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Proprietary Notice
This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 1, the balance of this letter may be considered non-proprietary.

MFN 08-882

Docket No. 52-010

November 10, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to NRC Request for Additional Information Letter No. 165 Related to Licensing Topical Report NEDC-33373P, Revision 0, "Dynamic, Load Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007 RAI Numbers 9.1-51 through 9.1-76

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission Request for Additional Information (RAI) sent by NRC Letter 165, March 19, 2008 (Reference 1). The responses to RAIs 9.1-51 through 9.1-76 are provided in Enclosure 1.

Should you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 08-284, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 165* Licensing Topical Report NEDC-33373P, Revision 0, "Dynamic, Load Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007, March 19, 2008.

Enclosures:

1. Response to NRC Request for Additional Information Letter No. 165 Related to Licensing Topical Report NEDC-33373P, Revision 0, "Dynamic, Load Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007, RAI Numbers 9.1-51 through 9.1-76 - Proprietary Version

2. Response to NRC Request for Additional Information Letter No. 165 Related to Licensing Topical Report NEDC-33373P, Revision 0, "Dynamic, Load Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007, RAI Numbers 9.1-51 through 9.1-76 – Non-Proprietary Version

3. Affidavit – MFN 08-882

cc:	AE Cubbage	USNRC (with enclosures)
	DH Hinds	GEH (with enclosures)
	RE Brown	GEH (with enclosures)
	eDRF	0000-0076-8445

Enclosure 2

MFN 08-882

Response to NRC Request for

Additional Information Letter No. 165 Related to

Licensing Topical Report NEDC-33373P, Revision 0, "Dynamic Load-Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks"

RAI Numbers 9.1-51 through 9.1-76

Non-Proprietary Version

NRC RAI 9.1-51

With regard to Licensing Topical Report NEDC-33373P, Revision 0, "Dynamic, Load-Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," Rev. 0, provide the following information: (1) Section 5.2.2 states that the [[

]]. *What is the basis for these flow rates?*

(2) Justify the equations used to calculate the maximum inlet temperature. Discuss the assumptions.

(3) Discuss how the equations used in Section 5.2.3.2 to calculate the heat generation in each rack were derived.

(4) Discuss the assumptions and methodology used to calculate the heat transfer coefficient (h) used in Section 5.2.3 to generate the velocity and temperature profiles in the spent fuel pool.

(5) Provide detailed drawings of the fuel assemblies with dimensions, center-to-center distances, and arrays layouts to demonstrate adequate cooling geometry.

GEH Response

1) [[

]].

2) The maximum inlet temperature at the bottom of the spent fuel storage racks is determined using the first law of thermodynamics in steady state (conservation of energy):

$\dot{m}\, c_p\, (T_{bulk} - T_{inlet}) = Q_{bundles}$

where: $\dot{m}$ = cooling mass flow rate of the spent fuel pool (kg/s)

c_p = specific heat (J/kg°C)

T_{bulk} = bulk pool temperature (°C)

T_{inlet} = pool inlet water temperature (°C)

$Q_{bundles}$ = residual heat of bundles (W)

The equation above was used to conservatively obtain the maximum inlet temperature for both normal and abnormal conditions. [[

]]

3) [[

]].

4) A heat transfer coefficient (h) is not used in Section 5.2.3 to generate velocity and temperature profiles in the spent fuel pool.

Heat transfer coefficients are used in Section 5.3.5. The first is the foulant layer heat transfer coefficient (for the crud deposit assumed on the cladding surface). The second is the heat transfer coefficient for water. These heat transfer coefficients were not calculated, but were provided by Reference 7 ("Heat Transmission", William H. McAdams, McGraw-Hill Book Company). Section 5.3.5 shall be revised to indicate this reference for the foulant layer heat transfer coefficient. The heat transfer coefficient currently points to the reference. Both values are used to calculate the maximum peak cladding temperature.

5) [[

]].

Drawings showing the fuel storage rack general arrangement, rack dimensions, and spacing are attached. These drawings were either used in the analysis or generated as a result of analysis.

The layout of the array of racks, as analyzed, is presented in Figures 5-3 and 5-5. These figures were generated by the ANSYS model and provide temperature distribution through the racks during both normal and abnormal conditions. [[

]]

DCD Impact

LTR NEDC-33373P, Rev. 0, shall be revised as in Item #4 described above.

[[ ]]

[[ ]]

[[ ]]

[[ ]]

[[ ]]

NRC RAI 9.1-52

LTR NEDC-33373P, Table 1-1 provides a list of documents of input data used to develop the analysis in Section 1.0. However, the LTR does not describe how the information and notations provided in the table should be interpreted (e.g., the footnote {3} in lower right corner). In addition, the LTR provides a finite element model of the rack.

In accordance with SRP 3.8.4 Appendix D, to facilitate the review and evaluation of the rack finite element model, the staff requests that GEH provide the spent fuel rack layouts (design drawings preferable) pertaining to structural dimensions of rack, arrangement of racks in the pool including spacing between racks, configuration and dimensions of spent fuel elements, and the general location and elevation (with respect to the nuclear island basemat) of the pool within fuel building (FB).

GEH Response

The information provided in Table 1-1 consists of the list of sources from which input data for analysis is documented. Notations are limited to the identification of proprietary information as described in the introductory paragraph of the LTR titled "Proprietary Information Notice". GEH proprietary information is identified by a double underline inside double square brackets. Proprietary figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation{3} refers to Paragraph (3) of the affidavit which provides the basis for the proprietary determination. [[ ]] All information that is not so marked will not be considered GEH proprietary.

Drawings showing the fuel storage rack general arrangement, rack dimensions, and spacing are attached. These drawings were either used in the analysis or generated as a result of analysis.

[[

]].

Elevations, with respect to the Nuclear Island basemat, can be found in Figure 1.2-10 of the DCD. This information is also applicable to Section 2 of the LTR.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

[[ ]]

[[ ]]

[[ ]]

[[ ]]

[[ ]]

NRC RAI 9.1-53

LTR NEDC-33373P, Section 1.4.1 provides a description of the structural elements for spent fuel storage racks (FSR). It states that [[ ]]. *However, it does not describe how the top level plates are connected to each other* [[ ]]. *The staff requests that GEH provide clarification to address how the stainless steel (SS) plates in the top level of rack which form the cell grid for the fuel elements are connected.*

GEH Response

The top level plates that form the internal grid of the fuel rack are not within the active region of spent fuel, therefore, they are fabricated from SA-240 Type 304L stainless steel. From plate to plate, the top level grid is assembled by fitting the slots in the plates together without welding. The top level plates are welded to the enveloping plates (the four side plates) that provide structural integrity of the racks, which are also fabricated from SA-240 Type 304L stainless steel.

This information is applicable to both spent fuel storage rack designs (Sections 1 and 2 of the LTR).

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-54

ESBWR DCD rev. 4 Tier 2, Section 9.1.2.5 provides thermal-hydraulic design for FSR, which states that "In the event of loss of FAPCS cooling trains boiling can occur. That structural acceptance criterion for FSR is that the storage rack design does not exceed the allowable stress level given in the ASME B&PV Code, Section III, Subsection NF during boiling". The boiling temperature is 212o F (100o C). However, LTR NEDC-33373P, Table 1-3 defines the [[ ]]. *The staff requests that GEH provide justification for the temperature specified in Table 1-3. Also address the same issue for LTR NEDC-33373P, Table 3-3.*

GEH Response

Due to the depths of the spent fuel storage racks in both the Buffer Pool and Spent Fuel Pool, re-analysis of all racks has been performed using ASME code material limits for 250°F. Tables 1-3, 2-3, and 3-3 shall be revised to update the material limits to 250°F. Sections 1.4.5.3, 2.4.6.3, and 3.4.6.3 of LTR NEDC-33373P *"Dynamic, Load Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007*, shall be revised to reference 250°F. In addition, a reference to the ASME Steam Tables shall be added to Sections 1.8, 2.7, and 3.7 as a source for the 250°F at the depths of the fuel storage racks.

DCD Impact

LTR NEDC-33373P, Rev. 0, shall be revised as described above.

