Omaha Public Power District
444 South 16th Street Mall
Omaha, Nebraska 68102-2247

December 1, 2000
LIC-00-0110

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Mail Station PI-137
Washington, DC 20555

References:
1. Docket No. 50-285
2. Letter from OPPD (W.G. Gates) to NRC (Document Control Desk) dated September 5, 2000 (LIC-00-0069), Application for Amendment
3. Letter from OPPD (R. L. Phelps) to NRC (Document Control Desk) dated May 31, 2000 (LIC-00-0057), Proprietary Material at Meeting on Licensing Methodology for Fort Calhoun Station Cycle 20 Reload
4. Letter from OPPD (S.K. Gambhir) to NRC (Document Control Desk) dated September 29, 2000 (LIC-00-0084), Transmittal of Siemens Fuel Assembly Growth Model

SUBJECT: Transmittal of Requested Information - Description of Core Reload Analysis Methodology

Gentlemen:

The attachment provides a narrative description of the reload analysis methodology being applied to Fort Calhoun Station's (FCS) Cycle 20 core design. The information provided in the attachment was verbally presented at the May 31, 2000 meeting between the Omaha Public Power District (OPPD) and the Nuclear Regulatory Commission (NRC) which discussed Siemens Power Corporation (SPC) methods described in Reference 3. Also, the Siemens Fuel Assembly Growth Model has been submitted, Reference 4, to support FCS's use of Siemens Fuel.

Accordingly, this letter with attachments provides the information required by the NRC Staff to support the review of the Reference 2 application, and is considered supplemental to that application.

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I declare under penalty of perjury under the laws of the United States of America that I am authorized by Omaha Public Power District to provide this information and that the foregoing is true and correct. Please contact me if you have any questions.

Sincerely,

S. K. Gambhir
Division Manager
Nuclear Operations

SKG/DLS/dls

Enclosure

c: E. W. Merschoff, NRC Regional Administrator, Region IV (w/o enclosure)
L. R. Wharton, NRC Project Manager
W. C. Walker, NRC Senior Resident Inspector (w/o enclosure)
Winston & Strawn (w/o enclosure)

Reload Analyses Description

Background:

Beginning with the 2001 refueling outage, Fort Calhoun Station will be using fuel supplied by Siemens Power Corporation (SPC). This change in fuel fabricator is intended to reduce the number of fuel failures experienced at Fort Calhoun. The change is being evaluated by Omaha Public Power District in accordance with the requirements of 10 CFR 50.59. A description of the SPC fuel and supporting analyses is provided below for information.

Fuel Description:

The Cycle 20 core loading will be composed of 53 SPC High Thermal Performance (HTP) fuel assemblies, 40 Batch X fuel assemblies manufactured by Westinghouse with Inconel Grids, and 40 assemblies from Batch T with Zircaloy Grids which were manufactured by Westinghouse and are currently in the spent fuel pool. All failed fuel rods in the Batch T assemblies have been repaired for insertion into Cycle 20.

The SPC supplied fuel will consist of 53 assemblies with the SPC HTP spacer grid and FUELGUARD^{TM} lower tie plates. The HTP spacer provides line contact with the fuel rods thus reducing the potential for fretting. The FUELGUARD lower tie plate provides protection against debris and improves resistance to flow induced fretting. The burnable absorber used in the SPC fuel will be gadolinia. The SPC fuel assembly components are part of the standard SPC design and have been used previously with no reported fretting failures at HTP spacer locations.

Reload Analysis Methodology:

The reload analyses for Cycle 20 will be performed by both OPPD and SPC. The reload analyses will consist of mechanical, neutronics, thermal-hydraulic, transient, setpoint and LOCA analyses. OPPD has the primary responsibility for the reload analyses but has contracted with SPC to perform selected analyses for Cycle 20. The use of SPC analyses necessitates a change to the list of approved methodology in Section 5, "Administrative Controls", of the Fort Calhoun Technical Specifications. The list of methods to be used in the reload analyses is presented in Table 1. This list has been included in the request for amendment to the facility operating license. The interrelationship between the analyses performed by OPPD and the analyses performed by SPC is depicted in Figure 1.

The neutronics analyses will be performed by OPPD using the methodology which is currently referenced in Section 5 of the Technical Specifications, OPPD-NA-8301-P-A and OPPD-NA-8302-P-A. OPPD will use CASMO3 (SPC version) and SIMULATE 3 to perform the neutronics analyses. These codes will be used to provide input to both SPC

and OPPD analyses. The SPC guidelines for generating input will be used when input is provided to an analysis being performed by SPC. This will include the mechanical design analyses, Control Element Assembly (CEA) Ejection, Seized Rotor, LOCA and Setpoint Analyses.

SPC will perform the mechanical design analyses for the SPC fuel. The NRC approved methodology is described in reports EMF-92-116(P)(A), XN-82-06(P)(A) Revision 1 and Supplements 2, 3, and 4, and ANF-88-133(P)(A) and Supplement 1. The report EMF-92-116(P)(A) describes the criteria to be used by SPC when performing design analyses and provides a mechanism for changes to designs to be made without prior NRC review and approval. The other two documents describe the methodology for performing the mechanical design analyses. The SPC-approved assembly growth models were not developed using assemblies without hold down springs, such as Fort Calhoun. A justification for the use of an assembly growth model has been developed and submitted to the NRC for review and approval in support of the request for amendment to the facility operating license. (Reference 3 of LIC-00-0110)

SPC will perform a thermal-hydraulic compatibility analyses for the mixed core configuration. The SPC methodology described in report XN-NF-82-81(P)(A) Revision 1 will be used to perform the analyses. Each assembly in the mixed core will be modeled in the SPC code XCOBRA-IIIC.

