PPL SUSQUEHANNA LLC
LEARNING CENTER

SIMULATOR SCENARIO

Scenario Title:	**ILO CERTIFICATION / NRC EXAM SCENARIO**
Scenario Duration:	**90 Minutes**
Scenario Number:	**ILO-604**
Revision/Date:	**2, 11/29/2007**
Course:	**PC007/PC008, Initial License RO/SRO Certification Examination** **PC017/PC018, Initial License RO/SRO NRC Examination**

Operational Activities:

1 Loss of 1D274/HPCI system
2 Swap In-service CRD Pumps
3 100 MWe Power Decrease (33)
4 Trip of RFPT A
5 Loss of CRD/Inoperable Accumulators
6 Failure to Scram/ATWS (3)
7 SLC System Failure
8 Main Turbine Trip/Loss of Aux Buses
9 RCIC Speed Control Failure
10 Rapid Depressurization

Prepared By:	_____ Instructor	_____ Date
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SCENARIO SUMMARY

The scenario begins with both Units at 100% power, EOL. A minimum generation alert has been issued for the PJM network.

Shortly after the crew assumes the shift, a loss of 250 VDC Load Center 1D274 occurs. Investigation reveals that the breaker for the HPCI Aux Oil Pump has failed and caused the Load Center transient. The crew will remove HPCI from service and restore DC loads by removing the failed breaker from the cubicle and restoring the Load Center. The crew will also address Technical Specifications.

GCC will call for a 100 MWe load decrease on Unit 1 due to a Minimum Generation Emergency. The crew will follow Reactor Engineering instructions in the CRC Book to conduct the power decrease.

Following the power decrease '1A' RFP will trip. Level will lower to 30 inches but the 1B RRP runback logic will fail to actuate. The crew will implement Off-Normal procedures to stabilize the plant. The Unit Supervisor will address the runback failure and loop flow mismatch in Tech Specs. The crew will lower the 1B RRP speed manually with the M/A and contact Maintenance for assistance with the runback logic.

A loss of CRD occurs when the '1B' CRD pump trips on overcurrent. The PCO will start the '1B' CRD in accordance with ON-155-007. A few minutes later, a clogged suction filter results in a complete loss of CRD. The Crew continues to address the loss of CRD and CRD accumulator trouble alarms on withdrawn control rods will result in inoperable conditions requiring the crew to manually scram the Reactor.

When the Reactor is scrammed, control rods will fail to insert due to a failure of RPS. Division I ARI will fail, preventing ARI actuation. When the crew injects SLC, the "1A" SLC pump will start, but will trip on overcurrent. The "1B" SLC pump-shaft will shear, eventually resulting in no SLC injection. RPV water level will be lowered to control power and alternate methods of control rod insertion will be attempted.

When level is controlled with feedwater, the Main Turbine will trip along with a loss of Aux Buses 11A and 11B and a subsequent loss of high pressure injection sources. When started, RCIC controller will fail and must be operated in manual. The RCIC controller fails completely and with the unavailability of HPCI, RPV water level lowers to TAF, requiring a Rapid Depressurization.

After Rapid Depressurization and subsequent RPV level restoration to >TAF, level will be restored and maintained with LPCI between -60" and -161". RPS fuses will be pulled and control rods will be fully inserted.

The scenario will be terminated when all control rods are fully inserted and actions are in progress to restore RPV water level to +13" to +54".

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SCENARIO OBJECTIVES

The objective of this scenario is to evaluate the licensed operator candidate's ability to respond to the scenario events. These events will require each candidate to demonstrate the following:

- Knowledge of integrated plant operations
- Ability to diagnose abnormal plant conditions
- Ability to work together as a team
- Ability to mitigate plant transients that exercise their knowledge and use of ONs and EOPs
- Ability to utilize Technical Specifications (SRO Only)

To meet this objective, the licensed operator candidates must demonstrate proficiency in the following competencies:

Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings
2. Comply with and use procedures, references, and Technical Specifications
3. Operate the control boards
4. Communicate and interact with other crew members

Senior Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings
2. Comply with and use procedures and references
3. Operate the control boards (N/A to upgrade candidates)
4. Communicate and interact with the crew and other personnel
5. Direct shift operations
6. Comply with and use Technical Specifications

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CRITICAL TASKS

★ **Recognize failure to scram and inhibit ADS**

Safety Significance

Inhibiting ADS prevents uncontrolled injection of large amounts of relatively cold, unborated low pressure ECCS water when the reactor is not shutdown with control rods.

Consequences for Failure to Perform Task

Failure to inhibit ADS can result in large amounts of positive reactivity addition due to boron dilution and cold water injection.

SSES EOP Basis for:

LQ/Q-3 IF INITIAL ATWS PWR > 5%
OR CANNOT BE DETERMINED

INJECT SLC
AND
INHIBIT ADS

When scram and ARI have failed, reactor power must be considered to determine if immediate boron injection is required. If initial ATWS power was greater than 5%, then a relatively large number of control rods have failed to insert. The seriousness of this condition requires immediate injection of boron to positively terminate the ATWS event.

ADS initiation may result in the injection of large amounts of relatively cold, unborated water from low-pressure injection systems. With the reactor either critical or shutdown on boron, the positive reactivity addition due to boron dilution and temperature reduction through the injection of cold water may result in a reactor power excursion large enough to cause substantial core damage. Preventing ADS is therefore appropriate whenever boron injection is required.

Indications/Cues for Event Requiring Critical Task

ATWS with initial reactor power level greater than 5% APRM power.

Performance Criteria

Inhibit ADS by placing 1C601 keylock switches to INHIBIT.

Performance Feedback

Successful ADS inhibiting is indicated by Green Indicating Light at switch illuminating.

CRITICAL TASKS

★ **Insert control rods IAW EO-000-113, Sheet 2, Control Rod Insertion**

Safety Significance

Control rod insertion initiates immediate power reduction.

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

Exceeding a RPS scram setting with NO reactor scram signal, or RPS/ARI fail to fully insert all control rods.

Performance Criteria

Insert Control Rods by one or more of the following methods:

Maximize CRD to drift control rods
Drive control rods after bypassing RWM and RSCS
Reset and Scram again by performing ES-158-002, Bypass RPS Logic Trips
De-energizing RPS solenoids by performing ES-158-001
Local venting of scram air header

Performance Feedback

Successful insertion of control rods will be indicated by:

Rod position full-in indication for manual insertion of control rods, venting scram air header or de-energizing RPS solenoids
Rod position full-in after resetting scram, draining scram discharge volume and re-scram

★ **Lower RPV level to < –60 inches but > –161 inches**

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.

CRITICAL TASKS

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. These density-wave instabilities will most likely develop in the non-isolation ATWS where the feedwater system is still available for makeup to the RPV. In this event, the feedwater system maintains normal water level, but feedwater heating is lost due to tripping of the turbine. Without preheating of the feedwater, high levels of core-inlet subcooling develop which can drive the reactor into a highly unstable mode of operation. General Electric calculations indicate that power oscillations become large enough to cause melting of fuel in high-power bundles.

SSES EOP Basis for:

LQ/L-13 MAINTAIN LVL BETWEEN **-60"** AND **-161"**
USING TABLE 15 SYSTEMS
BYPASSING INTERLOCKS AS NECESSARY IAW ANY:

The purpose of this step is to uncover the feedwater spargers sufficiently to reduce core inlet subcooling.

