ENCLOSURE 1

MFN 10-223

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Non-Proprietary Information

DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

AMENDMENT 33 TO TOPICAL REPORT NEDE-24011-P-A / NEDO-24011-A

"GENERAL ELECTRIC STANDARD APPLICATION FOR REACTOR FUEL (GESTAR II)"

GLOBAL NUCLEAR FUEL

PROJECT NO. 712

1.0 INTRODUCTION AND BACKGROUND

By letter dated March 5, 2010 (Reference 1), as supplemented by letter dated May 27, 2010 (Reference 2), Global Nuclear Fuel (GNF) submitted Amendment 33 to topical report (TR) NEDE-24011-P, "General Electric Standard Application for Reactor Fuel (GESTAR II)." GESTAR II provides a fuel design and core reload process used extensively by licensees with GNF or GE Hitachi Nuclear Energy Americas (GEH) fuel designs. This U.S. Nuclear Regulatory Commission (NRC)-approved process allows GNF to modify fuel assembly designs without undergoing a formal NRC submittal and review. As part of this process, GNF provides written notification outlining the new design and acknowledging compliance with the requirements of GESTAR II. Upon notification, the NRC staff may conduct an audit of the engineering calculations supporting the new fuel design. Amendment 32 to GESTAR II (Reference 3) was necessitated by an NRC staff audit of the GNF2 fuel design GESTAR II Compliance Report (Reference 4). Amendment 33 resolves remaining NRC staff concerns from its review of Amendment 32, incorporates the recently approved PRIME fuel rod thermal-mechanical (T-M) methods (Reference 5), and removes a more restrictive exposure limit imposed by Amendment 32 and the corresponding NRC staff safety evaluation (SE) (Reference 6) for the GNF2 fuel design.

2.0 REGULATORY EVALUATION

TR NEDE-24011-P-A/NEDO-24011-A provides an approved fuel design and core reload process. The approved methodology and acceptance criteria detailed within TR NEDE-24011 are cited within many boiling water reactor (BWR) technical specifications as references in the core operating limits reports.

Regulatory guidance for the review of fuel rod cladding materials and fuel system designs and adherence to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, General Design Criteria (GDC)-10 "Reactor Design," GDC-27 "Combined Reactivity Control Systems Capability," and GDC-35 "Emergency Core Cooling" is provided in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), Section 4.2, "Fuel System Design" (Reference 7). In accordance with SRP Section 4.2, the objectives of the fuel system safety review are to provide assurance that:

- The fuel system is not damaged as a result of normal operation and anticipated operational occurrences (AOOs),

- Fuel system damage is never so severe as to prevent control rod insertion when it is required,

- The number of fuel rod failures is not underestimated for postulated accidents, and

- Coolability is always maintained.

GESTAR II provides a licensed reload methodology, including an NRC-approved fuel T-M design methodology utilized to demonstrate compliance with the fuel design criteria in SRP Section 4.2. The NRC staff reviewed Amendment 33 to GESTAR II to confirm that the fuel design criteria in SRP Section 4.2 will continue to be satisfied with the changes introduced by this amendment.

3.0 TECHNICAL EVALUATION

Building on the NRC staff's review of the Economic Simplified BWR (ESBWR) GE14E fuel design, evaluations of GEH notifications pursuant to 10 CFR Part 21 related to General Electric Stress and Thermal Analysis of Reactor Rods - Mechanical (GESTR-M) (References 8, 9, and 10), and the GNF2 GESTAR II Compliance Report (References 4 and 11), GESTAR II Amendment 32 (Reference 3) and the corresponding NRC staff SE (Reference 6) imposed an exposure limitation for the GNF2 fuel design. For completeness, this SE will repeat, and then build upon, several findings from the NRC staff's audit report (Reference 12) for the GNF2 GESTAR II Compliance Report and the corresponding sections of the NRC staff's SE for Amendment 32. Enclosure 1 of Reference 1 documents GNF's response to NRC staff concerns and limitations resulting from its audit of the GNF2 fuel design and its review of Amendment 32.

