Exelon Generation®

PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390

10 CFR 50.4
10 CFR 2.390

March 24, 2015

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Peach Bottom Atomic Power Station, Unit 2
Renewed Facility Operating License No. DPR-44
NRC Docket No. 50-277

Subject: Extended Power Uprate: Response to Replacement Steam Dryer Requests for Additional Information

Reference:

1. NRC Letter to Exelon, "Peach Bottom Atomic Power Station, Units 2 and 3 – Issuance of Amendments Re: Extended Power Uprate (TAC Nos. ME9631 and ME9632)", dated August 25, 2014 (ADAMS Accession No. ML14133A046)
2. Exelon letter to the NRC, "Extended Power Uprate: Request for NRC Approval of Revision to Methodology for Establishing Replacement Steam Dryer Strain Limits", dated February 3, 2015 (ADAMS Accession No. ML15034A573)
3. Email from R. Ennis, NRC to K. Ainger, Exelon, "Peach Bottom Unit 2 - Revised Draft RAIs (Rev. 7) for Proposed Change to Steam Dryer Analysis Methodology", dated March 20, 2015.
4. Email from R. Ennis, NRC to K. Ainger, Exelon, "Peach Bottom Unit 2 - RAIs on Steam Dryer Methodology and Brief Stress Summary Report", dated February 27, 2015.

In accordance with 10 CFR 50.92, the NRC issued Reference 1, License Amendment Nos. 293 and 296 to the Peach Bottom Atomic Power Station (PBAPS) Renewed Facility Operating Licenses (FOLs) to increase the authorized maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. This change to power level is considered an extended power uprate (EPU).

The amended FOLs contain specific license conditions that control the monitoring, evaluating, and taking prompt action in response to potential adverse flow effects as a result of the EPU on plant structures, systems, and components (including verifying the continued structural integrity of the replacement steam dryer (RSD)) during initial EPU power ascension.

Attachment 1 contains Proprietary Information.
When separated from Attachment 1, this document is decontrolled.

As described in Exelon Generation Company, LLC (EGC) letter dated February 3, 2015 (Reference 2), data collected at near the previously licensed thermal power level identified low frequency loads on the RSD that were not previously predicted. As a result, EGC developed an approach to quantify the magnitude of the unpredicted loads and integrated the results into the original methodology. In accordance with PBAPS Unit 2 license condition 2.C(15)(d)3, EGC requested NRC approval for this revision to the methodology for establishing the RSD strain limits. The NRC staff reviewed the information regarding the proposed revised methodology and provided a request for additional information (RAI) (Reference 3). This letter provides the response to the NRC request for additional information. Responses to RAIs 1 through 8 are provided in a Westinghouse Electric Company (WEC)-proprietary document in Attachment 1. A non-proprietary version of this document is provided in Attachment 2. Response to RAI 9 is included in Attachment 4. As agreed to with the NRC staff, response to draft RAI 10 will be discussed at an upcoming meeting. Additionally, responses to NRC RAIs BSR-RAI-2 and BSR-RAI-3 (Reference 4) involving the Brief Summary Report are included in Attachment 1. BSR-RAI-1 was deleted by the NRC (Reference 4).

WEC considers portions of the information provided in the Attachment 1 response proprietary and, therefore, exempt from public disclosure pursuant to 10 CFR 2.390. In accordance with 10 CFR 2.390 and in support of this request for withholding, an affidavit executed by WEC is provided in Attachment 3.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Mr. Ken Ainger at (630) 657-3330.

Respectfully,

D. P. Helker

David P. Helker
Manager, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachments:
1. Response to Request for Additional Information – Proprietary, Westinghouse Electric Company LLC LTR-BWR-ENG-15-019-P
2. Response to Request for Additional Information - Non-Proprietary, Westinghouse Electric Company LLC LTR-BWR-ENG-15-019-NP
3. Affidavit, CAW-15-4142
4. Response to Request for Additional Information 9

cc: USNRC Region I, Regional Administrator w/attachments
USNRC Senior Resident Inspector, PBAPS w/attachments
USNRC Project Manager, PBAPS w/attachments
R. R. Janati, Commonwealth of Pennsylvania w/o proprietary attachment
S. T. Gray, State of Maryland w/o proprietary attachment

Attachment 2

Peach Bottom Atomic Power Station Unit 2

NRC Docket No. 50-277

Response to Request for Additional Information – Non-Proprietary
Westinghouse Electric Company LLC LTR-BWR-ENG-15-019-NP

The Nuclear Regulatory Commission (NRC) issued Amendment Nos. 293 and 296 to Renewed Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3 (ADAMS Accession No. ML14133A046). These amendments authorized an increase in the maximum licensed thermal power level for PBAPS, Units 2 and 3, from 3514 megawatts thermal (MWt) to 3951 MWt, which is an increase of approximately 12.4 percent.

In accordance with PBAPS Unit 2 License Condition 2.C(15)(d)3, EGC requested NRC approval for a revision to the methodology for establishing the RSD strain limits in a letter dated February 3, 2015 (ADAMS Accession No. ML15034A573). The NRC staff has reviewed the information supporting the revised methodology and has requested additional information. The responses to requests 1 through 8 are provided in this attachment.

LTR-BWR-ENG-15-019-NP

Responses to the U.S. NRC Requests for Additional Information Relative to the Peach Bottom Replacement Steam Dryer Acoustic/Structural Analyses Set

March 13, 2015

Westinghouse Electric Company LLC
1000 Westinghouse Drive
Cranberry Township, PA 16066 USA

RAI-1

The licensee is requested to [[

]]

e) Explain in detail how the licensee ensures that the true maximum stress locations are found using the methodology.

Response

RAI-1a)

A review of the PBAPS Replacement Steam Dryer (RSD) strain gauges (SGs) and main steam line (MSL) SG data concluded [

]^{a,c}

[

]^{a,c}

[

]a,c

An example of this method is provided in the response to RAI-1(b).