In the non-isolation ATWS event, 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. Once level drops below the sparger nozzles, which are located at -24", the feedwater is sprayed into a region occupied by saturated steam. Steam will then condense on the injected feedwater, and the coolant will be heated as it falls to the liquid surface within the downcomer. Heating of the feedwater by steam condensation limits the buildup of core inlet subcooling and can prevent the onset of severe power/flow instabilities.

This step identifies the widest acceptable water level control band. Although level fluctuations within this band are safe, it is very desirable to maintain level within the more restrictive target area of -110" to -60". The target area and expanded band are shown in Figure 8, Water Level Operation Guidance. The intent of this step is to remain within the target band at all times unless prohibited by system perturbations, and remain within the expanded band at all times.

Operation outside the target area has the following disadvantages:

The basis for an upper level of -60" is given above.

A lower level of -110" is specified for the following reasons:

1. Provides a margin for core coverage.

CRITICAL TASKS

2. *Avoids operation near TAF where core power is more responsive to RPV pressure fluctuations.*

3. *Makes level control easier by maintaining level above the narrow region of the downcomer.*

   Below -110" the downcomer free area reduces from 300 ft^2 to 88 ft^2 resulting in increased magnitude of indicated level oscillations.

4. *Maintains sufficient core flow to carry liquid boron from lower plenum upward into the core.*

   As level is decreased below -110", boron mixing efficiency is reduced because the natural circulation flow rate through the jet pumps is reduced and is not as efficient at carrying the injected boron from the lower plenum upward into the core.

   At very low downcomer water levels near or below top of active fuel, there is little water available in the region above the jet pump throat for mixing with boron injected via RCIC. In this situation, there is concern that boron may accumulate in the stagnant region of the downcomer which is below the jet pump throat.

5. *Water level can be determined from wide range level instrumentation.*

6. *Avoids MSIV isolation setpoint of -129".*

RPV level below TAF is <u>not</u>, by itself, a determination of whether or not level can be maintained > -161". The determination that level cannot be maintained > -161" must be made based upon:

- *availability of high pressure injection systems, <u>and</u>,*
- *present level trend*

This decision must not be made prematurely since depressurization of a critical core results in destabilizing affects and has a potential to cause core damage.

Controlling reactor pressure, power and level with condensate and SRVs at 500 psig is difficult because all 3 parameters affect each other. Therefore, rapid depressurization is recommended when high pressure injection cannot be obtained.

The initial influence of reactor depressurization is stabilizing since the additional flashing of liquid phase required for depressurization introduces excess voids in the reactor core which can essentially terminate the fission process if the rate of depressurization is high enough. Once the depressurization is complete, however, the result is the immediate initiation of power excursions. Core damage is expected to occur from high clad stresses induced by: temperature excursions above the rewet temperature, PCI, cyclic fatigue, burnout or having the fuel enthalpy exceed the cladding failure threshold.

CRITICAL TASKS

Indications/Cues for Event Requiring Critical Task

ATWS with initial reactor power level greater than 5% APRM power.

Performance Criteria

Lower reactor water level by manually controlling injection rate from Feedwater, HPCI, and/or RCIC.

Preventing injection such as RCIC and HPCI as level drops below -30" and -38" respectively may be required when Feedwater is available.

The preferred systems for use in controlling RPV water level are those Table 15 Systems which inject into the feedwater sparger or outside the core shroud. These are used because cold water is preheated by steam and the flow path outside the core shroud mixes the relatively cold injected water with the warmer water in the lower plenum prior to reaching the core. Injection from SLC and CRD are always permitted during ATWS events. The operator throttles existing injection except CRD and SLC and prevents unwanted injection as necessary to decrease level.

Performance Feedback

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

★ **Perform Rapid Depressurization when RPV level drops to –161 inches**

Safety Significance

RPV leakage or loss of injection systems impacts the ability to provide continued adequate core cooling through core submergence based on inventory loss.

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:

The following steps provide the operating crew guidance to line up injection systems as available to maintain level >-129". If these actions are unsuccessful, the crew receives additional direction when it is determined that level can not be maintained above TAF.

CRITICAL TASKS

RC/L- 4 RESTORE AND MAINTAIN LVL BETWEEN **+13"** AND **+54"** USING TABLE **3** SYSTEMS

RC/L-5 **IF** LVL CANNOT BE RESTORED AND MAINTAINED **> +13"** MAINTAIN LVL **> -129"** USING TABLE **3** SYSTEMS AUGMENTING AS DESIRED WITH TABLE **5** ALTERNATE SUBSYSTEMS

RC/L-10 IRRESPECTIVE OF VORTEX LIMITS WITH TABLE **3** SYSTEMS PERFORM ALL
1 LINE UP FOR INJECTION
2 START PUMPS
3 INCREASE INJECTION TO MAX

RC/L-11 **IF** LESS THAN 2 TABLE **4** SUBSYSTEMS CAN BE LINED UP COMMENCE LINING UP AS MANY AS POSSIBLE TABLE **5** ALTERNATE SUBSYSTEMS

RC/L-13 WITH TABLE **5** ALTERNATE SUBSYSTEMS PERFORM ALL:
1 LINE UP FOR INJECTION
2 START PUMPS
3 INCREASE INJECTION TO MAX

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)

Indications/Cues for Event Requiring Critical Task

Reactor water level trending downward, eventually indicating less than the top of active fuel height on the Fuel Zone Level Indicator.

CRITICAL TASKS

Performance Criteria

Perform a Rapid Depressurization per EO-000-112 when water level reaches the TAF –161" as read on the Fuel Zone Instrument: Initiate ADS / 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.

★ **Slowly increase injection to restore and maintain RPV level to < –60 inches but > –161 inches**

Safety Significance

Re-establishing injection into the RPV is required in order to adequately cool the core and to make up the mass of steam being rejected through open SRVs. Since the reactor may become critical during this evolution, injection into the RPV is increased slowly to preclude the possibility of large power excursions caused by rapid injection of cold unborated water.

Consequences for Failure to Perform Task

Failure to restore RPV level will result in uncovering the core and breach of the fuel clad due to over heating. Failure to slowly increase injection may result in large power excursions caused by rapid injection of cold unborated water.

SSES EOP Basis for:

WHEN RAPID DEPRESS HAS BEEN INITIATED

COMMENCE AND IRRESPECTIVE
OF VORTEX LIMITS
SLOWLY INCREASE INJECTION
TO RESTORE AND MAINTAIN
LVL BETWEEN **-60"** AND **-161"**

USING TABLE **15** SYSTEMS

CRITICAL TASKS

The intent of this step is to re-establish injection in a controlled manner after rapid depressurization has been initiated.

"Initiated" is defined as ADS valves have been opened, either automatically or manually. It is not intended that the depressurization process be completed; only initiated. As long as any number of ADS valves have been opened in response to an automatic signal or manual action, this condition is met and injection may be slowly re-established.

Steps LQ/L-6, LQ/L-12 and LQ/L-13 permit use of these same Table 15 systems. Refer to RC/L-6 for a complete explanation of the systems and cautions applicable to their use. Here, however, an explicit direction is given to commence injection "irrespective of vortex limits," since restoration of adequate core cooling takes precedence over adherence to normal operating limits. The undesirable consequences of uncovering the reactor core outweigh the risk of equipment damage which could result if vortex limits are exceeded. Immediate and catastrophic pump failure is not expected to occur should operation beyond these limits be required.

