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U.S. Nuclear Regulatory Commission

Document Control Desk

Washington, D.C. 20555-0001

Subject: NRC Safety Evaluation for GE Hitachi Nuclear Energy (GEH) Licensing Topical Report NEDC-33006P, "Maximum Extended Load Line Limit Analysis Plus"

By References 1 and 2, the NRC issued the final Safety Evaluation (SE) for the GEH Licensing Topical Report (LTR) NEDC-33006P, "Maximum Extended Load Limit Line Analysis Plus" (MELLLA+). GEH published the -A (accepted) version of the subject LTR by Reference 3.

GEH has applied the SE's Limitations and Conditions to subsequent MELLLA+ analyses performed for plant-specific applications. GEH has recently identified a statement in Section 13.0, Conclusions, of the SE that appears to impose a limitation that was not stated in Section 12.0, Limitations and Conditions. The following is the statement in question:

> "Based on the NRC staff review of the LTR, the information provided in the RAI responses, the insights from the NRC staff confirmatory analyses, and given the limitations and conditions of this SE, the NRC staff finds LTR NEDC-33006P acceptable for BWR plants <u>with GE/GNF fuel designs through GE14</u>, analyzed with GE methodologies."

Revision 0 and Revision 1 of the MELLLA+ LTR, as originally submitted (References 4 and 5), included generic evaluations seeking to limit the required scope of analysis for Anticipated Operational Occurrences (AOOs), as well as for the ASME Overpressure event. During the course of the NRC review, this approach was rejected by the NRC and in Revision 2 of the LTR (Reference 6), GEH defined these analyses as plant-specific evaluations. In addition, a generic evaluation for the Anticipated Transient Without Scram (ATWS) event with Core Instability was included in Revisions 0, 1 and 2. However, Limitation 12.19 of the final SE requires that a plant-specific ATWS Instability analysis be provided with plant-specific MELLLA+ submittals until such time that the NRC approves a generic solution for ATWS instability calculations for MELLLA+ operation. Therefore, the resulting approved LTR (Reference 3) does not contain

generic analyses that eliminate or reduce plant-specific work scope and the approved process is not fuel type dependent. Fuel-dependent analyses, consistent with the scope described in the approved LTR, supporting MELLLA+ license amendments referencing NEDC-33006P-A are performed on a plant-specific basis.

GEH found no other discussion or direct statements in the MELLLA+ SE that suggest an exclusive limitation to GE14 and earlier fuel designs. Thus, the effective GE14 limitation "GE/GNF fuel designs through GE14," in SE Section 13.0, Conclusions, is not consistent with the final disposition of the fuel-dependent tasks or the balance of the SE. For clarity in future plant-specific license amendment requests that may reference NEDC-33006P-A, GEH requests that the NRC review the SE for NEDC-33006P and, subject to your concurrence with our assessment, provide a revised or supplemental SE to correct this inconsistency.

There is a certain urgency associated with this request in that GEH is working on several plant-specific MELLLA+ submittals that will be based on the GNF2 fuel product line. The most near-term submittal will be approximately mid-year 2012.

As we are implementing the SE for plant-specific applications, GEH has identified certain other items that may be considered as potential changes. Enclosure 1 contains GEH suggestions for several other potential changes for consideration and discussion. These items may be accomplished at the same time as the above clarification, or separately, as these are not of the same timing urgency.

By way of reference, from the methods viewpoint, NEDC-33173P, Supplement 3, "Applicability of GE Methods to Expanded Operating Domains – Supplement for GNF2 Fuel," was approved by the NRC Staff on December 28, 2010 (Reference 7).

If you have any questions, please contact me or Ed Schrull at 910-819-5744.

Sincerely,

James F. Harrison
Vice President, Fuel Licensing
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Project No. 710

Enclosure:

1. Potential Clarifications to NEDC-33006P-A and Associated NRC Safety Evaluation - Non-Proprietary Information - Class I (Public)

References:

1. NRC letter, H. Hieh (NRC) to R. Brown (GEH), "Final Safety Evaluation for GE-Hitachi Nuclear Energy Americas, LLC (GHNE) Topical Report (TR) NEDC-33006P, 'Maximum Extended Load Line Limit Analysis Plus' (TAC No. MB6157)," MFN-07-517, September 17, 2007.
2. NRC letter, T. Blount (NRC) to R. Brown (GEH), "Correction of Final Safety Evaluation for General Electric (GE)-Hitachi Nuclear Energy Americas, LLC (GEH) Licensing Topical Report (LTR) NEDC-33006P, 'Maximum Extended Load Line Limit Analysis Plus'," MFN-08-837, October 15, 2008.
3. GEH Letter, J. Harrison (GEH) to Document Control Desk (NRC), "Accepted Version of GE Licensing Topical Report NEDC-33006P-A, Revision 3 (TAC No. MD0277)," MFN 09-362, June 19, 2009.
4. GE Letter, J. Klapproth (GE) to Document Control Desk (NRC), "Submittal of GE Proprietary Licensing Topical Report NEDC-33006P, 'General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus,' January 2002," MFN 02-003, January 15, 2002.
5. GE Letter, G. Stramback (GE) to Document Control Desk (NRC), "Submittal of GE Proprietary Licensing Topical Report NEDC-33006P, 'General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus,' August 2002," Revision 1, MFN 02-050, August 23, 2002.
6. GE Letter, L. Quintana (GE) to Document Control Desk (NRC), "GE Licensing Topical Report NEDC-33006P, Revision 2, 'Maximum Extended Load Line Limit Analysis Plus,' (TAC No. MB6157)," MFN 05-141, November 28, 2005.
7. NRC Letter, J. Jolicoeur (NRC) to J. Head (GEH), "Final Safety Evaluation for GE Hitachi Nuclear Energy Americas Topical Report NEDC-33173P, Supplement 3, 'Applicability of GE Methods to Expanded Operating Domains - Supplement for GNF2 Fuel' (TAC No. ME1815)," MFN 11-171, December 28, 2010.
8. GE Hitachi Nuclear Energy, "Licensing Topical Report General Electric Boiling Water Reactor Detect and Suppress Solution - Confirmation Density," NEDC-33075P-A, Revision 6, January 2008.

