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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 08-474

Docket No. 52-010

June 13, 2008

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

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 167 – Related To NEDE-33244P, Revision 1 "ESBWR Control Rod Mechanical Design Report", RAI Numbers 4.2-21 through 4.2-27**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH response to RAI Numbers 4.2-21 through 4.2-27 is addressed in Enclosures 1, 2, and 3.

Enclosure 1 contains GEH proprietary information as defined by 10 CFR 2.390. GEH customarily maintains this information in confidence and withholds it from public disclosure. A non-proprietary version is provided in Enclosure 2.

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 information of Enclosure 1 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN 08-246, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 167 Related To NEDE-33244P, Revision 1 "ESBWR Control Rod Mechanical Design Report"*, dated March 12, 2008.

Enclosures:

1. MFN 08-474 – Response to Portion of NRC Request for Additional Information Letter No. 167 – Related To NEDE-33244P, Revision 1 "ESBWR Control Rod Mechanical Design Report", – RAI Numbers 4.2-21 through 4.2-27 – GEH Proprietary Information

2. MFN 08-474 – Response to Portion of NRC Request for Additional Information Letter No. 167 – Related To NEDE-33244P, Revision 1 "ESBWR Control Rod Mechanical Design Report", – RAI Numbers 4.2-21 through 4.2-27 – Non-Proprietary Version

3. MFN 08-474 – Response to Portion of NRC Request for Additional Information Letter No. 167 – Related To NEDE-33244P, Revision 1 "ESBWR Control Rod Mechanical Design Report", – RAI Numbers 4.2-21 through 4.2-27 – Affidavit

cc:		
	AE Cubbage	USNRC (with enclosures)
	GB Stramback	GEH/San Jose (with enclosures)
	RE Brown	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF	0000-0084-2503

Enclosure 2

MFN 08-474

Response to NRC Request for

Additional Information Letter No. 167

Related to NEDE-33244P, Revision 1
"ESBWR Control Rod Mechanical Design Report",

RAI Numbers 4.2-21 through 4.2-27

Non-Proprietary Version

NRC RAI 4.2-21

Are connectors, including the rollers exposed to coolant or other corrosive environments?

Section 2.4 of NEDE-33244P describes the connector. Are connectors, including the rollers depicted in the connector figure, exposed to coolant or other corrosive environments at any time? If so, please demonstrate that materials will not seriously degrade via any relevant processes, such as stress corrosion cracking.

GEH Response

The ESBWR control rod connector, like the BWR/2-6 velocity limiter, resides in the Control Rod Guide Tube (CRGT) during operation. As such, it is immersed in reactor coolant.

The materials used for the connector casting are the same as the velocity limiter casting: type CF3. Further, the pins and rollers are of the same materials used for BWR2/6 since 1983 ([[ ]]). GEH has no reported material issues with velocity limiters. No stress corrosion cracking in the region of the pins and rollers or other locations has been observed. The irradiation levels that the velocity limiter or connector receives are considered negligible compared to other control rod components. Therefore, Irradiation Assisted Stress Corrosion Cracking (IASCC) is much less likely.

DCD Impact

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

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

NRC RAI 4.2-22

Austenitic stainless steels have no inherent age hardening capability and lend themselves readily to the welding process.

Section 3.2.4 of NEDE-33244P states, "Austenitic stainless steels have no inherent age hardening capability and lend themselves readily to the welding process." Please provide a more detailed basis for this statement.

GEH Response

With regard to the welding characteristics of Austenitic stainless steels, the ASM Handbook (Reference A) states "The austenitic stainless steels, except for the free-machining grades, are the easiest to weld and produce welded joints that are characterized by a high degree of toughness, even in the as-welded condition. Serviceable joints can be readily produced if the composition and the physical and mechanical properties are well suited to the welding process and condition." The free-machining grades of austenitic stainless steels are not used in control rod, or other reactor component designs.

With regard to the age hardening capability of Austenitic stainless steels, the ASM Handbook (Reference B) states "Precipitation-hardening stainless steels are chromium-nickel alloys containing precipitation-hardening elements such as copper, aluminum, or titanium." The austenitic stainless steels used in control rod and other reactor component designs do not contain sufficient levels of the precipitation-hardening elements to allow for the formation of hardening precipitates.

