TR 3.3 INSTRUMENTATION

TR 3.3.1 Reactor Trip System (RTS) Instrumentation

TR 3.3.1 The RTS instrumentation channels of Technical Specification (TS) 3.3.1, Table 3.3.1-1 shall be OPERABLE with RESPONSE TIMES as shown in Table 3.3.1-1 of this document.

APPLICABILITY: As shown in TS 3.3.1, Table 3.3.1-1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Refer to TS 3.3.1, Table 3.3.1-1.	A.1 Refer to TS 3.3.1, Table 3.3.1-1.	Refer to TS 3.3.1, Table 3.3.1-1.

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.1.1	Verify RTS RESPONSE TIME of each reactor trip function is within the limits of Table 3.3.1-1.	18 months on a STAGGERED TEST BASIS

Table 3.3.1-1 (Page 1 of 2)

Reactor Trip System Instrumentation Response Times

FUNCTIONAL UNIT		RESPONSE TIME
1.	Manual Reactor Trip	N/A
2.	Power Range, Neutron Flux	
	a. High	$\underline{\leq}$ 0.5 second (1)
	b. Low	$\underline{\leq}$ 0.5 second (1)
3.	Power Range, Neutron Flux	
	a. High Positive Rate	N/A
	b. High Negative Rate	Deleted
4.	Intermediate Range, Neutron Flux	N/A
5.	Source Range, Neutron Flux	$\leq$ 0.5 seconds (1)
6.	Overtemperature ΔT	$\leq$ 8 seconds (1)
7.	Overpower ΔT	$\leq$ 8 seconds (1)
8.	Pressurizer Pressure	
	a. Low	$\leq$ 2 seconds
	b. High	$\leq$ 2 seconds
9.	Pressurizer Water Level--High	N/A

(continued)

(1) Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from the detector output or input of first electronic component in channel.

Table 3.3.1-1 (Page 2 of 2)

Reactor Trip System Instrumentation Response Times

FUNCTIONAL UNIT		RESPONSE TIME
10.	Reactor Coolant Flow - Low	≤ 1.2 seconds
11.	Undervoltage-Reactor Coolant Pumps	≤ 1.5 seconds (2)
12.	Underfrequency-Reactor Coolant Pumps	≤ 0.6 second (3)
13.	Steam Generator Water Level-Low-Low	≤ 2 seconds (4)
14.	Turbine Trip	
	a. Low Fluid Oil Pressure	N/A
	b. Turbine Stop Valve Closure	N/A
15.	Safety Injection Input from ESF	N/A
16.	Reactor Trip System Interlocks	N/A
17.	Reactor Trip Breakers	N/A
18.	Reactor Trip Breaker UV and ST	N/A
19.	Automatic Trip and Interlock Logic	N/A

(2) Includes sensor delay time, adjustable time delay, logic and breaker trip times, gripper release (150 msec.) and EMF decay time (250 msec.).

(3) Includes sensor delay time, adjustable time delay, logic and breaker trip times and gripper release time (150 msec.).

(4) With Trip Time Delay (TTD) = 0 seconds.

TR 3.3 INSTRUMENTATION

TR 3.3.2 Engineered Safety Features Actuation System (ESFAS) Instrumentation

TR 3.3.2 The ESFAS instrumentation channels and interlocks as shown in Technical Specification (TS) 3.3.2, Table 3.3.2-1; TS 3.3.5, LCO 3.3.5; TS 3.3.6, Table 3.3.6-1; and TS 3.6.9 shall be OPERABLE with RESPONSE TIMES as shown in Table 3.3.2-1 of this document.

APPLICABILITY: As shown in TS 3.3.2, Table 3.3.2-1; TS 3.3.5 Applicability; TS 3.3.6 Applicability; and TS 3.6.9 Applicability.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Refer to TS 3.3.2, Table 3.3.2-1; TS 3.3.5 ACTIONS; TS 3.3.6 ACTIONS; and TS 3.6.9 ACTIONS.	A.1 Refer to TS 3.3.2, Table 3.3.2-1; TS 3.3.5 ACTIONS; TS 3.3.6 ACTIONS; and TS 3.6.9 ACTIONS.	Refer to TS 3.3.2, Table 3.3.2-1; TS 3.3.5 ACTIONS; TS 3.3.6 ACTIONS; and TS 3.6.9 ACTIONS.

