Entergy

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Attachments 2 and 3 contain **PROPRIETARY** information

GNRO-2015/00011

February 18, 2015

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

SUBJECT: Supplement to License Amendment Request 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
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 (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.

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 a Supplement to an amendment request to revise our existing license basis for Grand Gulf Nuclear Station, Unit 1.

The supplement is for the proposed amendment to revise Grand Gulf Nuclear Station, Unit 1's license basis to adopt a single fluence method. This supplement is needed to address the Staff's request for additional information regarding Benchmarking analysis of the proposed single fluence method.

When Attachments 2 and 3 are removed from this letter, the entire document is NON-PROPRIETARY

Attachment 1 provides responses to the Request for Additional Information. Attachment 2 provides the revised topical report from MP Machinery and Testing, LLC. Attachment 3 provides the revised report documenting the application of the single fluence method at GGNS.

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 February 18, 2015.

Sincerely,

KJM/ras

Attachments:

1. Supplement to proposed Single Fluence Method LAR

2. Revised Topical Report from MP Machinery and Testing, LLC
   MPM-614993 Revision 3, "Benchmarking of MPM Methods for Nuclear Plant Neutron Transport Calculations," January, 2015

3. Revised Single Fluence Method Applied to GGNS
   MPM-814779 Revision 2, "Neutron Transport Analysis for Grand Gulf Nuclear Station," January, 2015

cc: with Attachment and Enclosures

U.S. Nuclear Regulatory Commission
ATTN: Mr. John Daily, NRR/DLR
Mail Stop OWFN/ 11 F1
11555 Rockville Pike
Rockville, MD 20852-2378

cc: without Attachment and Enclosures

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
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission
ATTN: Mr. Alan Wang, NRR/DORL (w/2)
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Dr. Mary Currier, M.D., M.P.H
State Health Officer
Mississippi Department of Health
P. O. Box 1700
Jackson, MS 39215-1700

Attachment 1

GNRO-2015/00011

RAI Response Supplement to proposed Single Fluence Method LAR

1.0 Methods Qualification Outside of the Beltline Region

The statement below from Document GNRO-2014/00080, Attachment 3, "Single Fluence Method Applied to GGNS, MPM-814779 Revision 1, 'Neutron Transport Analysis for Grand Gulf Nuclear Station,' November 2014," is insufficient to qualify fluence calculations outside of the beltline region. It is stated explicitly that "there are no dosimetry data available at present from regions above and below the active core region to enable checking of 3D results in those regions of the plant." It is then implied that benchmarking the 3D method against the 2D synthesis method would be sufficient to qualify the 3D method for fluence calculations outside of the beltline region.

> *There are no dosimetry data available at present from regions above and below the active core region to enable checking of 3D results in those regions of the plant. Therefore, once TORT is benchmarked against the results of standard 2D synthesis, these 3D methods can be used routinely for flux calculations in the beltline, and outside of the beltline region.*

RAI 1a. To qualify the 3D fluence method for fluence calculations outside of the beltline region, some type of benchmarking of the 3D fluence method is necessary specific to the various regions-of-interest outside the beltline.

Response to RAI 1a: Installing dosimetry capsules and/or taking scrapings in specified areas outside of the beltline region would provide dosimetry data for a future benchmark analysis outside of the beltline region. The uncertainty in the fluence calculations at locations above the top of the core is dominated by uncertainty in the water density. Taking scrapings and/or inserting dosimetry in these locations (during future refueling outages) would not only provide benchmarking data, but it would also provide the data needed to check the output from thermal-hydraulics codes that can be used in future improvements of the upper region water density modeling.

Furthermore, on Page 6 of Document GNRO-2014/00080, Attachment 1, "Analysis of Proposed Single Fluence Methodology," Regulatory Position 1.4.3 of Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," is quoted as follows:

> *[...] For other applications [other than RT_{NDT} determination], the accuracy should be determined using the approach described in Regulatory Position 1.4, and an uncertainty allowance should be included in the fluence estimate as appropriate in the specific application.*

Page 7 of Document GNRO-2014/00080, Attachment 1, includes the following response from licensee:

> *An extensive evaluation of all contributors to the uncertainty in the calculated fluence was made for the BWR plant calculations performed to date. This evaluation indicated that the uncertainty in calculated fluences in the reactor beltline region is below 20% as specified in the guide. In addition, the comparisons with measurements indicate agreement well within the 20% limit. The agreement of calculations with measurements to within ±20% uncertainty indicates that the MPM calculations can be applied for fluence determination with no bias. This meets the requirement of RP 1.4.3.*

RAI 1b. The NRC staff did not locate specific information evaluating the uncertainty of the proposed methods for locations outside the reactor vessel beltline. Information describing uncertainty allowances and application for fluence estimates outside of the reactor vessel beltline is required, or the NRC staff review of the method will be limited to the vessel beltline. Further application of the method would require additional justification.

