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

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09493

Subject: **Update of Chapter 16 of US-APWR DCD**

Reference: 1) Letter MHI Ref: UAP-HF-09490 from Y. Ogata (MHI) to U.S. NRC, "Submittal of US-APWR Design Control Document Revision 2 in Support of Mitsubishi Heavy Industries, Ltd.'s Application for Design Certification of the US-APWR Standard Plant Design" dated on October 27, 2009.

MHI and Luminant have been working to resolve COLA Request for Additional Information (RAI). Currently, in CPNPP-3 and 4, COL RAI #91 was issued to request for sufficient detail for the NRC staff. In this activity, MHI decided that the Option (3), "Establish a PTS Section 5.5 or 5.6 Administrative Controls Program or Report" in proposed in DC/COL-ISG-08 will be chosen to resolve COL Holder Items identified in the CPNPP-3 and 4 COLA Technical Specification and US-APWR DCD (Reference 1) Technical Specification.

With this letter, MHI transmits to the NRC Staff the proposed updates to be made to the DCD. These updates will be incorporated into future DCD revision.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if NRC has questions concerning any aspect of this letter. His contact information is provided below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Update of Chapter 16 of US-APWR DCD

D081
NRO

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Enclosure 1

UAP-HF-09493
Docket No. 52-021

Update of Chapter 16 of US-APWR DCD

October 2009

1.1 Definitions

CHANNEL CALIBRATION

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass all devices in the channel required for channel OPERABILITY. CHANNEL CALIBRATION encompasses devices that are subject to drift between surveillance intervals and all input devices that are not tested through continuous automated self-testing. Refer to TADOT for output devices that are not tested through continuous automated self-testing.

The performance of a CHANNEL CALIBRATION shall be consistent with specification 5.5.21 "Setpoint Control Program" (SCP).

For analog measurements on each Technical Specification required automatic protection instrumentation function implemented with a digital bistable function, CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to digital Visual Display Unit (VDU) readout, as described in Topical Report, "Safety I&C System Description and Design Process," MUAP-07004 Section 4.4.2.

~~For analog measurements~~ CHANNEL CALIBRATION confirms the analog measurement accuracy at five calibration ~~setpoints~~ settings corresponding to 0%, 25%, 50%, 75% and 100% of the instrument range. The confirmed setpoint are monitored on the safety VDUs.

For analog measurements on each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to output device. For these channels, CHANNEL CALIBRATION confirms the analog measurement accuracy at the Nominal Trip Setpoint (NTSP).

For binary measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel's state change, as described in Topical Report, "Safety I&C System Description and Design Process," MUAP-07004 Section 4.4.1.

Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an inplace qualitative assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. The CHANNEL CALIBRATION may

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.9.1	Perform a CHANNEL CALIBRATION TEST on power range and intermediate range channels per SR 3.3.1.10, and ~~Table 3.3.1-1~~Setpoint Control Program.	Prior to initiation of PHYSICS TESTS
SR 3.1.9.2	Verify the RCS lowest loop average temperature is ≥ 541°F.	[30 minutes OR In accordance with the Surveillance Frequency Control Program]
SR 3.1.9.3	Verify THERMAL POWER is ≤ 5% RTP.	[30 minutes OR In accordance with the Surveillance Frequency Control Program]
SR 3.1. 9.4	Verify SDM is within the limits specified in the COLR.	[24 hours OR In accordance with the Surveillance Frequency Control Program]

Table 3.3.1-1 (page 1 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
1. Manual Reactor Trip Initiation	1,2	3 trains	B	SR 3.3.1.4	~~NA~~	~~NA~~
	$3^{(a)}$, $4^{(a)}$, $5^{(a)}$	3 trains	C	SR 3.3.1.4	~~NA~~	~~NA~~
2. High Power Range Neutron Flux						
a. high setpoint	1,2	4	E	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~[±4]% RTP~~	~~[109]% RTP~~
b. low setpoint	$1^{(b)}$,2	4	F	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~[±4]% RTP~~	~~[25]% RTP~~
3. High Power Range Neutron Flux Rate						
a. Positive Rate	1,2	4	F	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~[±2]% RTP~~	~~[10]% RTP with time constant ≥ [1] sec~~
b. Negative Rate	1,2	4	F	SR3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~[±2]% RTP[j]~~	~~[7]% RTP with time constant ≥ [1] sec~~
4. High Intermediate Range Neutron Flux	$1^{(b)}$, $2^{(c)}$	2	G,H	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~[±10]% RTP [j]~~	~~[25]% RTP~~

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(b) Below the P-10 (Power Range Neutron Flux) interlocks.

(c) Above the P-6 (Intermediate Range Neutron Flux) interlocks.

~~(j) An allowable value is not provided for time constants because time constants are digital values set in the application software. There is no drift or adjustments for these time constants.~~

Table 3.3.1-1 (page 2 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
5. High Source Range Neutron Flux	$2^{(d)}$	2	I,J	SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.10 SR 3.3.1.13	~~[±5]% of span~~	~~[1.0 E+5] cps~~
	$3^{(a)}$, $4^{(a)}$, $5^{(a)}$	2	J,K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.13	~~[±5]% of span~~	~~[1.0 E+5] cps~~
6. Overtemperature ΔT	1,2	3	F	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.13	~~Refer to Note 1 after this table~~	~~Refer to Note 1 after this table~~

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

Table 3.3.1-1 (page 3 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
7. Overpower ΔT	1,2	3	F	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.13	Refer to Note 2 after this table	Refer to Note 2 after this table
8. Pressurizer Pressure						
a. Low Pressurizer Pressure	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±2.5]% of span	[1865] psig
b. High Pressurizer Pressure	1,2	3	F	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±2.5]% of span	[2385] psig
9. High Pressurizer Water Level	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±3]% of span	[92]% of span
10. Low Reactor Coolant Flow	1(e)	3 per loop	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±3]% of rated flow	[90]% of rated flow
11. Low Reactor Coolant Pump (RCP) Speed	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±0.5]% rated pump speed	[95.5]% rated pump speed

(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

Table 3.3.1-1 (page 4 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
12. Steam Generator (SG) Water Level						
a. Low	1,2	3 per SG	F	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±3]% of span	[13]% of span
b. High-High	1(e)	3 per SG	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	[±3]% of span	[70]% of span
13. Turbine Trip						
a. Turbine Emergency Trip Oil Pressure	1(e)	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12	≥ [930] psig	[1000] psig
b. Main Turbine Stop Valve Position	1(e)	1 per valve	T	SR 3.3.1.9 SR 3.3.1.12	≥ [1]% open	[5]% open

(e) Above the P-7 (Low Power Reactor Trips Block) interlock.

Table 3.3.1-1 (page 5 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
14. ECCS Actuation	1,2	3 trains	M	SR 3.3.1.5	~~NA~~	~~NA~~
15. Reactor Trip System Interlocks						
a. Intermediate Range Neutron Flux, P-6	2[d]	2	O	SR 3.3.1.7 SR 3.3.1.10	~~[±5]% of span~~	~~[1E-10] A~~
b. Low Power Reactor Trips Block, P-7	1	1 per train	P	SR 3.3.1.5	~~NA~~	~~NA~~
c. Power Range Neutron Flux, P-10	1,2	4	O	SR 3.3.1.7 SR 3.3.1.10	~~[±4]% RTP~~	~~[10]% RTP~~
d. Turbine Inlet Pressure, P-13	1	3	P	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9	~~[±2.5]% of span~~	~~[10]% Turbine Power~~
16. Reactor Trip Breakers (RTBs)	1,2	3 trains[i]	N,S	SR 3.3.1.4 SR 3.3.1.13	~~NA~~	~~NA~~
	3[b], 4[b], 5[b]	3 trains[i]	D	SR 3.3.1.4 SR 3.3.1.13	~~NA~~	~~NA~~

(b) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

(i) Two reactor trip breakers per train.

Table 3.3.1-1 (page 6 of 9)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
17. Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms	1,2	3 trains 1 each per RTB	Q,S	SR 3.3.1.4 SR 3.3.1.13	~~NA~~	~~NA~~
	$3^{(b)}, 4^{(b)}, 5^{(b)}$	3 trains 1 each per RTB	D	SR 3.3.1.4 SR 3.3.1.13	~~NA~~	~~NA~~
18. Automatic Trip Logic	1,2	3 trains	R,S	SR 3.3.1.5	~~NA~~	~~NA~~
	$3^{(b)}, 4^{(b)}, 5^{(b)}$	3 trains	D	SR 3.3.1.5	~~NA~~	~~NA~~

(b) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

Table 3.3.1-1 (page 7 of 9)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function is initiated based on setpoints derived for DNB protection or core exit boiling conditions. ~~Allowable Value shall not exceed the following nominal Trip Setpoints by more than [±5.6]% RTP (DNB Protection) or [±9.4]% RTP (Core Exit Boiling Limit).~~

$$\Delta T_{SP} = Lowselect(\Delta T_{SP1}, \Delta T_{SP2})$$

$$\Delta T \frac{(1+T_7 s)}{(1+T_8 s)}\left(\frac{1}{1+T_9 s}\right) \geq \Delta T_{SP}$$

Where: T_7=[*]sec T_8=[*]sec T_9=[*]sec

1. DNB Protection

$$\Delta T_{SP1} = \Delta T_0\left(K_1 - K_2 \frac{(1+T_2 s)}{(1+T_3 s)}(T_{avg} - T_{avg0}) + K_3(P - P_0) - f_1(\Delta I)\right)$$

Where: ΔT is measured RCS ΔT,°F.
ΔT_0 is indicated RCS ΔT at RTP, °F
s is the Laplace transform operator, sec^{-1}.
T_{avg} is the measured RCS average temperature,°F.
T_{avg0} is the nominal T_{avg} at RTP, ≤ [*]°F.

P is the measured pressurizer pressure, psig
P_0 is the nominal RCS operating pressure, ≥ [*] psig

K_1 ≤ [*] K_2 ≥ [*]/ F K_3 ≥ [*]/psig
T_2 ≥ [*] sec T_3 ≤ [*] sec

$f_1(\Delta I)$ = [*] {[*] - (q_t - q_b)} when q_t - q_b ≤ [*]% RTP
0% of RTP when [*]% RTP < q_t - q_b ≤ [*]% RTP
[*] {(q_t - q_b) - [*]} when q_t - q_b > [*]% RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and q_t + q_b is the total THERMAL POWER in percent RTP.

*These values denoted with [*] are specified in the COLR.

Table 3.3.1-1 (page 9 of 9)
Reactor Trip System Instrumentation

Note 2: Overpower ΔT

~~The Overpower ΔT Function Allowable Value shall not exceed the following nominal Trip Setpoint by more than [±5.2]% RTP.~~

$$\Delta T \frac{(1+T_{13}s)}{(1+T_{14}s)}\left(\frac{1}{1+T_{15}s}\right) \le K_7 - K_8 \frac{T_6 s}{1+T_6 s} T_{avg} - K_9 \left(T_{avg} - T_{avg0}\right) - f_2(\Delta I)$$

Where: ΔT is measured RCS ΔT,°F.
s is the Laplace transform operator, sec^{-1}.
T_{avg} is the measured RCS average temperature,°F.
T_{avg0} is the nominal T_{avg} at RTP, ≤ [*]°F.

K_7 ≤ [*]

K_8 ≥ [*]/°F for increasing T_{avg}
[*]/°F for decreasing T_{avg}

K_9 ≥ [*]/°F when $T_{avg} > T_{avg0}$
[*]/°F when $T_{avg} \le T_{avg0}$

T_6 ≥ [*] sec

T_{13} ≥ [*] sec

T_{14} ≤ [*] sec

T_{15} ≤ [*] sec

$f_2(\Delta I)$ = [*]

*These values denoted with [*] are specified in the COLR.

Table 3.3.2-1 (page 1 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
1. ECCS Actuation						
a. Manual Initiation	1,2,3,4	3 trains	B	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2,3,4	3 trains	Q,R	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. High Containment Pressure	1,2,3	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±2.8]% of span~~	~~[6.8] psig~~
d. Low Pressurizer Pressure	1,2,3[(a)]	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±2.5]% of span~~	~~[1765] psig~~
e. Low Main Steam Line Pressure	1,2,3[(a)]	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[525][(b)] psig~~

(a) Above the P-11 (Pressurizer Pressure) interlock.

~~(b) Time constants used in the lead/lag controller are $t_1 \geq$ [50] seconds and $t_2 \leq$ [5] seconds.~~

Table 3.3.2-1 (page 2 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
2. Containment Spray						
a. Manual Initiation	1,2,3,4	2 switches per train for 3 trains	B	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2,3,4	3 trains	Q,R	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. High-3 Containment Pressure	1,2,3	3	E	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±2.8]% of span~~	~~[34.0] psig~~

Table 3.3.2-1 (page 3 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
3. Containment Isolation						
a. Phase A Isolation						
(1) Manual Initiation	1,2,3,4	Trains A and D	B	SR 3.3.2.6	~~NA~~	~~NA~~
(2) Actuation Logic and Actuation Outputs	1,2,3,4	Trains A and D	C	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
(3) ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.					
b. Phase B Isolation						
(1) Containment Spray - Manual Initiation	Refer to Function 2 (Containment Spray) for all initiation functions and requirements.					
(2) Actuation Logic and Actuation Outputs	1,2,3,4	4 trains	C	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
(3) High-3 Containment Pressure	Refer to Function 2 (Containment Spray) for all High-3 Containment Pressure requirements.					

Table 3.3.2-1 (page 4 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
4. Main Steam Line Isolation						
a. Manual Initiation	1,2 (h),3 (h)	Trains A and D	F	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2 (h),3 (h)	Trains A and D	S,T	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. High-High Containment Pressure	1, 2 (h), 3 (h)	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±2.8]% of span~~	~~[22.7] psig~~
d. Main Steam Line Pressure						
(1) Low Main Steam Line Pressure	1, 2 (h), 3 (a) (h)	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[525] (b) psig~~
(2) High Main Steam Line Pressure Negative Rate	3 (f) (h)	3 per steam line	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[100] (g) psi~~

(a) Above the P-11 (Pressurizer Pressure) interlock.

~~(b) Time constants used in the lead/lag controller are $t_1 \geq$ [50] seconds and $t_2 \leq$ [5] seconds.~~

(f) Below the P-11 (Pressurizer Pressure) interlock.

~~(g) Time constant utilized in the rate/lag controller is ≥ [50] seconds.~~

(h) Except when all MSIVs are closed.

Table 3.3.2-1 (page 5 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
5. Main Feedwater Isolation						
5A. Main Feedwater Regulation valve Closure						
a. Low T_{avg}	1,2 (j),3 (j)	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±2]°F~~	~~[564]°F~~
Coincident with Reactor Trip, P-4	Refer to Function 11.a for all P-4 requirements.					
5B. Main Feedwater Isolation						
a. Manual Initiation	1,2 (i),3 (i)	Trains A and D	F	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1, 2 (i), 3(i)	Trains A and D	S,T	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. High-High SG Water Level	1,2 (i),3(a) (i)	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[70]% of span~~
d. ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.					

(a) Above the P-11 (Pressurizer Pressure) interlock.

(i) Except when all MFIVs, MFRVs, MFBRVs, and SGWFCVs are closed.

(j) Except when all MFRVs are closed.

Table 3.3.2-1 (page 6 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
6. Emergency Feedwater Actuation						
a. Manual Initiation	1,2,3	3 trains	F	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2,3	3 trains	J,T	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. Low SG Water Level	1,2,3	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[13]% of span~~
d. ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.					
e. LOOP Signal	1,2,3	3 per bus for each EFW train	F	SR 3.3.2.5 SR 3.3.2.7 SR 3.3.2.8	~~≥ [4830] V with a time delay of ≤ [0.8] second~~	~~[4934] V(l) with ≤ [0.8] sec time delay~~
f. Trip of all Main Feedwater Pumps	1,2	1 per pump	H	SR 3.3.2.6 SR 3.3.2.8	~~NA~~	~~NA~~

~~(l) Nominal Trip Setpoint~~

Table 3.3.2-1 (page 7 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
7. Emergency Feedwater Isolation						
a. Manual Initiation	1,2,3	2 trains per SG	F	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2,3	2 trains per SG	G	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. High SG Water Level	1,2,3 [(a)]	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[50]% of span~~
Coincident with Reactor Trip, P-4	Refer to Function 11.a for all P-4 requirements.					
and						
No Low Main Steam Line Pressure	Refer to Function 7.d for all initiation functions and requirements.					
d. Low Main Steam Line Pressure	1,2,3 [(a)]	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[525] psig~~
8. CVCS Isolation						
a. Manual Initiation	1,2,3	Trains A and D	F	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Outputs	1,2,3	Trains A and D	G	SR 3.3.2.2 SR 3.3.2.4	~~NA~~	~~NA~~
c. High Pressurizer Water Level	1,2,3 [(a)]	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±3]% of span~~	~~[92]% of span~~

(a) Above the P-11 (Pressurizer Pressure) interlock.

Table 3.3.2-1 (page 8 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
9. Turbine Trip						
a. Actuation Logic and Actuation Outputs	1,2,3	4 trains	G	SR 3.3.2.2 SR 3.3.2.4	NA	NA
b. Reactor Trip, P-4	Refer to Function 11.a for all P-4 requirements.					
c. High-High SG Water Level	1,2 (i),3 (i)	3 per SG	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	[±3]% of span	[70]% of span
10. Reactor Coolant Pump Trip						
a. ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.					
Coincident with Reactor Trip, P-4	Refer to Function 11.a for all P-4 requirements.					
11. ESFAS Interlocks						
a. Reactor Trip, P-4	1,2,3	3 trains	F	SR 3.3.2.9	NA	NA
b. Pressurizer Pressure, P-11	1,2,3	3	I	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7	[±2.5]% of span	[1915] psig

(i) Except when all MFIVs, MFRVs, MFBRVs, and SGWFCVs are closed.

Table 3.3.2-1 (page 9 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
12. Containment Purge Isolation						
a. Containment Isolation Phase A - Manual Initiation	Refer to Function 3.a. (Containment Isolation Phase A - Manual Initiation) for all initiation functions and requirements.					
b. Containment Spray - Manual Initiation	Refer to Function 2.a. (Containment Spray - Manual Initiation) for all initiation functions and requirements.					
c. Actuation Logic and Actuation Outputs	1,2,3,4	Trains A and D	L	SR 3.3.2.2 SR 3.3.2.4	NA	NA
d. ECCS Actuation	Refer to Function 1 (ECCS Actuation) for all initiation functions and requirements.					
e. Containment High Range Area Radiation	1,2,3,4	3	K, L	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	[±6]% of span	[100] R/h

Table 3.3.2-1 (page 10 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~TRIP SETPOINT~~
13. Main Control Room (MCR) Isolation						
a. Manual Initiation	1,2,3,4,(k)	3 trains including A and D(m)	M, N, O, P	SR 3.3.2.6	~~NA~~	~~NA~~
b. Actuation Logic and Actuation Output	1,2,3,4,(k)	3 trains including A and D(m)	M, N, O,P	SR 3.3.2.2 SR3.3.2.4	~~NA~~	~~NA~~
c. MCR Outside Air Intake Radiation						
(1) MCR Outside Air Intake Gas Radiation	1,2,3,4,(k)	2	M, N, O, P	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±6]% of span~~	~~[2E-6] µCi/cc~~
(2) MCR Outside Air Intake Particulate Radiation	1,2,3,4,(k)	2	M, N, O, P	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±6]% of span~~	~~[8E-10] µCi/cc~~
(3) MCR Outside Air Intake Iodine Radiation	1,2,3,4,(k)	2	M, N, O, P	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	~~[±6]% of span~~	~~[8E-10] µCi/cc~~
d. ECCS Actuation	Refer to LCO 3.3.2, "ESFAS Instrumentation," Function 1, for all initiation functions and requirements.					

(k) During movement of irradiated fuel assemblies within containment.

(m) Two trains of MCREFS are required to be operable (trains A and D); three trains of MCRATS are required to be operable (three out of four trains A, B, C, D).

Table 3.3.2-1 (page 11 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
14. Block Turbine Bypass and Cooldown Valves						
a. Manual Initiation	1,2 (j),3 (j)	Trains A and D	F	SR 3.3.2.6	NA	NA
b. Actuation Logic and Actuation Outputs	1,2 (j),3 (j)	Trains A and D	S,T	SR 3.3.2.2 SR 3.3.2.4	NA	NA
c. Low-low T_{avg} Signal	1,2 (j),3 (j)	3	D	SR 3.3.2.1 SR 3.3.2.3 SR 3.3.2.7 SR 3.3.2.8	[2.0]°F	[553]°F

(j) Except when all MSIVs are closed.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.5.1	Perform CHANNEL CHECK.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2	Perform TADOT for LOP undervoltage relays.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3	Perform CHANNEL CALIBRATION for LOP undervoltage relays ~~with Nominal Trip Setpoint and Allowable Value as follows:~~in accordance with the SCP with following time delay a. Loss of voltage ~~Allowable Value ≥ [4830] V~~ with a time delay of ≤ [0.8] second ~~Loss of voltage Nominal Trip Setpoint [4934] V with a time delay of [0.8] second.~~ b. Degraded voltage ~~Allowable Value ≥ [6210] V~~ with a time delay of ≤ [20] seconds. ~~Degraded voltage Nominal Trip Setpoint [6314] V with a time delay of [20] seconds.~~	[24 months OR In accordance with the Surveillance Frequency Control Program]

Table 3.3.6-1 (page 1 of 2)
Diverse Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~NOMINAL TRIP SETPOINT~~
1. Reactor Trip/ Turbine Trip/ MFW Isolation						
a. Manual Initiation	1,2,3[(a)]	1[(b)]	A	SR 3.3.6.5 SR 3.3.6.6	~~NA~~	~~NA~~
b. Automatic Actuation Logic and Actuation Outputs	1,2,3[(a)]	2	A	SR 3.3.6.4 SR 3.3.6.5	~~NA~~	~~NA~~
c. Low Pressurizer Pressure	1,2,3[(a)]	2	A	SR 3.3.6.1 SR 3.3.6.2 SR 3.3.6.3	~~≥ [1805] psig~~	~~[1825] psig~~
d. High Pressurizer Pressure	1,2,3[(a)]	2	A	SR 3.3.6.1 SR 3.3.6.2 SR 3.3.6.3	~~≤ [2445] psig~~	~~[2425] psig~~
e. Low Steam Generator Water Level	1,2,3[(a)]	1 per SG for any 2 SGs	A	SR 3.3.6.1 SR 3.3.6.2 SR 3.3.6.3	~~≥ [4]% span~~	~~[7]% of span~~
f. Rod Drive Motor-Generator Set	1,2,3[(a)]	2(1 for each MG-Set)	A	SR 3.3.6.6	~~NA~~	~~NA~~
2. EFWS Actuation						
a. Manual Initiation	1,2,3[(a)]	1[(b)]	A	SR 3.3.6.5	~~NA~~	~~NA~~
b. Automatic Actuation Logic and Actuation Outputs	1,2,3[(a)]	2	A	SR 3.3.6.5	~~NA~~	~~NA~~
c. Low Steam Generator Water Level	Refer to Function 1.e for all Low Steam Generator Water Level requirements.					

