Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

January 15, 2002
LIC-02-0004

U. S. Nuclear Regulatory Commission
ATTN.: Document Control Desk
Washington, DC 20555

References:
1. Docket No. 50-285
2. Letter from OPPD (W. G. Gates) to NRC (Document Control Desk), "Fort Calhoun Station Unit No. 1 – License Amendment Request, "Minimum Reactor Coolant System (RCS) Flow Rate," dated December 14, 2001 (LIC-01-0105)

SUBJECT: Fort Calhoun Station Unit No. 1 – "Updated Evaluation of Minimum Reactor Coolant System (RCS) Flow Rate License Amendment Request"

The Attachment provides the Omaha Public Power District's (OPPD) update to the evaluation supporting our request, Reference 2, to amend Technical Specification (TS) 2.10.4, to decrease the minimum required reactor coolant system (RCS) flow rate from 206,000 gallons per minute (gpm) to 202,500 gpm. This update contains additional information that was not available at the time Reference 2 was prepared and does not change the previous conclusions of Reference 2. This updated evaluation continues to assume that calculations (currently in progress) will substantiate its assumptions and statements. On this basis OPPD concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

As discussed in Reference 2, in order to expedite replacement of fuel with fuel assemblies manufactured by Framatome ANP, the start of the 2002 refueling outage has been rescheduled from September to May, thus reducing the time available to complete the analyses and to process the needed license amendment. This update further supports the high confidence that the in-progress analyses and calculations will confirm the attached evaluation. Any results from the in-progress analyses adversely affecting these conclusions will promptly be brought to the NRC's attention. Before April 1, 2002, OPPD will provide confirmation that the fuel design parameters are maintained for the next operating fuel cycle, Cycle 21.

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I declare under penalty of perjury that the foregoing is true and correct. (Executed on January 15, 2002)

If you have any questions or require additional information, please contact Dr. Richard Jaworski at (402) 533-6833.

Sincerely,

R. T. Ridenoure
Division Manager
Nuclear Operations/Site Coordinator

RTR/RLJ/rlj

Attachment: Updated Fort Calhoun Station Evaluation for Amendment of Operating License

c: E. W. Merschoff, NRC Regional Administrator, Region IV
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Division Administrator, Public Health Assurance, State of Nebraska
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ATTACHMENT

Updated Fort Calhoun Station Evaluation
for
Amendment of Operating License

1.0 INTRODUCTION

This letter is a request to amend Operating License DPR-40 for Fort Calhoun Station (FCS) Unit No. 1 Technical Specifications Limiting Conditions for Operation, Section 2.10.4, "Reactor Core, Power Distribution Limits," (5) (a) (iii), "Reactor Coolant Flow Rate," from the current minimum value of 206,000 gpm to 202,500 gpm. This proposed amendment will accommodate the new fuel assemblies from Framatome ANP that have a higher flow resistance than the Westinghouse fuel assemblies for operating Cycles 21 and 22. The Cycle 22 core is planned to consist of all Framatome ANP fuel assemblies. The proposed change in the reactor coolant system (RCS) flow rate will also accommodate the reduced RCS flow rate due to the anticipated need to plug steam generator tubes during future refueling outages.

2.0 DESCRIPTION OF PROPOSED AMENDMENT

The proposed changes to FCS Unit No. 1 Technical Specifications Limiting Conditions for Operation Section 2.10.4 (5) (a) (iii) will reduce the reactor coolant minimum flow rate from an indicated value of 206,000 gpm to 202,500 gpm. The proposed change will replace the value "206,000" with "202,500" in TS 2.10.4 (5) (a) (iii) and in the Basis section of TS 2.10.4.

3.0 BACKGROUND

The proposed amendment is needed to accommodate the projected decrease in RCS flow rate due to: (1) the loading of higher flow-resistant Framatome ANP fuel assemblies into the core, which will result in a larger pressure drop than that experienced by the current Westinghouse fuel assemblies, and (2) the anticipated need to plug steam generator tubes during future refueling outages. Currently there are 53 Framatome ANP and 80 Westinghouse fuel assemblies in the core. FCS is planning to replace the remaining Westinghouse fuel assemblies with Framatome ANP fuel assemblies during the next two refueling outages. FCS also anticipates that additional steam generator tubes will need to be plugged during future refueling outages as a result of aging and test results.

