



Brian R. Moore, Ph.D.
Global Nuclear Fuel – Americas, LLC
General Manager, Core & Fuel Engineering
P.O. Box 780, M/C A55
Wilmington, NC 28401 USA

T 910 232-2115
Brian.Moore@ge.com

M190043

February 28, 2019

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

Subject: Draft Safety Evaluation for Proposed Amendment 46 to NEDE-24011-P-A-26, “General Electric Standard Application for Reactor Fuel (GESTAR II) to Provide Clarity and Formality to the Standby Liquid Control System (SLCS) Shutdown Margin Analysis” (EPID L-2018-TOP-0007)

In Reference 1, the NRC provided a draft Safety Evaluation (SE) for the proposed GESTAR II Amendment 46 and requested that Global Nuclear Fuel - Americas LLC (GNF) identify any information that it considers proprietary and provide comments on factual errors or clarity concerns. GNF did not identify any proprietary information in the draft SE. Enclosure 1 to this letter provides comments on factual errors and clarity concerns.

If you have any questions, please contact me or Lisa Schichlein at 910-819-4815.

Sincerely,

A handwritten signature in black ink, appearing to read "B. R. Moore", is written over a light blue horizontal line.

Brian R. Moore
General Manager, Core & Fuel Engineering
Global Nuclear Fuel – Americas, LLC

Docket No. 99901376
Project No. 712

Reference:

1. Letter from Dennis C. Morey (NRC) to Michelle P. Catts (GEH), Subject: Draft Safety Evaluation for Proposed Amendment 46 to NEDE-24011-P-A-26, “General Electric Standard Application for Reactor Fuel (GESTAR II) to Provide Clarity and Formality to the Standby Liquid Control System (SLCS) Shutdown Margin Analysis” (EPID L-2018-TOP-0007), February 14, 2019.

Enclosure:

1. Comment Summary Table and Draft SE Markup – Non-Proprietary Information

cc: J Golla, US NRC
MP Catts, GEH/Wilmington
LK Schichlein, GEH/Wilmington
PLM Specification 005N2132 Revision 0

ENCLOSURE 1

M190043

Comment Summary Table and Draft SE Markup

Non-Proprietary Information

**Comment Summary for Draft Safety Evaluation for
Proposed Amendment 46 to NEDE-24011-P-A-26,
“General Electric Standard Application for Reactor Fuel (GESTAR II)”**

Note: Page numbers shown in this table reflect the page numbers in this enclosure.

Location	Comment
Section 1.0 Introduction and Background	Page 3: Correct the title of Section 5. GEH suggests the following change (Line 18): “...Section 5, Standby Liquid Control System <u>Shutdown</u> Capability...” <i>Suggested change shown in the markup.</i>
Section 3.1 Introduction	Page 3: Correct the GESTAR II document designator. GEH suggests the following change (Line 32): “... NED <u>NEDE</u> -24011-P-A-26,...” <i>Suggested change shown in the markup.</i>
Section 3.2 Amendment 46 to GESTAR II	Page 4: For clarity of meaning, revise the sentence to focus on when the SLCS shutdown margin would be a minimum value. GEH suggests the following change (Lines 12-13): “The RHR startup occurs at a state when the SLCS shutdown margin is at a minimum value <u>at the state when the RHR startup occurs</u> since the borated water has a positive moderator temperature coefficient.” <i>Suggested change shown in the markup.</i>
Section 3.2 Amendment 46 to GESTAR II	Page 4: Correct the following typographical errors: GEH suggests the following changes Line 20: “...determined form <u>from</u> benchmarks...” Line 27: “...tolerance level multipliers combined...” <i>Suggested changes shown in the markup.</i>
Section 3.2 Amendment 46 to GESTAR II	Page 4: To be more precise, revise the sentence. GEH suggests the following change (Line 25): “For <u>analysis</u> temperatures less than...” <i>Suggested change shown in the markup.</i>

Location	Comment
Section 5.0 References	<p>Page 5: Correct the revision of GESTAR. GEH suggests the following change (Line 4): “NEDE-24011-P-A-24<ins>26</ins>...” <i>Suggested change shown in the markup.</i></p>

OFFICE OF NUCLEAR REACTOR REGULATION

SAFETY EVALUATION FOR AMENDMENT 46 TO GLOBAL NUCLEAR FUEL – AMERICAS

TOPICAL REPORT NEDE-24011-P-A-26,

GENERAL ELECTRIC STANDARD APPLICATION FOR REACTOR FUEL

(EPID: L-2018-TOP-0007)

1.0 INTRODUCTION AND BACKGROUND

By letter dated February 9, 2018, Global Nuclear Fuel – Americas, LLC (GNF) submitted Amendment 46 (Agencywide Documents and Access Management System No. ML18040A183) (Ref. 1) to Topical Report (TR) NEDE-24011-P-A-26, “General Electric Standard Application for Reactor Fuel (GESTAR II)” to the U.S. Nuclear Regulatory Commission staff for review (Ref. 2).

