Entergy

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Attachment 2 contains **PROPRIETARY** information

GNRO-2015/00031

May 8, 2015

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

SUBJECT: Response to Request for Additional Information Regarding Fluence License Amendment Request
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCES:

1. U.S. Nuclear Regulatory Commission Letter, "Requests for Additional Information for the Review of the Grand Gulf Nuclear Station, License Renewal Application," dated August 28, 2013 (Accession No. ML13227A394)

2. Grand Gulf Nuclear Station Letter, "Response to Requests for Additional Information (RAI) set 47," dated September 23, 2013 in letter GNRO-2013/00069 (Accession No. ML13266A368)

3. U.S. Nuclear Regulatory Commission Regulatory Guide, Regulatory Guide 1.190, dated March 2001 (Accession No. ML010890301)

4. Grand Gulf Nuclear Station Letter GNRO-2014/00080, "Application to Revise Grand Gulf Nuclear Station Unit 1's Current Fluence Methodology from 0 EFPY Through the End of Extended Operations to a Single Fluence Method," dated November 21, 2014.

5. Response to Request for Supplemental Information dated February 18, 2015 in letter GNRO-2015/00011 (ADAMS Accession No. ML15049A536).

6. Request for Additional Information Regarding Fluence License Amendment Request dated April 3, 2015 (GNRI-2015/00041).

Dear Sir or Madam:

In accordance with the provisions of Section 50.90 of Title 10 Code of Federal Regulations (10 CFR), Entergy Operations, Inc. (Entergy) is submitting responses to a Request for Additional Information (RAI) regarding an amendment request to revise the existing license basis for Grand Gulf Nuclear Station, Unit 1.

When Attachment 2 is removed from this letter, the entire document is NON-PROPRIETARY

The RAI is for the proposed amendment to revise Grand Gulf Nuclear Station, Unit 1's license basis to adopt a single fluence calculation methodology. This response is needed to address the Staff's request for additional information regarding fluence uncertainties.

Attachment 1 provides responses to Request for Additional Information (RAI) questions 1 and 2. Attachment 2 provides response to RAI question 3 and contains information which is considered proprietary by GEH and should be protected. The affidavit contained in Attachment 4 identifies that the information contained in Attachment 2 has been handled and classified as proprietary by GEH. Entergy hereby requests that the NRC withhold the information contained in Attachment 2 from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. A non-proprietary version of response to RAI 3 is provided in Attachment 3.

RAI question 4 requests regulatory commitments as follows: install dosimetry capsules and/or scrapings, to qualify the 3D fluence method for fluence calculations outside of the beltline region. Provide details regarding the plans and schedule for installing dosimetry capsules and/or scrapings including the proposed locations for dosimetry capsule installation.

Also, provide a regulatory commitment to confirm that future calculated-to-measured (C/M) fluence values at the dosimetry location(s) are reasonably close to one including explicit definition of "reasonably close to one" (e.g. C/M greater than 0.8) and plans to address any substantial disagreements.

Entergy is currently in discussions with GEH regarding feasibility of taking scrapings and/or installing dosimetry capsules and will provide a response to RAI question 4 in a separate letter within 60 days from the date of this letter.

This letter contains no new commitments. If you have any questions or require additional information, please contact Mr. James Nadeau at (601) 437-2103.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 8, 2015.

Sincerely,

KJM/ras

Attachments:

1. Response to Request for Additional Information RAI's 1 and 2
2. Response to Request for Additional Information RAI 3, Proprietary Information
3. Response to Request for Additional Information RAI 3, Non-Proprietary Version
4. GEH Affidavit for Attachment 2

cc: with Attachments

U.S. Nuclear Regulatory Commission
ATTN: Ms. Rebecca Richardson, NRR/DLR
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation
Mail Stop O-11 F1
Washington, DC 20555

cc: without Attachments

U.S. Nuclear Regulatory Commission
ATTN: Mr. Mark Dapas, (w/2)
Regional Administrator, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
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State Health Officer
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Attachment 1

GNRO-2015/00031

Response to Request for Additional Information
RAI's 1 and 2

RAI 1

Confirm that fluence corrections are applied appropriately (i.e. considering bias and uncertainty) for all calculated fluence results that exceed 20%. The supplementary information provided in the licensee's response dated February 8, 2015, to the acceptance review RAI 1b indicates that only calculated fluence results with uncertainties greater than 30% are appropriately treated; it is not stated how calculated fluence results with uncertainties between 20% and 30% are treated, if uncertainties in this range exist.

