Entergy

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Attachment 1 contains proprietary information.

GNRO-2012/00016

March 13, 2012

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

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

REFERENCES: 1. Entergy Operations, Inc. letter to the NRC (GNRO-2010/00056), *License Amendment Request - Extended Power Uprate*, September 8, 2010 (ADAMS Accession No. ML102660403)

Dear Sir or Madam:

The Nuclear Regulatory Commission (NRC) has requested additional information regarding the steam dryer discussed in the Grand Gulf Nuclear Station, Unit 1 (GGNS) Extended Power Uprate (EPU) License Amendment Request (LAR) (Reference 1). Attachment 1 provides responses to the requests for additional information items 1, 4, 6, 7, and 9 requested by the Mechanical and Civil Engineering Branch. Responses to items 2 and 6 are to be provided by March 19, 2012. RAIs 3 and 5 were dropped during the review.

GE-Hitachi Nuclear Energy Americas, LLC (GEH) considers portions of the information provided in support of the responses to the request for additional information (RAI) in Attachment 1 to be proprietary and therefore exempt from public disclosure pursuant to 10 CFR 2.390. An affidavit for withholding information, executed by GEH, is provided in Attachment 3. The proprietary information was provided to Entergy in a GEH transmittal that is referenced in the affidavit. Therefore, on behalf of GEH, Entergy requests Attachment 1 be withheld from public disclosure in accordance with 10 CFR 2.390(b)(1). A non-proprietary version of the RAI responses is provided in Attachment 2.

No change is needed to the no significant hazards consideration included in the initial LAR (Reference 1) as a result of the additional information provided. There are no new commitments in this letter.

When Attachment 1 is removed, the entire letter is non-proprietary.

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 March 13, 2012.

Sincerely,

M. A Krupa

MAK/FGB

Attachments:

1. Response to Request for Additional Information, Mechanical and Civil Engineering Branch, Steam Dryer (Proprietary)
2. Response to Request for Additional Information, Mechanical and Civil Engineering Branch, Steam Dryer (Non-Proprietary)
3. GEH Affidavit for Withholding Information from Public Disclosure

cc: Mr. Elmo E. Collins, Jr.
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U. S. Nuclear Regulatory Commission
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Attachment 2

GNRO-2012/00016

Grand Gulf Nuclear Station Extended Power Uprate

Response to Request for Additional Information

Mechanical and Civil Engineering Branch, Steam Dryer (Non-Proprietary)

This is a non-proprietary version of Attachment 1 from which the proprietary information has been removed. The proprietary portions that have been removed are indicated by double square brackets as shown here: [[ ]].

Non-Proprietary

Response to Request for Additional Information
Mechanical and Civil Engineering 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). The NRC has requested additional information regarding the steam dryer to support the review of the steam dryer analysis report. The responses to items 1, 4, 7, 8 and 9 are provided below (note RAIs 3 and 5 were dropped during the review.)

<u>RAI 01</u> [Follow-up to Round 5, RAI 04]

Solid-shell transition

The response does not resolve this RAI satisfactorily. For several components, the use of multi-point constraints (MPC) option provided in general purpose finite element (FE) program ANSYS [[

]] The licensee states that [[

]] The licensee further states that according to ANSYS, the use of multi point constraint (MPC) equations option does not guarantee the accuracy of the local stresses near the shell-thickness interface (at least within the shell thickness range). The licensee has performed further evaluation of the high-stresses at the outer-hood location and determines that [[

]] Therefore, the licensee concludes that the Overlay and MPC approach provide conservative results. This conclusion is not acceptable to the staff because, as stated in the response to RAI 6(a), the submodeling approach may not necessarily always provide a stress ratio less than 1.0 when the effects of the local features are included. The licensee is requested to provide the following:

a. What is the difference between the MPC option provided in ANSYS and the use of constraint equations in modeling the shell-solid interface?

b. Please explain how the accuracy of the stresses calculated using the MPC option is determined?

c. What is the accuracy of the stresses calculated using the overlay option?

d. Based on the maximum stress intensity calculated using the MPC option, what is the minimum alternating stress ratio?

e. Explain why the submodeling approach provides conservative results at the outer hood location, as discussed in the response.

f. Confirm that the use of submodeling shows that the stresses at all the shell-to-solid interfaces calculated using the overlay and MPC option are conservative.

g. Confirm that the results in Table 1 account for the effects of any unconnected nodes.