Audit Finding #1 (Reference 12):

> Based on limited lead use assembly (LUA) operating history and the lack of a post-irradiation examination (PIE) to validate in-reactor performance up to end-of-life (EOL) exposure, GEH has neither met the intent of the GESTAR-II LUA requirement, nor satisfied established regulatory practice.

Amendment 32 SE (Reference 6):

> In its response, GEH states that the LUA program for GNF2 "…is completely consistent with GESTAR II and with the long history of LUAs applied under GESTAR II." Further, GEH states that the "…evolutionary changes from an experience base of over 26,000 GE14 and GE12 bundles, not warranting more extensive LUA exposure or examinations." The NRC staff does not accept this position and expects further in-reactor experience and inspection prior to batch application.

GEH acknowledges that continued inspections at interim exposures are planned and will reveal any unanticipated behavior well before GNF2 reload bundles reach similar exposures. In addition, the exposure of GNF2 LUAs will always lead the reloads by a substantial margin.

Approval of the application of GESTAR II and use of GNF2 fuel for the [[ ]] is supported by the limited LUA operating experience documented in the compliance report and in Amendment 32. Extension [[ ]] requires further LUA operating experience and inspection along with NRC review and approval.

Amendment 33 SE:

In Enclosure 1 of Reference 1, GNF provided the details of additional LUA operating experience and inspections beyond that reported in Amendment 32. No indications of fretting wear or unusual corrosion were observed during these inspections while compiling this more extensive LUA inspection database. Based upon the additional LUA operating experience and inspection results, the NRC staff finds that GNF has met the requirements of GESTAR II and that the more restrictive GNF2-specific exposure limit may be removed.

<u>Audit Findings #2, #6, #7, #8, and #9 (Reference 12)</u>:

All findings are related to adequacy of GESTR-M methods above [[ ]] and GNF2 No Clad Liftoff (NCLO) rod internal pressure design calculations.

Amendment 32 SE (Reference 6):

In addition to the detailed information provided by GEH, the NRC staff has performed independent calculations using the FRAPCON-3 fuel thermal-mechanical model. The NRC staff's calculations are documented in Table 3 of the audit report (Reference [12]). The FRAPCON-3 calculations confirm that the GNF2 fuel rod design satisfies all thermal-mechanical design criteria except NCLO rod internal pressure criteria. Independent calculations reveal that the NCLO criteria (cladding creep outward, fuel pellet/cladding gap opening) are violated prior to the approved EOL [[ ]].

The FRAPCON-3 calculations confirm earlier concerns regarding the adequacy of GSTR-M at higher burnup. Specifically, GSTR-M calculations under predict UO_2 fuel temperature, which results in an under prediction of fission gas release and rod internal pressure. Hence, GSTR-M calculations do not predict clad liftoff (CLO) for the GNF2 fuel rod design.

In Item 2 of Table 1 (Reference 1), GNF states that GE11 fuel rods were licensed at [[ ]]. Based upon the concerns discussed above, this would bring into question the adequacy of the GSTR-M calculations for these higher power fuel rods. During a past audit, the NRC staff discussed the impact of the GSTR-M 10 CFR Part 21 concerns on the GE11/13 rod designs. Crediting the larger fuel rod plenum region of the GE11/13 (relative to the GE14 design), GEH provided sample rod internal pressure calculations, which demonstrate significant pressure margin to the NCLO criteria. GEH stated that millions of

GE11/13 rods have operated to design exposures with no indications of problems due to high internal rod pressure. This design is now being phased out in BWR/3-6 reactors, but is still being supplied to BWR/2 reactors. However, its application to BWR/2 reactors is limited to a peak linear heat generation rate [[ ]] due to the loss-of-coolant accident response characteristics for these reactors. The NRC staff accepts the disposition of this issue for GE11/13 fuel rods designs.