In 1998 OPPD removed the steam generator orifice plates (modification MR-FC-97-005), which resulted in an increase in RCS flow rate to an estimated value of 207,500 gpm. Operation with the steam generator orifice plates was equivalent to approximately 14% steam generator tube plugging; thus, on their removal, approximately a 5% gain in RCS flow rate was obtained, justifying Technical Specification Amendment No. 193. Associated with modification MR-FC-97-005, FCS was granted Technical Specification change Amendment No. 193 (References 10.1 and 10.2), which increased the minimum required RCS flow rate and changed the surveillance requirements for RCS flow rate. Amendment No. 193 increased the RCS minimum flow rate to gain additional operating

margin for departure from nucleate boiling ratio (DNBR) during power operation above 15 percent of rated power from 197,000 gpm, which corresponds to an indicated flow rate of 202,500 gpm, to an indicated flow rate of 206,000 gpm. In addition, the surveillance frequency was changed from monthly to refueling. Additional margin to peak cladding temperature for Loss of Coolant Accidents (LOCA), as well as DNB margin for non-LOCA events, was obtained with crediting the increased flow rate.

The flow rate is measured by periodic surveillance testing and includes +3.6% one-sided 95/95 volumetric flow uncertainty, which addresses uncertainty due to measurements of power, pressurizer pressure, cold and hot leg temperatures, and hot leg stratification. In order to assure that the actual flow rate is above the minimum flow rate used in the accident analysis, the measured or indicated flow rate must be above 202,500 gpm to assure that the actual flow rate is above the accident analysis minimum flow rate, with uncertainties, of 195,210 gpm.

The proposed amendment will maintain the minimum indicated RCS flow rate at the level of 202,500 gpm, which was the value prior to the steam generator orifice plate removal modification.

4.0 REGULATORY REQUIREMENTS AND GUIDANCE

The proposed amendment for changes in RCS flow rate must comply with Criterion 10 of 10 CFR 50, Appendix A, General Design Criteria for Nuclear Power Plants. The proposed change will comply with the criteria such that the RCS with the new flow rate will provide appropriate margin to assure that the specified acceptable fuel design limits (SAFDLs) are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences (AOOs).

5.0 TECHNICAL ANALYSIS

Note: Framatome ANP has recently completed a detailed margin evaluation for all transients and accidents (potentially affected by a change in RCS flow rate) contained in Chapter 14 of the Fort Calhoun Station Updated Safety Analysis Report (USAR). OPPD will validate the margin evaluation results noted below by April 1, 2002, upon completion of the Cycle 21 re-analysis effort.

5.1 Design Basis

Based on the Framatome ANP margin evaluation, the proposed change to the minimum RCS flow rate does not adversely affect the design bases of the plant and is therefore acceptable.

Framatome ANP performed a detailed margin evaluation in support of the proposed reduction in RCS flow rate. The evaluation includes the effects on RCS flow rate resulting from the increased pressure drop across the Framatome ANP fuel assemblies and accounting for anticipated future steam generator tube plugging during refueling outages.

All USAR Chapter 14 transients and accidents that are potentially affected by a change in RCS flow rate were examined in the evaluation. The results of the evaluation are summarized below.

Events Independent of RCS Flow Rate:

The following events are independent of RCS flow rate, and therefore, the acceptable results of the corresponding analyses are unaffected:

- Boron Dilution Event (USAR Section 14.3)
- Turbine-Generator Overspeed Incident (USAR Section 14.8)

Events Precluded by Technical Specification Requirements:

The following events are precluded by Technical Specification requirements, and therefore, the acceptable results of the corresponding analyses are unaffected:

- Mispositioning of the Non-Trippable CEAs (USAR Section 14.5)
- Idle Loop Startup Incident (USAR Section 14.7)

Events Presently Analyzed at 202,500 gpm Indicated or Less:

The following events have analyses of record (i.e., contained in the USAR) that were previously performed at 202,500 gpm indicated or less using NRC-approved methods contained in References 10.5 through 10.7. These analyses show acceptable results and, therefore, require no further evaluation or reanalysis:

- Loss of Load to Both Steam Generators (USAR Section 14.9.1)
- Loss of Load to One Steam Generator (USAR Section 14.9.2)
- Loss of Feedwater Flow (USAR Section 14.10.1)
- Loss of Feedwater Heating (USAR Section 14.10.2)
- Main Steam Line Break Accident (USAR Section 14.12)*
- Steam Generator Tube Rupture Accident (USAR Section 14.14)

*This event is being re-analyzed for Cycle 21 to establish a more current basis, not due to reduced RCS flow.