Table RAI-1a-1 Modal Participation Factors

a,b,c

[

]a,c

RAI-1b)

As discussed in the RAI-1(a) response, equations (2) and (3) are used to [
]^{a,c} Peach Bottom Unit 2 Dryer finite element model (FEM).

[

]^{a,c}

[

]^{a,c}

[

]^{a,c}

a,b,c

Figure RAI-1b-1 Non-MSL Acoustic Stress Cumulative Plot for Upper Dryer

a,b,c

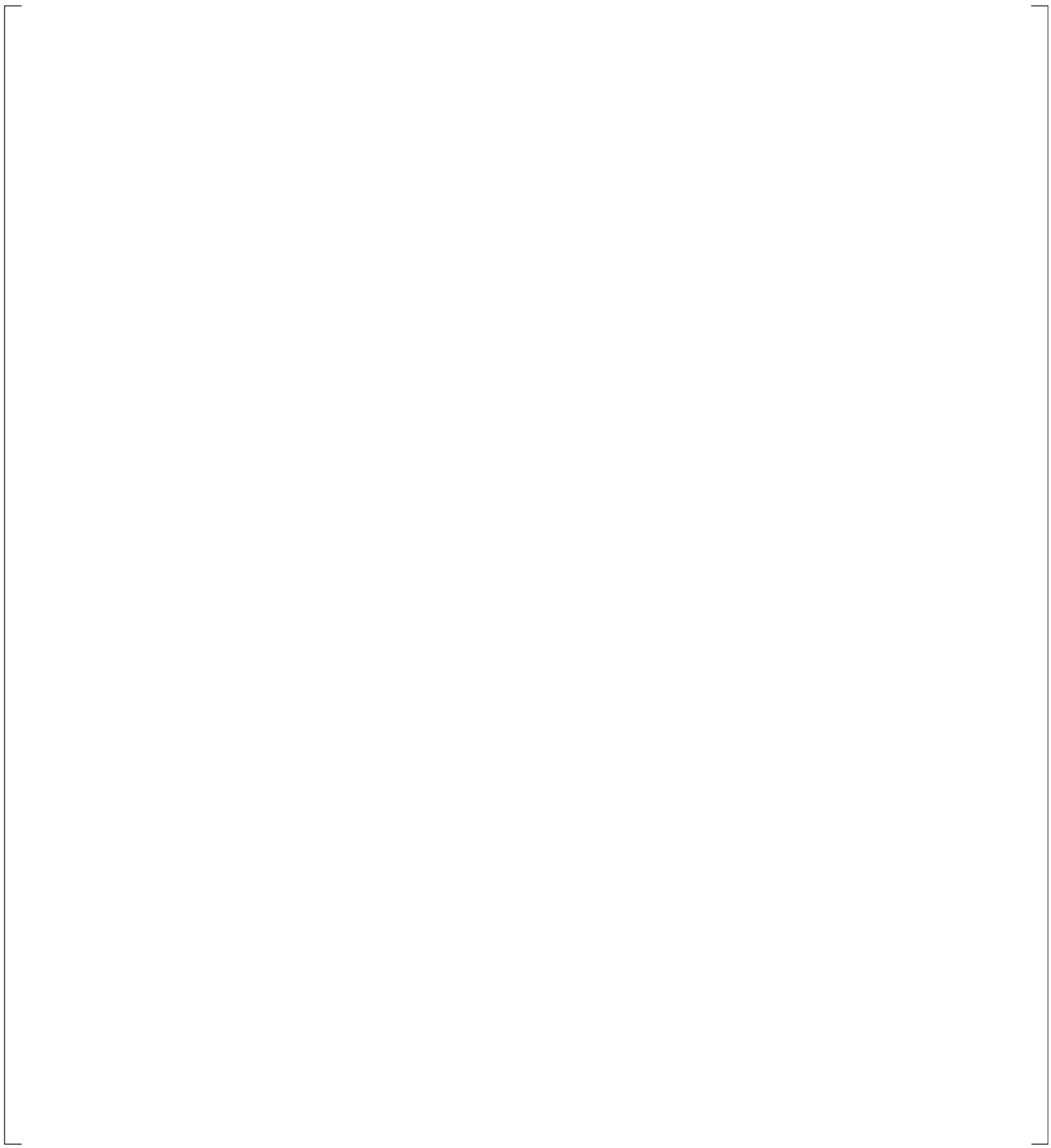

Figure RAI-1b-2 Upper Dryer Mode Shape Plot [ ]^{a,c}

a,b,c

Figure RAI-1b-3 Upper Dryer Mode Shape Plot [ ]^{a,c}

RAI-1c)

[

]^{a,c}

RAI-1d)

[

]a,c

Table RAI-1d-1: Upper Dryer Stress/Strain Prediction Comparison

a,b,c

Table RAI-1d-2: Lower Dryer Stress/Strain Prediction Comparison

a,b,c

Table RAI-1d-3: Measured versus Predicted Strain at Strain Gauges, including FEM Nodes near the Strain Gauge Node

a,b,c

RAI-1e)

[

]a,c

RAI-2

Provide the natural frequencies and mode shapes (displacement and stress - S_{xx}, S_{yy}, S_{xy}) of the PBAPS Unit 2 RSD for modes which contribute most to peak dryer stresses (at least 20) for frequencies below 50 Hz. Explain which of these modes are closely spaced in frequency where corresponding stresses should be added by absolute sum.

Follow-up to RAI 2: provide all mode shapes which correspond with the peaks in Figure 12 of the draft response to RAI 6 (PSD of skirt strain showing shell mode peaks). Note that the FE mode shapes likely have lower resonance frequencies than the peaks observed in the measurements.