RAI 1 Response:

Reactor Pressure Vessel Fluences

Regarding fluence results for use in the PT curve calculations, there is only one case in the Reference [1] report where a bias has been applied due to the uncertainty being above 20%. These data are provided in Table 5-23 of the Reference [1] report for the N6 nozzle. The fluences reported in this table were calculated at the vessel wetted surface and have been increased by 39 % over the values reported in Table 5-20 to account for the fact that the uncertainty exceeds the 20 % limit specified in Regulatory Guide 1.190. None of the below core nozzles will exceed a fast fluence of 1.0 E+17 n/cm^2 before 54 EFPY.

The fluences to the above core RPV plates and welds will exceed 1.0 E+17 n/cm^2 before 54 EFPY. Accordingly, the necessary bias will be applied to the fluences at these locations. Whenever the uncertainty is greater than 20%, the calculated fluences will be multiplied by 1 plus the 1 sigma uncertainty. The final update to the Reference [1] report will contain these final fluences.

Shroud Fluences

The uncertainty for the shroud welds located above and below the active fuel region is included in the Reference [1] report. However, a bias has not been included in the shroud fluences that are reported. Application of a bias is an RPV-related conservatism. Application of a bias for the shroud may be necessary in the future depending on the application requirements.

Reference:

[1] MPM Technical Report – "Neutron Transport Analysis for Grand Gulf Nuclear Station", Report Number MPM-814779, Revision 2, January, 2015.

RAI 2

The fluence uncertainties for upper regions of the reactor vessel are highly sensitive to the assumed above core void fraction distribution. What analysis has been performed in support of the assumed void fraction in the region above the core including consideration of the MELLLA+ operating domain?

RAI 2 Response:

The GGNS fluence analysis (reference MPM-814779, section 6.3) assumed an 'above core' uniformly distributed void fraction of 80%. The fluence analysis also developed a sensitivity analysis assuming a 2% increase in void fraction that is treated as a bias to the fluence. This results in a net 82% void fraction upper limit.

Thermal-hydraulic analyses of the RCS were performed using a TRACG model (used in previous GGNS analyses such as ATWSI, as described in NEDC-33612P, Safety Analysis Report for GGNS MELLLA+, Sept.2013). This analysis evaluated MELLLA+ operation using the GGNS final C20 design and an initial C21 design. The analyses determined the thermal-hydraulic conditions above the core for a variety of steady-state core operating conditions. The analyses demonstrate that the 'above core' nominal void fraction assumed in the fluence analysis is conservative for the expected cycle average core flow (approximately 90% of rated). At 90% of rated the 'above core' void fraction was determined to be 79.8%. Operation with higher core flows would yield lower 'above core' void fractions while operation at lower core flows produce higher 'above core' void fractions. The core flow varies during a given cycle due to core operating design limits such as OLMCPR and core reactivity effects. While the MELLLA+ operating domain allows operation to as low as 80% core flow, this operation is not achievable for extended periods of time due to these core operating design limits. Because of the integrated effects inherent in fluence analysis, a multi-cycle averaged core flow is the appropriate figure of merit to ensure the fluence analysis assumptions remain applicable. The TRACG analyses demonstrate that operation with cycle average core flows as low as 81% core flow meet the fluence analysis upper limit void fraction assumption of 82% voids. In order to ensure the fluence analysis remains applicable, the integrated multi-cycle average core flow will be confirmed to exceed 81% for core designs using the MELLLA+ operating domain. This approach is very conservative since it does not credit past operation at the lower control rod line available in the MELLLA operating domain. Additionally, there is no credit for void fraction distribution effects near the core edge where lower void fractions will occur.

Attachment 3

GNRO-2015/00031

Response to Request for Additional Information
RAI 3

Non- Proprietary Version

This is a non-proprietary version of Attachment 2 of letter GNRO-2015/00031 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 [[ ]].

