

Facility: SSES Scenario No.: PCO17-102 Op-Test No.: _____

Examiners: _____ Operators: _____

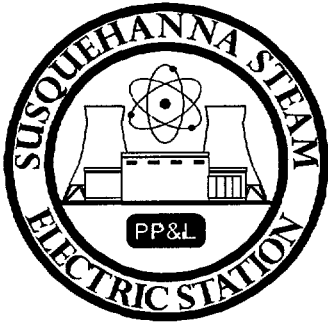
Initial Conditions: IC-20 Both Units at 100% Power EOL

Turnover: 'B' Service Air Compressor out of service for preventative maintenance. The compressor will not be returned to service this shift. Decrease power to 90% for rod adjustments IAW OP-AD-338 (Attachment C) then call Reactor Engineering. Prior to starting power reduction perform SO-155-006, QUARTERLY ARI MANUAL TRIP CHANNEL FUNCTIONAL TEST.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N	Perform ARI surveillance
2	N/A	R	10% Power reduction to 90%
3	IMF RL02:E411K17	I	HPCI CST low level switch failure
4	IMF AV04:TV11016B 0	I	"B" Recirc pump MG set HYD FLUID CTRL TCV (TIC-11016B) failed closed. "B" Reactor Recirc Pump trip (Auto trips at 210°F as a result of TIC-11016B failure).
5	IMF TC193016 130	M	TURBINE EHC PRESSURE/FLOW GAIN UNIT FAILURE (130%) - MSIV Closure
6	IMF RD155017 bat RPB.HYDATWS-1	M	Hydraulic ATWS
7	IMF SL153001A IMF SL153001B	C	SBLC Squib valves fail to fire.
8	IMF MV06:HV155F006	C	HPCI injection Auto Open failure

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

NOTE: Scenario # PCO 17-104
 designated as Spare
not used
 J. H. C. C.



PP&L-SUSQUEHANNA TRAINING CENTER

SIMULATOR SCENARIO

Scenario Title: NRC INITIAL LICENSE OPERATOR EXAMINATION

Scenario Duration: 90 Minutes

Scenario Number: PC017-102

Revision/Date: Rev 0, 5/1/2003

**Course: PC017, Senior Reactor Operator License
PC018, Reactor Operator License**

Operational Activities:

- | | |
|----------------------------------|----------------------------------|
| 1 Surveillance Activity | 5 Turbine EHC System Malfunction |
| 2 Power Change | 6 ATWS |
| 3 HPCI CST Level Switch Failure | 7 SBLC Squib Valve Fail to Fire |
| 4 MG B HYD Fluid TCV Fail Closed | 8 HPCI F006 Auto Logic Failure |

Prepared By:

Instructor

Date

Reviewed By:

Nuclear Operations Training Supervisor

Date

Approved By:

Supervising Manager/Shift Supervisor

Date

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SCENARIO SUMMARY

The scenario begins with the plant operating at 100% power. The "B" Service Air Compressor is out of service for preventive maintenance and will not be returned to service this shift. Unit 2 is in MODE 1 at 100% power.

After assuming the shift, the crew will perform a surveillance activity on the Alternate Rod Insertion system. Upon completion of the surveillance the crew will commence a power decrease requested by Reactor Engineering for a rod pattern adjustment. While meeting this request, a HPCI system CST low level switch fails; HPCI suction source will swap to the suppression pool and Technical Specifications will be addressed. Upon resumption of the power decrease a failure of the "B" Reactor Recirc MG set lube oil TCV-11016B occurs; the valve will fail shut, resulting in elevated lube oil temperatures to the MG set. This will cause "B" reactor recirc pump to eventually trip. The crew will take actions IAW General, Off-Normal and Operating procedures as well as address Technical Specifications for Single-Loop operation.

Following crew response to the tripped recirculation pump, the EHC Pressure/Flow Gain Unit will fail, causing all Main Turbine Bypass and Control valves to open. Reactor pressure will rapidly decrease to cause a MSIV isolation and reactor scram signal. When the reactor scram signal is received, one Scram Discharge Volume will become blocked, resulting in a hydraulic ATWS.

The crew will enter the Level/Power Control procedure to mitigate the ATWS. The crew will initiate SLC, but the Squib valves will fail to fire, requiring alternate SLC injection with RCIC. Since initial ATWS power level is above 5%, the crew will lower RPV level and stabilize in the target band of -60" to -110". When HPCI is initiated the injection valve will fail to open, placing the control switch to open will allow injection flowpath. As RPV water level is being maintained between -60" and -110" crew attempts to insert control rods manually and by resetting/rescramming will be successful. The crew should exit Level/Power Control and re-enter RPV Control to slowly restore and maintain level between +13" to +54".

When all control rods are inserted and actions are in progress to restore RPV water level to +13" to +54", the scenario will be terminated.

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SCENARIO OBJECTIVES

The **SRO** will:

1. Ensure initiation of ESF equipment if automatic operation was not properly initiated (00.AD.131).
2. Inform other shift members and plant management of changes in plant status, potential plant problems or limitations (00.AD.131).
3. Ascertain the need to notify the Duty Manager when a plant event develops and ensure the notification is made (00.AD.131).
4. Implement Loss of Reactor Recirculation Flow (64.ON.010).
5. Implement Turbine EHC Malfunction (93.ON.005).
6. Implement Main Turbine Trip (93.ON.006).
7. Implement Scram (00.ON.018).
8. Implement RPV Control (00.EO.026).
9. Implement Level/Power Control (00.EO.031).
10. Implement Primary Containment Control (00.EO.027).
11. Implement Boron Injection Via RCIC (50.EO.009).
12. Implement RPS and ARI trip bypass (58.EO.006).
13. Ensure required actions per Technical Specifications are met when a LCO is not met (00.TS.002).

The **ROs** will:

1. Perform normal operation of RHR in the Suppression Pool Cooling Mode (49.OP.003).
2. Perform automatic/manual startup of RCIC system (50.OP.010).
3. Perform manual startup of HPCI (52.OP.012).
4. Perform maximizing CRD flow (55.OP.001).
5. Perform initiation of Standby Liquid Control System (53.OP.003).
6. Perform inserting manual scram with CRD system in service (55.OP.006).
7. Perform shutdown of Recirculation Pump for Single Loop operation (64.OP.002).
8. Perform inhibiting ADS (83.OP.005).
9. Implement Loss of Reactor Recirculation Flow (64.ON.010).
10. Implement Turbine EHC Malfunction (93.ON.005).
11. Implement Main Turbine Trip (93.ON.006).
12. Implement Scram (00.ON.018).
13. Implement RPV Control (00.EO.026).
14. Implement Level/Power Control (00.EO.031).
15. Implement Primary Containment Control (00.EO.027).
16. Implement Boron Injection Via RCIC (50.EO.009).

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CRITICAL TASKS

03 ATWS
06 LEVEL / POWER CONTROL

- ★ Lowers RPV level to <-60" but >-161".

Safety Significance

Core damage due to unstable operation can be prevented or at least mitigated by promptly reducing feedwater flow so that level is lowered below the feedwater spargers.

Consequences for Failure to perform Task

A General Electric Company study (NEDO-32047) indicates that the major threat to fuel integrity from ATWS is caused by large-amplitude power/flow instabilities. The power oscillations can become large enough to cause melting of fuel in high-power bundles.

Indications/Cues for Event Requiring Critical Task

Lowering of reactor pressure and closure of MSIVs with NO reactor scram signal.

Performance Criteria

Lower reactor water level by controlling injection rate from RCIC using the RCIC speed controller.

NOTE: Manual HPCI control may be required based on initiating power of failure to scram event. If initiating event is from high power HPCI injection will be required to maintain reactor water level above Top of Active Fuel (TAF).

Performance Feedback

Lowering water level to -60 to -110 inches will result in power level lowering as indicated on the Average Power Range Monitors.

- ★ Inject SLC

Safety Significance

Early boron injection has the following benefits:
Stop or prevent large-magnitude Limit Cycle Oscillations which can lead to core damage.
Limit fuel damage from uneven flux patterns that could result from partial rod inserts.

Consequences for Failure to perform Task

Failure to inject Boron can result in
Cycle Oscillations which can lead to core damage.
Fuel damage from uneven flux patterns that could result from partial rod inserts.