Response

Table RAI-2-1 lists all of the significant dryer modes [

]^{a,c}

Table RAI-2-1: Peach Bottom Unit 2 with Instrumentation Mast: Natural Frequencies

[ ]a,c

a,b,c

Table RAI-2-1: Peach Bottom Unit 2 with Instrumentation Mast: Natural Frequencies [ ][a,c] (Continued)

[a,b,c]

[a,b,c

]

Figure RAI-2-1 Skirt Mode: [ ]a,c

[a,b,c

Figure RAI-2-2 Skirt Mode: [ ]^{a,c}

[a,b,c

Figure RAI-2-3 Middle Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-4 Skirt Mode: [ ]^{a,c}

[a,b,c]

Figure RAI-2-5 Middle Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-6 Skirt and Mast Mode: [ ]^{a,c}

[a,b,c]

Figure RAI-2-7 Middle Hoods, Lifting/Hold Down Rods, Skirt Mode: [ ]^{a,c}

[a,b,c

Figure RAI-2-8 Middle Hood and Hold Down Rod Mode: [ ]^{a,c}

[a,b,c

Figure RAI-2-9 Middle Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-10 Skirt and Mast Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-11 Inner Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-12 Full Dryer Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-13 Full Dryer Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-14 Inner Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-15 Skirt Mode: [ ]a,c

a,b,c

Figure RAI-2-16 Middle Hood Mode: [ ]^{a,c}

a,b,c

Figure RAI-2-17 Skirt Mode: [ ]a,c

[a,b,c

]

Figure RAI-2-18 Middle Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-19 Inner Hood, Lifting Rod and Skirt Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-20 Inner Hood and Skirt Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-21 Middle and Inner Hood Mode: [ ]^{a,c}

[a,b,c]

Figure RAI-2-22 Middle Hood Mode: [ ]^{a,c}

[a,b,c

]

Figure RAI-2-23 Inner Hood, Middle Hood, and Lifting Rod Mode: [ ]^{a,c}

[a,b,c]

Figure RAI-2-24 Inner Hood and Lifting Rod Mode: [ ]^{a,c}

Response to Follow-up to RAI 2:

FE modes below the 15 Hz frequency are shown in Figures RAI-2-25. through RAI-2-34. As can be seen in the mode plots, [ ]a,c

In order to identify the FE modes with the mode plots [

]a,c

Figures RAI-2-35 through RAI-2-44 present FE mode shapes and frequencies in the top half, [ ]a,c Table RAI-2-2 summarizes the FE and [ ]a,c

In the 0-15 Hz range, [

]a,c

[ ] a,b,c

[a,b,c]

Figure RAI-2-25: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c

Figure RAI-2-26: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c

]

Figure RAI-2-27: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c]

Figure RAI-2-28: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c

Figure RAI-2-29: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c]

Figure RAI-2-30: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c]

Figure RAI-2-31: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c]

Figure RAI-2-32: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c]

Figure RAI-2-33: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c

]