Response

In general, the Multi-Point Constraints (MPC) or the overlay technique provides a technically sound means of treating solid-shell transitions. As a point of clarification, the only location in the MPC versus overlay shell study that showed any significant differences is at the interface where these constraints are located, which was not unexpected. A more accurate submodel of the structure was evaluated and was used in the response to Round 5 RAI 04 [1]. This submodel did show that the overlay shell method provided more accurate results than the MPC approach in this area. The detailed solid model will provide a better stress prediction than will a shell model in intricate corners such as the location where [[ ]] come together. The submodel approach is the standard practice for resolving stress details and was applied to GGNS as described in NEDC-33601P. The following responses address the more specific questions:

1. Conceptually, there is no difference between the general approach of Constraint Equations (CEs) and the use of the MPC algorithm, although the mechanics of applying the particular software options will vary. Constraint equations are a general set of equations that relate the degrees of freedom of one nodal point to another. These can be formulated (constructed) in various ways. The point-to-surface contact method (MPC algorithm) is one method. The CE method requires the user to establish constraints, essentially by hand, and requires the user to know exactly how the constraints are applied. The MPC method is more automatic, with ANSYS picking nodes that will be connected, and with the user not knowing exactly which nodes are connected beforehand. The MPC algorithm internally generates a set of CEs to connect the nodes on the contact point to the target surface. These CEs are generated in the first time step and remain as such throughout the entire transient dynamic analysis (whereby direct integration is used). The internal creation of these CEs is dependent on the user's input and the selection of parameters for the "pin-ball" region and tolerance factor. The "pin-ball" is a sphere which selects all nodes within the sphere. Nodes out of plane and a "pinball" radius away from each other can be selected to be connected by constraint equations when in actuality they should not be connected. However, the ANSYS equations will be set up with these out of plane connections, generating artificial nodal moments which should not be in the equation set, resulting often in artificially high stress results. Great care must be used with the MPC method, to insure

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that all constraint equations established automatically are in fact valid. For the Grand Gulf Nuclear Station (GGNS) replacement steam dryer global Finite Element Model (FEM), [[ ]], leading to artificially high stress results. The reason the ANSYS manual states that stress at the interface is not 'guaranteed' (i.e., not accurate and not to be trusted), is that ANSYS cannot guarantee that only correct nodes are selected to be coupled. However, the incorrect nodal moments will offset each other in general, so stress in elements away from the interface are accurate.

2. The accuracy of the calculated stress using the MPC algorithm is not determined by the user, but rather by the ANSYS software developer. The software developer claims that the results at the MPC interface are not accurate. One possible explanation for this limitation associated with MPC algorithm is discussed in item 3 below.

3. The deformations and displacements in the dryer fatigue analysis at normal operating conditions are [[ ]], which would suggest that traditional constraint equations could be used for this application; however, the internal nodal rotations may not be insignificant. The use of CEs to connect the shell rotations to the solid nodes tends to produce artificially high internal moments. These internal moments sum to zero across the MPC boundary thereby producing an accurate set of output loads for a given set of input loads. This is confirmed by the stress prediction similarity between the MPC method and overlay shell method a short distance from the interface. These artificial moments will, however, affect the strain energy and stress at the interface in an adverse manner. The use of overlay shells also adequately transmits the shell rotations into the solid nodes, but the artificial internal moments are not generated. Therefore, the stress predictions in the shell elements are not significantly affected when using the overlay shell method. More importantly, the [[ ]] confirms that both the overlay shell method and MPC algorithm are conservative; the (limited) study results indicate that the overlay shell approach provides a more accurate stress prediction in the dryer interface regions than does the MPC algorithm.

4. The MPC option was not used as the basis for the GGNS replacement dryer analysis. The MPC-based analysis was performed solely as an alternate calculation to support the validity of the design approach and to address the previous RAI. [[ ]] Regardless, if the minimum alternating stress ratio calculated using either the overlay option or the MPC option were to exceed the acceptance criterion, [[ ]] Given this discussion and the fact that limiting dryer locations are resolved using the more accurate submodels, the MPC study does not impact the limiting margin (MASR) of the dryer.

