

**Simulator Scenario**  
**Waterford 3 Nuclear Plant**  
**Simulator Scenario Number: E-SRO0001**

**Author:** avest                      **Scenario Status:** DRAFT                      **Estimated Time:** 50

**Approval:**    **Revision Number:**

**References Verified:** avest                      7/22/99

**Applications:**                      **Initial Conditions:**  
Initial Exam                      IC-27

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**Scenario Description:**

The plant was at 100% power with Charging Pump A, HPSI Pump A, and EFW Pump AB out of service. A shutdown was performed to ~ 50% due to reaching the allowed outage time for EFW pump AB. After taking the shift, the crew continues the shutdown to MODE 3 in accordance with OP-010-005. During the shutdown a safety related Tcold instrument supplying CPC C fails low. After the crew bypasses the appropriate PPS trip bistables, a failure of SUT B occurs. After Tech Specs are addressed for the SUT B failure CVC-ILT-0227 fails low causing the suction of the charging pumps to swap to the RWSP. This starts a boration of the RCS while at power. When the crew addresses OP-901-113, a seismic event occurs and two CEAs drop without a reactor trip. The crew should perform a manual reactor trip. Power is lost to the B busses due to the previous failure of the SUT. Emergency Diesel Generator B fails to auto start but may be started manually. Three CEAs fail to insert on the reactor trip; this requires the crew to initiate emergency boration. After the crew initiates emergency boration a safety valve lifts on S/G 2 causing an uncontrolled cooldown. Prior to diagnostics a Steam Generator Tube Rupture occurs, also on S/G 2. The crew should diagnose to OP-902-008. The scenario may be terminated when the crew has performed the steps to isolate S/G 2 and taken action to commence a depressurization or at the lead examiners discretion.

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**Scenario Notes:**

Load Plant Matching composites in IC View.  
Load Scenario E-SRO0004 from the disc in Scenario View.

Initial Setup Chg pump A - Set remote CVR20 to RACKOUT, place Chg pump A C/S on CP-4 to OFF, and place danger tag on C/S.

Initial Setup HPSI pump A - Set remote SIR29 to RACKOUT, place HPSI pump A C/S on CP-8 to OFF, and place danger tag on C/S.

Initial Setup EFW pump AB - Set malfunction FW05 to TRUE. Set annunciators A10 and M03 on panel M and M13 on panel N to CRYWOLF. Override red, green, and white lights for MS-401A and B to OFF. Override C/Ss for MS-401A and B to CLOSE and place danger tags on MS-401A and B C/Ss on CP-8. Override red and green lights for MS-416 and MS-417 to OFF and place danger tag on MS-417 C/S on CP-8. Override EFW Pump AB Disch Press, Speed and Stm Press indicators to 0 on CP-8.

Main Steam Safety Failure - Initiate MS03B after the RO has initiated emergency boration.

Steam Generator Tube Rupture - Initiate SG01B prior to diagnostics.

**Scenario Timeline:**

Item	Malfunction	Time	Severity	Ramp	TUA	TRA	Triager	Event
1	RD11 68	LOAD	TRUE	N/A	N/A	N/A	N/A	
CEA MECHANICALLY STUCK								
2	RD11 79	LOAD	TRUE	N/A	N/A	N/A	N/A	
CEA MECHANICALLY STUCK								
3	RD11 88	LOAD	TRUE	NA	NA	NA	NA	
CEA MECHANICALLY STUCK								
4	EG08 B	LOAD	TRUE	N/A	N/A	N/A	N/A	
FAILURE OF EMERGENCY DIESEL GENERATOR TO AUTOSTART								
5	N/A N/A	0 MIN	N/A	N/A	N/A	N/A	N/A	N1000
7	RC19 G	10 MIN	0%	N/A	N/A	N/A	MTF03	T331
RCS COLD LEG SAFETY TT FAILS (0-100%)								
8	ED02 D	20 MIN	TRUE	N/A	N/A	N/A	MTF04	T3811
TRANSFORMER FAILURE								
9	CV12 A	20 MIN	LO	N/A	N/A	N/A	MTF05	A113
VOLUME CONTROL TANK LEVEL TRANSMITTER FAILS HI / LO								
10	RD02 23	40 MIN	TRUE	N/A	N/A	N/A	MTF06	E000
DROPPED CEA								
11	RD02 47	40 MIN	TRUE	N/A	N/A	N/A	MTF06	
DROPPED CEA								
12	MS03 B	NOTE	100%	N/A	N/A	N/A	MTF07	
SAFETY VALVE FAIL (0-100% OPEN)								
13	SG01 B	NOTE	7%	N/A	N/A	N/A	MTF08	E008.E
SG TUBE RUPTURE								
14	N/A N/A	N/A	N/A	N/A	N/A	N/A	N/A	E008.S

**Manip # Manipulation Description**

- 17 Loss of Protective System Channel
- 18 Mispositioned or Dropped CEAs
- 2 Plant Shutdown
- 4 Boration or Dilution During Power Operation
- 7A Steam Generator Tube Leak or Steam Generator Tube Rupture
- 9 Loss of Electrical Power or Degraded Power Source

**Scenario Critical Tasks****Event Number E000****STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 Establish Reactivity Control. The task is identified by at least one member of the crew. The PNPO manually trip the reactor by using Manual Trip pushbuttons or DRTS pushbuttons within 1 minute of recognizing two CEAs dropped.
- 2 Establish Reactivity Control. The task is identified by at least one member of the crew. The PNPO will initiate emergency boration using the BA pumps and Emergency Boration valve prior to entry into the diagnostics section of OP-902-000

Event	Reference	Rev	Chna	Event	Reference	Rev	Chna
A113	OP-901-113	01	01	E000	OP-902-000	08	00
E008.EN	OP-902-008	11	00	E008.SG	OP-902-008	11	00
N10005c	OP-010-005	00	02	N10005c	TS 4.4.7		
N10005c	TS 3.2.7			N10005c	TS 3.2.1		
N10005c	TS 3.1.2			T331	TS 3.3.2		
T331	TS 3.3.1			T331	OP-009-007	05	00

## Scenario Objectives

The ABILITY to:

- 1 Communicate as a team, prioritize actions, demonstrate attention to detail.
- 2 Analyze plant parameters in abnormal / emergency conditions to diagnose and determine which emergency / off-normal operating procedure should be entered, if appropriate.
- 3 Verify automatic actions, and perform procedural immediate operator actions from memory.
- 4 Identify all LCO conditions in Technical Specifications and interpret / apply required actions.
- 5 Classify emergencies, make notifications and apply required actions of EP-001-001 "Recognition and Classification of Emergency Conditions".
- 6 Locate and utilize pertinent plant reference material available in the control room, including electrical and mechanical drawings.
- 7 Make clear, accurate, and concise verbal reports, written logs, and in-plant communications.

### **Event Number A113 VCT MAKEUP MALFUNCTION**

- 1 Determine cause of VCT makeup malfunction and operate CVCS components in accordance with OP-901-114, VCT Makeup Malfunction.

### **Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 Carry out all operator actions, including necessary contingency actions in accordance with OP-902-000, Standard Post Trip Actions, in the event of a reactor trip.
- 2 Properly diagnose event in progress and transition to appropriate EOP recovery procedure.

### **Event Number E008.ENTRY FRP (ENTRY)**

- 1 Recognize entry criteria for the functional recovery procedure and take preliminary actions as required by OP-902-008.
- 2 Determine the safety function in jeopardy and proceed to proper success path.
- 3 Respond to the identified safety functions in jeopardy by selecting the proper success paths and implementing them.
- 4 Demonstrate knowledge of OP-902-008 General Usage  
By recognizing when success path criteria are met or when transition to another success path is appropriate.

### **Event Number E008.SGTR FRP, CI-1 (AUTOMATIC/MANUAL ISOLATION)**

- 1 Respond to the containment isolation safety function not met by selecting the proper success path and implementing it.
- 2 Demonstrate knowledge of OP-902-008 General Usage by recognizing when success path criteria are met or when transition to another success path is appropriate.
- 3 Given a loss of the containment isolation safety function due to an identified steam generator tube rupture, perform the appropriate HR success path actions to restore the containment isolation safety function.

### **Event Number N10005c PLANT SHUTDOWN 50% TO REACTOR SHUTDOWN**

- 1 Reduce reactor power and/or remove the unit from service by operating securing, or realigning plant equipment as directed by precautions, limitations, and procedural guidance of General Operating Procedure, OP-010-005.

**Event Number T331 SAFETY CHANNEL INSTRUMENTATION FAILURES**

- 1 Recognize failed instrument and verify RPS/CPC bistable functions as expected.
- 2 Bypass affected bistable channel.

**Event Number T3811 LOSS OF SUT B**

- 1 EVALUATE THE EFFECTS OF THE TRANSFORMER FAILURE ON PLANT OPERATIONS.
- 2 EVALUATE TECHNICAL SPECIFICATIONS TO DETERMINE AND DETERINE REQUIRED ACTIONS.

<b>Number:</b>	<b>Position:</b>	<b>Action</b>
	<b>Event Number</b>	<b>N10005c                    PLANT SHUTDOWN 50% TO REACTOR SHUTDOWN</b>
1	SNPO	SHUTDOWN ONE FEEDWATER PUMP IN ACCORDANCE WITH OP-003-003.
3	PNPO	MAINTAIN TCOLD 541-548 DURING DOWNPOWER. PERFORM BORATION EQUALIZATION. ESTIMATE BORON ADDITION USING THUMBRULE OR OP-002-005 (~750 GALS) BORATES TO REDUCE REACTOR POWER AT RATE DETERMINED BY THE CRS.
4	PNPO	MAINTAINS ASI USING GROUP 5, 6 OR PART LENGTH CONTROL RODS
5	SNPO	REDUCES GENERATOR LOAD AS REQUIRED ONCE TAVE STARTS TO DROP TO MATCH REFERENCE TEMPERATURE AND TAVE
6	CRS	HAS TURBINE BUILDING OPERATOR MONITOR CONDENSER POLISHER DIFFERENTIAL PRESSURE AND REMOVE POLISHERS AS NECESSARY TO MAINTAIN SYSTEM PRESSURE
7	SNPO	WHEN POWER IS 40%, REMOVE ONE OF THE THREE CONDENSATE PUMPS FROM SERVICE
8	SNPO	IF AT 35% GENERATOR LOAD AND THE PLANT IS NOT TO BE SHUTDOWN, THEN REDUCE MSR TEMPERATURE.
9	SNPO	AT 20% GENERATOR LOAD, VERIFIES TURBINE & EXTRACTION LINE DRAIN VALES ARE OPEN
10	SNPO	ALIGNS BD FLASH TANK VENT TO CONDENSER
11	CRS	HAS TURBINE BUILDING OPERATOR STARTUP AUXILIARY BOILER IF PLANT IS TO BE PLACED IN MODE 3
12	SNPO	TRANSFERS ELECTRICAL LOADS TO SU TRANSFORMERS AT 230 MWE
13	CRS	NOTIFY LOAD DISPATCHER AND SO CONTROL THAT UNIT IS GOING OFF-LINE
14	PNPO	AT CRS DIRECTION, WHEN <20% POWER, BYPASS HIGH SG LEVEL TRIPS.
15	SNPO	IF NECESSARY, TRANSFER FWCS TO MANUAL AND MAINTAIN 50-70% NR LEVELS.
16	SNPO	AT 60 MWE SECURE THE MAIN TURBINE. ENSURES GENERATOR TRIPS TURNS THE VOLTAGE REGULATOR OFF VERIFIES 86 G1 AND 86 G2 RELAYS ARE RESET SETS PMC TO MODE 2 AT <5%

- 17 SNPO SECURES MSR'S
- 18 PNPO MANUALLY TRIPS REACTOR AND INFORMS SS/CRS PLANT IS IN MODE 3
- 19 TERM THIS EVENT MAY BE TERMINATED AT ANY TIME AT THE LEAD EXAMINER'S DISCRETION

**Event Number T331 SAFETY CHANNEL INSTRUMENTATION FAILURES**

- 1 PNPO RECOGNIZE AND REPORT INDICATIONS OF FAILED CHANNEL
- 2 PNPO/CRS VERIFY RPS/CPC FUNCTION BISTABLE RESPOND AS EXPECTED
- 3 CRS REVIEW AND/OR IMPLEMENT ACTIONS REQUIRED BY TECHNICAL SPECIFICATION SECTION 3.3.1 OR 3.3.2 (RPS OR ESFAS)
- 4 CRS DIRECT BISTABLE BYPASS WITH 1 HOUR OF FAILURE (FOR FIRST CHANNEL FAILURE)
- 4.1 CRS NOTE: FAILURE OF A SECOND CHANNEL WILL REQUIRE THAT CHANNEL TO BE PLACED IN THE TRIP CONDITION. TO BYPASS A SECOND CHANNEL WILL REMOVE BOTH CHANNELS FROM BYPASS.
- 5 SNPO/PNP BYPASS AFFECTED CHANNEL IN ACCORDANCE WITH OP-009-007 SECTION 6.2
- 6 TERM BYPASS LIGHTS ILLUMINATE ON BCP AND ROM FOR THE DESIRED CHANNEL

**Event Number T3811 LOSS OF SUT B**

- 1 SNPO/CRS IDENTIFY TRANSFORMER FAILURE BY VERIFYING ANNUNCIATOR RESPONSE PROCEDURE AND BREAKER INDICATIONS ON CP-1.
- 2 CRS REVIEW TECHNICAL SPECIFICATION 3.8.1.1 AND DETERMINE THE FOLLOWING:  
 - 3.8.1.1.A APPLIES  
 - OP-903-066 MUST BE PERFORMED WITHIN ONE HOUR
- 3 CRS NOTIFY ELECTRICAL MAINTENANCE OR THE WORK WEEK MANAGER OF FAILURE
- 4 TERM TERMINATION POINT FOR EVENT

**Event Number A113 VCT MAKEUP MALFUNCTION**

- 1 CRS/PNPO IF VCT LEVEL instrument CVC-ILT-0227 227 FAILS LOW, simultaneously secure all Charging Pumps and close Letdown Stop Valve, CVC-101.
- 2 CRS/PNPO Operate Charging Pumps as necessary to maintain Pressurizer Level 26.5% to 62%.

- 3 CRS/PNPO/SN Match Tav<sub>g</sub> to Tref by adjusting Turbine Load.
- 4 CREW Initiate corrective action to repair level instrument.
- 5 CREW When level instrument CVC-ILT-0227 is repaired, then restore Charging and Letdown in accordance with OP-002-005, Chemical and Volume Control.

**Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 PNPO/CRS  
 VERIFY REACTIVITY CONTROL.  
 CHECK REACTOR POWER DROPPING OR PERFORM ANY OF THE FOLLOWING:  
 MANUALLY TRIP THE REACTOR, MANUALLY INITIATE DRTS, OPEN BOTH 32 BUS BKRS FOR 5 SECONDS AND RE-CLOSE.  
 CHECK STARTUP RATE IS NEGATIVE.  
 CHECK LESS THAN 2 CEAS INSERTED OR EMERGENCY BORATE.
- 2 SNPO/CRS  
 VERIFY MAINTENANCE OF VITAL AUXILIARIES  
 CHECK THE MAIN TURBINE TRIPPED OR PERFORM ANY OF THE FOLLOWING:  
 MANUALLY TRIP THE TURBINE OR CLOSE BOTH MSIVS.  
 CHECK THE GENERATOR TRIPPED OR MANUALLY TRIP THE MAIN GENERATOR BY PERFORMING ANY OF THE FOLLOWING: DEPRESS BOTH GENERATOR EMERG TRIP PUSHBUTTONS OR TRANSFER BOTH ELECTRICAL TRAINS TO THE SUTS AND OPEN BOTH GENERATOR OUTPUT BKRS AND THE EXCITER FIELD BKR.  
 CHECK TRAIN A AND B STATION LOADS ARE ENERGIZED FROM OFFSITE POWER OR VERIFY THE APPLICABLE EDG STARTS AND ITS OUTPUT BKR CLOSES.
- 3 PNPO/CRS  
 VERIFY RCS INVENTORY CONTROL BY CHECKING PZR LEVEL 7% AND 60% AND SUBCOOLING MARGIN GREATER THAN OR EQUAL TO 28 DEG. F. IF PZR LEVEL CONTROL SYSTEM IS MALFUNCTIONING THE OPERATOR TAKES MANUAL CONTROL OF THE SYSTEM OR OPERATES CHARGING AND LETDOWN COMPONENTS TO RESTORE PZR LEVEL (THIS STEP MAY BE N/A FOR ESD, LOCA, OR SGTR EVENTS)
- 4 PNPO/CRS  
 VERIFY RCS PRESSURE CONTROL BY CHECKING PZR PRESSURE BETWEEN 1750 PSIA AND 2300 PSIA OR  
 1) IF PZR PRESS CONTROL SYSTEM (PPCS) IS MALFUNCTIONING THE OPERATOR TAKES MANUAL OF PPCS CONTROLLERS TO RESTORE PRESSURE  
 2) IF PZR PRESSURE IS LESS THAN 1684 PSIA, THE OPERATOR VERIFIES THAT SIAS AND CIAS INITIATE OR PERFORMS MANUAL INITIATION  
 3)IF PZR PRESSURE IS LESS THAN 1621, THE OPERATOR VERIFIES NO MORE THAN TWO RCPS ARE OPERATING.  
 4) IF PZR PRESSURE IS LESS THAN MINIMUM RCP NPSH OF APP. 2A THE OPERATOR SECURES ALL RCPS.
- 5 PNPO/CRS  
 VERIFY CORE HEAT REMOVAL BY CHECKING AT LEAST ONE RCP OPERATING, OPERATING LOOP DELTA-T LESS THAN 13 DEG. F, AND RCS SUBCOOLING GREATER THAN OR EQUAL TO 28 DEG. F. (MAY BE N/A FOR ESD, LOCA, AND LOOP EVENTS)



- 6 SNPO/CRS CHECK RCS HEAT REMOVAL BY CHECKING AT LEAST ONE S/G IS BOTH 15-80% NR AND MAIN FEEDWATER IS AVAILABLE TO RESTORE LEVEL OR VERIFY EFW IS AVAILABLE TO RESTORE LEVEL IN AT LEAST ONE S/G.
- 7 PNPO/SNPO/C CHECK RCS TEMPERATURE 535-555 DEG. F OR  
 1) IF TC IS > 555 DEG. F VERIFY LEVEL IS BEING RESTORED TO AT LEAST ONE S/G AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F.  
 2) IF TC IS < 535 DEG. F THEN VERIFY FEED FLOW IS NOT EXCESSIVE AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F  
 3) IF TC IS < 500 DEG. F VERIFY NO MORE THAN 2 RCPs OPERATING  
 4) IF ESD IN PROGRESS STABILIZE RCS TEMPERATURE USING LEAST AFFECTED S/G PER APP. 13.
- 8 SNPO/CRS CHECK S/G PRESSURE 925-1050 PSIA OR  
 1) IF S/G PRESS <925 PSIA VERIFY STEAM BYPASS VALVES AND ADVs ARE CLOSED.  
 2) IF S/G PRESS LESS THAN OR EQUAL TO 764 PSIA VERIFY MSIS IS INITIATED.  
 3) IF S/G PRESS > 1050 PSIA VERIFY SBCS OR ADVs ARE RESTORING S/G PRESS TO < 1050 PSIA
- 9 SNPO/CRS VERIFY FWCS IN RTO BY CHECKING MAIN FEED REG VALVES ARE CLOSED, STARTUP FEED REG VALVES ARE 20-25% OPEN, AND OPERATING FEED PUMPS ARE 3800 TO 4000 RPM OR MANUALLY OPERATE FEEDWATER SYSTEM TO RESTORE LEVEL IN AT LEAST ONE S/G TO 50-70 NR.(N/A IF MSIS IS INITIATED)
- 10 SNPO/CRS RESET MOISTURE SEPARATOR REHEATERS AND CHECK THE TEMP CONTROL VALVES CLOSED OR NOTIFY AN NAO TO FAIL CLOSE THE VALVES LOCALLY. (N/A IF MSIS IS INITIATED)
- 11 PNPO/CRS VERIFY CONTAINMENT ISOLATION BY CHECKING CONTAINMENT PRESSURE < 16.4 PSIA, CHECK THAT NO CONT. AREA RAD MONITORS ARE IN ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY, AND CHECK THAT NO STEAM PLANT RAD MONITORS ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY. IF CONTAINMENT PRESSURE IS GREATER THAN OR EQUAL TO 17.1 PSIA VERIFY CIAS, SIAS, AND MSIS INITIATE.
- 12 SNPO/PNPO/C VERIFY CONTAINMENT TEMPERATURE AND PRESSURE CONTROL AND CONTAINMENT COMBUSTIBLE GAS CONTROL BY VERIFYING CONTAINMENT TEMP LESS THAN OR EQUAL TO 120 DEG. F AND CONTAINMENT PRESSURE IS < 16.4 PSIA OR  
 1) VERIFY AT LEAST 3 CFCs OPERATING.  
 2) IF CONTAINMENT PRESS IS GREATER OR EQUAL TO 17.1 PSIA VERIFY ALL CFCs ARE OPERATING IN EMERGENCY MODE.  
 3) IF CONTAINMENT PRESS IS GREATER THAN OR EQUAL TO 17.7 VERIFY CSAS IS INITIATED, ALL AVAILABLE CS PUMPS ARE DELIVERING > 1750 GPM, AND SECURE ALL RCPs .
- 13 CRS VERIFY ALL SAFETY FUNCTION ACCEPTANCE CRITERIA ARE MET
- 14 CRS/PNPO/SN PERFORM DIAGNOSTICS

15 TERM CREW DIAGNOSES A(N) \_\_\_\_\_ EVENT AND EXITS TO OP-902-  
\_\_\_\_\_.

**Event Number E008.ENTRY FRP (ENTRY)**

- |    |          |  |
|----|----------|--|
| 1  | SS/CRS   | CLASSIFY THE EVENT   |
| 2  | CRS      | IMPLEMENT PLACEKEEPING   |
| 3  | PNPO/CRS | TRIP RCPS<br>1. <1621, STOP 2<br>2. OUTSIDE PT CURVE, STOP ALL.                        |
| 4  | PNPO/CRS | VERIFY RCP OPERATING LIMITS<br>1. STOP ALL IF CSAS/LOSS CCW<br>2. <500 DEGREES, STOP 2 |
| 5  | CRS      | SAMPLE S/Gs  |
| 6  | SNPO/CRS | PLACE H2 ANALYZERS IN SERVICE  |
| 7  | CRS      | IDENTIFY SUCCESS PATHS   |
| 8  | STA/CRS  | PERFORM SFSC   |
| 9  | CRS      | PRIORITIZE SUCCESS PATHS   |
| 10 | CREW     | IMPLEMENT SUCCESS PATHS  |
| 11 | CREW     | PERFORM LONG TERM ACTIONS  |

**Event Number E008.SGTR FRP, CI-1 (AUTOMATIC/MANUAL ISOLATION)**

- |   |             |  |
|---|-------------|--|
| 1 | PNPO/SNPO/C | VERIFY CONTAINMENT ISOLATION                         |
| 2 | SNPO/CRS    | DETERMINE MOST AFFECTED SG                           |
| 3 | PNPO/SNPO/C | COMMENCE A RAPID COOLDOWN TO LESS THAN 520 DEGREES F |

- |   |          |   |
|---|----------|---|
| 4 | PNPO/CRS | DEPRESSURIZE THE RCS USING MAIN OR AUX. SPRAY TO MEET ALL OF THE FOLLOWING:<br>- RCS PRESSURE LESS THAN 1000 PSIA<br>- RCS PRESSURE WITHIN APPENDIX 2-A, "<br>IF HPSI THROTTLE CRITERIA ARE MET CONTROL CHARGING AND LETDOWN FLOW AND THROTTLE HPSI FLOW  |
| 5 | SNPO/CRS | WHEN RCS T-HOT IS LESS THAN 520 DEGREES F ISOLATE THE MOST AFFECTED SG BY:<br>- PLACE ADV 1(2) CONTROLLER SETPOINT TO 980 PSIG AND VERIFY THE CONTROLLER IS IN AUTO<br>- VERIFY MSIV 1(2) IS CLOSED<br>- IF EFAS 1(2) HAS NOT INITIATED CLOSE EFW-228A(B) AND EFW-229A(B)<br>- PLACE THE EFW FCV CONTROLLERS IN MANUAL AND CLOSE EFW-224A(B) AND EFW-223A(B)<br>- CLOSE MS-401A(B)<br>- CLOSE THE MAIN STEAM LINE DRAINS MS-120A(B) AND MS-119A(B)<br>CHECK MAIN STEAM SAFETY VALVES CLOSED |
| 6 | TERM     | TERMINATION POINT   |



**Simulator Scenario**  
**Waterford 3 Nuclear Plant**  
**Simulator Scenario Number: E-SRO0002**

**Author:** avest                      **Scenario Status:** DRAFT                      **Estimated Time:** 50

**Approval:**    **Revision Number:**

**References Verified:**

**Applications:**                      **Initial Conditions:**  
Initial Exam                      IC-30

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**Scenario Description:**

The plant is at 100% power and FWPT A is experiencing higher than normal vibration. After the crew assumes the shift a power reduction is commenced to 60% to remove FWPT A from service. After the reactivity manipulation is satisfied, the PMC fails, requiring implementation of OP-901-501, Loss of PMC/COLSS off-normal. The power reduction will be stopped. After evaluating DNBR, LPD, and ASI Tech Specs, a hot leg temperature instrument fails low causing the PZR level setpoint to lower. The crew should implement OP-901-110 and address the failure of the PZR level setpoint. After completing the actions of OP-901-110 the inservice letdown backpressure control valve fails closed due to a broken air line and instrument air lowers. The crew should implement the actions of OP-901-112 for a letdown malfunction and OP-901-511 for the Instrument Air leak. When the air leak is isolated a S/G 1 WR level transmitter fails high causing a closure of the MFIV and a reactor trip. The crew should implement OP-902-000, Standard Post Trip Actions and OP-902-001, Reactor Trip Recovery procedure. During the performance of OP-902-001, a SGTR occurs in S/G 1 due to the Reactor Trip transient. The crew should diagnose to OP-902-007. The scenario may be terminated when S/G 1 is isolated and the RCS has been depressurized to minimize leakage into the ruptured generator or at the discretion of the lead examiner.

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**Scenario Notes:**

Load Plant Matching composites in IC View.  
Load Scenario E-SRO0004 from the disc in Scenario View.

Initial Setup Chg pump A - Set remote CVR20 to RACKOUT, place Chg pump A C/S on CP-4 to OFF, and place danger tag on C/S.

Initial Setup HPSI pump A - Set remote SIR29 to RACKOUT, place HPSI pump A C/S on CP-8 to OFF, and place danger tag on C/S.

Initial Setup EFW pump AB - Set malfunction FW05 to TRUE. Set annunciators A10 and M03 on panel M and M13 on panel N to CRYWOLF. Override red, green, and white lights for MS-401A and B to OFF. Override C/Ss for MS-401A and B to CLOSE and place danger tags on MS-401A and B C/Ss on CP-8. Override red and green lights for MS-416 and MS-417 to OFF and place danger tag on MS-417 C/S on CP-8. Override EFW Pump AB Disch Press, Speed and Stm Press indicators to 0 on CP-8.

When the operator orders the RAB/RCA operator to open CVC-125A, allow time to perform the evolution and report that CVC-125A is open.

When the operator orders the RAB/RCA operator to slowly open CVC-121A, allow time to perform the evolution, set remote CVR03 to OPEN and report that CVC-121A is open.

When the operator orders the RAB/RCA operator slowly close CVC-121B, allow time to perform the evolution, set remote CVR04 to CLOSED, and report that CVC-121B is closed.

When the operator orders the RAB/RCA operator to close CVC-125B, allow time to perform the evolution and report that CVC-125B is closed.