(a) With the Pressurizer Pressure > P-11

(b) Manual initiation functions require operation of 2 switches, the Permissive Switch for DAS HSI and the manual initiation switch on the DHP.

Table 3.3.6-1 (page 2 of 2)
Diverse Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	~~ALLOWABLE VALUE~~	~~NOMINAL TRIP SETPOINT~~
3. ECCS Actuation						
a. Manual Initiation	1,2,3[(a)]	1[(b)]	A	SR 3.3.6.5	~~NA~~	~~NA~~
4. Containment Isolation						
a. Manual Initiation	1,2,3[(a)]	1[(b)]	A	SR 3.3.6.5	~~NA~~	~~NA~~
5. EFW Isolation Valves						
a. Manual Control	1,2,3[(a)]	1[(b)] for each SG	A	SR 3.3.6.5	~~NA~~	~~NA~~
6. Pressurizer Safety Depressurization Valves						
a. Manual Control	1,2,3[(a)]	1[(b)]	A	SR 3.3.6.5	~~NA~~	~~NA~~
7. Main Steam Depressurization Valves						
a. Manual Control	1,2,3[(a)]	1[(b)] for each SG	A	SR 3.3.6.5	~~NA~~	~~NA~~

(a) With the Pressurizer Pressure > P-11

(b) One channel is the Permissive Switch for DAS HSI which is common to all Manual Initiation/Control functions.

5.5 Programs and Manuals

5.5.20 Control Room Envelope Habitability Program (continued)

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.21 Setpoint Control Program (SCP)

a. The Setpoint Control Program (SCP) implements the regulatory requirement of 10 CFR 50.36(c)(1)(ii)(A) that technical specifications will include items in the category of limiting safety system settings (LSSS), which are settings for automatic protective devices related to those variables having significant safety functions.

b. The Limiting Trip Setpoint (LTSP), Nominal Trip Setpoint (NTSP), Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) for each Technical Specification required automatic protection instrumentation function shall be calculated in conformance with the instrumentation setpoint methodology previously reviewed and approved by the NRC in [Title, Revision No., dated Month dd, yyyy, (MLxxxxxxxxx)] and the conditions stated in the associated NRC safety evaluation, [Letter to MHI from NRC, Title, dated Month, dd, yyyy, (MLxxxxxxxxx)].

c. For each Technical Specification required automatic protection instrumentation function implemented with a digital bistable function, performance of a CHANNEL CALIBRATION surveillance shall include the following:

1. If all as-found calibration setting values are inside the two-sided limits of (calibration setting ± pre-defined test acceptance criteria band (PTAC)), then the channel is fully operable.
2. If any as-found calibration setting value is outside the two-sided limits of (calibration setting ± PTAC), but inside the limits of ± AV, then the channel is operable but degraded, and corrective action is required to restore the channel to within specifications.
3. If any as-found calibration setting value is outside the two-sided limits of ± AV, then the channel is inoperable, and corrective action is required.

including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The Calibration Tolerance (CT) limits are applied to the calibration setting. CT is a two-sided limit controlled by plant procedures, and is typically Sensor Calibration Accuracy (SCA), Rack Calibration Accuracy (RCA), or a combination of both.

d. For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, performance of a CHANNEL CALIBRATION surveillance shall include the following:

1. If the as-found trip setting differs from the specified NTSP by less than the PTAC, then the channel is fully operable.
2. If the as-found trip setting differs from the specified NTSP by more than the PTAC, but less than the specified AV, then the channel is operable but degraded, and corrective action is required to restore the channel to within specifications.
3. If the as-found trip setting is differs from the specified NTSP by more than the specified AV, then the channel is inoperable, and corrective action is required, including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

The CT limits are applied to NTSP. CT is a two-sided limit controlled by plant procedures, and is typically a function of SCA, RCA or a combination of both.

e. For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the difference between the instrument channel trip setting as-found value and the specified NTSP shall be trended and evaluated to verify that the instrument channel is functioning in accordance with its design basis.

f. The SCP shall establish a document containing the current values of the specified LTSP, NTSP, AV, PTAC, and CT for each Technical Specification required automatic protection instrumentation function, and references to the calculation documentation. Changes to this document shall be governed by the regulatory requirements of 10 CFR 50.59. In addition, changes to the specified LTSP, NTSP, AV, PTAC, and CT values shall be governed by the approved setpoint methodology. This document including any midcycle revisions or supplements shall be provided upon issuance for each reload cycle to the NRC.

-----------------------------------REVIEWER'S NOTE--------------------------------
The referenced NRC approved setpoint methodology shall meet the following guidance, and shall be applicable to Technical Specification required automatic protection instrumentation function surveillances that require verification that setpoints (or channel outputs) are within the necessary range and accuracy (e.g., CHANNEL CALIBRATIONS):

1. The methodology allows little variation in the values calculated by different analysts using identical input values (such as uncertainties and channel calibration drift).

2. For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the as-left value of the instrument channel trip setting shall be the value at which the channel was set at the completion of the surveillance with no additional adjustment of the instrument channel.

3. For each Technical Specification required automatic protection instrumentation function implemented with an analog bistable function, the as-found value of the instrument channel trip setting shall be the trip setting value measured during the subsequent performance of the surveillance before making any adjustment to the instrument channel that could change the trip setting value.

4. If the requirements of 5.5.21.c. or 5.5.21.d include an allowance for the as-found value to be compared with the specified calibration setting or NTSP, the following conditions shall be applied:

   a. The setting tolerance band (i.e., the specified CT) must be less than or equal to the square root of the sum of the squares of reference accuracy, measurement and test equipment errors, and readability uncertainties;

   b. The setting tolerance band (i.e., the specified CT) must be included in the total loop uncertainty; and

   c. The pre-defined test acceptance criteria band (i.e., the specified PTAC) for the as found value must include either the setting tolerance band (the specified CT) or the uncertainties associated with the setting tolerance band (the specified CT), but not both of these.

BASES

BACKGROUND (continued)

Technical Specifications contain measured accuracy values related to the OPERABILITY of equipment required for safe operation of the facility. The measured accuracy value accommodates expected drift in the analog components of the channel that would have been specifically accounted for in the setpoint methodology for calculating the Trip Setpoint and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to recalibrate the device to account for further drift during the next surveillance interval.

However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value. The Allowable Value is another important component of the LSSS.

The Allowable Value ~~specified~~ administered in ~~Table 3.3.1-1~~the Setpoint Control Program (SCP) serves as the LSSS such that a channel is OPERABLE if the measured accuracy is found not to exceed the Allowable Value during CHANNEL CALIBRATION. The CHANNEL CALIBRATION verifies the instrument at five calibration ~~setpoints~~ setting corresponding to 0%, 25%, 50%, 75% and 100% of the instrument range. As such, the Allowable Value accounts for the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the channel is "OPERABLE" under these circumstances, the channel should be left adjusted to a value within the established channel calibration tolerance band, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned. If the actual accuracy of the device is found to have exceeded the Allowable Value the device would be considered inoperable from a technical specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

BASES

BACKGROUND (continued)

Generally, if a parameter is used for input to the protection circuits and a control function, three channels with a two-out-of-three logic are also sufficient to provide the required reliability and redundancy. The Signal Selection Algorithm (SSA) within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation which would otherwise require the protection function actuation. Since the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the RTS and the RTS remains capable of providing its protective function with the remaining two operable channels. Again, a single failure will neither cause nor prevent the protection function actuation. These requirements are described in IEEE-603-1991 (Ref. 4). The actual number of channels required for each unit parameter is specified in Reference 2.

The RTB trains are arranged in a two out of four configuration. Therefore, three logic trains are required to ensure no single random failure of a logic train will disable the RTS. The logic trains are designed such that testing required while the reactor is at power may be accomplished without causing trip. Provisions allow removing logic trains from service during maintenance.

Allowable Values and RTS Setpoints

The Trip Setpoints used in the digital bistables are based on the Analytical Limits defined in the accident analysis and the channel uncertainty. The selection of these Trip Setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those RTS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 5), the Trip Setpoints ~~specified~~ administered in ~~Table 3.3.1-1~~the SCP in the accompanying LCO are conservative with respect to the Analytical Limits. The methodology used to calculate the Allowable Values and Trip Setpoints incorporates all of the known uncertainties applicable to each channel (Ref. 2). The magnitudes of these uncertainties are factored into the determination of each Trip Setpoint and corresponding Allowable Value. The Trip Setpoint entered into the ~~digital~~ bistable is more conservative than that specified by the Analytical Limit (LSSS) to account for measurement errors detectable by the CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION. One example of such a change in measurement error is drift during the surveillance interval. If the measured accuracy does not exceed the Allowable Value, the channel is considered OPERABLE.

BASES

BACKGROUND (continued)

The Nominal Trip Setpoint is the value at which the bistable is set. The Nominal Trip Setpoint value ensures the LSSS and the safety analysis limits are met for surveillance interval selected when a channel is adjusted based on the stated channel uncertainties. Any channel is considered to be properly adjusted when the "as left" accuracy value is within the ~~band for CHANNEL CALIBRATION uncertainty allowance (i.e. ± instrument, signal conditioning, and A/D converter uncertainties)~~established Calibration Tolerance (CT) band, in accordance with the methods and assumptions in the SCP. The Trip Setpoint value (i.e. expressed as a value without inequalities) is used for the purposes of COT.

Nominal Trip Setpoints consistent with the requirements of the Allowable Value ensure that SLs are not violated during AOOs (and that the consequences of PAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or PA and the equipment functions as designed).

Digital Trip Setpoints are maintained in non-volatile software memory within each RPS train. Each train of the process control equipment is self-tested continuously on line to verify that the digital Trip Setpoint settings are correct. Trip Setpoints are also verified periodically through a diverse software memory integrity test, which may be conducted with the RTS train out of service. A designated instrument channel is taken out of service for periodic calibration. SRs for the channels and trains are specified in the SRs section.

NOTE: The Allowable Value administered in ~~Table 3.3.1-1~~the SCP is the maximum deviation at the calibration setpoints that can be measured during CHANNEL CALIBRATION. This value is included in the calculations that determined the TRIP SETPOINT administered in ~~Table 3.3.1-1~~the SCP. The "expected as-found value" shall be as specified in the plant-specific setpoint analysis. The expected as-found value reflects the expected normal drift of actual plant equipment, so that a degraded device can be identified before the Allowable Value limit is reached.

Reactor Trip Breakers

The RTBs are in the electrical power supply line from the control rod drive motor generator set power supply to the CRDMs. Opening of the RTBs interrupts power to the CRDMs, which allows the shutdown rods and control rods to fall into the core by gravity. There are eight RTBs, two from each of four RTB trains, arranged in a two out of four configuration.

BASES

BACKGROUND (continued)

The decision logic matrix Functions are described in the functional diagrams included in Reference 2. In addition to the reactor trip or ESF, these diagrams also describe the various "permissive interlocks" that are associated with unit conditions. Each train has built in self-testing that automatically tests the decision logic Functions while the unit is at power. When any one or two trains are taken out of service for testing, the other two trains are capable of providing unit monitoring and protection until the testing has been completed.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The RTS functions to maintain the SLs during all AOOs and mitigates the consequences of PAs in all MODES in which the Rod Control System is capable of rod withdrawal or one or more rods are not fully inserted.

Each of the analyzed accidents and transients can be detected by one or more RTS Functions. The accident analysis described in Reference 3 and 9 takes credit for most RTS trip Functions. RTS trip Functions not specifically credited in the accident analysis are qualitatively credited in the safety analysis and the NRC staff approved licensing basis for the unit. These RTS trip Functions may provide protection for conditions that do not require dynamic transient analysis to demonstrate Function performance. They may also serve as backups to RTS trip Functions that were credited in the accident analysis.

The LCO requires all instrumentation performing an RTS Function, listed in Table 3.3.1-1 in the accompanying LCO, to be OPERABLE. A channel is OPERABLE provided the "as-found" value, measured during surveillance testing, does not exceed its associated Allowable Value. For digital functions Allowable Values are defined in terms pertinent to the channel calibration setpoints. For analog functions Allowable Values are defined in terms pertinent to the Nominal Trip Setpoint. A Nominal Trip Setpoint may be set more conservative than the ~~Nominal~~ Limiting Trip Setpoint as necessary in response to plant conditions. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

BASES

SURVEILLANCE REQUIREMENTS

The SRs for each RTS Function are identified by the SRs column of Table 3.3.1-1 for that Function.

A Note has been added to the SR Table stating that Table 3.3.1-1 determines which SRs apply to which RTS Functions.

Note that each channel of process protection supplies all trains of the RTS. However, when testing a Channel, it is only necessary to manually verify that the channel is OPERABLE in its respective train. This is because the interface to other trains is continuously verified through self-testing. Self-testing is confirmed through periodic COT and ACTUATION LOGIC TEST. The CHANNEL CALIBRATION is performed in a manner that is consistent with ~~the assumptions used in analytically calculating the required channel accuracies~~Section 5.5.21, SCP.

SR 3.3.1.1

Performance of the CHANNEL CHECK ensures that gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined based on a combination of the channel instrument uncertainties. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

[The Frequency of 12 hours is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

A CHANNEL CHECK may be conducted manually or automatically. For the US-APWR an automated CHANNEL CHECK is normally conducted continuously. Where the CHANNEL CHECK is conducted automatically, an alarm shall be generated when the agreement criteria is not met.

BASES

SURVEILLANCE REQUIREMENTS (continued)

For binary measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel's state change, as described in Reference 6. The state change must occur within the Allowable Value of the Trip Setpoint.

CHANNEL CALIBRATIONS must be performed consistent with ~~the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology~~the methods and assumptions in Section 5.5.21 SCP.

[The Frequency of 24 months is based on the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in ~~the setpoint methodology~~Section 5.5.21, SCP. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.3.1.9 is modified by a Note stating that this test shall include verification that the time constants are adjusted to the prescribed values where applicable.

SR 3.3.1.10

SR 3.3.1.10 is the performance of a CHANNEL CALIBRATION, as described in SR 3.3.1.9. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The CHANNEL CALIBRATION for the power range neutron detectors consists of a normalization of the detectors based on a power calorimetric and flux map performed above 15% RTP. The CHANNEL CALIBRATION for the source range and intermediate range neutron detectors consists of obtaining the detector plateau or discriminator curves, evaluating those curves, and comparing the curves to the manufacturer's data. This Surveillance is not required for the NIS power range detectors for entry into MODE 2 or 1, and is not required for the NIS intermediate range detectors for entry into MODE 2, because the unit must be in at least MODE 2 to perform the test for the intermediate range detectors and MODE 1 for the power range detectors. [The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed on the 24 month Frequency. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.11

SR 3.3.1.11 is the performance of a CHANNEL CALIBRATION, as described in SR 3.3.1.9. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the resistance temperature detectors (RTD) sensors is accomplished by an in-place cross calibration that compares the other sensing elements with the recently installed sensing element.

