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GNRO-2011/00050

June 21, 2011

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

SUBJECT: Request for Additional Information Regarding
Extended Power Uprate
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCES: 1. Email from A. Wang to F. Burford dated June 1, 2011, GGNS EPU
Request for Additional Information Related to Accident Dose Branch
Review (ME4679) (NRC ADAMS Accession Number ML111520458)
2. License Amendment Request, Extended Power Uprate, dated
September 8, 2010 (GNRO-2010/00056, NRC ADAMS Accession
Number ML102660403)

Dear Sir or Madam:

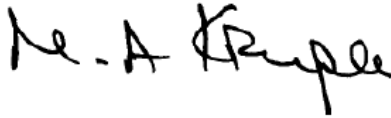
The Nuclear Regulatory Commission (NRC) requested additional information (Reference 1) regarding certain aspects of the Grand Gulf Nuclear Station, Unit 1 (GGNS) Extended Power Uprate (EPU) License Amendment Request (LAR) (Reference 2). Attachment 1 provides responses to the additional information requested by the Accident Dose Branch.

No change is needed to the no significant hazards consideration included in the initial LAR (Reference 2) as a result of the additional information provided. There are no new commitments included in this letter.

If you have any questions or require additional information, please contact Jerry Burford at 601-368-5755.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 21, 2011.

Sincerely,



MAK/FGB/dm

Attachments:

1. Response to Request for Additional Information, Accident Dose Branch

cc: Mr. Elmo E. Collins, Jr.
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
612 East Lamar Blvd., Suite 400
Arlington, TX 76011-4005

U. S. Nuclear Regulatory Commission
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State Health Officer
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P. O. Box 1700
Jackson, MS 39215-1700

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

Attachment 1

GNRO-2011/00050

Grand Gulf Nuclear Station Extended Power Uprate

Response to Request for Additional Information

Accident Dose Branch

Response to Request for Additional Information Accident Dose Branch

By letter dated September 8, 2010, Entergy Operations, Inc. (Entergy) submitted a license amendment request (LAR) for an Extended Power Uprate (EPU) for Grand Gulf Nuclear Station, Unit 1 (GGNS). By letter dated April 14, 2011, Entergy submitted responses to the initial request for additional information (RAI) from the Accident Dose Branch (NRC ADAMS Accession No. ML111050134). Subsequently, the U.S. Nuclear Regulatory Commission (NRC) staff has determined that the following additional information requested by the Accident Dose Branch is needed for the NRC staff to complete their review of the amendment. Entergy's response to each item is provided below.

RAI # 1

In Attachment 1 to the letter dated April 14, 2011, it is stated that a weighted dose scaling factor is used to calculate the EPU dose results for the fuel handling accident (FHA), the control rod drop accident (CRDA), and the pressure controller failure event. Please provide additional information describing the methodology used or provide the calculations used to develop the weighted dose scaling factors for the EAB, LPZ, and CR for the FHA, CRDA, and the pressure controller failure event. Please provide the basis for the weighted dose scaling factors that were used. Please provide any values that were used to develop the weighted dose scaling factors and describe any models that were used to calculate those values.

Response

As described in Entergy's letter to the NRC dated April 14, 2011, the EPU dose is estimated for certain events based on the contribution of each isotope to the calculated dose in the calculation-of-record and the predicted increase in each isotope for EPU. The current licensed thermal power (CLTP) doses are then increased by this weighted scaling factor to develop an accurate estimate of the doses at the EPU power level. The following three tables address the fuel handling accident, control rod drop accident, and the pressure controller failure events.

As shown in each table, the contributions to the calculated doses from each isotope are presented for the CLTP case at each location. To generate the EPU dose, these CLTP doses are then adjusted by the EPU-related increase or decrease for each isotope as reported in Tables 1 and 2 of the April 14, 2011 letter. At each location, the doses from each isotope are then summed for a total dose and the weighted dose scaling factor can be calculated based on the ratio of the total doses.