A specific order governing the priority over use of these systems cannot be predetermined as it will depend greatly on plant conditions. Consider the following factors to determine order:

- Injection through FW spargers (preferred)
- System availability
- Time and manpower required to operate system
- System throttling capability/control
- Water quality

Re-establishing injection into the RPV is required in order to adequately cool the core and to make up the mass of steam being rejected through open SRVs. Since the reactor may become critical during this evolution, injection into the RPV is increased slowly to preclude the possibility of large power excursions caused by rapid injection of cold unborated water.

The level control band of -60" to -161" is the widest, acceptable water level control band. Although level fluctuations within this band are safe, it is very desirable to maintain level within the more restrictive target area of -110" to -60". The target area and expanded band are shown in Figure 8, Water Level Operation Guidance. Operation outside of the target area has numerous disadvantages which are described in LQ/L-13. The intent of this step is to restore and maintain level within the target band at all times unless prohibited by system perturbations or inadequate vessel injection, and remain within the expanded band at all times.

CRITICAL TASKS

CAUTION

12 PROLONGED OPERATION IN YELLOW AREA OF FIG 8 MAY RESULT IN ADDITIONAL CONTAINMENT LOADING AND PWR INSTABILITIES.

This caution is added to alert the operator of the undesirable affects of operating outside the target band of -110" to -60". Operation outside the target band can result in increased power level, increased containment loading, and the potential for power oscillations.

(Reference: SSES-EPG C5-5.2)

Indications/Cues for Event Requiring Critical Task

The intent of this step is to re-establish injection in a controlled manner after rapid depressurization has been initiated. "Initiated" is defined as ADS valves have been opened, either automatically or manually. It is not intended that the depressurization process be completed; only initiated. As long as any number of ADS valves have been opened in response to an automatic signal or manual action, this condition is met and injection may be slowly re-established.

Performance Criteria

Since the reactor may become critical during this evolution, injection into the RPV is increased slowly to preclude the possibility of large power excursions caused by rapid injection of cold unborated water.

Specific criteria to be determined...

Performance Feedback

Injection flow to the RPV is determined using the available instrumentation (i.e., pressure, flow) for the respective injection system(s).

Observation of neutron monitoring system indications (i.e., IRMs, APRMs, and reactor period) will provide indication of the presence and severity of any power excursions.

Specific criteria to be determined...

★ Denotes Simulator Critical Task.

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SCENARIO REFERENCES

1. TECHNICAL SPECIFICATION EXERCISE (HPCI AOP FAILURE)
   - AR-106-B11 250V DC PANEL 1L660 SYSTEM TROUBLE
   - ON-188-001 LOSS OF 250 VDC BUS
   - T.S. 3.5.1 ECCS
   - T.S. 3.8.7 DISTRIBUTION SYSTEMS – OPERATING

2. 100 MWe POWER DECREASE
   CORE REACTIVITY CONTROL BOOK
   - OP-AD-338 COMMUNICATION REQUIREMENTS FOR REACTIVITY MANIPULATIONS
   - OI-AD-029 EMERGENCY LOAD CONTROL
   - GO-100-012 POWER MANEUVERS

3. TRIP OF RFPT 'A'
   - AR-101-A10 RFPT A TRIP
   - AR-101-F11 RFP A BRG OIL LO PRESS
   - ON-145-001 RPV LEVEL CONTROL SYSTEM MALFUNCTION
   - AR-102-C01/4 RECIRC A/B FLOW LIMIT RUNBACK
   - ON-164-002 LOSS OF RECIRCULATION FLOW

4. LOSS OF CRD / INOPERABLE ACCUMULATORS
   - AR-107-D02 CRD PUMP 'B' TRIP
   - AR-107-D01 CRD PUMP 'A' TRIP
   - ON-155-007 LOSS OF CRD SYSTEM FLOW
   - ON-100-101 SCRAM, SCRAM IMMINENT
   - TS 3.1.5 CONTROL ROD ACCUMULATORS

5. ATWS / SLC SYSTEM FAILURE / MAIN TURBINE TRIP / LOSS OF AUX BUSES
   - EO-000-102 RPV CONTROL
   - EO-000-113 LEVEL POWER CONTROL/CONTROL ROD INSERTION
   - OP-184-001 MAIN STEAM SYSTEM
   - ES-158-001 DE-ENERGIZING SCRAM PILOT SOLENOIDS
   - ES-150-002 BORON INJECTION VIA RCIC

6. RAPID DEPRESSURIZATION
   - EO-000-112 RAPID DEPRESSURIZATION
   - EO-000-103 PRIMARY CONTAINMENT CONTROL
   - OP-149-004 RHR CONTAINMENT COOLING

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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-120**, Unit 1 at 100% power EOL. Unit 2 is in Mode 5 Refueling.

2. Load SCN file **SCN_ILO-604**; verify the following pre-inserts and Key assignments.

MF	RF	OR	SCN	ET	Conditions
6:6	0:0	0:0	0	1:0	16

IMF cmfRL01_50BF190B01
IMF mfTC193025
IMF cmfBR05_1A10104
IMF cmfBR05_1A10204
aet ETILO604A
IMF cmfRL02_K21B
IMF cmfPM05_1P208B
{Key[1]} IRF rfDC188061 f:OPEN
{Key[2]} IRF rfDC188128 f:OPEN
{Key[3]} IRF rfDC188061 f:CLOSE
{Key[4]} IRF rfRD155014 f:0
{Key[5]} IRF rfRD155014 r:60 f:100
{Key[6]} IMF mfFW145009A
{Key[7]} SCN YPB_ILO-604A
{Key[8]} IMF mfTC193001
{Key[9]} IMF cmfCN02_FCE511R600 f:0
{Key[10]} MRF RD155055 OPEN
{Key[11]} SCN YPB_ILO-604C
{Key[12]} SCN YPB_ILO-604D
{Key[19]} IMF cmfCN03_FCE511R600 f:0
{Key[23]} SCN BATCH1\FWB_101ALARM
{Key[24]} SCN BATCH1\FWB_102ALARM
{Key[25]} SCN BATCH1\FWB_103ALARM

3. Verify LEFM is selected as the Feedwater flow input to PICSY IAW OI-TA-021.

SCENARIO SPECIAL INSTRUCTIONS

4. Prepare a turnover sheet indicating:

   a. Unit 1 is at 100% power EOL.
   b. Perform a swap of CRD pumps to allow maintenance to record vibration data on '1B' CRD pump.
   c. A Minimum Generation Alert has been issued for the PJM network.
   d. Chemistry/Rx Engineering investigating Off Gas System spike observed during last Control Rod Exercising Surveillance.
   e. Unit 2 is in MODE 5, Refueling in process.

5. Place simulator in RUN.

SCENARIO EVENT DESCRIPTION FORM

Initial Conditions: Initialize the Simulator to IC 120. Place the Simulator to RUN. Ensure the Keys are assigned as indicated on the Special Instructions sheet via the appropriate SCN File. Assign Shift positions; direct the start of the 5-minute panel walkdown.

EVENT	TIME	DESCRIPTION
1		TRIP OF 1D274 / LOSS OF HPCI AUX OIL PUMP
2		100 MWe POWER DECREASE
3		TRIP OF RFPT 'A' AND REACTOR RECIRCULATION RUNBACK
4		LOSS OF CRD / INOPERABLE ACCUMULATORS AND SCRAM
5		FAILURE TO SCRAM / ATWS
6		SLC SYSTEM FAILURE
7		MAIN TURBINE TRIP / LOSS OF AUX BUSES / LOSS OF HP FEED
8		RCIC SPEED CONTROL FAILURE
9		RAPID DEPRESSURIZATION AND LEVEL RESTORATION DURING ATWS

SCENARIO EVENT FORM

Event No: 1
Brief Description: TRIP OF 1D274 / LOSS OF HPCI AUX OIL PUMP.