**Scenario Timeline:**

Item	Malfunction		Time	Severitv	Ramp	TUA	TRA	Triaaer	Event
1	FW12	A	SETUP	40%	N/A	N/A	N/A	N/A	
MAIN FEEDWATER PUMP TURBINE HIGH VIBRATION									
2	N/A	N/A	0 MIN	N/A	N/A	N/A	N/A	N/A	N1000
3	PC01	N/A	10 MIN	TRUE	N/A	N/A	N/A	MTF03	A501
PMC HOST A & B TOTAL FAILURE									
4	RC21	A	20 MIN	0%	N/A	N/A	N/A	MTF04	A110.e
RCS HOT LEG CONTROL TT FAILS (0-100%)									
5	CV05	B1	25 MIN	CLOSE	N/A	N/A	N/A	MTF05	A112.e
LETDOWN BACK-PRESSURE REGULATOR VALVE FAILS OPEN / CLOSED									
6	IA04	B	25 MIN	100%	N/A	N/A	N/A	MTF05	A511
A.B.C RUPTURE AIR SUPPLY TO RAB									
7	SG06	A	35 MIN	100%	N/A	N/A	N/A	MTF06	E000
SG WR LEVEL XMITTER FAILS									
8	SG01	A	38 MIN	3%	5 MIN	2 MIN	N/A	MTF07	E007
SG TUBE RUPTURE									

**Manip # Manipulation Description**

15	Loss of Main Feedwater or Main Feedwater System Failure
19	Inability to Drive CEAs
24	Malfunction of RCS Pressure or Level Control (includes loss of letdown/charging)
25	Reactor Trip
4	Boration or Dilution During Power Operation
7A	Steam Generator Tube Leak or Steam Generator Tube Rupture
8	Loss of Instrument Air

**Scenario Critical Tasks****Event Number E007****STEAM GENERATOR TUBE RUPTURE**

2	Isolate the Most Affected Steam Generator.	The task is identified by at least one member of the crew. The SNPO takes action to isolate SG #1 prior to commencing a cooldown to 350 F.
3	Prevent opening of the Isolated SG Safety Valves.	The task is identified by at least one member of the crew. The PNPO takes action to reduce RCS pressure to < 950 psia.

Event	Reference	Rev	Chna	Event	Reference	Rev	Chna
A110.e2	TS 3.4.3			A110.e2	OP-901-110	03	01
A112.e2	TS 3.4.3			A112.e2	OP-901-112	02	01
A501	TS 3.2.4			A501	OP-901-501	05	03
A511	OP-901-511	04	03	E000	OP-902-000	08	00
E007	OP-902-007	09	00	E007	EP-001-001	19	00
N10005a	OP-010-005	00	02	N10005a	TS 4.4.7		
N10005a	TS 3.2.7			N10005a	TS 3.2.1		
N10005a	TS 3.1.2						

## Scenario Objectives

The ABILITY to:

- 1 Communicate as a team, prioritize actions, demonstrate attention to detail.
- 2 Analyze plant parameters in abnormal / emergency conditions to diagnose and determine which emergency / off-normal operating procedure should be entered, if appropriate.
- 3 Verify automatic actions, and perform procedural immediate operator actions from memory.
- 4 Identify all LCO conditions in Technical Specifications and interpret / apply required actions.
- 5 Classify emergencies, make notifications and apply required actions of EP-001-001 "Recognition and Classification of Emergency Conditions".
- 6 Locate and utilize pertinent plant reference material available in the control room, including electrical and mechanical drawings.
- 7 Make clear, accurate, and concise verbal reports, written logs, and in-plant communications.

### **Event Number A110.e2 PRESSURIZER LEVEL SETPOINT MALFUNCTION**

- 1 Determine faulty temperature channel(s) and take corrective actions to restore pressurizer level control back to normal
- 2 Properly perform general subsequent operator actions in accordance with OP-901-110, Pressurizer Level Control Malfunction.

### **Event Number A112.e2 LETDOWN MALFUNCTION**

- 1 Adjust letdown flow in manual, in the event of a letdown malfunction.
- 2 Locate and isolate leaks and/or faulted letdown system components in accordance with OP-901-112, Charging or Letdown Malfunction.
- 3 Place available standby components in service.

### **Event Number A501 PMC/COLSS INOPERABLE**

- 1 Respond to a loss of PMC/COLSS by notifying computer tech, and taking required Tech Spec actions, including calculations per (OP-901-501) PMC or COLSS System inoperable.
- 2 Restore COLSS to service following the restoration of the PMC.

### **Event Number A511 INSTRUMENT AIR MALFUNCTION**

- 1 Identify, isolate, and restore as much of the instrument air system as possible.
- 2 Respond to an instrument air leak in accordance with off-normal operating procedure OP-901-511, Instrument Air Malfunction.

### **Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 Carry out all operator actions, including necessary contingency actions in accordance with OP-902-000, Standard Post Trip Actions, in the event of a reactor trip.
- 2 Properly diagnose event in progress and transition to appropriate EOP recovery procedure.

### **Event Number E007 STEAM GENERATOR TUBE RUPTURE**

- 1 Verify a steam generator tube rupture exist and identify the affected steam generator.
- 2 Ensure adequate core cooling and sufficient RCS inventory exist.



- 3 Minimize radioactive effluents by isolating the affected steam generator in accordance with OP-902-007, Steam Generator Tube Rupture Recovery Procedure.

**Event Number N10005a PLANT SHUTDOWN 100% TO 90%**

- 1 Reduce reactor power and/or remove the unit from service by operating securing, or realigning plant equipment as directed by precautions, limitations, and procedural guidance of General Operating Procedure, OP-010-005.

<b>Number:</b>	<b>Position:</b>	<b>Action</b>
	<b>Event Number</b>	<b>N10005a                    PLANT SHUTDOWN 100% TO 90%</b>
1	SS/CRS	IF NECESSARY, ENSURE IPTE REQUIREMENTS ARE MET AND SENIOR LINE MANAGER ON SITE
2	CRS	NOTIFIES LOAD DISPATCHER PRIOR TO POWER REDUCTION AND ANNOUNCES POWER REDUCTION OVER PLANT PAGING SYSTEM
3	PNPO/CRS	MAINTAIN TCOLD 541-548 DURING DOWNPOWER. PERFORM BORATION EQUALIZATION. ESTIMATE BORON ADDITION USING THUMBRULE OR OP-002-005 (~150 GALS) BORATES TO REDUCE REACTOR POWER AT RATE DETERMINED BY THE CRS.
4	PNPO/CRS	MAINTAINS ASI USING GROUP 5, 6 OR PART LENGTH CONTROL RODS
5	SNPO/CRS	REDUCES GENERATOR LOAD AS REQUIRED ONCE TAVE STARTS TO DROP TO MATCH REFERENCE TEMPERATURE AND TAVE
6	PNPO/CRS	REEVALUATE CEA SUBGROUPS SELECTED TO DROP ON RPC BETWEEN 90% AND 80% POWER.
7	TERM	TERMINATE EVENT AT 90% POWER OR AT LEAD EXAMINER'S DISCRETION
	<b>Event Number</b>	<b>A501                                PMC/COLSS INOPERABLE</b>
1	CRS	IF CEA MOVEMENT IS NECESSARY, REDUCE POWER TO COMPLY WITH TS 3.2.1 AND 3.2.4
2	CRS	NOTIFY SHIFT COMPUTER TECHNICIAN TO REBOOT OR FAILOVER PMC
3	CRS	INFORM PINE BLUFF THAT PMC FEED FROM WATERFORD 3 HAS BEEN LOST.
4	CRS/SS	IF PMC/SPDS IS INOPERABLE >1 HOUR, THEN A 1 HOUR NOTIFICATION TO NRC REQUIRED
5	PNPO/SNPO/C	IF >20% POWER; WITHIN 15 MINUTES CALCULATE CPC DNBR LIMIT BY PERFORMING ATTACHMENT 1
6	PNPO/SNPO/C	VERIFY LPD, DNBR, AND ASI WITHIN LIMITS ON OPERABLE CPC CHANNELS EVERY 15 MINUTES BY PERFORMING ATTACHMENT 6.2
7	CRS/PNPO/SN	IF DNBR DROPS BELOW LIMIT DURING FIRST 2 HOURS, COMMENCE POWER REDUCTION TO RESTORE TO WITHIN LIMITS OF TS 3.2.4
8	CRS/PNPO/SN	IF COLSS NOT RESTORED WITHIN 2 HOURS AND LPD OR DNBR ARE OUTSIDE LIMITS, REDUCE POWER TO RESTORE DNBR AND LPD TO LIMITS OF TS 3.2.4 AND 3.2.1 OR REDUCE POWER TO <=20% RATED THERMAL POWER

9	CRS	DIRECT STA TO PERFORM AZIMUTHAL POWER TILT CALCULATION EVERY 12 HOURS, AS WELL AS RCS FLOW CALCULATION
10	PNPO/CRS	VERIFY AT LEAST 2 OF 3 CEA POSITION INDICATOR CHANNELS REQUIRED BY TS 3.1.3.2 ARE OPERABLE. DIRECT CHEMISTRY TO PERFORM THERMAL DICHARGE CALCULATIONS EVERY TWO HOURS
11	PNPO/CRS	VERIFY EACH REGULATING CEA GROUP INDIVIDUAL CEA POSITION WITHIN TRANSIENT INSERTION LIMIT EVERY 4 HOURS
12	CRS	WHEN PMC IS RESTORED, PLACE COLSS BACK IN SERVICE
13	CRS	VERIFY INCORE DETECTORS OPERABLE
14	PNPO/CRS	CHECK POWER DEPENDENT INSERTION LIMIT ANNUNCIATOR CLEARS
15	CRS	CONTACT PINE BLUFF TO INFORM THEM THAT WATERFORD 3 PMC FEED IS BACK OPERATING.
16	TERM	RESUME NORMAL PLANT OPERATIONS

**Event Number A110.e2 PRESSURIZER LEVEL SETPOINT MALFUNCTION**

1	PNPO/CRS	NOTIFY CRS OF INSTRUMENT FAILURE
2	SNPO/CRS	STOP ALL TURBINE LOAD CHANGES
3	PNPO/CRS	PLACE PZR LEVEL CONTROLLER TO MANUAL AND ADJUST OUTPUT SLOWLY TO RESTORE PRESSURIZER LEVEL.
4	PNPO/SNPO/C	VERIFY NORMAL INDICATIONS ON ALL SAFETY MEASUREMENT CHANNEL HOT LEG AND COLD LEG TEMPERATURE INDICATORS.
5	PNPO/CRS	DETERMINE AFFECTED CHANNEL(S) BY RRS TAVG RECORDERS.
6	PNPO/CRS	START/STOP CHARGING PUMPS AS NECESSARY TO MAINTAIN PRESSURIZER LEVEL ABOVE MINIMUM LEVEL FOR OPERATION.
7	PNPO/CRS	IF UNABLE TO CONTROL PZR LEVEL WITH LETDOWN IN SERVICE THEN: CLOSE CVC-101, CYCLE CHARGING PUMPS.
8	PNPO/CRS	IF FAILURE IS DUE TO LETDOWN FLOW CONTROLLER: PLACE LETDOWN FLOW CONTROLLER TO MANUAL
9	PNPO/CRS	IF BACKUP CHARGING PUMPS HAVE STARTED, SECURE UNNECESSARY CHARGING PUMPS.

10	PNPO/CRS	IF PZR BACKUP HEATERS HAVE ENERGIZED, THEN PLACE UNNECESSARY BACKUP HEATER BANKS TO OFF.
11	PNPO/CRS	CHECK RRS HOT AND COLD LEG TEMPERATURE METERS FOR ABNORMAL READINGS.
12	SNPO/CRS	IF HOT LEG 1 INDICATES ABNORMALLY HIGH OR LOW, SELECT LOOP 2 FOR TAVE LOOP SELECTOR IN BOTH RRS LOCAL CABINETS.
13	PNPO/CRS	IF SETPOINT OF PRESSURIZER LEVEL CONTROLLER RETURNS TO SETPOINT PER ATTACHMENT 1 PLACE PZR LEVEL CONTROLLER AND BACKUP CHARGING PUMPS IN AUTO, RESTORE PRESSURIZER HEATERS.  PLACES PRESSURIZER BACKUP HEATERS IN AUTO AND RESET PROPORTIONAL HEATERS, IF NECESSARY
22	TERM	

**Event Number A112.e2 LETDOWN MALFUNCTION**

0	TERM	THIS EVENT IS TERMINATED WHEN LETDOWN IS RESTORED.
1	CRS/SNPO	STOP ANY TURBINE LOAD CHANGE.
2	PNPO/CRS	ATTEMPT TO RESTORE PRESSURIZER LEVEL BY ADJUSTING LETDOWN FLOW CONTROLLER IN MANUAL.
3	PNPO/CRS	OPERATE CHARGING PUMPS AS NECESSARY TO MAINTAIN PRESSURIZER LEVEL IAW ATTACHMENT 1.
4	CRS/PNPO	IF LOSS OF PRESSURIZER LEVEL OCCURS, TRIP REACTOR, INITIATE SAFETY INJECTION, AND GO TO OP-902-000 EMERGENCY ENTRY PROCEDURE.
5	PNPO/CRS	IF BACKPRESSURE CONTROLLER NOT OPERATING PROPERLY, PLACE LETDOWN FCV AND BACKPRESSURE REGULATING VALVE IN MANUAL.
6	PNPO/CRS	IF BACKPRESSURE REGULATING VALVE IS NOT OPERATING PROPERLY, PLACE THE OTHER BACKPRESSURE REGULATING VALVE IN SERVICE.
7	PNPO/CRS	IF LETDOWN HAS BEEN SECURED AND ALL MALFUNCTIONS FOUND AND CORRECTED, RESTORE CHARGING AND LETDOWN

**Event Number A511 INSTRUMENT AIR MALFUNCTION**

1	CRS/SNPO	VERIFY THAT AUTOMATIC ACTIONS TAKE PLACE AS DESIGNED
2	CRS/PNPO	IF INSTRUMENT AIR PRESSURE DROPS TO 65 PSIG, THEN TRIP THE REACTOR AND REFER TO OP-902-000 AND WORK CONCURRENTLY

3	CRS	LOCALLY VERIFY INSTRUMENT AIR AND STATION AIR COMPRESSORS RUNNING LOADED. IF NECESSARY, VERIFY SA BACKUP SUPPLY VALVE (SA-125) OPEN (DRYER BYPASS OPENS AT 95 PSIG)
4	CRS	ANNOUNCE A LOSS OF INSTRUMENT AIR (DISCONTINUE USE/REPORT LEAKS)
5	CRS	IF INSTRUMENT AIR CANNOT BE MAINTAINED >80 PSIG, THEN CONSIDER SHUTTING DOWN THE REACTOR
6	CRS	COMPLETE SAFETY RELATED VALVE ACCUMULATOR CHECKS
7	CRS	IF ALL IA AND SA COMPRESSORS RUNNING AND PRESSURE DROPPING; IDENTIFY, ISOLATE, AND RESTORE AS MUCH AS POSSIBLE
8	CRS	SECURE BLOWDOWN IF BD-207 (LCV) FAILS OPEN
9	CRS/PNPO/SN	IF MSR TCVS FAIL CLOSED, REDUCE GENERATOR LOAD TO MAINTAIN ≈100% REACTOR POWER
10	PNPO/CRS	IF LETDOWN ISOLATES, OPERATES CHARGING PUMPS AS NECESSARY TO MAINTAIN 33-60% PRESSURIZER LEVEL
11	PNPO/CRS	IF SPRAY VALVES FAIL CLOSED, CONTROL PZR PRESSURE WITH AUX SPRAY
12	CRS/SNPO	IF ANY FWIV ACCUMULATOR OR AIR RESERVOIR PRESS LO ANNUNCIATOR IS IN ALARM, CLOSE ASSOCIATED FWIV AS SOON AS CONDITIONS PERMIT
13	CRS/TERM	IF CCW OR TCW SURGE TANKS OVERFLOWING, ISOLATE ASSOCIATE LCVS

**Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

1	PNPO/CRS	<p>VERIFY REACTIVITY CONTROL.  CHECK REACTOR POWER DROPPING OR PERFORM ANY OF THE FOLLOWING:  MANUALLY TRIP THE REACTOR, MANUALLY INITIATE DRTS, OPEN BOTH 32 BUS BKRS FOR 5 SECONDS AND RE-CLOSE.  CHECK STARTUP RATE IS NEGATIVE.  CHECK LESS THAN 2 CEAS INSERTED OR EMERGENCY BORATE.</p>
2	SNPO/CRS	<p>VERIFY MAINTENANCE OF VITAL AUXILIARIES  CHECK THE MAIN TURBINE TRIPPED OR PERFORM ANY OF THE FOLLOWING:  MANUALLY TRIP THE TURBINE OR CLOSE BOTH MSIVS.  CHECK THE GENERATOR TRIPPED OR MANUALLY TRIP THE MAIN GENERATOR BY PERFORMING ANY OF THE FOLLOWING: DEPRESS BOTH GENERATOR EMERG TRIP PUSHBUTTONS OR TRANSFER BOTH ELECTRICAL TRAINS TO THE SUTS AND OPEN BOTH GENERATOR OUTPUT BKRS AND THE EXCITER FIELD BKR.  CHECK TRAIN A AND B STATION LOADS ARE ENERGIZED FROM OFFSITE POWER OR VERIFY THE APPLICABLE EDG STARTS AND ITS OUTPUT BKR CLOSES.</p>

- |    |             |  |
|----|-------------|--|
| 3  | PNPO/CRS    | <p>VERIFY RCS INVENTORY CONTROL BY CHECKING PZR LEVEL 7% AND 60% AND SUBCOOLING MARGIN GREATER THAN OR EQUAL TO 28 DEG. F. IF PZR LEVEL CONTROL SYSTEM IS MALFUNCTIONING THE OPERATOR TAKES MANUAL CONTROL OF THE SYSTEM OR OPERATES CHARGING AND LETDOWN COMPONENTS TO RESTORE PZR LEVEL (THIS STEP MAY BE N/A FOR ESD, LOCA, OR SGTR EVENTS)</p>   |
| 4  | PNPO/CRS    | <p>VERIFY RCS PRESSURE CONTROL BY CHECKING PZR PRESSURE BETWEEN 1750 PSIA AND 2300 PSIA OR</p> <ol style="list-style-type: none"> <li>1) IF PZR PRESS CONTROL SYSTEM (PPCS) IS MALFUNCTIONING THE OPERATOR TAKES MANUAL OF PPCS CONTROLLERS TO RESTORE PRESSURE</li> <li>2) IF PZR PRESSURE IS LESS THAN 1684 PSIA, THE OPERATOR VERIFIES THAT SIAS AND CIAS INITIATE OR PERFORMS MANUAL INITIATION</li> <li>3) IF PZR PRESSURE IS LESS THAN 1621, THE OPERATOR VERIFIES NO MORE THAN TWO RCPS ARE OPERATING.</li> <li>4) IF PZR PRESSURE IS LESS THAN MINIMUM RCP NPSH OF APP. 2A THE OPERATOR SECURES ALL RCPS.</li> </ol> |
| 5  | PNPO/CRS    | <p>VERIFY CORE HEAT REMOVAL BY CHECKING AT LEAST ONE RCP OPERATING, OPERATING LOOP DELTA-T LESS THAN 13 DEG. F, AND RCS SUBCOOLING GREATER THAN OR EQUAL TO 28 DEG. F. (MAY BE N/A FOR ESD, LOCA, AND LOOP EVENTS)</p>   |
| 6  | SNPO/CRS    | <p>CHECK RCS HEAT REMOVAL BY CHECKING AT LEAST ONE S/G IS BOTH 15-80% NR AND MAIN FEEDWATER IS AVAILABLE TO RESTORE LEVEL OR VERIFY EFW IS AVAILABLE TO RESTORE LEVEL IN AT LEAST ONE S/G.</p>   |
| 7  | PNPO/SNPO/C | <p>CHECK RCS TEMPERATURE 535-555 DEG. F OR</p> <ol style="list-style-type: none"> <li>1) IF TC IS &gt; 555 DEG. F VERIFY LEVEL IS BEING RESTORED TO AT LEAST ONE S/G AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F.</li> <li>2) IF TC IS &lt; 535 DEG. F THEN VERIFY FEED FLOW IS NOT EXCESSIVE AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F</li> <li>3) IF TC IS &lt; 500 DEG. F VERIFY NO MORE THAN 2 RCPs OPERATING</li> <li>4) IF ESD IN PROGRESS STABILIZE RCS TEMPERATURE USING LEAST AFFECTED S/G PER APP. 13.</li> </ol>  |
| 8  | SNPO/CRS    | <p>CHECK S/G PRESSURE 925-1050 PSIA OR</p> <ol style="list-style-type: none"> <li>1) IF S/G PRESS &lt;925 PSIA VERIFY STEAM BYPASS VALVES AND ADVs ARE CLOSED.</li> <li>2) IF S/G PRESS LESS THAN OR EQUAL TO 764 PSIA VERIFY MSIS IS INITIATED.</li> <li>3) IF S/G PRESS &gt; 1050 PSIA VERIFY SBCS OR ADVs ARE RESTORING S/G PRESS TO &lt; 1050 PSIA</li> </ol>  |
| 9  | SNPO/CRS    | <p>VERIFY FWCS IN RTO BY CHECKING MAIN FEED REG VALVES ARE CLOSED, STARTUP FEED REG VALVES ARE 20-25% OPEN, AND OPERATING FEED PUMPS ARE 3800 TO 4000 RPM OR MANUALLY OPERATE FEEDWATER SYSTEM TO RESTORE LEVEL IN AT LEAST ONE S/G TO 50-70 NR.(N/A IF MSIS IS INITIATED)</p>   |
| 10 | SNPO/CRS    | <p>RESET MOISTURE SEPARATOR REHEATERS AND CHECK THE TEMP CONTROL VALVES CLOSED OR NOTIFY AN NAO TO FAIL CLOSE THE VALVES LOCALLY. (N/A IF MSIS IS INITIATED)</p>   |

- 11 PNPO/CRS VERIFY CONTAINMENT ISOLATION BY CHECKING CONTAINMENT PRESSURE < 16.4 PSIA, CHECK THAT NO CONT. AREA RAD MONITORS ARE IN ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY, AND CHECK THAT NO STEAM PLANT RAD MONITORS ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY. IF CONTAINMENT PRESSURE IS GREATER THAN OR EQUAL TO 17.1 PSIA VERIFY CIAS, SIAS, AND MSIS INITIATE.
- 12 SNPO/PNPO/C VERIFY CONTAINMENT TEMPERATURE AND PRESSURE CONTROL AND CONTAINMENT COMBUSTIBLE GAS CONTROL BY VERIFYING CONTAINMENT TEMP LESS THAN OR EQUAL TO 120 DEG. F AND CONTAINMENT PRESSURE IS < 16.4 PSIA OR  
 1) VERIFY AT LEAST 3 CFCs OPERATING.  
 2) IF CONTAINMENT PRESS IS GREATER OR EQUAL TO 17.1 PSIA VERIFY ALL CFCs ARE OPERATING IN EMERGENCY MODE.  
 3) IF CONTAINMENT PRESS IS GREATER THAN OR EQUAL TO 17.7 VERIFY CSAS IS INITIATED, ALL AVAILABLE CS PUMPS ARE DELIVERING > 1750 GPM, AND SECURE ALL RCPs .
- 13 CRS VERIFY ALL SAFETY FUNCTION ACCEPTANCE CRITERIA ARE MET
- 14 CRS/PNPO/SN PERFORM DIAGNOSTICS
- 15 TERM CREW DIAGNOSES A(N) \_\_\_\_\_ EVENT AND EXITS TO OP-902-\_\_\_\_\_.

**Event Number E007 STEAM GENERATOR TUBE RUPTURE**

- 1 CRS/STA CONFIRM DIAGNOSIS BY PERFORMING SAFETY FUNCTION STATUS CHECK LIST AND NOTIFY CHEMISTRY TO SAMPLE BOTH S/GS FOR ACTIVITY.
- 2 CREW ANNOUNCE THE EVENT
- 3 PNPO/SNPO/C IF PZR PRESSURE < 1684 PSIA VERIFY SIAS INITIATED, SAFETY INJECTION PUMPS STARTED, INJECTION FLOW IS ACCEPTABLE PER APPENDIX 2 AND AVAILABLE CHARGING PUMPS (2) ARE RUNNING OR PERFORM ANY OF THE FOLLOWING:  
 1) VERIFY POWER TO SI PUMPS.  
 2) VERIFY INJECTION VALES OPEN.  
 3) START ADDITIONAL SI PUMPS UNTIL FLOW IS ACCEPTABLE PER APP. 2.  
 4) ALIGN HPSI AB TO REPLACE A OR B.
- 4 PNPO/CRS IF PZR PRESS < 1621 PSIA AND SIAS IS ACTUATED VERIFY NO MORE THAN 2 RCPs OPERATING. IF PZR PRESS DOES NOT MEET APPENDIX 2A SECURE ALL RCPs.
- 5 PNPO/SNPO/C VERIFY RCP OPERATING LIMITS  
 1) VERIFY CCW AVAILABLE TO RCPs OR SECURE AFFECTED RCPs IF NOT RESTORED WITHIN 3 MINUTES.  
 2) SECURE ALL RCPs IF CSAS IS INITIATED.  
 3) IF TC >500 DEG. F, VERIFY NO MORE THAN 2 RCPS OPERATING.

- 6 SNPO/CRS VERIFY CCW OPERATION BY CHECKING A CCW PUMP IS OPERATING FOR EACH ENERGIZED 4 KV SAFETY BUS OR  
 1) IF AB BUS ALIGNED TO SAME SIDE AS FAULTED CCW PUMP START THE AB CCW PUMP  
 2) IF AB BUS ALIGNED TO OPPOSITE SIDE FROM FAULTED CCW PUMP START THE AB CCW PUMP AFTER THE SEQUENCER HAS TIMED OUT.  
 3) IF CCW FLOW CAN NOT BE RESTORED, NOTIFY AN NAO TO PULL THE OVERSPEED TRIP DEVICE ON THE AFFECTED EDG.
- 7 SNPO/CRS COOLDOWN RCS TO LESS THAN 520 F TH USING THE STEAM BYPASS VALVES. USE BOTH ADVs IF STEAM BYPASS IS UNAVAILABLE.
- 8 PNPO/SNPO/C MAINTAIN RCS PRESSURE WITHIN APPENDIX 2A, <950 PSIA, AND MINIMIZE D/P BETWEEN RCS AND FAULTED S/G USING MAIN OR AUX SPRAY. IF HPSI THROTTLE CRITERIA ARE MET CONTROL CHARGING AND LETDOWN FLOW AND THROTTLE HPSI FLOW AS NECESSARY.
- 9 PNPO/SNPO/C IF MSIS IS NOT PRESENT, LOWER S/G LOW PRESSURE AUTOMATIC INITIATION SETPOINTS AS THE COOLDOWN AND DEPRESSURIZATION PROCEED.
- 10 PNPO/SNPO/C IF SIAS IS NOT PRESENT, LOWER THE LOW PZR PRESSURE SETPOINTS AS THE COOLDOWN AND DEPRESSURIZATION PROCEEDS
- 11 CREW DETERMINE MOST AFFECTED S/G BY CONSIDERING THE FOLLOWING:  
 1) S/G ACTIVITIES  
 2) MS LINE RAD LEVELS  
 3) BD RAD MONITOR READINGS  
 4) S/G LEVEL RISE WHEN NOT FEEDING  
 5) ONE S/G LEVEL RISING MORE RAPIDLY WITH FEED AND STEAM RATES ESSENTIALLY THE SAME  
 6) FEED FLOW MISMATCH BETWEEN S/Gs  
 7) STM VS. FEED MISMATCH IN S/G PRIOR TO THE TRIP
- 12 SNPO/CRS ISOLATE MOST AFFECTED SG:  
 1) PLACE ADV SETPOINT TO 980 PSIG AND VERIFY CONTROLLER IS IN AUTO.  
 2) VERIFY THE MSIV CLOSED  
 3) VERIFY MFIV CLOSED.  
 4) IF EFAS-1 HAS NOT INITIATED, CLOSE EFW ISOLATION VALVES ARE CLOSED  
 EFW-228A SG 1 PRIMARY  
 EFW-229A SG 1 BACKUP  
 5) PLACE EFW FLOW CONTROL VALVES IN MANUAL AND CLOSE  
 EFW-224A SG 2 PRIMARY  
 EFW-223A SG 2 BACKUP  
 6) CLOSE MS-401A, PUMP AB TURB STM SUPPLY SG 2  
 7) CLOSE MAIN STEAM LINE 1 DRAINS:  
 MS-120A NORMAL  
 MS-119A BYPASS  
 8) VERIFY SG BLOWDOWN ISOLATION VALVES ARE CLOSED:  
 BD-103A STM GEN 1 (OUT)  
 BD-102A STM GEN 1 (IN)  
 9) CHECK MAIN STEAM SAFETY VALVES ARE CLOSED