**Table 1: FHA Dose Consequence –
Isotope-Weighted EPU Dose Scaling Factor**

	Pre-EPU		EPU Source Change %	EPU	
	EAB TEDE (Rem)	Control Room TEDE (Rem)		EAB TEDE (Rem)	Control Room TEDE (Rem)
Br-82	7.04E-04	5.67E-04	10.75%	7.80E-04	6.28E-04
Br-83	5.16E-07	7.20E-07	-5.74%	4.77E-07	6.79E-07
I-130	2.79E-03	2.94E-03	7.38%	3.00E-03	3.16E-03
I-131	1.68E+00	2.44E+00	11.73%	1.88E+00	2.73E+00
I-132	6.24E-02	2.60E-02	12.25%	7.00E-02	2.92E-02
I-133	1.94E-01	2.69E-01	9.05%	2.12E-01	2.93E-01
I-135	1.08E-02	9.57E-03	10.09%	1.19E-02	1.05E-02
Kr-83M	6.78E-08	5.65E-09	-5.70%	6.39E-08	5.33E-09
Kr-85	1.76E-04	1.47E-05	92.92%	3.40E-04	2.84E-05
Kr-85M	4.93E-03	4.10E-04	-10.18%	4.43E-03	3.68E-04
Kr-88	2.22E-02	1.85E-03	-12.80%	1.94E-02	1.61E-03
Xe-129M	2.77E-06	2.31E-07	2.52%	2.84E-06	2.37E-07
Xe-131M	3.18E-04	2.65E-05	10.93%	3.53E-04	2.94E-05
Xe-133	2.05E-01	1.70E-02	16.12%	2.38E-01	1.97E-02
Xe-133M	5.23E-03	4.35E-04	18.15%	6.18E-03	5.14E-04
Xe-135	4.15E-01	3.45E-02	53.85%	6.38E-01	5.31E-02
Xe-135M	3.55E-02	2.95E-03	11.19%	3.95E-02	3.28E-03
Total	2.64E+00	2.80E+00		3.12E+00	3.14E+00
Weighted Scaling Factor				1.18	1.12

EAB – Exclusion Area Boundary
TEDE – Total Effective Dose Equivalent

Table 2: CRDA Dose Consequence –
Isotope-Weighted EPU Dose Scaling Factor

	Pre-EPU				EPU			
	Bundle Source (1.7 peaking factor) (Ci/bundle)	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)	Bundle Source (1.7 peaking factor) (Ci/bundle)	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)
Br-82	2.717E+03	2.30E-05	2.07E-05	8.97E-05	3.028E+03	2.56E-05	2.30E-05	1.00E-04
Br-83	3.798E+04	7.99E-06	2.83E-06	1.24E-05	3.599E+04	7.58E-06	2.68E-06	1.17E-05
Br-84	7.107E+04	8.05E-05	1.91E-05	3.87E-06	6.460E+04	7.32E-05	1.74E-05	3.52E-06
Kr-83M	3.796E+04	1.31E-07	4.25E-08	9.47E-09	3.599E+04	1.24E-07	4.03E-08	8.97E-09
Kr-85	3.102E+03	1.20E-06	1.46E-06	5.90E-07	4.760E+03	1.85E-06	2.25E-06	9.05E-07
Kr-85M	8.844E+04	1.85E-03	9.16E-04	2.94E-04	7.982E+04	1.67E-03	8.26E-04	2.65E-04
Kr-87	1.786E+05	1.46E-02	4.14E-03	7.23E-04	1.567E+05	1.28E-02	3.63E-03	6.34E-04
Kr-88	2.525E+05	6.64E-02	2.61E-02	7.16E-03	2.213E+05	5.82E-02	2.28E-02	6.28E-03
Kr-89	3.207E+05	4.08E-03	9.33E-04	1.06E-05	2.754E+05	3.50E-03	8.01E-04	9.12E-06
I-128	8.534E+03	6.70E-07	1.56E-07	1.09E-07	9.131E+03	7.17E-07	1.67E-07	1.17E-07
I-130	2.002E+04	2.11E-04	1.44E-04	7.84E-04	2.157E+04	2.27E-04	1.56E-04	8.44E-04
I-131	2.394E+05	2.35E-02	2.05E-02	1.93E-01	2.691E+05	2.64E-02	2.31E-02	2.17E-01
I-132	3.415E+05	1.19E-03	4.22E-04	5.31E-04	3.861E+05	1.35E-03	4.77E-04	6.01E-04
I-133	4.781E+05	8.47E-03	6.22E-03	5.02E-02	5.243E+05	9.28E-03	6.82E-03	5.50E-02
I-134	5.369E+05	1.21E-03	3.10E-04	1.00E-04	5.804E+05	1.30E-03	3.35E-04	1.09E-04
I-135	4.455E+05	2.52E-03	1.40E-03	5.59E-03	4.932E+05	2.78E-03	1.55E-03	6.19E-03
Xe-129M	9.566E+00	3.29E-08	3.89E-08	1.56E-08	9.744E+00	3.36E-08	3.96E-08	1.59E-08
Xe-131M	2.711E+03	3.43E-06	4.08E-06	1.64E-06	3.029E+03	3.83E-06	4.56E-06	1.83E-06
Xe-133	4.502E+05	2.28E-03	2.63E-03	1.05E-03	5.243E+05	2.65E-03	3.07E-03	1.23E-03
Xe-133M	1.490E+04	6.57E-05	7.15E-05	2.84E-05	1.657E+04	7.31E-05	7.95E-05	3.15E-05
Xe-135	1.573E+05	5.66E-03	3.94E-03	1.43E-03	2.028E+05	7.30E-03	5.08E-03	1.85E-03
Xe-135M	9.684E+04	1.20E-03	2.75E-04	1.35E-05	1.083E+05	1.34E-03	3.08E-04	1.51E-05
Xe-137	4.213E+05	3.64E-03	8.32E-04	1.13E-05	4.590E+05	3.97E-03	9.06E-04	1.23E-05
Xe-138	4.380E+05	1.39E-02	3.19E-03	1.44E-04	4.502E+05	1.43E-02	3.28E-03	1.48E-04
Rb-86	1.048E+03	2.44E-07	2.17E-07	6.91E-07	1.203E+03	2.80E-07	2.49E-07	7.94E-07