Event Analysis:

The following events were examined for Cycle 21. The referenced evaluation has shown the following expected gains in margin from the sum of: 1) the improved DNB margin associated with the better coolant mixing of the Framatome ANP fuel (conservatively assumed here to be 5% instead of the calculated value of 5.4% as obtained from the "Cycle 20 Thermal Hydraulic Compatibility Analysis," which was performed using the NRC-approved methods of Reference 10.3 by Siemens Power Corporation (now Framatome ANP)); and 2) the margin lost from the RCS flow rate decrease:

	RCS Flow Rate DNB Margin Change (%)	Net Margin Change (%)
CEA Withdrawal Incident (USAR Section 14.2)	-2.64	+2.36
CEA Drop Incident (USAR Section 14.4)	-2.97	+2.03
Loss of Coolant Flow Event (USAR Section 14.6.1)	-2.84	+2.16
Seized Rotor Event (USAR Section 14.6.2)	-3.10	+1.90
Excess Load Increase (USAR Section 14.11)	-2.89	+2.11
CEA Ejection Accident (USAR Section 14.13)	-2.41	+2.59
RCS Depressurization (USAR Section 14.22)	-2.62	+2.38

Large Break Loss of Coolant Accident (Peak Clad Temperature Event):

The large break loss of coolant accident (LBLOCA) analysis (USAR Section 14.15), analyzed using the Reference 10.8 methods, has been re-evaluated. The reduction in initial RCS flow rate has a minor effect on the blowdown characteristics of the event. The change in peak clad temperature (PCT) is less than 50 °F with an existing margin of approximately 300 °F. Thus the criteria of 10 CFR 50.46 continues to be met.

Small Break Loss of Coolant Accident (Peak Clad Temperature Event):

For the small break loss of coolant accident (SBLOCA) (USAR Section 14.15), analyzed using the Reference 10.9 methods, the reduction in the initial RCS flow rate has no significant effect on the transient response, loop seal clearing time, core uncovery, and PCT due to the early tripping of the reactor coolant pumps. In addition, over 300 °F of PCT margin exists in the analysis of record.

Summary:

The results of this evaluation demonstrate that for each non-LOCA transient or accident contained in Chapter 14 of the USAR, adequate DNB margin presently exists, and the net DNB margin increases when more Framatome ANP fuel is placed in the core (i.e., the flow mixing benefits significantly offset the flow rate reduction effects).

For the Large Break LOCA small PCT changes occur, which are accommodated by exiting analysis margin. The analysis results remain within the limits of 10 CFR 50.46.

For the Small Break LOCA no PCT changes occur, and re-analysis is not necessary.

The Framatome ANP evaluation was performed using DNBR methods (Reference 10.3) described in the current XCOBRA-IIIC methodology and event-specific guidelines (Reference 10.4).

Conclusion:

Previous analysis has shown that decreasing the nominal RCS flow rate to 202,500 gpm indicated does not significantly degrade the margin to the mechanical fuel design limits, and all the fuel design criteria are met.

5.2 Risk Information

The proposed amendment does not involve application or use of risk-informed decisions.

6.0 REGULATORY ANALYSIS

Note: Before April 1, 2002, OPPD will provide confirmation that the fuel design parameters are maintained for the next operating fuel cycle, Cycle 21.

The technical evaluation by Framatome ANP satisfies all regulatory requirements and guidance as mentioned in Section 4. The analysis confirms that the proposed reduction in RCS flow rate does not degrade the margin to the mechanical fuel design limits and that the fuel design criteria continue to be met.

In conclusion, based on the considerations discussed above: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security.

7.0 NO SIGNIFICANT HAZARDS CONSIDERATION

Note: Before April 1, 2002, OPPD will provide confirmation that the fuel design parameters are maintained for the next operating fuel cycle, Cycle 21.

OPPD has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. **Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?**

Response: No.

