



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

June 26, 2018

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

FROM: Joseph A. Golla, Project Manager */RA/*
Licensing Processes Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

SUBJECT: AUDIT PLAN FOR GENERAL ELECTRIC-HITACHI NUCLEAR
ENERGY NEDC-33173P SUPPLEMENT 5 – APPLICABILITY OF
GE METHODS TO EXPANDED OPERATING DOMAINS –
SUPPLEMENT FOR GNF3 FUEL

By letter dated June 8, 2018, General Electric (GE)-Hitachi (GEH) submitted NEDC-33173P Supplement 5 – Applicability of GE Methods to Expanded Operating Domains – Supplement for GNF3 Fuel for U.S. Nuclear Regulatory Commission (NRC) staff review (Agencywide Documents Access and Management System Accession No. ML17159A680.) The NRC staff technical review of this supplement is ongoing. In order to facilitate the review the staff performed a regulatory audit at the Global Nuclear Fuel facility located near Wilmington, North Carolina. The staff's audit plan is enclosed.

Project No. 710
Docket No. 99902024

Enclosure:
As stated

CONTACT: Benjamin T. Parks, NRR/DSS
(301) 415-0979

SUBJECT: AUDIT PLAN FOR GENERAL ELECTRIC-HITACHI NUCLEAR ENERGY
 NEDC-33173P SUPPLEMENT 5 – APPLICABILITY OF GE METHODS TO
 EXPANDED OPERATING DOMAINS – SUPPLEMENT FOR GNF3 FUEL
 DATED JUNE 26, 2018

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DATE	06/25/2018	06/19/2018	06/26/2018	06/26/2018

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REGULATORY AUDIT PLAN

NRC STAFF REVIEW OF SUPPLEMENT 5 TO NEDC-33173P

SUPPLEMENT FOR GNF3 FUEL

1.0 BACKGROUND

By letter dated June 8, 2017, General Electric (GE)-Hitachi Nuclear Energy (GEH) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Supplement 5, "Supplement for GNF3 Fuel," to Topical Report (TR) NEDC-33173P-A, Revision 4, "Applicability of GE Methods to Expanded Operating Domains."

The NRC staff technical review of the supplement is ongoing.

2.0 REGULATORY AUDIT BASES

The bases for the regulatory audit are contained in the following documents, as discussed below.

- Revision 4 to the Interim Methods Licensing Topical Report (IMLTR, another name for NEDC-33173P-A) contains a limitation specifying that the IMTLR is approved for fuel designs up to and including GE14, but that applicability to new fuel designs must be established by submittal of a supplement demonstrating such applicability to new fuel designs. This limitation establishes the requirement for the NRC staff to review IMLTR applicability for the GNF3 fuel design, prior to its use in reactors operating with expanded operating domains such as Maximum Extended Load Line Limit Analysis Plus (MELLLA+) or extended power uprate (EPU).
- Supplement 3, "Supplement for GNF2 Fuel," to the IMLTR, along with corresponding Appendix K to the NRC staff approving safety evaluation (SE), provide similar information concerning vendor qualification efforts and documentation, and NRC staff review approaches, for a new fuel supplement.
- Chapter 4, "Reactor," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR-Edition," specifically, Sections 4.2, "Fuel System Design," 4.3, "Nuclear Design," and 4.4, "Thermal and Hydraulic Design." These guidance documents indicate the applicable regulatory requirements that are under consideration for the NRC staff review of IMLTR applicability to the GNF3 fuel design.

3.0 REGULATORY AUDIT SCOPE/OBJECTIVES

The NRC staff regulatory audit scope will focus on the data and calculations supporting the material provided in Supplement 5 to NEDC-33173P. GEH should be prepared to support discussions and provide documents related to the following topics. The objective of the audit is to identify additional information needed to reach regulatory conclusions, and to facilitate the development of a formal request for additional information and draft SE.

3.1. SPECIFIC TOPICS

3.1.1. TGBLA06 and MCNP Code-to-Code Comparisons

While the GNF2 supplement was supported by traversing in-core probe (TIP) data obtained from a full reload of GNF2 fuel in an EPU plant, the only TIP data supporting GNF3 applicability appear to be associated with lead use assemblies. This increases the importance of the code-to-code comparisons that were provided to support GNF3 applicability. The NRC staff will spend a portion of its time auditing specific lattices that were analyzed using TGBLA06 to determine whether, and to what extent, those lattice designs reflect characteristics of fuel that would be used in expanded operating domain plants.