Indications/Cues for Event Requiring Critical Task

Lowering of reactor pressure and closure of MSIVs with NO reactor scram signal.
NO SLC Flow indicated performance of SLC injection steps.

Performance Criteria

Inject SLC by inserting key into keylock switch and turning to start SLC pumps, fire the Squib valves and close the Reactor Water Cleanup isolation valve.

RECOGNIZE SLC squib valves did not fire (NO Flow indicated) and initiating alternate SLC injection using RCIC (ES-150-002) (Will not be completed during scenario)

Performance Feedback

Successful SLC injection would be indicated by a lowering SLC tank level and a corresponding power level decrease.

- ★ Inserts control rods IAW EO-100-113 Sht. 2.

Safety Significance

Control rod insertion initiates power reduction immediately

Consequences for Failure to perform Task

Failure to insert control rods allows power to remain elevated with resultant power oscillations and potential core damage.

Indications/Cues for Event Requiring Critical Task

Lowering of reactor pressure and closure of MSIVs with NO reactor scram signal.

Performance Criteria

Insert Control Rods by the following methods:

Maximize CRD to drift control rods (Will not be successful)

Drive control rods after bypassing RWM and RSCS (Will be successful)

Resetting and Scramming again by performing ES-158-002 Bypass RPS logic trips (Will be successful)

Performance Feedback

Successful insertion of control rods will be indicated by:

Rod position for manual insertion of control rods

Rod position full in after resetting scram, draining scram discharge volume and rescam

- ★ Manually open HPCI injection HV-155-F006.

This critical task is dependent on the power level at which the failure to scram occurs. If the failure to scram transient begins from 100% power, opening the HPCI injection valve will be a critical task.

If the failure to scram occurred from 100% power, opening the HPCI injection valve is considered a critical task based on ability to control water level above Top of Active Fuel. The MSIVs close preventing the use of the Feedwater system to control water level. The high pressure feed systems available are RCIC, and CRD. If the transient begins from 100% power, the CRD system does not have the capacity to maintain water level by itself. The RCIC system by procedural guidance is to be lined up for Boron injection leaving no high pressure feed system other than HPCI.

To ensure water level is controlled above Top of Active Fuel, HPCI injection is required and operator intervention is required for HPCI injection.

Safety Significance

Unable to maintain reactor water level above top of active fuel.

Consequences for Failure to perform Task

Potential core damage due to insufficient heat removal.

Indications/Cues for Event Requiring Critical Task

Lowering of reactor level below target level of -60 to -110 inches.

Performance Criteria

Manually open HPCI injection HV-155-F006.

Verify HPCI pump discharge pressure 100 psig greater than reactor pressure .

Operate control switch for HPCI injection HV-155-F006, observe HPCI flow and level control..

Performance Feedback

Reactor water level being maintained above the top of active fuel between -60 and -110 inches.

★ Denotes Simulator Critical Task

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SCENARIO REFERENCES

1. SURVEILLANCE ACTIVITY

- SO-155-006 QUARTERLY ARI MANUAL TRIP CHANNEL FUNCTIONAL TEST, REV. 8
- OP-AD-004 OPERATIONS STANDARDS FOR ERROR AND EVENT PREVENTION, REV. 5

2. POWER CHANGE

- GO-100-012 POWER MANEUVERS, REV. 17
- NDAP-QA-338 REACTIVITY MANAGEMENT AND CONTROLS PROGRAM, REV. 6
- OP-AD-001 OPERATIONS STANDARDS FOR SYSTEM AND EQUIPMENT OPERATION, REV. 5
- OP-AD-338 COMMUNICATION REQUIREMENTS FOR REACTIVITY MANIPULATIONS, REV. 1

3. HPCI SYS CST LO LEVEL SWITCH FAILURE

- AR-114-E01 CST LO WATER LEVEL, REV. 22
- TS 3.3.5.1 ECCS INSTRUMENTATION, AMENDMENTS 178 & 204
- OP-AD-002 STANDARDS FOR SHIFT OPERATIONS, REV. 9
- NDAP-QA-0702 ACTION REQUEST AND CONDITION REPORT PROCESS, REV. 12

4. MG B HYD FLUID TEMP CONTROL VALVE FAIL CLOSED / RRP B TRIP

- AR-102-C05 RECIRC MG SET A/B BRG OR FLUID DRIVE OIL HI TEMP, REV. 21
- AR-102-C06 RECIRC MG B FLUID DRIVE OIL HI-LO TEMP, REV. 21
- AR-102-B05 RECIRC MG B DRIVE MTR TRIP, REV. 21
- ON-164-002 LOSS OF REACTOR RECIRCULATION FLOW, REV. 20
- TS 3.4.1 RECIRCULATION LOOPS OPERATING, AMENDMENT 178
- TR 3.2 COLR SECTION 8, 3/15/02
- GO-100-009 SINGLE RECIRCULATION LOOP OPERATION, REV. 13

5. TURBINE EHC SYSTEM MALFUNCTION / MSIV ISOLATION

- ON-156-001 UNEXPLAINED REACTIVITY CHANGE, REV. 14
- ON-193-001 TURBINE EHC SYSTEM MALFUNCTION, REV. 10

6. ATWS / LEVEL/POWER CONTROL / RPV CONTROL

- ON-100-101 SCRAM, REV. 9
- EO-100-102 RPV CONTROL, REV. 1
- EO-100-113 LEVEL-POWER CONTROL/CONTROL ROD INSERTION, REV. 1
- ES-150-002 BORON INJECTION VIA RCIC, REV. 13
- ES-158-002 RPS AND ARI TRIP BYPASS, REV. 4
- EP-PS-100 EMERGENCY PLANT POSITION-SPECIFIC (ED), REV. 16

Continued on next page:

7. PRIMARY CONTAINMENT CONTROL

EO-100-103 PRIMARY CONTAINMENT CONTROL, REV. 2

8. OTHER

BWROG SIMULATOR SCENARIO DEVELOPMENT GUIDELINE, TEMPLATE RPV-6

SCENARIO SPECIAL INSTRUCTIONS

1. Initialize the simulator to **IC-20** (Both Units 100% Power, EOL).
2. Set up the simulator for the scenario by performing the following:
Place the "B" Service Air Compressor control switch on 1C668 to OFF.
3. Type **restorepref YPP.PC017-102**; verify the following pre-inserts and Program Button assignments:
Verify the Environment Window:

MALFS	REMFS	OVRDS	TRIGS
63 : 63	1	3:3	0

IOR ZAIM2J115HD5 15 MCFL POT AT 100%
MRF PM091K108B OUT "B" SERVICE AIR COMPRESSOR BKR RACKED OUT
IMF RD155017 PARTIAL SCRAM (BROWNS FERRY EVENT)
IMF MV07:PV146F003 8.7 CRD PRESS VLV F003 FAILED, 8.7%
IMF MV06:HV155F006 AUTO LOGIC FAILURE TO OPEN
IMF SL153001A SQUIB VALVE XV-C41-F004A FAILS TO FIRE
IMF SL153001B SQUIB VALVE XV-C41-F004B FAILS TO FIRE
bat RPB.HYDATWS-1
[P-1] IMF RL02:E411K17 HPCI SYS CST LO LEVEL SWITCH FAILURE
[P-2] IMF AV04:TV11016B 0 MG B HYD FLUID CTRL TCV (TIC-11016B) FAILED CLOSED
[P-3] IMF TC193016 130 TURBINE EHC PRESSURE/FLOW GAIN UNIT FAILURE (130%)
[P-4] MRF RD155017 0 146F034 CRD CHARGING WTR ISO VLV CLOSED
[P-5] bat RPB.DISABLARI OPENS ARI BKRS IAW ES-158-002
[P-6] bat RPB.ES158002 BYPASSES RPS IAW ES-158-002
[P-7] DMF RD155017 PARTIAL SCRAM – DELETED
[P-8] bat RBP.HYATW-CLR DELETE HYD ATWS

4. Prepare a turnover sheet indicating:
 - a. "B" Service Air Compressor out of service for preventive maintenance. The system will not be returned to service this shift.
 - b. Decrease power to 90% for rod adjustments IAW OP-AD-338 (Attachment C) then call RE.
 - c. Prior to starting power reduction perform SO-155-006, QUARTERLY ARI MANUAL TRIP CHANNEL FUNCTIONAL TEST.
 - d. Unit 2 is in MODE 1 at 100% power.
5. Setup board annunciators with tags indicating surveillance preparations.
6. Prepare a power change with Recirc (form OP-AD-338, Attachments A & C) indicating power to be reduced to 90% at 1%/min.
7. Prepare a copy of SO-155-006, QUARTERLY ARI MANUAL TRIP CHANNEL FUNCTIONAL TEST and a surveillance coversheet.
8. Make a copy of shift assignments.