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5. In general, all models are approximations; otherwise they would not be 'models'. Models of the dryer with all shells would be the least accurate approximation, combinations of shells and solids the next best, and a model made fully of solid elements, with all fillets and curved geometry, the most accurate. However, a geometrically perfect model would be too large to solve with current technology, so engineering approximations are used to get as close to a fully accurate answer as possible. Submodeling improves the resolution of the model to improve the accuracy of the predicted stress results in a local region, and is a trade-off of accuracy vs. ability to solve the engineering model. The addition of local features in the submodels, such as sharp corners and small fillet radii, removes the need for operator supplied constraint equations, and therefore operator judgment, as well as blind computer-generated constraint equations. All of the stress equations have direct connectivity. This can sometimes result in an increase in stress as compared to the global model prediction, but in general removes the artificially high stress generated with improper constraint equations, and is therefore a better approximation to the real stress in the dryer. In locations where the global model sufficiently models the geometric details, the global model results are appropriate for use. For locations where the global model does not sufficiently model the geometric details, accurately detailed submodels are used to calculate stress results. With an accurate submodel, whether or not the results are conservative depends on factors other than the FE model (e.g., input load definition). The outer hood model submodel shown in Round 5 RAI-04 used solid elements to accurately model the region where the [[ ]] In that submodel, solid elements are used to model the [[ ]], which was modeled with shell elements in the global model. The use of solid elements for both the [[ ]] eliminates the need to use either the overlay option or the MPC option. The weld details were also modeled with solid elements. The [[ ]] submodel with 3D solid elements accurately reflects the geometry and, therefore, is accurate for its intended purpose.

6. In the response to Round 5 RAI-04, both methods have been shown to predict conservative stress results in a majority of the component element stress intensity results (when compared to highly accurate submodel stress results). In the locations where additional refinement was necessary, it was observed that either a localized stress singularity was present or the global model did not sufficiently model the localized geometric details in enough detail to accurately resolve the strain energy (thus leading to an inaccurate stress solution). Application of the submodel technique (as described in NEDC-33601P) was appropriate in these cases and the dryer stresses were appropriately resolved; the overall application method [[ ]] ensures that the stresses and associated margins are adequately conservative.

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7. Table 1 is to be updated to include the effects of any disconnected nodes found in the earlier finite element model. These effects are to be calculated in response to Round 6 RAI-02 and tabulated in the response to Round 6-RAI-06.

In conclusion, the use of overlay shells to transmit the shell element nodal rotations into the solid element nodes is an acceptable method for use in the GGNS replacement steam dryer analysis.

References

1. Entergy letter, *Response to NRC Request for Additional Information Regarding Extended Power Uprate*, GNRO-2012/00009, dated February 15, 2012.

<u>RAI 4</u>

MSL strain gage strain conversion and measurement bias

The licensee is requested to quantify the following terms in equation (4-1) of Appendix-A (attachment 11B to GNRO-2010/00056) of NEDC-33601P, Rev. 0. Grand Gulf evaluations utilize the plant based load evaluation (PBLE) method 2 [main steam line (MSL) strain gage data] bias errors and uncertainties based on Quad Cities Unit 2 (QC2) benchmark, and Finite element (FE) bias errors and uncertainties based on SSES1 benchmark [PBLE method 1 (on-dryer instruments) & end-to-end based on on-dryer strain gages].

(1) The licensee is requested to quantify the magnitude of the strain gage bias term B_{bk} in equation (4-1) noted above

(2) The licensee is requested to confirm the following and provide any additional clarifications. [[

]]

<u>Response</u>

(1) [[

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(2) Yes, this statement in the RAI is confirmed and clearly stated.

[[

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The actual processing for the development of the [[ ]] and their use for GGNS was performed as described in this response, and this response replaces equation 4-1 and the description of its terms in the GGNS SDAR[1], Appendix A.

References

1. NEDC-33601P, Engineering Report Grand Gulf Replacement Steam Dryer Fatigue Stress Analysis Using PBLE Methodology, Revision 1, Class III, February 2012.

RAI-07 [Follow-up to Round 5 RAI 01]

Re-benchmarking of PBLE

The licensee's response is not sufficient for the staff to confirm the conservatism of the GGNS dryer stress margins. However, the commitment to instrument the GGNS dryer allows us to set a critical license condition (see below) where a re-benchmarking and subsequent reassessment of GGNS dryer EPU stress projections must be evaluated and approved by the staff.

