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Global Nuclear Fuel

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Attention: Chief, Information Management Branch
Program Management
Policy Development and Analysis Staff

Attention: R. Pulsifer

Subject: **Confirmation of 10x10 Fuel Design Applicability to Improved SLMCPR, Power Distribution and R-Factor Methodologies**

References:

1. Letter, Frank Akstulewicz (NRC) to Glen A. Watford (GE), "Acceptance for Referencing of Licensing Topical Reports NEDC-32601P, *Methodology and Uncertainties for Safety Limit MCPR Evaluations*; NEDC-32694P, *Power Distribution Uncertainties for Safety Limit MCPR Evaluation*; and Amendment 25 to NEDE-24011-P-A on Cycle Specific Safety Limit MCPR," (TAC Nos. M97490, M99069 and M97491), March 11, 1999.
2. Letter, Thomas H. Essig (NRC) to Glen A. Watford (GE), "Acceptance for Referencing of Licensing Topical Report NEDC-32505P, Revision 1, *R-Factor Calculation Method for GE11, GE12 and GE13 Fuel*," (TAC No. M99070 and M95081), January 11, 1999.
3. Letter, G. A. Watford (GNF) to R. Pulsifer (NRC), "Request for Additional Information – GE14 Review – Power Distribution Uncertainties and GEXL Correlation Development Procedure," March 27, 2001 (FLN-2001-004).

References 1 and 2 approve GNF methodologies associated with SLMCPR and R-factors. The NRC SERs provide conditions that require confirmation of the methodologies when new fuel designs are introduced. As requested by Dr. Tai Huang of the staff, this letter summarizes the confirmation of GNF's 10x10 fuel designs (GE12 and GE14) to the requirements of the SERs. Each requirement is quoted from the SER and the GNF response is then provided. These responses

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have previously been included in plant specific SLMCPR submittals and partly in Reference 3.

SLMCPR and Power Distribution Uncertainty (Reference 1)

"(1) The TGBLA fuel rod power calculational uncertainty should be verified when applied to fuel designs not included in the benchmark comparisons of Table 3.1 of NEDC-32601P, since changes in fuel design can have a significant effect on calculation accuracy." (Reference 1, page 3, Conclusions section)

GNF Response

The fidelity of the TGBLA lattice physics calculations for fuel rod powers depend on the lattice designs. The key considerations are the lattice geometry, the location of the water rods, the location of the gadded rods and for vanished-rod lattices the location of the part-length rods. All these characteristics are identical for GE12 and GE14. Although the length of the part-length rods is different between GE12 and GE14, this has no impact on the lattice calculations, which are, performed either for a fully-rodded or partially-rodded lattice. Table 3.1 of NEDC-32601P includes GE12 10x10 lattices. The values given in Table 3.1 for GE12 are representative of the values being calculated for GE14. Therefore, the TGBLA fuel rod power calculational uncertainty, supported by Table 3.1 of NEDC-32601P-A is applicable to GE12 and GE14 fuel designs.

"(2) The effect of the correlation of rod power calculation uncertainties should be reevaluated to insure the accuracy of R-Factor uncertainty when the methodology is applied to a new fuel lattice." (Reference 1, page 3, Conclusions section)

GNF Response

The R-factor uncertainty is dominated by the same factors that influence the rod powers as described above for item (1). The uncertainty is the same for GE12 and GE14. The derivation of the uncertainty value is presented for GE 10x10 lattices (i.e., GE12 and GE14) in Appendix C of NEDC-32601P-A.

"(3) In view of the importance of MIP criterion and its potential sensitivity to changes in fuel bundle designs, core loading and operating strategies, the MIP criterion should be reviewed periodically as part of the procedural review process to insure that the specific value recommended in NEDC-32601 P is applicable to future designs and operating strategies." (Reference 1, page 3,

Conclusions section)

GNF Response

GNF continues to monitor MIP and periodically assess it as part of the procedural review process. Specific scoping analyses performed for cores partially and fully-loaded with GE14 fuel have given no indications that suggests that the MIP values from these calculations are statistically distinct from historical data. The use of MIP is required by the GNF technical design procedure and is performed for each analysis. There is no indication for any current designs either with GE14 or any other GE fuel that suggest that the correlation is not applicable. Thus there is no indication that the MIP criteria should be changed.

"(4) The 3D-MONICORE bundle power calculational uncertainty should be verified when applied to fuel and core designs not included in the benchmark comparisons in Tables 3.1 and 3.2 of NEDC-32694P." (Reference 1, page 3, Conclusions section)

GNF Response

The effect of the introduction of 10x10 fuel on bundle power uncertainties was examined by considering the effects on the four-bundle power component of the uncertainty. This component is based on TIP radial RMS. The trend of TIP radial RMS agreement between predicted and measured was examined before and after introduction of 10x10 fuel in a BWR/4 and BWR/6. Approximately 70% of all fuel was based on 10x10 designs after two cycles of introduction. A total of 54 TIP comparisons were considered. The results show no statistically discernable trends of degradation. In fact, the cycles with 10x10 fuel result in cumulative RMS values lower than the approved values in NEDC-32694P-A. These results were previously provided to the staff in a letter, G. A. Watford (GNF) to R. Pulsifer (NRC), "Request for Additional Information – GE14 Review – Power Distribution Uncertainties and GEXL Correlation Development Procedure", March 27, 2001 (FLN-2001-004). These comparisons confirm that the bundle power calculational uncertainties of NEDC-32694P-A apply to GE12 and GE14 10x10 fuel designs.

R-factor Methdology (Reference 2)

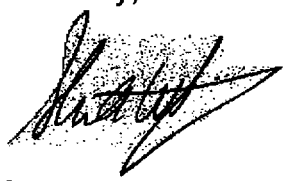
"...if new fuel is introduced, GENE must confirm that the revised R-factor method is still valid based on new test data." (Reference 2, page 4, Conclusions section).

GNF Response

Calculation of GE14 R-factors follows the approved methodology of NEDC-32505P-A Rev. 1. The R-factor calculations consist of three essential components: the weight scheme for combining rod peaking factors, the additive constants for adjusting individual position performance and the behavior for partially controlled conditions. The weighting scheme of GE14 is identical to that of GE12 because the two bundles are identical in the lattice geometry. The location of the part length rods and the water rods are identical. The main difference is that the length of the part length rods and the spacer locations are slightly different. The additive constants are derived from the test data along with the GEXL coefficients. For partially controlled conditions, the bundle R-factors are calculated based on the prescribed axial power shapes that correspond to the specific GEXL correlation. For GE14, analysis was done to confirm that the partial controlled bundle performances are reasonable using the same process as defined in the approved methodology in NEDC-32505P-A Rev. 1 and the recommendations in the SER.

Based on the above responses to the conditions of the SER, it is concluded that the GNF 10x10 fuel designs (GE12 and GE14) satisfy the conditions of the SERs.

Sincerely,



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