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SCENARIO EVENT DESCRIPTION FORM

Initial Conditions: Initialize the Simulator to IC-20. Place the Simulator to RUN. Ensure the Program Buttons are assigned as indicated on the Special Instructions sheet via the appropriate Preference File. Assign Shift positions. Direct the start of the 5-minute panel walk down.

[illegible]

SCENARIO EVENT FORM

Event No: 1, 2, 3

Brief Description: Surveillance Activity / Power Change / HPCI Sys CST Lo Level Switch Failure

POSITION	TIME	STUDENT ACTIVITIES
US		Reviews and authorizes performance of SO-155-006.
PCOP		Performs SO-155-006.
	NOTE	The timing of the relays in the next step is normally done with 2 timing devices due to the complexity of the evolution. If the crew determines the timing to be UNSAT, roleplay the second timer and inform the crew that the timing was SAT at 28 seconds
		<p>Place collar of ARI DIV 1 MAN TRIP HS-147103A1 to ARMED position. Confirm ARI MAN TRIP DIV 1 SWITCH ARMED annunciator ALARMS. Perform following in immediate succession: Depress ARI DIV 1 MAN TRIP HS-147103A1 and Release. AND Simultaneously Start timing 25 second time delay relay which inhibits system reset. THEN Depress and Hold ARI DIV 1 RESET HS-147103A2 push button. Confirm and Record Attachment A the following: ARI DIV 1 SCRAM AIR HDR VENT SV-14799 OPEN. ARI DIV 1 SCRAM AIR HDR BLOCK SV-147101 CLOSED. Confirm ARI TRIP DIV 1 annunciator ALARMS at Panel 1C651. Stop timing relay when following occurs: ARI DIV 1 SCRAM AIR HDR VENT SV-14799 CLOSED. AND ARI DIV 1 SCRAM AIR HDR BLOCK SV-147101 OPEN. Confirm ARI TRIP DIV 1 annunciator CLEARED at Panel 1C651. Release ARI DIV 1 RESET HS-147103A2 pushbutton. Record ARI DIV 1 time delay for resetting system logic on Attachment A. Place collar of ARI DIV 1 MAN TRIP HS-147103A1 to DISARMED position. Confirm ARI MAN TRIP DIV 1 SWITCH ARMED annunciator CLEARED. Independently Verify collar of ARI DIV 1 MAN TRIP HS-147103A1 is in DISARMED position.</p> <p>REPEAT for DIV 2</p>
US		Reviews and approves the Reactivity Manipulation Package.
		Conduct a reactivity briefing in accordance with OP-AD-338.
		Directs power reduction per <u>GO-100-012</u> .
		<p>From GO-100-012:</p> <p>Decrease power using; Approved Reactivity Manipulation Package provided by Reactor Engineering.</p>

PCOM		Commences power decrease at 1% per minute with Reactor Recirculation Flow Control in accordance with OP-AD-338 and <u>GO-100-012</u> .
PCOP		Reports CST LO WATER LEVEL alarm.
		Refers to <u>AR-114-E01</u> , . CONDENSATE STORAGE TANK LO WATER LEVEL
		From AR-114-E01: Verifies PUMP SUCT FROM SUPP POOL HV-155-F042 OPENS. Verifies PUMP SUCT FROM CST HV-155-F004 CLOSES. Checks CST A level on 0C653, LR-00812.(red pen still at 75%) Determines/Reports CST A level is NOT low. Dispatch Plant Operator to investigate.
US		Contacts Work Week Manager concerning CST level switches.
		Refers to TS 3.3.5.1, Table Function 3.d, enters Condition A & D.
		From <u>TS 3.3.5.1</u> : One or more channels inoperable. Enter the Condition referenced in Table 3.3.5.1-1 for the channel. Immediately
		Makes notifications IAW OP-AD-002, STANDARDS FOR SHIFT OPERATION.
		Identifies a CR is required.

★ Denotes Critical Task

NOTES:	

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
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Event No: 1, 2, 3

Brief Description: Surveillance Activity / Power Change / HPCI Sys CST Lo Level Switch Failure

INSTRUCTOR ACTIVITY:

When reactor power is reduced ~2%, insert HPCI system CST low level switch failure, **Depres P-1:**

[P-1] IMF RL02:E411K17 CST LO WTR LEVEL LSLL-E41-1N002 FAILURE

NOTE: Monitor sim diagram **MW3** to report local CST A level from 0C518A.

ROLE PLAY:

As Plant Operator sent to HPCI CST low level switches, wait ~2 mins. and report there is no visible indication of either switch having a problem.

As Plant Operator sent to CST A, wait ~2 mins. and report there is no visible leakage or loss of CST level.

As FIN Team/I&C sent to investigate the level switch problem, wait ~ 5 mins. and report LSLL-E41-1N002 has failed, it will take ~6 hours to replace and calibrate the switch.

SCENARIO EVENT FORM

Event No: 4
Brief Description: MG B HYD Fluid Temp Control Valve Fail Closed / RRP B Trip

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Recognizes/reports AR-102-C05, RECIRC MG SET A/B BRG OIL FLUID DRIVE HI TEMP, and AR-102-C06, RECIRC MG B FLUID DRIVE OIL HI-LO TEMP alarms.
		From AR-102-C05 Operator Actions: DETERMINE temperature element causing alarm by observing following on Recirc MG Panel 1C614: Sets A&B Gen/Drive Motor Winding Temp TRS-B31-1R625: CHECK TIC11016A(B) for proper operation. Control in MANUAL if system allows or THROTTLE/CONTROL oil temperature as necessary using TIC11016A(B) BPV 110041(110038)
		Attempts manual control of TIC-110016B; reports failure of TV-110016B.
		Manual or Automatic trip of "B" Recirc pump.
		Recognizes/reports loss of "B" Recirc pump.
		Depress B MG drive motor breaker stop pushbutton, HS-14001B per the AR.
		Performs actions of ON-164-002, LOSS OF REACTOR RECIRCULATION FLOW.
		From ON-164-002: Plot position on Power/Flow Map, Form NDAP-QA-0338-10.(Determines region 2) Ensure thermal power REDUCED to < 70% rod line. Comply with COLR Section 8.0 Limits in TRM. Comply with Tech Spec LCOs 3.4.1. For stopped pump, Place RECIRC A(B) MOV OL BYPS HV-143-F031A(B)/F032A(B) key switch to TEST position. Close RECIRC PUMP A(B) DSCH HV-143-F031A(B). Within 5 minutes, Open RECIRC PUMP A(B) DSCH HV-143-F031A(B). AFTER 2 minutes, Place RECIRC A(B) MOV OL BYPS HV-143-F031A(B)/F032A(B) key switch to NORM position.
US		Directs Work Week Manager about failure of TV-110016B.
		Directs actions of ON-164-002.
		Contacts Reactor Engineer.
		Refers to GO-100-012, POWER MANEUVERS and GO-100-009, SINGLE RECIRCULATION LOOP OPERATION.
		Refers to T.S. 3.4.1, Recirculating Loops Operating and COLR section 8.0 in TRM section 3.2.
		From TS 3.4.1 One recirculation loop may be in operation provided the following limits are applied when the associated LCO is applicable with a THERMAL POWER/core flow condition outside of Regions I and II of Figure 3.4.1.1.

		Directs I&C to perform Flow-Bias Scram setpoint changes for Single Loop operation.
		Makes notifications IAW <u>OP-AD-002</u> , STANDARDS FOR SHIFT OPERATIONS.

★ Denotes Critical Task

NOTES:	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 4
Brief Description: MG B HYD Fluid Temp Control Valve Fail Closed / RRP B Trip

INSTRUCTOR ACTIVITY:

When power reduction is resumed, wait **one minute** then activate the failure of TIC-11016B: (Ensure this malfunction is entered prior to reaching ~95% power, this will subsequently ensure the power level for ATWS actions later), **Depress P-2:**

[P-2] IMF AV04:TV11016B 0 MG B HYD FLUID CTRL TCV (TIC-11016B) FAIL CLOSED

NOTES:

- Refer to Simulator P&ID **SW3** for TV-110016B status; refer to P&ID **RR6** for "B" Recirc MG Set Oil temperatures.
- RECIRC MG B BRG OR FLUID DRIVE OIL HIGH TEMP alarm (AR-102-C05, 140°F) takes ~2 minutes to annunciate.
- RECIRC MG B FLUID DRIVE OIL HIGH TEMP alarm (AR-102-C06, 190°F) takes ~5 minutes to annunciate.
- The MG Set trips at 210°F in ~6 minutes.

If crew elects to take OP-164-001 Single Loop actions and is subsequently required to manually scram the reactor due to operation in Region I of the Power/Flow map, **perform the next event via [P-3]** as outlined on page 19 **BEFORE** the crew places the **Mode Switch to Shutdown**.

ROLE PLAY:

1. As RE, direct crew to insert control rods per OP-AD-338 Attachment E in CRC Book. You will run the core monitor and report results shortly.
2. If directed as NPO to investigate TV-11016B, wait ~2 minutes and report that the valve is closed; the valve stem appears to be bent.
3. If directed to bypass TV-11016B by opening 110038, wait ~2 minutes and report that the valve is stuck; you can not get the valve open.
4. If directed as FIN Team to investigate failure of TV-11016B, wait ~5 minutes and report that the valve is jammed on it's closed seat; it will take some time to free the valve. You have no time estimate for completion of repairs at this time.
5. As I&C directed to perform Flow-Bias Scram setpoint changes for Single Loop operation, acknowledge the order and perform no further actions.

SCENARIO EVENT FORM

Event No: 5, 6, 7

Brief Description: Turbine EHC System Malfunction / MSIV Isolation / ATWS / Squib Valve Failure

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Observes TCVs and BPVs open and SCRAM.
		Recognizes failure of all control rods to fully insert and announces failure to scram to crew..
		Performs ON-100-101, SCRAM: <ul style="list-style-type: none"> Place Mode Switch to S/D. Arm and Depress manual scram pushbuttons. Inserts SRMs and IRMs.
		Trips/verifies tripped "A" Recirc Pump.
		Maximize CRD flow
PCOP		Recognize/reports MSIV closure.
		Initiates ARI.
US		Enters EO-100-102, RPV CONTROL and exits to <u>EO-100-113</u> , LEVEL/POWER CONTROL.
		Directs initiating SLC and inhibiting ADS per LQ/Q-3.
PCOP	NOTE 1	Attempts to initiate SLC per <u>OP-153-001</u> , notifies US of SLC Squib valves failure.
		From OP-153-001 PLACE SBLC MANUAL INITIATION keylock control switch to START. OBSERVE following pumps START OBSERVE following: RWCU INLET OB ISO HV-144-F004 CLOSES. SBLC SQUIB READY A-B White indicating lights for both explosive valves EXTINGUISH indicating explosive valves fired (NOTE: Squib valves do not fire) Observes NO FLOW indicated for SLC injection and reports to US
★US		Directs alternate SLC injection IAW ES-150-002, Boron Injection Via RCIC. (Feedback will not be evident during scenario, as this evolution takes more than 30 minutes to locally perform)
PCOP		Inhibits ADS as directed per <u>OP-183-001</u> .

★ Denotes Critical Task

NOTES:	NOTE 1: This event is classified as a SITE AREA EMERGENCY due to ATWS/SLC failure IAW EP-PS-100, EAL 11.3.

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
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Event No: 5, 6, 7

Brief Description: Turbine EHC System Malfunction / MSIV Isolation / ATWS / Squib Valve Failure

INSTRUCTOR ACTIVITY:

1. When the actions for the loss of "B" Recirc pump are complete (pump tripped and single loop operations discussed), fail the in service EHC pressure transmitter, **Depress P-3:**

[P-3] IMF TC193016 130 TURBINE EHC PRESSURE/FLOW GAIN UNIT FAILURE (130%)

NOTE: Boron injection via RCIC will not be done in this scenario.

ROLE PLAY:

1. As NPO dispatched to investigate SLC, wait ~3 minutes and report that the SLC pumps are running and the discharge relief valves are chattering. Pump discharge pressure on the local gage is cycling between ~1250 psig and 1450 psig.
2. As FUS, acknowledge direction to perform ES-150-002, Boron Injection Via RCIC but take no further action. If the crew requests a status update role play as necessary since boron injection is not going to be permitted.

SCENARIO EVENT FORM

Event No: 6, 8

Brief Description: ATWS / Level Power Control / RPV Control / HPCI F006 Auto Logic Failure

POSITION	TIME	STUDENT ACTIVITIES
★US		<i>Directs RPV level lowered to <-60" but >-161". per EO-100-113</i>
		Directs establishing RPV level target band of -60" to -110"
		Directs controlling RPV pressure between 800 and ≤1087 psig.
★US		<i>Directs PCOM to insert control rods IAW EO-100-113 Sht. 2, CONTROL ROD INSERTION.</i> <ul style="list-style-type: none"> • <i>Directs bypassing RSCS/RWM and manually inserting control rods.</i> • <i>Directs implementation of ES-158-002, RPS, ARI TRIP BYPASS</i>
★PCOP		<i>Lowers and controls RPV level to <-60" but >-161" using HPCI and RCIC injection systems.</i> <i>Lowers RCIC speed controller</i>
		Reports HPCI Injection F006 failure to open.
		Establishes RPV level in target band of -60" to -110" using RCIC & HPCI.
★PCOP		<i>NOTE: This step is only critical if RCIC injection systems are unable to keep level above -161 inches.</i> <i>Manually OPENS HPCI Injection valve F006.</i> <i>Lowers HPCI speed controller</i>
PCOP		Maintains RPV pressure between 800 and 1087 psig using SRVs in alphabetical order per LQ/P6 of EOP-100-113
		From EOP Stabilize press < 1087 psig using BPV's Augmenting press control with any: SRV's Supp pool lvl > 5' Open SRV's using opening sequence a b c ≤ 200 psig indicated on either ads N2 bottle header Place all SRV switches to off

★ Denotes Critical Task

NOTES:	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 6, 8

Brief Description: ATWS / Level Power Control / RPV Control / HPCI F006 Auto Logic Failure

INSTRUCTOR ACTIVITY:

1. When the PCOM directs closing 146F034 to isolate the CRD Charging header, wait ~2 minutes and **Depress P-4:**

[P-4] MRF RD155017 0 146F034 CRD CHARGING WTR ISO VLV CLOSED

ROLE PLAY:

As NPO directed to close CRD Charging Water Isolation Valve 146F034, report the valve has been closed.

INSTRUCTOR ACTIVITY:

2. When the PCOM has manually inserted ~10 control rods and RPV water level has been stabilized between -60" and -110", call the Unit Supervisor on the page and ask permission to open ARI breakers 1D614006 & 1D624016 IAW ES-158-002 wait ~2 minutes, **Depress P-5:**

[P-5] bat RPB.DISABLARI OPENS ARI BKRS IAW ES-158-002

ROLE PLAY:

As FUS, report that the ARI breakers have been opened IAW ES-158-002. You are continuing with bypassing RPS at this time.

INSTRUCTOR ACTIVITY:

3. After disabling ARI above, call the Unit Supervisor on the page and ask permission to bypass RPS trips IAW ES-158-002 wait ~3 minutes and complete ES-158-002 **Depress P-6:**

[P-6] bat RPB.ES158002 BYPASSES RPS IAW ES-158-002

ROLE PLAY:

As FUS, report that RPS has been bypassed and ES-158-002 is now completed.

SCENARIO EVENT FORM

Event No: 6

Brief Description: ATWS / Level Power Control / RPV Control

[illegible]

★ Denotes Critical Task

NOTES:	
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**INSTRUCTOR ACTIVITIES, ROLE PLAY,
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 6
Brief Description: ATWS / Level Power Control / RPV Control

INSTRUCTOR ACTIVITY:

1. When the PCOM resets the scram, delete the ATWS malfunction, **Depress P-7 and P-8:**

[P-7] DMF RD155017 PARTIAL SCRAM – DELETED

[P-8] bat RBP.HYATW-CLR DELETES HYD ATWS

NOTE: It takes ~7 minutes for RPS A1/A2 (B1/B2) SCRAM DSCH VOL HI WTR LEVEL TRIP annunciators (AR-103/104-F02) on 1C651 to clear. Monitor P&ID Display **RD-5** for SDV status.

