SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

AMENDMENT 26 TO GENERAL ELECTRIC COMPANY (GE)

TOPICAL REPORT NEDE-24011-P-A, "GESTAR II"

ITEM 2: IMPLEMENTING IMPROVED GE STEADY-STATE METHODS

1.0 INTRODUCTION

By letter dated October 22, 1999 (Reference 1), General Electric Company Nuclear Energy group (GENE), submitted a request for review of Amendment 26 to GESTAR as a standard amendment. GESTAR Amendment 26 had been submitted by letter dated August 13, 1999 (Reference 2), as an administrative change involving three areas. These areas were for (1) clarifying classification of BWR 6 pressure regulator failure downscale event; (2) implementing improved GE steady-state methods; and (3) incorporation of Boiling Water Reactor Owners Group (BWROG) approved stability options. This submittal was later supplemented by letters of September 17, 1999 (Reference 3) and October 14, 1999 (Reference 4).

2.0 BACKGROUND and DISCUSSION

From August 14, 1995, through September 1, 1995, an NRC inspection team conducted a performance-based evaluation of the GENE reload core design, safety analysis and licensing processes, core component and fuel assembly fabrication, and fuel related inspection services activities at the Nuclear Energy Production (NEP) facilities in Wilmington, North Carolina. Along with the strengths noted in Inspection Report No. 99900003/95-01 (Reference 5), the team observed weaknesses in certain activities that affect quality. The most significant concern was the accuracy of reload design methods used to ensure that the reactor can safely be operated. The team concluded that errors in calculated hot and cold core reactivity for recent reloads with newer fuel designs and longer cycle lengths were due to a weakness of the NEP reload design process. However, the team noted that NEP was addressing this weakness by implementing improvements in its currently approved steady-state nuclear methods (Reference 9). These improvements included a formal review process, increased bench marking of certain calculations for an extensive number of bundle design conditions, implementing revised computer codes, and developing a new lattice code. The team noted that the proposed design improvements should be thoroughly documented, peer reviewed, and monitored over a period of time to ensure that the new design methods meet the requirements placed on them. The team concluded that the near-term use of the revised computer codes in combination with the eigenvalue selection process should help reduce uncertainties in the cold critical and shutdown margins. The team also concluded that assurance of adequate shutdown margin can be strengthened by joint GENE/licensee actions consistent with the plant startup safety analysis. The team concluded, given that the introduction of the new nuclear models and codes

constitutes a major upgrade of GENE'S nuclear design methods, the use of the new models as design tools after the first quarter of 1996 was not an unreasonable schedule.

As part of the response to the inspection observations of weaknesses, as discussed above, GENE began to inform the staff of progress in the qualification and bench marking of the improved steady-state nuclear methods. In December 1995 (Reference 6), GENE provided an update to the NRC staff on the status of the improved methods. In July 1996 (Reference 7), GENE provided the background for the methods and a roadmap for implementation of the revised lattice physics (TGBLA) and three-dimensional (3D) simulator (PANACEA) codes. The qualification of these methods addressed the observed weakness in previous qualification databases by significantly expanding the scope of benchmarks versus both higher-order analytical standards and measured operating plant data. GENE also analyzed the effect of the model change-over on the plant dynamic response calculated for reload licensing analyses.

GENE outlined their implementation plan, following the completion of the code revisions, testing and release, characterized as completion of three areas followed by an implementation review, summarized as follows:

- address all technical issues related to implementation,
- modify all interface codes and related databases for compatibility,
- revise technical documentation design procedures and design bases for consistency, and
- complete application design review for all process areas.

In January 1998 (Reference 8), GENE informed the staff of the completion of a Level 2 design review of the improved methods, consistent with the GE quality assurance process for a qualified engineering computer program which has been loaded on the program library and is accessible to users. GE also stated that 27 additional plant cycles have been analyzed and the results were consistent with the benchmarking discussed in Reference 7. GE also provided additional results from test cases, using the improved methods to generate input for the approved stability code ODYSY, demonstrating that the differences in calculated decay ratios are within the uncertainty of the stability methodology.

3.0 EVALUATION

In August 1999 (Reference 2), GE submitted Amendment 26 to GESTAR II, and in October 1999 (Reference 1), requested NRC review as a standard amendment. The NRC staff has reviewed Item 2 of the submittal, in relation to the GE improved steady-state methods.

Since the 1995 inspection, GENE has updated the staff periodically on the status of the improved steady-state methods, as noted above. The staff has reviewed the findings of the 1995 vendor inspection (Reference 5), along with the description of the improved methods relative to the previously approved steady-state Licensing Topical Report (Reference 9) and the benchmark and qualification data and the impact on transient analyses provided in the proprietary attachment to Reference 7. The staff also notes that a Level 2 design review

through the GE Quality Assurance process has been completed for the improved methods and that continuing qualification checks have been performed (Reference 8). Based on the staff's review, the inclusion of the improved GE steady-state methods into Amendment 26 of GESTAR II is acceptable.

4.0 CONCLUSIONS

The staff finds that Item 2, Implementing Improved GE Steady-State Methods, is acceptable and appropriate for inclusion in Amendment 26 to the GE Licensing Topical Report NEDE 24011-P-A (GESTAR II), as discussed in the above evaluation.

5.0 REFERENCES

1. Letter from G. A. Watford (GE) to USNRC, "Review of Amendment 26 to GESTAR II," October 22, 1999 (MFN-034-99).

2. Letter from G. A. Watford (GE) to USNRC, "Amendment 26 to GE Licensing Topical Report NEDE-24011-P-A (GESTAR II) for (1) Clarifying Classification of BWR 6 Pressure Regulator Failure Downscale Event, (2) Implementing Improved GE Steady-State Methods, and (3) Incorporation of BWROG Approved Stability Options," August 13, 1999 (MFN-008-99).

3. Letter from G. A. Watford to USNRC, "Additional Information Regarding Amendment 26 to NEDE-24011-P-A (GESTAR II)," September 17, 1999 (MFN-032-99).

4. Letter from G. A. Watford (GE) to USNRC, "Technology Update Meeting - Proposed Content," October 14, 1999 (MFN-033-99).

5. Letter from R. M. Gallo (NRC) to C. P. Kipp (GENE), "NRC Inspection Report No. 99900003/95-01," March 5, 1996.

6. Letter from R. J. Reda (GE) to R. C. Jones (NRC), "GE Fuel Technology Update," December 12, 1995.

7. Letter from R. J. Reda (GE) to R. C. Jones (NRC), "Implementation of Improved GE Steady-State Methods," July 2, 1996.

8. Letter from G. A. Watford (GE) to E. D. Kendrick (NRC), "Implementation of Improved GE Steady-State Nuclear Methods," January 8, 1998.

9. "Steady-State Nuclear Methods," NEDE- 30130-P-A (proprietary) and NEDO-30130-A, April 1985.

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