RAI 3

What is the potential for the high uncertainty outside-of-beltline reactor pressure vessel regions to be limiting with respect to pressure/temperature curve generation over the entire period of extended operation?

GEH Response

Fluence

Fluence was prepared using two (2) methods: (1) Equation 3 of Regulatory Guide (RG) 1.99, Revision 2, and (2) displacements per atom (dpa) attenuation. The key fluence inputs used in the evaluation are provided in Table 1.

Table 1: Fluence Applied to Grand Gulf Nuclear Station (GGNS) Pressure-Temperature (PT) Curves

Location	35 EFPY Peak ID Fluence (n/cm^2)	35 EFPY 1/4T Fluence (n/cm^2)		54 EFPY Peak ID Fluence (n/cm^2)	54 EFPY 1/4T Fluence (n/cm^2)	
		RG 1.99	dpa		RG 1.99	dpa
Shell 1	2.68E+17	1.74E+17	1.93E+17	5.05E+17	3.28E+17	3.63E+17
Shell 2	2.34E+18	1.52E+18	1.61E+18	4.02E+18	2.61E+18	2.76E+18
Shell 3	2.28E+17	1.48E+17	1.59E+17	4.38E+17	2.84E+17	3.04E+17
Weld AB[1]	Same as Shell 1					
Weld AC[2]	Conservatively Applied Shell 3 Fluence					
Nozzle N12[3]	2.47E+17	1.60E+17	1.76E+17	4.57E+17	2.96E+17	3.25E+17
Nozzle N6[4]	1.63E+17	1.06E+17	1.13E+17	3.13E+17	2.03E+17	2.17E+17

Notes:

[1] Weld AB is the circumferential weld between Shell 1 and Shell 2.

[2] Weld AC is the circumferential weld between Shell 2 and Shell 3.

[3] Nozzle N12 is the water level instrumentation nozzle in Shell 2.

[4] Nozzle N6 is the Low Pressure Coolant Injection (LPCI) nozzle in Shell 3.

Adjusted Reference Temperature (ART)

The ART was prepared for both 35 and 54 Effective Full Power Years (EFPY) using each set of fluence values. Tables 2 and 3 provide a comparison of the ART results for each beltline material for 35 and 54 EFPY, respectively.

