

3.3 INSTRUMENTATION

3.3.1 Reactor Protection System (RPS) Instrumentation

LC0 3.3.1 The RPS instrumentation for each Function in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more required channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.1-1 for the channel(s).	Immediately
B. One Manual Reactor Trip channel inoperable.	B.1 Restore channel to OPERABLE status.	48 hours
	<u>OR</u> B.2.1 Be in MODE 3.	54 hours
	<u>AND</u> B.2.2 Open reactor trip breakers (RTBs).	55 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One channel or train inoperable.	C.1 Restore channel or train to OPERABLE status.	48 hours
	<u>OR</u> C.2 Open RTBs.	49 hours
D. One Power Range Neutron Flux-High channel inoperable.	D.1.1 Place channel in trip.	6 hours
	<u>AND</u>	
	D.1.2 Reduce THERMAL POWER to \leq 75% RTP.	12 hours
	<u>OR</u>	
	D.2.1 Place channel in trip.	6 hours
	<u>AND</u>	
-----NOTE----- Only required to be performed when the Power Range Neutron Flux input to QPTR is inoperable. -----		
D.2.2 Perform SR 3.2.4.2.	Once per 12 hours	
<u>OR</u>		
D.3 Be in MODE 3.	12 hours	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One channel inoperable.	E.1 Place channel in trip. OR E.2 Be in MODE 3.	6 hours 12 hours
F. THERMAL POWER > P-6 and < P-10, one Intermediate Range Neutron Flux channel inoperable.	F.1 Reduce THERMAL POWER to < P-6. OR F.2 Increase THERMAL POWER to > P-10.	2 hours 2 hours
G. THERMAL POWER > P-6 and < P-10, two Intermediate Range Neutron Flux channels inoperable.	G.1 -----NOTE----- Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed. ----- Suspend operations involving positive reactivity additions. AND G.2 Reduce THERMAL POWER to < P-6.	 Immediately 2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. THERMAL POWER < P-6, one or two Intermediate Range Neutron Flux channels inoperable.	H.1 Restore channel(s) to OPERABLE status.	Prior to increasing THERMAL POWER to > P-6
I. One Source Range Neutron Flux channel inoperable.	I.1 -----NOTE----- Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed. ----- Suspend operations involving positive reactivity additions.	Immediately
J. Two Source Range Neutron Flux channels inoperable.	J.1 Open RTBs.	Immediately
K. One Source Range Neutron Flux channel inoperable.	K.1 Restore channel to OPERABLE status. OR K.2 Open RTBs.	48 hours 49 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
L. Required Source Range Neutron Flux channel(s) inoperable.	-----NOTE----- Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM. -----	
	L.1 Suspend operations involving positive reactivity additions.	Immediately
	AND L.2 Close unborated water source isolation valves.	1 hour
	AND L.3 Perform SR 3.1.1.1.	1 hour AND Once per 12 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
M. One channel inoperable.	M.1 Place channel in trip.	6 hours
	<u>OR</u> M.2 Reduce THERMAL POWER to < P-7.	12 hours
N. One Reactor Coolant Flow - Low (Single Loop) channel inoperable.	N.1 Place channel in trip.	6 hours
	<u>OR</u> N.2 Reduce THERMAL POWER to < P-8.	10 hours
O. One Reactor Coolant Pump Breaker Position channel inoperable.	O.1 Restore channel to OPERABLE status.	6 hours
	<u>OR</u> O.2 Reduce THERMAL POWER to < P-8.	10 hours
P. One Turbine Trip channel inoperable.	P.1 Place channel in trip.	6 hours
	<u>OR</u> P.2 Reduce THERMAL POWER to < P-7.	10 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>Q. One train inoperable.</p>	<p>-----NOTE----- One train may be bypassed for up to 12 hours provided the other train is OPERABLE. -----</p> <p>Q.1 Restore train to OPERABLE status.</p> <p><u>OR</u></p> <p>Q.2 Be in MODE 3.</p>	<p>6 hours</p> <p>12 hours</p>
<p>R. One RTB train inoperable.</p>	<p>-----NOTE----- One train may be bypassed for up to 12 hours, provided the other train is OPERABLE. -----</p> <p>R.1 Restore train to OPERABLE status.</p> <p><u>OR</u></p> <p>R.2 Be in MODE 3.</p>	<p>1 hour</p> <p>7 hours</p>