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ENCLOSURE 1

MFN 11-163

Potential Clarifications to NEDC-33006P-A
and
Associated NRC Safety Evaluation

Non-Proprietary Information – Class I (Public)

There are additional aspects of the MELLLA+ LTR and the SE, unrelated to the discussion in the cover letter, which may be corrected.

(1) Item 1 in Section 2.4.1.1 of the MELLLA+ SE contains the following statement which is incorrect:

> "DSS-CD does not require an amplitude setpoint to trigger scram actuation if the period-based detection algorithm (PBDA) identifies an instability event. With DSS-CD implemented, the reactor will trip automatically if a coherent oscillation of any amplitude (e.g., only 1 percent) is identified."

This statement was true for the early versions of the DSS-CD LTR, but an amplitude discriminator was added to the design in Revision 4 of the DSS-CD LTR. Therefore, Revision 5 of the DSS-CD LTR, which is the basis for NRC approval (Reference 8), included an amplitude discriminator component. Suggested wording:

> The DSS-CD includes an amplitude discriminator component in addition to the period-based algorithm (PBA) component to identify instability events that require a reactor scram. This prevents low amplitude coherent oscillations related to plant-specific noise from causing spurious reactor scrams.

(2) After the discussion of features in Section 2.4.1.1, the following statement is made:

> "Figure 2-4 of this SE illustrates the operation of the main DSS-CD algorithm (CDA) and the defense-in-depth algorithms (PBDA, GRA, and ABA). The defense-in-depth algorithm would only be required in case the CDA algorithm failed for an unforeseen reason. They are armed when the oscillation amplitude reaches either 10 percent (PBDA and GRA) or 30 percent (ABA)."

This statement is generally unnecessary in the MELLLA+ SE because the defense-in-depth algorithms and their associated setpoints are discussed in the DSS-CD LTR. Further, the specificity of the setpoint definition is misleading as the defense-in-depth algorithms are not part of the licensing basis and may require modification depending on plant-specific conditions. Suggested wording:

> Figure 2-4 of this SE illustrates the operation of the main DSS-CD algorithm (CDA) and the defense-in-depth algorithms (PBDA, GRA, and ABA). The defense-in-depth algorithms and setpoints are discussed in the DSS-CD LTR.

(3) The Stability section of the MELLLA+ LTR (Section 2.4) makes the following statements:

> "The DSS-CD solution uses the Confirmation Density Algorithm to detect the inception of power oscillations and generate a power suppression trip signal prior to significant oscillation amplitude growth and MCPR degradation. The DSS-CD LTR provides a generic basis, including the DSS-CD setpoints, for BWR/3-6 product lines, GE14 and earlier GE fuel designs, and operating domains including EPU and MELLLA+.
>
> ……

> The trip-enabled region is termed the Armed Region. In the DSS-CD LTR, the Armed Region boundaries are specified to conservatively envelope power and flow conditions potentially susceptible to power oscillation. The trip function is enabled below a specified core flow and above a specified core power. The DSS-CD LTR generically specifies the Armed Region for MELLLA+ operation below 75% rated core flow and above 25% OLTP. For power uprate, the setpoint in %CLTP is scaled to maintain the same power level in MWt."

In the first paragraph, the statements regarding DSS-CD are potentially misleading and overly specific. While DSS-CD provides a generic methodology, there are provisions for plant-specific setpoint adjustments. In addition, the DSS-CD LTR defines a process for extending the basis of the solution to other fuels designs. In the second paragraph, mentioning the specific arming setpoints is not necessary and creates a potential conflict with DSS-CD should the values be changed. GEH proposes to modify these paragraphs as follows:

> The DSS-CD solution uses the Confirmation Density Algorithm to detect the inception of power oscillations and generate a power suppression trip signal prior to significant oscillation amplitude growth and MCPR degradation. The DSS-CD LTR provides a stability solution for BWR/3-6 product lines and operating domains including EPU and MELLLA+.
>
> ……
>
> The trip-enabled region is termed the Armed Region. In the DSS-CD LTR, the Armed Region boundaries are specified to conservatively envelope power and flow conditions potentially susceptible to power oscillation. The trip function is enabled below a specified core flow and above a specified core power. The DSS-CD LTR generically specifies the Armed Region for MELLLA+ operation below a specific rated core flow and above a specific OLTP value. For power uprate, the setpoint in %CLTP is scaled to maintain the same power level in MWt.

(4) The NRC Staff evaluation of Appendix B RAI 16 in the MELLLA+ SE, makes the following statement:

> "In the interim, the NRC staff reviews the bounding control rod patterns used on plant-specific bases."

This appears to be an extraneous statement not having a basis from the RAI 16 response nor being reflected in the Limitations and Conditions (Section 12.0) of the SE. Reasonably limiting rod patterns are used to set up the cases used to analyze the SLMCPR at various power-core flow statepoints and times in the cycle. These calculations are performed for each cycle-specific SLMCPR determination. GEH suggests that the subject sentence be deleted.