References:

A. S.D. Washko and G. Aggen, Fabrication Characteristics, ASM Handbook, Tenth Edition, ASM International, 1990. Available in ASM Handbooks Online, HTTP://www.asmmaterials.info, ASM International, 2004.

B. S.D. Washko and G. Aggen, Wrought Stainless Steels, ASM Handbook, Tenth Edition, ASM International, 1990. Available in ASM Handbooks Online, HTTP://www.asmmaterials.info, ASM International, 2004.

DCD Impact

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

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

NRC RAI 4.2-23

Basis for the irradiated boron carbide swelling predictions

Section 3.6.1 of NEDE-33244P describes the basis for the irradiated boron carbide swelling predictions.

a) *Is the reactor referenced in this section a commercial LWR? If not, justify the applicability of the swelling data to the ESBWR.*

b) *Provide further documentation of the boron carbide swelling test program.*

GEH Response

a) The test capsules refered to in Section 3.6.1 of NEDE-33244P Rev. 1 were irradiated in a commercial BWR.

b) The test capsules were placed in neutron monitor tubes and irradiated in the BWR. After irradiation, they were removed and examined at GEH's Vallecitos facility. Test capsule configurations are shown in Figure 3-7 of NEDE-33244P Rev. 1. [[

]]. The dimensions of the test capsules were measured prior to examination using standard laboratory practice. The irradiated test specimens were examined post-test in a hot cell, also using laboratory standard practices. For test capsules with a mandrel, the diametral strains were mathematically corrected to compensate for the mandrel, resulting in an increase of the reported strain value.

DCD Impact

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

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

NRC RAI 4.2-24

Design Changes relative to the original Marathon

Section 2 of NEDE-33244P describes design changes relative to the original Marathon design. It is stated that the ESBWR capsule's end cap is the same as that used in the 1991 design. In Section 2.2, the capsule walls are said to be thicker than the 1991 design. Please explain why thicker walls are necessary but thicker end caps are not necessary.

GEH Response

Section 2 of NEDE-33244P Rev. 1 states "As in the BWR/2-6 Marathon design, the ESBWR capsules use a crimped capsule end cap connection." Section 2 then goes on to list the six primary changes made to the BWR/2-6 Marathon design to arrive at the ESBWR Marathon design, including capsule geometry.

The basic design of the capsule end caps for the original Marathon, and ESBWR Marathon are the same: a short cylindrical shape with a flange at the top and two circumferential grooves to accept the mechanical crimp of the capsule body tube. [[

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DCD Impact

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

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

NRC RAI 4.2-25

Capsule Length and no additional B_4C powder compaction or settling due to manufacturing.

Section 2.3 of NEDE-33244P describes Capsule Length. Therein a statement is made that, "It was shown that there was no additional B_4C powder compaction or settling due to manufacturing, handling or normal operating loads." The figure 3.7 radiograph indicates variable density within the capsules.

a) *Please explain the difference between the statement and the radiograph.*
b) *Please verify that increased B4C density at any sections of the tubes will not result in closure of the gap between capsule and tube.*
c) *Since the ESBWR capsule lengths are longer than those of reference 1, and shorter than those currently used, what is the relevance of the statements referring to the benefits of densification properties for longer rods?*
d) *Please explain how mechanical testing of 36" capsules is applicable to ESBWR capsules, which are a different length.*
e) *Please completely describe the mechanical testing of capsules, and the rationale for applying mechanical tests of longer length capsules to the ESBWR capsule design. Include a description of which, if any, ASTM standards or other acceptable test standards were followed. If none were followed, please provide an explanation of why not and the adequacy of the procedures which were employed.*

GEH Response

a) The magnified neutron radiograph shown in Figure 3-9 of NEDE-33244P shows insignificant edge effects near the top of the absorber column within the boron carbide capsules. This does not represent a significant settling due to manufacturing, handling or normal operating loads.

b) Any differences in swelling due to small, local variations in density within the boron carbide are bounded by the use of a +3σ upper bound swelling rate, as discussed in Section 3.6.1 of NEDE-33244P Rev. 1.

