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March 27, 2002  
LIC-02-0031

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Reference: Docket No. 50-285

**SUBJECT: Fort Calhoun Station Unit No. 1 License Amendment Request,  
"Revision of the High Power Trip Setpoint"**

Pursuant to 10 CFR 50.90, Omaha Public Power District (OPPD) hereby requests the following amendment to Technical Specification (TS) 1.3.1. The proposed amendment changes the Reactor Protective System High Power Level trip to 109.0% from the current 107.0% value.

Attachment 1 provides the No Significant Hazards Evaluation and the technical bases for this requested change to the Technical Specifications. Attachments 2 and 3 contain a marked-up and clean version reflecting the requested Technical Specification and Basis changes.

In order to help alleviate difficulties experienced with hot leg flow streaming anomalies, OPPD requests approval of the proposed amendment by May 31, 2002, to be available for 100% power operation following the Spring 2002 Refueling Outage. The Spring 2002 Refueling Outage is planned to end and power operation begin on May 31, 2002. Once approved, the amendment shall be implemented by June 5, 2002.

I declare under penalty of perjury that the foregoing is true and correct. (Executed on March 27, 2002)

*Pool*

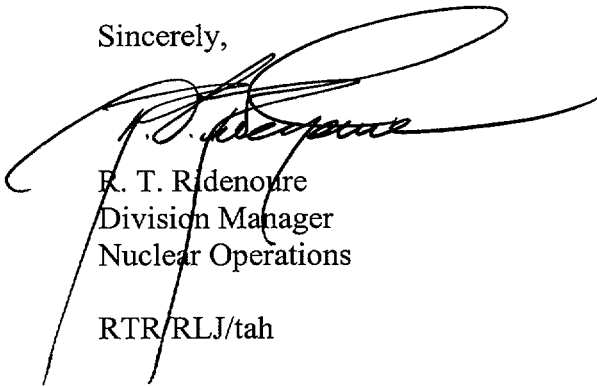
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If you have any questions or require additional information, please contact Dr. R. L. Jaworski of my staff at 402-533-6833.

Sincerely,



R. T. Ridenoure  
Division Manager  
Nuclear Operations

RTR/RLJ/tah

Attachments

1. Fort Calhoun Station's Evaluation for Amendment of Operating License
2. Mark-up of Technical Specifications
3. Clean Version of Technical Specifications

c: E. W. Merschoff, NRC Regional Administrator, Region IV  
A. B. Wang, NRC Project Manager  
W. C. Walker, NRC Senior Resident Inspector  
Division Administrator, Public Health Assurance, State of Nebraska  
Winston & Strawn

**Fort Calhoun Station's Evaluation  
For  
Revision of The Reactor Protective System High Power Trip Setpoint**

- 1.0 INTRODUCTION
- 2.0 DESCRIPTION OF PROPOSED AMENDMENT
- 3.0 BACKGROUND
- 4.0 REGULATORY REQUIREMENTS & GUIDANCE
- 5.0 TECHNICAL ANALYSIS
- 6.0 REGULATORY ANALYSIS
- 7.0 NO SIGNIFICANT HAZARDS CONSIDERATION (NSHC)
- 8.0 ENVIRONMENTAL CONSIDERATION
- 9.0 PRECEDENCE
- 10.0 REFERENCES

## 1.0 INTRODUCTION

This letter is a request to amend Operating License DPR-40 for the Fort Calhoun Station (FCS) Unit No. 1.

The Omaha Public Power District (OPPD) proposes to change the maximum Allowable Value of the Reactor Protective System (RPS) Variable High Power Trip (VHPT) Setpoint to 109.0% power from 107.0% power. This change is being proposed to improve the ability of the plant to respond to conditions caused by “flow streaming anomalies” that impact the measurement of reactor power by the Delta-T method and prevent unnecessary and invalid safety system challenges.

The discussion that follows uses the following terms as herein defined:

Analytical Limit – Limit of a measured or calculated variable established by the safety analysis to ensure that a safety limit is not exceeded. This limit will not be affected by this proposed amendment.

