April 13, 1998

Mr. Garry L. Randolph
Vice President and Chief Nuclear Officer
Union Electric Company
Post Office Box 620
Fulton, Missouri 65251

SUBJECT: CALLAWAY PLANT - AMENDMENT NO. 125 TO FACILITY OPERATING LICENSE NO. NPF-30 (TAC NO. MA0177)

Dear Mr. Randolph:

The Commission has issued the enclosed Amendment No. 125 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. This amendment consists of changes to the Technical Specifications (TS) in response to your application dated October 31, 1997, as supplemented by your letter dated February 27, 1998.

The proposed TS amendment changes setpoint and allowable values of certain reactor trip system (RTS) and engineered safety features actuation system (ESFAS) functional units and also changes the associated Bases.

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

Sincerely,
Original Signed By
Barry C. Westreich, Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures: 1. Amendment No. 125 to NPF-42
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

UNION ELECTRIC COMPANY

CALLAWAY PLANT UNIT 1

DOCKET NO. 50-483

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 125
License No. NPF-30

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Callaway Plant Unit 1(the facility) Facility Operating License No. NPF-30 filed by the Union Electric Company (the Company), dated October 31, 1997, as supplemented by letter dated February 27, 1998, 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, as amended, 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, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. NPF-30 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 125 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. The license amendment is effective as of its date of issuance to be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Barry C. Westreich, Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: April 13, 1998

ATTACHMENT TO LICENSE AMENDMENT NO. 125

FACILITY OPERATING LICENSE NO. NPF-30

DOCKET NO. 50-483

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain marginal lines indicating the areas of change. The corresponding overleaf pages are also provided to maintain document completeness.

REMOVE	INSERT
2-4	2-4
2-5	2-5
2-5(a)	2-5(a)
2-7	2-7
2-8	2-8
2-9	2-9
2-10	2-10
3/4 3-12	3/4 3-12
3/4 3-25(a)	3/4 3-25(a)
3/4 3-25(b)	3/4 3-25(b)
3/4 3-25(d)	3/4 3-25(d)
3/4 3-25(e)	3/4 3-25(e)
B 2-3	B 2-3
B 2-5	B 2-5
B 2-6	B 2-6
B 2-6a	B 2-6a

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
1. Manual Reactor Trip	N.A.	N.A.	N.A.	N.A.	N.A
2. Power Range, Neutron Flux					
a. High Setpoint	7.5	4.56	0	≤109% of RTP*	≤112.3% of RTP*
b. Low Setpoint	8.3	4.56	0	≤25% of RTP*	≤28.3 of RTP*
3. Power Range, Neutron Flux, High Positive Rate	2.4	0.5	0	≤4% of RTP* with a time constant ≥2 seconds	≤6.3 of RTP* with a time constant ≥2 seconds
4. Deleted					
5. Intermediate Range, Neutron Flux	17.0	8.41	0	≤25% of RTP*	≤35.3 of RTP*
6. Source Range, Neutron Flux	17.0	10.01	0	≤10^5 cps	≤1.6×10^5 cps
7. Overtemperature ΔT	N.A.	N.A.	N.A.	See Note 1	See Note 2
8. Overpower ΔT	N.A.	N.A.	N.A.	See Note 3	See Note 4
9. Pressurizer Pressure-Low	5.0	2.21	2.0	≥1885 psig	≥1874 psig
10. Pressurizer Pressure-High	7.5	4.96	1.0	≤2385 psig	≤2400 psig
11. Pressurizer Water Level-High	8.0	2.18	2.0	≤92% of instrument span	≤93.8% of instrument span
12. Reactor Coolant Flow-Low	2.5	1.38	0.6	≥90% of loop minimum measured flow**	≥88.8% of loop minimum measured flow**

* RTP = RATED THERMAL POWER
** Minimum Measured Flow = 95,660 gpm

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
13. Steam Generator Water Level Low-Low					
a. Vessel ΔT Equivalent ≤12.41% RTP Vessel ΔT (Power 1)	N.A.	N.A.	N.A.	≤Vessel ΔT Equivalent to 12.41% RTP	≤Vessel ΔT Equivalent to 13.9% RTP
Coincident with Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥20.2% of Narrow Range Instrument Span	≥18.4% of Narrow Range Instrument Span
and					
Containment Pressure - Environmental Allowance Modifier	2.8	0.71	2.0	≤1.5 psig	≤2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥14.8% of Narrow Range Instrument Span	≥13.0% of Narrow Range Instrument Span
With a Time Delay, (t)				≤232 seconds	≤240 seconds

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
13. Steam Generator Water Level Low-Low (Continued)					
b. 12.41% RTP < Vessel ΔT Equivalent ≤ 22.41% RTP Vessel ΔT (Power 2)	N.A.	N.A.	N.A.	≤ Vessel ΔT Equivalent to 22.41% RTP	≤ Vessel ΔT Equivalent to 23.9% RTP
Coincident with					
Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥20.2% of Narrow Range Instrument Span	≥18.4% of Narrow Range Instrument Span
and					
Containment Pressure - Environmental Allowance Modifier	2.8	0.71	2.0	≤1.5 psig	≤2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥14.8% of Narrow Range Instrument Span	≥13.0% of Narrow Range Instrument Span
With a Time Delay. (t)				≤ 122 seconds	≤ 130 seconds