ROLE PLAY:

As necessary.

TERMINATION CUE:

All control rods are inserted and actions are in progress to restore RPV water level to +13" to +54".

Facility: **SSES**Scenario No.: **PCO17-103**

Op-Test No.: _____

Examiners: _____

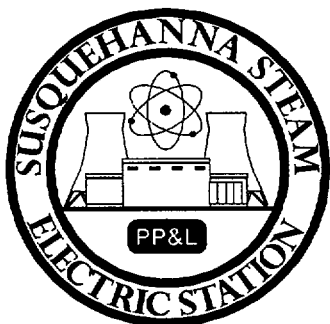
Operators: _____

Initial Conditions: **IC-123 Unit 1 30% Power EOL.(4)** Unit 2 start-up in progress, ~ 1 hour from synchronizing to the grid.

Turnover: **HPCI is out of service for repairs to oil pump breaker and oil changeout.(5)** The system will not be returned to service this shift. Mechanical vacuum pump is out of service for a seal replacement. The system will not be returned to service this shift. Perform SO-054-A03, QUARTERLY ESW FLOW VERIFICATION LOOP A. Maintenance is standing by for vibration data.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N	Perform "A" ESW Loop Surveillance
2	IMF RD1550043823 (NONE 0 20) 5	R	Rod 38-23 drifts to position 38 (6)
3	IMF PM03:0P504A	C	"A" ESW pump trips during surveillance
4	IMF DS104001A (NONE 10 0)	C	Loss of "1A" ESS bus/Loss of RPS/Loss of CRD
5	IMF MV07:HV144F100 100	C	RWCU F001 (7) VLV FAILED-OPEN
6	IMF CU161007 100 4:00 IMF MV07:HV144F106 (102) 100 IMF MV09:HV144F001 (004) 98	M	Unisolable break on RWCU line inside Secondary Containment
7	IMF RC150011 IMF BR05:1A10104 (204)	M	Loss of all High pressure feed. (Leads to loss of adequate core cooling, requiring rapid depressurization)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor



PP&L-SUSQUEHANNA TRAINING CENTER

SIMULATOR SCENARIO

Scenario Title: NRC INITIAL LICENSE OPERATOR EXAMINATION

Scenario Duration: 90 Minutes

Scenario Number: PC017-103

Revision/Date: Rev 0; 5/1/03

**Course: PC017, SENIOR REACTOR OPERATOR LICENSE
PC018, REACTOR OPERATOR LICENSE**

Operational Activities:

- | | |
|-------------------------------------|--|
| 1 Surveillance Activity | 5 Control Rod Drift |
| 2 Inoperable ESW Pump | 6 RWCU Break Inside Sec Containment |
| 3 Loss of 1A ESS Bus | 7 Loss of High Pressure Feed |
| 4 RWCU F001 Failure to Close | |

Prepared By:

Instructor

Date

Reviewed By:

Nuclear Operations Training Supervisor

Date

Approved By:

Supervising Manager/Shift Supervisor

Date

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SCENARIO SUMMARY

The scenario begins with the plant operating at 30% power. HPCI is out of service for governor repair work and the Mechanical Vacuum Pump is out of service for seal replacement. A quarterly surveillance test of the "A" ESW Loop is scheduled for this shift. Unit 2 start-up is in progress, ~1 hour from synchronizing to the grid.

The first event will be a control rod will drift in to position 38. The crew will insert the rod to position 00. Then a failure of the 1A ESW Pump when started for the "A" ESW Loop Flow Surveillance. The crew will address Technical Specifications and declare the pump inoperable as well as terminate the ESW Surveillance. A loss of ESS Bus 1A will occur as a result of breaker problems with the ESW Pump. The crew will respond to the loss of the bus per Off-Normal procedures and rack-out the failed ESW pump breaker; (the bus will not be recovered for the duration of the scenario). Other actions required by the crew will include restoring CRD and resetting the RPS half-scam.

Shortly after responding to the ESS Bus fault, an unisolable break will occur on the RWCU suction piping located in Secondary Containment. The break will cause one area of Secondary Containment to approach maximum safe temperature, requiring the crew to manually scram the reactor. Upon initiating the manual scram FWLC will fail, causing RPV water level to drop. When the Main Turbine trips, the Aux Buses will fail to transfer and cannot be manually transferred resulting in a loss of Condensate/Feedwater. Main Turbine BPVs will fail shut, requiring pressure control with SRVs. RCIC will trip when initiated either automatically or manually, and will be unavailable for the rest of the transient. The only high pressure sources remaining, SLC and CRD, will not be able to keep up with the rate of inventory loss from the RWCU system break and from actuating SRVs for pressure control. When RPV level can no longer be maintained above TAF, the crew will perform Rapid Depressurization and restore RPV level with low pressure systems. Automatic ADS actuation at RPV level of -129 inches (time delay) will be blocked to force the crew to manually perform rapid depressurization.

When the reactor has been rapidly depressurized, RPV level has been restored to +13" to 54" and actions are in progress to initiate Suppression Pool Cooling, the scenario will be terminated.

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SCENARIO OBJECTIVES

The **SRO** will:

1. Inform other shift members and plant management of changes in-plant status, potential plant problems or limitations.
2. Implement Loss of 4KV Bus (04.ON.011).
3. Implement Loss of CRD System Flow (55.ON.014).
4. Implement Scram (00.ON.018).
5. Implement RPV control (00.EO.026).
6. Implement Primary Containment Control (00.EO.027).
7. Implement Secondary Containment Control (00.EO.028).
8. Implement Rapid Depressurization (00.EO.030).
9. Ensure that required actions per Technical Specifications/Technical Requirements are met when a LCO/TRO is entered (00.TS.003).
10. Shutdown the reactor when it is determined reactor safety is in jeopardy, or when operating parameters exceed any RPS setpoint and scram does not occur.

The **ROs** will:

1. Perform LPCI injection through heat exchanger (49.OP.013).
2. Perform manual operation of Core Spray (51.OP.001).
3. Perform maximizing CRD System flow (55.OP.001).
4. Perform ESW system manual startup (54.OP.004).
5. Perform Loss of 4KV Bus (04.ON.011).
6. Perform Scram (00.ON.018).
7. Perform RPV Control (00.EO.026).
8. Perform Primary Containment Control (00.EO.027).
9. Perform Secondary Containment Control (00.EO.028).
10. Perform Rapid Depressurization (00.EO.030).

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CRITICAL TASKS

13 SECONDARY CONTAINMENT CONTROL

- ★ Manually scram the reactor before any RWCU area temperature reaches Max Safe Temperature.

Safety Significance

Steam leak in the Reactor Water Cleanup Room impacts the integrity of Secondary Containment. Failure of the Secondary Containment directly relates to the 10CFR100 design criteria of dose to the General Public.

Consequences for Failure to perform Task

Failure to take actions to mitigate the energy released to the secondary containment directly affects the radiation dose to the General Public.

SSES EOP Basis for:

SC/T-8 **BEFORE ANY RB AREA TEMP REACHES MAX SAFE**
GO TO RPV CONTROL

Areas monitored by steam leak detection (RWCU equipment, main steam line tunnel, HPCI and RCIC pipe routing, HPCI equipment, and RCIC equipment) are assigned a Max Safe temperature equal to the steam leak detection isolation setpoint. "The setpoints are designed to detect a leakage rate below the leak rate corresponding to critical crack size for the smallest high energy line in the room which is part of the respective system." (FSAR 5.2.5.1.3). Instrumentation and components required for isolation are qualified up to the isolation temperature setpoints.

(Reference: SSES-EPG SC/T-4.1)

BWROG EPGs/SAGs, Appendix B Basis

The purpose of this guideline is to:

- *Protect equipment in the secondary containment,*
- *Limit radioactivity release to the secondary containment, and either:*
- *Maintain secondary containment integrity, or*
- *Limit radioactivity release from the secondary containment.*

If temperatures in any one of the areas listed in Table SC-1 of the Secondary Containment Control guideline approach their maximum safe operating value, adequate core cooling, containment integrity, safety of personnel, or continued operability of equipment required to perform EPG actions can no longer be assured. The RPV Control Guideline must be entered to make certain the reactor is scrammed. Scramming the reactor reduces to decay heat levels the energy that the RPV may be discharging to the secondary containment. An explicit direction to scram the reactor is not provided in this step.

