

May 20, 2005

Mr. R. T. Ridenoure
Division Manager - Nuclear Operations
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Fort Calhoun Station FC-2-4 Adm.
Post Office Box 550
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SUBJECT: FORT CALHOUN STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT
RE: (TAC NO. MC3217)

Dear Mr. Ridenoure:

The Commission has issued the enclosed Amendment No. 235 to Renewed Facility Operating License No. DPR-40 for the Fort Calhoun Station, Unit No. 1. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated May 21, 2004, as supplemented by letters dated September 16, and December 14, 2004.

The amendment adds information to the TS Bases. Changes to the TS Bases are normally controlled by TS 5.20, "Technical Specifications (TS) Bases Control Program," and not required to be reviewed and approved by the staff. However, OPPD requested an amendment because the manual operator actions are being substituted for automatic actions which does require NRC review and approval which changes the design basis of the plant. This amendment is approved for Cycles 23 and 24 only.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Alan B. Wang, Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-285

Enclosures: 1. Amendment No. 235 to DPR-40
2. Safety Evaluation

cc w/encls: See next page

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OMAHA PUBLIC POWER DISTRICT

DOCKET NO. 50-285

FORT CALHOUN STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 235
License No. DPR-40

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Omaha Public Power District (the licensee) dated May 21, 2004, as supplemented on September 16, and December 14, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 235, Renewed Facility Operating License No. DPR-40 is amended to authorize revision to the Technical Specifications Basis, as set forth in the application for amendment by the licensee dated May 21, 2004, as supplemented by letters dated September 16, and December 14, 2004. The licensee shall update the TS Basis to incorporate the revision to the basis to reflect the use of manual operator actions in lieu of automatic actions, as described in the amendment application of May 21, 2004, and the staff Safety Evaluation attached to this amendment.
3. The license amendment is effective as of its date of issuance and shall be implemented within 120 days of issuance. This amendment is approved for Cycles 23 and 24 only.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert A. Gramm, Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: May 20, 2005

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 235 TO RENEWED FACILITY

OPERATING LICENSE NO. DPR-40

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION, UNIT NO. 1

DOCKET NO. 50-285

1.0 INTRODUCTION

By application dated May 21, 2004 (available in the Agencywide Documents Access System (ADAMS) under Accession No. ML041460311), as supplemented by letters dated September 16 (ADAMS Accession No. ML042610390), and December 14, 2004 (ADAMS Accession No. ML043490140), Omaha Public Power District (OPPD/the licensee) requested changes to the Technical Specifications (Appendix A to Renewed Facility Operating License No. DPR-40) for the Fort Calhoun Station, Unit No. 1 (FCS). The additional information provided in the supplemental letters dated September 16, and December 14, 2004, did not expand the scope of the application as noticed and did not change the Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination published in the *Federal Register* on June 22, 2004.

OPPD requested a license amendment which would revise the FCS Technical Specification (TS) Bases to include securing all but one containment spray pump following a loss-of-coolant accident (LOCA) when certain conditions are satisfied. The TS Bases changes are normally controlled by TS 5.20, "Technical Specifications (TS) Bases Control Program," and not required to be reviewed and approved by the staff. However, OPPD requested an amendment because the manual operator actions are being substituted for automatic actions (a change to the design basis of the plant) which requires NRC review and approval. This action would be beneficial in reducing the risk of core damage due to the blockage of the suction screens surrounding the sump from which the emergency core cooling system (ECCS) pumps take suction in the recirculation phase of the postulated LOCA. The blockage is assumed to be caused by LOCA-generated debris such as damaged thermal insulation. OPPD has requested that this license amendment be in effect only for the remainder of Cycle 22 and all of Cycles 23 and 24.

2.0 BACKGROUND

NRC Bulletin 2003-01 (Reference 1) described the potential for the screens surrounding ECCS sumps to become clogged with debris generated by the pipe break initiating the LOCA. The bulletin requested that pressurized water reactor licensees analyze the adverse effects of this debris on the recirculation function of the ECCS. It also requested that licensees describe the

implementation of any interim compensatory measures to reduce the risk of degraded performance of the ECCS.

The Westinghouse Owners Group report WCAP-16204 (Reference 2) described possible interim actions. One of the proposed actions is shutting off the containment spray pumps following the LOCA. The FCS licensee proposes to terminate spray flow from all but one containment spray pump. The licensee states that this compensatory action has the advantage of reducing the potential for sump blockage, delaying the time to the recirculation actuation signal (RAS) and maintaining an operable containment spray (CS) pump. The licensee states that:

The containment spray flow rate is a significant portion of the total flow rate from the Safety Injection and Refueling Water Tank (SIRWT). Extending the time during which water from the SIRWT can be utilized is advantageous since the SIRWT is free from debris.