One of the Proposed License Conditions

i. The licensee shall submit the updated PBLE and end-to-end benchmarking of the GGNS dryer strains and stresses at CLTP conditions, along with updated stress projections at EPU conditions to the staff for evaluation and approval prior to power ascension above CLTP.

ii. The licensee shall submit the updated PBLE and end-to-end benchmarking of the GGNS dryer strains and stresses at 103.5% of CLTP, 107% of CLTP, and 110% of CLTP power levels, along with updated stress projections at EPU conditions to the staff for evaluation and approval after 15 days of reaching those respective power levels.

iii. The results of the power ascension testing to verify the continued structural integrity of the steam dryer and the final steam dryer load definition and steam dryer stress report shall be submitted to the NRC staff in a report within 60 days following the completion of all 113% CLTP (EPU) power ascension testing.

To ensure that the GGNS replacement steam dryer will successfully withstand the loads at EPU conditions, the licensee is requested to provide the following additional information.

In order to resolve the concerns regarding the overly coarse (not meeting 6 elements / wavelength) QC2 acoustic mesh issue, the licensee is requested to provide narrow-band power spectral density (PSD) comparisons of the nominal and refined QC2 acoustic model simulations compared to those measured on the QC2 dryer. Also provide a table of narrow-band bias errors and uncertainties computed using the nominal and refined QC2 acoustic models. Address any non-conservative narrow-band results (the refined mesh producing lower loads than the coarse mesh, indicating non-conservative bias errors for the nominal mesh).

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Response

Narrow Band PSD Comparisons

The refined mesh QC2 SYSNOISE acoustic FE model used for mesh sensitivity study in Appendix B of the GGNS SDAR[1]is not available. The refined mesh model and FRFs were used only for the mesh study and were not retained after the evaluations and the generic LTR were completed. The NASTRAN FE model used in the alternate calculations for verification of the refined mesh acoustic FE model results is available; however, the NASTRAN model cannot be used directly for performing the requested calculations. While the NASTRAN program capabilities are sufficient for performing alternate calculations, NASTRAN does not have the detailed acoustic model capabilities that are being employed in the SYSNOISE calculations (i.e., frequency dependent speed of sound and damping). A comparison between the refined mesh NASTRAN PSD results and the coarse mesh SYSNOISE PSD results would, therefore, not be valid. It would take [[ ]] to migrate the NASTRAN model over to the SYSNOISE platform, revalidate the refined mesh model, generate the PSD comparisons to the QC2 measured data, and recalculate the revised GGNS stress with revised bias and uncertainty data. Reestablishing the refined mesh model includes reconstructing the SYSNOISE model, generating the FRFs and benchmarking the reconstructed model to replicate the generic LTR mesh study results. GEH had previously evaluated the work required to refine the QC2 acoustic model to address concerns raised by the Staff in RAI1 Round 5. This included remeshing to support the six elements per wavelength criterion to at least 250 Hz. These refined mesh model and bias and uncertainty assessments [[ ]]

There is another limitation with respect to the refined mesh comparisons based on the QC2 plant measurements. Other than the postulated SRV resonance design loads, the GGNS pressure loads are relatively low for frequencies in the [[ ]] (SDAR Figures 3-16 through 3-18). The GGNS SRV resonance loads are postulated to occur in the [[ ]]. The QC2 plant measurements have [[ ]] (SDAR Appendix C Section 3.4 page 94). QC2 benchmark comparisons between the current [[ ]] mesh prediction and refined mesh predictions (either [[ ]]) would not provide good data to define the bias and uncertainty values in the [[ ]] range of interest for GGNS because the load content in that band is very small. Therefore, a comparison between the QC2 coarse mesh and refined mesh narrow band predictions would not provide any additional information that would be relevant to the GGNS analyses.

Based on the current GGNS outage schedule, the plant will have collected on-dryer measurements at CLTP before the QC2 refined mesh comparisons would be available. The GGNS MSL measurements at CLTP show incipient SRV resonances at [[ ]] (SDAR Appendix G, Figures 64-68). These resonances will provide valid on-dryer signal content that can be used for benchmarking the GGNS acoustic models in the high frequency range.