Table 2: 35 EFPY ART Comparison Between RG 1.99 and DPA Method Results

					RG 1.99 1/4T	DPA 1/4T	RG 1.99	DPA
COMPONENT	HEAT	Chemistry Factor (CF)	Fitted or Adjusted CF °F	Initial RT_{NDT} °F	Fluence n/cm^2	Fluence n/cm^2	35 EFPY ART °F	35 EFPY ART °F
PLANT-SPECIFIC CHEMISTRIES								
PLATES:								
Shell Ring 3	C2741-1	[[			1.48E+17	1.59E+17	33.9	35.0
	C2741-2				1.48E+17	1.59E+17	13.9	15.0
	C2779-1			]]	1.48E+17	1.59E+17	33.9	35.0
Shell Ring 2	C2593-2	26		-30	1.52E+18	1.61E+18	-3.7	-3.0
	C2594-1	26		-10	1.52E+18	1.61E+18	16.3	17.0
	C2594-2	26		0	1.52E+18	1.61E+18	26.3	27.0
	A1224-1	26		0	1.52E+18	1.61E+18	26.3	27.0
Shell Ring 1	A1113-1	83.75		10	1.74E+17	1.93E+17	36.4	38.2
	C2557-2	83.6		10	1.74E+17	1.93E+17	36.4	38.1
	C2506-1	83.9		-20	1.74E+17	1.93E+17	6.5	8.2
AXIAL WELDS:								
Shell Ring 3	5P6214B/0331 Single	[[			1.48E+17	1.59E+17	-42.3	-42.0
	5P6214B/0331 Tandem			]]	1.48E+17	1.59E+17	-32.3	-32.0
Shell Ring 2	5P6214B/0331 Single	27		-50	1.52E+18	1.61E+18	-22.7	-22.0
	5P6214B/0331 Tandem	27		-40	1.52E+18	1.61E+18	-12.7	-12.0
Shell Ring 1	5P6214B/0331 Single	27		-50	1.74E+17	1.93E+17	-41.5	-40.9
	5P6214B/0331 Tandem	27		-40	1.74E+17	1.93E+17	-31.5	-30.9
CIRCUMFERENTIAL WELDS:								
AB	4P7216/0156 Single	41		-40	1.74E+17	1.93E+17	-27.1	-26.2
AB	4P7216/0156 Tandem	41		-60	1.74E+17	1.93E+17	-47.1	-46.2
AC	5P6771/0342 Single	[[			1.48E+17	1.59E+17	-18.3	-17.8
AC	5P6771/0342 Tandem			]]	1.48E+17	1.59E+17	-4.6	-3.9
NOZZLES:								
N6 Forging	Q2QL2W	[[			1.06E+17	1.13E+17	16.5	18.1
N6 Welds	5P6756/0342 Single				1.06E+17	1.13E+17	-35.4	-34.3
N6 Welds	5P6756/0342 Tandem			]]	1.06E+17	1.13E+17	-22.2	-20.9
N12	C2593-2	26		-30	1.60E+17	1.76E+17	-22.2	-21.7
N12	C2594-2	26		0	1.60E+17	1.76E+17	7.8	8.3
N12 Welds	SB166							
BEST ESTIMATE CHEMISTRIES from BWRVIP-135 R3								
Plate	A1224-1	[[		0	1.52E+18	1.61E+18	23.3	23.9
Weld	5P6214B/0331 Single			-50	1.52E+18	1.61E+18	-23.4	-22.7
Weld	5P6214B/0331 Tandem			-40	1.52E+18	1.61E+18	-13.4	-12.7
N6 Weld	5P6756/0342 Single			-60	1.06E+17	1.13E+17	-35.4	-34.3
N6 Weld	5P6756/0342 Tandem			-50	1.06E+17	1.13E+17	-25.4	-24.3
Weld AC	5P6771/0342 Single			-30	1.48E+17	1.59E+17	-16.9	-16.3
Weld AC	5P6771/0342 Tandem			-20	1.48E+17	1.59E+17	-6.9	-6.3
Weld AB	4P7216/0156 Single			-40	1.74E+17	1.93E+17	-23.8	-22.7
Weld AB	4P7216/0156 Tandem	]]		-60	1.74E+17	1.93E+17	-43.8	-42.7

COMPONENT	HEAT	Chemistry Factor (CF)	Fitted or Adjusted CF °F	Initial RT_{NDT} °F	RG 1.99 1/4T Fluence n/cm²	DPA 1/4T Fluence n/cm²	RG 1.99 35 EFPY ART °F	DPA 35 EFPY ART °F
INTEGRATED SURVEILLANCE PROGRAM (BWRVIP-135 R3):								
Plate	A1224-1		[[	0	1.52E+18	1.61E+18	41.2	41.8
Weld	5P6214B Single			-50	1.52E+18	1.61E+18	-6.2	-5.1
Weld	5P6214B Tandem		]]	-40	1.52E+18	1.61E+18	3.8	4.9

It is shown that in every case the fluence determined using the dpa method produces the higher ART result. It can also be seen that the differences are relatively small.

The materials from Table 2 that are used in generating the PT curves are the maximum of the N12 nozzle forging and weld, the maximum of the N6 nozzle forging and weld, and the maximum of all the remaining materials. The nozzles are addressed separately to account for the stresses that are different than those for the main shell. For this case, the ARTs used for the N12 nozzle are 7.8°F and 8.3°F, which differ by 0.5°F. For the N6 nozzle, the ARTs used are 16.5°F and 18.1°F, which differ by 1.6°F. Finally, for the remaining materials, plate heat A1224-1 (using the Boiling Water Reactor Vessel and Internals Program (BWRVIP)-135, Revision 3 chemistry) is the limiting material; the ARTs used for the PT curves are 41.2°F and 41.8°F, which differ by 0.6°F.

