRVIP) embarked on an effort to develop Topical Reports (TRs) to address steam dryer issues. By letter dated January 30, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080380544), the BWRVIP submitted TR BWRVIP-182 "BWR Vessel and Internals Project, Guidance for Demonstration of Steam Dryer Integrity for Power Uprate," to the U.S. Nuclear Regulatory Commission (NRC) staff for review. By letter dated December 31, 2008 (ADAMS Accession No. ML083650080), the NRC staff sent a request for additional information (RAI) to the BWRVIP. By letter dated April 23, 2009 (ADAMS Accession No. ML091170684), the BWRVIP submitted its responses to the staff's RAIs.

### 1.2 Purpose and Applicability

The purpose of the BWRVIP-182 TR is to provide guidance in demonstrating the structural integrity of BWR steam dryers for power uprates greater than 2% of current licensed thermal power (CLTP) up to EPU conditions. This TR is intended to assist the BWR owners with guidelines and considerations in planning for power uprates. The TR does not address specific methods for predicting steam dryer pressure loading and steam dryer stresses, but presents an overall guidance in defining the process to be followed and criteria to be used when developing, documenting, validating, and applying methods to demonstrate steam dryer integrity.

ENCLOSURE

This TR only addresses steam dryers. The pressure fluctuations inside the main steam lines (MSLs) may also have a detrimental effect on MSL instrumentation and other components such as relief valve operators. Techniques for conducting assessments of potential detrimental effects on components such as relief valve operators as a result of MSL vibrations at power uprate conditions are not in the scope of this TR.

## 2.0 SUMMARY OF THE TOPICAL REPORT

The BWRVIP-182 TR addresses only steam dryer related items such as: (1) screening to assess the potential for MSL acoustic excitation at power uprate, (2) defining MSL local pressure fluctuations based on in-plant tests, (3) prediction of MSL pressures at power uprate from pressure fluctuations measurements at CLTP, (4) defining steam dryer pressure loading at power uprate, (5) steam dryer structural response and stress margin, (6) supporting documentation, (7) power ascension monitoring, and (8) acoustic load mitigation.

The TR defines an overall approach for demonstrating steam dryer structural integrity that allows the use of subscale and full scale tests and analytical methods. The TR also addresses the technical basis, benchmarking, and documentation of any analytical or testing methodologies utilized in demonstrating steam dryer integrity. Specific acceptance criteria and values for key parameters to be used in the evaluation of steam dryers are defined. A description and the staff's evaluation of each section of the BWRVIP-182 TR is provided in Section 3.0, below.

## 3.0 STAFF EVALUATION

The steam dryer does not perform a safety function and is not required to prevent or mitigate the consequences of accidents. However, the steam dryer contributes to the thermal efficiency of the plant. Although the steam dryer is not a safety-related component, it is designed to withstand design basis events using ASME Code design and fabrication guidance. The structural integrity of the steam dryer is important from the perspective in regards to the potential for a degraded steam dryer in a cracked condition may continue to experience significant crack propagation and the associated safety consequences of any loose parts that may be generated.

Guidance on comprehensive vibration assessment programs for reactor internals during preoperational and initial startup testing is provided in Revision 3 of Regulatory Guide (RG) 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals during Preoperational and Initial Startup Testing," which was issued in March 2007. Section 3.9.5 of Appendix-A to the Standard Review Plan provides consideration of potential adverse flow effects on plant systems including steam dryers in BWR nuclear power plants. The BWRVIP-182 TR complies with the guidance provided in RG 1.20.

The staff has reviewed the BWRVIP-182 TR which provides guidance for demonstrating steam dryer integrity for power uprate conditions from the structural adequacy perspective. The TR provides general design guidance and an over-arching approach for demonstrating steam dryer integrity for power uprate. The staff recognizes that this is not a detailed technical methodologies report for demonstrating steam dryer integrity.

Section 1 of the BWRVIP-182 TR provides a brief introduction on the guidance that BWR utilities can follow to demonstrate the structural integrity of the steam dryer for power uprate conditions exceeding 2% of the CLTP. The staff reviewed the information provided in this section and finds it acceptable because the guidance to the industry is reasonable and is in compliance with RG 1.20.