Indications/Cues for Event Requiring Critical Task

Simplex Fire Detection Alarms indicating High temperature in RWCU Area
Increasing area radiation and alarm for RWCU Area
Increasing Steam Leak Detection System temperatures and alarms

Performance Criteria

Manually Scram the Reactor prior to Exceeding Max Safe Temperature (prior to receiving RWCU area high temperature alarm RWCU LEAK DET ISO LOGIC B HI TEMP (AR-100-A03)

Performance Feedback

Initiating a reactor scram reduces the heat load that will be absorbed and released by the Secondary Containment
Rods inserted
Power lowering

11 RAPID DEPRESSURIZATION

- ★ Perform Rapid Depressurization when RPV level drops to -161".

Safety Significance

The steam leak in the Reactor Water Cleanup Room impacts the ability to provide continued adequate core cooling based on inventory loss is greater than the high pressure makeup capability.

Consequences for Failure to perform Task

Failure to take the EOP actions will result in uncovering the core and breach of the fuel clad due to over heating.

SSES EOP Basis for:

RC/L-16 WHEN LVL CANNOT BE RESTORED AND MAINTAINED > -161" GO TO RAPID DEPRESS

Rapid Depressurization is not initiated until RPV water level has dropped to -161" (TAF) because:

- Adequate core cooling exists so long as RPV water level remains above -161" (TAF).
- The time required for RPV water level to decrease to -161" (TAF) can best be used to line up and start pumps, attempting to reverse the decreasing RPV water level trend before Rapid Depressurization is required to assure continued adequate core cooling.

(Reference: SSES-EPG C1-4 and second override before C3-1)

BWROG EPGs/SAGs, Appendix B Basis

The first paragraph of Step C1-3 prescribes use of available injection systems and permits use of the alternate injection subsystems. If the decreasing RPV water level trend cannot be reversed by the time the level drops to the top of the active fuel, available alternate injection subsystems must be used. While the core is expected to remain adequately cooled as long as RPV water level remains above the Minimum Steam Cooling RPV Water Level, permitting the core to become partially uncovered when it can be prevented is undesirable unless specific benefits can be gained. If available injection sources have not been sufficient to reverse the decreasing RPV water level trend before level drops to the top of the active fuel, it is unlikely that they will be sufficient after level drops below the top of the active fuel. Delaying use of the alternate injection subsystems and permitting water level to drop below the top of the active fuel are therefore unwarranted. In addition, alternate injection subsystem pumps must be started to support evaluations of available makeup capacity required in subsequent steps.

Indications/Cues for Event Requiring Critical Task

Reactor water level slowly trending downward.

Performance Criteria

Perform a Rapid Depressurization per EO-100-112 when water level reaches the TAF -161" as read on the Fuel Zone Instrument.

Manually open all 6 ADS valves

Performance Feedback

Initiating a rapid depressurization causes Reactor pressure to lower to the shutoff head of the low pressure injection systems allowing water level to rise on the Fuel Zone and Wide Range level instruments.

Verify ADS valves are open using light red light indication, acoustic monitoring and lowering Reactor pressure and rising reactor water level.

★ Denotes Simulator Team Critical Task

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SCENARIO REFERENCES

1. SURVEILLANCE ACTIVITY- INOPERABLE ESW PUMP
SO-054-001 QUARTERLY ESW FLOW VERIFICATION LOOP A, REV. 2
AR-016-A10 ESW PUMP A, B, C, D TRIP, REV. 35
TS 3.7.2 EMERGENCY SERVICE WATER SYSTEM, AMENDMENT 178
NDAP-QA-702 ACTION REQUEST AND CONDITION REPORT PROCESS, REV. 12
OP-AD-002 STANDARDS FOR SHIFT OPERATIONS, REV. 9
2. LOSS OF ESS BUS 1A
ON-104-201 LOSS OF ESS BUS 1A, REV. 5
TS 3.8.7 DISTRIBUTION SYSTEMS OPERATING, AMENDMENT 178
TS 3.6.1.3 PCIVs, AMENDMENT 195
3. LOSS OF CRD/LOSS OF RPS/RWCU F001 FAILURE
ON-155-007 LOSS OF CRD SYSTEM FLOW, REV. 16
ON-158-001 LOSS OF RPS, REV. 6
4. ROD DRIFT
AR-104-H05 ROD DRIFT, REV. 17
ON-155-001 CONTROL ROD PROBLEMS, REV. 18
5. RWCU BREAK INSIDE SECONDARY CONTAINMENT
AR-101-A02 RWCU LEAK DET ISO LOGIC A HI TEMP, REV. 29
AR-101-A03 RWCU LEAK DET ISO LOGIC B HI TEMP, REV. 29
AR-101-B02 RWCU LEAK DET ISO LOGIC A HI LEAKAGE, REV. 29
AR-101-B02 RWCU LEAK DET ISO LOGIC B HI LEAKAGE, REV. 29
EO-100-104 SECONDARY CONTAINMENT CONTROL, REV. 1
ON-100-101 SCRAM, REV. 9
6. LOSS OF HIGH PRESSURE FEED
EO-100-102 RPV CONTROL, REV. 1
7. LOSS OF ADEQUATE CORE COOLING
EO-100-112 RAPID DEPRESSURIZATION, REV. 1
8. PRIMARY CONTAINMENT CONTROL
EO-100-103 PRIMARY CONTAINMENT CONTROL, REV. 2
OP-149-005 RHR SUPPRESSION POOL COOLING, REV. 20
9. OTHER BWROG SIMULATOR SCENARIO DEVELOPMENT GUIDELINE, TEMPLATES SC-1 AND RPV-1

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SCENARIO SPECIAL INSTRUCTIONS

1. Set-up the simulator for the scenario by performing the following:
 - a. Initialize the simulator to **IC-18** (100% Power, EOL).
 - b. Close and status control pink tag the HPCI F002 and F003 valves, place the HPCI controller in MAN set at 0%. Also, depressurize the steam supply header by opening the F054, steam trap bypass; then reclose the valve.
2. Take a snapshot to a saved IC at 30% Power
3. Initialize the simulator to IC-136
4. Type **restorepref YPP.PC017-103**; verify the following pre-inserts and Program Button assignments.
Verify the Environment Window:

MALFS	REMFS	OVRDS	TRIGS
12 :12	8	2:2	5

TRG E1 BAAA26409 EVENT TRIGGER: MODE SWITCH TO SHUTDOWN
TRG E1 = IMF FW145011 FWLC MASTER CTRLR FAILS LOW WHEN E1 TRUE
TRG E1 = IMF TC193001 MAIN TURBINE TRIP WHEN E1 TRUE
TRG E2 GAAA00214 EVENT TRIGGER: RCIC TURBINE SPEED >500 RPM
TRG E2 = IMF RC150011 RCIC TURBINE TRIP WHEN E2 TRUE
TRG E3 CAAA00706 EVENT TRIGGER: "A" ESW PUMP START SWITCH DEPRESSED
TRG E3 = IMF PM03:0P504A "A" ESW PUMP TRIP WHEN E3 TRUE
TRG E3 = IMF DS104001A (NONE 10 0) ESS 1A LOCKOUT WHEN E3 TRUE, 10 SEC. TD
TRG E4 RPE.MSSHDWN Event Trigger Mode Switch to shutdown
TRG E4 = MMF CU161007 100 2:00 RWCU leak increase to 100%
TRG E4 = MMF TR02:RIT13708 64.2 2:00 32.1 Area Radiation levels increase
bat HPCIOOS SIMULATES HPCI OOS
bat YPB.EVAL505A REMOVES MECHANICAL VACUUM PUMP FOR MAINTENANCE
IMF CN03:LICC32R600 0 FWLC MASTER CONTROLLER FAILURE IN MAN
IMF TC193025 ALL TURBINE BPVs FAIL CLOSED
IMF MV09:HV144F001 98 RWCU INLET IB ISO VALVE BINDING
IMF MV09:HV144F004 98 RWCU INLET OB ISO VALVE BINDING
IMF BR05:1A10104 TIE BUS TO 11A BKR FAILS AS-IS
IMF BR05:1A10204 TIE BUS TO 11B BKR FAILS AS-IS
IMF MV07:HV144F100 100 RWCU F100 VLV FAILED-OPEN
IMF MV07:HV144F106 100 RWCU F106 VLV FAILED-OPEN
IMF MV07:HV144F102 100 RWCU F102 VLV FAILED-OPEN
IMF AD183001 Inhibit ADS

Continued on next page:

SCENARIO SPECIAL INSTRUCTIONS (Cont.)