In Amendment 46, GNF requests to amend GESTAR II to provide clarity and formality to the Standby Liquid Control System (SLCS) shutdown margin analysis without changing the methodology for SLCS shutdown margin calculation. Appendix A of GESTAR II, Standard Supplemental Reload Licensing Report and Fuel Bundle Information Report Template, Section 5, Standby Liquid Control System [Shutdown](#) Capability is proposed to be revised to use a variable designation for the plant specific analysis temperatures instead of specific values.

The draft safety evaluation (SE) for the Amendment 46 follows.

2.0 REGULATORY EVALUATION

Not Applicable in this case

3.0 TECHNICAL EVALUATION

3.1 Introduction

Amendment 46 to GESTAR II consists of modification and clarification of Section 3.2.4.3 of ~~NED~~NEDE-24011-P-A-26, SLCS shutdown margin analysis. The SLCS provides an alternative means of reactor shutdown by injecting soluble boron into the reactor core moderator. SLCS is designed to provide the capability of bringing the reactor, at any time in a cycle, to a subcritical condition with the reactor in the most reactive xenon-free state with all of the control rods in the full-out condition. The requirements of the SLCS are dependent primarily on the reactor power level and on the reactivity effects of voids and temperature between full power and cold, xenon-free condition. Amendment 46 provides detailed clarification and formality to the SLCS shutdown margin analysis.

Enclosure

3.2 Amendment 46 to GESTAR II

The SLCS shutdown margin, which is the difference between the cold critical eigenvalue and the eigenvalue predicted for the borated conditions using the boiling water reactor simulator code, is calculated based on the limiting reactivity carryover from the expected previous cycle shutdown.

The SLCS analysis is performed for the specific cycle and fuel type using borated fuel libraries at a temperature corresponding to the most reactive condition for the cycle. The most reactive condition is when the shutdown cooling mode of the residual heat removal (RHR) system is initiated, which results in a substantial dilution of the boron concentration (BC) due to the inclusion of the RHR system volume. The ~~RHR startup occurs at a state when the~~ SLCS shutdown margin is at a minimum value at the state when the RHR startup occurs since the borated water has a positive moderator temperature coefficient. The evaluated BC is the technical specification's BC which is adjusted for changes in water density between its reference temperature and the analysis temperature.

The minimum SLCS shutdown margin requirement includes biases and uncertainties associated with the calculation that includes: (1) bias and uncertainty associated with the calculation of a cold, un-borated core determined ~~form~~ from benchmarks of the BWR core simulator code against cold critical plant startup data, and (2) bias and uncertainty associated with the calculation of the worth of boron as determined from benchmarks of the lattice physics code against higher order computational methods benchmarked against critical experiments.

For analysis temperatures less than the most reactive condition, in order to account for the temperature effect, an additional reactivity bias is included. The uncertainties are one-sided 95/95 tolerance level multipliers combined with biases to establish the SLCS shutdown margin requirement needed to assure subcriticality.

The SLCS shutdown margin requirement depends on the fuel type. The most conservative requirement is applied when a core consists of multiple fuel design types.

The shutdown capability of the SLCS is given in the final safety analysis report or in the supplemental reload licensing report (SRLR). The SRLR template as modified is revised to use a variable designation for plant specific analysis temperatures instead of specific values.

4.0 CONCLUSION

The staff reviewed the documents related to the GESTAR II Amendment 46 regarding the SLCS shutdown margin analysis and found Amendment 46 acceptable. The request for Amendment 46 to GESTAR II is hereby approved for use by the licensees.

5.0 REFERENCES

1. Letter, M180032 from Brian Moore (GNF- A) to US NRC, Proposed Amendment 46 to NEDE-24011-P-A-~~24~~26, General Electric Standard Application for Reactor Fuel (GESTAR II) to Provide Clarity and Formality to the Standby Liquid Control System (SLCS) Shutdown Margin Analysis,” Global Nuclear Fuel, February 9, 2018.
2. NEDE-24011-P-A-26, General Electric Standard Application for Reactor Fuel (GESTAR II), Global Nuclear Fuel, January 2018.

Principal Contributor: Mathew M. Panicker

Date: