

Appendix 7A. Tables

Table 7-1. Reactor Trip Summary

Trip Variable	No. of Sensors	Steady-State Normal Range	Trip Value or Condition for Trip
Over Power ⁴	4 Flux Sensors	0-100%	105.5 percent of rated thermal power ⁴ (RTP) with four RC pumps operating 80.5 percent of RTP when reset for three RC pumps operating
Nuclear Over Power Based on Flow and Imbalance ²	4 Two-Section Flux Sensors 8 Δ P Flow	NA	109.4 percent RTP times flow minus reduction due to imbalance
Power/RC Pumps ²	4 Pump Monitors	3 to 4 Pumps	Loss of any two operating reactor coolant pumps with the reactor at power operation
Reactor Outlet Temperature	4 Temperature Sensors	532-604 F	618 F
Pressure/Temperature ²	4 Pressure Sensors 4 Temperature Sensors	NA	$(11.14T_{\text{hot}} - 4706) \geq P$
Reactor Coolant Pressure	4 Pressure Sensors	2,090-2,220 psig	2,355 psig (high) ³ 1,800 psig (low) ²
Reactor Building Pressure	4 Pressure Sensors	0 psig	4 psig
Main Turbine Trip	4 Pressure Sensors	NA	Turbine Trip
Loss of Main Feedwater Trip	4 Pressure Sensors /pump (8 total)	NA	Loss of both Main Feedwater Pump Turbines

Note:

1. Trip condition bypassed at predetermined low power setpoints.
2. Bypassed by shutdown bypass.
3. Reset to 1720 psig by shutdown bypass.
4. Administratively reset to 5 percent during reactor shutdown.

Table 7-2. Engineered Safeguards Actuation Conditions

Channel No.	Action	Trip Condition	Steady State Normal Value	Trip Point¹
1,2 ²	High Pressure Injection and Reactor Building Non-Essential Isolation	Low Reactor Coolant Pressure or	2,120-2,250 psig	1,600 psig ⁴
		High Reactor Building Pressure	Atmospheric	3 psig
3,4 ³	Low-Pressure Injection	Very Low Reactor Coolant Pressure or	2,120-2,250 psig	550 psig
		High Reactor Building Pressure	Atmospheric	3 psig
5,6	Reactor Building Cooling & Reactor Building Essential Isolation	High Reactor Building Pressure	Atmospheric	3 psig
7,8	Reactor Building Spray	Very High Reactor Building Pressure	Atmospheric	10 psig

Note:

1. Typical values and conditions. Refer to Technical specifications for current allowable value requirements.
2. May be bypassed below 1750 psig and is automatically reinstated above the removal setpoint value.
3. May be bypassed below 900 psig and is automatically reinstated above the removal setpoint value.
4. Based on the analyses presented in BAW-1976, "SBLOCA Analyses for B&W 177-FA Lowered-Loop Plants in Response to NUREG-0737, Item II.K.3.31", and the measurement uncertainty associated with wide range RCS pressure, 1600 psig is the minimum allowable setpoint for low RCS pressure.

Table 7-3. Engineered Safeguards Actuated Devices

Channel 1	Channel 2	Channels 1 & 2	Channel 3	Channel 4	Channels 3 & 4
HP-P1A HP-24 HP-26 HP-3 HP-4 HP-20 KEOWEE START (Channel A) LOAD SHED & STBY. BKR. 1 Standby BUS FEED BKR. 1 RC-5 RC-6 FDW-105 FDW-107 GWD-12 LWD-1 CS-5 PR-1 ⁽⁷⁾ PR-6 ⁽⁷⁾ PR-7 PR-9	HP-P1C HP-25 HP-27 HP-5 HP-21 KEOWEE START (Channel B) LOAD SHED & STBY. BRK. 2 Standby BUS FEED BKR. 2 RC-7 FDW-106 FDW-108 GWD-13 LWD-2 CS-6 PR-2 ⁽⁷⁾ PR-3 ⁽⁷⁾ PR-4 ⁽⁷⁾ PR-5 ⁽⁷⁾ PR-8 PR-10 FDW-103 FDW-104	HP-P1B	LP-P1A LP-17 LPSW-PIA ⁽¹⁾	LP-P1B LP-18 LPSW-PIB ⁽²⁾	LPSW-P1C ⁽³⁾
Channel 5	Channel 6	Channels 5 & 6		Channel 7	Channel 8
CC-7 LPSW-18 RBCU-F1A PR-E1A LPSW-1055 LPSW-1061	CC-8 LPSW-24 RBCU-F1C PR-E1B LPSW-1054 LPSW-1062	LPSW-15 LPSW-6 LPSW-21 RBCU-F1B		BS-1 BS-P1A	BS-2 BS-P1B

NOTES:

1. LPSW-P1C for Unit 2 LPSW-P3A for Unit 3
2. LPSW-P1B for Unit 2 LPSW-P3B for Unit 3
3. LPSW-P1A for Unit 2
4. Deleted per 2012 update
5. Deleted per 2012 update
6. Deleted per 2006 update
7. Maintained in ES position (closed) in accordance with the requirements of NUREG 0737, Item II.E.4.2.6 in any mode where ES is required operable.