[P-1] MRF PC125001 OPEN IA - CIG 90# HEADER CROSS-TIE VLVS OPEN
[P-2] IMF RD1550043823 (NONE 0 20) 5 ROD 3823 DRIFT TO POS. 38
[P-3] MRF RM179024 A MSL RAD MON RESET
[P-4] MRF RM179026 C MSL RAD MON RESET
[P-5] MRF PM140P504A OUT A ESW PUMP BKR 1A20108 RACKED-OUT
[P-6] IMF CU161007 0.25 10:00 RWCU SUCTION PIPING BREAK OUTSIDE CTMT
[P-7] IMF TR02:RIT13708 32.1 10:00 1.997 RWCU PUMP ACCESS ARM INCREASES

5. Prepare a turnover sheet indicating:
 - a. HPCI is out of service for repairs to oil pump breaker and lube oil changeout. The system will not be returned to service this shift.
 - b. Mechanical Vacuum Pump is out of service for a seal replacement. The system will not be returned to service this shift.
 - c. Perform SO-054-A03, QUARTERLY ESW FLOW VERIFICATION LOOP A. Maintenance is standing by for vibration data. The prejob brief for Ops and Maintenance personnel has been completed.
 - d. Unit 2 is at 100%
6. Prepare an LCO Sheet: HPCI has been out of service for 24 hours to repair a governor control-oil leak.
7. Copy the procedure SO-054-A03, QUARTERLY ESW FLOW VERIFICATION LOOP A and prepare a surveillance coversheet.
8. Prepare Startup Rod sequence Rod coupling surveillance and GO marked up to appropriate portion of the startup.
9. Make a copy of shift assignments.
10. Place the Simulator in **RUN**.

SCENARIO EVENT FORM

Event No: 1, 2, 3, 4, 5

Brief Description: Surveillance Activity / Rod Drift In INOP ESW Pump / Loss of 1A ESS Bus / Loss of CRD
Loss of RPS / RWCU F001 Failure

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Commences SO-054-A03, QUARTERLY ESW FLOW VERIFICATION LOOP A.
PCOM		Reports rod drift alarm.
US		Directs performance of ON-155-001, CONTROL ROD PROBLEMS.
PCOM		Depress Display Rods Drifting button for Full Core Display.
		Determines rod 38-23 is drifting.
		Depress Display Scram Valves Open button for Full Core Display.
		Determines scram valves are not open.
		Selects rod 38-23 on RMCS rod select matrix.
		Reports rod 38-23 position.
		Inserts rod 38-23 to position 00.
US		Contacts Reactor Engineering.
PCOP		Continues SO-054-A03, QUARTERLY ESW FLOW VERIFICATION LOOP A.
		Starts "A" ESW pump, responds to AR-016-A10 ESW PUMPS A,B,C,D TRIP annunciator.
		Directs NPO to investigate "A" ESW Pump and breaker.
US		Directs termination of SO-054-A03.
		Contacts Work Week Manager about "A" ESW Pump trip.
		Checks Technical Specifications, declares 7 day LCO IAW T.S. 3.7.2 C-1 for loss of "A" ESW pump.
PCOP		Recognizes/reports loss of 1A ESS Bus.
PCOM		Reports half-scram, , Due to 1A ESS bus loss and resulting loss of RPS
		Loss of 'A' CRD pump due to 1A bus loss
		Failure of RWCU F001 valve to fully close (binding) during loss of RPS. .

US		Directs performance of <u>ON-104-201</u> , LOSS OF ESS BUS 1A. Key Points: Restore Containment Instrument Gas Restore RPS Restore CRD
		Directs performance of <u>ON-158-001</u> , LOSS OF RPS. Key Points: Transfer to alternate Restore Recirc pump cooling Reset MSIV Rad monitors, reset half scram.
		Directs performance of <u>ON-155-007</u> , LOSS OF CRD SYSTEM FLOW. Key Points: Start 'B' CRD pump.
		Refers to T.S. 3.8.7 A-1, declares 8-hour LCO for loss of ESS Bus 1A. May also refer to T.S. 3.6.1.3 for containment isolation valve (F001) failure.
NOTE		Allow candidate sufficient time to address the Tech Specs before proceeding to the next event

★ Denotes Critical Task

NOTES:	

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
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Event No: 1, 2, 3, 4, 5
Brief Description: Surveillance Activity / Rod Drift In/INOP ESW Pump / Loss of 1A ESS Bus / Loss of CRD
Loss of RPS / RWCU F001 Failure

INSTRUCTOR ACTIVITY:

1. As soon as ESW surveillance has begun and BEFORE crew starts "A" ESW pump insert control rod 38-23 drift in, **Depress P-2:**

[P-2] IMF RD1550043823 (NONE 0 20) 5 ROD 38-23 DRIFT IN TO POS 38

When the crew starts "A" ESW pump for SO-054-A03, verify the Event Triggers activate to cause:

2. An instantaneous overcurrent trip of "A" ESW pump, **AND 10 sec. later**
3. A lockout-trip of 1A ESS Bus.

ROLE PLAY:

1. If contacted as NPO to investigate accumulator 38-23 report after appropriate time delay that there is nothing obvious at the HCU.
2. As Reactor Engineer acknowledge rod 38-23 drift and insertion, reply that you will run a Core Monitor look at the control rod pattern and come to the control room in a few moments.
3. If spray pond level is requested, report level as 678' 6".
4. When directed as ASO to investigate "A" ESW Pump, wait ~1 min. and report that the pump is not running; it otherwise appears to be normal.
5. When directed as NPO to investigate "A" ESW Pump breaker 1A20108, wait ~2 mins. and report that the breaker has a 50/51 device flag (instantaneous overcurrent). You also smell an burnt odor in the vicinity of the breaker.
6. As NPO dispatched to investigate 1A ESS Bus, report that both the Primary and Backup Lockout Relays (86A-201 and 86A1-201), are tripped. If asked to reset the lockouts, report that they will not reset.

As FIN Team dispatched to investigate "A" ESW Pump and 1A ESS Bus, wait ~3 mins. and report that breaker 1A20108 for the "A" ESW Pump has failed, which was the cause for the ESS Bus 1A Lockout trip. The ESS Bus will require extensive investigation and testing prior to attempting re-energization. Also, request ESW PUMP 1A 4.16kv breaker racked out.

SCENARIO EVENT FORM

Event No: 1, 2, 3, 4, 5

Brief Description: Surveillance Activity / INOP ESW Pump / Loss of 1A ESS Bus / Loss of CRD
Loss of RPS / RWCU F001 Failure / Rod Drift In

POSITION	TIME	STUDENT ACTIVITIES
US		Directs cross-tying Instrument Air and the CIG 90# Header.
		Evaluator Note: STAs would normally be available to support the monitoring functions for the ESW pumps
PCOP		Dispatches NPO to cross-tie IA and the CIG 90# Header.
		Starts 2 ESW Pumps to support auto start of A Diesel Generator.
		Starts "B" CRD pump, restores CRD system IAW ON-155-007, LOSS OF CRD SYSTEM FLOW.
PCOM		Transfers RPS "A" to ALT IAW ON-158-001.
		Directs resetting Main Steam Line Rad monitors
		Resets half scram when Main Steam Line Monitors reset.

★ Denotes Critical Task

NOTES:	

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
--

Event No: 1, 2, 3, 4, 5

Brief Description: Surveillance Activity / INOP ESW Pump / Loss of 1A ESS Bus / Loss of CRD
Loss of RPS / RWCU F001Failure /

INSTRUCTOR ACTIVITY:

1. When directed to cross-tie IA and the CIG 90# header, wait ~2 mins. and **Depress P-1:**

[P-1] MRF PC125001 OPEN

IA - CIG 90# HEADER CROSS-TIE VLVS OPEN

ROLE PLAY:

As NPO directed to cross-tie IA and CIG, report valves 126167 and 126172 are open and the headers have been cross-tied.