Figure RAI-2-34: PB2 Steam Dryer Modes – [ ]^{a,c}

[a,b,c

Figure RAI-2-35: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

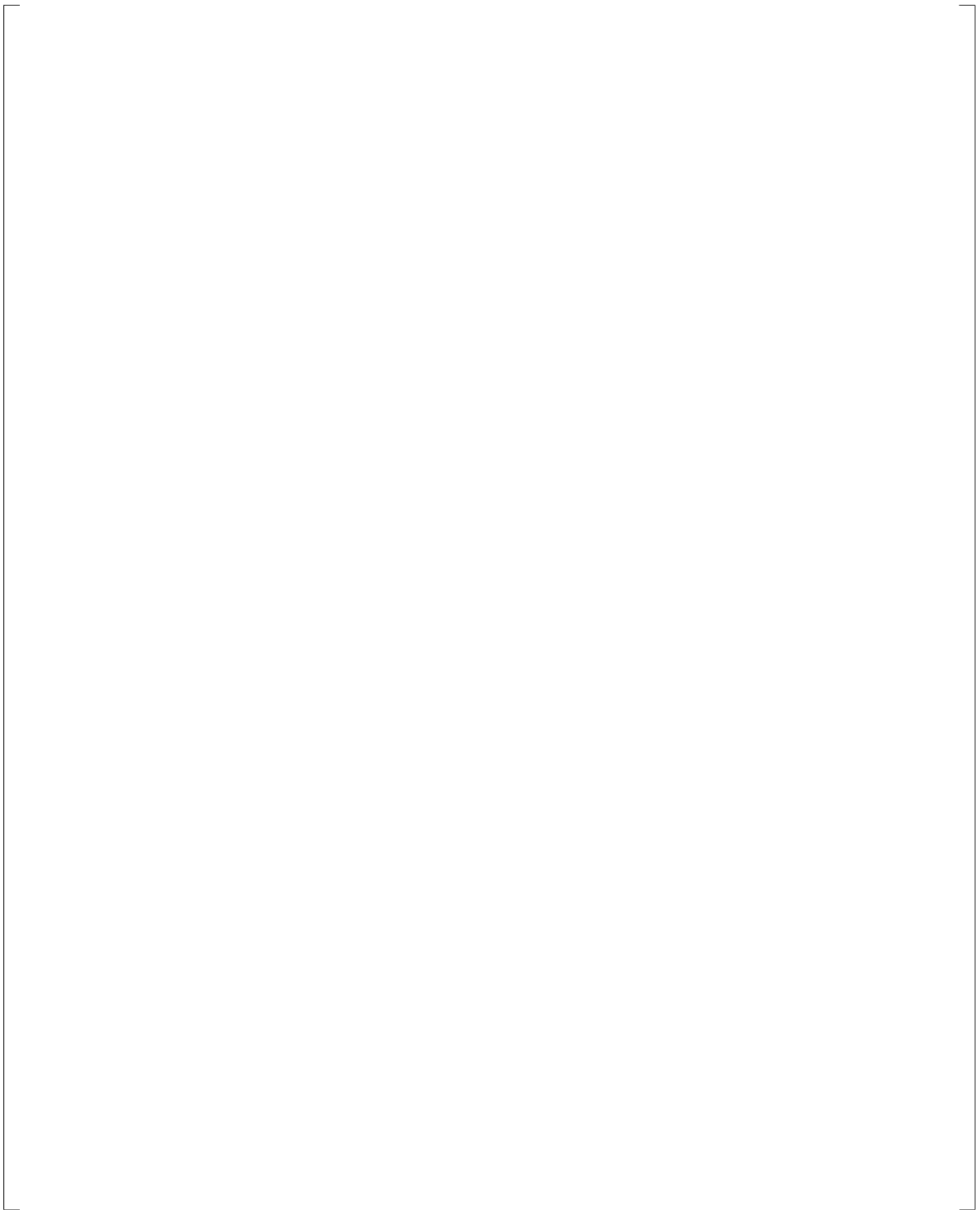

Figure RAI-2-36: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-37: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-38: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-39: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

[a,b,c

]

Figure RAI-2-40: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-41: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-42: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-43: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}

a,b,c

Figure RAI-2-44: PB2 Steam Dryer Skirt Mode – [ ]^{a,c}


a,b,c

Figure RAI-2-45: PB2 Steam Dryer Skirt SG PSD

RAI-3

Provide a comparison of measured and predicted (using ACE 2.0) pressures on the RSD [[
]] Also expand the existing pressure comparison plots (using ACE 3.0) [[

]]

Response

Figure RAI-3-1 presents the power spectral density (PSD) comparison for the measured and predicted pressure at replacement steam dryer (RSD) PT04; this location is generally representative of the overall trend. ACE Rev 2.0.1, which was [

]^{a,c}

Figure RAI-3-2 presents the PSD comparison for the ACE Rev 3.0a predicted pressure and the measured data (for the full 0-250 Hz frequency range) for RSD PT03; this location is generally representative of the overall trend.

ACE 2.0.1 [

]^{a,c} In order to meet the license conditions and maintain conservative methodologies, both ACE 3.0 [

]^{a,c}

Pressure PSD comparisons for the all active RSD transducers are provided in RAI-3 Appendix A.

a,b,c

Figure RAI-3-1 ACE Rev 2.0.1 and Measured Pressure PSD - PT04

a,b,c

Figure RAI-3-2 ACE Rev 3.0a and Measured Pressure PSD - PT03

RAI-3 Appendix A Figures

a,b,c

Figure RAI-3-A-1 ACE Rev 2.0.1 and Measured Pressure PSD - PT03

a,b,c

Figure RAI-3-A-2 ACE Rev 2.0.1 and Measured Pressure PSD - PT04

a,b,c

Figure RAI-3-A-3 ACE Rev 2.0.1 and Measured Pressure PSD - PT07

a,b,c

Figure RAI-3-A-4 ACE Rev 2.0.1 and Measured Pressure PSD - PT08

a,b,c

Figure RAI-3-A-5 ACE Rev 2.0.1 and Measured Pressure PSD - PT09

a,b,c

Figure RAI-3-A-6 ACE Rev 2.0.1 and Measured Pressure PSD – PT10


a,b,c

Figure RAI-3-A-7 ACE Rev 2.0.1 and Measured Pressure PSD – PT11

a,b,c

Figure RAI-3-A-8 ACE Rev 2.0.1 and Measured Pressure PSD – PT12

a,b,c

Figure RAI-3-A-9 ACE Rev 3.0a and Measured Pressure PSD - PT03

a,b,c

Figure RAI-3-A-10 ACE Rev 3.0a and Measured Pressure PSD - PT04

a,b,c

Figure RAI-3-A-11 ACE Rev 3.0a and Measured Pressure PSD - PT07

a,b,c

Figure RAI-3-A-12 ACE Rev 3.0a and Measured Pressure PSD - PT08

a,b,c

Figure RAI-3-A-13 ACE Rev 3.0a and Measured Pressure PSD - PT09

a,b,c

Figure RAI-3-A-14 ACE Rev 3.0a and Measured Pressure PSD – PT10

a,b,c

Figure RAI-3-A-15 ACE Rev 3.0a and Measured Pressure PSD – PT11

a,b,c

Figure RAI-3-A-16 ACE Rev 3.0a and Measured Pressure PSD – PT12

RAI-4

Please provide the following:

a) Provide a comparison of measured and predicted (using ACE 2.0) strains (resulting from main steam line (MSL) strain measurements) on the RSD [[ ]] Also expand the existing RSD strain comparison plots (using ACE 3.0) [[ ]]

b) Provide an example of an ACE-based dryer stress calculation [[ ]], including bias errors and uncertainties (B/U) based on PBAPS benchmarking. Show measured vs predicted (which include PBAPS-based B/U) strain comparisons, and a table of [[ ]] Provide the resulting lowest MASRs [[ ]] Identify the [[ ]]

Response

RAI 4a)

Figure RAI-4a-1 presents the strain power spectral density (PSD) for the measured data and the strain predicted using ACE+SPM Rev 2.0 at replacement stream dryer (RSD) SG13. ACE+SPM [ ]^{a,c} Figure RAI-4a-2 presents the strain PSD for the measured data and the strain predicted using ACE Rev 2.0.1 at SG04. ACE 2.0.1 [ ]^{a,c} These two plots provide example locations that are generally representative of the overall trend. The strain comparisons are presented [ ]^{a,c}

Both ACE 2.0.1 and ACE+SPM are acoustic models [

]^{a,c}

Figure RAI-4a-3 and Figure RAI -4a-4 present the measured strain PSD and the strain predictions generated by ACE 3.0a and ACE 3.0b, respectively. These plots are presented as example locations that generally represent the overall trend.