Allowable Value – The limiting value that a trip setpoint may have when tested periodically, beyond which appropriate action shall be taken. This is the limit specified in Technical Specifications.

## 2.0 DESCRIPTION OF PROPOSED AMENDMENT

The proposed changes are: 1) revision of the Trip Setpoints column in Table 1-1 (RPS Limiting Safety System Settings) for trip Number 1 (High Power Level 4-Pump Operation) from 107.0% to 109.0%, and 2) revision of the text describing the High Power Trip initiation in Section 1.3 (1) Basis, from 107.0% to 109.0%.

## 3.0 BACKGROUND

This change in trip setpoints is being performed to lessen the possibility of an invalid trip from the hot leg flow streaming anomaly which is characterized by an indicated power increase on two of the reactor protection system (RPS) channels without an actual increase in core power. At Fort Calhoun, this effect was initially observed once in September 1989 and has only recently reoccurred, six times so far during the current cycle (Cycle 20).

Hot Leg Streaming refers to the temperature non-uniformity in the reactor hot leg. It is the difference between a resistance temperature detector (RTD) measurement and the average hot leg temperature. As a result of the September 1989 flow steaming event Combustion Engineering prepared a report for Fort Calhoun Station. The report summarized that temperature shifts at the hot leg stations may be caused by a flow pattern rotation or change. The temperatures in the hot leg

pipe are not uniform since complete mixing does not take place in the upper guide structure. In general the fluid from the central portion of the core, usually high power bundles, exits near the top of the pipe while cooler flow from the core periphery exits along the bottom of the hot leg pipe. The temperature distribution in the hot leg pipe is therefore a function of the core power distribution. The 1989 flow streaming event and subsequent events during Cycle 20 which occurred on June 14<sup>th</sup>, November 29<sup>th</sup> and December 30<sup>th</sup> in 2001, and January 25<sup>th</sup>, February 11<sup>th</sup>, and February 26<sup>th</sup> in 2002 correlate with other flow streaming events during initial startup of ANO-2, and SONGS-3, startup of Cycle 5 at St Lucie and startup of Cycle 10 at Millstone-2.

Fort Calhoun Station has been operating with an Analytical Limit of 112.0% on the High Power Trip since the beginning of plant operation in 1973. The High Power Trip uncertainty in the original FSAR was listed as 5.5% necessitating a setpoint of 106.5%. The current setpoint for the High Power Trip is 107.0% with a calculated uncertainty of 2.32%. This leaves an available margin of 2.68% to the 112.0% Analytical Limit. The 2.68% was used as the bounding transient allowance between the actual and measured core power levels, better known as Transient Power Decalibration (TPD).

Advances in transient analysis codes and technology have allowed a direct modeling of the TPD so that it can be modeled as a transient-specific effect and not an allowance for all events. Changes in the measured core power as an input to the simulated reactor trip are now in the transient analysis models. (References 10.1 and 10.2) These methods have been approved for use at the Fort Calhoun station and are listed in Tech. Spec. 5.9.5. (Reference 10.3)

This change would use 2% of the available 2.68% margin to raise the high power trip setpoint to 109.0%. The Analytical Limit, used in the Transient Analysis (Reference 10.1) will continue to be 112.0% with the TPD calculated during the simulation of the transients (Reference 10.2). The transient analysis results are then fed into the Framatome Statistical Setpoint codes to produce (or verify) the trip setpoints.

#### 4.0 REGULATORY REQUIREMENTS & GUIDANCE

The regulations that govern the high power trip are 10 CFR 50 Appendix A Criterion 10 and Criterion 20. Criterion 10 states: The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. Criterion 20 states: The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense

accident conditions and to initiate the operation of systems and components important to safety. Both of these criteria will be satisfied after the change to 109.0% for the high power trip setpoint is accomplished.