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.2.1	Verify ESFAS RESPONSE TIME of each ESFAS function is within the limits of Table 3.3.2-1.	18 months on a STAGGERED TEST BASIS

Table 3.3.2-1 (Page 1 of 6)

Engineered Safety Features Actuation System Response Times

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
1. Manual Initiation	
a. Safety Injection (ECCS)	N/A
b. Containment Spray	N/A
c. Phase "A" Isolation	N/A
d. Phase "B" Isolation	N/A
e. Containment Ventilation Isolation	N/A
f. Steam Line Isolation	N/A
g. Feedwater Isolation	N/A
h. Auxiliary Feedwater	N/A
i. Essential Raw Cooling Water	N/A
j. CREVS Actuation	N/A
k. Containment Air Return Fan	N/A
l. Component Cooling System	N/A
m. Start Diesel Generators	N/A
n. Reactor Trip	N/A
2. Containment Pressure - High	
a. Safety Injection (ECCS)	$\leq$ 27 (4) / 32 (14) / 37 (5)
1) Reactor Trip	$\leq$ 2
2) Feedwater Isolation	$\leq$ 8 (3)
3) Containment Isolation - Phase “A” (6)	$\leq$ 12 (2) / 22 (1)
4) Containment Ventilation Isolation	$\leq$ 6.0 (2) (11)
5) Auxiliary Feedwater Pumps	$\leq$ 60 (10)
6) Essential Raw Cooling Water	$\leq$ 47 (2) / 57 (1)
7) CREVS Actuation	N/A

(continued)

Table 3.3.2-1 (Page 2 of 6)

Engineered Safety Features Actuation System Response Times

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
2. Containment Pressure – High (continued)	
8) Component Cooling System	≤ 50 (2) /60 (1)
9) Start Diesel Generators	≤ 12 (12)
3. Pressurizer Pressure - Low	
a. Safety Injection (ECCS)	≤ 27 (4) / 32 (14) / 37 (5)
1) Reactor Trip	≤ 2
2) Feedwater Isolation	≤ 8 (3)
3) Containment Isolation - Phase “A” (6)	≤ 12 (2) / 22 (1)
4) Containment Ventilation Isolation	≤ 6.0 (2) (11)
5) Auxiliary Feedwater Pumps	≤ 60 (10)
6) Essential Raw Cooling Water	≤ 47 (2) / 57 (1)
7) CREVS Actuation	N/A
8) Component Cooling System	≤ 50 (2) / 60 (1)
9) Start Diesel Generators	≤ 12 (12)
4. Steam Line Pressure Negative Rate - High	
a. Steam Line Isolation	≤ 8
5. Steam Line Pressure – Low	
a. Safety Injection (ECCS)	≤ 27 (4) / 32 (14) / 37 (5)
1) Reactor Trip (from SI)	≤ 2
2) Feedwater Isolation	≤ 8 (3)
3) Containment Isolation-Phase "A"(6)	≤ 12(2) / 22(1)

(continued)

Table 3.3.2-1 (Page 3 of 6)

Engineered Safety Features Actuation System Response Times

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
5. Steam Line Pressure – Low	
4) Containment Ventilation Isolation	≤ 6.0 (2) (11)
5) Auxiliary Feedwater Pumps	≤ 60 (10)
6) Essential Raw Cooling Water	≤ 47 (2) / 57 (1)
7) CREVS Actuation	N/A
8) Component Cooling System	≤ 50 (2) / 60 (1)
9) Start Diesel Generators	≤ 12 (12)
b. Steam Line Isolation	≤ 8
6. Containment Pressure - High – High	
a. Containment Spray	≤ 234 (13)
b. Containment Isolation-Phase "B"	≤ 68 (2) / 78 (1)
c. Steam Line Isolation	≤ 8
d. Containment Air Return Fans	480 ≤ RT ≤ 600
7. Steam Generator Water Level - High – High	
a. Turbine Trip	≤ 2.5
b. Feedwater Isolation	≤ 8 (3)
8. Steam Generator Water Level - Low – Low	
a. Motor-driven Auxiliary Feedwater Pumps	≤ 60 (7)
b. Turbine-driven Auxiliary Feedwater Pumps	≤ 60 (8)
9. DELETED	

(continued)

Table 3.3.2-1 (Page 4 of 6)

Engineered Safety Features Actuation System Response Times

INITIATING SIGNAL AND FUNCTION		RESPONSE TIME IN SECONDS
10.	RWST Level-Low Coincident with Containment Sump Level - High and Safety Injection	
	Automatic Switchover to Containment Sump	$\leq$ 250
11.	Loss-of-Offsite Power	
	Auxiliary Feedwater Pumps	$\leq$ 60
12.	Trip of All Main Feedwater Pumps	
	Auxiliary Feedwater Pumps	$\leq$ 60
13.	Auxiliary Feedwater Pump Suction Transfer on Suction Pressure – Low	
	a. Motor-driven Auxiliary Feedwater Pumps	$\leq$ 47
	b. Turbine-driven Auxiliary Feedwater Pumps	$\leq$ 42
14.	Loss of Voltage/Degraded Voltage	
	6.9 kV Shutdown Board	$\leq$ 12 (9)
15.	MSV Vault Room Water Level – High	
	a. North MSV Vault Room	$\leq$ 8.5 (15)
	b. South MSV Vault Room	$\leq$ 8.5 (15)

Table 3.3.2-1 (Page 5 of 6)

Engineered Safety Features Actuation System Response Times

TABLE NOTATIONS

(1) Diesel generator starting and sequence loading delays included.

(2) Diesel generator starting and sequence loading delay not included. Offsite power available.

(3) Air operated valves.

(4) Offsite power available - diesel generator starting and sequence loading delays not included. Response time limit includes the opening of valves to establish flowpath and bringing the pumps to full speed. The additional sequential transfer of CCP suction from the VCT to the RWST (RWST valves open, then the VCT valves close) is included.

(5) Diesel generator starting and sequence loading delays included. Response time limit includes the opening of valves to establish flow path and bringing the pumps up to full speed. The additional sequential transfer of suction from the VCT to the RWST (RWST valves open, then VCT valves close) is included.

(6) The following equipment are exceptions to the response time shown in the table and will have the following response times for the initiating signals and functions:

A. Fire Protection CIVs	22 (2) / 32 (1)
B. Ice Condenser CIVs	32
C. Excess Letdown Hx Supply CIV	68 (2) / 78 (1)
D. EGTS Fans	20 (2) / 30 (1)
E. Required for EGTS OPERABILITY	
1. Fire Protection Secondary CIVs	20 (2) / 30 (1)
2. Secondary Containment Purge Isolation Valves	12.7 (2) / 22.7 (1)
F. Steam Generator Blowdown CIVs	17 (2) / 27 (1)

(7) On 2/3 any steam generator and Trip Time Delay = 0 seconds.

(8) On 2/3 in 2/4 steam generators and Trip Time Delay = 0 seconds.

(continued)

Table 3.3.2-1 (Page 6 of 6)

Engineered Safety Features Actuation System Response Times

TABLE NOTATIONS

(9) The response time is measured from the time the 6.9 kV shutdown boards voltage exceeds the Setpoint until the time full voltage is returned for the loss of voltage sensors; or from the time the degraded voltage timers generate a signal to trip the feeder breakers and shed loads until the time full voltage is returned for the degraded voltage sensors.

(10) The Response Time for motor-driven AFW pumps includes the diesel generator starting and sequence loading delays. The Response Time for (steam) turbine driven AFW pumps does not include diesel generator starting and sequence loading delays.

(11) Containment purge valves only. Containment radiation monitor valves have a response time of 6.5 seconds.

(12) Diesel generator start time includes a reactor trip response time of 2 seconds.

(13) Includes diesel generator starting, containment spray pump sequence loading-delay/breaker closure, plus stroke time of 2-FCV-72-2 and -39.*

* The containment integrity analysis of record was performed using 221 seconds for initiation of spray. However, Westinghouse document WATD-11264 has evaluated the initiation of spray at 234 seconds with the conclusion that the increase will have no effect on the results or conclusions of the Watts Bar LOCA and MSLB containment integrity analysis.

(14) Diesel generator starting and sequence loading delays included. Response time limit includes the opening of valves to establish flowpath and bring pumps to full speed. The additional sequential transfer of ECCS pump suction from the VCT to the RWST (RWST valves open) is included.

(15) Feedwater Isolation Valve (motor) and Feedwater Regulating Valve (air operated) response time includes an ESFAS signal response time of 2 seconds.