Figures 2-1 through 2-5 provide results of the code-to-code comparisons. Additional review of the supporting data is required to verify that the conclusions offered in the TR supplement (e.g., currently used uncertainty parameters remain appropriate for GNF3) are supported by the code-to-code comparisons. In some cases, greater spread appears in the GNF3 data than appears for GNF2 and GE14. Specific examples include fission density benchmarks at 65 MWD/STU (Figure 2-2), and low moderator density reactivity benchmarks at 65 MWD/STU (Figure 2-4). While it is not expected that the trending align exactly among the fuel designs, the audit team will seek to confirm that the GNF3-specific trending supports the uncertainty parameters currently in use.

3.1.2. PANAC11 and MCNP Code-to-Code Comparisons

The audit team will review similar information concerning the PANAC11 and MCNP code-to-code comparisons that are discussed in IMLTR Supplement 5, to that described in Section 3.1.1 of this audit plan. The team will determine whether, and the extent to which, the miniature core problems reflect EPU/MELLLA+ operating conditions. Noting that the GNF2 applicability review also considered 4-bundle TIP data with heterogeneous fuel composition (i.e., varying ratios of GE14 to GNF2 content), the team will consider information demonstrating that the selection of homogeneous miniature cores provides a sufficient confirmation of methods applicability to GNF3 fuel, especially considering batch-level transitions in operating plants from GNF2 to GNF3 fuel designs. In addition, the audit team will attempt to identify additional information that could be used to support the assertion that the bundle-specific comparisons illustrated in Figure 2-6 adequately address power distribution uncertainties, as would TIP data and bundle gamma scans, as discussed on Page 2-9 of the IMLTR supplement.

3.1.3. Lead Use Assembly TIP Data

The audit team will review available data supporting the discussion, on Page 2-8 of IMLTR Supplement 5, concerning trending of lead use assembly TIP data at a BWR/5 and BWR/6 plant.

3.1.4. Thermal-Hydraulics

The team will audit the data supporting Figures 2-7, 2-8, and 2-9 of IMLTR Supplement 5 to develop a better understanding how the specific code-to-code comparisons and experimental data support the adequacy of GEH thermal-hydraulic methods to model GNF3 fuel in expanded operating domains, and to verify that the data support the conclusions presented in Supplement 5 to the IMLTR.

3.2. AUDIT OBJECTIVES

The NRC staff will be performing the audit as a means to facilitate developing a request for additional information and draft safety evaluation. It is expected that the team will identify the material considered during the audit that is essential to reaching regulatory conclusions with respect to IMLTR applicability to GNF3 fuel designs. These efforts are expected to lead to a more efficient completion of NRC staff review efforts.

Given the above objective, it is expected that the audit team will spend a majority of its time independently reviewing data and documentation furnished by GEH, and drafting its own review documentation. Thus, GEH should not expect to support extensive, formal presentations with large groups of personnel, but should be prepared to make relevant personnel available for periodic discussions as needed.

4.0 TEAM ASSIGNMENTS

The audit lead will be Benjamin Parks in the Nuclear Performance and Code Review Branch, Division of Safety Systems, Office of Nuclear Reactor Regulation.

The audit team will include the following additional staff from the Nuclear Performance and Code Review Branch:

- Kevin Heller
- Phillip Sahd, attending for training purposes

5.0 LOGISTICS AND SCHEDULE

The audit will take place at GEH facilities in Wilmington, North Carolina. The schedule will be as follows:

Monday, June 18, 2018

8:00 – 8:15 am	NRC staff arrival and badging
8:15 – 9:00 am	Introductions, entrance briefing, and safety messages
9:00 – 11:00 am	Introductory presentation from GEH (optional, length determined by GEH)
11:00 – 4:30 pm	Staff audit
4:30 – 5:00 pm	Daily exit briefing

Tuesday and Wednesday, June 19 and 20, 2018

8:00 – 8:15 am	Daily entrance briefing
8:15 – 4:30 pm	Staff audit
4:30 – 5:00 pm	Daily exit briefing

Thursday, June 21, 2018

8:00 – 11:15 am	Staff audit
11:15 – 12:00 noon	Exit briefing

The audit team requests that GEH provide a conference room or similar accommodation that allows the NRC staff to perform its audit, including conducting brief meetings and other discussions with GEH personnel, as appropriate. The audit team also requests that GEH make available, either in print copies, or in another suitable medium, the applicable design records and calculation files that contain the data identified above.