POSITION	TIME	STUDENT ACTIVITIES
PCOM/P		Recognizes/reports AR-106-B11, 250V DC PANEL 1L660 SYSTEM TROUBLE and AR-114-B05, HPCI OUT OF SERVICE annunciators.
		Dispatches NPO to check 1L660 reflash panel and Load Center 1D274.
US		Refers to ON-188-001, LOSS OF 250 VDC BUS.
		Contacts Electrical Maintenance to investigate loss of 1D274.
PCOP		Reports fault is on 1D274, HPCI MCC and is a failure of breaker 1D274031, HPCI AOP breaker.
US		Directs breaker 1D274031 opened and 1D274 restored.
		Refers to T.S. 3.5.1 D.1 and D.2, declares HPCI Inoperable due to AOP failure.
		Refers to T.S. 3.8.7 on loss of 1D274 and 3.6.1.3 for loss of power to PCIVs.
PCOP		Directs NPO to open HPCI AOP breaker 1D274031 and restore 1D274 to service.

★ Denotes Critical Task

NOTES:	

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

Event No: 1
Brief Description: TRIP OF 1D274 / LOSS OF HPCI AUX OIL PUMP.

INSTRUCTOR ACTIVITY:

Approximately one minute after the crew assumes the shift, initiate a loss of 1D274, activate:

{Key[1]} IRF rfDC188061 f:OPEN

NOTE: Monitor P&ID Display **DC1** for status of 1D662 and 1D274.

ROLE PLAY:

1. As NPO dispatched to check reflasher 1L660, wait ~2 minutes and report that the 1L660 panel indicates HPCI CONTROL CENTER 1D274 TROUBLE (LA-1L660-C02).

2. As NPO dispatched to check 1D274, wait ~1 minute and report that 1D274 appears to be deenergized and 1D274031, HPCI AOP breaker is tripped. There is a burnt smell of hot insulation in the area, but no other apparent damage. If asked to check 1D662, report breaker 1D662014 feed to 1D274 is tripped.

3. As Electrical Maintenance/FIN, wait ~3 minutes and report "MCC breaker 1D274031 HPCI TURB AUX OIL PP 1P213 has failed". Damage is limited to the breaker, and if the breaker is pulled, the control center can be re-energized. Stripping the MCC will not be required.

INSTRUCTOR ACTIVITY:

1. When directed to remove, breaker 1D274031 from the cubicle, activate:

   {Key[2]} IRF rfDC188128 f:OPEN

2. When directed to re-energize 1D274 following removal of HPCI AOP breaker, activate:

   {Key[3]} IRF rfDC188061 f:CLOSE

ROLE PLAY:

When directed as NPO to reenergize 1D274 following removal of breaker 1D274031 from the cubicle, wait ~1 minute and report that you have closed 1D662014. 1D274 has re-energized and both 1D274 and 1D662 appear to be normal.

SCENARIO EVENT FORM

Event No: 2
Brief Description: 100 MWe POWER DECREASE

POSITION	TIME	STUDENT ACTIVITIES
US		Briefs the crew for the upcoming reactivity evolution.
		Directs the power reduction.
		Directs implementation of Reactor Engineering Instructions in the CRC Book.
		Directs implementation of GO-100-012, POWER MANEUVERS.
		Refers to/implements OI-AD-029, EMERGENCY LOAD CONTROL.
PCOM		Decreases Reactor power as directed by the US and CRC Book.
		Plots power changes on the power-to-flow map.
PCOP		Notifies GCC when the power reduction is complete.

★ Denotes Critical Task

NOTES:	

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

Event No: 2
Brief Description: 100 MWe POWER DECREASE

INSTRUCTOR ACTIVITY:

Call SSES as GCC and state a Minimum Generation Emergency is issued and SSES Unit 1 is requested to reduce generation by 100 MWe as soon as possible.

ROLE PLAY:

As necessary from GCC/TCC to prompt the power reduction.

SCENARIO EVENT FORM

Event No: 3
Brief Description: TRIP OF RFPT '1A'

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports trip of '1A' RFP.
		Reports RPV water level is decreasing and feedwater system is responding.
		Reports Recirc pump runback, Limiter #2 and failure of 1B RRP to runback
		Refers to AR-102-C01/C04, RECIRC A/B FLOW LIMIT RUNBACK. PCOM with US concurrence may initiate a manual runback using M/A controller.
		Implements ON-164-002, LOSS OF RECIRCULATION FLOW. 1. Checks power to flow map; determines plant is not operating in a restricted region. 2. Selects a control rod to monitor for core flux oscillations.
PCOP		Refers to AR-101-A10, RFPT 'A' TRIP.
		Directs Plant Operator to remove hydrogen injection to RFP 'A' using OP-145-002.
		Refers to AR-101-F11, RFP A BRG OIL LO PRESS.
US		Directs implementation of ON-164-002, LOSS OF RECIRCULATION FLOW.
		Recognizes and directs actions for runback failure. • May direct PCOM to manually runback the 1B RRP to 45%. • Otherwise, once plant stable, recognizes loop delta flow limits exceeded, refers to Tech Specs and directs PCOM to manually reduce 1B RRP pump speed to match loop flows.
		May refer to ON-145-001 and determines no actions needed with RPV level stable.
		Contacts Reactor Engineering for assistance.
		Notifies GCC, Health Physics and Chemistry groups of power change.
		Directs STA to select Venturi flow elements for input to Core Thermal Power Calculation IAW OI-TA-021.
		Contacts WWM to investigate the cause of 1A RFPT trip.
PCOM		Prepare to reset the Recirc Runback in accordance with ON-164-002.
PCOP		Monitors Main Steam Line and Offgas Pretreatment Rad Monitors.
		Directs NPO to investigate cause of RFP trip.

★ Denotes Critical Task

NOTES:	

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

Event No: 3
Brief Description: TRIP OF RFPT '1A'

INSTRUCTOR ACTIVITY:

When generator output has been reduced, but prior to a 100 MWe reduction (Allow Evaluator to assess reactivity manipulation), trip RFPT 1A, activate:

{Key[6]} IMF mfFW145009A

ROLE PLAY:

As Plant Operator sent to '1A' RFP, wait 2 minutes and call Unit 1 control room and report no abnormal conditions are visible around the pump or turbine.

As Work Week Manager sent to '1A' RFP, wait 10 minutes and report the turbine trip circuit is energized but the reason has not yet been identified. "We will continue to investigate and let you know about any further developments."

As Reactor Engineering, report that you will run the Core Thermal Monitor and then come to the control room with any instructions or recommendations.

As WWM to contact I&C FIN to investigate the 1B RRP Runback Failure.