The FCS post-accident containment cooling function is performed by the containment spray system and the containment fan coolers. The containment spray system consists of three pumps and two shutdown cooling heat exchangers. The FCS TSs require that all three pumps are operable when in operating Modes 1, 2, 3, and 4. The FCS licensing basis credits only one of these pumps to limit the post-LOCA containment pressure to less than the design pressure. No credit is taken for the containment fan coolers in the LOCA analysis.

There are two redundant containment fan coolers. Although they are not credited in the design-basis LOCA analysis, they initiate on Containment High Pressure and Low/Low Pressurizer Pressure signals (TSs Table 2-1).

The licensee states that securing all but one containment spray pump would be done only if certain conditions are satisfied, as discussed in the technical evaluation section below.

The licensee states that the operator's action of securing all but one containment spray pump is assumed to occur prior to the RAS. Estimating the time required to carry out other actions called for by the emergency operating procedures prior to securing containment spray, the licensee estimates that this action will not occur prior to ten minutes after initiation of the LOCA.

The licensee discusses the actions necessary to secure the containment spray pumps. These actions are relatively simple and the operators are trained on the method of securing the containment spray pumps and the criteria for their termination (Reference 1).

To implement this change, the licensee proposes to add the following to the Basis of TS 2.4:

During a LOCA, excess CS pumps may be secured indefinitely such that only one pump and one header of CS remain in service provided the following conditions are met:

- 1) At least two CS [containment spray] pumps are operating normally and delivering a design flow rate prior to securing the excess CS pump(s);
- 2) Containment pressure is < 60 psig and NOT increasing;

- 3) Containment temperature is < 288°F and NOT increasing;
- 4) VA-3A, VA-3B, VA-7C, and VA-7D [containment fan coolers] and associated cooling units are operating; and
- 5) SI has actuated and is delivering flow within the flow delivery curves in Emergency Operating Procedure (EOP)/Abnormal Operating Procedure (AOP) Attachment 3.

The above containment pressure and temperature conditions indicate an excess of CS flow than what is required to maintain containment pressure and temperature control. A single CS pump is capable of meeting the design basis function for accident mitigation. Verifying that at least two CS pumps are operating, and that both trains of CFCs are in operation, indicates that maximum containment cooling has been provided following occurrence of the LOCA. Verifying that SI flow has been maintained within the delivery curves ensures that significant core damage has not occurred and that a significant source term does not exist inside the containment. This allowance applies only to the remainder of Cycle 22 and all of Cycles 23 and 24. ⁽¹²⁾

- (12) Report WCAP-16204, "Evaluation of Potential ERG [emergency response guideline] and EPG [emergency procedure guideline] Changes to Address NRC Bulletin 2003-01 Recommendations (PA-SEE-0085)

3.0 REGULATORY EVALUATION

The FCS received its construction permit on June 7, 1968. Since this is prior to the issuance of the General Design Criteria (GDC) of 10 CFR Part 50 Appendix A, these GDC are not applicable to the FCS. Appendix G to the FCS Updated Safety Analysis Report contains the applicable criteria for the FCS. The FCS Design Criterion 52, "Containment Heat Removal Systems," states:

Where active heat removal systems are needed under accident conditions to prevent exceeding containment design pressure, at least two systems, preferably of different principles, each with full capacity, shall be provided.

Both the containment spray and the containment fan coolers would remain in operation with this proposed change to the Bases. The TS Bases changes are normally controlled by TS 5.20, "Technical Specifications (TS) Bases Control Program," and not required to be reviewed and approved by the staff. However, OPPD requested an amendment because the manual operator actions are being substituted for automatic actions (a change to the design basis of the plant) which requires NRC review and approval.

4.0 TECHNICAL EVALUATION

The design-basis containment analysis for the peak containment pressure following a LOCA, described in the Updated Final Safety Analysis Report, Section 14.16, assumes one operable containment spray pump and does not credit the containment fan coolers. Thus, the licensee's proposal is conservative with respect to this design-basis analysis.

4.1 Human Factors Engineering

The staff's review is based on an adaptation of existing NRC review guidance for human factors engineering as found primarily in NUREG-800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Chapter 18.0, "Human Factors Engineering," (Revision 1, February 2004).