This test will verify the rate lag compensation for flow from the core to the RTDs.

[The Frequency is justified by the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysisSection 5.5.21, SCP. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.3.1.12

SR 3.3.1.12 is the performance of a TADOT of Turbine Trip Functions. This TADOT is performed prior to exceeding the P-7 interlock whenever the unit has been in MODE 3. This Surveillance is not required if it has been performed within the previous 31 days. Verification of the Trip Setpoint does not have to be performed for this Surveillance. Performance of this test will ensure that the turbine trip Function is OPERABLE prior to exceeding the P-7 interlock.

SR 3.3.1.13

SR 3.3.1.13 verifies that the response times for all RTS functions are less than or equal to the maximum values assumed in the accident analysis. Accident analysis response time values are defined in Reference 2. Individual component response times are not modeled in the analyses.

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the Trip Setpoint value at the sensor to the point at which the equipment reaches the required functional state (i.e. control and shutdown rods fully inserted in the reactor core).

BASES

BACKGROUND (continued)

Field Transmitters or Sensors

To meet the design demands for redundancy and reliability, more than one, and often as many as four, field transmitters or sensors are used to measure unit parameters. In many cases, field transmitters or sensors that input to the ESFAS are shared with the Reactor Trip System (RTS). In some cases, the same channels also provide control system inputs. To account for calibration tolerances and instrument drift, which are assumed to occur between calibrations, statistical allowances are provided in the Trip Setpoint and Allowable Values. The OPERABILITY of each transmitter or sensor is determined by either "as-found" calibration data evaluated during the CHANNEL CALIBRATION or by qualitative assessment of field transmitter or sensor, as related to the channel behavior observed during performance of the CHANNEL CHECK.

Signal Processing Equipment

Generally, four channels of process control equipment are used for the signal processing of unit parameters measured by the field instruments. The process control equipment provides signal conditioning, analog to digital conversion, comparable digital output signals for VDUs located on the main control board, and comparison of measured input signals with setpoints established by safety analyses. These setpoints are defined in Chapter 7 (Ref. 2) and Chapter 8 (Ref. 8). If the measured value of a unit parameter exceeds the predetermined setpoint, ~~an output from a digital bistable~~a bistable output is forwarded to the ESFAS for decision evaluation. Channel separation is maintained throughout the PSMS. Some unit parameters provide input only to the PSMS, while others are use by the PSMS and are retransmitted to the PCMS for use in one or more control systems.

Generally, if a parameter is used only for input to the protection circuits, three channels with a two-out-of-three logic are sufficient to provide the required reliability and redundancy. If one channel fails in a direction that would not result in a partial Function trip, the Function is still OPERABLE with a two-out-of-two logic. If one channel fails such that a partial Function trip occurs, a trip will not occur and the Function is still OPERABLE with a one-out-of- two logic.

BASES

BACKGROUND (continued)

Generally, if a parameter is used for input to the protection circuits and a control function, three channels with a two-out-of-three logic are also sufficient to provide the required reliability and redundancy. The Signal Selection Algorithm (SSA) within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation which would otherwise require the protection function actuation. Since the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the ESFAS and the ESFAS remains capable of providing its protective function with the remaining two operable channels. Again, a single failure will neither cause nor prevent the protection function actuation.

These requirements are described in IEEE-603-1991 (Ref. 4). The actual number of channels required for each unit parameter is specified in Reference 2.

Allowable Values and ESFAS Setpoints

The Trip Setpoints used in the digital bistables are based on the Analytical Limits defined in the accident analysis and the channel uncertainty. The selection of these Trip Setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those ESFAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 5), the Allowable Values and Trip Setpoints ~~specified~~ administered in ~~Table 3.3.2-1~~the SCP in the accompanying LCO are conservative with respect to the Analytical Limits. The SCP methodology used to calculate the Allowable Values and ESFAS setpoints incorporates all of the known uncertainties applicable to each channel (Ref. 7). The magnitudes of these uncertainties are factored into the determination of each ESFAS Trip Setpoint and corresponding Allowable Value. The ESFAS Trip Setpoint entered into the ~~digital~~ bistable is more conservative than that specified by the Analytical Limit to account for measurement errors detectable by the CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION. One example of such a change in measurement error is drift during the surveillance interval. If the measured accuracy does not exceed the Allowable Value, the channel is considered OPERABLE.

BASES

BACKGROUND (continued)

The ESFAS Nominal Trip Setpoints are the values at which the ~~digital~~ bistables are set. The ESFAS Trip Setpoint value ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on stated channel uncertainties. Any channel is considered to be properly adjusted when the "as-left" accuracy value is within the ~~band for CHANNEL CALIBRATION uncertainty allowance (i.e. instrument and signals conditioning uncertainties)~~established Calibration Tolerance (CT) band in accordance with the methods and assumptions in the SCP. The ESFAS Trip Setpoint value (i.e. expressed as a value without inequalities) is used for the purposes of the COT.

ESFAS Nominal Trip Setpoints consistent with the requirements of the Allowable Value ensure that the consequences of Postulated Accidents (PAs) will be acceptable, providing the unit is operated from within the LCOs at the onset of the PA and the equipment functions as designed.

Digital Trip Setpoints are maintained in non-volatile software memory within each RPS train. Each train is self-tested continuously on line to verify that the digital Trip Setpoint settings are correct. ESFAS Trip Setpoints are also verified periodically through a diverse software memory integrity test, which is conducted with the RPS train out of service. A designated instrument channel is taken out of service for periodic calibration. SRs for the channels and trains are specified in the SR section.

ESFAS and SLS

The ESFAS and SLS equipment is used for the decision logic processing of outputs from the RPS. To meet the redundancy requirements, four trains of ESFAS-SLS, each performing the same functions, are provided. If one train is taken out of service for maintenance or test purposes, the remaining trains will provide ESF actuation for the unit. Each train is packaged in its own cabinet for physical and electrical separation to satisfy separation and independence requirements. In addition, each train provides qualified features, such as separate function processors and communication processors, to ensure communications independence.

The ESFAS-SLS performs the decision logic for most ESF equipment actuation; generates the electrical output signals that initiate the required actuation; and provides the status, permissive, and annunciator output signals to the main control room of the unit.

BASES

BACKGROUND (continued)

The ~~digital~~ bistable outputs from all trains of the RPS are sensed by each ESFAS train and combined into logic that represent combinations indicative of various transients. If a required logic combination is completed, the ESFAS train will send actuation signals via the Safety Bus to its respective SLS train. The SLS actuates those components whose aggregate Function best serves to alleviate the condition and restore the unit to a safe condition. Examples are given in the Applicable Safety Analyses, LCO, and Applicability sections of this Bases.

The ESFAS and SLS are continuously automatically self-tested while the unit is at power. When any one train is taken out of service for manual testing, the remaining trains are capable of providing unit monitoring and protection until the testing has been completed.

The actuation of ESF components is accomplished through solid state Actuation Outputs. The SLS energizes the Actuation Outputs appropriate for the condition of the unit. Each Actuation Output energizes one plant component. Actuation Outputs are tested in conjunction with their respective plant components. This test overlaps with the continuous automatic self-testing.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

Each of the analyzed accidents can be detected by one or more ESFAS Functions. One of the ESFAS Functions is the primary actuation signal for that accident. An ESFAS Function may be the primary actuation signal for more than one type of accident. An ESFAS Function may also be a secondary, or backup, actuation signal for one or more other accidents. For example, Low Pressurizer Pressure is a primary actuation signal for small loss of coolant accidents (LOCAs) and a backup actuation signal for steam line breaks (SLBs) outside containment. Functions such as manual initiation, not specifically credited in the accident safety analysis, are qualitatively credited in the safety analysis and the NRC staff approved licensing basis for the unit. These Functions may provide protection for conditions that do not require dynamic transient analysis to demonstrate Function performance. These Functions may also serve as backups to Functions that were credited in the accident analysis (Ref. 3).

The LCO requires all instrumentation performing an ESFAS Function, listed in Table 3.3.2-1 in the accompanying LCO, to be OPERABLE. A channel is OPERABLE provided the "as-found" accuracy value does not exceed its associated Allowable Value. A trip setpoint may be set more conservative than the Trip Setpoint as necessary in response to plant conditions. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Each of the above Functions except Reactor Coolant Pump Trip is interlocked with P-4 to avert or reduce the continued cooldown of the RCS following a reactor trip. An excessive cooldown of the RCS following a reactor trip could cause an insertion of positive reactivity with a subsequent increase in generated power. Reactor Coolant Pump Trip function is interlocked with P-4 to prevent the unexpected Reactor Coolant Pump Trip after a small break LOCA. The unexpected Reactor Coolant Pump Trip after a small break LOCA could cause the increasing of the Peak Clad Temperature (PCT). To avoid such these situations, the noted Functions have been interlocked with P-4 as part of the design of the unit control and protection system.

The RTB position switches that provide input to the P-4 interlock only function to energize or de-energize or open or close contacts. Therefore, this Function has no adjustable trip setpoint ~~with which to associate a Trip Setpoint and Allowable Value~~.

This Function must be OPERABLE in MODES 1, 2, and 3 when the reactor may be critical or approaching criticality. This Function does not have to be OPERABLE in MODE 4, 5, or 6 because the main turbine, the MFW System, and the Turbine Bypass System are not in operation.

BASES

SURVEILLANCE REQUIREMENTS

The SRs for each ESFAS Function are identified by the SRs column of Table 3.3.2-1.

A Note has been added to the SR Table to clarify that Table 3.3.2-1 determines which SRs apply to which ESFAS Functions.

Note that each channel of process protection supplies all trains of the ESFAS. However, when testing a channel, it is only necessary to manually verify that the channel is OPERABLE in its respective division. This is because the interface to other divisions is automatically verified through self-testing. Self-testing is confirmed through periodic COT and ACTUATION LOGIC TEST. The CHANNEL CALIBRATION is performed in a manner that is consistent with ~~the assumptions used in analytically calculating the required channel accuracies~~Section 5.5.21, SCP.

SR 3.3.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined based on a combination of the channel instrument uncertainties. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

[The Frequency of 12 hours is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

A CHANNEL CHECK may be conducted manually or automatically. For the US-APWR an automated CHANNEL CHECK is normally conducted continuously. Where the CHANNEL CHECK is conducted automatically, an alarm shall be generated when the agreement criteria is not met.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.7

SR 3.3.2.7 is the performance of a CHANNEL CALIBRATION.

CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to measured parameter within the necessary range and accuracy, as defined by the Allowable Valuedescribed in Section 5.5.21, SCP.

For analog measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to VDU as described in Reference 6. CHANNEL CALIBRATION confirms the analog measurement accuracy conforms to the Allowable Value at multiple points over the entire measurement channel span, encompassing all reactor trip and interlock Trip Setpoint values. Digital reactor trip and interlock Trip Setpoint values are confirmed through COT.

For binary measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel's state change, as described in Reference 6. The state change must occur within the Allowable Value of the Trip Setpoint.

CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodologythe methods and assumptions in Section 5.5.21, SCP.

[The Frequency of 24 months is based on the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint methodologySection 5.5.21, SCP. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note stating that this test should include verification that the time constants are adjusted to the prescribed values where applicable.

B 3.3 INSTRUMENTATION

B 3.3.5 Loss of Power (LOP) Class 1E Gas Turbine Generator (GTG) Start Instrumentation

BASES

BACKGROUND

The Class 1E GTG provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow safe unit operation. Undervoltage protection will generate an LOP start if a loss of voltage or degraded voltage condition occurs in the switchyard. There are four LOP start signals, one for each 6.9 kV Class 1E bus.

Three undervoltage relays with inverse time characteristics are provided on each 6.9 kV Class 1E bus for detecting a sustained degraded voltage condition or a loss of bus voltage. The relays are combined in a two-out-of-three logic to generate an LOP signal when the voltage is dropped before reaching the loss of voltage limit for a short time or before reaching the degraded voltage limit for a long time. The LOP start actuation is described in Reference 1.

The Allowable Value in conjunction with the Trip Setpoint and LCO establishes the threshold for Engineered Safety Features Actuation System (ESFAS) action to prevent exceeding acceptable limits such that the consequences of Postulated Accidents (PAs) will be acceptable. The Allowable Value is considered a limiting value such that a channel is OPERABLE if the setpoint is found not to exceed the Allowable Value during the CHANNEL CALIBRATION. Note that although a channel is OPERABLE under these circumstances, the setpoint must be left adjusted to within the established calibration tolerance band of the setpoint in accordance with ~~uncertainty assumptions stated in the referenced setpoint methodology, (as-left criteria) and confirmed to be operating within the statistical allowances of the uncertainty terms assigned~~Section 5.5.21, SCP.

Allowable Values and LOP Class 1E GTG Start Instrumentation Setpoints

Setpoints adjusted consistent with the requirements of ~~the Allowable Value~~Section 5.5.21, SCP, ensure that the consequences of accidents will be acceptable, providing the unit is operated from within the LCOs at the onset of the accident and that the equipment functions as designed. The time delay of the Class 1E GTG starting initiated by LOOP signal is considered as mitigation system time delay in the analysis presented in Chapter 15.

~~Allowable Values and/or Nominal Trip Setpoints are specified for each Function in SR 3.3.5.3.~~ The trip setpoints are selected to ensure that the setpoint measured by the surveillance procedure does not exceed the Allowable Value if the relay is performing as required. If the measured

BASES

SURVEILLANCE REQUIREMENTS (continued)

CHANNEL CALIBRATIONS must be performed consistent with ~~the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology~~the methods and assumptions in Section 5.5.21 SCP.

[The Frequency of 24 months is based on operating experience and consistency with the typical industry refueling cycle and is justified by the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in ~~the setpoint analysis~~Section 5.5.21, SCP. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.3.5.4

SR 3.3.5.4 is the performance of an ACTUATION LOGIC TEST. The Class 1E GTG start logic within the PSMS is self-tested on a continuous basis from the digital side of all input modules to the digital side of all output modules. Self-testing also encompasses all data communications within a PSMS train, between PSMS trains and between the PSMS and PCMS. The self-testing is described in Reference 2 and 3. The ACTUATION LOGIC TEST is a check of the PSMS software memory integrity to ensure there is no change to the internal PSMS software that would impact its functional operation or the continuous self-test function. The software memory integrity test is described in Reference 2 and 3. [The Frequency of every 24 months is justified based on the reliability of the PSMS. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

The complete continuity check from the input device to the output device is performed by the combination of the continuous CHANNEL CHECK, the 24 month CHANNEL CALIBRATION for the non digital sided of the input module, the continuous self-testing for the digital side, the 24 month ACTUATION LOGIC TEST, and the 24 month ESFAS and SLS TADOT for the non-digital side of the output module. The Channel CALIBRATION, ACTUATION LOGIC TEST and TADOT, which are manual tests, overlap with the CHANNEL CHECK and self-testing and confirm the functioning of the self-testing.

