April 23, 2015

Mr. Jerald G. Head
Senior Vice President, Regulatory Affairs
GE-Hitachi Nuclear Energy Americas, LLC
P.O. Box 780, M/C A-18
Wilmington, NC 28401-0780

SUBJECT: FINAL SAFETY EVALUATION FOR AMENDMENT 41 TO GLOBAL NUCLEAR FUEL – AMERICAS TOPICAL REPORT NEDE-24011-P-A, GENERAL ELECTRIC STANDARD APPLICATION FOR REACTOR FUEL (GESTAR II) (TAC NO. MF4784)

Dear Mr. Head:

By letter dated August 8, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14220A385), Global Nuclear Fuel – Americas (GNF) submitted Amendment 41 to Topical Report (TR) NEDE-24011-P-A, Amendment 41 to GESTAR II Incorporating the GEH Simplified Stability Solution (GS3) in the GESTAR II US Supplement, to the U.S. Nuclear Regulatory Commission (NRC) staff for review.

The NRC staff has found that Amendment 41 to GESTAR II is acceptable for referencing in licensing applications for General Electric-designed boiling water reactors to the extent specified in the enclosed final safety evaluation (SE). The final SE defines the basis for acceptance of the TR.

Our acceptance applies only to material provided in the subject TR. We do not intend to repeat our review of the applicable material described in the TR. When the TR appears as a reference in license applications, our review will ensure that the material presented applies to the specific plant involved. License amendment requests that deviate from this TR will be subject to a plant-specific review in accordance with applicable review standards.

The accepted versions shall incorporate this letter and the enclosed final SE after the title page. Also, they must contain historical review information, including NRC requests for additional information and your responses. The accepted versions shall include a “-A” (designating accepted) following the TR identification symbol.

If future changes to the NRC's regulatory requirements affect the acceptability of this TR, GNF and/or licensees referencing it will be expected to revise the TR appropriately, or justify its continued applicability for subsequent referencing.

Sincerely,

/RA/

Mirela Gavrilas, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 710

Enclosure:
Final Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION FOR AMENDMENT 41

TO GLOBAL NUCLEAR FUEL – AMERICAS LLC

TOPICAL REPORT NEDE-24011-P-A-20-US, GENERAL ELECTRIC STANDARD

APPLICATION (GESTAR II) FOR REACTOR FUEL (GESTAR II)

(TAC NO. MF4784)

1.0 INTRODUCTION AND BACKGROUND

By letter dated August 8, 2014, Global Nuclear Fuel – Americas, LLC (GNF) submitted Amendment 41 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14220A385) to Topical Report (TR) NEDE-24011-P-A-20, General Electric Standard Application for Reactor Fuel (GESTAR II, U. S. Supplement) to the U.S. Nuclear Regulatory Commission (NRC) staff for review (Reference 1).

In Amendment 41, GNF requests to incorporate the accepted (-A) version of GEH Simplified Stability Solution (GS3) TR (Reference 2) into the GESTAR II U.S. Supplement, Section S.4, *Stability Analysis Methods*. Also, GNF requests to add the reference to the approved TR to Section S.6, *References* of the GESTAR II U.S. Supplement.

GNF proposes to add short summary statements consistent with the level of detail in Section S.4 of the GESTAR II document consistent with the approved version of the TR (Reference 1).

2.0 EVALUATION

Section S.4 of Reference 2 describes several types of stability analyses that are performed to ensure plant-specific implementation of NRC-approved long term stability solutions.

2.1 GNF Requests

One of the proposed changes is to extend the core and channel decay ratio calculations that are performed in order to ensure that the fuel is as stable as previously licensed General Electric (GE)/GNF fuel designs. This extension of the fuel type included all licensed GNF fuel in addition to GE fuel designs.

GNF requested to add the following paragraph to Section S.4 regarding the GEH Simplified GS3 methodology (Reference 3):

a. ***The GEH Simplified Stability Solution (GS3) methodology (Reference S-111) is applicable to plants implementing Option I-D, Option II, or Option III stability solutions. The GS3 methodology can replace the TRACG DIVOM methodology described in References S-85, S-102, and S-103. GS3 is a methodology improvement rather than a new Long Term Solution. For Option III plants, GS3 uses the existing detection algorithm, the Period Based Detection Algorithm (PBDA), which reliably detects the inception of power oscillations and generates a power suppression trip signal prior to***

exceeding the SLMCPR [safety limit minimum critical power ratio]. For Option I-D and Option II plants, GS3 uses the Average Power Range Monitor (APRM) and flow-biased scram line, which reliably detects the power oscillations and generates a power suppression trip signal prior to exceeding the SLMCPR. The GS3 methodology does not affect the Backup Stability Protection or Exclusion Region determination for the Option I-D, Option II, or Option III stability solutions.