Using the review guidance and acceptance criteria in NUREG-0800, Chapter 18.0, "Human Factors Engineering," the staff evaluated the licensee's safety analysis in support of its proposed request for a change to its operating license involving crediting manual operator actions. This change requires regulatory approval because manual operator action will be required to stop two of the three pumps that started in response to a Containment Spray Actuation Signal. If a single active failure occurs that results in failure of the operating pump, a manual action is required to restart one of the two pumps that were previously shut off. Therefore, the licensee submitted this change because manual actions are being substituted for automatic actions. As previously indicated in this safety evaluation, the licensee states that the operator's action of securing all but one containment spray pump is assumed to occur prior to the RAS. Estimating the time required to carry out other actions called for by the emergency operating procedures prior to securing containment spray, the licensee estimates that this action will not occur prior to ten minutes after initiation of the LOCA. In addition, the proposed compensatory actions are only taken following a LOCA if all safeguards have functioned and if an excess of CS flow exists above that required to control containment pressure, temperature, and remove the accident source term. The proposed actions are only taken if the worst-case single failure has not occurred indicating maximum containment cooling and safety injection cooling delivered, and a minimum source term due to no severe core damage.

The licensee discusses the actions necessary to secure the containment spray pumps. These actions are relatively simple and the operators are trained on the method of securing the containment spray pumps and the criteria for their termination.

The licensee used the American National Standards Institute/American Nuclear Society (ANSI/ANS) 58.8, "Time Response Design Criteria for Safety-Related Operator Actions" (1994), and WCAP-14966, "ERG Operator Response Time Assessment Program Final Report," to evaluate operator action times for various proposed compensatory manual actions. In the licensee's December 14, 2004 response to the staff's request for additional information, the licensee indicated that all compensatory actions are taken from the control room and that the only action needed to reduce to the one Containment Spray Pump is to take the control switches in the control room to the "pull-to-lock" position. There are no additional actions needed to be taken by operators outside the control room.

In its May 24, 2004 amendment request, the licensee indicated that the estimated time for operators to take all the required actions that terminate the CS pumps is approximately four minutes. The licensee further stated that the emergency operating procedures do not direct these actions until other, more time restrictive actions such as post trip actions, safety function status checks, or tripping of the reactor coolant pumps are performed. However, the required actions (i.e., to terminate the CS pumps) are intended to be taken as soon as possible and prior to the RAS. The staff requested the licensee to clarify aspects associated with terminating one

train of CS. In its December 14, 2004 response, the licensee stated that though it preferred that the action to terminate to one CS train takes place prior to RAS, to provide the benefit of delaying time until switchover to the sump; it is not critical. Other benefits of reducing CS flow are the reduction in debris transport to the sump once RAS switchover has occurred and the preservation of a CS pump for use in later mitigation strategies. If the action is not completed before the RAS switchover, then it is taken as soon as practicable thereafter. There is no impact on accident mitigation if the CS pumps are stopped after RAS since the goal of stopping the excess CS pumps is preserving a CS pump for use in later mitigation strategies.

The licensee further stated that it is assumed that operators can accomplish the more restrictive actions (e.g., post trip actions, safety function status checks, or tripping of the reactor coolant pumps) in 10 minutes. Assuming 20 minutes to RAS, this allows 10 minutes for operators to reduce to one CS train, by using simple actions taken from the control room. The time to RAS does vary with break size. For a Large Break LOCA, with the Safety Injection Refueling Water Storage Tank at minimum technical specification level and all pumps (three CS pumps, three high pressure safety injection pumps (HPSI) and two low pressure safety injection pumps (LPSI)) running at full capacity, the time to RAS switchover is approximately 20 minutes. For smaller breaks, where HPSI and LPSI pumps do not operate at maximum capacity, the time to RAS will be delayed.

Based on a comparison of the staff's guidance and review criteria for reviewing changes to human actions contained in NUREG-0800, Chapter 18.0, "Human Factors Engineering," to the information provided by the licensee in its analysis of crediting manual actions, the staff finds the licensee's proposed crediting of manual actions is acceptable.

4.2 Peak Cladding Temperature

The design-basis calculation of the minimum containment pressure, which is part of the calculation of the peak cladding temperature following a large break LOCA, assumes that all three containment spray pumps and both fan cooler trains are in operation (Reference 1). This is consistent with Branch Technical Position CSB 6-1 in Section 6.2.15 of the Standard Review Plan. Since it assumes that all containment spray pumps are running, this analysis is not consistent with the licensee's proposal. This inconsistency, however, is acceptable because the minimum pressure calculation serves a different purpose. The assumption of all containment heat removal systems in operation maximizes the peak cladding temperature. Having one containment spray pump in operation would reduce the calculated peak cladding temperature by increasing the containment pressure which increases the water flow through the core. Therefore, the licensee's minimum containment pressure calculation remains conservative and acceptable with approval of this license amendment.