## 5.0 TECHNICAL ANALYSIS

### 5.1 Design Basis

A reactor trip (Trip Unit No. 1; TU-1) at high power level (neutron flux) is provided to prevent damage to the fuel resulting from reactivity excursions too rapid to be detected by pressure and temperature measurements. This "Nuclear Power" signal is derived from power range safety channels NI-005, NI-006, NI-007, and NI-008. The nuclear power signal is auctioneered with the thermal power signal (DELTA T) to provide a backup to the neutron flux signal for high power level trip. A reactor trip is initiated when the reactor power level reaches its setpoint.

The high power trip function is provided with a variable trip setpoint, an upper limit and a lower limit. The variable setpoint is derived from the measured power signal. Per Tech. Spec. Table 1-1 note , the trip setpoint is  $\leq 10\%$  above measured reactor power. As reactor power is increased, this setpoint can be reset by Operator action. The upper limit is in accordance with Tech. Spec. Table 1-1 for trip Number 1. The lower limit of  $\leq 20\%$  assures compliance with Note A to Tech. Spec. Table 1-1 by providing a trip setpoint that is  $\leq 10\%$  above measured power whenever reactor power is  $> 10\%$ .

The factors used in the calculation of trip setpoint uncertainty (currently 2.32%) for the upper limit of the VHPT are:

1. Calorimetric Power Measurement Uncertainty
2. Trip Bistable Drift
3. Trip Bistable Unit Accuracy
4. Trip Bistable Temperature Uncertainty
5. Trip Unit Calibration and Adjustment Uncertainties
6. Measurement and Test Equipment Uncertainty
7. Trip Reference Value Uncertainty
8. Power Auctioneer Uncertainty (Between  $\Delta T$  and NI Power)

The allowance for the total uncertainty in this trip will be the difference between the Analysis Value of 112.0% and the proposed Technical Specification Allowable Value of 109.0% or 3%. The additional margin of 0.68% is conservatively retained.

## 5.2 Risk Information

The proposed amendment does not involve application or use of risk-informed decisions. The risk to the health and safety of the public as a result of a change to the high power trip setpoint is minimal.

## 6.0 REGULATORY ANALYSIS

The proposed amendment to change the high power trip setpoint from 107.0% to 109.0% complies with the regulatory requirements in 10 CFR 50 Appendix A Criterion 10 and 20 by continuing to protect the fuel from exceeding the design basis limits.

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 or to the health and safety of the public.

## 7.0 NO SIGNIFICANT HAZARDS CONSIDERATION

OPPD has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) 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 change does not result in a high power trip setpoint that will cause the analysis value of 112.0% to be exceeded. There is no change in the analysis value of 112.0% for the high power trip setpoint used in the evaluation of the transients and accidents. All of the evaluated transients and accidents currently show acceptable results and will not be affected by this change. Changing the high power trip setpoint will not affect the probability of an accident, since that circuit is not a transient or accident initiator. The change to the setpoint will not change the failure possibilities for this circuit. The effect of the proposed change is the reduction in the probability of an undesired safety system challenge initiated by an erroneous high power trip during a flow streaming event.

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

Response: No.

The change to the RPS high power trip setpoint does not provide the possibility of the creation of a new or different type of accident. Changing the setpoint does not change the method of operation of the high power trip circuit or its expected response once the setpoint is reached. The trip will occur within previously analyzed limits.

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

Response: No.

The proposed setpoint change does not constitute a significant reduction in the margin of safety due to the fact that the transient and accident analyses contained in the Updated Safety Analysis Report have been evaluated using an analysis trip setpoint of 112.0% with the event initiated from the appropriate power level and have been shown to produce acceptable results.

The acceptance criteria used in the analysis have been developed for the purpose of use in design basis accident analyses such that meeting these limits demonstrates adequate protection of public health and safety. An acceptable margin of safety is inherent in these licensing limits. Therefore, the proposed changes do not involve a 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

The proposed amendment is confined to administrative procedures or requirements related to the basis for applying uncertainty factors. The changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) for the following reasons:

- 1) As demonstrated in Section 7.0, the proposed amendment does not involve a significant hazards consideration.



- 2) The proposed amendment does not result in a significant change in the types or increase in the amounts of any effluents that may be released offsite. Also, the TS change does not introduce any new effluents or significantly increase the quantities of existing effluents. As such, the change cannot significantly affect the types or amounts of any effluents that may be released offsite.
- 3) The proposed amendment does not result in a significant increase in individual or cumulative occupational radiation exposure. The proposed change does not result in any physical plant changes. No new surveillance requirements are anticipated as a result of these changes that would require additional personnel entry into radiation controlled areas. Therefore, the amendment has no significant affect on either individual or cumulative occupational radiation exposure.

Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

## 9.0 PRECEDENCE

NRC review of a request for a change to the Palisades Plant Technical Specification for the maximum allowed value for variable high power trip is in progress. (TAC No. MB3326)

## 10.0 REFERENCES

- 10.1 EMF-2310(P)(A) Rev. 0 "SRP Chapter 15 Non-LOCA Methodology for Pressurized Water Reactors", May 2001, by Framatome ANP Richland, Inc.
- 10.2 EMF-1961(P)(A) Rev. 0 "Statistical Setpoint/Transient Methodology for Combustion Engineering Type Reactors", July 2000, by Framatome ANP Richland, Inc.
- 10.3 Letter from NRC (A. B. Wang) to OPPD (R. T. Ridenoure), dated March 4, 2002, "Fort Calhoun Station Unit No. 1- Issuance of Amendment - Addition of Topical Report References to TS 5.9.5, "Core Operating Limits Report" (TAC No. MB3449) (NRC-02-030)

Mark-up of Technical Specifications

## TECHNICAL SPECIFICATIONS

### 1.0 **SAFETY LIMITS AND LIMITING SAFETY SYSTEM SETTINGS**

#### 1.3 Limiting Safety System Settings, Reactor Protective System

##### Applicability

This specification applies to RPS Limiting Safety System settings and bypasses for instrument channels.

##### Objective

To provide for automatic protection action in the event that the principal process variables approach a safety limit.

##### Specification

The reactor protective system trip setting limits and the permissible bypasses for the instrument channels shall be within the Limiting Safety System Setting as stated in Table 1-1.

##### Basis

The reactor protective system consists of four instrument channels to monitor selected plant conditions which will cause a reactor trip if any of these conditions deviate from a preselected operating range to the degree that a safety limit may be reached.

- (1) High Power Level - A reactor trip at high power level (neutron flux) is provided to prevent damage to the fuel cladding resulting from some reactivity excursions too rapid to be detected by pressure and temperature measurements (in addition, thermal signals are provided to the high power level trip unit as a backup to the neutron flux signal).

During normal plant operation, with all reactor coolant pumps operating, reactor trip is initiated when the reactor power level reaches 109.0-107.0% of indicated full power. Adding to this the possible variation in trip point due to calibration and measurement errors, the maximum actual steady-state power at which a trip would be actuated is 112%, which was used for the purpose of safety analysis.<sup>(1)</sup> Provisions have been made to select different high-power level trip points for various combinations of reactor coolant pump operation as described below under "Low Reactor Coolant Flow".<sup>(2)</sup>

During reactor operation at power levels between 19.1% and 100% of rated power, the Variable High Power Trip (VHPT) will initiate a reactor trip in the event of a reactivity excursion that increases reactor power by 10% or less of rated power. The high power trip setpoint can be set no more than 10% of rated power above the indicated plant power. Operator action is required to increase the set point as plant power is increased. The setpoint is automatically decreased as power decreases.