Table 7-4. Characteristics of Out-of-Core Neutron Detector Assemblies

Characteristic	Source/Wide	Power
Type Tube Sensitivity	FC Gamma - Metrics 900217-101	UCIC ¹
Thermal Neutron Flux	20 CPS/nv	Note 2
Gamma Flux	NA	1.5×10^{-10} A/R/hr
Maximum Ratings		
External Pressure	70 psig (QTR 010)	150 psig
Temperature	420 F (DBE QTR 010)	212 F
Thermal Neutron Flux		
Operating	1×10^{10} nv	1.5×10^{10} nv
Non-Operating	1×10^{10} nv	2.5×10^{11} nv
Gamma Flux	1×10^6 R/hr	5×10^5 R/hr
Integrated Exposure Before 10% Reduction in Sensitivity		
Neutron	10^{20} nvt	10^{19} nvt
Gamma	N/A	3×10^9 R

Note:

1. WL23636, WL23636A, and WL23636B Type Detectors are installed in various locations in Oconee Units (For Safety Related RPS Inputs); WL23675 is only installed in unit 1, a non-safety application (Unit 1 NI-9 abandoned in place per EC100792). Unit 2 NI-9 was abandoned in place per EC100793 and Unit 3 NI-9 was abandoned in place per EC100794. The original Qualification Test Report is for a WL23675 detector. All applicable data is the same for the WL23636 series except for Thermal Neutron Sensitivity. WL23636B is available replacement for all applications.
2. Approximate Thermal Neutron Sensitivity for Each Section
 WL-23675 3.75×10^{-13} A/nv
 WL-23636 3.75×10^{-13} A/nv
 WL-23636A 3.75×10^{-13} A/nv
 WL-23636B 2.15×10^{-13} A/nv (spec. for new detector)

Table 7-5. NNI Inputs to Engineered Safeguards

Characteristics	Reactor Outlet Pressure (WR) ⁽¹⁾	Reactor Building Pressure (WR)	Reactor Building Pressure (NR)	
Component Item Number	RC3A-PT3	BS4-PS1 & 2	BS4-PT1	
	RC3A-PT4	BS4-PS3 & 4	BS4-PT2	
	RC3B-PT3	BS4-PS5 & 6	BS4-PT3	
ESPS Channel	A,B,C	A,B,C	A,B,C	
Sensor Type	Pressure Transmitter	Pressure Switch	Pressure Transmitter	
Type Readout	all indicating	NA	all indicating	
Power Required	external	none	external	
Sensors Connected to Common Taps	Note (3)	BS4-PS2 & BS4-PT1 BS4-PS4 & BS4-PT2 BS4-PS6 & BS4-PT3	All separate building penetrations	
NNI Inputs to RPS				
Characteristics	Reactor Outlet Pressure (NR) ⁽¹⁾	Reactor Outlet Temperature (NR)	Reactor Coolant Flow	Reactor Building Pressure (NR)
Component Item Number	RC3A-PT1	RC4A-TE1	RC14A-dPT1	BS4-PS7
	RC3A-PT2	RC4A-TE4	RC14A-dPT2	BS4-PS8
	RC3B-PT1	RC4B-TE1	RC14A-dPT3	BS4-PS9
	RC3B-PT2	RC4B-TE4	RC14A-dPT4	BS4-PS10
			RC14B-dPT1	
			RC14B-dPT2	
			RC14B-dPT3	
		RC14B-dPT4		
Reactor Protective Channel	A,B,C,D	A,B,C,D	A,B,C,D ⁽²⁾	A,B,C,D
Sensor Type	Press. Transmitter	RTD	Differential Pressure Transmitter	Pressure Switch
Type Readout	all indicating	all indicating	all indicating	NA
Power Required	external	external	external	none

NNI Inputs to RPS				
Characteristics	Reactor Outlet Pressure (NR) ⁽¹⁾	Reactor Outlet Temperature (NR)	Reactor Coolant Flow	Reactor Building Pressure (NR)
Sensors Connected to Common Taps	RC3A-PT1 ⁽³⁾ & RC3A-PT3 RC3A-PT2 & RC3A-PT4 RC3B-PT1 & RC3B-PT3	All sensors have separate taps.	All sensors for same loop are connected to common taps.	All sensors have separate taps.

Note:

1. NR = Narrow Range, WR = Wide Range
2. Each channel has an input from each loop.
3. Pressure taps for each RPS channel are independent. A RPS channel and an ESPS channel may have common pressure sensing taps.
4. Deleted per 2006 Update.

Table 7-6. ICS Transient Limits

Transient	Ramp Range (% Full Power)	Ramp Input Limit (% Power/min)
Power Increase	2-15	1
	15-20	5
	20-95	9.9
	95-100	5
Power Decrease	100-95	9.9
	95-20	9.9
	20-15	5
	15-2	1
Runback	High Limit (% Full Power)	Ramp Input Limit (% Power/min)
RC Flow		20
RCP	74	25
Feedwater Pump Limit	65	25
Asymmetric Rod	55	1
Generator Breakers	20	20
Maximum Runback	15	20
Condensate/Feedwater Pump Low Suction Pressure	15	20
Reactor Trip	0	600