- |    |          |  |
|----|----------|--|
| 13 | SNPO/CRS | MAINTAIN ISOLATED SG PRESSURE LESS THAN 1000 PSIA. IF PRESSURE IS NOT < 1000 PSIA OPERATE ASSOCIATED ADV IN MANUAL OR HAVE NAO TAKE LOCAL CONTROL OF ASSOCIATED ADV.   |
| 14 | CREW     | VERIFY MOST AFFECTED SG ISOLATED BY CONSIDERING S/G ACTIVITIES AND LEVELS AND STEAM PLANT RAD LEVELS. IF THE WRONG S/G WAS ISOLATED RESTORE FEEDING AND STEAMING CAPABILITY TO THE ISOLATED S/G AND ISOLATE THE CORRECT S/G. |
| 15 | TERM     | EVENT MAY BE TERMINATED AFTER CORRECT S/G IS ISOLATED AND ACTION TO DEPRESSURIZE THE RCS IS PERFORMED OR AT LEAD EXAMINERS DISCRETION.   |



**Simulator Scenario**  
**Waterford 3 Nuclear Plant**  
**Simulator Scenario Number: E-SRO0003**

**Author:** avest                      **Scenario Status:** DRAFT                      **Estimated Time:** 50

**Approval:**    **Revision Number:**

**References Verified:**

**Applications:**                      **Initial Conditions:**  
Initial Exam                      IC-30

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**Scenario Description:**

Plant power is initially 100%. After assuming the shift, the crew commences a down power to 90% for turbine valve testing. During the power reduction S/G 2 pressure transmitter SG-IPT-1023A fails low. When the crew bypasses the appropriate trip bistables in PPS Channel A, Charging Pump B trips on overcurrent. The crew should implement the applicable actions of OP-901-112 for a charging malfunction. After implementing the actions of OP-901-112 and evaluating Tech Specs 3.0.3, 3.1.2.4, and TRM 3.1.2.4, the in-service PZR pressure control channel fails high, initiating PZR spray and securing PZR heaters. The crew should implement OP-901-120 and transfer to the non-faulted channel. When the crew transfers pressure control to the non-faulted channel, PZR spray valve RC-301A remains open due to mechanical binding. The crew should manually trip the reactor and secure RCP 1A to stop the plant depressurization. After completing Standard Post Trip Actions, the crew should diagnose to OP-902-001, Reactor Trip Recovery. During the performance of OP-902-001 an unisolable main steam line break occurs on MS line 1 inside containment. EFW Pump A fails to start automatically when EFAS is initiated. The crew should rediagnose to OP-902-004 and take the appropriate actions. The scenario may be terminated after the crew takes action to stabilize RCS temperature and pressure or at the lead examiner's discretion.

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**Scenario Notes:**

Load Plant Matching composites in IC View.  
Load Scenario E-SRO0004 from the disc in Scenario View.

Initial Setup Chg pump A - Set remote CVR20 to RACKOUT, place Chg pump A C/S on CP-4 to OFF, and place danger tag on C/S.

Initial Setup HPSI pump A - Set remote SIR29 to RACKOUT, place HPSI pump A C/S on CP-8 to OFF, and place danger tag on C/S.

Initial Setup EFW pump AB - Set malfunction FW05 to TRUE. Set annunciators A10 and M03 on panel M and M13 on panel N to CRYWOLF. Override red, green, and white lights for MS-401A and B to OFF. Override C/Ss for MS-401A and B to CLOSE and place danger tags on MS-401A and B C/Ss on CP-8. Override red and green lights for MS-416 and MS-417 to OFF and place danger tag on MS-417 C/S on CP-8. Override EFW Pump AB Disch Press, Speed and Stm Press indicators to 0 on CP-8.

Charging Pump B trip - If the crew sends a NAO to the Charging Pump report that the motor casing is discolored and the smell of burnt insulation is present.

Charging Pump B trip - If the crew sends a NAO to the Charging Pump breaker report flags on all phases of the overcurrent trip devices. Use Remote Function CVR23 to rackout the breaker if requested.

**Scenario Timeline:**

Item	Malfunction		Time	Severity	Ramp	TUA	TRA	Triager	Event
1	FW07	A	LOAD	TRUE	N/A	N/A	N/A	N/A	
EMERGENCY FEEDWATER PUMP FAILS TO AUTO START									
2			0 MIN	N/A	N/A	N/A	N/A	N/A	N1000
3	SG04	A	10 MIN	0%	N/A	N/A	N/A	MTF03	T331
SG PRESSURE SAFETY CHANNEL FAILS									
4	CV01	B	15 MIN	TRUE	N/A	N/A	N/A	MTF04	A112.e
CHARGING PUMP TRIP									
5	RX14	A	30 MIN	100%	N/A	N/A	N/A	MTF05	A120.e
PRESSURIZER PRESSURE CONTROL INSTRUMENT FAILURE HIGH									
6	RC14	A1	35 MIN	OPEN	N/A	N/A	N/A	MTF05	A120.e
PZR SPRAY VALVE FAILS OPEN/CLOSED									
7	MS11	A	40 MIN	10%	5 MIN	N/A	N/A	MTF06	E000
MS LINE BREAK INSIDE CNTMT (0-100%. 100% = 40)									
8			N/A	N/A	N/A	N/A	N/A	N/A	E004

**Manip # Manipulation Description**

- 17 Loss of Protective System Channel
- 2 Plant Shutdown
- 24 Malfunction of RCS Pressure or Level Control (includes loss of letdown/charging)
- 25 Reactor Trip
- 26A Main Steam Line Break, Inside Containment

**Scenario Critical Tasks**

**Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 Stop all Reactor Coolant Pumps. The task is identified by at least one member of the crew. The PNPO takes actions to secure all RCP's within 3 minutes of loss of CCW due to the CSAS.

**Event Number E004 EXCESS STEAM DEMAND**

- 2 Establish RCS Temperature Control. The task is identified by at least one member of the crew. The SNPO takes actions to stabilize RCS Temperature within the limits of the PT Curve following Blowdown of the Affected SG.
- 3 Establish RCS Pressure Control. The task is identified by at least one member of the crew. The PNPO takes actions to stabilize RCS Pressure within the Limits of the PT curve following Blowdown of the affected Steam Generator.

Event	Reference	Rev	Chna	Event	Reference	Rev	Chna
A112.e1	TS 3.1.2			A112.e1	OP-901-112	02	01
A120.e1	OP-901-120	02	02	A120.e1	TS 3.2.8		
A120.e3	OP-901-120	02	02	A120.e3	TS 3.2.8		
E000	OP-902-000	08	00	E004	EP-001-001	19	00
E004	OP-902-004	08	00	N10005a	OP-010-005	00	02
N10005a	TS 3.2.1			N10005a	TS 3.2.7		
N10005a	TS 4.4.7			N10005a	TS 3.1.2		
T331	TS 3.3.1			T331	TS 3.3.2		
T331	OP-009-007	05	00				

## Scenario Objectives

The ABILITY to:

- 1 Communicate as a team, prioritize actions, demonstrate attention to detail.
- 2 Analyze plant parameters in abnormal / emergency conditions to diagnose and determine which emergency / off-normal operating procedure should be entered, if appropriate.
- 3 Verify automatic actions, and perform procedural immediate operator actions from memory.
- 4 Identify all LCO conditions in Technical Specifications and interpret / apply required actions.
- 5 Classify emergencies, make notifications and apply required actions of EP-001-001 "Recognition and Classification of Emergency Conditions".
- 6 Locate and utilize pertinent plant reference material available in the control room, including electrical and mechanical drawings.
- 7 Make clear, accurate, and concise verbal reports, written logs, and in-plant communications.

### **Event Number A112.e1 CHARGING PUMP MALFUNCTION**

- 1 Determine the cause of charging malfunction and realign system as necessary to restore charging capability.
- 2 Properly perform subsequent operator actions in accordance with offnormal operating procedure OP-901-112, Charging and Letdown Malfunctions.

### **Event Number A120.e1 PRESSURIZER CONTROL PRESSURE TRANSMITTER FAILURE**

- 1 Stabilize pressurizer pressure on alternate control channel according to off-normal operator procedure OP-901-120, Pressurizer Pressure Control Malfunction.

### **Event Number A120.e3 SPRAY VALVE FAILURE**

- 1 Perform actions necessary for a spray valve failed open.
- 2 Realign pressurizer spray components for failed closed spray valve(s).

### **Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 Carry out all operator actions, including necessary contingency actions in accordance with OP-902-000, Standard Post Trip Actions, in the event of a reactor trip.
- 2 Properly diagnose event in progress and transition to appropriate EOP recovery procedure.

### **Event Number E004 EXCESS STEAM DEMAND**

- 1 Verify the existence/location of an excess steam demand.
- 2 Ensure the reactor is maintained in a shutdown condition.
- 3 Ensure the conditions for pressurized thermal shock are minimized.
- 4 Mitigate the consequences of an excess steam demand by properly utilizing OP-902-004, Excess Steam Demand Recovery Procedure.

### **Event Number N10005a PLANT SHUTDOWN 100% TO 90%**

- 1 Reduce reactor power and/or remove the unit from service by operating securing, or realigning plant equipment as directed by precautions, limitations, and procedural guidance of General Operating Procedure, OP-010-005.

**Event Number T331**

**SAFETY CHANNEL INSTRUMENTATION FAILURES**

- 1 Recognize failed instrument and verify RPS/CPC bistable functions as expected.
- 2 Bypass affected bistable channel.

<b>Number:</b>	<b>Position:</b>	<b>Action</b>
	<b>Event Number</b>	<b>N10005a                    PLANT SHUTDOWN 100% TO 90%</b>
1	SS/CRS	IF NECESSARY, ENSURE IPTE REQUIREMENTS ARE MET AND SENIOR LINE MANAGER ON SITE
2	CRS	NOTIFIES LOAD DISPATCHER PRIOR TO POWER REDUCTION AND ANNOUNCES POWER REDUCTION OVER PLANT PAGING SYSTEM
3	PNPO/CRS	MAINTAIN TCOLD 541-548 DURING DOWNPOWER. PERFORM BORATION EQUALIZATION. ESTIMATE BORON ADDITION USING THUMBRULE OR OP-002-005 (~150 GALS) BORATES TO REDUCE REACTOR POWER AT RATE DETERMINED BY THE CRS.
4	PNPO/CRS	MAINTAINS ASI USING GROUP 5, 6 OR PART LENGTH CONTROL RODS
5	SNPO/CRS	REDUCES GENERATOR LOAD AS REQUIRED ONCE TAVE STARTS TO DROP TO MATCH REFERENCE TEMPERATURE AND TAVE
6	PNPO/CRS	REEVALUATE CEA SUBGROUPS SELECTED TO DROP ON RPC BETWEEN 90% AND 80% POWER.
7	TERM	TERMINATE EVENT AT 90% POWER OR AT LEAD EXAMINER'S DISCRETION
	<b>Event Number</b>	<b>T331                                SAFETY CHANNEL INSTRUMENTATION FAILURES</b>
1	PNPO	RECOGNIZE AND REPORT INDICATIONS OF FAILED CHANNEL
2	PNPO/CRS	VERIFY RPS/CPC FUNCTION BISTABLE RESPOND AS EXPECTED
3	CRS	REVIEW AND/OR IMPLEMENT ACTIONS REQUIRED BY TECHNICAL SPECIFICATION SECTION 3.3.1 OR 3.3.2 (RPS OR ESFAS)
4	CRS	DIRECT BISTABLE BYPASS WITH 1 HOUR OF FAILURE (FOR FIRST CHANNEL FAILURE)
4.1	CRS	NOTE: FAILURE OF A SECOND CHANNEL WILL REQUIRE THAT CHANNEL TO BE PLACED IN THE TRIP CONDITION. TO BYPASS A SECOND CHANNEL WILL REMOVE BOTH CHANNELS FROM BYPASS.
5	SNPO/PNP	BYPASS AFFECTED CHANNEL IN ACCORDANCE WITH OP-009-007 SECTION 6.2
6	TERM	BYPASS LIGHTS ILLUMINATE ON BCP AND ROM FOR THE DESIRED CHANNEL
	<b>Event Number</b>	<b>A112.e1                            CHARGING PUMP MALFUNCTION</b>
1	PNPO/CRS	RECOGNIZE AND REPORT CHARGING PUMP TRIP (ALARMS AND INDICATION)



2	SNPO/CRS	STOP TURBINE LOAD CHANGES (IF APPLICABLE)
3	PNPO/CRS	IF CHARGING PUMPS HAVE TRIPPED: VERIFY CHARGING PUMP SUCTION PATH (EITHER CVC-183 OR CVC-507 OPEN )
4	PNPO/CRS	IF LETDOWN IS NOT ISOLATED ATTEMPT TO RESTART CHARGING PUMPS
5	PNPO/CRS	CLOSE LETDOWN STOP VALVE (CVC-101) IF CHARGING PUMPS CANNOT BE RESTARTED
6	CRS/SS	CHECK TECHNICAL SPECIFICATIONS
7	PNPO/CRS	IF THE REASON FOR THE CHARGING PUMP TRIP IS CORRECTED AND PRESSURIZER LEVEL IS NORMAL, THEN PLACE CHARGING AND LETDOWN IN SERVICE
8	TERM	WHEN LETDOWN IS RESTORED

**Event Number A120.e1 PRESSURIZER CONTROL PRESSURE TRANSMITTER FAILURE**

1	PNPO/CRS	VERIFIES PRESSURIZER PRESSURE INSTRUMENT FAILURE BY CHECKING X/Y RECORDER
2	PNPO/CRS	TRANSFER PRESSURIZER PRESSURE CONTROL TO OPERABLE CHANNEL USING PRESSURIZER PRESSURE CHANNEL SELECTOR CONTROL SWITCH
3	PNPO/CRS	IF PRESSURIZER PRESSURE CONTROL CHANNEL IS FAILED HIGH, THEN PERFORM THE FOLLOWING: A) TRANSFER PRESSURIZER LO LEVEL CUTOUT SELECTOR SWITCH TO THE OPERABLE PRESSURIZER PRESSURE CONTROL CHANNEL B) RESET PROPORTIONAL HEATER BANKS #1 AND #2.
4	TERM	TERMINATE WHEN FAILED SPRAY VALVE IS NOTED.

**Event Number A120.e3 SPRAY VALVE FAILURE**

1	PNPO/CRS	PLACES PRESSURIZER SPRAY CONTROLLER TO MANUAL
2	PNPO/CRS	IF SPRAY VALVE FAILS OPEN, ADJUSTS PRESSURIZER SPRAY CONTROLLER OUTPUT TO ZERO % AND
3	PNPO/CRS	SELECTS OPERABLE SPRAY VALVE AND
4	PNPO/CRS	VERIFIES ALL BACKUP HEATERS ARE ON.