The majority of the transients will be analyzed by OPPD with respect to the system response. The methodology to be used is that currently referenced in the Technical Specifications, OPPD-NA-8303-P-A. OPPD will evaluate the events with respect to fuel centerline melt and system over-pressure criteria. SPC will use its approved methodology as described in reports XN-NF-82-21(P)(A) Revision 1, EMF-92-153(P)(A) and Supplement 1, and XN-75-32(P)(A) supplements 1, 2, 3, and 4 to evaluate the minimum departure form nucleate boiling for each event using boundary conditions supplied by OPPD.

SPC will perform the analyses for two transient events, reactor coolant pump seized rotor and CEA ejection. The SPC-approved methodology as described in ANF-89-151(P)(A) will be used for the seized rotor analysis. The SPC approved methodology as described in ANF-89-151(P)(A), XN-NF-78-44(NP) and XN-NF-85-92(P)(A) will be used for the performance of the CEA ejection analysis.

SPC will perform both the Large and Small Break LOCA analyses. The SPC approved methodology as described in EMF-2087(P)(A) will be used for the Large Break LOCA analysis and the approved methodology as described in XN-NF-82-49(P)(A) Revision 1 Supplement 1 will be used for the Small Break LOCA analysis.

SPC will perform the setpoint analyses using the approved methodology as described in EMF-1961(P)(A). OPPD will provide input to the SPC analyses in the form of neutronics input and core boundary conditions from the systems analyses performed by

OPPD. Both the neutronics analyses and the systems analyses use methods which were previously reviewed and approved by the NRC and are currently in the list of approved methods in the Technical Specifications.

The performance of the analyses by both OPPD and SPC is performed in a planned and controlled manner to assure that problems do not arise due to the interfaces. The analysis methods used to perform the analyses have been previously reviewed and approved by the NRC, with the one exception of the assembly growth correlation, which has been submitted. Appropriate interfaces have been established starting with formal documents, the Design Interface Document and Calculation Plans. Assumptions inherent to the required data exchanges are mutually understood and documented. Meetings have been held between OPPD and SPC to discuss the shared analyses in order to foster communication.

A preliminary review of the above reload analyses has indicated that the only areas requiring NRC review and approval are the Technical Specification changes to reference the SPC methodology to be used for the reload and the assembly growth model which has not previously been reviewed by the NRC for use at Fort Calhoun. These two items have been previously submitted to the NRC as described in the cover letter to this attachment, LIC-00-0110.

Table 1: Methods List to be Added to TS Section 5.0
by Reference 2 of LIC-00-0110

1. XN-75-32(P)(A) Supplements 1, 2, 3 and 4, "Computational Procedure for Evaluating Fuel Rod Bowing," approved version as specified in the COLR.

2. XN-NF-82-06(P)(A) and Supplements 2, 4 and 5, "Qualification of Exxon Nuclear Fuel for Extended Burnup," approved version as specified in the COLR.

3. XN-NF-85-92(P)(A), "Exxon Nuclear Uranium Dioxide/Gadolinia Irradiation Examination and Thermal Conductivity Results," approved version as specified in the COLR.

4. ANF-88-133(P)(A) and Supplement 1, "Qualification of Advanced Nuclear Fuels PWR Design Methodology for Rod Burnups of 62 GWd/MTU," approved version as specified in the COLR.

5. EMF-92-116(P)(A),"Generic Mechanical Design Criteria for PWR Fuel Designs," approved version as specified in the COLR.

6. XN-NF-78-44(P)(A), "A Generic Analysis of the Control Rod Ejection Transient for Pressurized Water Reactors," approved version as specified in the COLR.

7. XN-NF-82-21(P)(A), "Application of Exxon Nuclear Company PWR Thermal Margin Methodology to Mixed Core Configurations," approved version as specified in the COLR.

8. EMF-1961 (P)(A), "Statistical Setpoint/Transient Methodology for CE Reactors, Siemens Power Corporation," approved version as specified in the COLR.

9. XN-NF-621 (P)(A), "Exxon Nuclear DNB Correlation for PWR Fuel Designs," approved version as specified in the 'COLR.

10. ANF-89-151 (P)(A), "'ANF-RELAP Methodology for Pressurized Water Reactors: Analysis of Non-LOCA Chapter 15 Events," approved version as specified in the COLR.

11. EMF-92-153(P)(A) and Supplement 1, "HTP: Departure from Nucleate Boiling Correlation for High Thermal Performance Fuel," approved version as specified in the COLR.

12. XN-NF-82-49(P)(A) Supplement 1; "Exxon Nuclear Company Evaluation Model Revised EXEM PWR Small Break Model," approved version as specified in the COLR.

13. EMF-2087(P)(A), "SEM/PWR-98: ECCS Evaluation Model for PWR LBLOCA applications" approved version as specified in the COLR.

14. ANF-84-73 Appendix B (P)(A), "Advanced Nuclear Fuels Methodology for Pressurized Water Reactors: Analysis of Chapter 15 Events," Advanced Nuclear Fuels Corporation, approved version as specified in the COLR.

15. EMF-84-093(P)(A), "Steam Line Break Methodology for PWRs," Siemens Power Corporation, approved version as specified in the COLR.

Reload Analysis SPC/OPPD Interface Flowchart