**Table 2: CRDA Dose Consequence –
Isotope-Weighted EPU Dose Scaling Factor**

Pre-EPU					EPU		
Bundle Source (1.7 peaking factor) (Ci/bundle)	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)	Bundle Source (1.7 peaking factor) (Ci/bundle)	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)
Rb-88	2.546E+05	1.90E-07	3.47E-08	2.241E+05	7.28E-07	1.67E-07	3.06E-08
Rb-89	3.323E+05	5.62E-07	3.62E-08	2.900E+05	2.14E-06	4.91E-07	3.16E-08
Cs-132	1.140E+02	5.86E-09	1.38E-08	1.280E+02	7.03E-09	6.58E-09	1.55E-08
Cs-134	1.002E+05	1.65E-04	4.69E-04	1.453E+05	2.39E-04	2.15E-04	6.80E-04
Cs-134M	2.432E+04	3.59E-08	2.52E-08	2.729E+04	4.03E-08	1.55E-08	2.83E-08
Cs-136	2.653E+04	7.80E-06	1.94E-05	3.633E+04	1.07E-05	9.87E-06	2.66E-05
Cs-137	3.544E+04	3.98E-05	1.15E-04	5.948E+04	6.69E-05	6.01E-05	1.92E-04
Cs-138	4.718E+05	8.14E-06	2.63E-07	4.942E+05	8.52E-06	2.02E-06	2.76E-07
Total		1.51E-01	2.62E-01		1.48E-01	7.36E-02	2.91E-01
Weighted Scaling Factor					0.98*	1.02	1.11

* Although the isotope-specific weighting factor approach concludes that the CRDA EAB dose decreases with EPU, EPU LAR Attachment 5 Table 2.9-9, *CRDA Radiological Consequences*, conservatively assumes no change in dose.