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
S. One channel inoperable.	S.1 Verify interlock is in required state for existing unit conditions. <u>OR</u> S.2 Be in MODE 3.	1 hour 7 hours
T. One channel inoperable.	T.1 Verify interlock is in required state for existing unit conditions. <u>OR</u> T.2 Be in MODE 2.	1 hour 7 hours
U. One trip mechanism inoperable for one RTB.	U.1 Restore inoperable trip mechanism to OPERABLE status. <u>OR</u> U.2.1 Be in MODE 3. <u>AND</u> U.2.2 Open RTB.	48 hours 54 hours 55 hours
V. Two RPS trains inoperable.	V.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

-----NOTE-----
Refer to Table 3.3.1-1 to determine which SRs apply for each RPS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.2	<p>-----NOTES-----</p> <ol style="list-style-type: none"> 1. Adjust NIS channel if absolute difference is > 2%. 2. Not required to be performed until 12 hours after THERMAL POWER is \geq 15% RTP. <p>-----</p> <p>Compare results of calorimetric heat balance calculation to Nuclear Instrumentation System (NIS) channel output.</p>	24 hours
SR 3.3.1.3	<p>-----NOTES-----</p> <ol style="list-style-type: none"> 1. Adjust NIS channel if absolute difference is \geq 3%. 2. Not required to be performed until 36 hours after THERMAL POWER is \geq 15% RTP. <p>-----</p> <p>Compare results of the incore detector measurements to NIS AFD.</p>	31 effective full power days (EFPD)

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.3.1.4 -----NOTE----- This Surveillance must be performed on the reactor trip bypass breaker prior to placing the bypass breaker in service. ----- Perform TADOT.</p>	<p>31 days on a STAGGERED TEST BASIS</p>
<p>SR 3.3.1.5 -----NOTE----- Not required to be performed for the logic inputs from Source Range Neutron Flux detector prior to entering MODE 3 from MODE 2 until 4 hours after entry into MODE 3. ----- Perform ACTUATION LOGIC TEST.</p>	<p>31 days on a STAGGERED TEST BASIS</p>
<p>SR 3.3.1.6 -----NOTE----- Not required to be performed until 24 hours after THERMAL POWER is \geq 50% RTP. ----- Calibrate excore channels to agree with incore detector measurements.</p>	<p>92 EFPD</p>
<p>SR 3.3.1.7 -----NOTE----- Not required to be performed for source range instrumentation prior to entering MODE 3 from MODE 2 until 4 hours after entry into MODE 3. ----- Perform COT.</p>	<p>92 days</p>

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.3.1.8 -----NOTE----- This Surveillance shall include verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. ----- Perform COT.</p>	<p>-----NOTE----- Only required when not performed within previous 92 days ----- Prior to reactor startup <u>AND</u> Four hours after reducing power below P-10 for power and intermediate instrumentation <u>AND</u> Four hours after reducing power below P-6 for source range instrumentation <u>AND</u> Every 92 days thereafter</p>

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.3.1.9NOTE..... Verification of setpoint is not required. Perform TADOT.	92 days
SR 3.3.1.10NOTE..... This Surveillance shall include verification that the time constants are adjusted to the prescribed values where applicable. Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.11NOTE..... Neutron detectors are excluded from CHANNEL CALIBRATION. Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.12NOTE..... This Surveillance shall include verification that the electronic dynamic compensation time constants are set at the required values, and verification of RTD response time constants. Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.13 Perform COT.	18 months

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SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.3.1.14NOTE..... Verification of setpoint is not required. Perform TADOT.	18 months
SR 3.3.1.15NOTE..... Verification of setpoint is not required. Perform TADOT.NOTE..... Only required when not performed within previous 31 days Prior to reactor startup

