



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 14, 2019

Ms. Michelle P. Catts
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas, LLC
P.O. Box 780, M/C A-10
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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)

Dear Ms. Catts:

By letter dated February 9, 2018 (Agencywide Documents Access and Management System Accession No. ML18040A183), Global Nuclear Fuel – Americas, LLC (GNF) submitted 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," to the U.S. Nuclear Regulatory Commission (NRC) staff for review. Enclosed for GEH review and comment is a copy of the NRC staff's draft safety evaluation (SE) for the proposed supplement.

Twenty working days are provided for you to comment on any factual errors or clarity concerns contained in the draft SE. The final SE will be issued after making any necessary changes. The NRC staff's disposition of your comments on the draft SE will be discussed in the final SE.

To facilitate the NRC staff's review of your comments, please provide a marked-up copy of the draft SE showing proposed changes and provide a summary table of the proposed changes.

If you have any questions, please contact Joseph Golla at 301-415-1002.

Sincerely,

/RA/

Dennis C. Morey, Chief
Licensing Processes Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Docket No. 99901376

Enclosure: Draft SE

cc w/ encl.:

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ANALYSIS (EPID L-2018-TOP-0007) DATE: FEBRUARY 14, 2019

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***concurrence via e-mail**

NRR-043

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NAME	JGolla	DHarrison	RLukes	DMorey
DATE	2/7/2019	2/5/2019	2/13/2019	2/14/2019

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1 OFFICE OF NUCLEAR REACTOR REGULATION

2 SAFETY EVALUATION FOR AMENDMENT 46 TO GLOBAL NUCLEAR FUEL – AMERICAS

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

4 GENERAL ELECTRIC STANDARD APPLICATION FOR REACTOR FUEL

5 (EPID: L-2018-TOP-0007)

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7 **1.0 INTRODUCTION AND BACKGROUND**

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9 By letter dated February 9, 2018, Global Nuclear Fuel – Americas, LLC (GNF) submitted
10 Amendment 46 (Agencywide Documents and Access Management System No. ML18040A183)
11 (Ref. 1) to Topical Report (TR) NEDE-24011-P-A-26, “General Electric Standard Application for
12 Reactor Fuel (GESTAR II)” to the U.S. Nuclear Regulatory Commission staff for review (Ref. 2).
13

14 In Amendment 46, GNF requests to amend GESTAR II to provide clarity and formality to the
15 Standby Liquid Control System (SLCS) shutdown margin analysis without changing the
16 methodology for SLCS shutdown margin calculation. Appendix A of GESTAR II, Standard
17 Supplemental Reload Licensing Report and Fuel Bundle Information Report Template,
18 Section 5, Standby Liquid Control System Capability is proposed to be revised to use a variable
19 designation for the plant specific analysis temperatures instead of specific values.
20

21 The draft safety evaluation (SE) for the Amendment 46 follows.
22

23 **2.0 REGULATORY EVALUATION**

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25 Not Applicable in this case
26

27 **3.0 TECHNICAL EVALUATION**

28
29 3.1 Introduction
30

31 Amendment 46 to GESTAR II consists of modification and clarification of Section 3.2.4.3 of
32 NEDO-24011-P-A-26, SLCS shutdown margin analysis. The SLCS provides an alternative
33 means of reactor shutdown by injecting soluble boron into the reactor core moderator. SLCS is
34 designed to provide the capability of bringing the reactor, at any time in a cycle, to a subcritical
35 condition with the reactor in the most reactive xenon-free state with all of the control rods in the
36 full-out condition. The requirements of the SLCS are dependent primarily on the reactor power
37 level and on the reactivity effects of voids and temperature between full power and cold,
38 xenon-free condition. Amendment 46 provides detailed clarification and formality to the SLCS
39 shutdown margin analysis.
40

41
42 Enclosure
43

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 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 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 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, 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: