

ATTACHMENT VI
PROPOSED TECHNICAL SPECIFICATION CHANGES

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. Power Range, Neutron Flux, High Negative 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
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 x 10 ⁵ cps
7. Overtemperature ΔT	7.2	3.50 3.40	2.72 2.49	See Note 1	See Note 2
8. Overpower ΔT	5.5	1.83 1.43	0.17 0.15	See Note 3	See Note 4
9. Pressurizer Pressure-Low	3.7	0.71	2.49	>1875 psig	>1866 psig
10. Pressurizer Pressure-High	7.5	0.71	2.49	<2385 psig	<2400 psig
11. Pressurizer Water Level-High	8.0	2.18	1.96	<92% of instrument span	<93.9% of instrument span

*RTP = RATED THERMAL POWER

**Loop design flow = 95,700 gpm

WOLF CRF - UNIT 1

2-4

Amendment No. 7, 20

TABLE 2.2-1 (Continued)

TABLE NOTATIONS

NOTE 1: OVERTEMPERATURE ΔT

$$\Delta T \frac{(1 + \tau_1 S)}{(1 + \tau_2 S)} \left(\frac{1}{1 + \tau_3 S} \right) \leq \Delta T_0 \{ K_1 - K_2 \frac{(1 + \tau_4 S)}{(1 + \tau_5 S)} [T \left(\frac{1}{1 + \tau_6 S} \right) - T'] + K_3(P - P') - f_1(\Delta T) \}$$

Where: ΔT = Measured ΔT by RID Manifold Instrumentation;

$\frac{1 + \tau_1 S}{1 + \tau_2 S}$ = lead-lag compensator on measured ΔT ;

τ_1, τ_2 = Time constants utilized in lead-lag compensator for ΔT , $\tau_1 = 8$ s,
 $\tau_2 = 3$ s;

$\frac{1}{1 + \tau_3 S}$ = lag compensator on measured ΔT ;

τ_3 = Time constant utilized in the lag compensator for ΔT , $\tau_3 = 0$ s;

ΔT_0 = Indicated ΔT at RATED THERMAL POWER;

K_1 = 1.10;

K_2 = 0.0137/°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} , $\tau_4 = 28$ s,
 $\tau_5 = 4$ s;

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, $\tau_6 = 0$ s;

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 1: (Continued)

T'	$\leq 588.5^{\circ}\text{F}$ (Nominal T_{avg} at RATED THERMAL POWER);
K_3	$= 0.00067i$;
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 -27% and $+7\%$, $f_1(\Delta I) = 0$, 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 the magnitude of $q_t - q_b$ exceeds -27% , the ΔT Trip Setpoint shall be automatically reduced by 1.57% of its value at RATED THERMAL POWER; and
- (iii) for each percent that the magnitude of $q_t - q_b$ exceeds $+7\%$, the ΔT Trip Setpoint shall be automatically reduced by 0.85% 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 ~~2.8%~~ of ΔT span.

2.6%

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 3: OVERPOWER ΔT

$$\Delta T \frac{(1 + \tau_1 S)}{(1 + \tau_2 S)} \left(\frac{1}{1 + \tau_3 S} \right) \leq \Delta T_0 \{ K_4 - K_5 \left(\frac{\tau_7 S}{1 + \tau_7 S} \right) \left(\frac{1}{1 + \tau_6 S} \right) T - K_6 \left[T \left(\frac{1}{1 + \tau_6 S} \right) - T'' \right] - f_2(\Delta I) \}$$

Where: ΔT = Measured ΔT ; by RTD manifold instrumentation;

$\frac{1 + \tau_1 S}{1 + \tau_2 S}$ = Lead-lag compensator on measured ΔT ;

τ_1, τ_2 = Time constants utilized in lead-lag compensator for ΔT , $\tau_1 = 8$ s, $\tau_2 = 3$ s;

$\frac{1}{1 + \tau_3 S}$ = Lag compensator on measured ΔT ;

τ_3 = Time constant utilized in the lag compensator for ΔT , $\tau_3 = 0$ s;

ΔT_0 = Indicated ΔT at RATED THERMAL POWER;

K_4 = 1.08;

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} , $\tau_7 = 10$ s;

$\frac{1}{1 + \tau_6 S}$ = Lag compensator on measured T_{avg} ;

τ_6 = Time constant utilized in the measured T_{avg} lag compensator, $\tau_6 = 0$ s;

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 3: (Continued)

- K_6 = 0.00128/°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, $\leq 538.5^\circ\text{F}$);
 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 ~~4.1%~~ of ΔT span.

3.7%

TABLE 4.3-1

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
1. Manual Reactor Trip	N.A.	N.A.	N.A.	R(11)	N.A.	1, 2, 3*, 4*, 5*
2. Power Range, Neutron Flux						
a. High Setpoint	S	D(2, 4) M(3, 4) Q(4, 6) R(4, 5)	Q(14)	N.A.	N.A.	1, 2
b. Low Setpoint	S	R(4)	S/U(1)	N.A.	N.A.	1###, 2
3. Power Range, Neutron Flux, High Positive Rate	N.A.	R(4)	Q(14)	N.A.	N.A.	1, 2
4. Power Range, Neutron Flux, High Negative Rate	N.A.	R(4)	Q(14)	N.A.	N.A.	1, 2
5. Intermediate Range, Neutron Flux	S	R(4, 5)	S/U(1)	N.A.	N.A.	1###, 2
6. Source Range, Neutron Flux	S	R(4, 5, 12)	S/U(1), Q(9, 14)	N.A.	N.A.	2##, 3, 4, 5
7. Overtemperature ΔT	S	R(13)	Q(14)	N.A.	N.A.	1, 2
8. Overpower ΔT	S	R	Q(14)	N.A.	N.A.	1, 2
9. Pressurizer Pressure-Low	S	R	Q(14)	N.A.	N.A.	1
10. Pressurizer Pressure-High	S	R	Q(14)	N.A.	N.A.	1, 2
11. Pressurizer Water Level-High	S	R	Q(14)	N.A.	N.A.	1
12. Reactor Coolant Flow-Low	S	R	Q(14)	N.A.	N.A.	1

TABLE 4.3-1 (Continued)

TABLE NOTATIONS

- (13) ~~CHANNEL CALIBRATION shall include the RTD bypass loops flow rate.~~ DELETED
- (14) Each channel shall be tested at least every 92 days on a STAGGERED TEST BASIS.
- (15) The surveillance frequency and/or MODES specified for these channels in Table 4.3-2 are more restrictive and, therefore, applicable.
- (16) The TRIP ACTUATING DEVICE OPERATIONAL TEST shall independently verify the OPERABILITY of the undervoltage and shunt trip attachments of the Reactor Trip Breakers.
- (17) Local manual shunt trip prior to placing breaker in service.
- (18) Automatic undervoltage trip.

LIMITING SAFETY SYSTEM SETTINGS

BASES

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 ~~(about 4 seconds)~~ 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.

Overpower ΔT

The Overpower ΔT Reactor 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."

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