

April 23, 2009

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

Attention: Joseph Williams

Subject: Project No. 704 – BWRVIP Response to NRC Request for Additional Information on BWRVIP-182

Reference: Letter from Vanice A. Perin (NRC) to Rick Libra (BWRVIP Chairman), “Request for Additional Information (RAI) for Electric Power Research Institute (EPRI) Boiling Water Reactor (BWR) Vessel and Internals Project (BWRVIP) Topical Report (TR)-1016166, BWRVIP-182: BWR Vessel and Internals Project, Guidance for Demonstration of Steam Dryer Integrity for Power Uprate (TAC NO. MD9427),” dated December 31, 2008.

Enclosed are five (5) copies of the BWRVIP response to the NRC Request for Additional Information (RAI) on the BWRVIP report entitled “BWRVIP-182: BWR Vessel and Internals Project, Guidance for Demonstration of Steam Dryer Integrity for Power Uprate.” that was transmitted to the BWRVIP by the NRC letter referenced above.

Please note that the enclosed response contains proprietary information. The response includes margin bars to indicate the proprietary information. 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 1. Note that all the proprietary information in the enclosed report is considered “trade secrets” and is marked “TS” in accordance with 10CFR2.390(a)(4).

Two (2) copies of a non-proprietary version of the BWRVIP response to the RAI are also enclosed. This non-proprietary response is identical to the enclosed proprietary response except that the proprietary information has been deleted and the words “Non-Proprietary” appear at the top of each page.

Together . . . Shaping the Future of Electricity

*Add 1 copies have  
been sent to the PM*

*6004  
NRR*

BWRVIP 2009-144

If you have any questions on this subject please call Robert Geier (Exelon Corporation, BWRVIP Assessment Committee Technical Chairman) at 630-657-3830.

Sincerely,

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

Rick Libra  
Exelon  
Chairman, BWR Vessel and Internals Project

**CHRISTIAN B. LARSEN**  
Vice President and  
Chief Nuclear Officer

April 23, 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:**

BWRVIP RESPONSES to NRC REQUEST FOR ADDITIONAL INFORMATION on  
"BWRVIP-182: BWR VESSEL AND INTERNALS PROJECT  
GUIDANCE FOR DEMONSTRATION of STEAM DRYER  
INTEGRITY FOR POWER UPRATE

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 "Response"). Proprietary and non-proprietary versions of the Response and the Affidavit in support of this request are enclosed.

EPRI desires to disclose the Report in confidence as a means of exchanging technical information with the NRC. The Response 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 Response 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) 855-2329. Questions on the content of the Response should be directed to John Hosler of EPRI at (704)595-2226.

Sincerely,



## AFFIDAVIT

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

BWRVIP RESPONSES to NRC REQUEST FOR ADDITIONAL INFORMATION on  
"BWRVIP-182: BWR VESSEL AND INTERNALS PROJECT  
GUIDANCE FOR DEMONSTRATION of STEAM DRYER  
INTEGRITY FOR POWER UPRATE

I, CHRISTIAN B. LARSEN, being duly sworn, depose and state as follows:

I am a Vice President and the Chief Nuclear Officer of 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 Response that is sought under this Affidavit to be withheld (the "Response"). I am authorized to apply to the U.S. Nuclear Regulatory Commission ("NRC") for the withholding of the Response on behalf of EPRI.

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

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

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

b. EPRI considers the Response and the proprietary information contained therein (the "Proprietary Information") to constitute trade secrets of EPRI. As such, EPRI holds the Response in confidence and disclosure thereof is strictly limited to individuals and entities who have agreed, in writing, to maintain the confidentiality of the Response. EPRI made a substantial economic investment to develop the Response, 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 Response. If the Response 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 Response for their own commercial benefit and profit and without expending the substantial economic resources required of EPRI to develop the Response.

c. EPRI's classification of the Response 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 Response and the Proprietary Information contained therein are not generally known or available to the public. EPRI developed the Response 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 Response. EPRI was required to devote these resources and effort to derive the Proprietary Information and the Response. As a result of such effort and cost, both in terms of dollars spent and dedicated employee time, the Response 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 Response 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.

April 23, 2009



Christian B. Larsen

State of California )  
County of Santa Clara)

Subscribed and sworn to (or affirmed) before me on this \_\_\_\_ day of \_\_\_\_\_, 20\_\_, by \_\_\_\_\_, proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Signature See attached (Seal)

# CALIFORNIA JURAT WITH AFFIANT STATEMENT

- See Attached Document (Notary to cross out lines 1-6 below)
- See Statement Below (Lines 1-5 to be completed only by document signer[s], *not* Notary)

1 \_\_\_\_\_  
2 \_\_\_\_\_  
3 \_\_\_\_\_  
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6 \_\_\_\_\_

Signature of Document Signer No. 1 \_\_\_\_\_ Signature of Document Signer No. 2 (if any) \_\_\_\_\_

State of California  
County of Santa Clara

Subscribed and sworn to (or affirmed) before me on this  
23<sup>rd</sup> day of April, 2009, by  
Date Month Year  
(1) Christina Hansen  
Name of Signer



proved to me on the basis of satisfactory evidence  
be the person who appeared before me (.)   
(and)  
(2) \_\_\_\_\_  
Name of Signer

proved to me on the basis of satisfactory evidence  
be the person who appeared before me.)