SCENARIO EVENT FORM

Event No: 4
Brief Description: LOSS OF CRD / INOPERABLE ACCUMULATORS

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Reports trip of '1A' CRD pump.
		Refers to AR-107-D01, CRD PUMP 'A' TRIP.
		Implements ON-155-007, LOSS OF CRD SYSTEM FLOW: 1. Closes flow control valve FV-146-F002 using FC-C12-1R600 in MANUAL. 2. Starts '1B' CRD pump. Restores CRD parameters to normal and controller to AUTO.
		Dispatches Plant Operators to check CRD pumps and '1A' CRD pump breaker 1A20107.
		Reports charging water header pressure.
		Reports trip of the '1B' CRD pump and dispatches Plant Operators to check '1B' CRD pump. Recognizes a loss of both CRD pumps and reports, a CRD low suction pressure trip of CRD.
		Implements ON-155-007, LOSS OF CRD SYSTEM FLOW for low CRD Suction Pressure.
PCOM		Reports control rod accumulator trouble alarms.
		Reports all trouble alarms are for withdrawn control rods.
		Dispatches a Plant Operator to the HCU to report status.
US		Directs implementation of ON-155-007, LOSS OF CRD SYSTEM FLOW. Directs placing mode switch to S/D within 20 minutes when two or more accumulators are determined inoperable for withdrawn control rods with steam dome pressure >900 psig.
		Contacts WWM to investigate the accumulator trouble alarms.
		Discusses or requests Shift Manager permission for Unit 2 CRD X-tie to Unit 1.
		Directs Scram Imminent Actions IAW ON-100-101, SCRAM, SCRAM IMMINENT.
		Refers to TS 3.1.5, CONTROL ROD ACCUMULATORS.
PCOP		Notifies Generation Control Center (GCC) Unit 1 coming off line.

★ Denotes Critical Task

NOTES:	

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

Event No: 4
Brief Description: LOSS OF CRD / INOPERABLE ACCUMULATORS

INSTRUCTOR ACTIVITY:

When the first RRP runback is reset, insert a loss of CRD system flow with several control rod accumulator trouble alarms; activate:

{Key[7]} SCN YPB_ILO-604A

NOTES:
1) The key trips the 1A CRD pump and activates the suction strainer clogging.

2) Times for accumulator alarms are:
   Rod 46-47 3:45
   Rod 38-39 4:20
   Rod 10-19 4:40
   Rod 14-23 5:30

3) Monitor Display **RD-11** for CRD Temperatures if required.

ROLE PLAY:

As Plant Operator sent to '1A' CRD pump breaker 1A20107, wait 2 minutes and report overcurrent relay 50/51 has a target dropped.

As Plant Operator, sent to Bypass CRD Suction Filter 146F116 will not open, it is stuck closed.

As Plant Operator sent to HCUs for Accumulator Trouble alarms, report pressures less than 900 psig for rod 46-47, rod 38-39, rod 10-19, and rod 14-23.

Wait until 2 accumulator trouble alarms are in and as Plant Operator report on 1C007 there are 40 to 50 high temperature alarms in.

NOTE: In order to avoid a long time delay in candidate activities, make it clear that neither pump appears to be capable for return to service any time soon.

As Shift Manager, report CRD cross tie from Unit 2 is not available since Unit 2 CRD is out of service for outage activities.

SCENARIO EVENT FORM

Event No: 5, 6
Brief Description: ATWS / SLC SYSTEM FAILURE

POSITION	TIME	STUDENT ACTIVITIES
PCOM		When directed, places Mode Switch to SHUTDOWN.
★ **PCOM**		**Recognizes and reports failure to scram.**
		Inserts manual scram via scram pushbuttons; reports continued failure to scram.
		Inserts SRMs and IRMs.
US		Enters EO-000-102, RPV CONTROL, exits EO-000-102 and enters EO-000-113, LEVEL POWER CONTROL.
		Directs initiating SLC.
★ **US**		**Directs ADS inhibited.**
		Directs tripping Recirc pumps one at a time while monitoring RPV level for swell.
PCOP		Initiates ARI; reports failure to scram via ARI.
★ **PCOP**		**Inhibits ADS.** Places ADS A and B Logic Control keylock switches to INHIBIT.
PCOP		Initiates SLC; reports '1B' SLC pump tripped on start, '1A' pump running.
		Dispatches Plant Operator to investigate '1B' SLC pump failure.
		Recognizes and reports subsequent trip of '1A' SLC pump.
★ **US**		**Directs insertion of control rods IAW EO-000-113 Sht. 2, Control Rod Insertion.** 1. Directs venting the scram air header. 2. Directs performance of ES-158-001, DE-ENERGIZING SCRAM PILOT SOLENOIDS.
★ **PCOM**		**Inserts control rods IAW EO-000-113 Sht. 2, Control Rod Insertion.** Directs Plant Operator to vent scram air header.

★ Denotes Critical Task

NOTES:	

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

Event No: **5, 6**
Brief Description: **ATWS / SLC SYSTEM FAILURE**

INSTRUCTOR ACTIVITY:

Ensure Event Trigger activates to trip '1A' SLC pump 3 minutes after start.

ROLE PLAY:

As Plant Operator directed to investigate SLC pumps, wait ~2 minutes and report '1B' pump shaft is sheared. When directed to investigate the '1A' SLC pump trip, wait ~2 minutes and report the motor appears to have scorching and the breaker has tripped on over current.

Role play with US as Shift Manager to direct ES-150-002, Boron Injection Using RCIC.

SCENARIO EVENT FORM

Event No: 7, 8
Brief Description: MAIN TURBINE TRIP/LOSS OF AUX BUSES / RCIC SPEED CONTROL FAILURE

POSITION	TIME	STUDENT ACTIVITIES
★ US		**Directs lowering RPV water level to < –60 inches but > –161 inches.** Gives a target level band of –60 inches to –110 inches using Feedwater.
		Directs overriding RCIC system injection.
		Directs RPV pressure stabilized below 1087 psig with SRVs.
		Directs bypassing MSIV and CIG interlocks.
NOTE		Directs SLC injection with RCIC IAW ES-150-002.
		Directs Work Week Manager to investigate Aux Bus problem.
★ PCOM		**Lowers RPV water level to < –60 inches but > –161 inches.** 1. Reduces RFP speed / discharge pressure to lower RPV level. 2. Maintains RPV level < –60 inches but > –161 inches (> –110 inches) using Feedwater.
PCOP		Overrides RCIC system injection by reducing flow controller setpoints.
		Stabilizes RPV pressure below 1087 psig with SRVs.
		Bypasses MSIV and CIG interlocks IAW OP-184-001, MAIN STEAM SYSTEM.
PCOM		Informs US of Main Turbine trip and TBV failure to open.
		Recognizes/reports loss of Feedwater, Condensate and Circ Water systems.
PCOP		Attempts to maintain level between –60" and –161" with RCIC.
		Starts RCIC (previously overridden) and recognizes/reports RCIC speed control malfunction. Places RCIC flow controller in MANUAL to control injection.
		Recognizes/reports RPV level can no longer be maintained > –161". Recognizes that RCIC speed controller has failed completely and RCIC no longer injecting.

★ Denotes Critical Task

NOTES:	US may recognize that RCIC operation is needed for ES-150-002, Boron Injection Using RCIC.

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

Event No: 7, 8
Brief Description: MAIN TURBINE TRIP/LOSS OF AUX BUSES / RCIC SPEED CONTROL FAILURE

INSTRUCTOR ACTIVITY:

When RPV water level is lowered into the target band, insert the Main Turbine trip; activate:

{Key[8]} IMF mfTC193001

NOTE: When the Main Generator lockout occurs, Aux Buses 11A/11B will fail to transfer and will de-energize causing a loss of Feedwater and Condensate.

Following the Turbine Trip when RCIC is started to attempt to restore RPV level, fail the controller in AUTO, activate:

{Key[9]} cmfCN02_FCE511R600 f:0

One [1] minute after the PCOP is injecting with RCIC in manual, fail the RCIC Controller (speed failure), activate:

{Key[19]} IMF cmfCN03_FCE511R600 f:0

ROLE PLAY:

1. As Work Week Manager if directed to investigate Aux Bus breaker problem, wait ~3 minutes and inform crew that a bus fault is present; you are continuing to investigate.