- 5 PNPO/CRS/SN IF PRESSURIZER PRESSURE STILL DROPS  
 1) TRIP REACTOR  
 2) STOPS REACTOR COOLANT PUMP FOR AFFECTED SPRAY VALVE(S)
- 6 TERM ENTER OP-902-000.

**Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 PNPO/CRS VERIFY REACTIVITY CONTROL.  
 CHECK REACTOR POWER DROPPING OR PERFORM ANY OF THE FOLLOWING:  
 MANUALLY TRIP THE REACTOR, MANUALLY INITIATE DRTS, OPEN BOTH 32 BUS  
 BKRS FOR 5 SECONDS AND RE-CLOSE.  
 CHECK STARTUP RATE IS NEGATIVE.  
 CHECK LESS THAN 2 CEAS INSERTED OR EMERGENCY BORATE.
- 2 SNPO/CRS VERIFY MAINTENANCE OF VITAL AUXILIARIES  
 CHECK THE MAIN TURBINE TRIPPED OR PERFORM ANY OF THE FOLLOWING:  
 MANUALLY TRIP THE TURBINE OR CLOSE BOTH MSIVS.  
 CHECK THE GENERATOR TRIPPED OR MANUALLY TRIP THE MAIN GENERATOR  
 BY PERFORMING ANY OF THE FOLLOWING: DEPRESS BOTH GENERATOR  
 EMERG TRIP PUSHBUTTONS OR TRANSFER BOTH ELECTRICAL TRAINS TO THE  
 SUTS AND OPEN BOTH GENERATOR OUTPUT BKRS AND THE EXCITER FIELD  
 BKR.  
 CHECK TRAIN A AND B STATION LOADS ARE ENERGIZED FROM OFFSITE POWER  
 OR VERIFY THE APPLICABLE EDG STARTS AND ITS OUTPUT BKR CLOSES.
- 3 PNPO/CRS VERIFY RCS INVENTORY CONTROL BY CHECKING PZR LEVEL 7% AND 60% AND  
 SUBCOOLING MARGIN GREATER THAN OR EQUAL TO 28 DEG. F. IF PZR LEVEL  
 CONTROL SYSTEM IS MALFUNCTIONING THE OPERATOR TAKES MANUAL  
 CONTROL OF THE SYSTEM OR OPERATES CHARGING AND LETDOWN  
 COMPONENTS TO RESTORE PZR LEVEL (THIS STEP MAY BE N/A FOR ESD, LOCA,  
 OR SGTR EVENTS)
- 4 PNPO/CRS VERIFY RCS PRESSURE CONTROL BY CHECKING PZR PRESSURE BETWEEN  
 1750 PSIA AND 2300 PSIA OR  
 1) IF PZR PRESS CONTROL SYSTEM (PPCS) IS MALFUNCTIONING THE  
 OPERATOR TAKES MANUAL OF PPCS CONTROLLERS TO RESTORE PRESSURE  
 2) IF PZR PRESSURE IS LESS THAN 1684 PSIA, THE OPERATOR VERIFIES THAT  
 SIAS AND CIAS INITIATE OR PERFORMS MANUAL INITIATION  
 3)IF PZR PRESSURE IS LESS THAN 1621, THE OPERATOR VERIFIES NO MORE  
 THAN TWO RCPS ARE OPERATING.  
 4) IF PZR PRESSURE IS LESS THAN MINIMUM RCP NPSH OF APP. 2A THE  
 OPERATOR SECURES ALL RCPS.
- 5 PNPO/CRS VERIFY CORE HEAT REMOVAL BY CHECKING AT LEAST ONE RCP OPERATING,  
 OPERATING LOOP DELTA-T LESS THAN 13 DEG. F, AND RCS SUBCOOLING  
 GREATER THAN OR EQUAL TO 28 DEG. F. (MAY BE N/A FOR ESD, LOCA, AND  
 LOOP EVENTS)
- 6 SNPO/CRS CHECK RCS HEAT REMOVAL BY CHECKING AT LEAST ONE S/G IS BOTH 15-80%  
 NR AND MAIN FEEDWATER IS AVAILABLE TO RESTORE LEVEL OR VERIFY EFW IS  
 AVAILABLE TO RESTORE LEVEL IN AT LEAST ONE S/G.

- 7 PNPO/SNPO/C CHECK RCS TEMPERATURE 535-555 DEG. F OR  
 1) IF TC IS > 555 DEG. F VERIFY LEVEL IS BEING RESTORED TO AT LEAST ONE S/G AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F.  
 2) IF TC IS < 535 DEG. F THEN VERIFY FEED FLOW IS NOT EXCESSIVE AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F  
 3) IF TC IS < 500 DEG. F VERIFY NO MORE THAN 2 RCPs OPERATING  
 4) IF ESD IN PROGRESS STABILIZE RCS TEMPERATURE USING LEAST AFFECTED S/G PER APP. 13.
- 8 SNPO/CRS CHECK S/G PRESSURE 925-1050 PSIA OR  
 1) IF S/G PRESS <925 PSIA VERIFY STEAM BYPASS VALVES AND ADVs ARE CLOSED.  
 2) IF S/G PRESS LESS THAN OR EQUAL TO 764 PSIA VERIFY MSIS IS INITIATED.  
 3) IF S/G PRESS > 1050 PSIA VERIFY SBCS OR ADVs ARE RESTORING S/G PRESS TO < 1050 PSIA
- 9 SNPO/CRS VERIFY FWCS IN RTO BY CHECKING MAIN FEED REG VALVES ARE CLOSED, STARTUP FEED REG VALVES ARE 20-25% OPEN, AND OPERATING FEED PUMPS ARE 3800 TO 4000 RPM OR MANUALLY OPERATE FEEDWATER SYSTEM TO RESTORE LEVEL IN AT LEAST ONE S/G TO 50-70 NR.(N/A IF MSIS IS INITIATED)
- 10 SNPO/CRS RESET MOISTURE SEPARATOR REHEATERS AND CHECK THE TEMP CONTROL VALVES CLOSED OR NOTIFY AN NAO TO FAIL CLOSE THE VALVES LOCALLY. (N/A IF MSIS IS INITIATED)
- 11 PNPO/CRS VERIFY CONTAINMENT ISOLATION BY CHECKING CONTAINMENT PRESSURE < 16.4 PSIA, CHECK THAT NO CONT. AREA RAD MONITORS ARE IN ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY, AND CHECK THAT NO STEAM PLANT RAD MONITORS ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY. IF CONTAINMENT PRESSURE IS GREATER THAN OR EQUAL TO 17.1 PSIA VERIFY CIAS, SIAS, AND MSIS INITIATE.
- 12 SNPO/PNPO/C VERIFY CONTAINMENT TEMPERATURE AND PRESSURE CONTROL AND CONTAINMENT COMBUSTIBLE GAS CONTROL BY VERIFYING CONTAINMENT TEMP LESS THAN OR EQUAL TO 120 DEG. F AND CONTAINMENT PRESSURE IS < 16.4 PSIA OR  
 1) VERIFY AT LEAST 3 CFCs OPERATING.  
 2) IF CONTAINMENT PRESS IS GREATER OR EQUAL TO 17.1 PSIA VERIFY ALL CFCs ARE OPERATING IN EMERGENCY MODE.  
 3) IF CONTAINMENT PRESS IS GREATER THAN OR EQUAL TO 17.7 VERIFY CSAS IS INITIATED, ALL AVAILABLE CS PUMPS ARE DELIVERING > 1750 GPM, AND SECURE ALL RCPs .
- 13 CRS VERIFY ALL SAFETY FUNCTION ACCEPTANCE CRITERIA ARE MET
- 14 CRS/PNPO/SN PERFORM DIAGNOSTICS
- 15 TERM CREW DIAGNOSES A(N) \_\_\_\_\_ EVENT AND EXITS TO OP-902-\_\_\_\_\_.  
 \_\_\_\_\_.

Event Number	E004	EXCESS STEAM DEMAND
1	CRS/STA	CONFIRM DIAGNOSIS BY PERFORMING SAFETY FUNCTION STATUS CHECK LIST AND NOTIFY CHEMISTRY TO SAMPLE BOTH S/GS FOR ACTIVITY.
2	CREW	ANNOUNCE THE EVENT
3	PNPO/SNPO/C	IF PZR PRESSURE < 1684 PSIA VERIFY SIAS INITIATED, SAFETY INJECTION PUMPS STARTED, INJECTION FLOW IS ACCEPTABLE PER APPENDIX 2 AND AVAILABLE CHARGING PUMPS (2) ARE RUNNING OR PERFORM ANY OF THE FOLLOWING: 1) VERIFY POWER TO SI PUMPS. 2) VERIFY INJECTION VALES OPEN. 3) START ADDITIONAL SI PUMPS UNTIL FLOW IS ACCEPTABLE PER APP. 2. 4) ALIGN HPSI AB TO REPLACE A OR B.
4	SNPO/CRS	VERIFY MSIS ACTUATION BY VERIFYING BOTH MSIVs AND BOTH MFIVs ARE CLOSED.
5	PNPO/CRS	IF PZR PRESS < 1621 PSIA AND SIAS IS ACTUATED VERIFY NO MORE THAN 2 RCPs OPERATING. IF PZR PRESS DOES NOT MEET APPENDIX 2A SECURE ALL RCPs.
6	PNPO/SNPO/C	VERIFY RCP OPERATING LIMITS 1) VERIFY CCW AVAILABLE TO RCPs OR SECURE AFFECTED RCPs IF NOT RESTORED WITHIN 3 MINUTES. 2) SECURE ALL RCPs IF CSAS IS INITIATED. 3) IF TC >500 DEG. F, VERIFY NO MORE THAN 2 RCPS OPERATING.
7	SNPO/CRS	VERIFY CCW OPERATION BY CHECKING A CCW PUMP IS OPERATING FOR EACH ENERGIZED 4 KV SAFETY BUS OR 1) IF AB BUS ALIGNED TO SAME SIDE AS FAULTED CCW PUMP START THE AB CCW PUMP 2) IF AB BUS ALIGNED TO OPPOSITE SIDE FROM FAULTED CCW PUMP START THE AB CCW PUMP AFTER THE SEQUENCER HAS TIMED OUT. 3) IF CCW FLOW CAN NOT BE RESTORED, NOTIFY AN NAO TO PULL THE OVERSPEED TRIP DEVICE ON THE AFFECTED EDG.
8	SNPO/CRS	DETERMINE MOST AFFECTED SG BY CONSIDERING THE FOLLOWING: 1) HIGH STEAM FLOW FROM S/G 2) DROPPING S/G PRESSURE 3) DROPPING RCS COLD LEG TEMPERATURE

- |    |             |   |
|----|-------------|---|
| 9  | SNPO/CRS    | <p>ISOLATE MOST AFFECTED SG:</p> <ol style="list-style-type: none"> <li>1) VERIFY THE MSIV CLOSED</li> <li>2) VERIFY MFIV CLOSED.</li> <li>3) VERIFY ADV CLOSED AND CONTROLLER IN MANUAL</li> <li>4) VERIFY EFW ISOLATION VALVES ARE CLOSED <ul style="list-style-type: none"> <li>EFW-228A SG 1 PRIMARY</li> <li>EFW-229A SG 1 BACKUP</li> </ul> </li> <li>5) PLACE EFW FLOW CONTROL VALVES IN MANUAL AND CLOSE <ul style="list-style-type: none"> <li>EFW-224A SG 1 PRIMARY</li> <li>EFW-223A SG 1 BACKUP</li> </ul> </li> <li>6) CLOSE MS-401A, PUMP AB TURB STM SUPPLY SG 1</li> <li>7) CLOSE MAIN STEAM LINE DRAINS: <ul style="list-style-type: none"> <li>MS-120A NORMAL</li> <li>MS-119A BYPASS</li> </ul> </li> <li>8) VERIFY SG BLOWDOWN ISOLATION VALVES ARE CLOSED: <ul style="list-style-type: none"> <li>BD-103A STM GEN 1 (OUT)</li> <li>BD-102A STM GEN 1 (IN)</li> </ul> </li> </ol> |
| 10 | PNPO/SNPO/C | <p>VERIFY CORRECT SG ISOLATED BY CHECKING S/G PRESSURES, S/G LEVELS, AND RCS COLD LEG TEMPERATURES. IF THE WRONG STEAM GENERATOR WAS ISOLATED RESTORE FEED AND STEAM CAPABILITY TO THE ISOLATED S/G AND THEN ISOLATE THE CORRECT STEAM GENERATOR.</p>   |
| 11 | PNPO/SNPO/C | <p>STABILIZE RCS TEMPERATURE USING THE LEAST AFFECTED S/G:</p> <ol style="list-style-type: none"> <li>1) PLACE THE ADV FOR THE LEAST AFFECTED S/G IN MANUAL AND FULLY OPEN.</li> <li>2) MANUALLY INITIATE EFAS TO THE LEAST AFFECTED S/G.</li> <li>3) PLACE THE EFW FLOW CONTROL VALVE TO MANUAL AND COMMENCE FEEDING THE LEAST AFFECTED S/G.</li> <li>4) WHEN RCS PRESSURE IS GREATER THAN HPSI SHUTOFF HEAD STABILIZE RCS PRESSURE USING PZR SPRAY.</li> </ol>  |
| 12 | TERM        | <p>THE EVENT MAY BE TERMINATED WHEN ACTIONS TO STABILZE RCS TEMPERATURE AND PRESSURE HAVE BEEN PERFORMED.</p>   |



**Simulator Scenario**  
**Waterford 3 Nuclear Plant**  
**Simulator Scenario Number: E-SRO0004**

**Author:** avest                      **Scenario Status:** DRAFT                      **Estimated Time:** 50

**Approval:**    **Revision Number:**

**References Verified:** avest                      7/26/99

**Applications:**                      **Initial Conditions:**  
Initial Exam                      IC-30

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**Scenario Description:**

The crew takes the shift with the plant at 100% power. Shortly after taking the shift Safety Channel A ENI middle detecto fails low, energizing Startup Channel 2. After the crew takes action to de-energize Startup Channel 2 and bypasses trip bistables for Linear Power Hi, DNBR Lo, and LPD Hi in PPS Channel A (the crew may also bypass Log Power Hi) CC Pump B trips on overcurrent due to a bearing seizure. Shortly after restoring normal CC flow, by starting CC Pump AB to replace CC Pump B, RCP 2B middle seal fails requiring entry into OP-901-130. After the crew commences a controlled shutdown based on management guidance, S/G 2 master controller fails low. The crew should take manual control of individual component controllers for FWCS 2 to regain level control. When the crew has implemented the actions of OP-901-201 and recommenced the controlled shutdown, the RCP 2B suffers a shaft seizure bringing in automatic trip signals on PPS. The reactor fails to automatically or manually trip using PPS components. The crew should manually trip the reactor by manually initiating DRTS. After entry into OP-902-001 a large break LOCA occurs inside containment. HPSI Pump B fails to start automatically, but may be started manually by the SNPO. The crew should diagnose to OP-902-002. The scenario may be terminated when the crew has verified adequate Safety Injection flow using App. 2 of OP-902-009 or at the lead examiners discretion.