The NRC staff's independent calculations predict CLO of the GNF2 fuel rod design, but at an exposure [[ ]]. Based upon the GEH thermal-mechanical analyses and the NRC staff's independent calculations, the NRC staff finds the application of GSTR-M to GNF2 fuel acceptable up to a peak pellet exposure of [[ ]]. Extension [[ ]] requires further justification. This may involve using an approved PRIME methodology and/or a modified GNF2 fuel rod design. NRC review and approval is required to [[ ]].

Amendment 33 SE:

The incorporation of the approved PRIME methodology into GESTAR II and its application to GNF2 fuel designs addresses previous concerns with GESTR-M. In addition to other enhancements, the PRIME fuel thermal conductivity model has been benchmarked against an extensive database and accurately predicts thermal conductivity degradation with increasing fuel burnup.

As indicated above, from the NRC staff's SE for Amendment 32, independent NRC staff calculations with FRAPCON-3 confirmed that the GNF2 fuel rod designs satisfy all T-M design criteria except NCLO rod internal pressure criteria. The NRC staff repeated the limiting rod internal pressure cases (full length, UO_2 and [[ ]] Gadolinium rod designs) using the revised linear heat generation rate (LHGR) envelopes provided in Appendix B to the revised GNF2 GESTAR II Compliance Report (Enclosure 7 of Reference 1). Consistent with earlier audit calculations, the NRC staff deterministically applied worst case manufacturing tolerances (to maximize fuel temperature and fission gas release and minimize void volume) and applied a 10 percent rod power penalty in lieu of modeling uncertainties.

Examination of the revised GNF2 LHGR power envelopes revealed that the UO_2 rod power limit is [[ ]] at beginning of life. These changes appear to be prompted by differences between GESTR-M and PRIME fuel thermal conductivity models and the resulting calculations of fuel temperature and fission gas release. Independent NRC staff calculations confirmed that rod internal pressure remained below the critical value which would produce an outward creep of the cladding and re-open the clad-to-fuel pellet gap (i.e., cladding liftoff) at these new rod power envelopes. Unlike the earlier audit calculations, the calculated rod internal pressure is [[ ]]

The modifications to GESTAR II proposed in Amendment 33 include the addition of the recently approved PRIME fuel rod T-M methodology, along with the following implementation plan.

GEH Commitment to Transition from GESTR-M to PRIME (Reference 2):

> GNF will transition from the GESTR-M to the PRIME Thermal-Mechanical (T-M) methodology basis as quickly as practical. Beginning with the GNF2 fuel product line, the fuel T-M design will use the PRIME methodology. Fuel products preceding GE14 (e.g., GE11 and GE12), which are currently operating, may continue to use the GESTR-M basis. GNF is no longer loading these older fuel products, but some may remain in operating plants for several more cycles. GNF will implement the PRIME T-M basis for the GE14 fuel product line, including GE14 currently in operation, in the reload workscope for new fuel cycle designs initiated following the completion of the downstream codes implementation, which is anticipated in early 2011. The GE14 GESTAR II Compliance Report will be amended to include PRIME based T-M limits that include consideration of the revised design criteria in Amendment 33.

The NRC staff finds the inclusion of PRIME in GESTAR II and the transition plan described above acceptable. Based upon this migration to PRIME and independent calculations, the NRC staff finds that the more restrictive GNF2-specific exposure limit may be removed.

<u>Audit Finding #3 (Reference 12):</u>

> The GNF design continues to use the [[ ]] design criteria. While this approach is consistent with GESTAR II, it does not address issues identified by the NRC staff during the Economic Simplified BWR (ESBWR) review. Note that GEH plans to revise the fuel rod cladding strain design criteria for the ESBWR fuel design (GE14E). GEH needs to demonstrate, via empirical data, that GNF2 fuel rod cladding is capable of achieving the [[ ]] at EOL conditions or revisit the criterion.