Mesh Density Effect

The QC2 acoustic model is used in two areas of the GGNS replacement dryer analysis. The first area is in the development of the PBLE [[ ]] used in projecting the main steamline acoustic pressure measurements to the dryer pressure loading. The second area is in the PBLE load definition bias and uncertainty terms used in assessing the overall bias and uncertainty in the GGNS FIV stress predictions. The QC2 acoustic model used to support the GGNS analyses did not meet the [[ ]] criterion for frequencies above [[ ]]. It should be noted that the GGNS load definition used an acoustic model that satisfies the [[ ]]; therefore, the GGNS load definition used in the structural analyses is adequately resolved throughout the GGNS frequency range of interest.

The [[ ]] used in the GGNS analysis are not affected by the coarse mesh used in the QC2 acoustic model. The QC2 acoustic model used a mesh density that supported frequencies up to [[ ]]. The primary [[ ]] The QC2 acoustic model is adequately meshed in these frequency ranges. As previously described in the response to Round 3 RAI 3 concerning the [[ ]] based on the full EPU conditions at QC2 has been used in the GGNS analysis. The [[ ]] is not a significant contributor to the load definition; therefore further refinement of the QC2 acoustic mesh is not expected to have a significant effect on the GGNS load definition. Based on the previous discussion, a change in the QC2 acoustic mesh to the more refined mesh density will not have significant effect on the [[ ]] used in the GGNS acoustic load definitions. Similarly, a change in the QC2 acoustic mesh to the more refined mesh density will not have a significant effect on the [[ ]] used in the QC2 PBLE mesh density studies.

The GGNS stress predictions also rely on the bias and uncertainty values developed from the QC2 PBLE load definition benchmark analyses that used the coarse meshed [[ ]] acoustic model that did not meet the [[ ]] The effect of the coarse acoustic mesh on the dryer pressure load predictions is that the resulting load prediction will tend to under-predict the actual loads. The coarser mesh is insufficient to fully resolve the waveform and amplitude peaks at higher frequencies and, therefore, the tendency is that the loads will be under-predicted. As the mesh density increases, the higher frequency acoustic waves and mode shapes become more accurately resolved and the peaks become better defined, resulting in a more accurate load prediction.

Figures 1 through 6 of this RAI response present the available frequency response function (FRF) plots from the QC2 mesh sensitivity study. The figures compare the nominal [[ ]] mesh to the more refined [[ ]] mesh. The increase in amplitude at higher frequencies as the mesh is refined is indicated in the FRF comparisons in these figures. Figures 1 through 4 are sample FRFs between each of the vessel main steamline nozzles. [[

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The mesh refinement results are documented in SDAR Appendix C Table 22; these results show that the predicted loads are generally higher with the refined mesh. Because of the amplitude under-prediction due to the coarse mesh, the coarse mesh QC2 benchmark evaluations will result in bias terms in the high frequency range that reflect the pressure load under-prediction. Therefore, the application of the coarse mesh QC2 benchmark bias terms in the GGNS FIV stress analysis will increase the predicted stresses in the GGNS analysis.

In the QC2 benchmark bias and uncertainty evaluations where there is limited or no acoustic loads or results to compare above [[

]] The bias results from the PBLE narrow band statistical assessment are shown in Figures 26 and 27 of SDAR Appendix C. The bias values are tabulated in Tables 37 and 38 in Appendix K of SDAR Appendix C.

SRV Acoustic Resonance Loads

The GGNS load definition used an acoustic model that satisfies the [[
]]; therefore, the GGNS load definition used in the structural analyses is adequately resolved throughout the GGNS frequency range of interest. Other than the postulated SRV resonance design loads, the GGNS pressure loads are relatively low for frequencies in the [[ ]] range (SDAR Figures 3-16 through 3-18). The GGNS SRV resonance loads are postulated to occur in the [[ ]] range. As described in the previous section, the QC2 plant measurements have little acoustic load content above [[ ]], therefore, the QC2 benchmark bias and uncertainty evaluations provide little basis for bias and uncertainty values in the [[ ]] range of interest for GGNS. However, the SRV acoustic resonance design loads for the GGNS replacement dryer analysis were
[[

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The methodology used to model the SRV design loads is documented in the GGNS SDAR Appendix A Sections 3 and 5.3. Section 3.1 describes the process used to [[

]]

GGNS SDAR Appendix A Section 5.3 provides the details of [[

]] While these comparisons are not benchmark comparisons in the true sense, they do provide further assurance that the SRV acoustic resonance design loads used in the GGNS analysis are reasonable.

