

ATTACHMENT 2

**General Electric Hitachi Nuclear Energy Responses to
NRC RAIs for PBAPS SRV/SV Setpoint Tolerance Increase
(Non-Proprietary Version)**

ENCLOSURE 2

7491-318366-HE0-1

Responses to PBAPS SRXB RAIs 1-4

Non-Proprietary Information- Class I (Public)

NON-PROPRIETARY NOTICE

This is a non-proprietary version of Enclosure 1 of 7491-318366-HE0-1 which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[]].

Overpressure Analysis

With regard to vessel overpressure analysis, the NRC's acceptance criteria are based on (1) draft General Design Criteria (GDC) 9, insofar as it requires that the reactor coolant pressure boundary (RCPB) be designed and constructed so as to have an exceedingly low probability of gross rupture or significant leakage throughout its design lifetime; and (2) final GDC-31, insofar as it requires that the RCPB be designed with sufficient margin to assure that it behaves in a non-brittle manner and that the probability of rapidly propagating fracture is minimized.

The safety evaluation (SE) approving NEDC-31753P, "BWROG In-Service Pressure Relief Technical Specification Revision Licensing Topical Report," requires that the entire operating domain ("plant specific alternate operating modes") be considered in the assessment of the acceptability of the proposed SRV/SV setpoint tolerance increase (reference Attachment 1, Page 4 of the application). The overpressure analysis described in NEDO-33533, "Peach Bottom Atomic Power Station Units 2 and 3 Safety Valve Setpoint Tolerance Increase Safety Analysis Report," considers the increased core flow (ICF) statepoint (reference Attachment 4, Page 2-1 of the application).

At the other full-power extent of the power-flow operating domain, the Maximum Extended Load Line Limit (MELLL) statepoint, which is characterized by significantly reduced recirculation flow, the steady-state initial void fraction could be higher at the fully licensed thermal power level, resulting in a greater void collapse and a higher pre-scrum flux spike. The flux spike could result in the delivery of greater energy to the coolant, causing a faster pressurization and more severe result.

SRXB RAI-1

Please provide information to address the selection of the ICF statepoint for the analysis of this event, relative to the MELLL statepoint, to confirm that the ICF initial conditions result in a more limiting overpressure transient.

Response

While the increased core flow (ICF) initial condition often results in the limiting overpressure transient, it is not uncommon for the low core flow (Maximum Extended Load Line Limit Analysis (MELLLA)) initial condition to be comparable or even limiting due to the dynamic thermal-hydraulic and nuclear effects observed during the overpressure transient response. [[

]] However, the complexity of

the interactions between the physical transient response parameters is the reason for considering the entire flow operating domain.

The overpressure transient analyses performed to support NEDC-33533P Revision 1 included the main steamline isolation valve closure flux scram (MSIVF) event initiated at both ICF and MELLLA conditions. The analysis was based on PBAPS Unit 3 Cycle 18 with SRV/safety valve (SV) opening setpoints 3% above the nominal lift setpoint and one SRV out-of-service. The results presented in NEDC-33533P Revision 1 are the more limiting of the ICF and MELLLA cases. The MSIVF results including both ICF and MELLLA initial conditions are provided below.

Flow Domain	Event	Peak Dome Pressure (psig)	Peak Vessel Pressure (psig)
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The entire flow operating domain has been considered in NEDC-33533P Revision 1 vessel overpressure conclusions.

Thermal Limits Assessment

Condition/Limitation 1 of the SE approving NEDC-31753P requires that licensees provide transient analyses, using NRC-approved methods, of anticipated operational occurrences (AOOs) as described in NEDC-31753P utilizing a $\pm 3\%$ setpoint tolerance for the safety mode of the SRVs/SVs (reference Attachment 1, Page 3 of the application). Condition/Limitation 3 of the SE approving NEDC-31753P requires that licensees assure that analyses supporting the requested setpoint tolerance increase reflect the TS operability requirements (reference Attachment 1, Page 3 of the application). Condition/Limitation 5 of the SE approving NEDC-31753P requires that the entire operating domain (“plant specific alternate operating modes”) be considered in the assessment of the acceptability of the proposed SRV/SV setpoint tolerance increase (reference Attachment 1, Page 4 of the application).