Table 3: 54 EFPY ART Comparison Between RG 1.99 and DPA Method Results

COMPONENT	HEAT	CF	Fitted or Adjusted CF °F	Initial RT_{NDT} °F	RG 1.99 1/4T Fluence n/cm²	DPA 1/4T Fluence n/cm²	RG 1.99 54 EFPY ART °F	DPA 54 EFPY ART °F
PLANT-SPECIFIC CHEMISTRIES								
PLATES:								
Shell Ring 3	C2741-1	[[			2.84E+17	3.04E+17	45.7	47.2
	C2741-2				2.84E+17	3.04E+17	25.7	27.2
	C2779-1			]]	2.84E+17	3.04E+17	45.7	47.2
Shell Ring 2	C2593-2	26		-30	2.61E+18	2.76E+18	3.0	3.7
	C2594-1	26		-10	2.61E+18	2.76E+18	23.0	23.7
	C2594-2	26		0	2.61E+18	2.76E+18	33.0	33.7
	A1224-1	26		0	2.61E+18	2.76E+18	33.0	33.7
Shell Ring 1	A1113-1	83.75		10	3.28E+17	3.63E+17	48.7	51.1
	C2557-2	83.6		10	3.28E+17	3.63E+17	48.7	51.0
	C2506-1	83.9		-20	3.28E+17	3.63E+17	18.8	21.1
AXIAL WELDS:								
Shell Ring 3	5P6214B/0331 Single	[[			2.84E+17	3.04E+17	-38.5	-38.0
	5P6214B/0331 Tandem			]]	2.84E+17	3.04E+17	-28.5	-28.0
Shell Ring 2	5P6214B/0331 Single	27		-50	2.61E+18	2.76E+18	-15.7	-15.0
	5P6214B/0331 Tandem	27		-40	2.61E+18	2.76E+18	-5.7	-5.0

					RG 1.99 1/4T	DPA 1/4T	RG 1.99	DPA
COMPONENT	**HEAT**	**CF**	**Fitted or Adjusted CF °F**	**Initial RT_{NDT} °F**	**Fluence n/cm²**	**Fluence n/cm²**	**54 EFPY ART °F**	**54 EFPY ART °F**
Shell Ring 1	5P6214B/0331 Single	27		-50	3.28E+17	3.63E+17	-37.5	-36.8
	5P6214B/0331 Tandem	27		-40	3.28E+17	3.63E+17	-27.5	-26.8
CIRCUMFERENTIAL WELDS:								
AB	4P7216/0156 Single	41		-40	3.28E+17	3.63E+17	-21.0	-19.9
AB	4P7216/0156 Tandem	41		-60	3.28E+17	3.63E+17	-41.0	-39.9
AC	5P6771/0342 Single	[[			2.84E+17	3.04E+17	-12.6	-11.9
AC	5P6771/0342 Tandem			]]	2.84E+17	3.04E+17	3.0	3.9
NOZZLES:								
N6 Forging	Q2QL2W	[[			2.03E+17	2.17E+17	35.6	37.9
N6 Welds	5P6756/0342 Single				2.03E+17	2.17E+17	-22.5	-20.9
N6 Welds	5P6756/0342 Tandem			]]	2.03E+17	2.17E+17	-7.6	-5.9
N12	C2593-2	26		-30	2.96E+17	3.25E+17	-18.7	-18.0
N12	C2594-2	26		0	2.96E+17	3.25E+17	11.3	12.0
N12 Welds	SB166							
BEST ESTIMATE CHEMISTRIES from BWRVIP-135 R3								
Plate	A1224-1	[[		0	2.61E+18	2.76E+18	29.2	29.9
Weld	5P6214B/0331 Single			-50	2.61E+18	2.76E+18	-16.6	-15.9
Weld	5P6214B/0331 Tandem			-40	2.61E+18	2.76E+18	-6.6	-5.9
N6 Weld	5P6756/0342 Single			-60	2.03E+17	2.17E+17	-22.5	-20.9
N6 Weld	5P6756/0342 Tandem			-50	2.03E+17	2.17E+17	-12.5	-10.9
Weld AC	5P6771/0342 Single			-30	2.84E+17	3.04E+17	-10.4	-9.6
Weld AC	5P6771/0342 Tandem			-20	2.84E+17	3.04E+17	-0.4	0.4
Weld AB	4P7216/0156 Single			-40	3.28E+17	3.63E+17	-16.2	-14.8
Weld AB	4P7216/0156 Tandem	]]		-60	3.28E+17	3.63E+17	-36.2	-34.8
INTEGRATED SURVEILLANCE PROGRAM (BWRVIP-135 R3):								
Plate	A1224-1		[[	0	2.61E+18	2.76E+18	47.4	48.1
Weld	5P6214B Single			-50	2.61E+18	2.76E+18	4.9	6.1
Weld	5P6214B Tandem		]]	-40	2.61E+18	2.76E+18	14.9	16.1