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**Scenario Notes:**

Load Plant Matching composites in IC View.  
Load Scenario E-SRO0004 from the disc in Scenario View.

Initial Setup Chg pump A - Set remote CVR20 to RACKOUT, place Chg pump A C/S on CP-4 to OFF, and place danger tag on C/S.

Initial Setup HPSI pump A - Set remote SIR29 to RACKOUT, place HPSI pump A C/S on CP-8 to OFF, and place danger tag on C/S.

Initial Setup EFW pump AB - Set malfunction FW05 to TRUE. Set annunciators A10 and M03 on panel M and M13 on panel N to CRYWOLF. Override red, green, and white lights for MS-401A and B to OFF. Override C/Ss for MS-401A and B to CLOSE and place danger tags on MS-401A and B C/Ss on CP-8. Override red and green lights for MS-416 and MS-417 to OFF and place danger tag on MS-417 C/S on CP-8. Override EFW Pump AB Disch Press, Speed and Stm Press indicators to 0 on CP-8.

When the crew sends a NAO to the CCW pump report that the pump outboard bearing has no oil level and oil is on the floor.

**Scenario Timeline:**

Item	Malfunction	Time	Severity	Ramp	TUA	TRA	Triager	Event
1	SI02 B	LOAD	TRUE	N/A	N/A	N/A	N/A	
LOSS AUTOSTART SIGNAL TO HPSI								
2	RP01 A	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS MANUAL PUSHBUTTONS FAIL								
3	RP01 B	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS MANUAL PUSHBUTTONS FAIL								
4	RP01 C	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS MANUAL PUSHBUTTONS FAIL								
5	RP01 D	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS MANUAL PUSHBUTTONS FAIL								
6	RP02 A	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS AUTO TRIP FAILURE								
7	RP02 B	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS AUTO TRIP FAILURE								
8	RP02 C	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS AUTO TRIP FAILURE								
9	RP02 D	LOAD	TRUE	N/A	N/A	N/A	N/A	
RPS AUTO TRIP FAILURE								
10	NI01 E	1 MIN	0%	N/A	N/A	N/A	MTF03	AR008.
SAFETY CHANNEL ENI DETECTOR FAILS								
11	CC03 B	5 MIN	TRUE	N/A	N/A	N/A	MTF04	A510.e
CCW PUMP BEARING SEIZURE								
12	RC09 D	10 MIN	75%	N/A	N/A	N/A	MTF05	A130.e
RCP MIDDLE SEAL FAILURE (0-100%)								
14	N/A N/A	15 MIN	N/A	N/A	N/A	N/A	N/A	N1000
15	RX09 B	25 MIN	65%	N/A	N/A	N/A	MTF06	A201.e
FWCS MASTER CONTROLLER FAIL (0-100% OF RANGE)								
16	RX09 B	25 MIN	0%	3 MIN	N/A	N/A	MTF07	
FWCS MASTER CONTROLLER FAIL (0-100% OF RANGE)								
17	RC03 D	35 MIN	TRUE	N/A	N/A	N/A	MTF08	E000
RCP SHAFT SEIZURE								
18	RC23 D	POST-T	8%	N/A	N/A	N/A	MTF09	E002
RCS COLD LEG RUPTURE (DBL-END 30" BREAK @100%. MAX IS 14% = 10.000 LBM/SEC)								



**Manip # Manipulation Description**

14	Loss of CC Trains or CC to an Individual Component
17	Loss of Protective System Channel
2	Plant Shutdown
23	Malfunction of Auto Control System Which Affects Reactivity
27	Nuclear Instrumentation Failure
3B	Manual Control of Feedwater During Plant Shutdown
7B	LOCA, Inside Containment

**Scenario Critical Tasks****Event Number E000****STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

1	Establish Reactivity Control.	The task is identified by at least one member of the crew. The PNPO trips the reactor within one minute of receiving automatic trips on common bistables in at least two out of four PPS channels.
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**Event Number E002****LOSS OF COOLANT ACCIDENT**

2	Establish RCS Inventory Control	The task is identified by at least one crew member. The SNPO takes action to start HPSI "B" prior to Plenum Level dropping below 20%.
3	Stop all Reactor Coolant Pumps.	The task is identified by at least one crew member. The PNPO takes action to stop all Reactor Coolant Pumps within 3 minutes on a loss of CCW flow or on a loss of subcooled margin.

Event	Reference	Rev	Chna	Event	Reference	Rev	Chna
A130.e1	OP-901-130	02	01	A201.e3	OP-901-201	02	00
A510.e2	TS 3.7.3			A510.e2	OP-901-510	03	01
A510.e2	OP-100-014	10	00	AR008.I3	TS 3.3.1		
AR008.I3	OP-009-007	05	00	E000	OP-902-000	08	00
E002	OP-902-002	08	00	E002	EP-001-001	19	00
N10005a	OP-010-005	00	02	N10005a	TS 4.4.7		
N10005a	TS 3.2.7			N10005a	TS 3.2.1		
N10005a	TS 3.1.2						

## Scenario Objectives

The ABILITY to:

- 1 Communicate as a team, prioritize actions, demonstrate attention to detail.
- 2 Analyze plant parameters in abnormal / emergency conditions to diagnose and determine which emergency / off-normal operating procedure should be entered, if appropriate.
- 3 Verify automatic actions, and perform procedural immediate operator actions from memory.
- 4 Identify all LCO conditions in Technical Specifications and interpret / apply required actions.
- 5 Classify emergencies, make notifications and apply required actions of EP-001-001 "Recognition and Classification of Emergency Conditions".
- 6 Locate and utilize pertinent plant reference material available in the control room, including electrical and mechanical drawings.
- 7 Make clear, accurate, and concise verbal reports, written logs, and in-plant communications.

### **Event Number A130.e1 REACTOR COOLANT PUMP SEAL FAILURE**

- 1 Monitor Component Cooling Water parameters for reactor Coolant Pumps Cooling and take appropriate action as necessary.
- 2 Determine which reactor coolant pump seal(s) have failed and take appropriate actions in accordance with OP-901-130, Reactor Coolant Pump Malfunction.

### **Event Number A201.e3 STEAM GENERATOR LEVEL MASTER CONTROLLER FAILURE**

- 1 Place appropriate steam generator level control system(s) to manual.
- 2 Restore and maintain steam generator levels between 60% and 70% NR by adjusting appropriate feedwater level controllers in accordance with OP-901-201, Steam Generator Level Control System Malfunction.

### **Event Number A510.e2 LOSS OF CCW PUMP(S)**

- 1 Restore and properly align CCW in accordance with off-normal operating procedure OP-901-510, Component Cooling Water System Malfunction.
- 2 Recognize that losing all CCW flow requires a Reactor Trip and Securing of RCPs.

### **Event Number AR008.I3 EXCORE NUCLEAR INSTRUMENTATION FAILURES (SAFETY)**

- 1 Identify the failed NIS channel, making appropriate switch manipulations locally on drawer/CP-10
- 2 Properly bypass affected protection channel bistables according to Tech Specs.

### **Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 Carry out all operator actions, including necessary contingency actions in accordance with OP-902-000, Standard Post Trip Actions, in the event of a reactor trip.
- 2 Properly diagnose event in progress and transition to appropriate EOP recovery procedure.

### **Event Number E002 LOSS OF COOLANT ACCIDENT**

- 1 Take appropriate actions to mitigate the consequences of a large break loss of coolant accident in accordance with OP-902-002, Loss of Coolant Accident Recovery Procedure.
- 2 Monitor RCS/Core conditions and verify all critical safety functions are being addressed.

- 3 Ensure reactor coolant pumps are secured as required, and the automatic & manual actions required for recirc actuation take place with two minutes of signal.

**Event Number N10005a PLANT SHUTDOWN 100% TO 90%**

- 1 Reduce reactor power and/or remove the unit from service by operating securing, or realigning plant equipment as directed by precautions, limitations, and procedural guidance of General Operating Procedure, OP-010-005.

<b>Number:</b>	<b>Position:</b>	<b>Action</b>
	<b>Event Number</b>	<b>AR008.I3                      EXCORE NUCLEAR INSTRUMENTATION FAILURES (SAFETY)</b>
1	PNPO/CRS	RECOGNIZE AND REPORT INDICATIONS OF FAILED CHANNEL
2	NOTE	STARTUP CHANNEL HIGH VOLTAGE, AUDIBLE, AND METER INDICATION WILL ENERGIZE IF THE SELECTED LOG SAFETY CHANNEL (MIDDLE DETECTOR) FAILS LOW. (PRIMARY/ALTERNATE - A/B FOR STARTUP B, C/D FOR STARTUP A)
3	PNPO/SNPO/C	IF LOG SAFETY CHANNEL FAILS LOW, SELECT HV PRIMARY, ALTERNATE, OR OFF IN STARTUP/CONTROL DRAWER (IF STARTUP CHANNEL REENERGIZED)
4	PNPO/SNPO/C	IF LOG SAFETY CHANNEL FAILED HIGH, RESET RATE LIGHT FOR ASSOCIATED CP-10 CHANNEL
5	PNPO/CRS/CR	VERIFY RPS/CPC FUNCTION BISTABLES RESPOND AS EXPECTED
6	CRS	REVIEW AND/OR IMPLEMENT ACTIONS REQUIRED BY TECHNICAL SPECIFICATION SECTION 3.3.1 (RPS)
7	CRS	DIRECT BISTABLE BYPASS WITHIN 1 HOUR OF FAILURE (FOR FIRST CHANNEL FAILURE)
7.1	NOTE	FAILURE OF A SECOND CHANNEL WILL REQUIRE THAT CHANNEL TO BE PLACED IN THE TRIP CONDITION. TO BYPASS A SECOND CHANNEL WILL REMOVE BOTH CHANNELS FROM BYPASS
8	PNPO/SNPO/C	BYPASS AFFECTED CHANNEL IN ACCORDANCE WITH OP-009-007, SECTION 6.2
9	TERM	BYPASS LIGHTS ILLUMINATE ON BCP AND ROM FOR THE DESIRED CHANNEL
	<b>Event Number</b>	<b>A510.e2                      LOSS OF CCW PUMP(S)</b>
1	SNPO/CRS	RECOGNIZE AND REPORT CCW PUMP B TRIP.
2	SNPO/CRS	VERIFY OPEN SUCTION/ AND DISCHARGE CROSS CONNECT VALVES FROM TRAIN B ARE OPEN.
3	SNPO/CRS	ALIGN AB CCW PUMP ASSIGNMENT SWITCH TO B POSITION.
4	SNPO/CRS	START THE STANDBY CCW PUMP, VERIFY ELECTRICAL BUS ALIGNMENT.
5	SNPO/CRS/TE	EVALUATE TECHNICAL SPECIFICATION IMPACT. T. S. 3.7.3 AND CASCADING TECH SPECS PER OP-100-014, TRM 3.7.3.

Event Number	A130.e1	REACTOR COOLANT PUMP SEAL FAILURE
1	PNPO/CRS	IF ONLY ONE SEAL HAS FAILED ON A RCP, THEN OPERATIONS MAY CONTINUE PROVIDED SEAL IS MONITORED FOR FURTHER DEGRADATION.
2	CRS/SS	INFORM SYSTEM ENGINEER OF REACTOR COOLANT PUMP SEAL FAILURE.
3	SNPO/CRS	IF CONTROLLED BLEEDOFF HIGH TEMPERATURE ALARM OCCURS, THEN LOWER CCW TEMPERATURE BY STARTING DRY COOLING TOWER FANS OR START ACCW PUMPS AND ASSOCIATED WET COOLING TOWER FANS (SYSTEM ENGINEER, DUTY PLANT MANAGER, AND SS WILL RECOMMEND PLANT SHUTDOWN PER OP-010-005 AT THIS TIME)
4	PNPO/SNPO/C	ANNOUNCE POWER REDUCTION TO STATION PERSONNEL.
5	PNPO/CRS	PERFORM ALIGNMENT FOR BORON EQUALIZATION.
6	PNPO/CRS	ESTIMATE BORON REQUIRED TO SHUTDOWN USING THUMBRULE OR OP-002-005 (~1500 GALS)
7	PNPO/CRS	COMMENCES BORATION TO COMMENCE REACTOR SHUTDOWN AT RATE DETERMINED BY THE CRS.
8	SNPO/CRS	WHEN TAVG BEGINS TO DROP REDUCE GENERATOR LOAD TO MATCH TAVG AND TREF.
9	PNPO/CRS (T	IF TWO OR MORE SEALS FAIL IN RAPID SUCCESSION, TRIP THE REACTOR, SECURE THE AFFECTED RCP, GO TO OP-902-000.

Event Number	N10005a	PLANT SHUTDOWN 100% TO 90%
1	SS/CRS	IF NECESSARY, ENSURE IPTE REQUIREMENTS ARE MET AND SENIOR LINE MANAGER ON SITE
2	CRS	NOTIFIES LOAD DISPATCHER PRIOR TO POWER REDUCTION AND ANNOUNCES POWER REDUCTION OVER PLANT PAGING SYSTEM
3	PNPO/CRS	MAINTAIN TCOLD 541-548 DURING DOWNPOWER. PERFORM BORATION EQUALIZATION. ESTIMATE BORON ADDITION USING THUMBRULE OR OP-002-005 (~150 GALS) BORATES TO REDUCE REACTOR POWER AT RATE DETERMINED BY THE CRS.
4	PNPO/CRS	MAINTAINS ASI USING GROUP 5, 6 OR PART LENGTH CONTROL RODS
5	SNPO/CRS	REDUCES GENERATOR LOAD AS REQUIRED ONCE TAVE STARTS TO DROP TO MATCH REFERENCE TEMPERATURE AND TAVE
6	PNPO/CRS	REEVALUATE CEA SUBGROUPS SELECTED TO DROP ON RPC BETWEEN 90% AND 80% POWER.

