

PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390

10 CFR 50.4
10 CFR 2.390

October 1, 2015

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

Peach Bottom Atomic Power Station, Unit 2 and Unit 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: MELLLA+ License Amendment Request – Supplement 6 Response to Request for Additional Information

- Reference:
1. Exelon letter to the NRC, "License Amendment Request – Maximum Extended Load Line Limit Analysis Plus," dated September 4, 2014 (ADAMS Accession No. ML14247A503)
 2. Email from R. Ennis, NRC to K. Borton, Exelon, transmitted on September 8, 2015, to Mr. Kevin Borton of Exelon Generation Company, LLC (Exelon, the licensee).
 3. Exelon letter to the NRC, "MELLLA+ License Amendment Request – Supplement 3 Response to Request for Additional Information," dated April 28, 2015 (ADAMS Accession No. ML 15118A717)
 4. Exelon letter to the NRC, "MELLLA+ License Amendment Request – Supplement 4 Response to Request for Additional Information," dated July 6, 2015 (ADAMS Accession No. ML 15187A391)

In accordance with 10 CFR 50.90, Exelon Generation Company, LLC (EGC) requested amendments to Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS) Units 2 and 3, respectively (Reference 1). Specifically, the proposed changes would revise the Renewed Operating Licenses to allow operation in the expanded Maximum Extended Load Line Limit Analysis Plus (MELLLA+) operating domain and the use of the Detect and Suppress – Confirmation Density (DSS-CD) stability solution.

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

This letter provides responses to Requests for Additional Information (RAIs) from the Reactor Systems Branch (SRXB) provided in Reference 2. Portions of the information provided in Attachment 1 are considered to be proprietary and are, therefore, exempt from public disclosure pursuant to 10 CFR 2.390. Attachment 2 provides a nonproprietary version. Attachment 4 contains an affidavit for withholding information executed by GE Hitachi Nuclear Energy Americas LLC (GEH). On behalf of GEH, EGC requests Attachment 1 be withheld from public disclosure in accordance with 10 CFR 2.390(b)(1).

In addition, PBAPS MELLLA+ Supplement 3 and 4 (Reference 3 and 4), responded to an NRC request regarding adding a license condition to confirm the execution of future plans with respect to time-critical operator actions associated with the MELLLA+ analysis activities. The proposed license condition actions have been completed prior to NRC approval of the requested MELLLA+ amendments. Attachment 3 provides the results of the activities as described in the proposed license condition. By way of this letter, the proposed license condition requirements have been met. Since the information being provided in this letter meets the requirements of the proposed license condition prior to NRC approval of the requested MELLLA+ amendment, the proposed license condition is withdrawn and no longer necessary.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please call me at (610) 765-5528.

Respectfully,



Kevin F. Borton
Manager, Power Uprate Licensing
Exelon Generation Company, LLC

Attachments:

1. Enclosure 1 - GEH-PBAPS-MP-141, "Response to SRXB-RAI-18 in Support of PBAPS MELLLA+ LAR" – Proprietary
2. Enclosure 2 - GEH-PBAPS-MP-141, "Response to SRXB-RAI-18 in Support of PBAPS MELLLA+ LAR" – Non-Proprietary
3. Maximum Extended Load Line Limit Analysis Plus Operator Training Results
4. Affidavit

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 and Unit 3

NRC Docket Nos. 50-277 and 50-278

**Enclosure 2 - GEH-PBAPS-MP-141,
"Response to SRXB-RAI-18 in Support of PBAPS MELLLA+ LAR"– Non-Proprietary**

ENCLOSURE 2

GEH-PBAPS-MP-141

Response to SRXB-RAI-18 in Support of PBAPS MELLLA+ LAR

Non-Proprietary Information - Class I (Public)

NON-PROPRIETARY NOTICE

This is a non-proprietary version of Enclosure 1 of GEH-PBAPS-MP-141 which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[]].

SRXB-RAI-18

The NRC staff needs to better understand the performance of TRACG beyond Nucleate Boiling (i.e., in Transition Boiling and Film Boiling). The staff has questions regarding the use of a Minimum Film Boiling Temperature (Tmin) model in TRACG as a means of predicting the transition to film boiling and determining the Transition and Film Boiling Heat Transfer Coefficient.

- 1) Provide TRACG turbine trip with bypass (TTWBP) and dual recirculation pump trip (2RPT) sensitivity calculations for PBAPS in which the Homogeneous Nucleation Temperature is used for Tmin; include relevant plots of results.
- 2) Additionally, provide TRACG sensitivity calculations with more realistic assumptions in which both the Homogenous Nucleation Temperature and the Shumway correlation (as currently implemented in TRACG) is used. Include relevant sensitivity parameters (such as, but not necessarily limited to: operator response time, Tmin model, peak cladding temperature (PCT) and/or number of assemblies that exceed 2200 °F, peaking factor and feedwater assumptions); also include relevant plots of results.