NRC RAI 9.1-55

NOTE: PROPRIETARY INFORMATION IS IN DOUBLE BRACKETS

LTR NEDC-33373P, Section 1.4.5 provides the finite element model for FSR analysis. The description in the third bullet for the borated SS plates is not clear how in the finite element model the [[ ]] connections for the borated plated are modeled in terms of displacements and rotations at connected nodes. The staff requests that GEH provide a clearer description of the [[ ]] connections, preferably using figures.

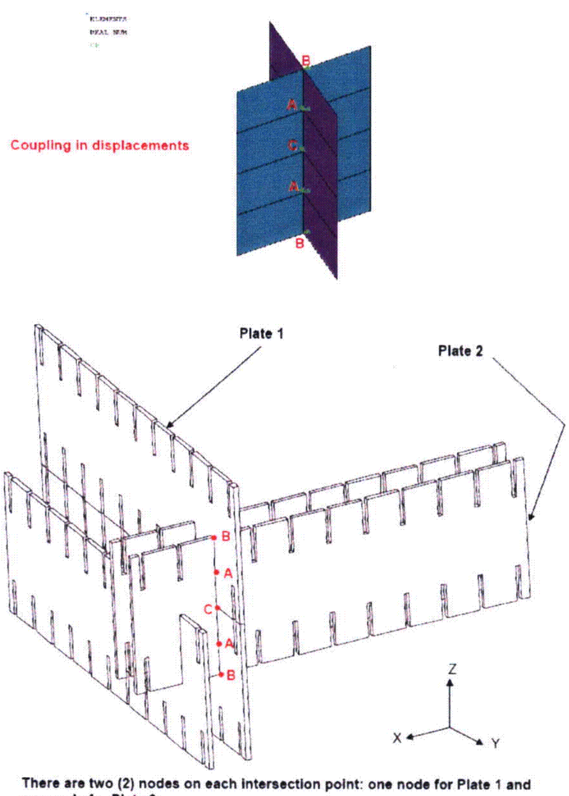
GEH Response

The figure below provides a pictoral presentation of how the borated stainless steel plates interlock to form the internal grid of the spent fuel storage racks in both the Buffer Pool and Spent Fuel Pool. This figure also shows how coincident nodes (one per BSS plate) at each point (A, B, or C) are coupled and modeled in the FEM in terms of displacement, where:

"U" defines displacement

"1 or 2" indicates plate number, as noted

"x, y, z" indicates direction, as noted



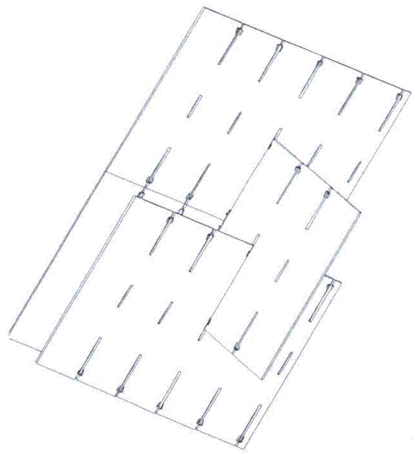
There are two (2) nodes on each intersection point: one node for Plate 1 and one node for Plate 2

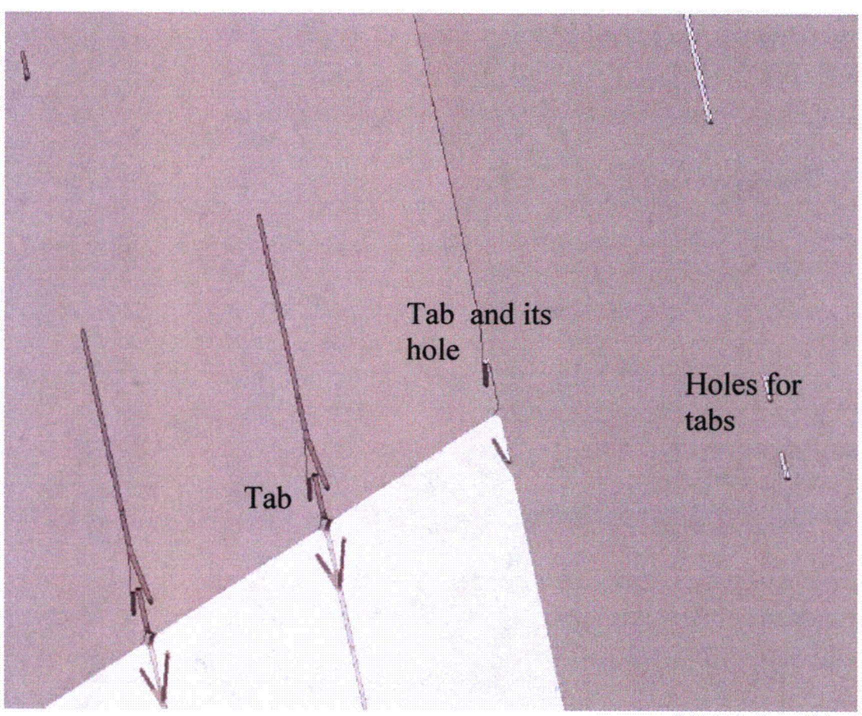
In Points A : $U1x = U2x$; $U1y = U2y$; $U1z \neq U2z$