Strain PSD comparisons for the all active RSD strain gauges are provided in RAI-4 Appendix A.

a,b,c

Figure RAI-4a-1 ACE+SPM Rev 2.0 and Measured Strain PSD – SG13

a,b,c

Figure RAI-4a-2 ACE Rev 2.0.1 and Measured Strain PSD – SG04

[a,b,c]

Figure RAI-4a-3 ACE Rev 3.0a and Measured Strain PSD – SG09

a,b,c

Figure RAI-4a-4 ACE Rev 3.0b and Measured Strain PSD – SG18

RAI-4 Appendix A Figures

a,b,c

Figure RAI-4-A-1 ACE Rev 2.0.1 and Measured Strain PSD - SG03

a,b,c

Figure RAI-4-A-2 ACE Rev 2.0.1 and Measured Strain PSD - SG04

a,b,c

Figure RAI-4-A-3 ACE Rev 2.0.1 and Measured Strain PSD - SG07

a,b,c

Figure RAI-4-A-4 ACE Rev 2.0.1 and Measured Strain PSD - SG08

a,b,c

Figure RAI-4-A-5 ACE Rev 2.0.1 and Measured Strain PSD - SG09

[a,b,c]

Figure RAI-4-A-6 ACE Rev 2.0.1 and Measured Strain PSD – SG10

[a,b,c]

Figure RAI-4-A-7 ACE Rev 2.0.1 and Measured Strain PSD – SG21

a,b,c

Figure RAI-4-A-8 ACE Rev 2.0.1 and Measured Strain PSD – SG23

a,b,c

Figure RAI-4-A-9 ACE Rev 2.0.1 and Measured Strain PSD – SG24

a,b,c

Figure RAI-4-A-10 ACE+SPM Rev 2.01 and Measured Strain PSD – SG11

a,b,c

Figure RAI-4-A-11 ACE+SPM Rev 2.01 and Measured Strain PSD – SG12

a,b,c

Figure RAI-4-A-12 ACE+SPM Rev 2.01 and Measured Strain PSD – SG13

a,b,c

Figure RAI-4-A-13 ACE+SPM Rev 2.01 and Measured Strain PSD – SG14

a,b,c

Figure RAI-4-A-14 ACE+SPM Rev 2.01 and Measured Strain PSD – SG15

a,b,c

Figure RAI-4-A-15 ACE+SPM Rev 2.01 and Measured Strain PSD – SG16

a,b,c

Figure RAI-4-A-16 ACE+SPM Rev 2.01 and Measured Strain PSD – SG17

a,b,c

Figure RAI-4-A-17 ACE+SPM Rev 2.01 and Measured Strain PSD – SG18

a,b,c

Figure RAI-4-A-18 ACE+SPM Rev 2.01 and Measured Strain PSD – SG20

a,b,c

Figure RAI-4-A-19 ACE Rev 3.0a and Measured Strain PSD – SG03

a,b,c

Figure RAI-4-A-20 ACE Rev 3.0a and Measured Strain PSD – SG04

a,b,c

Figure RAI-4-A-21 ACE Rev 3.0a and Measured Strain PSD – SG07

a,b,c

Figure RAI-4-A-22 ACE Rev 3.0a and Measured Strain PSD – SG08

a,b,c

Figure RAI-4-A-23 ACE Rev 3.0a and Measured Strain PSD – SG09

a,b,c

Figure RAI-4-A-24 ACE Rev 3.0a and Measured Strain PSD – SG10

a,b,c

Figure RAI-4-A-25 ACE Rev 3.0a and Measured Strain PSD – SG21

a,b,c

Figure RAI-4-A-26 ACE Rev 3.0a and Measured Strain PSD – SG23

a,b,c

Figure RAI-4-A-27 ACE Rev 3.0a and Measured Strain PSD – SG24

a,b,c

Figure RAI-4-A-28 ACE Rev 3.0b and Measured Strain PSD – SG11

a,b,c

Figure RAI-4-A-29 ACE Rev 3.0b and Measured Strain PSD – SG12

a,b,c

Figure RAI-4-A-30 ACE Rev 3.0b and Measured Strain PSD – SG13

a,b,c

Figure RAI-4-A-31 ACE Rev 3.0b and Measured Strain PSD – SG14

[a,b,c]

Figure RAI-4-A-32 ACE Rev 3.0b and Measured Strain PSD – SG15

a,b,c

Figure RAI-4-A-33 ACE Rev 3.0b and Measured Strain PSD – SG16

a,b,c

Figure RAI-4-A-34 ACE Rev 3.0b and Measured Strain PSD – SG17

a,b,c

Figure RAI-4-A-35 ACE Rev 3.0b and Measured Strain PSD – SG18

a,b,c

Figure RAI-4-A-36 ACE Rev 3.0b and Measured Strain PSD – SG20

RAI 4b)

The ACE benchmarks provided in this response are examples that represent attempts to [

]a,c

Summary Example

[

]a,c

a,b,c

Figure RAI-4b-1 Peach Bottom Unit 2 Instrumentation Summary
(locations are approximate; not to scale)

a,b,c

Figure RAI-4b-2 Strain PSD Comparison - SG03

a,b,c

Figure RAI-4b-3 Strain PSD Comparison - SG04

a,b,c

Figure RAI-4b-4 Strain PSD Comparison - SG07

a,b,c

Figure RAI-4b-5 Strain PSD Comparison - SG08

a,b,c

Figure RAI-4b-6 Strain PSD Comparison - SG09

a,b,c

Figure RAI-4b-7 Strain PSD Comparison – SG10

a,b,c

Figure RAI-4b-8 Strain PSD Comparison - PT04

Bias and Uncertainty

Table RAI-4b-1a and Table RAI-4b-1b present the bias and uncertainty for the [ ]^{a,c} As discussed previously, MSL acoustic models [