The ACTUATION LOGIC TEST interval of 24 months with the self test capability is justified in the PSMS reliability analysis. For detail information, refer to the US-APWR Technical Report MUAP-07030 PRA, Attachment 6A.12. The result of the PSMS reliability analysis is

BASES

BACKGROUND (continued)

Allowable Values and DAS Setpoints

The trip setpoints used in the DAAC bistables are based on the analytical limits stated in the D3 Coping Analysis. These setpoints are generally less conservative than corresponding setpoints in the PSMS to allow the PSMS to actuate first. If the PSMS actuates, DAS actuation is block.

The selection of these trip setpoints is such that adequate protection is provided when all sensor and processing time delays are taken into account. To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those DAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 4), the Allowable Values ~~specified~~ administered in ~~Table 3.3.6-1~~the SCP in the accompanying LCO are conservative with respect to the analytical limits. A detailed description of the methodology used to calculate the Allowable Values and trip setpoints, incorporates the known uncertainties applicable to each channel. The magnitudes of these uncertainties are factored into the determination of each trip setpoint and corresponding Allowable Value. The trip setpoint entered into the bistable is more conservative than that specified by the Allowable Value to account for measurement errors detectable by the COT. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the COT. One example of such a change in measurement error is drift during the surveillance interval. If the measured setpoint does not exceed the Allowable Value, the bistable is considered OPERABLE.

The trip setpoint is the value at which the bistable is set and is the expected value to be achieved during calibration. The trip setpoint value ensures the D3 Coping Analysis (Ref. 2) limits are met for surveillance interval selected when a channel is adjusted based on stated channel uncertainties. Any bistable is considered to be properly adjusted when the "as left" setpoint value is within the band for CHANNEL CALIBRATION uncertainty allowance (i.e. ± rack calibration + comparator setting uncertainties). The trip setpoint value is therefore considered a "nominal" value (i.e. expressed as a value without inequalities) for the purposes of COT and CHANNEL CALIBRATION.

Trip setpoints consistent with the requirements of the Allowable Value ensure that the consequences of AOOs and PAs will be acceptable, providing the unit is operated from within the LCOs at the onset of the AOO or PA and the equipment functions as designed.

BASES

BACKGROUND (continued)

Rod Drive Motor-Generator sets

The Rod Drive Motor-Generator sets are the electrical power supply for the CRDMs. Tripping the Rod Drive Motor-Generator sets trip devices interrupts power to the CRDMs, which allows the control rod shutdown banks and control banks to fall into the core by gravity. There are two Rod Drive Motor-Generator sets operating in parallel. The DAS trips both Rod Drive Motor-Generator sets trip devices.

The DAS interface to the Rod Drive Motor-Generator sets is via hardwired circuit. This interface may be tested, with no reactor trip, as described in subsection 7.8.2.4. Actual tripping of the Rod Drive Motor-Generator set may be tested from the DAS. Rod Drive Motor-Generator sets may be tripped one at a time for testing.

Diverse Human System Interface Panel (DHP)

The DHP provides Manual Initiation switches for all DAS automatic actuation functions and for additional functions that are required, per the D3 Coping Analysis, to control all critical safety functions. Manual Initiation switches are not redundant. To prevent spurious actuation due to a failure of any of the above switches, a separate manual actuation permissive switch is provided. This is referred to as the "Permissive Switch for DAS HSI."

The DHP also provides indications, per the D3 Coping Analysis, to monitor all critical safety functions.

The DHP also provides indications, per the D3 Coping Analysis, to monitor RCS Leakage.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The DAS is required to provide a diverse capability to trip the reactor and actuate the specified safety-related equipment. The DAS is not credited for mitigating accidents in the Chapter 15 safety analyses. The DAS satisfy Criterion 4 of 10 CFR 50.36(c)(2)(ii) (Ref. 5).

The DAS LCO provides the requirements for the OPERABILITY of the DAS necessary to place the reactor in a shutdown condition and to remove decay heat in the event that required PSMS components do not function due to CCF.

A channel is OPERABLE provided the "as-found" accuracy value does not exceed its associated Allowable Value. A ~~trip setpoint~~Nominal Trip Setpoint may be set more conservative than the Limiting Trip Setpoint as necessary in response to plant conditions. Failure of any instrument

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.6.2

A COT is performed on each required channel to ensure the entire channel will perform the intended Function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of single contact of the relay. This clarifies what is an acceptable COT of a relay. This is acceptable because all of the other required contacts of relay are verified by Technical Specifications and Non-Technical Specifications test at least once per refueling interval with applicable extensions.

Setpoints must be within the Allowable Value ~~specified~~ administered in ~~Table 3.3.6-1~~the SCP.

The difference between the current "as found" value and the previous test "as left" value must be consistent with the drift allowance used in the setpoint methodology. The setpoint shall be left set consistent with the assumptions of the current unit specific setpoint methodology.

[The Frequency of 24 months is adequate. It is based on industry operating experience. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.3.6.3

CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

CHANNEL CALIBRATION must be performed consistent with ~~the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology~~the methods and assumptions in Section 5.5.21 SCP.

[The Frequency of 24 months is based on the assumption of 24 months calibration interval in the determination of the magnitude of equipment drift in the setpoint methodology. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

16.2 Combined License Information

COL 16.1(1)	*Adoption of RMTS is to be confirmed and the relevant descriptions are to be fixed.*
COL 16.1(2)	*Adoption of SFCP is to be confirmed and the relevant descriptions are to be fixed.*
COL 16.1_3.3.1(1)	*~~The trip setpoints and allowable values in Table 3.3.1-1 are to be confirmed after completion of a plant specific setpoint study following selection of the plant specific instrumentation.~~Deleted.*
COL 16.1_3.3.2(1)	*~~The trip setpoints, allowable values and time delay value in Table 3.3.2-1 are to be confirmed after completion of a plant specific setpoint study following selection of the plant specific instrumentation.~~Deleted.*
COL 16.1_3.3.5(1)	*The ~~trip setpoints and~~ time delay values in SR 3.3.5.3 are to be confirmed ~~after completion of a plant specific setpoint study following selection of~~ based on the plant specific ~~instrumentation~~transmission system performance.*
COL 16.1_3.3.6(1)	*~~The trip setpoints and allowable values in Table 3.3.6-1 are to be confirmed after completion of a plant specific setpoint study following selection of the plant specific instrumentation.~~Deleted.*
COL 16.1_3.4.17(1)	*The site specific information for tube repair is to be provided.*
COL 16.1_3.7.9(1)	*LCO 3.7.9 and associated Bases for the Ultimate Heat Sink based on plant specific design, including required UHS water volume, lowest water level for ESW pumps and maximum water temperature of the UHS, are to be developed.*
COL 16.1_3.7.10(1)	*LCO 3.7.10 and associated Bases for hazardous chemical are to be confirmed by the evaluation with site-specific condition.*
COL 16.1_3.8.4(1)	*The battery float current values in required action A.2 is to be confirmed after selection of the plant batteries.*
COL 16.1_3.8.5(1)	*The battery float current values in required action A.2 is to be confirmed after selection of the plant batteries.*
COL 16.1_3.8.6(1)	*The battery float current values in condition B, required action B.2, and SR 3.8.6.1 are to be confirmed after selection of the plant batteries.*
COL 16.1_4.1(1)	*The site specific information for site location is to be provided.*
COL 16.1_4.3.1(1)	*The site specific boron concentration is to be provided.*