In Points B : $U1x = U2x$; $U1y \neq U2y$; $U1z \neq U2z$

In Points C : $U1x \neq U2x$; $U1y = U2y$; $U1z \neq U2z$

The figures below show how tabs in the BSS plates are used to limit rotation and reduce buckling, thus improving alignment between successive vertical plates.





This configuration was modeled for both spent fuel storage rack designs (LTR Sections 1 and 2)

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-56

The eighth bullet in LTR NEDC-33373P, Section 1.4.5 does not clearly explain whether the mass for borated stainless steel (BSS) plates was included in the finite element model [[

]]. *The staff requests clarification to address whether the mass of BSS plates is included in the finite element model.*

GEH Response

Section 1.4.5, bullet eight (second sentence) says [[

]].

This information is applicable to both spent fuel rack designs (LTR Sections 1 and 2).

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-57

LTR NEDC-33373P, Section 1.4.5.1 provides a frequency calculation for FSR to demonstrate that [[

]].

GEH Response

[[

]].

This information is applicable to both spent fuel rack designs (LTR Sections 1 and 2).

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-58

DCD Tier 2, Rev 4 Section 9.1.2.4 specifies that the applied loads to the rack include a live load which is the effect of lifting an empty rack during installation. SRP Section 3.8.4, Appendix D also requires that a live load be included in the load combinations (SRP Section 3.8.4, Appendix D, Table 1). LTR NEDC-33373P, Section 1.4.6 provides the analysis loads, [[ ]]. The staff request that GEH justify [[ ]]. Also address the same issue for LTR NEDC-33373P, Section 3.4.5.

GEH Response

Live loads as indicated in SRP Section 3.8.4, Appendix D, Subsection II.3, are movable loads or other varying loads other than those associated with seismic, SRV actuation, or LOCA loads. ASCE 7-02, Minimum Design Loads for Buildings and Other Structures, Section 4.0 also defines live loads as moveable loads imposed on the structure during use. Live loads associated with construction such as handling are excluded.

LTR NEDC-33373 discusses the dynamic analysis of the fuel storage racks due to loads imposed during operation and does not cover installation and handling aspects of the fuel storage racks. There are no other live loads to be combined with the dynamic loads for the fuel storage racks during operation.

The loads associated with installation are evaluated in combination with the other normal loads during installation and are handled separately.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 9.1-59

DCD rev. 4 Tier 2, Section 9.1.2.5 states that "In the event of loss of FAPCS cooling ..., the structural acceptance criteria for the fuel storage racks is that the storage rack design not exceed the allowable stress levels given in the ASME B&PV Code, Section III, Subsection NF during boiling." LTR NEDC-33373P, Section 1.4.6 [[ ]] *in assessing the effect of differential temperature loads on anchor bolts. The staff requests that GEH justify why the differential temperature induced loads did not consider the boiling temperature of 212o F (100o C) for the event of loss of FAPCS cooling trains. Also address the same issue for LTR NEDC-33373P, Section 3.4.7.2.*

GEH Response

This issue is addressed in the response to RAI 9.1-54.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-60

LTR NEDC-33373P, Section 1.4.6.4 described the FSR analysis for safe shutdown earthquake (SSE) loads using [[ ]]. FSR is a weld steel construction. According to Regulatory Guide 1.61 Table 1 for welded steel, the SSE damping values should be 4 percent. The staff requests that GEH justify for using [[ )]] in the FSR analysis for SSE loads. Also address the same issue for LTR NEDC-33373P, Section 3.4.7.3.