TECHNICAL SPECIFICATIONS

TABLE 1-1

**RPS LIMITING SAFETY SYSTEM SETTINGS**

| <b><u>No.</u></b> | <b><u>Reactor Trip</u></b>                          | <b><u>Trip Setpoints</u></b>  |
|-------------------|---|---|
| 1                 | High Power Level (A)<br>4-Pump Operation            | $\leq 109.0-107.0\%$ of Rated Power   |
| 2                 | Low Reactor Coolant Flow (B)(F)<br>4-Pump Operation | $\geq 95\%$ of 4 Pump Flow  |
| 3                 | Low Steam Generator Water Level                     | 31.2% of Scale<br>(Top of feedwater ring; 4'10" below normal water level)   |
| 4                 | Low Steam Generator Pressure (C)                    | $\geq 500$ psia   |
| 5                 | High Pressurizer Pressure                           | $\leq 2400$ psia  |
| 6                 | Thermal Margin/Low Pressure (B)(F)                  | 1750 psia to 2400 psia<br>(depending on the reactor coolant temperature as shown in the Thermal Margin/Low Pressure 4 Pump Operation Figure provided in the COLR) |
| 7                 | High Containment Pressure (D)                       | $\leq 5$ psig   |
| 8                 | Axial Power Distribution (E)                        | (as shown in the Axial Power Distribution for 4 Pump Operation Figure provided in the COLR)   |
| 9                 | Steam Generator Differential Pressure               | $\leq 135$ psid   |

**Clean Version of Technical Specification**

## TECHNICAL SPECIFICATIONS

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##### Basis

The reactor protective system consists of four instrument channels to monitor selected plant conditions which will cause a reactor trip if any of these conditions deviate from a preselected operating range to the degree that a safety limit may be reached.

- (1) High Power Level - A reactor trip at high power level (neutron flux) is provided to prevent damage to the fuel cladding resulting from some reactivity excursions too rapid to be detected by pressure and temperature measurements (in addition, thermal signals are provided to the high power level trip unit as a backup to the neutron flux signal).

During normal plant operation, with all reactor coolant pumps operating, reactor trip is initiated when the reactor power level reaches 109.0% of indicated full power. Adding to this the possible variation in trip point due to calibration and measurement errors, the maximum actual steady-state power at which a trip would be actuated is 112%, which was used for the purpose of safety analysis.<sup>(1)</sup> Provisions have been made to select different high-power level trip points for various combinations of reactor coolant pump operation as described below under "Low Reactor Coolant Flow".<sup>(2)</sup>

During reactor operation at power levels between 19.1% and 100% of rated power, the Variable High Power Trip (VHPT) will initiate a reactor trip in the event of a reactivity excursion that increases reactor power by 10% or less of rated power. The high power trip setpoint can be set no more than 10% of rated power above the indicated plant power. Operator action is required to increase the set point as plant power is increased. The setpoint is automatically decreased as power decreases.

TECHNICAL SPECIFICATIONS

TABLE 1-1

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| <b><u>No.</u></b> | <b><u>Reactor Trip</u></b>                          | <b><u>Trip Setpoints</u></b>  |
|-------------------|---|---|
| 1                 | High Power Level (A)<br>4-Pump Operation            | ≤109.0% of Rated Power  |
| 2                 | Low Reactor Coolant Flow (B)(F)<br>4-Pump Operation | ≥95% of 4 Pump Flow   |
| 3                 | Low Steam Generator Water Level                     | 31.2% of Scale<br>(Top of feedwater ring; 4'10" below normal water level)   |
| 4                 | Low Steam Generator Pressure (C)                    | ≥500 psia   |
| 5                 | High Pressurizer Pressure                           | ≤2400 psia  |
| 6                 | Thermal Margin/Low Pressure (B)(F)                  | 1750 psia to 2400 psia<br>(depending on the reactor coolant temperature as shown in the Thermal Margin/Low Pressure 4 Pump Operation Figure provided in the COLR) |
| 7                 | High Containment Pressure (D)                       | ≤5 psig   |
| 8                 | Axial Power Distribution (E)                        | (as shown in the Axial Power Distribution for 4 Pump Operation Figure provided in the COLR)   |
| 9                 | Steam Generator Differential Pressure               | ≤135 psid   |