EAB – Exclusion Area Boundary
LPZ – Low Population Zone

**Table 3: Pressure Controller Failure Dose Consequence
Isotope-Weighted EPU Scaling Factor**

	Pre-EPU			EPU			
	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)	Isotope-Specific Scaling Factor based on core source terms	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)
Br-82	9.88E-05	2.26E-05	5.87E-04	2.79%	1.02E-04	2.32E-05	6.03E-04
Br-83	5.73E-05	1.31E-05	3.84E-04	9.69%	6.28E-05	1.44E-05	4.21E-04
Kr-83m	4.61E-12	1.05E-12	1.70E-09	9.69%	5.06E-12	1.16E-12	1.86E-09
Br-84	1.17E-03	2.67E-04	1.63E-03	8.28%	1.26E-03	2.89E-04	1.76E-03
Kr-85	1.47E-05	3.37E-06	9.41E-06	3.73%	1.53E-05	3.49E-06	9.76E-06
Kr-85m	2.17E-02	4.97E-03	1.05E-02	-10.03%	1.96E-02	4.47E-03	9.46E-03
Rb-86	7.43E-06	1.70E-06	3.63E-05	5.13%	7.81E-06	1.79E-06	3.81E-05
Kr-87	2.18E-01	4.98E-02	6.57E-02	-4.99%	2.07E-01	4.73E-02	6.24E-02
Rb-87	3.40E-18	7.77E-19	1.04E-14	-4.99%	3.23E-18	7.39E-19	9.87E-15
Kr-88	7.28E-01	1.66E-01	3.09E-01	-0.90%	7.21E-01	1.65E-01	3.06E-01
Rb-88	1.01E-03	2.32E-04	3.29E-01	-0.90%	1.00E-03	2.30E-04	3.26E-01
Rb-89	5.10E-04	1.17E-04	7.57E-05	-0.79%	5.06E-04	1.16E-04	7.51E-05
Sr-89	1.30E-08	2.97E-09	1.26E-05	-0.79%	1.29E-08	2.95E-09	1.25E-05
I-131	1.59E-01	3.64E-02	1.76E+00	13.17%	1.80E-01	4.12E-02	1.99E+00
Xe-131m	6.66E-13	1.52E-13	6.97E-10	13.17%	7.54E-13	1.72E-13	7.89E-10
I-132	1.09E-02	2.48E-03	2.15E-02	13.18%	1.23E-02	2.81E-03	2.43E-02
I-133	5.92E-02	1.35E-02	5.90E-01	14.84%	6.80E-02	1.56E-02	6.77E-01
Xe-133	2.70E-02	6.17E-03	1.70E-02	14.84%	3.10E-02	7.09E-03	1.96E-02
Xe-133m	6.67E-11	1.52E-11	6.42E-08	14.84%	7.66E-11	1.75E-11	7.38E-08
Cs-134	5.82E-03	1.33E-03	2.82E-02	-12.43%	5.10E-03	1.16E-03	2.47E-02
I-134	1.59E-02	3.64E-03	9.50E-03	14.56%	1.83E-02	4.18E-03	1.09E-02
Cs-135	1.27E-13	2.91E-14	7.13E-10	15.02%	1.46E-13	3.34E-14	8.20E-10
I-135	1.86E-02	4.26E-03	1.05E-01	15.02%	2.14E-02	4.90E-03	1.21E-01
Xe-135	8.18E-02	1.87E-02	4.58E-02	15.02%	9.41E-02	2.15E-02	5.26E-02
Xe-135m	7.68E-02	1.76E-02	7.82E-03	15.02%	8.84E-02	2.02E-02	8.99E-03

**Table 3: Pressure Controller Failure Dose Consequence
Isotope-Weighted EPU Scaling Factor**

	Pre-EPU			EPU			
	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)	Isotope-Specific Scaling Factor based on core source terms	EAB 2 hr TEDE (Rem)	LPZ TEDE (Rem)	Control Room TEDE (Rem)
Cs-136	3.07E-04	7.01E-05	1.32E-03	-3.66%	2.95E-04	6.75E-05	1.27E-03
Ba-137m	3.66E-07	8.38E-08	4.77E-06	1.55%	3.72E-07	8.51E-08	4.84E-06
Cs-137	2.04E-03	4.67E-04	9.97E-03	1.55%	2.07E-03	4.74E-04	1.01E-02
Cs-138	1.06E-03	2.43E-04	3.38E-04	13.64%	1.21E-03	2.76E-04	3.84E-04
Xe-138	8.49E-01	1.94E-01	7.98E-02	13.04%	9.60E-01	2.19E-01	9.02E-02
Total	2.28E+00	5.21E-01	3.39E+00		2.43E+00	5.56E-01	3.74E+00
Weighted Scaling Factor					1.07	1.07	1.10

RAI # 2

It is the NRC staff's understanding that the current GGNS analyses of record for the radiological dose consequences for design basis accidents is evaluated at a power level of 3910 MWt or lower depending on the accident scenario being evaluated. Please describe what the GGNS analyses of record will consist of for the proposed change at the EPU power level, provided a weighted dose scaling factor was used to calculate the EPU dose results instead of a reanalysis of the current radiological dose analyses for DBAs.

Response

The GGNS radiological analyses are maintained in accordance with 10 CFR 50, Appendix B, Part III. The weighted dose scaling factors have been developed via verified, safety-related calculations under Shaw's Quality Assurance program. The reported EPU doses developed with these weighted scaling factors represent the predicted post-EPU doses that would be anticipated if full re-analyses of the affected radiological calculations were performed. Thus, full re-analyses are not required to maintain these calculations updated for design control purposes and GGNS plans to rely on the weighted scaling factor results.