GEH Response

Higher damping values are allowed under Regulatory Guide 1.61, Paragraph C.2, and Standard Review Plan 3.8.4, Appendix. D, Section 3, Paragraph 4, which states that submergence in water can be taken into account.

Based on a review of the work by Lawrence Livermore laboratory, Report UCRL-52342, Effective Mass and Damping of Submerged Structures, by R. G. Dong (1978), damping values higher than 4% and 6% damping were justified for the spent fuel racks located under water with close tolerance fit-up to the fuel assembly. A conservative approach within the industry showed most racks evaluated with this allowance were using an additional 2% damping.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 9.1-61

When a building in-structure response spectrum (ISRS) is used as input to the FSR seismic response analysis in the vertical direction, in addition to the vertical ISRS, the contribution of rocking motion should also be included. The LTR NEDC-33373P, Section 1.4.6.4 does not describe how the rocking motion is considered in the vertical input spectrum. The staff requests that GEH clarify whether the rocking ISRS was considered and how the rocking ISRS was combined with the vertical ISRS to arrive at the vertical input spectrum for the FSR seismic analysis. Also address the same issue for LTR NEDC-33373P, Section 3.4.7.3.

GEH Response

DCD Section 3A.9.2 addresses how the rocking ISRS and vertical ISRS were combined to generate the vertical input spectrum for rack analysis. This information is applicable for the spectra used to evaluate the three ESBWR rack designs analyzed in Sections 1, 2, and 3 of LTR NEDC-33373P.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-62

NOTE: PROPRIETARY INFORMATION IS IN DOUBLE BRACKETS

With regard to LTR NEDC-33373P, Section 1.4.6.4, [[

]]. Per SRP 3.8.4 Appendix D.3, the staff requests that GEH provide an assessment of the impact loads of fuel assemblies on the rack during an SSE.

GEH Response

Each of the three sections (1, 2, and 3) of LTR NEDC-33373P documenting the dynamic analyses of the three rack designs shall be revised to include the applicable assessment of the impact load on the respective rack from fuel assemblies during a SSE.

DCD Impact

LTR NEDC-33373P, Rev 0 will be revised as described above.

NRC RAI 9.1-63

Appendix A to SRP 3.8.1, 3A states that "... For dynamic responses resulting from the seismic initiating event, when the time-phase relationship between the responses cannot be established, the absolute summation of these dynamic responses should be used." Since the [[

]], if available, provide the time-phase relationship to demonstrate that the respective responses are uncorrelated. Address the same issue for LTR NEDC-33373P, Sections 2.4.8 and 3.4.9.

GEH Response

RAI 3.8-9 (Supplement 5 is currently in evaluation) generically addresses the applicability of the SRSS method of load combinations for ESBWR. Therefore evaluation of RAI 3.8-9 envelopes consideration of this issue for ESBWR fuel storage racks.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 9.1-64

With regard to LTR NEDC-33373P, Section 2.0, the structural configurations for FSR in buffer pool are similar to FSR for the spent fuel pool, except that the buffer pool is located in Reactor Building (RB) on a higher floor level and FSRs have smaller storage capacity, all issues and concerns raised in LTR NEDC-33373P, Section 1.0 also apply to this section, which the staff request GEH to address.

GEH Response

The RAIs that are the subject of this request are 9.1-52 through 9.1-63. A discussion of the how those RAIs are addressed for Section 2 of LTR NEDC-33373P follows.

RAI 9.1-52: A statement was added to the end of the response specifying applicability to Section 2 of the LTR.

RAI 9.1-53: A statement was added to the end of the response specifying applicability to Section 2 of the LTR.

RAI 9.1-54: The response details required changes to the LTR in Sections 1, 2, and 3.

RAI 9.1-55: A statement was added to the end of the response specifying applicability to Section 2 of the LTR.

RAI 9.1-56: A statement was added to the end of the response specifying applicability to Section 2 of the LTR.

RAI 9.1-57: A statement was added to the end of the response specifying applicability to Section 2 of the LTR.

RAI 9.1-58: The response discusses live load considerations associated with dynamic analysis of fuel storage racks generically.

RAI 9.1-59: The response points to RAI 9.1-54, which is discussed above.

RAI 9.1-60: The response generically discusses the applicability of 6% damping for fuel racks.

RAI 9.1-61: The response discussed applicability for Sections 1, 2, and 3 of the LTR.

RAI 9.1-62: The response details required changes to the LTR in Sections 1, 2, and 3.

RAI 9.1-63: The response points to RAI 3.8-9, which generically addresses applicability of the SRSS method of load combination for ESBWR, not just fuel storage racks.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-65

With regard to LTR NEDC-33373P, Section 2.4.9, level A demand vs. capacity checks for [[ ]], *in both average normal stress and shear stress show inconsistent use of capacities as prescribed in ASME Code, Section III, Subsection NF, NF-3324. The staff requests that GEH provide clarification regarding the inconsistency, and if corrections are made, provide updated stress checks.*

GEH Response

Corrections shall be included to NEDC-33373P, Section 2.4.9 to address the initial inconsistencies with the ASME Code concerning both average normal stress and shear stress. The corrections are detailed below:

[[

]]

DCD Impact

LTR NEDC-33373P, Rev. 0 shall be revised as described above.

NRC RAI 9.1-66

LTR NEDC-33373P, Section 3.4.5 describes the FSR model which includes channel plates, grid assembly, and other FSR components. It is not clear from the model description how the channel plates and grid assembly are connected (welded or only contact). The staff requests that GEH provide a clarification of the connection between the channel plates and grid assembly.

GEH Response

Each cell section in the new fuel storage rack contains a channel plate (U-shaped as indicated in Figure E4 of the LTR). which is welded to a common grid plate. This series of channel plates welded to the grid plate forms the grid assembly.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-67

LTR NEDC-33373P, Table 3-8 shows a [[

]]. If this is the case, a correct entry should be entered. The staff requests that GEH provide the correct maximum membrane stress for the comparison. In addition, the staff requests that GEH provide the detailed calculation for the staff review.

LTR NEDC-33373P, Table 3-9 shows a [[

]]. The staff treats it as an inadequate justification for the following reasons. First, if the ASME code procedure, which is supposed to be conservative, is followed in the analysis, [[ ]]. Second, if additional conservatism is included in the analysis, it should be identified and the effect on the calculated demand should be assessed and quantified. The staff requests that GEH provide an assessment of the effect of conservatism in the analysis on the calculated demand for double fillet welds.

GEH Response

Due to the significant reductions in SRV and LOCA loads, the maximum membrane stresses calculated in Table 3-8 and the weld stresses calculated in Table 3-9 have been re-calculated. Tables 3-8 and 3-9 shall be revised to include the new stresses, which indicate a significant presence of margin when compared to allowable stresses. In addition, footnotes associated with the original tables shall be deleted.

The maximum membrane stress (S_z) presented in Table 3-8 was calculated using the ANSYS analysis model. The model generated a figure, which indicates maximum stress and the location of the maximum stress point [[ ]]. A pointer to this figure shall be provided in the table for clarification.

DCD Impact

LTR NEDC-33373P, Rev. 0 shall be revised to include information as described above.

NRC RAI 9.1-68

LTR NEDC-33373P, Section 4.1.2 considers impact loads on FSR due to accident drops of fuel element and handling tool. Two scenarios were considered: [{[

]]. The staff requests that GEH provide the criteria used for the selection of various drop heights for the accident scenarios.

GEH Response

LTR NEDC-33373P will be revised to specify drop heights of 6.4 m and 1.8 m over the top of the spent fuel storage racks. The basis for the heights is as follows.

Maximum drop height in Reactor Building

The 6.4 m [21 ft] is the maximum drop height over the fuel storage rack in the Reactor Building buffer pool deep storage area. The basis assumes the refueling machine mast is at full up. At full up the fuel bail handle is 2.134 m [7 ft] from the surface (and the TAF is greater than 2.59 m [8.5 ft]). The fuel bail handle at 2.134 m [7 ft] from the surface is standard for all refueling machines.

