

SOUTH CAROLINA ELECTRIC & GAS COMPANY

POST OFFICE BOX 764

COLUMBIA, SOUTH CAROLINA 29218

O. W. DIXON, JR.
VICE PRESIDENT
NUCLEAR OPERATIONS

July 8, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Reactor Coolant System Narrow
Range RTD's

Dear Mr. Denton:

Because of problems encountered in cross calibration of the reactor coolant system temperature instrumentation during previous hot functional tests, South Carolina Electric and Gas (SCE&G) is changing the reactor coolant system narrow range RTD's from Rosemount Model 176KF to RdF Model 21204. As a result of this change, minor revisions must be made to the Technical Specifications, the FSAR and Table 3-4 of the Reactor Protection System/Engineered Safety Features Actuation System Setpoint Methodology. These revisions result from the RdF RTD's having a slightly slower response time along with a small increase in sensor drift in comparison to the Rosemount RTD's.

Since the RdF RTD's have a slower (2 second) time response in comparison to the Rosemount RTD's (0.5 second), the time constants used in the lag compensators (filters) for ΔT and T_{avg} are reset to zero. This is reflected in Note #1 of Table 2.2-1 in Technical Specifications.

As a result of qualification testing of the RdF RTD's, a sensor drift of $+ 1.0^{\circ}\text{F}$ has been included in the setpoint and margin analysis for the overtemperature ΔT , overpower ΔT and T_{avg} -Low-Low functions. When combined with the other uncertainties using the Reactor Protection System/Engineered Safety Features Actuation System Setpoint Methodology, the margin is reduced by approximately 0.2% but has no impact on safety analysis assumptions. Technical Specification Table 2.2-1 (Item 7 and 8 and

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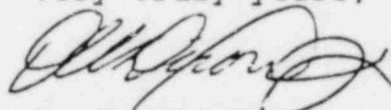
Notes 2 and 4) and Table 3.3-4 (Items 4d and 9b) are marked with the effects of this change. A revision to Table 3-4 of the setpoint and margin study will be forwarded as it becomes available.

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Also enclosed are marked up FSAR Tables 3.10-2 and 3.11-0 reflecting changes that will be included in the next FSAR amendment.

If you have any questions please contact us.

Very truly yours,



O. W. Dixon, Jr.

AW:OWD/fjc

cc: V. C. Summer
G. H. Fishcher
H. N. Cyrus
T. C. Nichols, Jr.
O. W. Dixon, Jr.
M. B. Whitaker, JR.
J. P. O'Reilly
H. T. Babb
D. A. Nauman
C. L. Ligon (NSRC)
W. A. Williams, Jr.
R. B. Clary
O. S. Bradham
A. R. Koon
M. N. Browne
G. J. Braddick
J. L. Skolds
J. B. Knotts, Jr.
B. A. Bursey
F. Mangan
NPCF
File

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

Functional Unit	Total Allowance (TA)	Z	S	Trip Setpoint	Allowable Value
1. Manual Reactor Trip	Not Applicable	NA	NA	NA	NA
2. Power Range, Neutron Flux High Setpoint	7.5	4.56	0	$\leq 109\%$ of RTP	$\leq 111.2\%$ of RTP
Low Setpoint	8.3	4.56	0	$\leq 25\%$ of RTP	$\leq 27.2\%$ of RTP
3. Power Range, Neutron Flux High Positive Rate	1.6	0.5	0	$\leq 5\%$ of RTP with a time constant ≥ 2 seconds	$\leq 6.3\%$ of RTP with a time constant ≥ 2 seconds
4. Power Range, Neutron Flux High Negative Rate	1.6	0.5	0	$\leq 5\%$ of RTP with a time constant ≥ 2 seconds	$\leq 6.3\%$ of RTP with a time constant ≥ 2 seconds
5. Intermediate Range, Neutron Flux	17.0	8.4	0	$\leq 25\%$ of RTP	$\leq 31\%$ of RTP
6. Source Range, Neutron Flux	17.0	10.0	0	$\leq 10^5$ cps	$\leq 1.4 \times 10^5$ cps
7. Overtemperature ΔT	7.1	2.94	0.8 1.8	See note 1	See note 2
8. Overpower ΔT	4.5	1.4	0.2 1.2	See note 3	See note 4
9. Pressurizer Pressure-Low	3.1	0.71	1.5	≥ 1870 psig	≥ 1859 psig
10. Pressurizer Pressure-High	3.1	0.71	1.5	≤ 2300 psig	≤ 2391 psig
11. Pressurizer Water Level-High	5.0	2.10	1.5	$\leq 92\%$ of instrument span	$\leq 93.8\%$ of instrument span
12. Loss of Flow	2.5	1.0	1.5	$> 90\%$ of loop design flow*	$> 89.2\%$ of loop design flow*

Loop design flow = 90,000 gpm

RTP = RATED THERMAL POWER

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION

NOTE 1: OVERTEMPERATURE ΔT

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

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 controller for ΔT , $\tau_1 = 8$ sec., $\tau_2 = 3$ sec.

