**Entergy Operations, Inc.**
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**Michael A. Krupa**
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Grand Gulf Nuclear Station
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GNRO-2012/00027

April 18, 2012

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

SUBJECT: Responses to NRC Requests for Additional Information Pertaining to License Amendment Request for Criticality Safety Analysis

Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

REFERENCES:
1. Entergy Operations, Inc. letter to the NRC (GNRO-2011/00076), *License Amendment Request - Criticality Safety Analysis and Technical Specification 4.3.1,* Criticality, September 9, 2011 (ADAMS Accession No. ML1125321287)
2. NRC e-mail to Entergy Operations, Inc., *CSA LAR*, March 21, 2012

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc. (Entergy) submitted to the NRC a license amendment request (LAR), which proposes to: 1) revise the criticality safety analysis (CSA) for the spent fuel and new fuel storage racks; 2) impose additional requirements for the spent fuel and new fuel storage racks in TS 4.3.1, *Criticality;* and 3) delete the spent fuel pool loading criteria Operating License Condition.

In Reference 2, the NRC transmitted to Entergy three requests for additional information (RAIs) pertaining to the CSA LAR. Responses to these RAIs are provided in the attachment to this letter.

This letter contains no new commitments.

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 April 18, 2012.

Sincerely,

MAK/FGB/ghd

Attachments: 1. Responses to NRC Requests for Additional Information Pertaining to License Amendment Request - Criticality Safety Analysis

2. NETCO Potential 10 CFR Part 21 Notification

cc: Mr. Elmo E. Collins, Jr.
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
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U. S. Nuclear Regulatory Commission
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NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

**Attachment 1**

**GNRO-2012/00027**

**Grand Gulf Nuclear Station Extended Power Uprate**

**Responses to NRC Requests for Additional Information**
**Pertaining to License Amendment Request - Criticality Safety Analysis**

**Responses to NRC Requests for Additional Information**
**Pertaining to License Amendment Request - Criticality Safety Analysis**

Entergy Operations, Inc. (Entergy) submitted to the NRC a license amendment request (LAR), which proposes to: 1) revise the criticality safety analysis (CSA) for the spent fuel and new fuel storage racks; 2) impose additional requirements for the spent fuel and new fuel storage racks in TS 4.3.1, *Criticality;* and 3) delete the spent fuel pool loading criteria Operating License Condition.

In an e-mail dated March 21, 2012, the NRC transmitted to Entergy three requests for additional information (RAIs) pertaining to the CSA LAR. Responses to these RAIs are provided below.

**RAI #1**

*In the GGNS response letter dated November 21, 2011, RAI 3, the licensee stated that in 2010, NETCO identified a latent software error that incorrectly incorporated the drift correction factor into the areal density calculations for each analyzed panel in a BADGER campaign. In order for the staff to have reasonable assurance that the BADGER tool will provide pertinent and informative data to inform the licensee about the state of degradation of Boraflex in the SFP, the staff requests additional information about the data processing error and steps taken to address this error.*

a) *Please provide the initial correspondence letter NETCO provided to GGNS identifying this issue.*

b) *Please discuss the summary of actions taken by GGNS as a result of this error.*

**Response**

On July 22, 2010, NETCO issued a potential 10 CFR Part 21 notification (see Attachment 2). The NETCO error notification was entered into the GGNS Corrective Action Process for operability and reportability considerations. The revised areal densities reported by NETCO decreased when the error was corrected. The escape coefficients used in the GGNS Racklife calculation were then adjusted to better conform the updated Racklife predicted boron loss to the BADGER test results. These increased escape coefficients continue to be used for the current Racklife predictions. An evaluation was then completed to show that the reactivity margin between the Design Basis Bundle in the Analysis of Record and the actual fuel stored in the Spent Fuel Pool more than offset the reactivity penalty associated with the reduced areal density and the racks still maintained $K_{eff} \leq 0.95$ for the stored fuel.

A new CSA, which also considers the updated boron loss data, has been prepared. That CSA is the subject of the CSA LAR.

