July 29, 2002

Mr. K. S. Canady
Duke Energy Corporation
526 South Church St
Charlottte, NC 28202

SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2 AND MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 RE: REQUEST FOR ADDITIONAL INFORMATION RE: TOPICAL REPORT DPC-NE-1005P, REVISION 0, NUCLEAR DESIGN METHODOLOGY USING CASMO-4/SIMULATE-3 MOX (TAC NOS. MB2578, MB2579, MB2726 AND MB2729)

Dear Mr. Canady:

The Nuclear Regulatory Commission is reviewing your submittal dated August 3, 2001, entitled “Topical Report DPC-NE-1005P, Revision 0, Nuclear Design Methodology Using CASMO-4/SIMLATE-3 MOX (Proprietary)" and has identified a need for additional information as identified in the Enclosure. These issues were discussed with your staff on June 25, 2002. Please provide a response to this request within 45 days of receipt of this letter so that we may complete our review.

Sincerely,

/RA by R.Martin/

Robert E. Martin, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-413, 50-414, 50-369 and 50-370

Enclosure: Request for Additional Information

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION

TOPICAL REPORT DPC-NE-1005P, REVISION 0

NUCLEAR DESIGN METHODOLOGY USING CASMO-4/SIMULATE-3 MOX

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

MCGUIRE NUCLEAR STATION, UNITS 1 and 2

DUKE ENERGY CORPORATION

1. Please provide, in a side-by-side format, all of the changes made to CASMO-4 and SIMULATE-3 to accommodate the presence of mixed-oxide (MOX) fuel.

2. In section 2.1, page 2-2, second paragraph from the end, it is stated that for a MOX fuel lattice, CASMO-4 automatically adjusts the detail of appropriate internal calculations to accommodate the variation of the plutonium cross-sections.

   1.01 Please provide additional details as to how this is accomplished.

   1.02 Also, it is stated in the same paragraph that CASMO-4 also edits several additional coefficients which are----. Which coefficients are referenced?

3. The second paragraph on page 2-5 of the topical report states that several modifications were made to SIMULATE-3 to more accurately model the local flux gradients at the MOX-low enriched uranium (MOX-LEU) fuel interfaces. The same paragraph also briefly discusses other changes made to the SIMULATE-3 model to accommodate the presence of MOX fuel. Please provide a more detailed technical qualitative description (that is, the physics behind this claim) in support of the changes made to SIMULATE-3 to handle the presence of MOX fuel.

4. The last paragraph in section 2.3 addresses the issue of mixed cores, and indicates that the mixed core methodology applicable to LEU cores are also applicable to cores loaded with MOX and LEU. Please provide qualitative and quantitative technical justifications to support this claim.

5. On page 2-7, it is stated that scaler multipliers may be applied to important parameters. How are the multipliers determined and who decides to apply them at the appropriate time?

6. On page 3-2, the last sentence of the second paragraph indicates that SIMULATE-3 MOX was compared to prior Duke methodologies. Were the prior Duke methodologies applied to the same type LEU fuel as is referred to in the methodologies described in DPC-NE-1005P, Revision 0?

Enclosure

7. On page 3-3, the second and third paragraphs also make reference to prior Duke methodologies. Therefore, question six above is also applicable to these paragraphs. Please explain. Additionally, for both paragraphs, the accuracy of the SIMULATE-3 MOX code is compared to predictions, so please quantify the accuracy of the results using: (a) the previous method and, (b) the SIMULATE-3 MOX method.

8. In the first paragraph of section 3.2.5, the last sentence states that the fission chambers are very similar. What are the differences between them?

9. In the middle of the second paragraph from the bottom of page 3-9, it is stated that a small bias was applied to a measured signal. How small is this bias and how was the bias determined?

10. Also, in the second paragraph from the bottom of page 3-9, it is stated that conversion factors were applied. What conversion factors? How are these conversion factors calculated and when are they applied?

11. In Table 3-5, it appears that there are large differences between the measured and predicted hot zero power isothermal temperature coefficients. Please explain.

12. In Table 3-2, it appears that CASMO-4/SIMULATE-3 is over-predicting the boron concentrations and thus is non-conservative. This is also the case in Table 3-8. Please explain.

13. The last sentence of the last paragraph of Section 6.2, “Impact of MOX Fuel on DRWM,” suggests that there is little difference between an LEU fuel core and an LEU/MOX fuel core. However, no data was provided to support this claim. Please provide quantitative technical justification to support this claim.

14. The two paragraphs on page 6-3 also indicate that the presence of MOX does not impact the excore detector signal. Yet no data is provided to support this claim. Please provide quantitative technical justification (results) to support this assertion.

15. Section 6.3 addresses the issue of model sensitivity of the dynamic rod worth measurement to the inaccuracies in the computer models. Please provide sensitivity study results for staff review.

16. The third paragraph on page 2-4, states that SIMULATE-3 MOX supplements the polynomial expansion method with additional terms derived from purely analytic nodal solution methods. Please provide additional details on how this is accomplished.

17. In several places in the document a statement is made that the new models yield results consistent with the results of the conventional methods in LEU cores. For every occasion where this statement is made demonstrate that this statement is true. Provide graphics and commentary for each occasion where the statement is made.

18. In the first paragraph on page 2-5, the document discusses the spatial homogenization error that SIMULATE-3 MOX reduces by recalculating. Please provide a detailed discussion of how this recalculation is accomplished and why it is conservative.

19. In the first paragraph on page 4-1 of Reference 23, it is stated that the fuel assembly design is similar to the design proposed for use by Duke. Please provide details including quantifying how similar the designs are, both from a mechanical and neutronic standpoint.

20. Please provide two copies of all proprietary, non-NRC reviewed references. Please note that proprietary information must be accompanied by an affidavit that identifies the document or part to be withhheld and that meets the other requirements of the Commission's regulations in 10 CFR 2.790, "Public inspections, exemptions, requests for withholding."

21. The second paragraph on page 4-7 discusses the EPICURE experiments. It is mentioned that the experiments used a fuel pin layout that is comparable to the Duke MOX fuel assembly layout. Please provide additional details to support this statement.

22. Please provide all documentation and the code for CASMO4 and SIMULATE-3. This entails all code documentation, including user guides, model and methods description, verification and validation, and the source codes as well as executables of the codes.

23. Please provide a discussion of the differences between weapons-grade and reactor-grade MOX fuel. Provide a specific basis for why the data for reactor-grade MOX fuel is adequate for weapons-grade MOX fuel and quantify the differences between the fuel types.

cc:
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