TABLE 2.2-1 (Continued)

TABLE NOTATIONS

NOTE 1: OVERTEMPERATURE ΔT

$$\Delta T \frac{(1+\tau_1 S)}{(1+\tau_2 S)} \left[\frac{1}{1+\tau_3 S}\right] \le \Delta T_o \left\{K_1 - K_2 \left[\frac{(1+\tau_4 S)}{(1+\tau_5 S)} T \left[\frac{1}{1+\tau_6 S}\right] - T'\right] + K_3(P - P') - f_1(\Delta I)\right\}$$

Where: ΔT	=	Measured ΔT;
$\frac{1+\tau_1 S}{1+\tau_2 S}$	=	Lead-Lag compensator on measured ΔT;
τ_1, τ_2	=	Time constants utilized in lead-lag compensator for $\Delta T, \tau_1 \geq 8s, \tau_2 \leq 3s$;
$\frac{1}{1+\tau_3 S}$	=	Lag compensator on measured ΔT;
τ_3	=	Time constant utilized in the lag compensator for ΔT, $\tau_3 = 0s$;
ΔT_0	=	Indicated ΔT at RATED THERMAL POWER;
K_1	=	1.1950;
K_2	=	0.0251/°F;
$\frac{1+\tau_4 S}{1+\tau_5 S}$	=	The function generated by the lead-lag compensator for T_{avg} dynamic compensation;
τ_4, τ_5	=	Time constants utilized in the lead-lag compensator for T_{avg}, $\tau_4 \geq 28s$, $\tau_5 \leq 4s$;
T	=	Average temperature,°F;
$\frac{1}{1+\tau_6 S}$	=	Lag compensator on measured T_{avg};
τ_6	=	Time constant utilized in the measured T_{avg} lag compensator, $\tau_6 = 0s$;

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 1: (Continued)

T'	≤	588.4°F (Referenced T_{avg} at RATED THERMAL POWER);
K_3	=	0.00116/psig;
P	=	Pressurizer pressure, psig;
P'	=	2235 psig (Nominal RCS operating pressure);
S	=	Laplace transform operator, s^{-1};

and $f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range neutron ion chambers; with gains to be selected based on measured instrument response during plant STARTUP tests such that:

(i) For $q_t - q_b$ between -21% and + 8%, $f_1(\Delta I) = 0$, where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER;

(ii) For each percent that $q_t - q_b$ is more negative than -21%, the ΔT Trip Setpoint shall be automatically reduced by 3.25% of its value at RATED THERMAL POWER; and

(iii) For each percent that the magnitude of $q_t - q_b$ exceeds +8%, the ΔT Trip Setpoint shall be automatically reduced by 2.973% of its value at RATED THERMAL POWER.

NOTE 2: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 1.23% of ΔT span (1.85% RTP).

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 3: OVERPOWER ΔT

$$\Delta T \frac{(1+\tau_1 S)}{(1+\tau_2 S)}\left[\frac{1}{1+\tau_3 S}\right] \le \Delta T_o \left\{K_4 - K_5 \left[\frac{\tau_7 S}{1+\tau_7 S}\right]\left[\frac{1}{1+\tau_6 S}\right] T - K_6\left[T\left[\frac{1}{1+\tau_6 S}\right] - T''\right] - f_2(\Delta I)\right\}$$

Where: ΔT	=	Measured ΔT;
$\frac{1+\tau_1 S}{1+\tau_2 S}$	=	Lead-Lag compensator on measured ΔT;
τ_1, τ_2	=	Time constants utilized in lead-lag compensator for ΔT, $\tau_1 \ge 8s$, $\tau_2 \le 3s$;
$\frac{1}{1+\tau_3 S}$	=	Lag compensator on measured ΔT;
τ_3	=	Time constant utilized in the lag compensator for ΔT, τ_3 = 0s;
ΔT_0	=	Indicated ΔT at RATED THERMAL POWER;
K_4	=	1.1073;
K_5	=	0.02/°F for increasing average temperature and 0 for decreasing average temperature;
$\frac{\tau_7 S}{1+\tau_7 S}$	=	The function generated by the rate-lag compensator for T_{avg} dynamic compensation;
τ_7	=	Time constant utilized in the rate-lag compensator for T_{avg}, $\tau_7 \ge 10s$;
$\frac{1}{1+\tau_6 S}$	=	Lag compensator on measured T_{avg};
τ_6	=	Time constant utilized in the measured T_{avg} lag compensator, τ_6 = 0s;

<u>TABLE 2.2-1 (Continued)</u>

<u>TABLE NOTATIONS (Continued)</u>

NOTE 3: (Continued)

K_6	=	0.0015/°F for $T > T''$ and $K_6 = 0$ for $T \leq T''$;
T	=	Average Temperature, °F;
T''	=	Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, ≤ 588.4°F);
S	=	Laplace transform operator, s^{-1}; and
$f_2(\Delta I)$	=	0 for all ΔI.