Amendment 32 SE (Reference 6):

> This item is discussed in Supplement 2 of the Part 21 Notification (Reference [10]). GEH states that the exposure-dependent strain limits proposed for ESBWR are consistent with the analyzed strain criteria [[ ]]. The NRC staff agrees with this statement. However, the GNF2 Alloy X-750 grid [spacers] provide an additional source of hydrogen pickup for the fuel rod cladding which must be considered when setting the exposure-dependent breakpoint. Extension [[ ]] requires further justification for the exposure-dependent strain limits for GNF2 and NRC review and approval.

Amendment 33 SE:

Section 2.2.2.7 of GESTAR II Amendment 33 (Reference 1) originally indicated that the revised, hydrogen (burnup)-dependent cladding strain failure criteria and associated corrosion limits would apply to future fuel designs beginning with GNF2. Based on NRC staff concerns,

Amendment 33 was revised to indicate that these revised criteria and corrosion limits apply to all fuel designs (Reference 2). The basis for the revised hydrogen (burnup)-dependent cladding strain criteria and corrosion limits (detailed in Reference 13) was previously approved by the NRC staff as part of its review of the ESBWR GE14E fuel design.

Attachment 2 of Enclosure 1 ("Amendment 32 Safety Evaluation Follow-on Items and GNF Response") of the GESTAR II Amendment 33 submittal (Reference 1) provides results of visual inspections, pool-side corrosion measurements, and hot-cell examinations to support the application of the new corrosion limits to the GNF2 fuel design with its Alloy X-750 grid spacers. Section 3.2.10 of the revised GNF2 GESTAR II Compliance Report (NEDC-33270P, Revision 3 – Enclosure 7 of Reference 1) details the conformance of the GNF2 fuel rod designs to the revised cladding strain limits. The NRC staff completed independent FRAPCON-3 calculations as part of the original GNF2 compliance audit which confirmed the calculated cladding strain and mechanical overpower limits.

Based upon the corrosion data provided in Reference 1, the NRC staff finds the introduction of the previously approved revised cladding strain criteria and corrosion limits in GESTAR II and their application to the GNF2 fuel design acceptable. As such, the NRC staff finds that the more restrictive GNF2-specific exposure limit may be removed.

<u>Audit Finding #4 (Reference 12):</u>

> The GNF2 fuel rod design needs to include limits for cladding corrosion. While this approach is consistent with GESTAR-II, corrosion limits are required to ensure that key assumptions related to fuel performance analyses remain applicable. Specifically, an upper limit on local cladding oxidation (corresponding to oxide spallation) and an upper limit on local cladding hydrogen content (corresponding to the strain limit) need to be provided.

Amendment 32 SE (Reference 6):

> This item is being addressed for the GE14E fuel assembly design in the ESBWR design review. It is anticipated that a similar approach will be pursued for GNF2. Since cladding corrosion is expected to be low [[
>
>]]. Extension [[
>]] requires further justification, established corrosion limits, and NRC review and approval.

Amendment 33 SE:

This item was addressed above as part of audit finding #3.

<u>Audit Finding #5 (Reference 12):</u>

> The GNF2 design maintains an allowance for fuel centerline melting during local AOOs. While this approach is consistent with GESTAR II, little data is available to validate fuel

swelling models at melting conditions, especially for higher burnup fuel. In addition, little data is available to validate fuel performance models for future operation with fuel rods which have previously undergone melting. If GEH desires to maintain this approach, then validation of these models against measured data should be included in the ongoing PRIME review.

Amendment 32 SE (Reference 6):

In its response, GEH states that the GSTR-M application methodology is such that melting during local AOOs is precluded for any fuel design and that current reloads do not utilize the GESTAR II allowance for limited fuel melting. The NRC staff considers this issue resolved for GNF2 fuel.

