GE-Hitachi Nuclear Energy Americas LLC

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

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MFN 07-071, Supplement 1

Docket No. 52-010

September 14, 2007

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. 69 Related to ESBWR Design Certification Application – Minimum Critical Power Ratio – RAI Number 15.0-16S01**

Enclosure 1 contains GE-Hitachi Nuclear Energy Americas (GEH) response to the subject NRC RAI transmitted via Reference 1.

Enclosure 1 contains GNF proprietary information as defined by 10 CFR 2.390. GNF 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 GNF. 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 regarding the information provided here, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Project Manager, ESBWR Licensing

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MRO

Reference:

1. MFN 06-381 – Letter from US Nuclear Regulatory Commission (NRC) to David H. Hinds, *Request for Additional Information Letter No. 69 Related to ESBWR Design Certification Application,* dated October 11, 2006

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 69 Related to ESBWR Design Certification Application – Minimum Critical Power Ratio, RAI Number 15.0-16S01 – GNF Proprietary Information
2. Response to Portion of NRC Request for Additional Information Letter No. 69 Related to ESBWR Design Certification Application – Minimum Critical Power Ratio, RAI Number 15.0-16S01 – Non-Proprietary Version
3. Affidavit – Jens G. M. Andersen – September 14. 2007

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GEH /San Jose (with enclosures)
RE Brown GEH /Wilmington (with enclosures)
eDRF 0071-6070

Enclosure 2

MFN 07-071, Supplement 1

Response to Portion of NRC Request for Additional Information Letter No. 69 Related to ESBWR Design Certification Application

Minimum Critical Power Ratio

RAI Number 15.0-16S01

Non-Proprietary Version

NRC RAI 15.0-16S01:

The staff reviewed the RAI 15.0-16 response and found the response unacceptable. It is our position that the SLMCPR numerical value should be kept as a safety limit in the TS as in the BWR STS. Our position is based on the following:

(1) Allowing the removal of the SLMCPR eliminates regulatory control of core analysis issues and eliminates a mechanism for the staff to apply conditions that might be needed in some situations to ensure safety. The NRC previously considered and rejected the same request (i.e., removal of the SLMCPR from the TS) from BWROG and Exelon (ML043140475 and ML030520480).

(2) Use of TRACG for calculating the OLMCPR is not an appropriate basis for removing the SLMCPR from the TS. In its response, GE referred to the ESBWR TRACG methodology used for the ESBWR OLMCPR calculation. GE states that this process allows for the direct calculation of the number of rods subject to boiling transition (NRSBT) for a transient. Since the SLMCPR is not used to calculate the OLMCPR, it is appropriate not to include the SLMCPR as assurance that the SAFDLs are met in TS. The staff disagrees. The staff does not find use of the TRACG methodology to calculate OLMCPR to be an appropriate basis for excluding the SLMCPR from the TS. The NRC has approved the TRACG methodology for calculating OLMCPR in the past for BWR/2-6s, and licensees who currently use the TRACG methodology for calculating OLMCPR are still required to have a SLMCPR TS.

(3) 10 CFR 50.36c (1)(i)A specifically states, "Safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity." The staff has interpreted this section as requiring that the values of the safety limits must remain in a licensee's technical specifications. Revised TS section 2.1.1.2 (Rev. 3) proposes to replace the MCPR safety limit values with a description of what the safety limit protects against, i.e., "Greater than 99.9% of the fuel rods in the core would be expected to avoid boiling transition." The proposed description is a fuel condition and is not an acceptance criterion. The staff does not believe that the proposed change is consistent with the staff's interpretation of section 50.36c(1)(i)A since it is not a safety limit, but a criterion.

GEH Response:

Background:

The GETAB methodology (NEDE-10958-PA "General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application" dated January 1977), which determines both a Safety Limit Minimum Critical Power Ratio (SLMCPR) and an Operating Limit Minimum Critical Power Ratio (OLMCPR), has historically been used for BWR/2-6 and ABWR reactor designs. The TRACG methodology (NEDE-32906P-A dated September 2006), which only determines an OLMCPR, and thus eliminates the SLMCPR concept, is used for the ESBWR reactor design. Both the GETAB and TRACG methodologies are based on the same Fuel Cladding Integrity Safety Limit (FCISL) design basis: "transients caused by single operator error or equipment malfunction shall be limited such that considering uncertainties in monitoring the core operating state, more than 99.9% of the fuel rods would be expected to avoid boiling transition," as stated in Section 5 of the GETAB Safety Evaluation (SE); and "such that less than 0.1 percent of the fuel rods are expected to experience a boiling transition for the most severe AOO," as stated in Section 3 of the TRACG Anticipated Operational Occurrences (AOO) SE.