]^{a,c}

Table RAI-4b-1a ACE Rev 3.0a_Example Bias and Uncertainty

[a,b,c

Table RAI-4b-1b ACE Rev 3.0b_Example Bias and Uncertainty

[a,b,c

Table RAI-4b-2a and Table RAI-4b-2b present the total uncertainty [
]a,c

Table RAI-4b-2a ACE Rev 3.0a_Example Total Uncertainty

[a,b,c

]

Table RAI-4b-2b ACE Rev 3.0b_Example Total Uncertainty

[a,b,c

]

RMS Strain

Another aspect that contributes to the particular characteristics of the benchmarks is [

]a,c

Table RAI-4b-3 [ ]a,c

a,b,c

Strain PSD Comparisons

The resulting strain PSD comparisons for the [

]^{a,c}

[a,b,c

]

Figure RAI-4b-9 Strain PSD Comparison – SG03

a,b,c

Figure RAI-4b-10 Strain PSD Comparison - SG04

a,b,c

Figure RAI-4b-11 Strain PSD Comparison - SG07

a,b,c

Figure RAI-4b-12 Strain PSD Comparison - SG08

a,b,c

Figure RAI-4b-13 Strain PSD Comparison - SG09

[a,b,c]

Figure RAI-4b-14 Strain PSD Comparison – SG10

a,b,c

Figure RAI-4b-15 Strain PSD Comparison – SG21

[a,b,c]

Figure RAI-4b-16 Strain PSD Comparison – SG23

a,b,c

Figure RAI-4b-17 Strain PSD Comparison – SG24

[a,b,c]

Figure RAI-4b-18 Strain PSD Comparison – SG11

a,b,c

Figure RAI-4b-19 Strain Comparison – SG12

a,b,c

Figure RAI-4b-20 Strain PSD Comparison – SG13

a,b,c

Figure RAI-4b-21 Strain PSD Comparison – SG14

a,b,c

Figure RAI-4b-22 Strain PSD Comparison – SG15

a,b,c

Figure RAI-4b-23 Strain PSD Comparison – SG16

a,b,c

Figure RAI-4b-24 Strain PSD Comparison – SG17

a,b,c

Figure RAI-4b-25 Strain PSD Comparison – SG18

a,b,c

Figure RAI-4b-26 Strain PSD Comparison – SG20

Stress Summary

Table RAI-4b-4 and Table RAI-4b-5 present the five lowest stress ratio locations [

]a,b,c

Table RAI-4b-4 ACE 3.0a_Example Stress Ratio Summary at Predicted EPU Conditions [ ]a,c

[a,b,c]

Table RAI-4b-5 ACE 3.0b_Example Stress Ratio Summary at Predicted EPU Conditions [ ]a,c

[a,b,c]

The results from these tables were [

]a,c

[a,b,c]

Figure RAI-4b-27 Stress PSD [ ]^{a,c}

a,b,c

Figure RAI-4b-28 Cumulative Stress [ ]a,c

[a,b,c]

Figure RAI-4b-29 Stress PSD [ ]^{a,c}

[a,b,c

Figure RAI-4b-30 Cumulative Stress [ ]^{a,c}

RAI-5

For the [[

]] Also, provide the modal amplitude and phase of these mode shapes.

Response

[

]^{a,c}

a,b,c

Figure RAI-5-1: Non-MSL Acoustic Predicted Cumulative Strain Plot [ ]^{a,c}

[a,b,c

Figure RAI-5-2: Outer Hood Mode Shape Plot [ ]^{a,c}

[a,b,c

Figure RAI-5-3: Outer Hood Mode Shape Plot [ ]^{a,c}

RAI-6

[[

]]

a) [[
]]

b) [[ ]]

c) [[

]]

Follow-up: Regarding figures 37 and 38 in the draft response to RAI 6: Please split the figures into separate figures showing only sensors on one face of the dryer, being sure to use different colors for each sensor so they are discernible. Figures 35 and 36, which show hood strains on separate dryer faces, are good examples. Please also split Figure 12 into separate figures, one for each instrumented dryer face.

Response

[

]^{a,c}

The frequency spectra plots requested in the RAI for the [ ]^{a,c} are presented below. Selected additional plots are also presented to facilitate interpretation. The following observations and conclusions are made:

1. [

]^{a,b}

2. [

]^{a,b}

3. [

]a,b

4. [

]a,b

The summary discussion and data presented herein is based on the steam dryer benchmark test conditions at [

]d

RAI 6a)

- [
  ]a,c
- [
  ]a,c

[

]a,c

[

]a,b,c

[

]a,b,c

[

]a,b,c

[

]a,b,c

[

]a,b,c

[

]a,b,c

[

]a,b,c

[ ] a,c

[

]a,c

[

]a,b,c

RAI 6b)

- [ ]^{a,c}
- [ ]^{a,c}

[

]^{a,b,c}

[

]^{a,b,c}

RAI 6c)

The [ ]^{a,c} requested by RAI 6c) are given in Figures RAI-6-23 through RAI-6-31:

- [ ]^{a,c}
- [ ]^{a,c}
- [ ]^{a,c}

For convenience, Figures RAI-6-32 through RAI-6-34 show all [ ]^{a,c}

For reference, Figures RAI-6-35 and RAI-6-36 are [ ]^{a,c}

Summary

[ ]^{a,b,c}

[ ]^{a,c}

[ ]^{a,b,c}

[

]a,c

[b

Figure RAI-6-1 [ ][a,c]

[b

]

Figure RAI-6-2 [ ]a,c

[b

Figure RAI-6-3 [ ]a,c

[b

Figure RAI-6-4 [

]a,c

[b

]

Figure RAI-6-5 [ ]a,c

[b

]