Signature Kathy Eileen Syler  
Signature of Notary Public

Place Notary Seal Above

## OPTIONAL

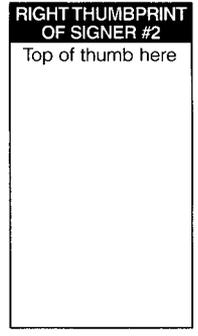
Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

### Further Description of Any Attached Document

Title or Type of Document: AFFIDAVIT FOR RWPO HBWRVIP-182

Document Date: 4/23/09 Number of Pages: 3

Signer(s) Other Than Named Above: \_\_\_\_\_



*Non-Proprietary*

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BWRVIP RESPONSES to NRC REQUEST FOR ADDITIONAL INFORMATION on  
“BWRVIP-182: BWR VESSEL AND INTERNALS PROJECT  
GUIDANCE FOR DEMONSTRATION of STEAM DRYER INTEGRITY FOR  
POWER UPRATE”

(Non-Proprietary)

Note that all the proprietary information in the enclosed report is considered “trade secrets” and is marked “TS” in accordance with 10CFR2.390(a)(4).

BWRVIP RESPONSES to NRC REQUEST FOR ADDITIONAL INFORMATION on  
“BWRVIP-182: BWR VESSEL AND INTERNALS PROJECT  
GUIDANCE FOR DEMONSTRATION of STEAM DRYER INTEGRITY FOR  
POWER UPRATE”

Items from the NRC Request for Additional Information (RAI) on BWRVIP-182 are repeated below verbatim followed by the BWRVIP response to that item.

RAI-1

Section 5.1, Elimination of Extraneous Main Steam Line (MSL) Data:

Page 5-1: The TR states that the MSL data shall be selectively filtered to eliminate extraneous strain measurements at the specific frequencies based on known sources of strain gage response not related to internal fluctuating pressure. The BWRVIP is requested to clarify the magnitude of noise filtering relative to the noise floor of the sensors and data acquisition system.

BWRVIP Response to RAI-1

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RAI-2

Section 5.3, Adjustment of MSL Pressure Fluctuations when Screening Indicates a Potential for Acoustic Excitation at Power Uprate:

Page 5-1: It is stated that sub-scale testing or an alternative validated methodology shall be implemented. The BWRVIP should explain or clarify what specific alternative methodology is intended.

Page 5-2: The TR states that the results of sub-scale testing shall be used to adjust the MSL pressure fluctuation amplitudes measured at the same locations in the plant (after elimination of extraneous data) at the highest power level tested by multiplying the pressure fluctuation amplitudes at each discrete frequency by the ratio (at that frequency) of the MSL pressure fluctuation amplitudes measured in sub-scale testing ( $P_{\text{power uprate}}/P_{\text{highest tested}}$ ) to obtain a prediction of MSL fluctuation pressures at power uprate. The TR should specify that this ratio will not be less than the square of flow velocities ( $V_{\text{power uprate}}/V_{\text{highest tested}}$ )<sup>2</sup> at frequencies other than acoustic resonance and the above the specified ratio (Bump-up factor) shall be much higher than ( $V_{\text{power uprate}}/V_{\text{highest tested}}$ )<sup>2</sup> at acoustic resonance frequencies.

#### BWRVIP Response to NRC RAI-2

The statement made on page 5-1 was meant to allow any method for adjusting the MSL data from CLTP to power uprate conditions as long as the method is well documented and validated. It is the responsibility of the vendors to provide the details of their adjustment method as part of the topical report documenting their methodology.

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#### RAI-3

Section 6, Defining Steam Dryer Pressure Loading:

Page 6-1: The TR states that the steam dryer fluctuating pressure load definition methodology shall be capable of defining the pressure fluctuations on the steam dryer surfaces with sufficient spatial resolution to ensure that the peak fluctuating pressure loading is applied to the steam dryer surfaces (typically a resolution of 9 square inches) in

critical areas (i.e., near the entrance to each of the MSLs). How was 9 square inches spatial resolution established to be adequate? Was this based on sensitivity studies? If yes, provide a discussion in support of these studies.

BWRVIP Response to NRC RAI-3

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EPRI Proprietary Information

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RAI-4

Section 7, Defining Steam Dryer Structural Response And Stress Margin:

Page 7-1: The TR states that use of structural damping values greater than one percent and specific values of stress concentration factors applied be justified.