Section 4 of the GETAB SE discusses the application of this design basis as a two step process. These two steps consist of first calculating the Minimum Critical Power Ratio (MCPR) (i.e., referred to as the SLMCPR) for which less than 0.1% of the rods are expected to experience boiling transition, and second calculating the change in CPR resulting from AOOs. The steady-state operating limit (i.e., OLMCPR) is then determined as the sum of the largest change in CPR due to any of the AOOs considered and the SLMCPR. Since the calculation of the SLMCPR does not include the AOO MCPR impact, it is considered a lower bound on the steady-state MCPR and is used only along with the low probability of an AOO occurring to protect the fuel cladding when the MCPR is not within its Limiting Conditions for Operation (LCO) specification.

Since the TRACG methodology includes the AOO MCPR impact explicitly in a single step process , it eliminates the separation technique used by the GETAB methodology. As such, for TRACG analyses, the SLMCPR concept and terminology disappeared and only an OLMCPR is established. Hence, the TRACG methodology directly establishes an OLMCPR such that less than 0.1 percent of the fuel rods are expected to experience boiling transition, but does not establish a lower bound on the steady-state MCPR.

GEH Response to each Staff Position:

(1) The removal of this Reactor Core Safety Limit from the Technical Specification (TS) was not requested. Instead, the request made was to replace the GETAB SLMCPR terminology with the TRACG FCISL terminology. Hence, this Reactor Core Safety Limit would remain in the TS for the ESBWR. As such, the request made was not the same as the BWROG or Exelon request, which involved relocation of the SLMCPR from the TS into the Core Operating Limits Report (COLR).

10 CFR 50.36 b) states "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34..." The FCISL is the TRACG analysis and evaluation basis for protection of the fuel cladding; therefore, GEH determined that the FCISL should be used in the TS. Furthermore, regulatory control of core analysis issues is assured by the provisions of 10CFR 50.59(c)(2)(viii), which requires NRC approval of a License amendment for changes that "Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses."

(2) BWR/2-6s TRACG applications still requires a SLMCPR in the TS because not all AOOs for these plants are analyzed using the TRACG methodology. Therefore, the GETAB SLMCPR is still required for these applications to support the non-TRACG AOO analyses. For the ESBWR, all AOO events are analyzed using the TRACG methodology. Therefore, a SLMCPR was not determined for the ESBWR.

(3) MCPR generally can not be measured by the plant during or at the end of an AOO event. Hence the SLMCPR/FCISL definition or terminology (i.e. description, criterion, process variable, fuel condition, etc.) is immaterial, since immediately after the AOO the plant usually can only show compliance to a definition or terminology of the SLMCPR/FCISL by confirming the MCPR was within the LCO OLMCPR at the start of the AOO. NUREG-1434, "Standard Technical Specifications General Electric Plants, BWR/6," Bases Section B 2.1.1 recognizes this fact by the statement: "The Reactor Protection System setpoints (LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"), in combination with other LCOs, are designed to prevent any anticipated combination of transient conditions for Reactor Coolant System water level, pressure, and THERMAL POWER level that would result in reaching the MCPR limit." Therefore, LCOs have historically been used to protect the fuel cladding during an AOO and not the SLMCPR. GEH believed using the FCISL terminology for the ESBWR in the TS versus the SLMCPR terminology was not a technical change but would be more consistent with the actual situation.

GEH Position:

Although using the ESBWR TRACG FCISL Reactor Core Safety Limit terminology ensures protection of the fuel cladding for AOOs, it is recognized that a separate lower bound on the steady-state MCPR (i.e., SLMCPR) protects the fuel cladding when the MCPR is not within its LCO specification. A potential violation of the Reactor Core Safety Limit would only occur if the newly defined ESBWR SLMCPR is violated during steady-state operations, or if an AOO occurs when the MCPR is not within its LCO specification. For both of these situations, the process variable MCPR could be used. GEH proposes the following revised response to the original RAI 15.0-16 response (as documented in MFN 07-071 dated February 12, 2007).

GEH Revised Response to the RAI 15.0-16:

GEH proposes that an ESBWR SLMCPR be included in the TS as determined by the following methodology.

The ODYN methodology (NEDO-24154-A Volumes 1 and 2 dated August 1986, NEDE-24154-P-A Volume 3 dated August 1988 and NEDC-24154P-A Supplement 1 - Volume 4 dated February 2000 "Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors") has the following relationship between the SLMCPR and the OLMCPR:

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Based on this SLMCPR methodology, the following changes listed below will be made to the ESBWR documentation. The following process is used to describe these changes. Each document to be changed is underlined. The description of the change is in Italic font, and the change itself is in regular font.

ESBWR DCD Tier 2 Chapter 16 "Technical Specifications" Rev. 5:

The wording of section 2.1.1.2 will be revised as follows:

2.1.1.2 With the reactor steam dome pressure ≥ { } MPaG ({ } psig) and core flow ≥ { }% rated core flow:

Greater than 99.9% of the fuel rods in the core avoid boiling transition, and

All MCPRs shall be greater than or equal to [ ] during steady-state operation.

ESBWR DCD Tier 2 Chapter 16B "Bases" Rev. 5:

The following changes will be made to the APPLICABLE SAFETY ANALYSES in section B 2.1.1:

The following sentence will be added at the end of the first paragraph:

The Safety Limit MCPR (SLMCPR) is a lower bound on the steady-state MCPR that ensures greater than 99.9% of the fuel rods in the core would be expected to avoid boiling transition.