7 TERM TERMINATE EVENT AT 90% POWER OR AT LEAD EXAMINER'S DISCRETION

**Event Number A201.e3 STEAM GENERATOR LEVEL MASTER CONTROLLER FAILURE**

- 1 SNPO NOTIFIES CRS OF CONTROLLER FAILURE
- 2 CREW IF REACTOR TRIPS GO TO OP-902-000
- 3 SNPO AT SS/CRS DISCRETION, STOP TURBINE LOAD CHANGES.
- 4 PNPO AT SS/CRS DISCRETION, SECURE BORATION AND DILUTION TO RCS.
- 5 SNPO PLACE FAILED MASTER CONTROLLER FW-IFIC-1111(1121) TO MANUAL. IF THIS HAS NO EFFECT, PLACE ASSOCIATED MFRV/STARTUP CONTROLLERS AND BOTH SGFPT SPEED CONTROLLERS IN MANUAL
- 6 TERM RESTORE SG LEVEL TO 60 - 70% NR USING MASTER CONTROLLER OR INDIVIDUAL CONTROLLERS (VERIFY FW PUMP DISCHARGE PRESSURE > SG PRESSURE)

**Event Number E000 STANDARD POST TRIP ACTIONS (IMMEDIATE OPERATOR ACTIONS)**

- 1 PNPO/CRS VERIFY REACTIVITY CONTROL.  
CHECK REACTOR POWER DROPPING OR PERFORM ANY OF THE FOLLOWING:  
MANUALLY TRIP THE REACTOR, MANUALLY INITIATE DRTS, OPEN BOTH 32 BUS BKRS FOR 5 SECONDS AND RE-CLOSE.  
CHECK STARTUP RATE IS NEGATIVE.  
CHECK LESS THAN 2 CEAS INSERTED OR EMERGENCY BORATE.
- 2 SNPO/CRS VERIFY MAINTENANCE OF VITAL AUXILIARIES  
CHECK THE MAIN TURBINE TRIPPED OR PERFORM ANY OF THE FOLLOWING:  
MANUALLY TRIP THE TURBINE OR CLOSE BOTH MSIVS.  
CHECK THE GENERATOR TRIPPED OR MANUALLY TRIP THE MAIN GENERATOR BY PERFORMING ANY OF THE FOLLOWING: DEPRESS BOTH GENERATOR EMERG TRIP PUSHBUTTONS OR TRANSFER BOTH ELECTRICAL TRAINS TO THE SUTS AND OPEN BOTH GENERATOR OUTPUT BKRS AND THE EXCITER FIELD BKR.  
CHECK TRAIN A AND B STATION LOADS ARE ENERGIZED FROM OFFSITE POWER OR VERIFY THE APPLICABLE EDG STARTS AND ITS OUTPUT BKR CLOSES.
- 3 PNPO/CRS VERIFY RCS INVENTORY CONTROL BY CHECKING PZR LEVEL 7% AND 60% AND SUBCOOLING MARGIN GREATER THAN OR EQUAL TO 28 DEG. F. IF PZR LEVEL CONTROL SYSTEM IS MALFUNCTIONING THE OPERATOR TAKES MANUAL CONTROL OF THE SYSTEM OR OPERATES CHARGING AND LETDOWN COMPONENTS TO RESTORE PZR LEVEL (THIS STEP MAY BE N/A FOR ESD, LOCA, OR SGTR EVENTS)

- |    |             |  |
|----|-------------|--|
| 4  | PNPO/CRS    | <p>VERIFY RCS PRESSURE CONTROL BY CHECKING PZR PRESSURE BETWEEN 1750 PSIA AND 2300 PSIA OR</p> <ol style="list-style-type: none"> <li>1) IF PZR PRESS CONTROL SYSTEM (PPCS) IS MALFUNCTIONING THE OPERATOR TAKES MANUAL OF PPCS CONTROLLERS TO RESTORE PRESSURE</li> <li>2) IF PZR PRESSURE IS LESS THAN 1684 PSIA, THE OPERATOR VERIFIES THAT SIAS AND CIAS INITIATE OR PERFORMS MANUAL INITIATION</li> <li>3) IF PZR PRESSURE IS LESS THAN 1621, THE OPERATOR VERIFIES NO MORE THAN TWO RCPS ARE OPERATING.</li> <li>4) IF PZR PRESSURE IS LESS THAN MINIMUM RCP NPSH OF APP. 2A THE OPERATOR SECURES ALL RCPS.</li> </ol> |
| 5  | PNPO/CRS    | <p>VERIFY CORE HEAT REMOVAL BY CHECKING AT LEAST ONE RCP OPERATING, OPERATING LOOP DELTA-T LESS THAN 13 DEG. F, AND RCS SUBCOOLING GREATER THAN OR EQUAL TO 28 DEG. F. (MAY BE N/A FOR ESD, LOCA, AND LOOP EVENTS)</p>   |
| 6  | SNPO/CRS    | <p>CHECK RCS HEAT REMOVAL BY CHECKING AT LEAST ONE S/G IS BOTH 15-80% NR AND MAIN FEEDWATER IS AVAILABLE TO RESTORE LEVEL OR VERIFY EFW IS AVAILABLE TO RESTORE LEVEL IN AT LEAST ONE S/G.</p>   |
| 7  | PNPO/SNPO/C | <p>CHECK RCS TEMPERATURE 535-555 DEG. F OR</p> <ol style="list-style-type: none"> <li>1) IF TC IS &gt; 555 DEG. F VERIFY LEVEL IS BEING RESTORED TO AT LEAST ONE S/G AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F.</li> <li>2) IF TC IS &lt; 535 DEG. F THEN VERIFY FEED FLOW IS NOT EXCESSIVE AND VERIFY SBCS OR ADVs ARE MAINTAINING RCS TEMP 535-555 DEG. F</li> <li>3) IF TC IS &lt; 500 DEG. F VERIFY NO MORE THAN 2 RCPs OPERATING</li> <li>4) IF ESD IN PROGRESS STABILIZE RCS TEMPERATURE USING LEAST AFFECTED S/G PER APP. 13.</li> </ol>  |
| 8  | SNPO/CRS    | <p>CHECK S/G PRESSURE 925-1050 PSIA OR</p> <ol style="list-style-type: none"> <li>1) IF S/G PRESS &lt; 925 PSIA VERIFY STEAM BYPASS VALVES AND ADVs ARE CLOSED.</li> <li>2) IF S/G PRESS LESS THAN OR EQUAL TO 764 PSIA VERIFY MSIS IS INITIATED.</li> <li>3) IF S/G PRESS &gt; 1050 PSIA VERIFY SBCS OR ADVs ARE RESTORING S/G PRESS TO &lt; 1050 PSIA</li> </ol>   |
| 9  | SNPO/CRS    | <p>VERIFY FWCS IN RTO BY CHECKING MAIN FEED REG VALVES ARE CLOSED, STARTUP FEED REG VALVES ARE 20-25% OPEN, AND OPERATING FEED PUMPS ARE 3800 TO 4000 RPM OR MANUALLY OPERATE FEEDWATER SYSTEM TO RESTORE LEVEL IN AT LEAST ONE S/G TO 50-70 NR.(N/A IF MSIS IS INITIATED)</p>   |
| 10 | SNPO/CRS    | <p>RESET MOISTURE SEPARATOR REHEATERS AND CHECK THE TEMP CONTROL VALVES CLOSED OR NOTIFY AN NAO TO FAIL CLOSE THE VALVES LOCALLY. (N/A IF MSIS IS INITIATED)</p>   |
| 11 | PNPO/CRS    | <p>VERIFY CONTAINMENT ISOLATION BY CHECKING CONTAINMENT PRESSURE &lt; 16.4 PSIA, CHECK THAT NO CONT. AREA RAD MONITORS ARE IN ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY, AND CHECK THAT NO STEAM PLANT RAD MONITORS ALARM OR SHOW AN UNEXPLAINED RISE IN ACTIVITY. IF CONTAINMENT PRESSURE IS GREATER THAN OR EQUAL TO 17.1 PSIA VERIFY CIAS, SIAS, AND MSIS INITIATE.</p>   |

12 SNPO/PNPO/C VERIFY CONTAINMENT TEMPERATURE AND PRESSURE CONTROL AND CONTAINMENT COMBUSTIBLE GAS CONTROL BY VERIFYING CONTAINMENT TEMP LESS THAN OR EQUAL TO 120 DEG. F AND CONTAINMENT PRESSURE IS < 16.4 PSIA OR  
 1) VERIFY AT LEAST 3 CFCs OPERATING.  
 2) IF CONTAINMENT PRESS IS GREATER OR EQUAL TO 17.1 PSIA VERIFY ALL CFCs ARE OPERATING IN EMERGENCY MODE.  
 3) IF CONTAINMENT PRESS IS GREATER THAN OR EQUAL TO 17.7 VERIFY CSAS IS INITIATED, ALL AVAILABLE CS PUMPS ARE DELIVERING > 1750 GPM, AND SECURE ALL RCPs .

13 CRS VERIFY ALL SAFETY FUNCTION ACCEPTANCE CRITERIA ARE MET

14 CRS/PNPO/SN PERFORM DIAGNOSTICS

15 TERM CREW DIAGNOSES A(N) \_\_\_\_\_ EVENT AND EXITS TO OP-902-\_\_\_\_\_.

**Event Number E002 LOSS OF COOLANT ACCIDENT**

1 STA/CRS CONFIRM DIAGNOSIS BY PERFORMING SAFETY FUNCTION STATUS CHECK LIST AND NOTIFY CHEMISTRY TO SAMPLE BOTH S/GS FOR ACTIVITY.

2 CREW ANNOUNCE THE EVENT

3 PNPO/SNPO/C IF PZR PRESSURE < 1684 PSIA VERIFY SIAS INITIATED, SAFETY INJECTION PUMPS STARTED, INJECTION FLOW IS ACCEPTABLE PER APPENDIX 2 AND AVAILABLE CHARGING PUMPS (2) ARE RUNNING OR PERFORM ANY OF THE FOLLOWING:  
 1) VERIFY POWER TO SI PUMPS.  
 2) VERIFY INJECTION VALES OPEN.  
 3) START ADDITIONAL SI PUMPS UNTIL FLOW IS ACCEPTABLE PER APP. 2.  
 4) ALIGN HPSI AB TO REPLACE A OR B.

4 PNPO/CRS IF PZR PRESS < 1621 PSIA AND SIAS IS ACTUATED VERIFY NO MORE THAN 2 RCPs OPERATING. IF PZR PRESS DOES NOT MEET APPENDIX 2A SECURE ALL RCPs.

5 PNPO/CRS VERIFY RCP OPERATING LIMITS  
 1) VERIFY CCW AVAILABLE TO RCPs OR SECURE AFFECTED RCPs IF NOT RESTORED WITHIN 3 MINUTES.  
 2) SECURE ALL RCPs IF CSAS IS INITIATED.  
 3) IF TC >500 DEG. F, VERIFY NO MORE THAN 2 RCPS OPERATING.

6 SNPO/CRS VERIFY CCW OPERATION BY CHECKING A CCW PUMP IS OPERATING FOR EACH ENERGIZED 4 KV SAFETY BUS OR  
 1) IF AB BUS ALIGNED TO SAME SIDE AS FAULTED CCW PUMP START THE AB CCW PUMP  
 2) IF AB BUS ALIGNED TO OPPOSITE SIDE FROM FAULTED CCW PUMP START THE AB CCW PUMP AFTER THE SEQUENCER HAS TIMED OUT.  
 3) IF CCW FLOW CAN NOT BE RESTORED, NOTIFY AN NAO TO PULL THE OVERSPEED TRIP DEVICE ON THE AFFECTED EDG.



- 7 PNPO/SNPO/C ISOLATE THE LOCA BY:  
 1) VERIFY LETDOWN CONTAINMENT ISOLATIONS ARE CLOSED.  
 2) VERIFY RCS SAMPLING ISOLATIONS ARE CLOSED.  
 3) CHECK CCW AB RAD MONITOR NOT IN ALARM AND NO ABNORMAL RISE IN READING OR STOP ALL RCPs AND CLOSE CCW CONTAINMENT ISOLATIONS.
- 8 PNPO/SNPO/C VERIFY LOCA NOT OUTSIDE CONTAINMENT BY CHECKING RAB RAD MONITORS, SUMP LEVELS, AND WASTE TANK LEVELS. IF A LEAK IS INDICATED, LOCATE AND ISOLATE THE LEAK AND VERIFY CIAS ACTUATED PER APPENDIX 4D.
- 9 SNPO/CRS PLACE HYDROGEN ANALYZERS A AND B IN SERVICE
- 10 PNPO/SNPO/C IF CONTAINMENT PRESSURE IS > 17.1 PSIA OR CONTAINMENT AREA RAD MONITORS ARE IN HI ALARM, VERIFY CIAS IS INITIATED AND VERIFY ALL AVAILABLE CFCs ARE IN THE EMERGENCY MODE. IF ANY CFC IS NOT OPERATING AND CONTAINMENT PRESSURE IS > 17.1 PSIA NOTIFY A NAO TO PERFORM APPENDIX 22B AND CLOSE THE ASSOCIATED CFC CCW ISOLATION VALVES.
- 11 SNPO/PNPO/C IF CONTAINMENT PRESSURE IS > 17.7 PSIA VERIFY CSAS IS INITIATED AND ALL OPERATING CS PUMPS ARE DELIVERING > 1750 GPM. IF ANY CS PUMP IS NOT OPERATING AND ITS ASSOCIATED CS-125 VALVE IS OPEN, PERFORM APPENDIX 22A AND CLOSE THE ASSOCIATED VALVE.
- 12 SNPO/CRS IF OFFSITE POWER HAS BEEN LOST VERIFY MSIVs AND BLOWDOWN CONTAINMENT ISOLATIONS ARE CLOSED.
- 13 SNPO/CRS RESTORE IA  
 1) IF A TCW PUMP AND CW PUMP ARE NOT RUNNING NOTIFY NAO TO ALIGN IA COMPRESSORS TO POTABLE WATER  
 2) IF IA PRESSURE < 95 PSIG DISPATCH AN OPERATOR TO START ALL AVAILABLE AIR COMPRESSORS  
 3) IF IA PRESS > 95 PSIG ENSURE IA CONTAINMENT ISOLATION VALVE IA-909 IS OPEN.
- 14 PNPO/SNPO/C COOLDOWN/DEPRESSURIZE/RESET MSIS AND SIAS SETPOINTS (AFTER COOLDOWN HAS BEEN STARTED THE EXAM LEAD MAY TERMINATE THE SCENARIO)