It can be seen that in every case the fluence determined using the dpa method produces the higher ART result. It is also shown that the differences are relatively small.

The materials from Table 3 that are used in generating the PT curves are the maximum of the N12 nozzle forging and weld, the maximum of the N6 nozzle forging and weld, and the maximum of all the remaining materials. The nozzles are addressed separately to account for the stresses that are different than those for the main shell. For this case, the ARTs used for the N12 nozzle are 11.3°F and 12°F, which differ by 0.7°F. For the N6 nozzle, the ARTs used are 35.6°F and 37.9°F, which differ by 2.3°F. Finally, for the remaining materials, plate heat A1113-1 is the limiting material; the ARTs used for the PT curves are 48.7°F and 51.1°F, which differ by 2.3°F. Note that by expanding the ARTs for the plate heat A1113-1 by an additional significant figure, the ARTs used for the PT curves are 51.06°F and 48.74°F, which yield a 2.3°F difference.

PT Curves

PT curves were generated for 35 and 54 EFPY using both sets of ART results. The results for each set were compared; the results are discussed below.

35 EFPY – Curve A

Between 0 and 312.5 psig, there is no difference in the bounding curve; this portion of the curve is bounded by the 10 Code of Federal Regulations (CFR) 50 Appendix G requirements. For this pressure range, the temperature for both the RG 1.99 and the dpa curves is at 70°F.

Between 312.5 and 1,040 psig, the RG 1.99 curve remains bounded by the 10 CFR 50 Appendix G requirements. Between 312.5 and 1,010 psig, the dpa curve remains bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 100°F.

Between 1,040 and 1,400 psig, the RG 1.99 curve becomes bounded by the LPCI nozzle curve. Between 1,010 and 1,400 psig, the dpa curve becomes bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 1.6°F throughout the range between 1,040 and 1,400 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

35 EFPY – Curve B

Between 0 and 240 psig, the RG 1.99 curve is bounded by the 10 CFR 50 Appendix G requirements. Between 0 and 230 psig, the dpa curve is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 70°F.

Between 240 and 312.5 psig, the RG 1.99 curve is bounded by the LPCI nozzle curve. Between 230 and 312.5 psig, the dpa curve is bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 1.6°F throughout the range between 240 and 312.5 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

Between 312.5 and 950 psig, the RG 1.99 curve is bounded by the 10 CFR 50 Appendix G requirements. Between 312.5 and 900 psig, the dpa curve is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 130°F.

Between 950 and 1,400 psig, the RG 1.99 curve becomes bounded by the LPCI nozzle curve. Between 900 and 1,400 psig, the dpa curve becomes bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 1.6°F throughout the range between 950 and 1,400 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

35 EFPY – Curve C

Between 0 and 100 psig, both the RG 1.99 curve and the dpa curve are bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 70°F.

Between 100 and 312.5 psig, both the RG 1.99 curve and the dpa curve are bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 1.6°F throughout the range between 100 and 312.5 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

Between 312.5 and 950 psig, the RG 1.99 curve is bounded by the 10 CFR 50 Appendix G requirements. Between 312.5 and 900 psig, the dpa curve is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 170°F.

Between 950 and 1,400 psig, the RG 1.99 curve becomes bounded by the LPCI nozzle curve. Between 900 and 1,400 psig, the dpa curve becomes bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 1.6°F throughout the range between 950 and 1,400 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

54 EFPY – Curve A

Between 0 and 312.5 psig, there is no difference in the bounding curve; this section is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 70°F.