The section title of 2.1.1.2 will be changed to:

2.1.1.2 FCISL and SLMCPR

The following paragraph will be added at the end of section 2.1.1.2:

The Safety Limit MCPR (SLMCPR) is a lower bound on the steady-state MCPR. Details of the SLMCPR calculation process are given in Reference 5.

The following changes will be made to section B 3.3.2.1:

The phrase "the Fuel Cladding Integrity Safety Limit (FCISL)" *will be replaced with* "the Safety Limit MCPR (SLMCPR)" *in the second sentence of the second paragraph of the BACKGROUND section.*

The word "FCISL" *will be replaced with* "SLMCPR" *in the first sentence of the first paragraph of the APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY section.*

ESBWR DCD Tier 2 Chapter 4 "Reactor" Rev. 5:

The following definition will be added:

SLMCPR Safety Limit Minimum Critical Power Ratio

The following sections will be added:

4.4.1.1.3 MCPR Safety Limit Bases

A plant-unique MCPR safety limit (SLMCPR) is established to provide adequate assurance that 99.9% of the total fuel rods are expected to avoid boiling transition during steady-state operation. The SLMCPR is a lower operating bound on the steady-state MCPR. This operating requirement is obtained by removing the delta CPR effect of the most limiting AOO from the OLMCPR.

4.4.2.1.4 MCPR Safety Limit Calculation Method

The MCPR Safety Limit is calculated in accordance with Section 5.14 of Reference 4.4-12.

4.4.3.1.4 MCPR Safety Limit Evaluation

The ESBWR representative MCPR safety limit is in Section 6 of Reference 4.4-12.

The first sentence of section 4.4.1.7 will be replaced with the following sentence:

The steady-state operating limits (except for the SLMCPR) have been established to ensure that the design bases are satisfied for the most severe AOO discussed in Section 15.2.

Licensing Topical Report (LTR) NEDC-33237P Rev. 2, GE14E for ESBWR Critical Power Correlation Uncertainty and OLMCPR Development:

The following section will be added:

5.14 ESBWR SAFETY LIMIT MCPR EVALUATION METHODOLOGY

The GETAB methodology (Reference 1) has the following relationship between the SLMCPR and the OLMCPR:

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The following changes to Section 6.0 will be made:

The title will be changed to "REPRESENTATIVE OPERATING LIMIT AND SAFETY LIMIT MCPR".

The following paragraph will be added at the end of the section:

The SLMCPR is calculated in accordance with Section 5.14 and presented in Table 6-1. The SLMCPR is not used in any of the ESBWR analysis and is only used in the

Technical Specifications as a lower bound on the steady-state MCPR. The representative SLMCPR is calculated based on using [[ ]] for the OLMCPR,

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]]. The SLMCPR will be calculated on a cycle–specific basis for each reload.

The title of Table 6-1 will be changed to "Representative OLMCPR and SLMCPR Results" *and the following new row will be added:*

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DCD and LTR Impact:

The proposed changes to the Technical Specifications (DCD Tier 2 Chapter 16) will be made in Revision 5. The proposed changes to LTR NEDC-33237P Rev. 2, GE14E for ESBWR Critical Power Correlation Uncertainty and OLMCPR Development will be made by January 31, 2008.

Enclosure 3

MFN 07-071, Supplement 1

Affidavit for GNF Proprietary Information for the NRC

Executed by Jens G. M. Andersen, September 14, 2007

Global Nuclear Fuel – Americas
AFFIDAVIT

I, Jens G. M. Andersen, state as follows:

(1) I am Consulting Engineer, Thermal Hydraulic Methods, Global Nuclear Fuel – Americas, L.L.C. ("GNF-A"), 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 MFN 07-071, Supplement 1, James C. Kinsey to Document Control Desk (USNRC), *Response to Portion of NRC Request for Additional Information Letter No. 69 Related to ESBWR Design Certification Application, Minimum Critical Power Ratio, RAI Number 15.0-16S01,* dated September 14, 2007. The proprietary information in Enclosure 1, *Response to Portion of NRC Request for Additional Information Letter No. 69 Related to ESBWR Design Certification Application, Minimum Critical Power Ratio, RAI Number 15.0-16S01,* is identified by [[dotted underline inside double square brackets{3}]]. Figures and other large 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, GNF-A 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 GNF-A's competitors without license from GNF-A 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 GNF-A customer-funded development plans and programs, resulting in potential products to GNF-A;

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 GNF-A, 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 GNF-A, 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 GNF-A. Access to such documents within GNF-A 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 GNF-A 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) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GNF-A'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 GNF-A.

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.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A 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 GNF-A 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 GNF-A 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 14th day of September 2007.

Jens G. M. Andersen
Consulting Engineer, Thermal Hydraulic Methods
Global Nuclear Fuel – Americas, L.L.C.