References

1. NEDC-33601P, Engineering Report Grand Gulf Replacement Steam Dryer Fatigue Stress Analysis Using PBLE Methodology, Revision 1, Class III, February 2012.

[[

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Figure 1 - FRF at Nozzle A / Excited at Nozzle A
Green – nominal mesh / Red – finer mesh
(SDAR Appendix B Figure 25)

[[

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Figure 2 - FRF at Nozzle A / Excited at Nozzle B
Green – nominal mesh / Red – finer mesh

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Figure 3 - FRF at Nozzle C / Excited at Nozzle A
Green – nominal mesh / Red – finer mesh

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Figure 4 - FRF at Nozzle D / Excited at Nozzle A
Green – nominal mesh / Red – finer mesh

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Figure 5 - FRF at P:1 (facing Nozzle B) / Excited at Nozzle A
Green – nominal mesh / Red – finer mesh

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Figure 6 - FRF at P:20 (facing Nozzle C)/ Excited at Nozzle B
Green – nominal mesh / Red – finer mesh
(SDAR Appendix B Figure 25)

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RAI-08

Strain gage bias errors

The strain gage test report describes [[

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Response

Drift is a concern in any long time span measurement. Drift can result from strain gage relaxation, Data Acquisition System drift, or temperature changes in the wiring to the gage pairs on the MSL locations. Drift is not a significant factor in FIV loads because these loads are measured dynamically (i.e., no static term) and over relatively short time spans [[ ]] Therefore drift will not cause a large enough imbalance in the circuit bridges to affect dynamic strain sensitivity. The calibration of the gages during the hydrostatic pressure testing uses [[ ]][1] and does include calibration periods of approximately [[ ]] Therefore drift has the potential to affect the gage bias values calculated in this test.

Drift was evaluated over a [[

]]

The calibration of the gages during the [[

]] The drift evaluation data can be used as the representative drift during the entire test interval. For the gage calibration during the pressure change, the mean strain change was approximately [[ ]] Therefore the drift constitutes an uncertainty of approximately [[ ]] over the calibration period.

This additional uncertainty term is being added to the strain gage correction factor uncertainty calculation. The result will be included in the final stress table provided in response to Round 6 RAI-06.

References

1. NEDC-33601P, Engineering Report Grand Gulf Replacement Steam Dryer Fatigue Stress Analysis Using PBLE Methodology, Revision 1, Class III, February 2012.

RAI-09

Dryer instrumentation, Benchmark of B&U using GGNS-specific MSL & on-dryer Instrumentation, and Power Ascension

Based on the review of the response to RAI 9 (Attachment 1 to GNRO–2012/ 00009) the staff requests the following information:

i) The table on Page 49 of 66 (GNRO-2012/00009) for response to RAI 09 in Round #5 shows that each accelerometer is associated with several high stress locations. The licensee is requested to explain how the accelerometer measurements will be used in estimating the stresses at these locations.

ii) How the accelerometer data will be used in determining the end-to-end B&U at the high stress locations on the outer hood?

iii) On Page 51of 66 (GNRO-2012/00009) for response to RAI 09 in Round #5, it is stated, [[ ]] However, no criteria are presented in the response. Instead, it is stated, [[ ]] The licensee is requested to clarify when these criteria or the updated power ascension test plan will be submitted for the staff review.

iv) On Page 53 of 66 (GNRO-2012/00009) for response to RAI 09 in round #5, the use of [[ ]] in prediction of peak stress and its location is summarized. It appears that the [[ ]] would be able to identify the changes in the peak stress location as power is increased. The licensee is requested to explain whether this specific use of [[ ]] has been validated. In addition, the licensee is requested to confirm that

   a. Whether this determination of the peak stress and its location would be made at each hold period. Please identify the hold periods.

   b. The results with sufficient details will be submitted to the staff for its review and approval.