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

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT (1)
1. Manual Reactor Trip	1.2	2	B	SR 3.3.1.14	NA	NA
	3(a), 4(a), 5(a)	2	C	SR 3.3.1.14	NA	NA
2. Power Range Neutron Flux						
a. High	1.2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7 SR 3.3.1.11	≤ 110.93% RTP	108% RTP (2)
b. Low	1(b), 2	4	E	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 26.93% RTP	24% RTP
3. Intermediate Range Neutron Flux	1(b), 2(c)	2	F,G	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 37.02% RTP	25% RTP
	2(d)	2	H	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 37.02% RTP	25% RTP
4. Source Range Neutron Flux	2(d)	2	I,J	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 1.28 E5 cps	1.0 E5 cps
	3(a), 4(a), 5(a)	2	J,K	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.11	≤ 1.28 E5 cps	1.0 E5 cps
	3(e), 4(e), 5(e)	1	L	SR 3.3.1.1 SR 3.3.1.11	N/A	N/A

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- (1) A channel is OPERABLE with an actual Trip Setpoint value found outside its calibration tolerance band provided the Trip Setpoint value is conservative with respect to its associated Allowable Value and the channel is re-adjusted to within the established calibration tolerance band of the Nominal Trip Setpoint.
- (2) The Nominal Trip Setpoint is as stated unless reduced as required by one or more of the following requirements: LCO 3.2.1 Required Action A.2.2; LCO 3.2.2 Required Action A.1.2.2; or LCO 3.7.1 Required Action B.2.
 - (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) interlock.
 - (c) Above the P-6 (Intermediate Range Neutron Flux) interlock.
 - (d) Below the P-6 (Intermediate Range Neutron Flux) interlock.
 - (e) With the RTBs open. In this condition, source range Function does not provide reactor trip but does provide indication and alarm.

Table 3.3.1-1 (page 2 of 7)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT (1)
5. Overtemperature ΔT	1,2	3	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.12	Refer to Note 1 (Page 3.3-18)	Refer to Note 1 (Page 3.3-18) (3)
6. Overpower ΔT	1,2	3	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.12	Refer to Note 2 (Page 3.3-19)	Refer to Note 2 (Page 3.3-19) (3)
7. Pressurizer Pressure						
a. Low	1 ^(f)	3	M	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	\geq 1832.02 psig	1844 psig
b. High	1,2	3	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	\leq 2381.11 psig	2376 psig
8. Pressurizer Water Level - High	1 ^(f)	3	M	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	\leq 91.64%	91%

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- (1) A channel is OPERABLE with an actual Trip Setpoint value found outside its calibration tolerance band provided the Trip Setpoint value is conservative with respect to its associated Allowable Value and the channel is re-adjusted to within the established calibration tolerance band of the Nominal Trip Setpoint.
(3) The Nominal Trip Setpoint is as stated unless reduced as required by LCO 3.2.1 Required Action A.2.3.
(f) Above the P-7 (Low Power Reactor Trips Block) interlock.

Table 3.3.1-1 (page 3 of 7)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT (1)
9. Reactor Coolant Flow - Low						
a. Single Loop	1(g)	3 per loop	N	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≥ 93.47%	94.26%
b. Two Loops	1(h)	3 per loop	M	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≥ 93.47%	94.26%
10. Reactor Coolant Pump (RCP) Breaker Position						
a. Single Loop	1(g)	1 per RCP	O	SR 3.3.1.14	NA	NA
b. Two Loops	1(h)	1 per RCP	M	SR 3.3.1.14	NA	NA
11. Undervoltage RCPs	1(f)	1 per bus	M	SR 3.3.1.9 SR 3.3.1.10	≥ 2959 V	3120 V
12. Underfrequency RCPs	1(f)	1 per bus	M	SR 3.3.1.10 SR 3.3.1.14	≥ 57.84 Hz	58.2 Hz
13. Steam Generator (SG) Water Level - Low Low	1,2	3 per SG	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≥ 15.36%	16%

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- (1) A channel is OPERABLE with an actual Trip Setpoint value found outside its calibration tolerance band provided the Trip Setpoint value is conservative with respect to its associated Allowable Value and the channel is re-adjusted to within the established calibration tolerance band of the Nominal Trip Setpoint.
- (f) Above the P-7 (Low Power Reactor Trips Block) interlock.
- (g) Above the P-8 (Power Range Neutron Flux) interlock.
- (h) Above the P-7 (Low Power Reactor Trips Block) interlock and below the P-8 (Power Range Neutron Flux) interlock.