Section 2 of the BWRVIP-182 TR provides an overview of the approach along with a flowchart depicting the process for demonstrating structural integrity of the steam dryer. The need to document the technical basis, benchmarking and uncertainties associated with all methods used in the process of demonstrating steam dryer structural integrity is highlighted. Based on the staff's review of Section 2 of the topical report, the staff identified the need to add several footnotes and requested revisions to the BWRVIP Steam Dryer Integrity Demonstration Flowchart (Figure 2-1), in order to provide further clarification. In its response to the staff's RAIs, the BWRVIP agreed to revise the flowchart in Section 2 of the TR. The staff reviewed the proposed changes to the flowchart and finds them acceptable because the notes regarding the five items proposed to be added by the BWRVIP provides adequate clarification regarding (1) sub-scale model tests (SMT) and main steam isolation valve (MSIV) closure tests, (2) bump up factors, (3) minimum alternating stress ratio of 2.0, (4) consideration for the installation of instrumentation, such as pressure transducers and strain gauges on replacement dryers, and (5) the pursuit of acoustic load mitigation.

Section 3 of the BWRVIP-182 TR provides guidance on screening methods to assess the potential for MSL acoustic excitation at power uprate conditions. The TR recommends a graded approach to screening for potential acoustic excitation starting with validated analytical methods. If analytical methods indicate a potential for MSL acoustic excitation,

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The staff reviewed the information provided in this section and finds it acceptable because the BWRVIP adequately provided an overview of the use of analytical methods,

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Section 4 briefly describes the measurement of MSL local pressure fluctuations based on inplant tests and also provides guidance on the appropriate locations, and the number of strain gages or pressure transducers used to obtain MSL fluctuating pressure measurements. The staff found the information provided in Section 4 of the TR acceptable because the BWRVIP has provided adequate guidance on MSL fluctuating pressure measurements using either pressure transducers or strain gages.

Guidance for predicting MSL pressures at power uprate conditions based on measured MSL pressure fluctuations at CLTP is briefly addressed in Section 5 of the TR. In Section 5.1, the TR states that MSL data shall be selectively filtered to eliminate extraneous strain measurements at the specific frequencies based on known sources of strain gage responses not related to internal fluctuating pressures. The staff requested the BWRVIP to clarify the magnitude of noise filtering, relative to the noise floor of the sensors and of the data acquisition system. In its response, the BWRVIP agreed to revise the TR by adding a paragraph to reflect the importance of establishing the noise floor of the data acquisition system,

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[Redacted] This clarification proposed by the BWRVIP is

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satisfactory to the staff because the proposed paragraph clarifies the noise floor, as well as, the required checks as noted above.

In response to the staff's request for specific examples regarding alternative methodology to adjust the MSL pressures from highest power level tested at the plant to power uprate conditions, the BWRVIP agreed to add a paragraph in Section 5.3 of the TR.

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[Redacted] This is

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acceptable to the staff because the BWRVIP's proposed revision clarified the alternative methodologies by providing specific examples.

In response to the staff's RAI on bump-up factors, the BWRVIP indicated that it would revise Section 5.3 of the BWRVIP-182 TR to state that that

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[Redacted] Based on a review of the above information,

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the staff finds the proposed revisions acceptable because the BWRVIP clarified that the minimum bump up factor used will not be less than the MSL velocities squared, even if the SMTs indicate a value less than the velocities squared ratio.

An outline on defining steam dryer pressure loading at power uprate conditions, using the predicted MSL pressure fluctuations is presented in Section 6 of the TR. The report also mentions the bias and random uncertainties associated with measurements of MSL pressure fluctuations and application of an analytical model for evaluating steam dryer pressure loading.

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[Redacted] The staff finds Section 6 of the TR acceptable because the BWRVIP has provided adequate information on defining steam dryer pressure loading at power uprate conditions. The staff notes that adjusted MSL pressure fluctuations are used for steam dryer pressure loading.

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Section 7 of the BWRVIP-182 TR briefly addresses the topic of steam dryer structural response and stress margins. The fluctuating pressure loading is dynamically applied to a detailed finite element model of steam dryer to determine its structural response. The staff sought clarification on structural damping, stress concentration factors for fillet welds, and minimum alternating stress ratio and stress margins. In its response, the BWRVIP proposed revisions to Section 7 of the TR to state that **Content Deleted - EPRI Proprietary Information**

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are acceptable to the staff because they are in agreement with the staff's position and experience with current EPU applications under staff review as well as recently approved EPU applications.