(a) The topical report should include a statement that, based on past experience, the use of structural damping coefficients greater than one percent must be substantiated with measurements per the guidance given in Regulatory Guide 1.20.

(b) With respect to the stress concentration factor, the BWRVIP TR should state that stress concentration factor (for fatigue) of no less than 1.8 shall be used for fillet welds.

(c) In Section 7, the BWRVIP is requested to clarify the minimum required stress margin or minimum required alternating stress ratio. Considering all end-to-end bias errors and uncertainties (in recent EPU approved license amendment requests such as Hope creek) as well as applicable stress concentration factors, a minimum stress margin of 100 percent on alternating stress or a minimum alternating stress ratio of 2 shall be maintained in steam dryer components, when fluctuating pressure loads prediction on dryer relies on MSL measurements. The minimum alternating stress ratio is defined as the endurance limit of the material divided by maximum alternating stress. The stress margin as a percentage is defined as  $(\text{minimum alternating stress ratio} - 1)(100)$ . Specifically, either the alternating stress ratio  $\geq 2.0$ ; or stress margin on alternating stress  $\geq 100$  percent.

BWRVIP Response to RAI-4

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EPRI Proprietary Information

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RAI-5

Section 8, Preparation and Submittal of Supporting Documentation:

Page 8-1: This section is incomplete and the BWRVIP is requested to address the following items.

(a) The documentation should include a detailed summary table of all known end-to-end bias errors and uncertainties (bias errors and uncertainties associated with analytical or test methods used in developing fluctuating pressure loads acting on the dryer, instrument location and measurement uncertainties, frequency discretization error, finite element mesh discretization error, and uncertainties associated with finite element modeling simplifications and approximations) similar to the one approved by the NRC staff in recently approved extended power uprate (EPU) applications.

(b) The supporting documentation should also contain an evaluation of any existing flaws in the steam dryer components and their impact on steam dryer operation at EPU conditions.

BWRVIP Response to RAI-5

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RAI-6

Section 9, Power Ascension Monitoring/Data Evaluation, Item 1, Comparison to Pre-established Limit Curves:

Page 9-1: The TR addresses level 1 and level 2 limit curves and the action to be taken when level 1 curve is exceeded, but does not address the action to be taken if a level 2 limit curve is exceeded. The BWRVIP is requested to address this item.

BWRVIP Response to RAI-6

Section 9 of BWRVIP-182 will be revised to add the following paragraph:

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RAI-7

Section A, Acoustic Load Mitigation:

Page A-1: The TR addresses the installation of load mitigation devices in the valve inlets. The BWRVIP is requested to also address load mitigation devices for blind standpipes in steam flow path.

BWRVIP Response to RAI-7

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RAI-8

Section 2, Overview of Approach:

Page 2-2, Figure 2-1, BWRVIP Steam Dryer Integrity Demonstration Flowchart: The flowchart is incomplete and several steps need to be included to fully address evolution considerations not present in the proposed guidance. These can be added as notes to the chart. BWRVIP is requested to address the following items.

(a) Rectangular Box, right hand side, 3<sup>rd</sup> row: This block, Conduct in-plant test at CLTP (Current Licensed Thermal Power), should refer to Note 1. Note 1 should be added to the flowchart to reflect the following: If analytical screening indicates a potential for acoustic excitation, sub-scale tests or in-plant main steam isolation valve closure tests when feasible may be conducted.

(b) Rectangular Box, right hand side, 6<sup>th</sup> row: This block, Increase in-plant MSL pressures at each frequency by ratio of sub-scale tests (Power uprate/CLTP), should refer to Note 2. Note 2 should be added to the flowchart to reflect the following: At any frequency, the factor used to increase the in-plant CLTP pressures shall not be less than the ratio of flow velocity squared. At acoustic resonance frequencies, larger bump-up

factor, typically much higher than the ratio of velocity squared, determined from subscale tests shall be used.

(c) Diamond Box, left hand side, 9<sup>th</sup> row: This block, Stress Margin, should refer to Note 3. Note 3 should be added to the flowchart to reflect the following: For un-instrumented steam dryers relying on MSL measurements for steam dryer analysis, the minimum alternating stress ratio (defined as the material endurance limit to maximum calculated alternating stress in the dryer) of 2 for EPU conditions shall be maintained.

(d) Rectangular Box, right hand side, 7<sup>th</sup> row: This block, Modify/Replace Dryer, should refer to Note 4. Note 4 should be added to the flowchart to reflect the following: If existing steam dryers are replaced by new steam dryers, consideration shall be given to instrument the new dryers instead of simply relying on measurements from MSL strain gage data to establish the structural integrity of the steam dryer for power uprate conditions.

#### BWRVIP Response to RAI-8

In response to RAI-8, following Notes 1-4 will be added to the revised Flowchart (Figure 2-1 of BWRVIP-182) as shown below:

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**Figure 2-1 (Revised to show references to Notes 1-5)**

TS