Figure RAI-6-6 [ ]a,c

[b

Figure RAI-6-7 [

]^{a,c}

[b

Figure RAI-6-8 [

]a,c

[b

Figure RAI-6-9 [

]a,c

[b

Figure RAI-6-10 [ ][a,c]

[b

Figure RAI-6-11 [ ][a,c]

[b

Figure RAI-6-12a [ ]^{a,c}

[b

Figure RAI-6-12b [ ][a,c]

[b

Figure RAI-6-13 [

]a,c

[b

Figure RAI-6-14 [

]a,c

[b

Figure RAI-6-15 [

]a,c

[b

Figure RAI-6-16 [

]a,c

[b

Figure RAI-6-17 [

]a,c

[b

Figure RAI-6-18 [

]a,c

[b

]

Figure RAI-6-19 [

]a,c

[b

]

Figure RAI-6-20 [

]a,c

[ ]b

Figure RAI-6-21 [ ]a,c

[b

Figure RAI-6-22 [

]a,c

[b

Figure RAI-6-23 [

]a,c

[b

Figure RAI-6-24 [

]a,c

[b

]

Figure RAI-6-25 [ ]a,c

[b

Figure RAI-6-26 [

]a,c

[b

]

Figure RAI-6-27 [

]a,c

[b

Figure RAI-6-28 [ ][a,c]

[b

Figure RAI-6-29 [

]a,c

[ ]b

Figure RAI-6-30 [ ]a,c

[b

Figure RAI-6-31 [

]a,c

[b

Figure RAI-6-32 [

]a,c

[b

]

Figure RAI-6-33 [ ]a,c

[b

Figure RAI-6-34 [

]^{a,c}

[b

Figure RAI-6-35 [ ][a,c]

[b

Figure RAI-6-36 [ ]^{a,c}

[b

Figure RAI-6-37a [

]^{a,c}

[b

Figure RAI-6-37b [ ]^{a,c}

[b

Figure RAI-6-37c [

]a,c

[b

Figure RAI-6-37d [ ]^{a,c}

b

Figure RAI-6-38a [

]^{a,c}

[b

Figure RAI-6-38b [

]^{a,c}

[b

Figure RAI-6-38c [

]^{a,c}

[b

Figure RAI-6-38d [

]^{a,c}

RAI-7

Please provide a table similar to Table 6.1 for the measurements taken at 98.5% of CLTP.

Response

For the same locations that have minimum stress ratios at EPU, both above and below the support ring, 98.5% CLTP stress results are summarized in Table RAI-7- 1.

Table RAI-7-1: PBAPS U2 Stress Ratio Summary at CLTP conditions

[ ] a,b,c

RAI-8

[[“

]]

[[

]]

Response

[

]a,c

[a,c]

[

]a,c

[

]a,c

[

]a,b,c

[

]a,c

[b

Figure RAI-8-1 [ ]^{a,c}

[ ]b

Figure RAI-8-2 [ ]a,c

b

Figure RAI-8-3 [ ]a,c

b

Figure RAI-8-4 [ ][a,c]

b

Figure RAI-8-5 [ ]^{a,c}

b

Figure RAI-8-6 [ ][a,c]

[b

Figure RAI-8-7 [ ]a,c

b

Figure RAI-8-8 [

]a,c

b

Figure RAI-8-9 [

]a,c

[ ]b

Figure RAI-8-10 [ ]a,c

[ ]b

Figure RAI-8-11 [ ]a,c

[ ]b

Figure RAI-8-12 [ ]a,c

Brief Summary Report RAIs

BSR-RAI-2

Table 6-1 of the stress report shows that the contribution of the stresses calculated using the new methodology to the maximum stress is quite small. [[

]] Please provide a comparison of the five highest stress results for the upper portion of the dryer and the five highest stress results for the lower portion of the dryer and their locations from both methodologies. Confirm whether the new methodology is conservative with respect ACE 3.0.

Response

[

]^{a,c}

Table BSR-RAI-2-1: Five Highest MSL Acoustic Stress Locations for PBAPS Unit 2 Upper Dryer

[ ] a,b,c

Table BSR-RAI-2-2: Five Highest MSL Acoustic Stress Locations for PBAPS Unit 2 Lower Dryer

[ ] a,b,c

[

]a,c

In summary, the [
]a,c

Please provide the following additional information regarding the stress results:

a) Update RSD Strain PSD plots shown in [[
]]

b) Provide [[

]] Also, expand Table 6.1 to include these peak stress locations. Include images of the dryer FE model with the top stress locations highlighted.

Response

BSR-RAI-3a)

[

]^{a,c}

BSR-RAI-3b)

[

]a,c

Table BSR-RAI-3b-1 High Stress Locations [ ]a,c

[a,b,c]

Table BSR-RAI-3b-2 High Stress Locations [ ]a,c

[a,b,c]

Table BSR-RAI-3b-3 Dominant Frequency Summary [ ]a,c

[a,b,c]

Table BSR-RAI-3b-4 Dominant Frequency Summary [ ]a,c

a,b,c

[a,b,c]

Figure BSR-RAI-3b-1 Stress PSD [ ]^{a,c}

[a,b,c

Figure BSR-RAI-3b-2 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-3 Stress PSD [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-4 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-5 Stress PSD [ ]^{a,c}

[a,b,c

Figure BSR-RAI-3b-6 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-7 Stress PSD [ ]^{a,c}

[a,b,c

]

Figure BSR-RAI-3b-8 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-9 Stress PSD [ ]^{a,c}

[a,b,c

Figure BSR-RAI-3b-10 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-11 Stress PSD [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-12 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-13 Stress PSD [ ]^{a,c}

[a,b,c

Figure BSR-RAI-3b-14 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-15 Stress PSD [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-16 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-17 Stress PSD [ ]^{a,c}

[a,b,c

]

Figure BSR-RAI-3b-18 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-19 Stress PSD [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-20 Cumulative Stress [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-21 General location [ ]^{a,c}

[a,b,c

]

Figure BSR-RAI-3b-22 General location [ ]^{a,c}

[a,b,c]

Figure BSR-RAI-3b-23 Relative Position [ ]^{a,c}

[a,b,c

]

Figure BSR-RAI-3b-24 Relative Position [ ]^{a,c}

Attachment 3

Peach Bottom Atomic Power Station Unit 2

NRC Docket No. 50-277

AFFIDAVIT

Note

Attachment 1 contains proprietary information as defined by 10 CFR 2.390. WEC, as the owner of the proprietary information, has executed the enclosed affidavit, which identifies that the proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. The proprietary information has been faithfully reproduced in the attachment such that the affidavit remains applicable.