Amendment 33 SE:

Section 2.2.2.5 of GESTAR II Amendment 33 (Reference 2) stipulates that fuel centerline temperature during normal operation and AOOs does not exceed melting temperature. Section 3.2.9 of the revised GNF2 GESTAR II Compliance Report (NEDC-33270P, Revision 3 – Enclosure 7 of Reference 1) details the conformance of the GNF2 fuel rod designs to this fuel centerline melting criteria. The NRC staff completed independent FRAPCON-3 calculations as part of the original GNF2 compliance audit which confirmed the calculated fuel temperature and thermal overpower limits.

The NRC staff finds the introduction of the revised fuel melting strain criteria in GESTAR II and their application to the GNF2 fuel design acceptable.

<u>Audit Finding #10 (Reference 12):</u> Open Items

Audit finding #10 referred to five open items concerning additional detail needed by the NRC staff to complete its review of the GNF2 fuel assembly design evaluations. Amendment 32 provided responses to the open items identified in the NRC staff's GNF2 audit. In Enclosure 1 of Reference 1, GNF provided additional information related to these open items.

The first open item requested information related to GNF2 channel design's susceptibility to shadow corrosion induced channel bow. This item was addressed in Amendment 32 and the NRC staff's corresponding SE. The NRC staff considers this item closed.

Amendment 32 SE (Reference 6):

In a second open item, the NRC staff requested information related to the effect of GNF2 design features on flow induced vibration. In its response, GEH stated that there were no known occurrences of grid to rod fretting failures in GNF BWR fuel designs over several decades of deployment. To date, inspections on GNF2 LUAs have shown no abnormal indications near grid locations. The NRC staff finds the application of GESTAR II and use of GNF2 fuel for the [[ ]] acceptable based on the limited LUA operating experience (especially fuel rod wear inspections under grid straps). Extension

beyond the [[ ]] requires further justification that assembly design features (e.g., introduction of mixing vanes) do not introduce fuel rod vibration and the potential for grid-to-rod fretting and NRC review and approval.

Amendment 33 SE:

In Enclosure 1 of Reference 1, GNF details additional LUA operating experience and inspections beyond that reported in Amendment 32. Individual fuel rods were removed and inspected, including visual inspection adjacent to grid strap locations. No indications of fretting wear or unusual corrosion were observed while compiling this more-extensive LUA inspection database. Based upon the additional LUA operating experience and inspections, the NRC staff finds that GNF has met the requirements of GESTAR II and that the more restrictive GNF2-specific exposure limit may be removed.

Amendment 32 SE (Reference 6):

In a third open item, the NRC staff requested information related to the inclusion of water holes in the water rod structural analysis. In its response, GEH concluded that while the water rod holes were not explicitly modeled in the finite element analysis (FEA), the amount of conservatism in the structural calculations assuming all loads are applied at the minimum water rod diameter offsets the reduced cross-sectional effect of both sets of water rod holes. During a recent ESBWR audit, the NRC staff questioned similar engineering judgments for the GE14E fuel design. GEH, following its corrective action program, is performing detailed FEA calculations (modeling the water rod holes) to investigate its conclusion. The GNF2 fuel design does not introduce any new design features which exacerbate this potential problem. As such, the NRC staff considers this issue to be generic in scope and not specific to its approval of Amendment 32 or the GNF2 fuel design.

Amendment 33 SE:

Section 3.2.1 of the GNF2 compliance report (NEDC-33270P, Revision 3 – Enclosure 7 of Reference 1) and Enclosure 1 of Reference 1 include a description of the detailed ANSYS FEA calculations (with explicit modeling of the water holes) which demonstrate that the GNF2 water rod will not buckle under the maximum handling and shipping loads. The NRC staff agrees with this conclusion and considers this item closed.

Amendment 32 SE (Reference 6):

In a fourth open item, the NRC staff requested information related to the applicability of power ramp test results to GNF2 fuel. In its response, GEH stated that current GNF2 fuel designs have the standard barrier cladding design. Historically, the inclusion of the zirconium barrier has been an effective method on minimizing vulnerability to pellet cladding interaction (PCI)/stress corrosion cracking (SCC). A comparison of power ramp test results with barrier cladding (Figure 1 of Reference 1) shows that PCI/SCC failure would not be expected at or below the GNF2 rod power envelope. In its response, GEH provides a discussion of the applicability of the power ramp test results to the GNF2 design.