GEH Response

TRACG sensitivity analyses are performed and results are provided.

The first row of Table 1 (Case RG) shows the results for the licensing case for the TTWBP anticipated transient without scram instability (ATWSI) event. [[
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- a conservative feedwater temperature reduction that decreases from the initial feedwater temperature to the condenser temperature over a 60 second time constant,
- a 120-second operator action time to reduce reactor water level,
- [[

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Sensitivity calculations are performed with changes to these parameters, and results are shown in Table 1 and in Figures 2 through 8.

The first row of Table 2 (Case RG) shows the results for the licensing case for the recirculation pump trip (RPT) ATWSI event. [[
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- a 60-second operator action time to initiate manual scram (and recognize failure to scram),
- a 120-second operator action time to reduce reactor water level,

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Sensitivity calculations are performed with changes to these parameters, and results are shown in Table 2 and in Figures 9 through 15.

For the TTWBP analysis, an expected feedwater temperature response is used in the sensitivity analysis. This nominal response is based on Peach Bottom Atomic Power Station (PBAPS) simulator data and decreases at a much slower rate. It also includes some added conservatism by assuming a constant feedwater temperature for 20 seconds, then a linear decrease of 1.5°F/sec to the condenser temperature. Both feedwater temperature profiles used in the analysis are shown in Figure 1.

The homogeneous nucleation T_{min} model is estimated to result in T_{min} values that are conservatively low compared to the modified Shumway T_{min} correlation. This T_{min} correlation is used in the sensitivity analysis. This correlation, as applied in TRACG, is defined in Section 6.6.7 of the TRACG Model Description (Reference 1). The equation is:

$$T_{min} = T_c + (T_c - T_\ell) \left(\frac{\rho_\ell k_\ell C_{p,\ell}}{\rho_w k_w C_{p,w}} \right)^{1/2}$$

where T_c is the critical temperature for water (647 K). [[

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For the TTWBP event, the operator action time to reduce water level is assumed to be either 90, 120 (licensing value), or 200 seconds.

For the RPT event, the operator action time to manually scram the reactor is assumed to be either 30 or 60 seconds (licensing value). The operator action time to reduce water level is either 120 (licensing value) or 200 seconds. Table 2 only shows the summation of these operator action times since it is only the combination of the two that is important in the TRACG analysis.

The rod-to-rod peaking factors are increased in all analyses. For the licensing case, the initial LHGR peaking is increased to 95% of the limit [[]]. This is the only value assumed in the TTWBP sensitivity analysis. In some RPT analyses, the initial LHGR peaking is increased to the maximum core value corresponding to the peak hot excess exposure and peaked power shape associated with the event [[]].

The effect of the sensitivity cases on the output parameters of interest is consistent with the expected effect of the changes. [[

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Reference

1. GE Hitachi Nuclear Energy, "TRACG Model Description," NEDE-32176P, Revision 4, January 2008.

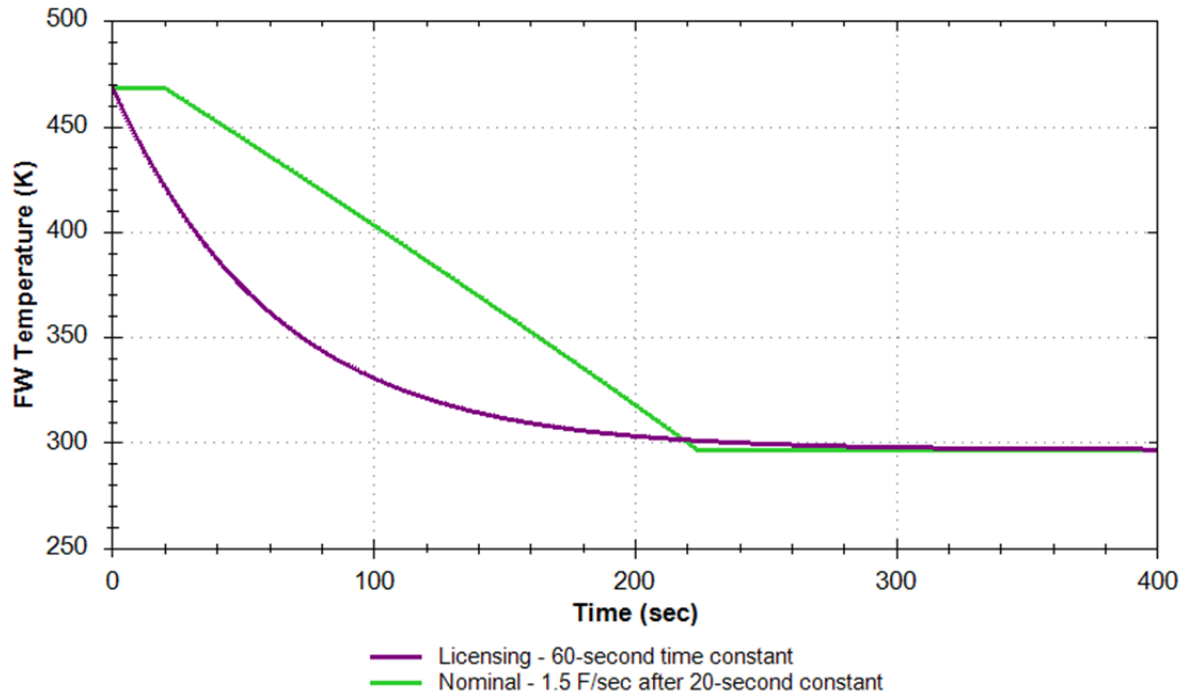


Figure 1 – Turbine Trip Feedwater Temperature Reduction

Table 1. TTWBP-ATWSI PCT Results

Case Figure #	Transient FW Temperature Response	Operator Action Time to Reduce Water Level (sec)	Tmin Model	Limiting Rod Peaking (kW/ft)	PCT (K)
RG. Figure 2	Licensing	120	Modified Shumway	[[
RG4. Figure 3	Nominal	120	Modified Shumway		
RG6. Figure 4	Nominal	120	Homogeneous Nucleation		
RG2. Figure 5	Licensing	90	Modified Shumway		
RG7. Figure 6	Licensing	90	Homogeneous Nucleation		
RG3. Figure 7	Licensing	200	Modified Shumway		
RG5. Figure 8	Nominal	200	Modified Shumway]]

Table 2. RPT-ATWSI PCT Results

Case. Figure #	Operator Action Time to Reduce Water Level (sec) (Includes time for manual scram)	Tmin Model	Limiting Rod Peaking (kW/ft)	PCT (K)
RG1a. Figure 9	180	Modified Shumway	[[
RG4a. Figure 10	180	Homogeneous Nucleation		
RG2a. Figure 11	150	Modified Shumway		
RG5a. Figure 12	150	Homogeneous Nucleation		
RG8. Figure 13	150	Modified Shumway		
RG9. Figure 14	150	Homogeneous Nucleation		
RG3a. Figure 15	260	Modified Shumway]]

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**Figure 2a – ATWSI-TTWBP
Licensing FW Temperature,
120-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 2b – ATWSI-TTWBP
Licensing FW Temperature,
120-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 3a – ATWSI-TTWBP
Best-Estimate FW Temperature,
120-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 3b – ATWSI-TTWBP
Best-Estimate FW Temperature,
120-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 4a – ATWSI-TTWBP
Best-Estimate FW Temperature,
120-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}**

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**Figure 4b – ATWSI-TTWBP
Best-Estimate FW Temperature,
120-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}**

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**Figure 5a – ATWSI-TTWBP
Licensing FW Temperature,
90-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 5b – ATWSI-TTWBP
Licensing FW Temperature,
90-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 6a – ATWSI-TTWBP
Licensing FW Temperature,
90-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}**

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**Figure 6b – ATWSI-TTWBP
Licensing FW Temperature,
90-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}**

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**Figure 7a – ATWSI-TTWBP
Licensing FW Temperature,
200-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 7b – ATWSI-TTWBP
Licensing FW Temperature,
200-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 8a – ATWSI-TTWBP
Best-Estimate FW Temperature,
200-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 8b – ATWSI-TTWBP
Best-Estimate FW Temperature,
200-second Operator Action to Reduce Water Level,
Modified Shumway Tmin**

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**Figure 9a – ATWSI-RPT
180-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at 95% of Limit**

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**Figure 9b – ATWSI-RPT
180-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at 95% of Limit**

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**Figure 10a – ATWSI-RPT
180-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}
Initial LHGR at 95% of Limit**

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**Figure 10b – ATWSI-RPT
180-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}
Initial LHGR at 95% of Limit**

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**Figure 11a – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at 95% of Limit**

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**Figure 11b – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at 95% of Limit**

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**Figure 12a – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}
Initial LHGR at 95% of Limit**

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**Figure 12b – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}
Initial LHGR at 95% of Limit**

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**Figure 13a – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at Core Maximum**

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**Figure 13b – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at Core Maximum**

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**Figure 14a – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}
Initial LHGR at Core Maximum**

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**Figure 14b – ATWSI-RPT
150-second Operator Action to Reduce Water Level,
Homogeneous Nucleation T_{min}
Initial LHGR at Core Maximum**

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**Figure 15a – ATWSI-RPT
260-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at 95% of Limit**

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**Figure 15b – ATWSI-RPT
260-second Operator Action to Reduce Water Level,
Modified Shumway Tmin
Initial LHGR at 95% of Limit**

Attachment 3

Peach Bottom Atomic Power Station Unit 2 and Unit 3

NRC Docket Nos. 50-277 and 50-278

Maximum Extended Load Line Limit Analysis Plus Operator Training Results

In a letter from Exelon to the NRC dated July 6, 2015 (ADAMS Accession No. ML 15187A391), text for a proposed Peach Bottom Atomic Power Station (PBAPS) Unit 2 and Unit 3 license condition 2.C (17) related to operator training associated with MELLLA+ was provided. The proposed license condition is being withdrawn since the information provided below provides and meets the requirements of the proposed license condition prior to NRC approval of the requested Maximum Extended Load Line Limit Analysis Plus (MELLLA+) amendment.

The proposed license condition, including the completed activities and information required by the proposed license condition, is as follows:

Proposed License Condition

(17) Maximum Extended Load Line Limit Analysis Plus (MELLLA+) Operator Training Prior to operation in the MELLLA+ operating domain, the Exelon Generation Company shall:

- (a) Complete operator training on time-critical actions supporting the MELLLA+ analysis.
- (b) Validate the ability to complete the time-critical actions consistent with the assumptions in the MELLLA+ analysis.
- (c) Provide the results of the validation activities to the NRC as a report in accordance with 10 CFR 50.4. As a minimum, the report shall contain the following:
 - 1) A listing of the time-critical response times assumed in the MELLLA+ analysis.
 - 2) The average times recorded for completion of the associated actions for all operating crews during operator training.
 - 3) A description of the resolution of any problems/discrepancies identified during the validation activities.

Completed Activities and Information Required

- (a) Operator training on time-critical actions supporting the MELLLA+ analysis was completed on August 14, 2015, for all five PBAPS Operating Shift Crews.
- (b) All five Operating Shift Crews were evaluated in order to assure they can meet the new time-critical actions consistent with the assumptions in the MELLLA+ analysis.
- (c) Results of the operating crew's evaluation regarding the new time-critical actions are provided below.
 - 1. The new time-critical response times assumed in the MELLLA+ analysis are Standby Liquid Control (SBLC) pump initiation within 120 seconds and reduction of reactor water level by reducing feedwater flow within 120 seconds.

2.

Action	Average Operator Crew Action Time	Required Time
SBLC pump initiation	73 seconds	120 seconds
Commence reactor water level reduction by reducing feedwater flow	84 seconds	120 seconds

Notes: SBLC pump initiation time is from the failure-to-scrum until SBLC pump is started. Reactor water reduction time is from the failure-to-scrum until injection rate of an in-service injection system is lowered.

- 3. No problems or discrepancies were identified during the activities.

Attachment 4

Peach Bottom Atomic Power Station Unit 2 and Unit 3

NRC Docket Nos. 50-277 and 50-278

AFFIDAVIT

Note

Attachment 1 contains proprietary information as defined by 10 CFR 2.390. GEH, 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.

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, **Lisa K. Schichlein**, state as follows:

- (1) I am a Senior Project Manager, NPP/Services Licensing, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.
- (2) The information sought to be withheld is contained in Enclosure 1 of GEH letter, GEH-PBAPS-MP-141, “GEH Response to PBAPS MELLLA+ RAI SRXB-RAI-18,” dated October 1, 2015. The GEH proprietary information in Enclosure 1, which is entitled “Response to SRXB-RAI-18 in Support of PBAPS MELLLA+ LAR,” is identified by a dotted underline inside double square brackets. [[This sentence is an example.^{3}]] Figures and large objects are identified with double square brackets before and after the object. In each case, the superscript notation ^{3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.
- (3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the *Freedom of Information Act* (“FOIA”), 5 U.S.C. Sec. 552(b)(4), and the *Trade Secrets Act*, 18 U.S.C. Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F.2d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2d 1280 (D.C. Cir. 1983).
- (4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:
 - a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;
 - b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
 - c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;
 - d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.

GE-Hitachi Nuclear Energy Americas LLC

- (5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in the following paragraphs (6) and (7).
- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary or confidentiality agreements.
- (8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed results and conclusions regarding supporting evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability of the Maximum Extended Load Line Limit Analysis Plus analysis for a GEH Boiling Water Reactor (“BWR”). The analysis utilized analytical models and methods, including computer codes, which GEH has developed, obtained NRC approval of, and applied to perform evaluations of Maximum Extended Load Line Limit Analysis Plus for a GEH BWR.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience and information databases that constitute a major GEH asset.

- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

GE-Hitachi Nuclear Energy Americas LLC

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 1st day of October 2015.



Lisa K. Schichlein
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