Table 3.3.1-1 (page 4 of 7)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT (1)
14. SG Water Level - Low	1,2	2 per SG	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≥ 29.36%	30%
Coincident with Steam Flow/ Feedwater Flow Mismatch	1,2	2 per SG	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≤ 7.06 E5 lbm/hr	6.4 E5 lbm/hr
15. Turbine Trip						
a. Low Auto Stop Oil Pressure	1(f)	3	P	SR 3.3.1.10 SR 3.3.1.15	≥ 40.87 psig	45 psig
b. Turbine Stop Valve Closure	1(f)	2	P	SR 3.3.1.15	NA	NA
16. Safety Injection (SI) Input from Engineered Safety Feature Actuation System (ESFAS)	1,2	2 trains	Q	SR 3.3.1.14	NA	NA

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- (1) A channel is OPERABLE with an actual Trip Setpoint value found outside its calibration tolerance band provided the Trip Setpoint value is conservative with respect to its associated Allowable Value and the channel is re-adjusted to within the established calibration tolerance band of the Nominal Trip Setpoint.
- (f) Above the P-7 (Low Power Reactor Trips Block) interlock.

Table 3.3.1-1 (page 5 of 7)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	NOMINAL TRIP SETPOINT (1)
17. Reactor Protection System Interlocks						
a. Intermediate Range Neutron Flux, P-6	2 ^(d)	2	S	SR 3.3.1.11 SR 3.3.1.13	≥ 7.29 E-11 amp	1 E-10 amp
b. Low Power Reactor Trips Block, P-7	1	1 per train	T	SR 3.3.1.13 SR 3.3.1.14	NA	NA
c. Power Range Neutron Flux, P-8	1	4	T	SR 3.3.1.11 SR 3.3.1.13	≤ 42.94% RTP	40% RTP
d. Power Range Neutron Flux, P-10	1,2	4	S	SR 3.3.1.11 SR 3.3.1.13	≥ 7.06% RTP and ≤ 12.94% RTP	10% RTP
e. Turbine Impulse Pressure, P-7 input	1	2	T	SR 3.3.1.1 SR 3.3.1.10 SR 3.3.1.13	≤ 10.71% turbine power	10% turbine power
18. Reactor Trip Breakers ⁽¹⁾	1,2	2 trains	R,V	SR 3.3.1.4	NA	NA
	3 ^(a) , 4 ^(a) , 5 ^(a)	2 trains	C,V	SR 3.3.1.4	NA	NA
19. Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms	1,2	1 each per RTB	U	SR 3.3.1.4	NA	NA
	3 ^(a) , 4 ^(a) , 5 ^(a)	1 each per RTB	C	SR 3.3.1.4	NA	NA
20. Automatic Trip Logic	1 ^(j) , 2	2 trains	Q,V	SR 3.3.1.5	NA	NA
	3 ^(a) , 4 ^(a) , 5 ^(a)	2 trains	C,V	SR 3.3.1.5	NA	NA

- (1) A channel is OPERABLE with an actual Trip Setpoint value found outside its calibration tolerance band provided the Trip Setpoint value is conservative with respect to its associated Allowable Value and the channel is re-adjusted to within the established calibration tolerance band of the Nominal Trip Setpoint.
- (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) interlock.
- (i) Including any reactor trip bypass breakers that are racked in and closed for bypassing an RTB.
- (j) Below the P-6 (Intermediate Range Neutron Flux) interlock for the logic inputs from Source Range Neutron Flux detector channels.