> GEH states that the local cladding stresses are driven by the change in local power (and resulting pellet strain) and independent of rod diameter and cladding thickness. One item not discussed is the initial pellet-to-cladding gap size between the older test rods and GNF2. For a given power change, initial gap size will impact cladding stresses. This item requires further investigation prior to removing the [[ ]] limit.
>
> The GNF2 design includes a non-barrier option. Due to the limited scope of this review and schedule restrictions, the NRC staff was unable to reach a safety finding with respect to the acceptability of a non-barrier GNF2 fuel rod design. Hence, the [NRC] staff's approval of Amendment 32 for GNF2 is limited to the zirconium barrier fuel rod design.

Amendment 33 SE:

Attachment 1 to Enclosure 1 of Reference 1 provides justification for the continued applicability of earlier power ramp test data to the GNF2 fuel design, including consideration of the potential effects of differences in initial cladding-to-fuel pellet gap size. GNF concluded that, despite differences in fuel rod diameter, cladding thickness, pellet diameter, and initial gap size, the ramp test data is applicable to GNF2 fuel rod designs.

To assess the validity of the GNF conclusion, the NRC staff performed independent calculations with FRAPCON-3 simulating power ramps on both 8x8 and 10x10 fuel rod designs. The results indicate that the smaller gap size closes faster and calculated cladding strain is slightly larger for the 10x10 design for an identical power ramp. However, these differences were not significant. Further evaluations may be necessary to assess the applicability of the power ramp test data to future fuel designs that exhibit more substantial differences in design specifications and whether it would be necessary to scale test data and consider the impact of these differences on power maneuvering restrictions and predicted fuel rod performance during AOOs.

The zirconium barrier design has proven to reduce PCI/SCC susceptibility both during in-reactor operations and during power ramp testing. As documented in Enclosure 1 of Reference 1, GNF has not provided additional information to support the non-barrier option and accepts the continued application of the Amendment 32 limitation (i.e., the NRC staff review and approval of GESTAR II is limited to the zirconium barrier GNF2 fuel rod design.). With the continued inclusion of the barrier design, the NRC staff's concerns related to slight differences in predicted cladding stress and strain and the applicability of the power ramp test data is diminished. Non-barrier fuel rod designs or future designs with more substantial differences (e.g., fuel rod specifications, pellet composition, barrier alloy) may require a more detailed assessment.

Based upon the review detailed above, the NRC staff finds that the more restrictive GNF2-specific exposure limit may be removed.

Amendment 32 SE (Reference 6):

> In a fifth open item, the NRC staff requested information related to local cladding hydrogen concentration near the Alloy X-750 grid spacers. In its response, GEH concludes that the performance of GNF2 will not be adversely affected by shadow corrosion and hydriding at

spacer locations, especially given the rod exposure limit. Based upon anticipated corrosion (and hydrogen pickup) during the limited rod exposure, the NRC staff finds this response acceptable. However, further data needs to be provided to justify extended operation beyond one cycle.

Amendment 33 SE:

This item was addressed in a previous section of this SE (see audit finding #3 above).

Amendment 32 imposed a limitation of [[ ]] on the approval of the GNF2 fuel assembly design and on the application of GESTAR II to the GNF2 fuel assembly design. This limitation was prompted by several issues, including the lack of LUA data, NRC staff concerns with the GESTR-M thermal conductivity model and UO_2 rod internal pressure, and necessary updates to cladding strain criteria and corrosion limits. As described above, all of these issues have been dispositioned to the satisfaction of the NRC staff. As such, the cycle and exposure limitation is no longer necessary. The approved burnup limit for the GNF2 fuel assembly design is [[ ]].