Maximum drop height in Fuel Building

The maximum drop height in the Fuel Building spent fuel storage pool is a distance of 4.55 m [15 ft]. This distance is based on the fuel handling machine mast at full up and the fuel bail handle 2.134 m [7 ft] from the surface (and the TAF is greater than 2.59 m [8.5 ft]). The drop height in the Reactor Building exceeds the drop height in the Fuel Building. The fuel bail handle at 2.134 m [7 ft] from the surface is standard for all fuel handling machines.

Fuel handling in spent fuel pool

The purpose of the 1.8 m [5.9 ft] drop is to assess the possible damage to the racks during typical fuel handling in the spent fuel pool. The 1.8 m basis assumes normal handling in the Fuel Building of fuel between the IFTS terminus area and the spent fuel storage racks. During normal handling fuel is typically raised high enough to clear the bottom of the gate between the IFTS terminus area and clear the handles of fuel in the spent fuel pool racks. Typically the fuel is raised to clear the gate by 150 mm to 300 mm [6-12 in]. The tops of the fuel storage racks are 0.85 m [2.8 ft] below the gate. The 1.8 m allows latitude in normal handling height over the racks. This distance also encompasses (1) handling fuel between the spent fuel racks and the new fuel inspection stands, and (2) handling of fuel between the spent fuel racks and the cask pit area.

DCD Impact

No DCD changes will be made in response to this RAI.

LTR NEDC-33373P, Rev 0 will be revised as described above.

NRC RAI 9.1-69

LTR NEDC-33373P, Sections 4.2.2.2 and 4.2.3.2 describe the criteria for no damage to the base plates for accident drops of both spent and fresh fuel elements, which state that: [[ ]].
LTR NEDC-33373P, Figures 4-9 and 4-13 show the velocity time histories of the dropped fuel elements. These figures appear to indicate [[ ]]. *The staff requests that GEH explain the apparent inconsistency [[ ]].*

GEH Response

[[

]].

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-70

LTR NEDC-33373P, Section 4.4.1 describes various impact scenarios for accident drops of fuel with tools on the top of the FSR cells postulated for the FSR impact analysis. The staff noticed that there may be another impact scenario where a drop of fuel element with tools in a cell which is already filled with a fuel element. The staff requests that GEH justify why the impact scenario where a drop of fuel element with tools in a cell which is already filled with a fuel element should not be evaluated.

GEH Response

This event is bounded by the fuel drop accident described in DCD Section 15.4.1, Fuel Handling Accident, wherein a fuel bundle is dropped from the full up position [refueling machine full up] directly on to the top of a fuel bundle seated in the core. The drop distance referenced in the DCD Section 15.4.1, Fuel Handling Accident is 23.038 m in the core and that exceeds the drop distance of 6.4 m for the refueling machine at mast full up in the buffer pool area, and 4.6 m for the fuel handling machine at mast full up in the spent fuel storage pool.

DCD Impact

No DCD changes will be made in response to this RAI.

NRC RAI 9.1-71

LTR NEDC-33373P, Section 4.4.2.1 describes the finite element model for impacts on cell walls. The model includes [[ ]]. *The staff noticed that it did not describe what lateral boundaries were imposed on the model. The staff requests that GEH identify lateral boundary conditions that were applied* [[ ]].

GEH Response

The lateral boundaries are [[ ]]. These boundary nodes are constrained to move [[ ]] in which they are contained. This analysis method yields conservative results, as the modeled configuration corresponds to [[ ]] in the rack.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-72

NOTE: PROPRIETARY INFORMATION IS IN DOUBLE BRACKETS

With regard to LTR NEDC-33373P, Section 4.4.2.2, [[

]]. The staff is concerned that [[

]]. The staff requests that GEH confirm with basis that [[

]].

GEH Response

Analysis of the "Walls Slotted Above" case (Section 4.4.2.2) has been re-performed and results shall be documented in LTR NEDC-33373P. Results show that deformation is limited to the 304L stainless steel that provides structural integrity at the top of the rack, which is more in line with expected results based on the configuration of the interaction. The borated stainless steel is not damaged, therefore, the active fuel region of any fuel located within the impacted rack is not affected.