2. As NPO directed to vent the Scram Air Header, wait ~3 minutes and report that you are unable to get the cap off of the 147007 valve's vent line and that the cap appears to be galled; you request Mechanical Maintenance assistance.

3. As FUS, when directed to perform ES-150-002, acknowledge the direction and perform no further actions.

SCENARIO EVENT FORM

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

POSITION	TIME	STUDENT ACTIVITIES
★ US		**Directs Rapid Depressurization when RPV level drops to –161 inches.** 1. Enters EO-000-112, RAPID DEPRESSURIZATION. 2. Directs STOPPING and PREVENTING injection except for SLC, CRD, and RCIC. 3. Verifies Suppression Pool level > 5 feet. 4. Directs opening all ADS SRVs. 5. Verifies all ADS SRVs are open.
★ PCOP		**Performs Rapid Depressurization by opening all ADS SRVs.** 1. Arms and depresses Division 1 and/or Division 2 ADS manual pushbuttons and verifies 6 red lights lit for ADS solenoids, or 2. Places individual control switch to open for each ADS SRV (G, J, K, L, M, & N) and verifies red light lit and amber light not lit for each valve solenoid. 3. Verifies 6 ADS SRVs are open: • Observes 6 ADS SRVs open on acoustic monitor status light indication. • Observes RPV pressure decrease. • Observes elevated tail pipe temperatures on TRS-B21-1R614.
★ US		**Directs slowly increasing injection to restore and maintain RPV level to < –60 inches but > –161 inches using LPCI.** Directs LPCI injection through the RHR heat exchangers as soon as possible.
★ PCOP		**Slowly increases injection to restore and maintain RPV level to < –60 inches but > –161 inches using LPCI.** 1. Throttles open HV-151-F017A(B) at a rate to prevent/minimize power oscillations. 2. Injects through the RHR heat exchangers as soon as possible.

★ Denotes Critical Task

NOTES:	

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

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

When the Rapid Depressurization is begun, Report as NPO that maintenance has opened the CRD Suction Filter Bypass Valve , activate:

{Key[10]} IRF rfRD155028 f:100

When RPV water level is restored > –161" following RD proceed with pulling RPS fuses, activate:

{Key[11]} scn SCN_ILO-604C

NOTE: The above file also deletes the Accumulator Fault malfunctions so that all rods can be fully inserted later in the scenario.

When RPV level is stabilized at < –60" but > –161" following Rapid Depressurization, pull Division 2 RPS fuses to complete ES-158-001, activate:

{Key[12]} scn SCN_ILO-604D

ROLE PLAY:

As Operator dispatched to perform ES-158-001, wait ~2 minutes and report that you are ready to pull the Division 1 RPS fuses.

As Operator pulling fuses, call the control room and report you have completed pulling Division 1 RPS fuses and you are now going to the LRR to pull Division 2 fuses.

As Operator pulling fuses, wait ~2 minutes and report that RPS Division 2 fuses have been pulled and ES-158-001 is now completed.

SCENARIO EVENT FORM

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

POSITION	TIME	STUDENT ACTIVITIES
★ PCOM		**Inserts control rods IAW EO-000-113 Sht. 2, Control Rod Insertion.** 1. Coordinates ES-158-001 with FUS/NPO. 2. Verifies indications as Division 1 RPS fuses are pulled. 3. Verifies control rod insertion as Division 2 RPS fuses are pulled. 4. Verifies/reports all rods fully inserted.
US		Directs SLC injection terminated and restoration from ES-150-002.
		Exits EO-000-113 Sheets 1 and 2; re-enters EO-000-102.
		Directs establishing RPV water level +13" to +54".
PCOP		Establishes RPV water level +13" to +54" with LPCI.
US		Enters EO-000-103, PRIMARY CONTAINMENT CONTROL.
		Directs RHR placed in Suppression Pool Cooling.

★ Denotes Critical Task

NOTES:	PCOM may be successful in driving control rods once CRD is restored.

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

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Places both loops of Suppression Pool Cooling in service IAW OP-149-005, RHR SUPPRESSION POOL COOLING. 1. Ensures ESW in service. 2. Places RHRSW in service to RHR heat exchanger A / B. 3. Opens Suppression Chamber test shutoff valve HV-151-F028A / B. 4. Starts RHR pump 1P202A(C) / B(D). 5. Throttles open test line control valve HV-F024A / B to achieve ≤10,000 gpm on FI-E11-1R603 A / B. 6. Observes minimum flow valve HV-151-F007A / B closes at ~ 3000 gpm. 7. Closes heat exchanger bypass HV-151-F048A / B. 8. Checks RHR pump room coolers 1V210A(C) / B (D) started.
US		***After the scenario is complete, classifies the event as a SITE AREA EMERGENCY under EAL MS3 due to RPS and ARI failure, OR classifies the event as a SITE AREA EMERGENCY under EAL FS1 due to a Loss or Potential Loss of the Fuel Clad Barrier and a Loss of the RCS Barrier.***

★ Denotes Critical Task

NOTES:	

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

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

As necessary

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".

EVENT CLASSIFICATION:

After the Scenario is complete, have the US classify the scenario for the HIGHEST EAL. Provide the US with any requested information needed to perform the classification.

PPL SUSQUEHANNA, LLC
LEARNING CENTER

SIMULATOR SCENARIO

Scenario Title:	**ILO CERTIFICATION / NRC EXAM SCENARIO**
Scenario Duration:	**90 Minutes**
Scenario Number:	**ILO-503A**
Revision/Date:	**Rev 4, 11/14/2007**
Course:	**PC007/PC008, Initial License RO/SRO Certification Examination** **PC017/PC018, Initial License RO/SRO NRC Examination**

Operational Activities:

1. **Loss of 1A RPS/RWCU Fails to Isolate**
2. **Control Rod Drift Out**
3. **RRP '1B' #1 (Lower) Seal Failure**
4. **RRP '1B' #2 (Upper) Seal Failure**
5. **LOCA Inside Drywell**
6. **HPCI Auto Start Failure/Trip**
7. **Diesel Generator Fail to Start**
8. **Loss of Offsite Power**
9. **1A201 Bus Lockout**
10. **Rapid Depressurization**
11. **RPV Flooding**

Prepared By:	Instructor	Date
Reviewed By:	Nuclear Operations Training Supervisor	Date
Approved By:	Supervising Manager/Shift Manager	Date

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SCENARIO SUMMARY

The scenario begins with Unit 1 at 70 percent power, rod sequence A2SU step 566 and Reactor Engineer is finalizing instructions for increasing power. Instrument Air compressor '1B' is out of service for rebuild. SRV 'R' is leaking. Unit 2 is at 100 percent power. Fuel handling is in progress in Unit 1 Spent Fuel Pool.

Shortly after the crew assumes shift responsibilities, the 1A RPS MG set will trip resulting in a loss of Division 1 RPS. All actions will occur as expected with the exception of the RWCU inboard isolation valve failing to isolate. The crew will respond in accordance with Alarm Response and Off-Normal procedures, recover Division 1 RPS (on Alternate power supply) and manually isolate RWCU. Additionally, the crew will review Technical Specifications for RPS trip and RWCU isolation valve failure.

When plant conditions are stable Control Rod 30-47 will drift out, resulting in a small power change. The crew will respond by implementing ON-155-001, CONTROL ROD PROBLEMS, and applying the appropriate Technical Specification Required Action(s). When notified, the Reactor Engineer will direct the shift to insert three other control rods in order to maintain core symmetry.

When the control rod manipulations have been completed, the Reactor Recirc Pump '1B' #1 (Lower) seal failure will occur. The crew will monitor Seal Cavity Temperatures and pressures as well as any changes in leakage into the Drywell Equipment Drain Tank.

While the crew is addressing the lower seal failure and making required notifications, the Reactor Recirc Pump '1B' #2 (Upper) seal will fail, resulting in Drywell temperature and pressure increase. The crew will implement ON-164-003, REACTOR RECIRCULATION PUMP DUAL SEAL FAILURE. The crew will evaluate plant conditions and decide to trip Reactor Recirc Pump '1B', or perform an orderly shutdown of the pump. Once the pump is stopped, the crew will isolate the pump to reduce leakage. When the pump is isolated, a small, unrelated leak develops inside the drywell. This will result in a continuation of the rise in Drywell temperature and pressure. The crew will be expected to perform ON-100-101, SCRAM, SCRAM IMMINENT, and place the Mode Switch to Shutdown.

Condensate and Feedwater will initially be available to maintain RPV water level, but will become unavailable (if Main Generator Lockouts have not been reset) when Plant Auxiliary Load Shed logic is initiated. HPCI fails during initiation and cannot be recovered. RCIC and CRD can be started for injection. D/G 'C' will fail to auto start on Hi Drywell pressure and must be manually started.

When RCIC has been initiated to restore and maintain RPV water level, or when the Condensate System is initiated to restore RPV level, a Loss of Offsite Power occurs that results in loss of Division 1 RHR and Core Spray Systems. Additionally, Bus Lockouts will occur on the 1A and 1C ESS Buses. Division 2 RHR and Core Spray Systems will be available after D/Gs energize the remaining ESS Buses. Primary Containment Control will require use of Suppression Chamber Sprays for pressure and temperature control. The leakage rate will eventually increase beyond RCIC and CRD makeup capability and RPV level will decrease below TAF. Rapid Depressurization will be required to recover Adequate Core Cooling using Low Pressure ECCS Systems. Because ADS Auto Logic is failed, the crew must perform the operation manually.

The scenario will be terminated when the Reactor is depressurized, Reactor water level is restored to +13 to +54 inches, and EO-100-103, PRIMARY CONTAINMENT CONTROL actions are being addressed.

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SCENARIO OBJECTIVES

The objective of this scenario is to evaluate the Licensed Operator Candidate's ability to respond to the scenario events. These events will require each candidate to demonstrate the following:

- Knowledge of integrated plant operations
- Ability to diagnose abnormal plant conditions
- Ability to work together as a team
- Ability to mitigate plant transients that exercise their knowledge and use of ONs and EOPs
- Ability to utilize Technical Specifications (SRO Only)

To meet this objective, the licensed operator candidates must demonstrate proficiency in the following competencies:

Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings.
2. Comply with and use procedures, references, and Technical Specifications.
3. Operate the control boards.
4. Communicate and interact with other crew members.

Senior Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings.
2. Comply with and use procedures and references.
3. Operate the control boards (N/A to upgrade candidates).
4. Communicate and interact with the crew and other personnel.
5. Direct shift operations.
6. Comply with and use Technical Specifications.

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CRITICAL TASKS

★ **Perform Rapid Depressurization when RPV level drops to -161 inches**

Safety Significance

RPV leakage or loss of injection systems impacts the ability to provide continued adequate core cooling through core submergence based on inventory loss.

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:

The following steps provide the operating crew guidance to line up injection systems as available to maintain level >-129 inches. If these actions are unsuccessful, the crew receives additional direction when it is determined that level can not be maintained above TAF.

RC/L-4 RESTORE AND MAINTAIN LVL BETWEEN
+13" AND **+54"**
USING TABLE **3** SYSTEMS

RC/L-5 **IF** LVL CANNOT BE RESTORED AND MAINTAINED **> +13"**
MAINTAIN LVL **> -129"** USING TABLE **3** SYSTEMS
AUGMENTING AS DESIRED WITH
TABLE **5** ALTERNATE SUBSYSTEMS

RC/L-10 IRRESPECTIVE OF VORTEX LIMITS
WITH TABLE **3** SYSTEMS
PERFORM ALL
1 LINE UP FOR INJECTION
2 START PUMPS
3 INCREASE INJECTION TO MAX

RC/L-11 **IF** LESS THAN 2 TABLE **4** SUBSYSTEMS CAN BE LINED UP
COMMENCE LINING UP AS MANY AS POSSIBLE
TABLE **5** ALTERNATE SUBSYSTEMS

CRITICAL TASKS

RC/L-13 WITH TABLE **5** ALTERNATE SUBSYSTEMS PERFORM ALL:
1 LINE UP FOR INJECTION
2 START PUMPS
3 INCREASE INJECTION TO MAX

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 inches (TAF) because:

- *Adequate core cooling exists so long as RPV water level remains above -161 inches (TAF).*
- *The time required for RPV water level to decrease to -161 inches" (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)

Indications/Cues for Event Requiring Critical Task

Reactor water level trending downward, eventually indicating less than the top of active fuel height on the Fuel Zone Level Indicator.

Performance Criteria

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

Initiate ADS/Manually Open all six 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.

CRITICAL TASKS

★ **Determines RPV level instrument indication is no longer valid due to violation of the Saturation Curve.**
★ **Performs RPV Flooding when RPV water level becomes indeterminate by establishing RPV Flooded to Steamlines.**

Safety Significance
Adequate core cooling may be challenged if core submergence cannot be verified.

Consequences for Failure to Perform Task
Failure to take the EOP actions may result in uncovering the core and breach of the fuel clad due to overheating.

SSES EOP Basis for:

RC/L-2 **IF** LVL CANNOT BE DETERMINED
GO TO RPV FLOODING

If RPV water level cannot be determined, the actions specified in the subsequent [E0-102] steps cannot be performed, since RPV water level and water level trend information is required for determining which actions to take. The transition to EO-000-114, RPV Flooding, is necessary ***to assure continued adequate core cooling*** *under conditions where RPV water level cannot be determined.*
These systems consist of all motor-driven systems, which are available to flood the RPV. As many of these systems as necessary must be used to establish and maintain the conditions required to verify RPV flooding. Establishing adequate core cooling conditions dictates that adherence to Vortex limits not be required.

Indications/Cues for Event Requiring Critical Task
Violation of the RPV Saturation Curve is indicated by PICSY format (RPVSAT) showing purple indication on the curve, plot on the unsafe side by the Crew and/or RPV level instrumentation failing in the upscale direction.

Performance Criteria
Recognize failure of RPV level indicators due to reaching saturation conditions on the instrument runs, initiate rapid depressurization by opening ADS Valves, and then increasing RPV injection until RPV flooded as indicated by a combination of conditions as shown in FLOODED TO STEAMLINES TABLE.

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 to the point that RPV pressure will increase to a value that is 82 psid above Suppression Chamber. At this point injection should be stabilized to maintain the DP.
Verify ADS Valves are open using light red light indication, acoustic monitoring and lowering Reactor pressure.