Response to RAI 1b:
Updated Final Reports under S&L PO 32356 with the latest fluence uncertainty results are attached. Both reports have been updated to include the latest fluence uncertainty analyses for nozzles N6 and N12. Uncertainties have been evaluated for shroud welds, top guide welds, and for nozzles located above the top of the active fuel. For the upper shroud and top guide welds, and for the N6 nozzle, the uncertainties are greater than 30%. Since the nozzles must be incorporated into the PT curves, an appropriate margin must be added to account for the higher uncertainty in accordance with the requirements of Regulatory Guide 1.190.

The N12 nozzle elevation is close to that of the top of the active fuel, and the fluence uncertainty is below 20% as expected. Therefore, the calculated fluence at these nozzles can be used directly in the PT curves. However, the N6 nozzle uncertainty is dominated by uncertainty in the steam density, and the fluence uncertainty is 39%. Regulatory Guide 1.190 states that if the analytical uncertainty at the 1 sigma level is greater than 30%, the methodology of the regulatory guide is not applicable and the plant application will be reviewed on an individual basis. Based on guidance provided in Equation 6 of Regulatory Guide 1.190, it would seem reasonable to multiply the calculated fluences by 1 plus the 1 sigma uncertainty for the cases where the uncertainty is over 30%. Accordingly, the fluences for the N6 nozzles have been increased by 39 % to provide sufficient margin in the PT curve calculations.

2.0 Applicability of 2D Method Validation to 3D Method

Method qualification was done primarily for the 2D synthesis method; however, the 3D method is used for calculating fluence results. The licensee uses the 3D code results with aspects of the 2D synthesis bias and uncertainty analysis. Applying the validation of one method to another is inappropriate as there may be certain deficiencies that are masked in the method that is not formally qualified.

Seven 2D synthesis calculations were compared to corresponding measurements for the PCA calculational benchmark, 25 2D synthesis calculations were compared to corresponding measurements for the BWR calculational benchmark, eight 2D synthesis calculations were compared to corresponding measurements as part of dosimetry benchmarking, and only one 3D calculation was compared to a corresponding measurement as part of dosimetry benchmarking. In summary, 40 calculations support the validation of the 2D synthesis method and one calculation supports the validation of the 3D method; however, the 3D method is relied upon to support all fluence projections as discussed in Section 7, "Summary and Conclusions," of Document GNRO-2014/00080, Attachment 3.

RAI 2. To qualify the 3D fluence method for fluence calculations inside the beltline region, completion of an independent benchmarking of the 3D method is required.

Response to RAI 2: Neutron Transport Analysis Update Project - Scope Change PCA Benchmark Analysis in Support of GGNS LAR. GGNS will provide the PCA Benchmark Analysis Report to the NRC Project Manager by March 31, 2015.

This work involves creation of a 3D TORT model and subsequent running of the model to analyze the PCA benchmark. The post-processing will include an analysis of all 7 PCA dosimetry locations. Each PCA location has as many as 6 individual dosimeter results. The calculated-to-measured (C/M) benchmarks will be reported for all PCA measurements available. Further, comparisons will also be made with the existing 2D synthesis results, thus giving calculated-to-calculated (C/C) results at all locations. The results will be given in a new report subsection in the MPM benchmark report.

3.0 MELLLA+ Operating Conditions

Document GNRO-2014/00080, Attachment 1, includes the following statement:

> *GGNS has calculated the fluence for every cycle up to the present. This gives the most accurate value of the present fluence. Extrapolations to future times are made using best estimate values of future fuel designs in a cycle 21 best estimate projection cycle. As changes in fuel core loadings are made, updated extrapolations will be made. Further, the flux values from the cycle 21 transport calculation were multiplied with a factor of 1.1 applied for projection to exposures after cycle 21. This 10% conservatism was applied by Entergy to ensure that fluence estimates remain conservative. [...]*

RAI 3: NRC staff is presently concluding its review of Entergy's request to implement the Maximum Extended Load Line Limit Analysis Plus (MELLLA+) operating domain. The NRC staff requires confirmation that the flux evaluation for Cycle 21 includes the water density and neutron spectral conditions reflective of a MELLLA+ core design.

Response to RAI 3: It has been confirmed that the flux evaluation for Cycle 21 includes the water density and neutron spectral conditions reflective of a MELLLA+ core design.