With regard to the thermal limits assessment, NRC’s acceptance criteria are based on final GDC-10, insofar as it requires that the reactor core be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of AOOs.

The plant-specific thermal limits assessment in Chapter 3 of NEDO-33533, which is based on the limiting results from the PBAPS Unit 3, Cycle 18 Supplemental Reload Licensing Report, does not reflect the requested TS operability requirements, nor does it adequately address operation within the entire operating domain. The analysis discussed assumes that all SRVs are in service. Attachment 4, Page 3-1 of the application states, in part, that:

Changing the SRV setpoint tolerance and/or the number of SRVs out-of-service could only effect the protection of the MCPR [minimum critical power ratio] safety limit if it worsened the reactor pressure increase before the peak surface heat flux and the minimum MCPR occur.

The NRC staff does not agree, based on the limited information provided, that the analyses demonstrate that PBAPS operation with one SRV out-of-service and an increased lift setpoint is acceptable. For one reason, in the case of the fast transients, the nuclear flux, void reactivity, reactor vessel water level, and steam flow are expected to oscillate with periods of 1-2 seconds immediately following the initiating event, and the system pressure may continue increasing (potentially causing additional void collapse) for a short period of time following the actuation of the SRVs. These trends would all suggest that the transient may not be returning to a stable condition at the time the present analysis indicates that maximum heat flux has been achieved. Second, the information presented does not characterize the limited transients presented in the context of the entire suite of analyses performed, including the extent of the licensed operating domain and the equipment operability options permitted for PBAPS, including various scram speeds. Therefore, while the licensee may have provided a limited assessment based on previously analyzed limiting events, the licensee has not demonstrated that these events would be reasonably unaffected by the requested setpoint tolerance increase and valve operability requirements, nor has the licensee demonstrated that other, non-limiting events would become limiting with the SRV/SV changes explicitly analyzed.

SRXB RAI-2

Please provide additional information to justify the thermal limits assessment, or alternatively, satisfy Conditions 1, 3, and 5 of the approving SE for NEDC-31753P directly by providing analyses that reflect the proposed TS operability requirements and SRV/SV setpoint tolerance.

The licensee presents results for a current Unit 3 PBAPS operating cycle (reference Attachment 4, Section 3.2 to the application), and states that the events are re-analyzed on a cycle-specific basis for both Units 2 and 3. The licensee's assessment is based on a present analysis that does not reflect the proposed SRV/SV operability requirements; however, Condition/Limitation 3 of the SE approving NEDC-31753P requires assurance that the analysis reflects the proposed TS operability requirements for SRVs and SVs.

Response

The assessment provided in NEDC-33533P Revision 1 was not intended to provide explicit transient thermal limits results; rather, it references the PBAPS Unit 3 Cycle 18 analyses performed with no safety relief valve (SRV) out-of-service and SRV/safety valve (SV) opening setpoints at +3% of the nominal setpoint and provides discussion on why pressurization event thermal response would not be further influenced by one SRV/SV out-of-service or SRV/SV opening setpoints at -3% of the nominal setpoint.

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]] This is consistent with the AOO evaluation provided in Section 4.3 of NEDC-31753P. One SRV/SV out-of-service would also not impact the thermal limits response based on the same reasoning, and was also not explicitly analyzed.

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A full suite of explicit analyses and results is not required to conclude that operation with one SRV/SV out-of-service and a $\pm 3\%$ SRV/SV setpoint tolerance is acceptable for transient thermal limits.

SRXB RAI-3

Please explain how this assurance will be provided on a cycle-specific basis for both Units 2 and 3.

Response

In accordance with NEDE-24011-P-A-19-US and Section A.2 of NEDC-31753P, the SRV/SV setpoint tolerance and out-of-service option applicable for each unit/cycle are incorporated into the reload licensing evaluations. The specific results are incorporated into the supplemental reload licensing report (SRLR) and subsequent core operating limits report (COLR) to support operation for that unit/cycle.