Between 312.5 and 750 psig, the RG 1.99 curve remains bounded by the 10 CFR 50 Appendix G requirements. Between 312.5 and 720 psig, the dpa curve remains bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 100°F.

Between 750 and 1,400 psig, the RG 1.99 curve becomes bounded by the LPCI nozzle curve. Between 720 and 1,400 psig, the dpa curve becomes bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 2.3°F throughout the range between 750 and 1,400 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

54 EFPY – Curve B

Between 0 and 160 psig, the RG 1.99 curve is bounded by the 10 CFR 50 Appendix G requirements. Between 0 and 150 psig, the dpa curve is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 70°F.

Between 160 and 312.5 psig, the RG 1.99 curve is bounded by the LPCI nozzle curve. Between 150 and 312.5 psig, the dpa curve is bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 2.3°F throughout the range between 160 and

312.5 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

Between 312.5 and 600 psig, the RG 1.99 curve is bounded by the 10 CFR 50 Appendix G requirements. Between 312.5 and 570 psig, the dpa curve is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 130°F.

Between 600 and 1,400 psig, the RG 1.99 curve becomes bounded by the LPCI nozzle curve. Between 570 and 1,400 psig, the dpa curve becomes bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 2.3°F throughout the range between 600 and 1,400 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

54 EFPY – Curve C

Between 0 and 70 psig, there is no difference in the bounding curve; this section is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 70°F.

Between 80 and 312.5 psig, the RG 1.99 curve is bounded by the LPCI nozzle curve. Between 80 and 312.5 psig, the dpa curve is bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 2.3°F throughout the range between 80 and 312.5 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

Between 312.5 and 600 psig, the RG 1.99 curve is bounded by the 10 CFR 50 Appendix G requirements. Between 312.5 and 570 psig, the dpa curve is bounded by the 10 CFR 50 Appendix G requirements. For these pressure ranges, the temperature for both the RG 1.99 and the dpa curves is 170°F.

Between 600 and 1,400 psig, the RG 1.99 curve becomes bounded by the LPCI nozzle curve. Between 570 and 1,400 psig, the dpa curve becomes bounded by the LPCI nozzle curve. The difference between the RG 1.99 and the dpa curves is consistently 2.3°F throughout the range between 600 and 1,400 psig; this is consistent with the difference in the ART results, demonstrating a one-for-one change in the curves being equal to that in the ART.

Conclusions

In the sections above, it has been demonstrated that the difference in the resulting ART between the RG 1.99 Equation 3 and the dpa methodology is small. For the bounding materials that directly affect the PT curves, that difference is 1.6°F for 35 EFPY and 2.3°F for 54 EFPY. It is also noted that, when the curves are bounded by the LPCI nozzle, the dpa curve shifts at a lower pressure than the RG 1.99 Equation 3 curve.

The N12 nozzle is not limiting at any point on the curves. The limiting curves are those representing the LPCI nozzle or the 10 CFR 50 Appendix G requirements.

Throughout the sections of the PT curves that are affected by the beltline LPCI (N6) nozzle, it was found that the difference in the ART translates directly to the PT curves. That is, for 35 EFPY, the difference in the curves is the same 1.6°F, consistent with the difference in ART between the RG 1.99 and dpa method fluence. The same is true for 2.3°F and the 54 EFPY PT curves.

It is therefore concluded that the difference (increase) in the PT curves due to using the dpa attenuation method for deriving the 1/4T fluence is 2.3°F or less for GGNS.

Attachment 4

GNRO-2015/00031

GEH Affidavit for Attachment 2

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, DOC-0004-5682-04, Larry Beese (GEH) to Richard Scarbrough (Entergy) entitled "GEH Response to Grand Gulf Fluence License Amendment Request RAI 3," dated April 27, 2015. The GEH proprietary information in Enclosure 1, which is entitled "GEH Response to NRC RAI 3 in Support of the GGNS Fluence LAR," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] Figures and large objects containing proprietary information 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.

(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 details on the GEH fluence methodology for boiling water reactors (BWRs). Development of these methods, techniques, and information and their application for the design, modification, and analyses methodologies and processes was achieved at a significant cost to GEH.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience 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.

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 27th day of April 2015.

Lisa K. Schichlein

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