 $\frac{1}{1 + \tau_3}$ = Lag compensator on measured ΔT
 τ_3 = Time constants utilized in the lag compensator for ΔT , $\tau_3 = 0$ sec.

 ΔT_0 = Indicated ΔT at RATED THERMAL POWER

 K_1 = 1.090

 K_2 = 0.01450

 $\frac{1 + \tau_4 S}{1 + \tau_5 S}$ = The function generated by the lead-lag controller for T_{avg} dynamic compensation

 $\tau_4, \text{ \& } \tau_5$ = Time constants utilized in the lead-lag controller for T_{avg} , $\tau_4 = 33$ secs., $\tau_5 = 4$ secs.

 T = Average temperature $^{\circ}F$
 $\frac{1}{1 + \tau_6 S}$ = Lag compensator on measured T_{avg}
 τ_6 = Time constant utilized in the measured T_{avg} lag compensator, $\tau_6 = 0$ sec.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTSNOTATION (Continued)

NOTE 1: (Continued)

T'	\leq	507.4°F Reference T_{avg} at RATED THERMAL POWER
K_3	$=$.0006720
p	$=$	Pressurizer pressure, psig
p'	$=$	2235 psig, Nominal RCS operating pressure
s	$=$	Laplace transform operator, sec^{-1} .

and $f_1(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range nuclear 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 - 34 percent and + 8 percent $f_1(\Delta I) = 0$ 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 -34 percent, the ΔT trip setpoint shall be automatically reduced by 1.67 percent of its value at RATED THERMAL POWER.
- (iii) for each percent that the magnitude of $q_t - q_b$ exceeds +8 percent, the ΔT trip setpoint shall be automatically reduced by 1.11 percent of its value at RATED THERMAL POWER.

NOTE 2: The channel's maximum trip setpoint shall not exceed its computed trip point by more than ~~3.2~~ percent ΔT span.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION (Continued)

NOTE 3: (Continued)

K_G	=	0.001190 for $T > T''$ and $K_G = 0$ for $T \leq T''$
T	=	as defined in Note 1
T''	\leq	587.4°F Reference T_{avg} at RATED THERMAL POWER
S	=	as defined in Note 1
$f_2(\Delta I)$	=	0 for all ΔI

NOTE 4: The channel's maximum trip setpoint shall not exceed its computed trip point by more than ~~3.4~~ percent ΔT span.

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TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

<u>Functional Unit</u>	<u>Total Allowance (TA)</u>	<u>Z</u>	<u>S</u>	<u>Trip Setpoint</u>	<u>Allowable Value</u>
4. STEAM LINE ISOLATION					
a. Manual	NA	NA	NA	NA	NA
b. Automatic Actuation Logic and Actuation Relays	NA	NA	NA	NA	NA
c. Reactor Building Pressure-High 2	3.0	0.71	1.5	≤ 6.35	≤ 6.61
d. Steam Flow in Two Steamlines-High, Coincident with	20.0	13.16	1.5/ 1.5	< a function defined as follows: A Δp corresponding to 40% of full steam flow between 0% and 20% load and then a Δp increasing linearly to a Δp corresponding to 110% of full steam flow at full load	\leq a function defined as follows: A Δp corresponding to 44% of full steam flow between 0% and 20% load and then a Δp increasing linearly to a Δp corresponding to 114.0% of full steam flow at full load.
Tavg - Low-Low	4.0	1.12	0.2 1.2	$\geq 553^\circ\text{F}$	$\geq 550.5^\circ\text{F}$ 550.6
e. Steamline Pressure - Low	20.0	10.71	1.5	≥ 675 psig	≥ 635 psig ⁽¹⁾

(1) Time constants utilized in lead lag controller for steamline pressure low are as follows:
 $\tau_1 = 50$ secs. $\tau_2 = 5$ secs.

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

<u>Functional Unit</u>	<u>Total Allowance (TA)</u>	<u>Z</u>	<u>S</u>	<u>Trip Setpoint</u>	<u>Allowable Value</u>
9. ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INTERLOCKS					
INTERLOCKS					
a. Pressurizer Pressure, P-11	3.1	.71	1.5	1985 psig	>1974 psig & <1996 psig
b. Tavg Low-Low, P-12	4.0	1.12	0.2 1.2	553°F	550.5°F & 555.5°F 550.6 555.4
c. Reactor Trip, P-4	NA	NA	NA	NA	NA

TABLE 3.10-2

IDENTIFICATION OF NUCLEAR STEAM SUPPLY SYSTEM
SEISMIC CATEGORY I INSTRUMENTATION, ELECTRICAL
EQUIPMENT AND SUPPORTS

<u>Item</u>	<u>Method</u>	
1. Pressure Transmitters** and Differen- Pressure Transmitters**	Bi-axial, multifrequency*	6 14
2. Process Control Equipment Cabinets**	Single axis sine beat, bi-axial multifrequency	
3. NSSS Solid State Protection System Cabinets	Single axis sine beat	
4. Nuclear Instrumentation System Cabinets	Single axis sine beat, bi-axial multifrequency	6
5. Safeguards Test Racks	Single axis sine beat	
6. Resistance Temperature Detectors**	Many Multi-axis single frequency Single axis sinusoidal	33
7. Instrument Supply Inverters**	Single axis sine beat, bi-axial sine beat	8
8. Reactor Trip Switchgear	Multi-axis, multifrequency*	14
9. Power Range Neutron Detectors	Single axis sinusoidal	6
10. Post Accident Monitoring Equipment (Indicators** and Recorders)	Multi-axis, multifrequency*	14 8
11. Post Accident Electric Hydrogen Recombiners	Single axis sine beat for recombiners, bi-axial sine beat for control panel	6
*Not yet completed.		
**Required for safe shutdown (assuming normal operation and not post accident conditions).		14

TABLE 3.11-0
NUCLEAR STEAM SUPPLY SYSTEM CLASS 1E EQUIPMENT
IN CONTAINMENT

Description	Manufacturer	Category	Safety Function FSAR Chapter	Location ⁽⁴⁾	Time	Equipment Tag or Location Number	
<u>Instrumentation</u>							
Narrow Range Resistance Temperature Detectors	<i>RdF</i> Rosemount	a2, c1	Section 7.5, <u>W</u> Response to 031.47	RBc, by pass loop	<u>W</u> Response to 031.47	TE-412 A,B,C,D TE-422 A,B,C,D TE-432 A,B,C,D	<i>33</i> 27
Wide Range Resistance Temperature Detectors	Rosemount	a1 ⁽¹⁾ a2 ⁽¹⁾	Section 7.5 <u>W</u> Response to 031.47	RBc, RGS loop	<u>W</u> Response to 031.47	TE-410, 419, 420, 423, 430, 433	<i>27</i> 33
Reactor Coolant Flow DP Transmitters	Barton	c1, c2	Section 7.2	RBc RBa RBB	(2)	FT-414, 415, 416 FT-424, 425, 426 FT-434, 435, 436	27 27 27
Pressurizer Pressure P Transmitters	Barton	a1, a2	Section 7.2, <u>W</u> Response to 031.47	RBd	<u>W</u> Response to 031.47	PT-455, 456, 457	27
Pressurizer Level DP Transmitters	Barton	a1 ⁽¹⁾ a2 ⁽¹⁾	Section 7.2, 7.3, 7.5 <u>W</u> Response to 031.47	RBd	<u>W</u> Response to 031.47	LT-459, 460, 461	27
Steam Generator Level Narrow Range DP Transmitters	Barton	a1 ⁽¹⁾ a2 ⁽¹⁾	Section 7.2, 7.3, 7.5 <u>W</u> Response to 031.47	RBe	<u>W</u> Response to 031.47	LT-474, 475, 476 LT-484, 485, 486 LT-494, 495, 496	27
Reactor Coolant System Pressure Wide Range P Transmitter	Barton	a1 ⁽¹⁾ a2 ⁽¹⁾	Section 7.5 <u>W</u> Response to 031.47	RBc	<u>W</u> Response to 031.47	PT-402, 403	27

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APPENDIX 33
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