Anticipated Transients Without Scram (ATWS) Mitigation Analysis

Condition/Limitation 2 of the SE approving NEDC-31753P requires analysis of the design basis overpressure event using the increased tolerance limit for the SRV/SV setpoints to confirm that the vessel pressure does not exceed American Society of Mechanical Engineers (ASME) pressure vessel upset limits (reference Attachment 1, Page 3 of the application). Although an ATWS event is technically considered beyond the PBAPS design basis, ATWS mitigation must still ensure that the vessel pressure does not exceed ASME Service Level C limits under the conditions associated with the most severe ATWS event. For analytic purposes, Service Level C limits are commonly accepted as 120-percent of the vessel design pressure, or 1500 pounds per square inch (psig).

Condition/Limitation 5 of the SE approving NEDC-31753P requires that the entire operating domain ("plant specific alternate operating modes") be considered in the assessment of the acceptability of the proposed SRV/SV setpoint tolerance increase (reference Attachment 1, Page 4 of the application).

The ATWS mitigation analysis is discussed in Section 4 of NEDO-33533 (Attachment 4 to the application).

ATWS is defined as an AOO followed by the failure of the reactor portion of the protection system specified in draft GDCs 14 and 15. The regulation in 10 CFR 50.62 requires, in part, that:

- *each boiling water reactor (BWR) have an alternate rod injection (ARI) system that is designed to perform its function in a reliable manner and be independent (from the existing reactor trip system) from sensor output to the final actuation device.*
- *each BWR have a standby liquid control system (SLCS) with the capability of injecting into the reactor vessel a boric acid solution with reactivity control at least equivalent to the control obtained by injecting 86 gallons per minute (gpm) of a 13 weight-percent sodium pentaborate decahydrate solution at the natural boron-10 isotope abundance into a 251-inch inside diameter reactor vessel. The system initiation must be automatic.*
- *each BWR have equipment to trip the reactor coolant recirculation pumps automatically under conditions indicative of an ATWS.*

The NRC staff observed that, while the ASME overpressure AOO analysis considered initial conditions in the ICF extent of the operating domain, this analysis conversely considered conditions at the MELLL boundary. It is not clear how these two initiating events, which should have similar transients, would each be more limiting at a different initial statepoint.

SRXB RAI-4

Please provide additional information to confirm that the licensee appropriately considered ATWS mitigation throughout the entire operating domain, as Condition/Limitation 5 of the SE approving NEDC-31753P would require.

Response

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ATTACHMENT 3

Affidavit

ENCLOSURE 3

7491-318366-HE0-1

GEH Affidavit for Enclosure 1

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, **Linda C. Dolan**, state as follows:

- (1) I am the Manager of Regulatory Compliance, of GE-Hitachi Nuclear Energy Americas LLC (“GEH”), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.
- (2) The information sought to be withheld is contained in Enclosure 1 of GEH letter, 7491-318366-HE0-1, “GEH RAI Support SRV/SV Setpoint Tolerance Change,” dated October 31, 2013. The GEH proprietary information in Enclosure 1, which is entitled “Responses to PBAPS SRXB RAIs 1-4,” is identified by a dotted underline inside double square brackets. [[This sentence is an example.^{3}]] 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 U.S.C. Sec. 552(b)(4), and the *Trade Secrets Act*, 18 U.S.C. Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F.2d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2d 1280 (D.C. Cir. 1983).
- (4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:
 - a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;
 - b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
 - c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;
 - d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.
- (5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my

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knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in the following paragraphs (6) and (7).

- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited to a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary or confidentiality agreements.
- (8) The information identified in paragraph (2), above, is classified as proprietary because it contains the detailed GEH methodology for pressure-temperature curve analysis for the GEH Boiling Water Reactor (BWR). These methods, techniques, and data along with their application to the design, modification, and analyses associated with the SRV/SV setpoint tolerance were achieved at a significant cost to GEH.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience databases that constitute 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

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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 31st day of October 2013.



Linda C. Dolan
Manager, Regulatory Compliance
GE-Hitachi Nuclear Energy Americas LLC
3901 Castle Hayne Rd.
Wilmington, NC 28401
Linda.Dolan@ge.com