An overview on the preparation and submittal of documentation on steam dryer integrity is addressed in Section 8 of the TR. In response to the staff's RAI regarding supporting documentation to include a detailed summary table of all known end-to-end bias errors and uncertainties associated with analytical or test methods used in developing fluctuating pressure loads, and an evaluation of any existing flaws in the steam dryer components and their impact on steam dryer operation at EPU conditions, the BWRVIP agreed to revise Section 8 of the TR. The staff reviewed the proposed revisions and finds them acceptable because the BWRVIP adequately addressed the staff's RAI on requiring the licensee to include in its documentation a table on end-to-end bias errors and uncertainties as well as evaluations for any existing unrepaired flaws in the steam dryer components and their impact on steam dryer operation at EPU conditions.

In Section 9, the preparation and submittal of supporting documentation describing the technical basis and validation of all analytical and test methods demonstrating the steam dryer integrity at power uprate conditions are addressed. Section 9 also provides an outline of the two approaches that can be used for power ascension monitoring and data evaluation. The two approaches to confirm that steam dryer stresses are within acceptable limits during power ascension are

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In Section 9 of the TR, the staff noted that the BWRVIP did not address actions to be taken by the licensee when the level 2 limit curve is exceeded during power ascension monitoring. In its response to the staff's RAI, the BWRVIP agreed to revise the section by including a paragraph clarifying that when

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The staff reviewed the proposed changes and finds them acceptable because they adequately provide reasonable assurance regarding the structural integrity of the steam dryer and are in conformance with the staff's position and experience with the recently approved EPU applications.

The quality assurance (QA) program for the design and testing associated with the evaluation of structural integrity of the steam dryer is briefly addressed in Section 10 of the topical report. The staff found the QA program acceptable because the design and testing activities associated with the evaluation of the structural integrity of the steam dryer are to be conducted under an augmented QA program that meets the intent of the design and fabrication requirements of 10 CFR Part 21 or 10 CFR Part 50, Appendix B, as the steam dryer is not a safety-related component. Section 11 lists the applicable references cited in the body of the TR. A brief discussion on acoustic load mitigation is provided in Appendix-A of the TR. The staff also reviewed the proposed clarification by the BWRVIP in Appendix A of the TR regarding load mitigation devices for blind standpipes in steam flow path, and finds that the BWRVIP agreed to adequately revise the TR to include this clarification.

Based on the staff's review of the BWRVIP-182 TR and the responses to the staff's RAIs provided by the BWRVIP, the staff agrees that the over-arching guidance provided in the TR is useful in providing the BWR owners, considering power uprates, with an overview of the demonstration of structural integrity of the steam dryers. The guidance provided in the BWRVIP-182 TR adequately captures the issues, requirements, and experiences from recently granted EPU licenses, as applicable.

#### 4.0 CONCLUSION

The NRC staff has reviewed the BWRVIP-182 TR and additional information the BWRVIP provided in its RAI responses, and found that the TR, as modified and clarified to incorporate the staff's comments above, is acceptable for providing guidance on the steam dryer integrity demonstration for power uprate conditions. The BWRVIP shall include the modifications and clarifications, as discussed in the body of this SE in the "-A" version of this TR. Based on its review of the TR and the RAI responses provided by the BWRVIP, the staff concludes that the implementation of the guidance in the BWRVIP-182 TR, as modified to incorporate the resolution of the RAIs as discussed in this SE, by licensees seeking power uprates greater than 2% CLTP and up to EPU, provides an acceptable technical basis for demonstrating integrity of the steam dryers in BWR plants.

Principal Contributor: C. Basavaraju

Dated: November 23, 2009

December 17, 2009

Document Control Desk  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**Subject: Request for Withholding of the following Proprietary Document:**

“SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
BOILING WATER REACTOR VESSEL AND INTERNALS PROJECT  
TOPICAL REPORT “BWRVIP-182: [EPRI REPORT NO. 1016166, JANUARY 2008]  
GUIDANCE FOR DEMONSTRATION OF STEAM DRYER INTEGRITY  
FOR POWER UPRATE” (TAC NO. MD9427) PROJECT NO. 704

To Whom It May Concern:

This is a request under 10 C.F.R. §2.390(a)(4) that the U.S. Nuclear Regulatory Commission (“NRC”) withhold from public disclosure the information identified in the enclosed Affidavit consisting of the proprietary information owned by Electric Power Research Institute, Inc. (“EPRI”) identified above (the “Report”). Proprietary and non-proprietary versions of the Report and the Affidavit in support of this request are enclosed.

