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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 06-464
Supplement 3

Docket No. 52-010

August 7, 2007

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

Subject: **Response to RAI 3.9-142 S01 - Related to ESBWR Design Certification Application – DCD Section 3.9**

Enclosure 1 contains GE-Hitachi Nuclear Energy Americas LLC (GEH)'s response to the subject NRC RAI 3.9-142 S01 which was transmitted via Reference 1.

Enclosure 1 contains proprietary information as defined in 10CFR2.390. The affidavit contained in Enclosure 3 identifies that the information contained in Enclosure 1 has been handled and classified as proprietary to GEH. GEH hereby requests that the proprietary information in Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. Enclosure 2 contains the non-proprietary version of Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Project Manager, ESBWR Licensing

D068
NRR

Reference:

1. EMail to GEH from Chandu Patel (NRC) 05/10/07
2. MFN 06-464, *Response to Portion of NRC Request for Additional Information Letter No. 67 Related to ESBWR Design Certification Application – DCD Section 3.9 – RAI Numbers 3.9-4 through 3.9-11, 3.9-17, 3.9-18, 3.9-23, 3.9-26, 3.9-27, 3.9-29, 3.9-32, 3.9-34 through 3.9-36, 3.9-38 through 3.9-40, 3.9-44, 3.9-46 through 3.9-55, 3.9-57, 3.9-59, 3.9-60, 3.9-67, 3.9-72 through 3.9-76, 3.9-79, 3.9-80, 3.9-91 through 3.9-94, 3.9-96 through 3.9-99, 3.9-101, 3.9-102, 3.9-104, 3.9-105, 3.9-108, 3.9- 110, 3.9-132, 3.9-140, 3.9-142, 3.9-147, 3.9-150, 3.9-151, and 3.9-153,* dated November 22, 2006

Enclosure:

1. MFN 06-464, Supplement 3, RAI Response to RAI 3.9-142 S01
2. MFN 06-464, Supplement 3, RAI Response to RAI 3.9-142 S01 – Non-Proprietary Version
3. Affidavit - James C. Kinsey – Dated August 7, 2007

cc: AE Cubbage USNRC (with enclosures)
RE Brown GEH/Wilmington (with enclosures)
GB Stramback GEH/San Jose (with enclosures)
eDRF 0000-0070-0632, Revision 1

MFN 06-464, Supplement 3

Enclosure 2

RAI Response to RAI Number 3.9-142 S01

Non-Proprietary Version

For historical purposes, the original text of RAI 3.9-142 and the GE responses are included. The attachments are not included from the original response to avoid confusion.

NRC RAI 3.9-142

GE is requested to explain what fluctuating pressure loads are expected to emanate from the various nozzles in the reactor pressure vessel adjacent to the chimney. This explanation should include the Reactor Water Cleanup and Shutdown Cooling (RWCU/SDC) nozzle, the Isolation Condenser (IC) return nozzle, and the Gravity-Driven Cooling System (GDCS) nozzle near the chimney side walls as shown in Figure 2 on page 15 of the GE report (NEDE-33259P).

GE Response

Of the three systems that have nozzles and associated piping in the chimney region of the RPV, only the RWCU/SDC operates during normal plant operating conditions and has an external pump to drive flow. The other two systems are passive systems that do not operate during normal plant conditions and rely on hydraulic principles to create flow.

For the RWCU/SDC system, the RPV nozzle is used to remove water from the RPV during normal plant conditions. The flow rate in this mode is a maximum of 2% of the feedwater flow, and is provided by a pump with comparatively low capacity. The vane passing frequency from this pump will be similar to other pumps, but the amplitude will be very low. The BWR operating experience has been that only small sensing line components have been impacted by external pump vane passing frequencies.

The IC system is only operated when containment isolation occurs and heat removal from the reactor system is required. When this system is opened, steam flow drives each of the closed loops and flow enters the RPV from the IC return line nozzle. Plant operation with this system in operation will be very limited, and with the large mass of the chimney structure no flow induced vibration issues will occur.

For the GDCS lines, the only time these are placed in operation is during LOCA conditions when makeup water is required for the RPV. The flow from these nozzles is gravity driven from an elevated pool. The low associated flow rates and limited operating time, if such an event should ever occur, will not result in any vibration issues.