4.0 LIMITATIONS AND CONDITIONS

There are no additional limitations and conditions associated with Amendment 33 to GESTAR II. Licensees referencing NEDE-24011-P (GESTAR II) must continue to comply with all previous NRC limitations and conditions except for the Amendment 32 limitations (#1 and #3) associated with [[ ]] for batch loading of GNF2 fuel assemblies.

5.0 CONCLUSION

Based upon its review described above, the NRC staff finds Amendment 33 to NEDE-24011-P-A / NEDO-24011-A, “General Electric Standard Application for Reactor Fuel (GESTAR II),” acceptable. Licensees referencing GESTAR II need to comply with the conditions listed in Section 4.0 of this SE.

6.0 REFERENCES

1. Letter from GNF to NRC, MFN 10-045, “Amendment 33 to NEDE-24011-P-A, General Electric Standard Application for Reactor Fuel (GESTAR II) and GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, Revision 3, March 2010,” dated March 5, 2010. (ADAMS Package Accession Number ML100700464)

2. Letter GNF to NRC, MFN 10-045 Supplement 1, “Amendment 33 to NEDE-24011-P, General Electric Standard Application for Reactor Fuel (GESTAR II),” dated May 27, 2010. (ADAMS Package Accession Number ML101481067)

3. Letter from GNF to NRC, FLN-2008-011, ~~A~~"Amendment 32 to NEDE-24011-P-A, General Electric Standard Application for Reactor Fuel (GESTAR II)," dated October 15, 2008. (ADAMS Package Accession No. ML082910505)

4. Letter from GNF to NRC, FLN-2007-011, ~~A~~"GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, March 2007, and GEXL17 Correlation for GNF2 Fuel, NEDC-33292P, March 2007," dated March 14, 2007. (ADAMS Accession No. ML070780335)

5. Final SE for GNF TR NEDC-33256P, NEDC-33257P, and NEDC-33258P, "The PRIME Model for Analysis of Fuel Rod Thermal-Mechanical Performance," dated January 22, 2010. (ADAMS Package Accession No. ML100210284)

6. Final SE for GNF Amendment 32 to TR NEDE-24011-P-A / NEDO-24011-A, "General Electric Standard Application for Reactor Fuel (GESTAR II)," dated July 30, 2009. (ADAMS Package Accession No. ML091680754)

7. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 4.2, Revision 3, "Fuel System Design," dated March 2007. (ADAMS Accession No. ML070740002)

8. Letter from GEH to NRC, MFN 07-040, ~~A~~"Part 21 Notification: Adequacy of GE Thermal-Mechanical Methodology, GESTR-M," dated January 21, 2007. (ADAMS Package Accession No. ML072290203)

9. Letter from GEH to NRC, MFN 07-040 Supplement 1, ~~A~~"Part 21 Notification: Adequacy of GE Thermal-Mechanical Methodology, GESTR-M – Supplement 1," dated January 4, 2008. (ADAMS Accession No. ML080100670)

10. Letter from GEH to NRC, MFN 07-040 Supplement 2, ~~A~~"Part 21 Notification: Adequacy of GE Thermal-Mechanical Methodology, GESTR-M – Supplement 2," dated August 28, 2008. (ADAMS Package Accession No. ML082420309)

11. Letter from GNF to NRC, FLN-2008-008, ~~A~~"GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, Revision 1, August 2008," dated August 29, 2008. (ADAMS Accession No. ML082460763)

12. NRC Memorandum, "Audit Report for GNF2 Advanced Fuel Assembly Design GESTAR II Compliance Report," dated September 25, 2008. (ADAMS Package Accession No. ML082690382)

13. Letter from GEH to NRC, MFN 08-347, "Response to Portion of NRC Request for Additional Information Letter No. 110 - Related to ESBWR Design Certification Application - RAI Numbers 4.2-2 Supplement 3, 4.2-4 Supplement 2 and 4.8-6 Supplement 1," dated May 9, 2008. (ADAMS Package Accession No. ML081350404)

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Date: