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LIC-94-0198

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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References:
1. Docket No. 50-285
2. CENPD-153-P, "INCA/CECOR Power Peaking Uncertainty," Revision 1-P-A, dated May 1980
3. Southern California Edison Topical Report SCE-9001-A, "PWR Reactor Physics Methodology Using CASMO-3/SIMULATE-3," for use at San Onofre Nuclear Generating Station Units 1, 2 and 3 dated September 1992
4. Letter from OPPD (W. G. Gates) to NRC (Document Control Desk) dated May 2, 1994 (LIC-94-0092)
5. OPPD-NA-8301-P, "Core Reload Methodology Overview," Revision 6, dated May, 1994
6. OPPD-NA-8302-P, "Neutronics Design Methods and Verification," Revision 4, dated May, 1994

SUBJECT: Use of CECOR Power Peaking Uncertainties at Fort Calhoun Station (FCS)

The Omaha Public Power District (OPPD) submitted revisions to the core reload analysis methodology topical reports to incorporate the use of the CASMO-3/SIMULATE-3 computer codes for performing neutronics calculations for the FCS Cycle 16 Core Reload Analysis in References 4 through 6. In subsequent conversations between OPPD and the NRC, the methodology reviewer requested clarification/justification for the continued use of the CECOR power peaking uncertainties contained in Reference 5.

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The CECOR power peaking uncertainties documented in Reference 5 for F_Q, F_R and F_{XY} are 6.2%, 6.0% and 5.3%, respectively. These measurement uncertainties, which were approved for use in Reference 2, consist of two parts:

1) the basic measurement uncertainty which includes uncertainty components from the raw signal, background correction, initial calibrated sensitivity, sensitivity depletion, and the signal-to-power conversion, and

2) the synthesis uncertainty consisting of software dependent components including radial coupling between instrumented and uninstrumented locations, axial expansion of the power profile, and the translation of assembly power to pin power via pin-to-box factors.

OPPD plans to continue to use CECOR as the in-core monitoring software for Cycle 16 as indicated in References 5 and 6.

As described in the above paragraph, the final numerical CECOR power peaking uncertainties are a combination of many components. The Reference 2 CECOR power peaking uncertainty components that change due to the use of CASMO-3/SIMULATE-3 are the box power measurement uncertainty and the pin-to-box calculational uncertainty.

The box power measurement uncertainty is a combination of the sensitivity depletion uncertainty and the signal-to-power conversion uncertainty. OPPD has performed box power measurement uncertainty calculations for the past three operating cycles as well as for the current operating cycle, Cycle 15. The results indicated that the SIMULATE-3 box power measurement uncertainties derived from the calculations are less than the box power measurement uncertainties in Reference 2. In addition, OPPD's calculations of the SIMULATE-3 box power measurement uncertainties are comparable to and consistent with the box power measurement uncertainties documented in Reference 3.

The pin-to-box calculational uncertainty is described on page II.3.59 in Reference 2 for inclusion in the overall CECOR peaking uncertainty. Pin-to-box uncertainties generated from CASMO-3/SIMULATE-3 cold-critical models developed by OPPD and Studsvik of America were within the range of 0.80% to 1.30%. A similar effort performed by Southern California Edison in Reference 3 derived an overall pin-to-box uncertainty of 1.608%. Thus, it is concluded that the OPPD generated pin-to-box calculational uncertainty is bounded by the Reference 2 value.

In summary, the two uncertainty components of the Reference 2 CECOR power peaking uncertainties that change due to the use of CASMO-3/SIMULATE-3 are bounded by the existing Reference 2 uncertainty components. Based upon the above information, OPPD concludes that the continued use of the Reference 2 power peaking measurement uncertainties for the FCS Cycle 16 Core Reload Analysis and for future FCS core reload analyses remains conservative.

If you should have any questions, please contact me.

Sincerely,

W. G. Gates

W. G. Gates
Vice President

WGG/dll

c: LeBoeuf, Lamb, Greene & MacRae
L. J. Callan, NRC Regional Administrator, Region IV
S. D. Bloom, NRC Project Manager
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