TR 3.3 INSTRUMENTATION

TR 3.3.3 Power Distribution Monitoring System (PDMS)

TR 3.3.3 The PDMS shall be OPERABLE with:

a. THERMAL POWER ≥25% RTP, and

b. The required channel inputs from the plant computer for each function OPERABLE as defined in Table 3.3.3-1

APPLICABILITY: When the PDMS is used for:

a. Calibration of the Excore Neutron Flux Detection System, or

b. Monitoring the QUADRANT POWER TILT RATIO, or

c. Measurement of $F^N_{\Delta H}$ and $F_Q(Z)$, or

d. Verifying the position of a rod with inoperable position indicators.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. PDMS inoperable.	A.1 ----------NOTE---------- TR 3.0.3 is not applicable. ---------- Restore the inoperable system to OPERABLE status.	Prior to using the system for incore power distribution measurement purposes.

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.3.1	Perform CHANNEL CHECK for each required instrumentation channel specified in Table 3.3.3-1.	24 hours
TSR 3.3.3.2	Verify by administrative means that the surveillance requirements for each required channel specified in Table 3.3.3-1 are satisfied.	24 hours
TSR 3.3.3.3	----------NOTE---------- The initial calibration after each refueling requires ≥ 218 Self-Powered Detector Elements. ---------- Perform PDMS calibration.	Once after each refueling AND 180 EFPD thereafter.

Table 3.3.3-1 (Page 1 of 1)

Power Distribution Monitoring System (PDMS) Instrumentation

FUNCTION	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	SURVEILLANCE TYPE
1. RCS Cold Leg Temperature	2	SR 3.3.3.3	CHANNEL CALIBRATION
2. Reactor Power	1[1]	SR 3.3.1.2[4] SR 3.3.1.10[3]	Calorimetric Heat Balance CHANNEL CALIBRATION
3. Control Bank Position (per bank)	1[2]	SR 3.1.8.1	CHANNEL CHECK
4. Self-Powered Detector Elements	≥ 145 total and ≥ 16 per core quadrant and > 6 per top core quadrant and > 6 per bottom core quadrant		

(1) Either secondary calorimetric power, average power range neutron flux power, or average RCS Loop ΔT power

(2) Either the Demand Position Indication or the average of the individual Rod Position Indications

(3) Applies to average RCS Loop ΔT power only

(4) Not applicable to average RCS Loop ΔT power

TR 3.3 INSTRUMENTATION

TR 3.3.4 Seismic Instrumentation

TR 3.3.4 The seismic monitoring instrumentation shown in Table 3.3.4-1 shall be OPERABLE.

APPLICABILITY: At all times.

----------NOTE----------
TR 3.0.3 is not applicable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more seismic monitoring instruments in Panel 0-R-113 or foundation instrument 0-XT-52-75A in the Containment annulus inoperable for > 30 days, OR One or more remaining seismic monitoring instruments inoperable for >60 days.	A.1 Document in accordance with the Corrective Action Program.	In accordance with the Corrective Action Program.

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. ----------NOTE---------- All Required Actions must be completed whenever this Condition is entered. ----------	B.1	Document in accordance with the Corrective Action Program.	In accordance with the Corrective Action Program.
	AND		
One or more seismic monitoring instruments actuated during a seismic event.	B.2	Analyze data retrieved from 0-XT-52-75A to determine the magnitude of the vibratory ground motion.	4 hours
	AND		
	B.3	If OBE exceedance is verified, perform walkdowns of key plant equipment and structures to determine extent of damage.	8 hours
	AND		
	B.4	Restore each actuated monitoring instrument to OPERABLE status.	24 hours
	AND		
	B.5	Perform a CHANNEL CALIBRATION on each actuated monitoring instrument.	10 days
	AND		
	B.6	Analyze data retrieved from remaining seismic monitoring instruments.	14 days

TECHNICAL SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.4-1 to determine which Technical Surveillance Requirements apply for each seismic monitoring instrument.