3. When directed to reset MSL rad monitors, wait ~ 2 mins. and **Depress P-3 and P-4:**

[P-3] MRF RM179024 RESET A MSL RAD MON RESET

[P-4] MRF RM179026 RESET C MSL RAD MON RESET

ROLE PLAY:

As NPO directed to reset MSL rad monitor A & C, call on the plant page and report MSL rad monitors A & C are reset.

NOTE:

1. If directed to reset other Area and Process Rad Monitors, **type: RFI RM** and reset Rad Monitors as directed.
2. Recovery of RPS Bus 'A' should be allowed to continue until cooling is restored to both RRP's.

SCENARIO EVENT FORM

Event No: 1, 2, 3, 4, 5

Brief Description: Surveillance Activity / INOP ESW Pump / Loss of 1A ESS Bus / Loss of CRD
Loss of RPS / RWCU F001 Failure / Rod Drift In

[illegible]

★ Denotes Critical Task

NOTES:	

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
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Event No: 1, 2, 3, 4, 5

Brief Description: Surveillance Activity / INOP ESW Pump / Loss of 1A ESS Bus / Loss of CRD
Loss of RPS / RWCU F001 Failure / Rod Drift In

INSTRUCTOR ACTIVITY:

When directed to rack-out breaker 1A20108, wait ~2 mins. and **Depress P-5:**

[P-5] MRF PM140P504A OUT A ESW PUMP BKR 1A20108 RACKED-OUT

ROLE PLAY:

1. As NPO directed to rack-out breaker 1A20108, report that the breaker is racked-out.

SCENARIO EVENT FORM

Event No: 6
Brief Description: RWCU Break Inside Sec Containment

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Recognizes/reports indications of RWCU system leak. Fire Detection Alarm Area Radiation Alarm RWCU area temperatures increasing. Dispatch operator to investigate
		Evacuates area and notifies Health Physics.
US		Enters EO-100-104, SECONDARY CONTAINMENT CONTROL.
		Directs starting of ESW, and all Room Coolers.
		Directs commencing reactor shutdown due to area temps. increasing and approaching max normal.
★US		<i>Enters EO-100-102 RPV CONTROL and directs manual scram before any RWCU temperature reaches max safe.(Prior to receiving RWCU LEAK DET ISO LOGIC B HI TEMP - AR-100-A03 alarm)</i>
★PCOM		<i>Manually scrams reactor before any RWCU temperature reaches max safe. Verifies Rods inserted and Power lowering</i>
	NOTE	Crew may have time to perform scram imminent actions, however this will not prevent reaching max safe temperature and the need to scram the reactor.
PCOP		Attempts to transfer house loads to Aux Buses; reports failure of Tie Bus to 11A and 11B breakers.
PCOM	NOTE 1	When RWCU receives isolation signal due to high temperature, PCOM reports RWCU has failed to isolate; reports loss of indication on RWCU F004 valve.

★ Denotes Critical Task

NOTES:	NOTE 1: This event is classified as a SITE AREA EMERGENCY based on RWCU leak
IAW EP-PS-100-6, EAL 18.3.	

**INSTRUCTOR ACTIVITIES, ROLE PLAY,
AND INSTRUCTOR'S PERSONAL NOTES**

Event No: 6
Brief Description: RWCU Break Inside Sec Containment

INSTRUCTOR ACTIVITY:

1. ~1 min. after reporting breaker 1A201108 has been racked out, insert an unisolable RWCU leak, **Depress P-6 and P-7:**

[P-6] IMF CU161007 .25- 10:00 RWCU SUCTION PIPING BREAK OUTSIDE CTMT

[P-7] IMF TR02:RIT13708 32.1 10:00 1.997 RAMP UP RWCU PUMP AREA RADS

2. When Mode Switch is placed in SHUTDOWN, verify event triggers activate to cause the following:
 - FWLC Master Controller output fails low, resulting in RPV level shrinking to ~-40 to -50".
 - The Main Turbine trips, causing the Aux Buses to subsequently de-energize.

ROLE PLAY:

1. As NPO directed to investigate RWCU F001, wait ~2 mins. and report that breaker 1B236053 is tripped-open. If asked to reset/reclose the breaker, report that it immediately tripped-open again.
2. As NPO directed to investigate RWCU F004, wait ~2 mins. and report that breaker 1D274042 is tripped-open. If asked to reset/reclose the breaker, report that it immediately tripped-open again.
3. As FIN Team dispatched to investigate the RWCU F001/F004 problems, wait ~3 mins. and report that the breakers functioned properly; the problem may be with the associated valve's motor-operator.
- 4.

SCENARIO EVENT FORM

Event No: 7

Brief Description: Loss of High Pressure Feed / Loss of Adequate Core Cooling

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports failure of FWLC Master Controller output.
		Reports loss of Feedwater/Condensate Pumps when Turbine trips.
US		Directs RPV water level restored to +13" to +54" with RCIC.
		Contacts Work Week Manager concerning Aux Buses failing to transfer.
PCOP		Reports RCIC tripped when started.
		Dispatches NPO to investigate RCIC trip.
US		Directs RPV level maintained +13" to -161" with CRD/SLC.
		Contacts Work Week Manager concerning RCIC.
PCOP		Maximizes CRD and initiates SLC if directed.
US		Directs RHR and CS systems started and lined-up for injection.
PCOM/P		Initiates both loops of CS and RHR.
	NOTE	With Automatic ADS actuation blocked, it is possible for the crew to recognize this failure and commence the Rapid depressurization based on this automatic actuation failure. This will also accomplish the critical task
PCOM/P		Informs US that RPV level has reached -161".

★ Denotes Critical Task

NOTES:	

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
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Event No: 7

Brief Description: Loss of High Pressure Feed / Loss of Adequate Core Cooling

INSTRUCTOR ACTIVITY:

None.

ROLE PLAY:

1. As FIN Team dispatched to investigate the Aux Buses, wait ~3 mins. and report that the Transfer logic has failed. It will take time to troubleshoot the exact cause for the failure. You will call back when you have a better idea of repair strategy and time estimates.
2. As NPO directed to investigate the RCIC trip, wait ~2 mins. and report that the RCIC overspeed trip mechanism is tripped and the linkage is bent. You cannot reset the overspeed trip.

SCENARIO EVENT FORM

Event No: 7
Brief Description: Loss of High Pressure Feed / Loss of Adequate Core Cooling

POSITION	TIME	STUDENT ACTIVITIES
★US		<i>Performs Rapid Depressurization when RPV level drops to -161".</i>
		<i>Enters EO-100-112, RAPID DEPRESSURIZATION.</i>
		<i>Verifies Suppression Pool level >5'.</i>
		<i>Directs Rapid Depressurization by opening 6 ADS valves.</i>
★PCOM/P		<i>Initiates Rapid Depressurization by opening 6 ADS valves.</i>
		<i>Verify ADS valves are open using red light indication, acoustic monitoring and lowering Reactor pressure and rising reactor water level.</i>
US		Directs restoring RPV level to +13" to +54" with RHR and CS.
PCOM/P		Restores RPV level to +13" to +54" with RHR and CS.
US		Enters EO-100-103 due to high Suppression Pool temperature.
		Directs maximizing Suppression Pool Cooling.
PCOM/P		Places both loops of RHR in Suppression Pool Cooling IAW OP-149-005, RHR SUPPRESSION POOL COOLING.
		TERMINATION CUE: Rapid Depressurization has been completed, RPV level has been restored to +13" to +54", and actions are in progress to initiate Suppression Pool Cooling.
		EVALUATOR CUE
		Have the SRO perform the E-Plan classification Admin JPM here.

★ Denotes Critical Task

NOTES:	

INSTRUCTOR ACTIVITIES, ROLE PLAY, AND INSTRUCTOR'S PERSONAL NOTES
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Event No: 7

Brief Description: Loss of High Pressure Feed / Loss of Adequate Core Cooling

INSTRUCTOR ACTIVITY:

None.

ROLE PLAY:

As necessary.

TERMINATION CUE:

Rapid Depressurization has been completed, RPV level has been restored to +13" to +54", and actions are in progress to initiate Suppression Pool Cooling.