NOTE 4: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 1.21% of ΔT span (1.82% RTP).

TABLE 4.3-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL CALIBRATION	ANALOG CHANNEL OPERATIONAL TEST	TRIP ACTUATING DEVICE OPERATIONAL TEST	ACTUATION LOGIC TEST	MODES FOR WHICH SURVEILLANCE IS REQUIRED
18. Reactor Trip System Interlocks (Continued)						
d. Power Range Neutron Flux, P-10	N.A.	R(4)	R	N.A.	N.A.	1,2
e. Turbine Impulse Chamber Pressure, P-13	N.A.	R	R	N.A.	N.A.	1
19. Reactor Trip Breaker	N.A.	N.A.	N.A.	M (7, 11)	N.A.	1,2,3*,4*,5*
20. Automatic Trip and Interlock Logic	N.A.	N.A.	N.A.	N.A.	M(7)	1,2,3*,4*,5*
21. Reactor Trip Bypass Breaker	N.A.	N.A.	N.A.	M(17), R(18)	N.A.	1,2,3*,4*,5*

TABLE 4.3-1 (Continued)

TABLE NOTATIONS

* Only if the Reactor Trip System breakers happen to be closed and the Control Rod Drive System is capable of rod withdrawal.

The specified 18 month frequency may be waived for Cycle 1 provided the surveillance is performed prior to restart following the first refueling outage or June 1, 1986, whichever occurs first. The provisions of Specification 4.0.2 are reset from performance of this surveillance.

Below P-6 (Intermediate Range Neutron Flux interlock) Setpoint.

Below P-10 (Low Setpoint Power Range Neutron Flux interlock) Setpoint.

(1) If not performed in previous 31 days.

(2) Comparison of calorimetric to excore power indication above 15% of RATED THERMAL POWER. Adjust excore channel gains consistent with calorimetric power if absolute difference is greater than 2%. The provisions of Specification 4.0.4 are not applicable for entry into MODE 2 or 1.

(3) Single point comparison of incore to excore AXIAL FLUX DIFFERENCE above 15% of RATED THERMAL POWER. Recalibrate if the absolute difference is greater than or equal to 2%. The provisions of Specification 4.0.4 are not applicable for entry into MODE 2 or 1.

(4) Neutron detectors may be excluded from CHANNEL CALIBRATION.

(5) For Source Range detectors, integral bias curves are obtained, evaluated, and compared to manufacturer's data. For Intermediate Range and Power Range channels, detector plateau curves shall be obtained, evaluated, and compared to manufacturer's data. For the Intermediate Range and Power Range Neutron Flux channels the provisions of Specification 4.0.4 are not applicable for entry into MODE 2 or 1.

(6) Incore - Excore Calibration, above 75% of RATED THERMAL POWER. The provisions of Specification 4.0.4 are not applicable for entry into MODE 2 or 1. Determination of the loop specific vessel ΔT and T_{avg} values should be made when performing the Incore/Excore quarterly recalibration, under steady state conditions.

(7) Each train shall be tested at least every 62 days on a STAGGERED TEST BASIS. The TRIP ACTUATING DEVICE OPERATIONAL TEST shall independently verify the OPERABILITY of the Undervoltage and Shunt Trip Attachments of the Reactor Trip Breakers.

(8) Deleted

(9) Quarterly surveillance in MODES 3*, 4*, and 5* shall also include verification that permissives P-6 and P-10 are in their required state for existing plant conditions by observation of the permissive annunciator window. Quarterly surveillance shall include verification of the Boron Dilution Alarm Setpoint of less than or equal to an increase of 1.7 times the count rate within a 10-minute period.

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
5. Feedwater Isolation (Continued)					
b. Steam Generator Water Level-High-High	5.0	2.18	2.0	$\leq$ 78% of narrow range instrument span	$\leq$ 79.8% of narrow range instrument span
c. Safety Injection	See Item 1. above for all Safety Injection Trip Setpoints and Allowable Values.				
6. Auxiliary Feedwater					
a. Manual Initiation	N.A.	N.A.	N.A.	N.A.	N.A.
b. Automatic Actuation Logic and Actuation Relays (SSPS)	N.A.	N.A.	N.A.	N.A.	N.A.
c. Automatic Actuation Logic and Actuation Relays (BOP ESFAS)	N.A.	N.A.	N.A.	N.A.	N.A.
d. Steam Generator Water Level-Low-Low					

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
6. Auxiliary Feedwater (Continued)					
d. Steam Generator Water Level Low-Low (Continued)					
1) Start Motor-Driven Pumps					
a. Vessel ΔT Equivalent ≤ 12.41% RTP Vessel ΔT (Power-1)	N.A.	N.A.	N.A.	≤ Vessel ΔT Equivalent to 12.41% RTP	≤ Vessel ΔT Equivalent to 13.9% RTP
Coincident with					
Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥ 20.2% of Narrow Range Instrument Span	≥ 18.4% of Narrow Range Instrument Span
and					
Containment Pressure - Environmental Allowance Modifier	2.8	0.71	2.0	≤ 1.5 psig	≤ 2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥ 14.8% of Narrow Range Instrument Span	≥ 13.0% of Narrow Range Instrument Span
With a Time Delay, (t)				≤ 232 seconds	≤ 240 seconds

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
6. Auxiliary Feedwater (Continued)					
d. Steam Generator Water Level Low-Low (Continued)					
1) Start Motor-Driven Pumps (Continued)					
b. 12.41% RTP < Vessel ΔT Equivalent ≤ 22.41% RTP Vessel ΔT (Power-2)	N.A.	N.A.	N.A.	≤ Vessel ΔT Equivalent to 22.41% RTP	≤ Vessel ΔT Equivalent to 23.9% RTP
Coincident with					
Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥ 20.2% of Narrow Range Instrument Span	≥ 18.4% of Narrow Range Instrument Span
and					
Containment Pressure-Environmental Allowance Modifier	2.8	0.71	2.0	≤ 1.5 psig	≤ 2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥ 14.8% of Narrow Range Instrument Span	≥ 13.0% of Narrow Range Instrument Span
With a Time Delay, (t)				≤ 122 seconds	≤ 130 seconds

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
6. Auxiliary Feedwater (Continued)					
d. Steam Generator Water Level Low-Low (Continued)					
1) Start Motor-Driven Pumps (Continued)					
c. Vessel ΔT Equivalent > 20% RTP					
Coincident with					
Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥ 20.2% of Narrow Range Instrument Span	≥ 18.4% of Narrow Range Instrument Span
and					
Containment Pressure - Environmental Allowance Modifier	2.8	0.71	2.0	≤ 1.5 psig	≤ 2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥ 14.8% of Narrow Range Instrument Span	≥ 13.0% of Narrow Range Instrument Span

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
6. Auxiliary Feedwater (Continued)					
d. Steam Generator Water Level Low-Low (Continued)					
2) Start Turbine-Driven Pump					
a. Vessel ΔT Equivalent ≤ 12.41% RTP Vessel ΔT (Power-1)	N.A.	N.A.	N.A.	≤ Vessel ΔT Equivalent to 12.41% RTP	≤ Vessel ΔT Equivalent to 13.9% RTP
Coincident with					
Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥ 20.2% of Narrow Range Instrument Span	≥ 18.4% of Narrow Range Instrument Span
and					
Containment Pressure - Environmental Allowance Modifier	2.8	0.71	2.0	≤ 1.5 psig	≤ 2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥ 14.8% of Narrow Range Instrument Span	≥ 13.0% of Narrow Range Instrument Span
With a Time Delay, (t)				≤ 232 seconds	≤ 240 seconds

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
6. Auxiliary Feedwater (Continued)					
d. Steam Generator Water Level Low-Low (Continued)					
2) Start Turbine-Driven Pump (Continued)					
b. 12.41% RTP < Vessel ΔT Equivalent ≤ 22.41% RTP Vessel ΔT (Power-2)	N.A.	N.A.	N.A.	≤ Vessel ΔT Equivalent to 22.41% RTP	≤ Vessel ΔT Equivalent to 23.9% RTP
Coincident With					
Steam Generator Water Level Low-Low (Adverse Containment Environment)	20.2	17.58	2.0	≥ 20.2% of Narrow Range Instrument Span	≥ 1.4% of Narrow Range Instrument Span
and					
Containment Pressure - Environmental Allowance Modifier	2.8	0.71	2.0	≤ 1.5 psig	≤ 2.0 psig
OR					
Steam Generator Water Level Low-Low (Normal Containment Environment)	14.8	12.18	2.0	≥ 14.8% of Narrow Range Instrument Span	≥ 13.0% of Narrow Range Instrument Span
With a Time Delay, (t)				≤ 122 seconds	≤ 130 seconds

2.2.1 REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS

The Reactor Trip Setpoint Limits specified in Table 2.2-1 are the nominal values at which the Reactor trips are set for each functional unit. The Trip Setpoints have been selected to ensure that the core and Reactor Coolant System are prevented from exceeding their Safety Limits during normal operation and design basis anticipated operational occurrences and to assist the Engineered Safety Features Actuation System in mitigating the consequences of accidents. The Setpoint for a Reactor Trip System or interlock function is considered to be adjusted consistent with the nominal value when the "as measured" Setpoint is within the band allowed for calibration accuracy.

To accommodate the instrument drift assumed to occur between operational tests and the accuracy to which Setpoints can be measured and calibrated, Allowable Values for the Reactor Trip Setpoints have been specified in Table 2.2-1. Operation with Setpoints less conservative than the Trip Setpoint but within the Allowable Value is acceptable since an allowance has been made in the safety analysis to accommodate this error. An optional provision has been included for determining the OPERABILITY of a channel when its Trip Setpoint is found to exceed the Allowable Value. The methodology of this option utilizes the "as measured" deviation from the specified calibration point for rack and sensor components in conjunction with a statistical combination of the other uncertainties of the instrumentation to measure the process variable and the uncertainties in calibrating the instrumentation. In Equation 2.2-1, $Z + R + S \leq TA$, the interactive effects of the errors in the rack and the sensor, and the "as measured" values of the errors are considered. Z, as specified in Table 2.2-1, in percent span, is the statistical summation of errors assumed in the analysis excluding those associated with the sensor and rack drift and the accuracy of their measurement. TA or Total Allowance is the difference, in percent span, between the Trip Setpoint and the value used in the analysis for Reactor trip. R or Rack Error is the "as measured" deviation, in percent span, for the affected channel from the specified Trip Setpoint. S or Sensor Error is either the "as measured" deviation of the sensor from its calibration point or the value specified in Table 2.2-1, in percent span, from the analysis assumptions. Use of Equation 2.2-1 allows for a sensor drift factor, an increased rack drift factor, and provides a threshold value for REPORTABLE EVENTS.

The methodology to derive the Trip Setpoints is based upon combining all of the uncertainties in the channels. Inherent to the determination of the Trip Setpoints are the magnitudes of these channel uncertainties. Sensors and other instrumentation utilized in these channels are expected to be capable of operating within the allowances of these uncertainty magnitudes. Rack drift in excess of the Allowable Value exhibits the behavior that the rack has not met its allowance. Being that there is a small statistical chance that this will happen, an infrequent excessive drift is expected. Rack or sensor drift, in excess of the allowance that is more than occasional, may be indicative of more serious problems and should warrant further investigation.

REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS (Continued)

The various Reactor trip circuits automatically open the Reactor trip breakers whenever a condition monitored by the Reactor Trip System reaches a preset or calculated level. In addition to redundant channels and trains, the design approach provides a Reactor Trip System which monitors numerous system variables, therefore providing Trip System functional diversity. The functional capability at the specified trip setting is required for those anticipatory or diverse Reactor trips for which no direct credit was assumed in the safety analysis to enhance the overall reliability of the Reactor Trip System. The Reactor Trip System initiates a Turbine trip signal whenever Reactor trip is initiated. This prevents the reactivity insertion that would otherwise result from excessive Reactor Coolant System cooldown and thus avoids unnecessary actuation of the Engineered Safety Features Actuation System.

Manual Reactor Trip

The Reactor Trip System includes manual Reactor trip capability.

Power Range, Neutron Flux

In each of the Power Range Neutron Flux channels there are two independent bistables, each with its own trip setting used for a High and Low Range trip setting. The Low Setpoint trip provides protection during subcritical and low power operations to mitigate the consequences of a power excursion beginning from low power, and the High Setpoint trip provides protection during power operations to mitigate the consequences of a reactivity excursion from all power levels.

The Low Setpoint trip may be manually blocked above P-10 (a power level of approximately 10% of RATED THERMAL POWER) and is automatically reinstated below the P-10 Setpoint.

Power Range, Neutron Flux, High Positive Rate

The Power Range Positive Rate trip provides protection against rapid flux increases which are characteristic of a rupture of a control rod drive housing. Specifically, this trip complements the Power Range Neutron Flux High and Low trips to ensure that the criteria are met for rod ejection from mid-power.

Intermediate and Source Range, Neutron Flux

The Intermediate and Source Range, Neutron Flux trips provide core protection during reactor startup to mitigate the consequences of an uncontrolled rod cluster control assembly bank withdrawal from a subcritical condition. These trips provide redundant protection to the Low Setpoint trip of the Power Range, Neutron Flux channels. The Source Range channels will initiate a Reactor trip at about 10^5 counts per second unless manually blocked when P-6 becomes active. The Intermediate Range channels will initiate a Reactor trip at a current level equivalent to approximately 25% of RATED THERMAL POWER unless manually blocked when P-10 becomes active.

Overtemperature ΔT

The Overtemperature ΔT trip provides core protection to prevent DNB for all combinations of pressure, power, coolant temperature, and axial power distribution, provided that the transient is slow with respect to piping transit delays from the core to the temperature detectors, and pressure is within the range between the Pressurizer High and Low Pressure trips. The Setpoint is automatically varied with: (1) coolant temperature to correct for temperature induced changes in density and heat capacity of water and includes dynamic compensation for piping delays from the core to the loop temperature detectors, (2) pressurizer pressure, and (3) axial power distribution. With normal axial power distribution, this Reactor Trip limit is always below the core Safety Limit as shown in Figure 2.1-1. If axial peaks are greater than design, as indicated by the difference between top and bottom power range nuclear detectors, the Reactor trip is automatically reduced according to the notations in Table 2.2-1.

ΔT_0 and T', as used in the Overtemperature ΔT trip, represent the 100% RTP values as measured by the plant for each loop. For the startup of a refueled core, ΔT_0 is initially assumed at a value which is conservatively lower than the last measured 100% RTP ΔT_0 for each loop. Upon reaching 100% RTP, and during each quarterly Incore-Excore CHANNEL CALIBRATION thereafter, ΔT_0 and T' are adjusted to be consistent with measured values for each loop. This normalizes each loop's Overtemperature ΔT trip to the actual operating conditions existing at the time of measurement, thus forcing the trip to reflect the equivalent full power conditions as assumed in the accident analyses. These differences in vessel ΔT and T_{avg} can arise due to several factors, the most prevalent being measured RCS loop flows greater than Minimum Measured Flow, and slightly asymmetric power distributions between quadrants. While RCS loop flows are not expected to change with cycle life, radial power redistribution between quadrants may occur, resulting in small changes in loop specific vessel ΔT and T_{avg} values. Accurate determination of the loop specific vessel ΔT and T_{avg} values should be made when performing the Incore/Excore quarterly recalibration and under steady state conditions (i.e., power distributions not affected by Xe or other transient conditions).

The Allowable Value, as specified in Note 2 of Table 2.2-1, is associated with the uncertainties in the process rack electronics. The Allowable Value provides a criterion for assessing the OPERABILITY of the process rack portion of the protection channel. Deviations in excess of the Allowable Value are indicative of instrumentation problems and should therefore result in an investigation of the Overtemperature ΔT process rack OPERABILITY for the affected channel.

Overtemperature ΔT (Continued)

The time constants utilized in the lag compensation of measured ΔT, τ_3, and measured T_{avg}, τ_6, are set in the field at 0 seconds. This setting corresponds to the 7300 NLL cards used for lag compensation of these signals. Safety analyses that credit Overtemperature ΔT for protection must account for these field adjustable lag cards as well as all other first order lags (i.e., the combined RTD/thermowell) response time and the scoop transport delay and thermal lag). The safety analyses use a total first order lag of less than or equal to 6 seconds.

Overpower ΔT

The Overpower ΔT trip provides assurance of fuel integrity (e.g., no fuel pellet melting and less than 1% cladding strain) under all possible overpower conditions, limits the required range for Overtemperature ΔT trip, and provides a backup to the High Neutron Flux trip.

The Setpoint is automatically varied with: (1) coolant temperature to correct for temperature induced changes in density and heat capacity of water, and (2) rate of change of temperature for dynamic compensation for piping delays from the core to the loop temperature detectors, to ensure that the allowable heat generation rate (kW/ft) is not exceeded. The Overpower ΔT trip provides protection to mitigate the consequences of various size steam breaks as reported in WCAP-9226, "Reactor Core Response to Excessive Secondary Steam Releases."

ΔT_0 and T", as used in the Overpower ΔT trip, represent the 100% RTP values as measured by the plant for each loop. For the startup of a refueled core, ΔT_0 is initially assumed at a value which is conservatively lower than the last measured 100% RTP ΔT_0 for each loop. Upon reaching 100% RTP, and during each quarterly Incore-Excore CHANNEL CALIBRATION thereafter, ΔT_0 and T" are adjusted to be consistent with measured values for each loop. This normalizes each loop's Overpower ΔT trip to the actual operating conditions existing at the time of measurement, thus forcing the trip to reflect the equivalent full power conditions as assumed in the accident analyses. These differences in vessel ΔT and T_{avg} can arise due to several factors, the most prevalent being measured RCS loop flows greater than Minimum Measured Flow, and slightly asymmetric power distributions between quadrants. While RCS loop flows are not expected to change with cycle life, radial power redistribution between quadrants may occur, resulting in small changes in loop specific vessel ΔT and T_{avg} values. Accurate determination of the loop specific vessel ΔT and T_{avg} values should be made when performing the Incore/Excore quarterly recalibration and under steady state conditions (i.e., power distributions not affected by Xe or other transient conditions).

The Allowable Value, as specified in Note 4 of Table 2.2-1, is associated with the uncertainties in the process rack electronics. The Allowable Value provides a criterion for assessing the OPERABILITY of the process rack portion of the protection channel. Deviations in excess of the Allowable Value are indicative of instrumentation problems and should therefore result in an investigation of the Overpower ΔT process rack OPERABILITY for the affected channel.

Overpower ΔT (Continued)

The time constants utilized in the lag compensation of measured ΔT, τ_3, and measured T_{avg}, τ_6, are set in the field at 0 seconds. This setting corresponds to the 7300 NLL cards used for lag compensation of these signals. Safety analyses that credit Overpower ΔT for protection must account for these field adjustable lag cards as well as all other first order lags (i.e., the combined RTD/thermowell response time and the scoop transport delay and thermal lag). The safety analyses use a total first order lag of less than or equal to 6 seconds.

Pressurizer Pressure

In each of the pressurizer pressure channels, there are two independent bistables, each with its own Trip Setting to provide for a High and Low Pressure trip thus limiting the pressure range in which reactor operation is permitted. The Low Setpoint trip protects against low pressure which could lead to DNB by tripping the reactor in the event of a loss of reactor coolant pressure.

On decreasing power the Low Setpoint trip is automatically blocked by P-7 (a power level of approximately 10% of RATED THERMAL POWER with turbine impulse chamber pressure at approximately 10% of full power equivalent); and on increasing power, automatically reinstated by P-7.

The High Setpoint trip functions in conjunction with the pressurizer relief and safety valves to protect the Reactor Coolant System against system overpressure.

Pressurizer Water Level

The Pressurizer High Water Level trip is provided to prevent water relief through the pressurizer safety valves. On decreasing power the Pressurizer High Water Level trip is automatically blocked by P-7 (a power level of approximately 10% of RATED THERMAL POWER with a turbine impulse chamber pressure at approximately 10% of full power equivalent); and on increasing power, automatically reinstated by P-7.

Reactor Coolant Flow

The Low Reactor Coolant Flow trips provide core protection to prevent DNB by mitigating the consequences of a loss of flow resulting from the loss of one or more reactor coolant pumps.

On increasing power above P-7 (a power level of approximately 10% of RATED THERMAL POWER or a turbine impulse chamber pressure at approximately 10% of full power equivalent) an automatic Reactor trip will occur if the flow in more than one loop drops below 90% of nominal full loop flow. Above P-8 (a power level of approximately 48% of RATED THERMAL POWER) an automatic Reactor trip will occur if the flow in any single loop drops below 90% of nominal full loop flow. Conversely, on decreasing power between P-8 and P-7 an automatic Reactor trip will occur on low reactor coolant flow in more than one loop and below P-7 the trip function is automatically blocked.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 125 TO FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated October 31, 1997, as supplemented by letter dated February 27, 1998, Union Electric Company (the licensee) requested changes to the Technical Specifications (Appendix A to Facility Operating License No. NPF-30) for the Callaway Plant. The proposed changes would incorporate changes to setpoints and allowable values in TS Tables 2.2-1, 4.3-1 and 3.3-4, as well as their associated Bases. The proposed amendment is required by the licensee to preclude occurrences such as repeated alarms, rod blocks, and partial reactor trips that continue to occur during routine surveillance tests, especially during the beginning of cycle operation following refueling outages. The licensee stated that the proposed amendment besides reducing the potential for distracting operator attention away from more safety significant evolutions, will also eliminate the requirement to reduce power during surveillance testing in order to avoid reactor trips, since the channel being tested is placed in a tripped condition.

The February 27, 1998, supplemental letter provided additional clarifying information that did not change the initial no significant hazards consideration determination that was published in the Federal Register on January 14, 1998.

2.0 PROPOSED CHANGES AND EVALUATIONS

2.1. Column entries for the Total Allowance (TA), Z, and S setpoint terms for the Delta T functions are deleted.

2.1.1 The affected functional units in TS Table 2.2-1 are:

Functional Unit 7 - Over temperature Delta T (OTDT),
Functional Unit 8 - Overpower Delta T (OPDT),
Functional Unit 13.a - Steam Generator (SG) Water Level Low-Low Vessel Delta T (Power-1), and
Functional Unit 13.b - SG Water Level Low-Low Vessel Delta T (Power-2).

2.1.2 The following affected functional units in TS Table 3.3-4 are associated with the start of the auxiliary feedwater pumps upon SG Water Level Low-Low.

Functional Units 6.d.1).a and 6.d.2).a - Vessel Delta T (Power-1), and
Functional Units 6.d.1).b and 6.d.2).b - Vessel Delta T (Power-2).

Evaluation

In their submittal, the licensee stated that the optional Action b.1 of the current TS (CTS) 2.2.1 and 3.3.2 is not used anymore. Until the current TS to improved TS conversion is completed, the affected functional units will apply the CTS Action b.2. Action b.2 does not rely on TA, Z and S terms for entry. Therefore, there is no need to retain the TA, Z, and S setpoint terms in the CTS since they have meaning only in the context of the setpoint calculations. The staff concludes that the proposed revision is, therefore, acceptable.

2.2 Setpoint and allowable value changes.

2.2.1 The nominal trip setpoint (K1) for the OTDT trip function has been increased from 1.15 to 1.1950. The allowable value for the OTDT trip function has been increased by 1.93% Delta T span.

2.2.2 The nominal trip setpoint (K4) for the OPDT trip function has been increased from 1.09 to 1.1073. The allowable value for the Overpower Delta T trip function has been decreased by 0.03% Delta T span.

2.2.3 The nominal trip setpoints for the Vessel Delta T Power-1 and Power-2 portions of the SG Water Level Low-Low RTS and ESFAS trip functions have been increased by 2.41% of reactor thermal power (RTP).

2.2.4 Note 6 of Table 4.3-1 will be revised to change the word "value" to "values" and add words "and T_{avg}" between words "Vessel Delta T" and "values".