v) In order to expedite the review process and not to lose the functionality of the on-dryer instruments, the licensee is requested to submit the following information. Please provide a detailed report outline including section titles, tables, plots and figures. Please identify all the data that will be submitted to the staff at power levels reaching to CLTP, CLTP, and each hold period above CLTP, so that the staff can make a decision about further power increase. As a minimum, the staff would like to review the following data:

a. Benchmarking of PBLE Methods 1 and 2

b. End-to-end benchmarking

c. Maximum stress and its location

d. Comparison with acceptance criteria

e. Projection to next hold period and to EPU

f. Any projected violation of acceptance criteria

g. Any revisions to limit curves

vi) Reanalysis of the GGNS RSD using the measured pressure loads at CLTP. Compare the stress results with the ones obtained using [[ ]]

Please note that the staff's review of the MSL and on-dryer instrumentation data and evaluations to be submitted by the licensee at CLTP condition may require longer than 96 hours due to complete reassessment of the first time use of PBLE methodology and end-to-end benchmark. The subsequent staff assessments of power ascension data at power plateaus above CLTP, however, will be subject to the usual 96 hour evaluation periods.

<u>Response</u>

<u>Response to i) and ii)</u>

The potential monitoring location areas depicted in Figures 1 through 5 in the response to Round 5 RAI 9 are evaluated using [[

Non-Proprietary

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Response to iii)

The Round 5 RAI 09 response section “Full FE Reanalysis” describes the criteria considered for this determination. Item v) of this response includes a detailed summary of the information to be provided in each NRC report. The PAT Plan with the detailed criteria will be submitted for NRC review a minimum of 14 days before the CLTP plateau is achieved.

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Response to iv)

Validation of Stress Adjustment Method:

In addition to the stress analysis performed OLTP conditions as part of the EPU license amendment request, GEH also performed complete dryer stress analyses at 1672 MWth, 1791 MWth, and 1912 MWth during the Vermont Yankee (VY) power ascension. GE performed a nominal time step analysis [[

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<u>Response to iv) a and iv) b</u>

The determination of the [[

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<u>Response to v)</u>

Table 1 summarizes target test points for data acquisition and assessment for the power ascension up to the full EPU power level. Reports to the NRC will include data plots and tables at the indicated test point and for any test point since the last report. Table 2 summarizes the information to be generated at each test point. (Note the NRC a to g list of minimum items requested in this RAI section have been flagged in the description column of Table 2.)

Response vi)

ANSYS FE Model Reanalysis at CLTP

The purpose of the instrumentation is to [[

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Acknowledgement of MSL and on-dryer instrumentation data review

Entergy understands the NRC may need additional time to review the initial results provided at CLTP conditions. With this information, it is requested that a review period of no more than 168 hours (7 days) be applied to the CLTP plateau review and that the 96-hour evaluation periods be applied to the data submitted at the 105% and 110% hold-point plateaus.

References

1. Engineering Report: ”Susquehanna Replacement Steam Dryer Instrumentation Acceptance Criteria – Dryer Mounted Instrumentation”, February 2008, ML080660255, Attachment 1.

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Attachment 3

GNRO-2012/00016

Grand Gulf Nuclear Station Extended Power Uprate

Response to Request for Additional Information

Mechanical and Civil Engineering Branch, Steam Dryer

GEH Affidavit for Withholding Information from Public Disclosure

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Edward D. Schrull, PE state as follows:

(1) I am the Vice President, Regulatory Affairs, Services Licensing, 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, 173280-JB-061, "Grand Gulf Steam Dryer: Transmittal of Steam Dryer Responses to Requests for Additional Information 1, 4, 7, 8, and 9," dated March 13, 2012. The GEH proprietary information in Enclosure 1, which is entitled "GEH Responses to GGNS Steam Dryer Requests for Additional Information 1, 4, 7, 8 and 9, GEH Proprietary Information - Class III (Confidential)" is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] Figures, equations and some tables containing GEH 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 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC 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 F2d 871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F2d 1280 (DC 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 and/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 and/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. Access to such documents within GEH is limited to a "need to know" basis.

(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 and/or confidentiality agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed GEH design information of the methodology used in the design and analysis of the steam dryers for the GEH Boiling Water Reactor (BWR). 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 major GEH asset.

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(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 affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 13th day of March 2012.

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