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Engineering, Equipment and Major Projects
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USA

U.S. Nuclear Regulatory Commission
Document Control Desk
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Direct tel: (412) 374-4643
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CAW-15-4142

March 24, 2015

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: "Response to Request for Additional Information - Proprietary," Attachment 1 to Exelon Generation submittal to the NRC "Extended Power Uprate: Response to Replacement Steam Dryer Requests for Additional Information"

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-15-4142 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The Affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying Affidavit by Exelon Generation.

Correspondence with respect to the proprietary aspects of the Application for Withholding or the Westinghouse Affidavit should reference CAW-15-4142, and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066.

Very truly yours,

James A. Gresham, Manager
Regulatory Compliance

Enclosures

CAW-15-4142
March 24, 2015

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

I, James A. Gresham, am authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief.

James A. Gresham, Manager
Regulatory Compliance

(1) I am Manager, Regulatory Compliance, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitute Westinghouse policy and provide the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(iii) There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component

may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iv) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(v) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(vi) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Response to Request for Additional Information - Proprietary," Attachment 1 to Exelon Generation submittal to the NRC "Extended Power Uprate: Response to Replacement Steam Dryer Requests for Additional Information" for submittal to the Commission, being transmitted by Exelon Generation letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with the NRC's review of a revised methodology for determining RSD strain limits for PBAPS Unit 2, and may be used only for that purpose.

(a) This information is part of that which will enable Westinghouse to:

(i) Assist Exelon Generation in obtaining NRC review and approval of a revised methodology for determining RSD strain limits for PBAPS Unit 2.

(b) Further this information has substantial commercial value as follows:

(i) Westinghouse plans to sell the use of this information to its customers for purposes of plant-specific replacement steam dryer analysis for licensing basis applications.

(ii) Its use by a competitor would improve their competitive position in the design and licensing of a similar product for BWR steam dryer analysis methodology.

(iii) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and non-proprietary versions of documents furnished to the NRC associated with the NRC's review of a revised methodology for determining RSD strain limits with regard to RSD analysis benchmarking for PBAPS Unit 2, and may be used only for that purpose.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the Affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

Attachment 4

Peach Bottom Atomic Power Station Unit 2

NRC Docket No. 50-277

Response to Request for Additional Information 9

The Nuclear Regulatory Commission (NRC) issued Amendment Nos. 293 and 296 to Renewed Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3 (ADAMS Accession No. ML14133A046). These amendments authorized an increase in the maximum licensed thermal power level for PBAPS, Units 2 and 3, from 3514 megawatts thermal (MWt) to 3951 MWt, which is an increase of approximately 12.4 percent.

In accordance with PBAPS Unit 2 License Condition 2.C(15)(d)3, EGC requested NRC approval for a revision to the methodology for establishing the RSD strain limits in a letter dated February 3, 2015 (ADAMS Accession No. ML15034A573). The NRC staff has reviewed the information supporting the revised methodology and has requested additional information. The response to request 9 is provided in this attachment.

RAI-9

Please elaborate on the reason for changing the steam dryer analysis methodology. As part of your response, please address if the following NRC staff understanding of the reason for the change is correct.

When the licensee predicted dryer strains using MSL measurements (i.e., original methodology that the NRC evaluated and addressed in the EPU safety evaluation but re-benchmarked with on-dryer strain gage data at or near CLTP), it found that the measured strains were too high compared to predictions in certain low frequency ranges. As a result, the corresponding end-to-end B/Us were too high and the resulting MASR was predicted to be smaller than 1.0 at EPU. What was the MASR and at how many locations in the dryer did the MASR fall below 1.0? Please provide a table showing dryer locations with a MASR less than 1.0 and the corresponding MASR values. The high B/Us in certain low frequency ranges may account for some loads that were not seen in the MSL measurements. Is there any technical reason why these high stresses are incorrect or overly conservative? If not, then please explain how these stresses can be reduced by using a new methodology.

RESPONSE

The measured data from the Peach Bottom Unit 2 main steam lines and replacement steam dryer (RSD) taken at 3460 MWt were used to develop an end-to-end benchmark of the steam dryer acoustic analysis methodology. The RSD instrumentation measured noticeable strain responses in the low frequency range that were not present in the predicted strains from the acoustic analysis methodology using MSL inputs. It was determined that the acoustic analysis methodology could not appropriately predict those loads in the low frequency range (i.e., < 50 hz.) while meeting the benchmarking criteria and yielding a MASR greater than 1.0 at EPU conditions.

The acoustic analysis methodology predicted EPU stress ratios less than 1.0 at more than 10 location types on the steam dryer. The MASR was predicted to be 0.48 on the upper dryer and 0.62 on the lower dryer. In the response to RAI 4b (see Attachment 1 in this submittal), Table RAI 4b-4 and Table RAI 4b-5 present the five lowest stress ratio locations on the upper and lower dryer, respectively.

The technical reason why the high stresses are overly conservative is that the model produces an overly conservative pressure load definition in the low frequency range when meeting the license condition benchmark requirements to bound both RMS measured strain and the dominant frequency power spectral density.