[[

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d,e) [[

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To date, mechanical testing of the Marathon-5S/ESBWR Marathon capsule crimp has been performed for BWR/2-6 capsule lengths and scram impact speeds. Testing using ESBWR Marathon capsule lengths and scram impact speeds is planned. All capsule mechanical testing is performed in accordance with the NRC approved GEH quality program: NEDO-11209-04A Rev. 8. A formal test plan and procedure is developed and followed, which includes certification of test personnel, calibration of all instruments with traceability to NIST standards, and verification of results.

DCD Impact

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

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

NRC RAI 4.2-26

ESBWR Marathon Control Rod surveillance program

Section 5 of NEDE-33244P presents the ESBWR surveillance program. Please update the surveillance program to include more rigorous inspection and notification and to address operating experiences.

GEH Response

An update of the status of the Marathon surveillance program has been submitted to NRC via MFN 08-355. This letter updates the inspection history with recently completed inspections, contains a listing of planned inspections, and summarizes root cause analyses and 10CFR Part 21 evaluations. In MFN 08-355, GEH commits to providing updates of the surveillance program on an annual basis, at minimum.

DCD Impact

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

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

NRC RAI 4.2-27

Marathon-5S Control Rod Assembly is an improvement of the marathon, and that potential problems with the marathon are eliminated by the 5S design.

GEH has submitted a topical report, NEDE-33284P, Marathon-5S Control Rod Assembly, to the staff. Throughout that document there are statements that the new design of the marathon 5S is an improvement of the marathon, and that potential problems with the marathon are eliminated by the 5S design. Please explain why each of the suggested 5S design changes is not necessary for those ESBWR specifications which do no vary from the marathon.

GEH Response

The primary improvement in mechanical design margin made for the Marathon-5S design is [[

]].

The following are the design differences between the ESBWR Marathon (NEDE-33244P Rev. 1) and the Marathon-5S (NEDE-33284P Rev. 1) designs.

1. Absorber Section Length: As discussed in Section 2.1 of NEDE-33244P Rev. 1, the absorber section is shorter ([[ ]]) for the ESBWR design.
2. Capsule Length: As discussed in Section 2.3 of NEDE-33244P Rev. 1, the length of the capsules is reduced, proportional to the reduction in absorber section length ([[ ]]).
3. Connector Instead of Velocity Limiter: As discussed in Section 2.4 of NEDE-33244P Rev. 1, the ESBWR control rod uses a connector, rather than a velocity limiter, to be compatible with the Fine Motion Control Rod Drive.
4. Outer Absorber Tube Geometry: The ESBWR Marathon control rod employs the square absorber tube, shown in Figure 3-5 of NEDE-33244P Rev. 1. The Marathon-5S control rod employs the simplified absorber tube, shown in Figure 2-1 of NEDE-33284P Rev. 1. [[

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DCD Impact

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

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

Enclosure 3

MFN 08-474

Response to Portion of NRC Request for

Additional Information Letter No. 167

Related to NEDE-33244P, Revision 1, "ESBWR Marathon Control Rod Mechanical Design Report"

RAI Numbers 4.2-21 through 4.2-27

Affidavit

GE Hitachi Nuclear Energy

AFFIDAVIT

I, Larry J. Tucker, on behalf of **David H. Hinds,** state as follows:

(1) I am General Manager, New Units Engineering, GE Hitachi Nuclear Energy ("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's letter, MFN 08-474, Mr. James C. Kinsey to U.S. Nuclear Energy Commission, entitled "*Response to Portion of NRC Request for Additional Information Letter No. 167 – Related to NEDE-33244P, Revision 1, "ESBWR Marathon Control Rod Mechanical Design Report," – RAI Numbers 4.2-21 through 4.2-27,*" dated June 13, 2008. The proprietary information in enclosure 1, which is entitled "*MFN 08-474 – Response to Portion of NRC Request for Additional Information Letter No. 167 – Related To NEDE-33244P, Revision 1, "ESBWR Marathon Control Rod Mechanical Design Report – RAI Numbers 4.2-21 through 4.2-27 – 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.

(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 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, 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 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 contains details of GEH's evaluation methodology.

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 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 June 13th day of June 2008.

Larry J. Tucker

for David H. Hinds
GE Hitachi Nuclear Energy