SURVEILLANCE		FREQUENCY
TSR 3.3.4.1	Perform CHANNEL CHECK.	31 days
TSR 3.3.4.2	Perform CHANNEL OPERATIONAL TEST.	184 days
TSR 3.3.4.3	Perform CHANNEL CALIBRATION.	18 months

Table 3.3.4-1 (Page 1 of 1)

Seismic Monitoring Instrumentation

INSTRUMENTS AND SENSOR LOCATIONS	REQUIRED CHANNELS	SURVEILLANCE REQUIREMENTS	MEASUREMENT RANGE
1. Strong Motion Triaxial Accelerometers (1) (5)			
a. 0-XT-52-75A (Annulus El. 703)	1	TSR 3.3.4.1 (2) TSR 3.3.4.2 (4) TSR 3.3.4.3 (3)	0 - 1.0 g
b. 0-XT-52-75B (Reactor Bldg. El. 757)	1	TSR 3.3.4.1 (2) TSR 3.3.4.2 (4) TSR 3.3.4.3 (3)	0 - 1.0 g
c. 0-XT-52-75D (D/G Bldg. El. 742)	1	TSR 3.3.4.1 (2) TSR 3.3.4.2 (4) TSR 3.3.4.3 (3)	0 - 1.0 g
2. Triaxial Strong Motion Accelerograph			
a. 0-XR-52-80 (Aux. Cont. Room. El. 757)	1	TSR 3.3.4.1 (2) TSR 3.3.4.2 (4) TSR 3.3.4.3 (3)	0 - 2.0 g

(1) With associated acceleration triggers, and control room indication on 0-XR-52-82A, -82B, -83.

(2) Except acceleration trigger.

(3) Includes acceleration trigger.

(4) Except setpoint verification.

(5) Includes recording and analyzing components on 0-R-113.

TR 3.3 INSTRUMENTATION

TR 3.3.5 Turbine Overspeed Protection

TR 3.3.5 At least one Turbine Overspeed Protection System shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

----------NOTE----------
Not applicable to MODES 2 and 3 when all main steam isolation valves are closed and all other steam flow paths to the turbine are isolated.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One high pressure turbine steam inlet valve inoperable.	A.1.1 Verify the two high pressure turbine steam inlet valves on the same steam chest which are opposite the inoperable valve are OPERABLE. AND A.1.2 Restore inoperable valve to OPERABLE status. OR A.2.1 Verify the two high pressure turbine steam inlet valves on the same steam chest which are opposite the inoperable valve are OPERABLE. AND	6 hours 72 hours 6 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.2 Remove the turbine from service by closing all the high pressure turbine steam inlet valves. OR A.3 Close MSIVs.	78 hours 78 hours
B. One reheat stop valve or one reheat intercept valve per low pressure turbine steam line inoperable.	B.1 Restore inoperable valve(s) to OPERABLE status. OR B.2 Close at least one valve in the affected steam line(s). OR B.3 Isolate the turbine from the steam supply.	72 hours 78 hours 78 hours
C. Turbine Overspeed Protection System inoperable for causes other than Condition A or Condition B.	C.1 Isolate the turbine from the steam supply system.	6 hours

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.5.1	Verify the Turbine Overspeed Protection System is OPERABLE in accordance with the Turbine Integrity Program With Turbine Overspeed Protection (TIPTOP).	In accordance with TIPTOP.

TR 3.3 INSTRUMENTATION

TR 3.3.6 Loose-Part Detection System

TR 3.3.6 The Loose-Part Detection System shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

----------NOTE----------
TR 3.0.3 is not applicable.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Loose-Part Detection System channels inoperable > 30 days.	A.1 Document in accordance with the Corrective Action Program.	In accordance with the Corrective Action Program.

TECHNICAL SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
TSR 3.3.6.1	Perform CHANNEL CHECK.	24 hours
TSR 3.3.6.2	Perform CHANNEL OPERATIONAL TEST.	31 days
TSR 3.3.6.3	Perform CHANNEL CALIBRATION.	18 months

TR 3.3 INSTRUMENTATION

TR 3.3.7 RESERVED FOR FUTURE ADDITION

TR 3.3 INSTRUMENTATION

3.3.8 Hydrogen Monitor

TR 3.3.8 The Hydrogen Monitor shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Hydrogen Monitor inoperable.	A.1 Restore monitor to OPERABLE status.	7 days
B. Required Action and associated Completion Time of Condition A not met.	Initiate a Corrective Actions Program (CAP) document to develop plans and schedule for restoring the monitor to OPERABLE status.	24 hours

(Continued)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.8.1	Perform CHANNEL CALIBRATION.	18 months