**RAI # 2**

*The staff understands that GGNS has an upper containment spent fuel pool that credits Boraflex in maintaining subcriticality. Discuss whether the upper containment pool is included in the Boraflex Monitoring Program. Also, please discuss in detail the surveillance approach that will be used in monitoring this material in the upper containment pool, specifically the methods*

*of neutron attenuation testing (i.e., in-situ testing), frequency of inspection, sample size, data collection, and acceptance criteria.*

**Response**

Racklife calculations are also performed for the Boraflex storage racks located in the GGNS Upper Containment Pool. Since fuel assemblies are not stored in these racks during normal operation, their use is limited to short durations during refueling outages for the temporary storage of fuel assemblies. Thus, their accumulated doses and boron losses are well bounded by the racks in the spent fuel pool. As such, no neutron attenuation testing has been conducted on the racks in the Upper Containment Pool. Racklife predicted peak panel doses and boron losses for the Spent Fuel Pool and the Upper Containment Pool are given in Table 1, below, for 02/19/2012 (EOC18).

Table 1

Racklife Predicted Peak Panel Doses and Boron Loss for 02/19/2012

| Pool | Peak Panel Dose (Rad) | Peak Panel Boron Loss (%) |
|---|---|---|
| Spent Fuel Pool | 4.09E10 | 10.8 |
| Upper Containment Pool | 1.16E10 | 7.8 |

**RAI #3**

*Provide the current number of usable storage racks for the upper containment and spent fuel pools.*

**Response**

The Spent Fuel Pool contains 15 usable Boraflex storage racks while the Upper Containment Pool contains 7 usable Boraflex storage racks.

TS 4.3.3 allows the storage of up to 4348 assemblies in the spent fuel pool and 800 assemblies in the upper containment pool. There are racks to provide storage for up to 4348 assemblies in the spent fuel pool and up to 712 assemblies in the upper containment pool. Of the storage cells in the spent fuel pool, there are currently 126 cells designated as Region II cells and the balance (4222 cells) are Region 1 cells. All of the storage cells in the upper containment pool are considered to be usable.

GGNS has restricted fuel storage in some of the racks for reasons other than reactivity control. The restrictions may be due to access limitations, load restrictions or dose restrictions; these are generally still considered to be usable locations. A total of 717 cells are restricted in the Region 1 racks in the spent fuel pool and 126 are restricted in the upper containment pool.

**Attachment 2**

**GNRO-2012/00027**

**NETCO Potential 10 CFR Part 21 Notification**

# Notice of Inability to Evaluate Possible 10CFR21 Implications

RE: Decrease in average BADGER measured Boraflex $B^{10}$ areal density/Grand Gulf.

Date: 7/22/10

NOTE: Please acknowledge receipt to NETCO QA Manager as soon as possible (LMariani@curtisswright.com).

Recent improvements in the method used to calibrate BADGER equipment lead to the discovery that a correction factor used to account for physical differences between the un-attenuated region of the reference panel fuel cell and each of the other fuel cells subjected to BADGER measurement may not, in all instances, have provided conservative results. As a consequence in some cases, the corrected value of the average measured Boraflex areal density has been seen to decrease.

In connection with the most recent BADGER campaign conducted at Grand Gulf Nuclear Station, NETCO reported in NET-287-01, BADGER TEST CAMPAIGN AT GRAND GULF NUCKEAR STATION, 2/8/08, that the average areal density for all panels measured was 0.0207 ± 0.0016 grams of $B^{10}$ per $cm^2$. Re-evaluation of the average measured areal density has provided a revised value for the average measured areal density of 0.0185 ± 0.0020 grams of $B^{10}$ per $cm^2$. During the Grand Gulf BADGER campaign 32 Boraflex panels were tested. The spent fuel pool contains 4393 fuel cells.

For these panels, the average measured areal density has decreased by approximately 10.6 percent below the previously reported value. Further, the minimum value of measured areal density reported in NET-287-01 was 0.0170 grams of $B^{10}$ per $cm^2$. The recalculated value was determined to be 0.0157 gram of $B^{10}$ per $cm^2$. Thus the minimum measured value of areal density decreased by 7.6 percent.

Depending upon how these results are used in connection with the Grand Gulf criticality analysis of record for the spent fuel pool, there may be an associated decrease in margin to the $K_{eff} < 0.95$ limit. In that NETCO is not able to evaluate the impact of these revisions on criticality margin and is therefore unable to evaluate possible 10CFR21 implications, these results are provided for your consideration and possible evaluation of 10CFR21 implications.

The date of discovery of these modified values of measured areal density was made on July 22, 2010. In the event that you require further information please do not hesitate to contact NETCO.

Sincerely,

Matthew C. Harris, NETCO BADGER Test Engineer

cc. Matthew Eyre, Director, NETCO

Leo Mariani, QA Manager, NETCO