4.3 Radiological Consequences

The calculation of the radiological dose consequences following a large break LOCA assumes one containment spray pump in operation. Thus, the licensee's proposal is consistent with this design-basis analysis.

4.4 Containment Spray Operaton

The licensee has stated that all but one spray pump will be secured only if the five conditions listed in Section 2.0 are satisfied.

The NRC staff finds these conditions to be acceptable since they ensure adequate core and containment cooling is maintained, consistent with the safety analyses and the emergency or abnormal operating procedures following the LOCA.

The FCS containment spray system and the containment fan cooler system must satisfy the single failure criterion. Verifying that at least two spray pumps are operating and both trains of fan coolers are operating prior to securing all but one containment spray pump ensures that the required redundancy is maintained.

If only two of the three spray pumps started, this would be a single failure and one of the two remaining pumps would be secured. Alternatively, assuming that all three spray pumps start and the operator secured two of these pumps, failure of the operating containment spray pump would constitute the single failure in this analysis. Failure of the operating spray pump would require starting the single secured pump or one of the two pumps which had been secured. Failure of one of these pumps to re-start would be a second failure. Since a design basis analysis must only consider a single failure, failure of a secured pump to re-start does not have to be considered to satisfy the single failure criterion. The licensee did state, however, that there is reasonable assurance that a secured pump would restart because:

- (i) the thermal transient due to CS flow being stopped and restarted is not expected to exceed the thermal transient limits for the CS pumps;
- (ii) restarting a secured CS pump will not exceed the duty cycle limits for the pump motors or major electrical components;
- (iii) restart of the secured CS pump will not result in emergency bus loading concerns;
- (iv) the likelihood of air binding of the pumps is low based on the fact that the pumps are secured prior to experiencing net positive suction head (NPSH) or air ingestion concerns and a sufficient head of water exists above the pump suctions to prevent air introduction into the pumps during the period they are secured; and
- (v) in order to take the compensatory measure of reducing to one the number of CS pumps, it is required that the CS pumps start and run properly at the onset of the event. (Reference 1)

In addition, as stated above, the licensee states that the heat removal capacity of the FCS containment fan coolers exceeds the capacity of the containment spray system operating with only one pump and one header. Thus, even if a secured containment spray pump could not be restarted, adequate containment cooling is assured.

Thus, the licensee's proposal is acceptable with respect to the single failure criterion from both a regulatory and a safety perspective.

The licensee also considered the radiological consequences of securing all but one containment spray pump. The licensee states that since all but one containment spray pump would not be secured unless there was adequate safety injection, and adequate safety injection implies adequate core cooling, there would not be a significant radiological source term following the large break LOCA. In addition, the licensee's large break LOCA radiological dose analysis assumes one containment spray pump is in operation, which is consistent with the licensee's proposal. Therefore, the licensee's dose analysis remains valid.

The licensee's proposal ensures adequate core and containment cooling and no change to the assumptions of the radiological dose analysis. Therefore, the licensee's proposal complies with the FCS General Design Criterion 52 and is acceptable.

The NRC has reviewed the licensee's request for revising the licensing and design basis as described in the FCS TS Bases to include securing all but one containment spray pump following a LOCA. OPPD has requested that this license amendment be in effect only for the remainder of Cycle 22 and all of Cycles 23 and 24, as the licensee expects to complete the implementation of the requested actions of Generic Letter 2004-02 (Reference 3) by then. The NRC staff finds this request for the actions necessary to secure the containment spray pumps to be acceptable with respect to proposed operator manual actions. This amendment is approved for Cycles 23 and 24 only, as Cycle 22 has been completed.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Nebraska State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (69 FR 34703, published on June 22, 2004). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (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 or to the health and safety of the public.

7.0 REFERENCES

1. Ridenoure, Ross T., Vice President, Omaha Public Power District, to the US NRC, "Response to Request for Additional Information Regarding License Amendment Request, 'Incorporation of Allowance to Secure Containment Spray Pumps During a Loss-of-Coolant Accident to Minimize the Potential for Containment Sump Clogging,'" September 16, 2004.
2. WCAP-16204, "Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01."
3. US NRC, Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," September 13, 2004.

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Date: May 20, 2005

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