DCD Impact

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

NRC RAI 3.9-142 S01

RAI 3.9-142 S01 Comment on response to RAI 3.9-142 (MFN 06-464):

In its response to NRC RAI 3.9-142, dated November 22, 2006, the applicant stated that the operation of isolation condenser system and gravity driven cooling system would not result in any vibration issues because these two systems are passive systems that do not operate during normal plant conditions and rely on hydraulic principles to create flow. Also the plant operation with these systems in operation would be very limited.

However, the staff has a concern about the pump-driven reactor water cleanup/ shutdown cooling system that might produce flow-induced vibrations. Generally the amplitudes of the pressure fluctuations due to vane passing frequencies from the pump are quite small. However, when the pulsation frequency coincides with the natural frequency of a component, the pressure pulsation can cause stresses of high magnitude even though the amplitude of the pressure fluctuations due to steam lines of BWR plants, and have caused pressure waves and vibrations that have damaged plant equipment including steam dryers and safety relief valves. The applicant is requested to identify any vessel internal components that have natural frequencies which correspond to the pump vane passing frequencies. If so, the applicant should submit analyses which show clearly that the stresses within those components are below the ASME fatigue code limits.

GEH Response

Of the three systems that have nozzles and associated piping in the chimney region of the RPV, only the RWCU/SDC operates during normal plant operating conditions and has an external pump to drive flow. For the RWCU/SDC system, the RPV nozzle is used to remove water from the RPV during normal plant conditions. The flow rate in this mode is a maximum of 2% of the feedwater flow, and is provided by a pump with comparatively low capacity.

The fluctuating pressure waves at the Vane Passing Frequency (VPF) produced by the RWCU/SDC pumps are not expected to affect the vessel internal components, or safety relief valves. Pressure waves at the VPF travels upstream and downstream from the pump. This pressure wave is attenuated due to flow path changes as it travels to the reactor. As the pressure wave enters the vessel, it is significantly attenuated because of the very significant increase in the flow area. The attenuation is expected to be related to the area ratio (vessel annulus area/nozzle area) squared. Thus, the small pressure fluctuations generated by the pumps is further reduced. In comparison to the current BWR forced-recirculation loops, which have much higher energy pumps and a shorter path of travel through piping and components the RWCU/SDC pumps produces much lower pressure induced vibration.

To ensure that resonance or near resonance conditions (between the vessel internals natural frequencies and the VPF) are not present, a comparison of the frequencies is made. The RWCU pump has 5 vanes and runs at 1780 rpm. This makes its VPF approximately 148 Hz. The Shutdown Cooling pump has 5 vanes running at 3550 rpm results in a VPF of approximately 296 Hz. The lowest natural frequencies of the reactor components of interest near the vessel nozzle are:

Name of Component	Lowest Natural Frequency (Hz.)
Standby Liquid Control Piping	[[ ]]
Shroud/Chimney/Separator	[[ ]]

Since these lowest natural frequencies are far removed from the VPF, no resonance or near resonance conditions are present. It is possible for the higher modes of these components to be near the VPF. However, the responses for these higher modes are negligibly small, since (1), the response varies inversely as the frequency squared, and (2) the complex higher mode shapes result in very low generalized forces.

DCD Impact

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

MFN 06-464 Supplement 3

Enclosure 3

AFFIDAVIT

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, James C. Kinsey, state as follows:

(1) I am Project Manager, ESBWR Licensing, GE-Hitachi Nuclear Energy Americas LLC ("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 06-464 Supplement 3, *Mr. James C. Kinsey to U.S. Nuclear Regulatory Commission, entitled "Response to RAI 3.9-142 S01 - Related to ESBWR Design Certification Application – DCD Section 3.9"*, dated August 7, 2007. The proprietary information in Enclosure 1, *MFN 06-464, Supplement 3, RAI Response to RAIs 3.9-142 S01*, is in dark red font 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.

(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 2.790(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's 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. 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 GEH ESBWR methods, techniques, information, procedures and assumptions related to its ESBWR Reactor Technology. Development of these methods, techniques, information, procedures and assumptions and their application for the design, modification, and analyses methodologies and processes for ESBWR Reactor Technology was achieved at a significant cost to GEH, on the order of approximately several million dollars and would result in a significant economic and competitive advantage to a competitor.

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 7th day of August 2007.

James C. Kinsey

James C. Kinsey
GE-Hitachi Nuclear Energy Americas LLC