GNF proposed to add in Section S.4 of Reference 3 the following paragraph:

> ***b. The GS3 is a TRACG Best-Estimate Plus Uncertainty (BEPU) stability methodology. The plant and cycle-specific application of GS3 is defined in the approved TR, Reference S-111.***

GNF proposes to add the following paragraph in Section S.4.1.2 *Option II* regarding the use of GS3 methodology (Reference 3) in the Option II stability solution to confirm safety limit minimum critical power ratio (SLMCPR) protection by using the APRM setpoints:

> ***c. The Option II stability solution may use the GS3 methodology as described in Reference S-111 to confirm safety limit MCPR protection by using the APRM setpoints. The cycle specific confirmation checklist described in Reference S-111 is documented in the supplemental reload licensing report.***

GNF proposes to add the following paragraph to Section S.4.1.3 *Option I-D* to state that the Option I-D stability solution may also use the GS3 methodology described in Reference 3 and to confirm SLMCPR protection by using the APRM setpoints:

> ***d. The Option I-D stability solution may use the GS3 methodology as described in Reference S-111 to confirm safety limit MCPR protection by using the APRM setpoints. The cycle-specific confirmation checklist described in Reference S-111 is documented in the supplemental reload licensing report.***

GNF proposes to add the following paragraph to Section S.4.1.4 *Option III* to specify that the Option III stability solution may use the GS3 methodology described in Reference 3 to determine the OPRM setpoint to confirm the SLMCPR protection:

> ***e. The Option III stability solution may use the GS3 methodology as described in Reference S-111 to determine the OPRM setpoint that confirms the safety limit MCPR protection. The cycle-specific confirmation checklist described in Reference S-111 is documented in the supplemental reload licensing report.***

GNF requests addition of the accepted version (-A version) of GEH topical report, NEDE-33766P, *GEH Simplified Stability Solution,* to Section S.6, *References* of GESTAR II document as Reference Number 111:

> ***S-111 GEH Simplified Stability Solution (GS3), NEDE-33766P-A, Revision 1, [March 2015]***

2.2 Evaluation of the Requests

The NRC staff has evaluated the changes and additions that are proposed by GNF with respect to the use of the NRC-approved GS3 methodology in support of various stability solutions listed in Section 2.1 of the safety evaluation (SE).

Reference 3 and its SE has indicated the that GS3 does not require any hardware and/or software changes for plants already implementing Option I-D, Option II, Option III stability solutions. Also, for Option III plants, GS3 uses the existing detection algorithm, the PBDA, which reliably detects the inception of power oscillations and generates a power suppression trip signal prior to exceeding the SLMCPR. The TR also confirms that the implementation of GS3 methodology does not change any aspect of the already implemented backup stability protection solutions. This verifies the GNF request (a) of Section 2.1 of the SE.

The TR and its SE confirms that GS3 is BEPU that uses the TRACG BEPU code and simulates oscillation detection and suppression. Therefore, the NRC staff determined that the insertion (b) above to the GESTAR II document is justified.

GNF has confirmed the SLMCPR protection based on anticipated instability events are selected and simulated by TRACG to quantify their effect on the margin to SLMCPR. The Option II and I-D stability solution use the GS3 methodology to confirm SLMCPR protection by using the APRM setpoints. Therefore, the NRC staff approves the items (c) and (d) above to be inserted into the GESTAR II document, as requested by GNF.

GNF has indicated that for Option III plants, GS3 uses the existing detection algorithm (PBDA) which reliably detects the inception of power oscillations and generates a power suppression trip signal prior to exceeding the SLMCPR. Option III reliance on PBDA monitors oscillation amplitude and the OPRM setpoints ensure that the SLMCPR is not exceeded by the presence of growing power oscillations resulting from anticipated instability events. Therefore, the NRC staff approves the item (e) listed above to be inserted in the GESTAR II document, as requested by GNF.

The NRC staff approves the addition of the approved version of the TR NEDE-33766P to the list of references in Section S.6 of the GESTAR II document.

The NRC staff has reviewed the request from GNF and finds the additions listed in Section 2.1 of the SE to the GESTAR II document acceptable.

3.0 CONCLUSION

Based on the review and evaluation of GNF request for Amendment 41 to GESTAR II, the NRC staff finds that the proposed Amendment 41 to NEDE-24011-P-A-20 which includes the additions and a reference listed in Section 2.1 are acceptable.

4.0 REFERENCES

1. Letter, MFN 14-051, from Brian Moore (GNF) to U.S. Nuclear Regulatory Commission, "Amendment 41 to GESTAR II Incorporating the GEH Simplified Stability Solution (GS3) in the GESTAR II U.S. Supplement," Global Nuclear Fuel, August 8, 2014.
2. NEDE-24011-P-A-20, General Electric Standard Application for Reactor Fuel (GESTAR II, U.S. Supplement), Global Nuclear Fuel.
3. NEDE-33766P-A, Revision 0, "GEH Simplified Stability Solution (GS3), GE-Hitachi Nuclear Energy, March 2015.

Principal Contributor: M. Panicker

Date: April 23, 2015