DCD Impact

LTR NEDC-33373P, Rev. 0 shall be revised to include updated analysis and results as described above.

NRC RAI 9.1-73

With regard to LTR NEDC-33373P, Section 4.7, the staff noticed that ASME Section III, 1977 version was included in the reference, instead of the 2003 version of the Code referenced by the first three sections. The staff requests that GEH clarify why an older version (1977) of ASME Section III was referenced, as opposed to the 2003 version of ASME Section III referenced in the first three sections of the report.

GEH Response

In accordance with the Composite Design Specification for ESBWR, the 2003 version of ASME Section III is the version of record for design. ASME Section III – 2003 was used to perform the analyses documented in the first four sections of LTR NEDC-33373P. Section 4, reference 1 has been corrected to reflect the 2003 version of ASME Section III.

DCD Impact

LTR NEDC-33373P, Rev. 0 shall be revised to include to include information as described above.

NRC RAI 9.1-74

LTR NEDC-33373P, Section 5.2.2.1 references "ESBWR Spent Fuel Pool Decay Heat Part II" for the basis of the heat generated under normal conditions. Please provide this reference.

GEH Response

The subject document, "ESBWR Spent Fuel Pool Decay Heat Part II", was audited by the NRC in January of 2008 as part of the review of RAI 9.1-10 S02.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-75

LTR NEDC-33373P, Section 5.2.2.1 references "ESBWR Spent Fuel Pool Boil-off" for the basis of the heat generated under abnormal conditions. Please provide this reference.

GEH Response

The subject document, "ESBWR Spent Fuel Pool Boil-off", was audited by the NRC in January of 2008 as part of the review of RAIs 9.1-18 S02 and 9.1-44.

DCD Impact

No changes to the subject LTR will be made in response to this RAI.

NRC RAI 9.1-76

LTR NEDC-33373P, Section 5.4 states the maximum expected heat load in the buffer pool is 2.5 MW. Please provide the basis for this heat load.

GEH Response

The source of the maximum expected heat load in the buffer pool (2.5 MW) is a calculation titled "Buffer Pool Boil-off and Makeup Capacity". This document was reviewed by the NRC in January of 2008 during the review of RAI 9.1-41 S01, which was included in an audit of DCD Chapter 9. This reference shall be added to Section 5.6 of LTR NEDC-33373P and a pointer to the reference shall be added to the first sentence of Section 5.4.

DCD Impact

LTR NEDC-33373P, Rev. 0 shall be revised to include information as described above.

MFN 08-882

Enclosure 3

Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, David H. Hinds, state as follows:

(1) I am the Manager, New Units Engineering, GE Hitachi Nuclear Energy ("GEH"), 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 MFN 08-882, Mr. Rick E. Kingston to U.S. Nuclear Regulatory Commission, entitled *Response to NRC Request for Additional Information Letter No. 165 Related to Licensing Topical Report NEDC-33373P, "Dynamic, Load-Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007, RAI Numbers 9.1-51 through 9.1-76 - GEH Proprietary Information,* dated November 10, 2008. The GEH proprietary information in Enclosure 1, which is entitled "*Response to NRC Request for Additional Information Letter No. 165 Related to Licensing Topical Report NEDC-33373P, "Dynamic, Load-Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," November 2007, RAI Numbers 9.1-51 through 9.1-76 - GEH Proprietary Information,* is delineated by a [[dotted underline inside double square brackets.{3}]]. Figures and large equation objects 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. A non-proprietary version of this information is provided in Enclosure 2, "*Response to NRC Request for Additional Information Letter No. 165* Related to *Licensing Topical Report NEDO-33373, "Dynamic, Load-Drop and Thermal-Hydraulic Analysis for ESBWR Fuel Racks," RAI Numbers 9.1-51 through 9.1-76 - Non-Proprietary Version."*

(3) In making this application for withholding of proprietary information of which it is the owner, 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 qualify 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, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which 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 competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

(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, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on 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, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, 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 agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it identifies detailed GE ESBWR design information for the Spent Fuel Storage Racks. GE utilized prior design information and experience from its fleet with significant resource allocation in developing the system over several years at a substantial cost.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes 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 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 10th day of November 2008.

David H. Hinds
GE-Hitachi Nuclear Energy Americas LLC