Evaluation

In their submittal, the licensee stated that implementation of the proposed TS modification will not affect assumptions of the safety analyses for any of the accidents previously evaluated, the protection systems will continue to function in a manner consistent with the plant design basis, and the overall protection system performance will remain within the bounds of the previously performed accident analyses.

The staff's review verified that the licensee's setpoint calculations (1) properly addressed all components of the instrument uncertainties, (2) were based on an acceptable methodology, and 3) properly addressed the margin between the TA and channel statistical allowance (CSA) so that it is not reduced significantly. Total allowance is the difference between the safety analysis limit (SAL) and the nominal trip setpoint, and the CSA is a total of the instrument channel's uncertainty.

The staff, through its request for additional information (RAI) dated January 20, 1998, requested the licensee to provide copies of the referenced setpoint calculations and clarifications of the "significant hazards evaluation." The licensee in their response to the staff's RAI provided clarifications relating to the calculation methodology used to calculate the proposed setpoint values and also provided tables containing the existing and new-calculated-values of setpoints and allowable values. The staff found the licensee's setpoint calculation methodology acceptable as it properly accounts for instrument uncertainty and margins in setpoint and allowable values.

In their response to the staff's RAI, the licensee stated that for the setpoint calculations, all terms of process measurement accuracy (PMA) were not eliminated, but only those terms which are relating to hot leg streaming and scoop streaming were treated using a fixed bias. The value of this bias was not calculated but was determined by operating experience during Cycle 8, which indicated that the streaming effect was unidirectional in nature. The resistance temperature detector (RTD) sensor drift and calibration accuracy error terms were not just eliminated but were treated differently by including (1) a power calorimetric term equal to 1.33% of delta T measurement span to account for the RTD calibration accuracy including measurement and test equipment (M&TE) terms, and (2) the additional burn down effects bias of 1.0^{0}F for Delta T measurement and of 0.5^{0}F for T_{avg} measurement to account for the RTD drift and hot leg streaming effects. The licensee further stated that the above biases are in addition to periodic re-normalization of each loop's parameters performed during quarterly surveillance to compensate for the RTD uncertainties. The licensee's explanation is acceptable as it provides justification for the capability of the instrument loop to properly respond to a demand if such a demand was placed on the system during the period between the two successive surveillance (i.e. just before the loop was to be re-normalized).

In their response to the RAI, the licensee also stated that in their past TS revisions, the PMA term for the OTDT function included an additional error component corresponding to the 2% value in the TS Table 4.3-1 Note 3. This note stipulates that if the absolute difference between incore and excore axial flux difference (AFD) is $\geq$ 2% during the monthly surveillance, the channel must be recalibrated. The licensee believes that this PMA term was overly conservative in that the setpoint margin is always used even when the AFD penalty function from TS Table 2.2-1 Note 1 is not imposed, i.e., when the AFD is within the deadband where no trip setpoint penalty is imposed. This PMA error component will no longer be treated as a random term in the CSA; rather, it will be applied as a bias only when the AFD is outside the deadband. AFD deadband is the band where the value of the setpoint penalty for the AFD function is taken as zero. The licensee justified elimination of the random PMA error component by moving the AFD penalty function deadband <u>in</u> by a corresponding 2% on both sides. Moving the deadband in by 2% shortens the deadband or requires the setpoint penalty to be taken sooner which is conservative. This is acceptable to the staff.

In their submittal, the licensee stated that the new setpoint calculation resulted in a reduced value of the rack drift error component as compared to what was previously assumed. Plant data supports this reduction. Also, the seismic allowance bias from the OTDT setpoint calculation was eliminated from the revised calculation. The seismic allowance was originally included by Westinghouse as a result of minor setpoint shifts in the Westinghouse 7300 Process Protection System NCH (Function Generator) and NPC (Potentiometer) cards observed during seismic qualification testing. However, the OTDT trip function is not required to provide plant protection coincident with any seismic events. Westinghouse had previously included this bias to account for the following sequence of events: (1) a less than an operating basis earthquake occurs for which no plant shutdown is required, (2) the potentiometer of the AFD penalty function card shifts introducing an additional unknown error in the instrument loop and, (3) with this potentiometer shift present, a subsequent plant transient occurs that requires OTDT protection. To support the elimination of the seismic bias and to protect against the sequence of events described above, the licensee revised the plant seismic response procedures for responding to any ground motion sufficient to actuate the seismic annunciators (> 0.01g). These revised procedures require a specific evaluation of the impact of ground motion on the AFD penalty function cards, to ensure that seismic-induced errors are not introduced. This is acceptable to the staff as it provides the necessary response to ensure proper instrument function following a seismic event.

2.3 Revise associated Bases sections, Tables, Notes and Surveillances to reflect the revised trip setpoints and revised allowable values.

Evaluation

The licensee's proposed modifications to the Bases, Notes and Surveillance requirements are consistent with the proposed setpoint and allowable value changes in the TS and are, therefore, acceptable to the staff.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. 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 (63 FR 2283). 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.

5.0 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.

Principal Contributor: S. V. Athavale

Date: April 13, 1998