The proposed amendment to the RCS flow rate is the same as the indicated RCS flow rate prior to the TS Amendment 193 (Reference 10.1). The plant was operated with the same RCS flow rate as the proposed value prior to Amendment 193. Fort Calhoun Station USAR Chapter 14 events and design basis accidents were evaluated with the RCS flow rates not exceeding 202,500 gpm using NRC approved methodology.

In 1999 Fort Calhoun Station was granted TS Amendment 193 to increase the minimum indicated RCS flow rate to 206,000 gpm as a result of the removal of the steam generator orifice plates. Transient and thermal hydraulic analyses were performed using the amended RCS flow rate to verify that the minimum departure from nucleate boiling ratio (MDNBR) does not fall below the limiting value that supports the DNB specified acceptable fuel design limits.

The Framatone ANP evaluation confirms that the proposed reduction in RCS flow rate does not degrade the margin to the mechanical fuel design limits and that the fuel design criteria continue to be met.

In view of the above confirmation, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. **Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?**

Response: No.

The proposed change to the RCS flow rate is not new since the plant was operating with the same value prior to TS Amendment No. 193. The proposed revision does not change any equipment required to mitigate the consequences of an accident. OPPD will continue to analyze all applicable USAR Chapter 14 events and design basis accidents as part of the reload analyses to establish the safety margin to the mechanical fuel design limits and confirm that all the fuel design criteria continue to be met. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. **Does the proposed change involve a significant reduction in a margin of safety?**

Response: No.

The decreased RCS flow rate has been analyzed for thermal hydraulic effects on the reactor core. The analysis has confirmed that the proposed amendment does not degrade the margin to the mechanical fuel design limits and meets the fuel design criteria. The RCS flow rate surveillance requirements will continue to assure that the design functions are met. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, OPPD concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

8.0 ENVIRONMENTAL CONSIDERATION

Based on the above considerations, the proposed amendment does not involve, and will not result in, a condition that significantly alters the impact of the Station on the environment. Thus, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR Part 51.22(c)(9) and, pursuant to 10 CFR Part 51.22(b), no environmental assessment need be prepared.

9.0 PRECEDENCE

Prior to TS Amendment No. 193 (Reference 10.1), the plant operated with the same RCS flow rate of 202,500 gpm. Amendment No. 193 increased the minimum indicated RCS flow rate to 206,000 gpm resulting from the removal of the steam generator orifice plates in 1998.

The Framatome ANP analysis was performed using the DNBR methods (Reference 10.3) described in the current XCOBRA-IIIC methodology and event-specific guidelines described in Reference 10.4. This NRC-approved methodology is currently used for safety analyses at Robinson Unit 2, Shearon Harris, St. Lucie Units 1 and 2, and Millstone Unit 2 plants.

10.0 REFERENCES

10.1 Letter from NRC (L. R Wharton) to OPPD (S. K. Gambhir), "Fort Calhoun Station, Unit No. 1 Issuance of Amendment Re: Reactor Coolant System Flow Rate (TAC NO. MA5318)," dated October 6, 1999 (NRC-99-145)

10.2 Letter from OPPD (W. G. Gates) to NRC (Document Control Desk), "Application for Amendment of Facility Operating License No. DPR-40," dated March 31, 1999 (LIC-99-0031)

10.3 XN-75-21(P)(A) Revision 2, "XCOBRA-IIIC, A Computer Code to Determine the Distribution of Coolant During Steady-State and Transient Core Operation," Exxon Nuclear Company, dated January 1986

10.4 EMF-2062(P), "Guidelines for PWR Safety Analysis," Siemens Power Corporation

10.5 OPPD-NA-8301, Revision 6, "Reload Core Analysis Methodology Overview," dated December 1994 (TAC No. M89455)

10.6 OPPD-NA-8302, Revision 4, "Reload Core Analysis Methodology, Neutronics Design Methods and Verification," dated December 1994 (TAC No. M89456)

10.7 OPPD-NA-8303, Revision 4, "Reload Core Analysis Methodology, Transient and Accident Methods and Verification," dated January 1993 (TAC No.M85845)

10.8 EMF-2087(P)(A), Revision 0, "SEM/PWR-98: ECCS Evaluation Model for PWR LBLOCA Applications," dated June 1999

10.9 XN-NF-82-49(P)(A), Supplement 1, Revision 1, "Exxon Nuclear Company Evaluation Model Revised WEM PWR Small Break Model," dated December 1994