EPRI desires to disclose the Report, in confidence, the report for informational purposes to assist the NRC. The Report is not to be divulged to anyone outside of the NRC or to any of its contractors, nor shall any copies be made of the Report provided herein. EPRI welcomes any discussions and/or questions relating to the information enclosed.

If you have any questions about the legal aspects of this request for withholding, please do not hesitate to contact me at (650) 855-2064. Questions on the content of the Report should be directed to Randy Stark of EPRI at (650)855-2122.

Sincerely,



Tuan Nguyen  
Acting Vice President, Nuclear

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## AFFIDAVIT

**RE: Request for Withholding of the Following Proprietary Document:**

“SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
BOILING WATER REACTOR VESSEL AND INTERNALS PROJECT  
TOPICAL REPORT “BWRVIP-182: [EPRI REPORT NO. 1016166, JANUARY 2008]  
GUIDANCE FOR DEMONSTRATION OF STEAM DRYER INTEGRITY  
FOR POWER UPRATE” (TAC NO. MD9427) PROJECT NO. 704

I, TUAN NGUYEN, being duly sworn, depose and state as follows:

I am a senior program manager at Electric Power Research Institute, Inc. whose principal office is located at 3420 Hillview Avenue, Palo Alto, California (“EPRI”) and I have been specifically delegated responsibility for the above-listed Report that is sought under this Affidavit to be withheld (the “Report”). I am authorized to apply to the U.S. Nuclear Regulatory Commission (“NRC”) for the withholding of the Report on behalf of EPRI.

EPRI requests that the Report be withheld from the public on the following bases:

Withholding Based Upon Privileged And Confidential Trade Secrets Or Commercial Or Financial Information:

a. The Report is owned by EPRI and has been held in confidence by EPRI. All entities accepting copies of the Report do so subject to written agreements imposing an obligation upon the recipient to maintain the confidentiality of the Report. The Report is disclosed only to parties who agree, in writing, to preserve the confidentiality thereof.

b. EPRI considers the Report and the proprietary information contained therein (the “Proprietary Information”) to constitute trade secrets of EPRI. As such, EPRI holds the Report in confidence and disclosure thereof is strictly limited to individuals and entities who have agreed, in writing, to maintain the confidentiality of the Report. EPRI made a substantial economic investment to develop the Report, and, by prohibiting public disclosure, EPRI derives an economic benefit in the form of licensing royalties and other additional fees from the confidential nature of the Report. If the Report and the Proprietary Information were publicly available to consultants and/or other businesses providing services in the electric and/or nuclear power industry, they would be able to use the Report for their own commercial benefit and profit and without expending the substantial economic resources required of EPRI to develop the Report.

c. EPRI’s classification of the Report and the Proprietary Information as trade secrets is justified by the Uniform Trade Secrets Act which California adopted in 1984 and a version of which has been adopted by over forty states. The California Uniform Trade Secrets Act, California Civil Code §§3426 – 3426.11, defines a “trade secret” as follows:

“Trade secret’ means information, including a formula, pattern, compilation, program device, method, technique, or process, that:

(1) Derives independent economic value, actual or potential, from not being generally known to the public or to other persons who can obtain economic value from its disclosure or use; and

(2) Is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.”

d. The Report and the Proprietary Information contained therein are not generally known or available to the public. EPRI developed the Report only after making a determination that the Proprietary Information was not available from public sources. EPRI made a substantial investment of both money and employee hours in the development of the Report. EPRI was required to devote these resources and effort to derive the Proprietary Information and the Report. As a result of such effort and cost, both in terms of dollars spent and dedicated employee time, the Report is highly valuable to EPRI.

e. A public disclosure of the Proprietary Information would be highly likely to cause substantial harm to EPRI's competitive position and the ability of EPRI to license the Proprietary Information both domestically and internationally. The Proprietary Information and Report can only be acquired and/or duplicated by others using an equivalent investment of time and effort.

I have read the foregoing and the matters stated herein are true and correct to the best of my knowledge, information and belief. I make this affidavit under penalty of perjury under the laws of the United States of America and under the laws of the State of California.

Executed at 3420 Hillview Avenue, Palo Alto, California being the premises and place of business of Electric Power Research Institute, Inc.

December 17, 2009



Tuan Nguyen

State of California )  
County of Santa Clara)

Subscribed and sworn to (or affirmed) before me on this 17th day of December, 2009, by Tuan Nguyen, proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Signature  (Seal)