★ Denotes Simulator Critical Task

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SCENARIO REFERENCES

1. RPS BUS "1A" FAILURE/SINGLE MSIV CLOSURE

AR-103-A01	RPS CHANNEL A1/A2 AUTO SCRAM
OP-158-001	RPS DISTRIBUTION SYSTEM
ON-158-001	LOSS OF RPS
T.S. 3.3.8.2	RPS ELECTRIC POWER MONITORING
T.S. 3.6.1.3	PRIMARY CONTAINMENT ISOLATION VALVES

2. CONTROL ROD 30-47 DRIFT

AR-104-H05	ROD DRIFT
ON-155-001	CONTROL ROD PROBLEMS
TS 3.1.3	CONTROL ROD OPERABILITY

3. RRP '1B' #1 (LOWER) SEAL FAILURE

AR-102-G05	RRP 'B' SEAL STAGE HI/LO FLOW
SO-100-006	SHIFTLY SURVEILLANCE OPERATING LOG

4. RRP "1B" #2 (UPPER) SEAL FAILURE

AR-102-G04	SEAL LEAKAGE HI/LO
ON-164-003	RRP 'B' DUAL SEAL FAILURE
GO-100-009	SINGLE RECIRC LOOP OPERATION
TS 3.4.4	RCS OPERATIONAL LEAKAGE
TS 3.4.1	RECIRCULATION LOOPS OPERATING

5. LOCA INSIDE DRYWELL

EO-100-102	RPV CONTROL
EO-100-103	PRIMARY CONTAINMENT CONTROL

6. HPCI AUTO START FAILURE/TRIP

OP-152-001	HPCI SYSTEM

7. LOSS OF OFFSITE POWER / LOCKOUT 1A AND 1C ESS BUSES

ON-104-001	UNIT 1 RESPONSE TO LOSS OF OFFSITE POWER
ON-104-201	LOSS OF 4KV ESS BUS 1A (1A201)
ON-104-203	LOSS OF 4KV ESS BUS 1C (1A203)
AR-015-D08	4 KV BUS 1A BUS LOCKOUT RELAY TRIP
AR-015-F14	4 KV BUS 1C BUS LOCKOUT RELAY TRIP

8. RAPID DEPRESSURIZATION

EO-100-112	RAPID DEPRESSURIZATION

9. RPV FLOODING

EO-100-114	RPV FLOODING

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SCENARIO SPECIAL INSTRUCTIONS

1. Initialize simulator to **IC-17**, 69 percent power.

2. Place a Status Tag on IA Compressor 'B' control switch.

3. Load SCN file **SCN_ILO-503A**; verify the following pre-inserts and Key assignments.

MF	RF	OR	SCN	ET	Conditions
9:9	2:2	0:0	0	1:0	16

SCN BATCH1\FWB_ALLALMCLR
IRF crfPM09_1K107B f:OUT
IMF cmfPM01_1K107B
IMF cmfRL01_B21C1K5A
IMF cmfRL01_B21C1K5B
IRF rfAD183021 f:0.01
SCN BATCH1\YPB_ILO-503A
{$ILO503HPCIFLOW} IMF mfHP152015
IMF mfDG024001C
aet ETILO503A-D
IMF cmfMV06_HV144F001
{Key[1]} IMF mfRP158008A
{Key[2]} IMF mfRD1550053047
{Key[3]} DMF mfRD1550053047
{Key[4]} IRF rfRD1550073047
{Key[5]} IMF mfRR164003B r:45:00 i:0 f:5
{Key[6]} IMF mfRR164004B r:10:00 i:0 f:10
{Key[7]} IRF rfRR164041 f:CLOSE
{Key[7]} IMF mfRR164010 f:20 d:3:30 r:5:30
{Key[8]} SCN BATCH1\DSB_LOOPT21
{Key[9]} IMF mfDS104001A
{Key[9]} IMF mfDS104001C
{Key[10]} MMF mfRR164010 r:4:00 i:1 f:100
{Key[23]} SCN BATCH1\FWB_101ALARM
{Key[24]} SCN BATCH1\FWB_102ALARM
{Key[25]} SCN BATCH1\FWB_103ALARM

4. Add the CRC package to the shutdown section.

5. Verify LEFM is selected as the Feedwater flow input to PICSY IAW OI-TA-021.

SCENARIO SPECIAL INSTRUCTIONS

6. Prepare a turnover sheet indicating:

   Unit 1

   - Reactor power at 70 percent. Rod Sequence is A2/SU step 566.
   - Power ascension is on hold while Reactor Engineer evaluates thermal limits.
   - 1B Instrument Air Compressor OOS for rebuild.
   - "E" SRV Tailpipe Temperature is elevated.
   - Unit 2 is in MODE 1 at 100 percent.

SCENARIO EVENT DESCRIPTION FORM

Initial Conditions: Initialize the Simulator to **IC-17**. Place the Simulator to RUN. Ensure the Keys are assigned as indicated on the Special Instructions sheet via the appropriate SCN File. Assign Shift positions; direct the start of the 5-minute panel walkdown.

EVENT	TIME	DESCRIPTION
1		RPS 1A LOSS / RWCU FAILS TO ISOLATE
2		CONTROL ROD 42-55 DRIFT
3		RRP '1B' #1 (LOWER) SEAL FAILURE
4		RRP '1B' #2 (UPPER) SEAL FAILURE / DUAL SEAL FAILURE
5		LOCA INSIDE DRYWELL
6		HPCI AUTO START FAILURE / TRIP
7		D/G FAILS TO START
8		LOSS OF OFFSITE POWER
9		1A AND 1C ESS BUS LOCKOUTS
10		RAPID DEPRESSURIZATION
11		RPV FLOODING/TERMINATION

SCENARIO EVENT FORM

Event No: 1
Brief Description: RPS 1A LOSS / RWCU FAILS TO ISOLATE

POSITION	TIME	STUDENT ACTIVITIES
PCOM/P		Recognizes/reports loss of "1A" RPS Bus.
		Dispatches NPO to check "1A" RPS MG set and EPA breakers.
PCOM		Recognizes/reports failure of RWCU valve HV-144-F001 to isolate.
US		Directs performance of ON-158-001, LOSS OF RPS.
		Contacts Electrical Maintenance to investigate the failure of the "1A" RPS MG set output EPA breakers.
		Contacts Electrical Maintenance to investigate the failure of the RWCU valve.
		Reviews Technical Specifications 3.6.1.3.
		Directs closing of HV-144-F001.
PCOM		Isolates RWCU by closing HV-144-F001.
PCOP		Performs ON-158-001
		- Transfers RPS "A" to Alternate , by placing HS-C72B-S1 in ALT A position - Directs Main Steam Line Rad monitors reset - Resets NSSSS isolation, Depresses HS-B21-1S32 and HS-B21-1S33 - Recovers from RBCW isolation, Depresses HV-18791A1&A2 and HV-18792A1&A2 and ensures associated cooling water valves open

★ Denotes Critical Task

NOTES:	

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

Event No: 1
Brief Description: RPS 1A LOSS / RWCU FAILS TO ISOLATE

INSTRUCTOR ACTIVITIES:

When the crew has assumed the shift, initiate a loss of RPS Bus 1A and RWCU isolation failure, activate:

{Key[1]} IMF mfRP158008A

ROLE PLAY:

1. As the NPO directed to investigate the loss of "1A" RPS bus, wait ~2 minutes and report that the Normal EPA breakers are tripped and the "1A" RPS MG set is not running.

2. As Electrical Maintenance when directed to investigate the cause of the "1A" RPS Bus failure, wait ~3 minutes and report a suspected locked rotor on the 1A RPS MG Set. Additional troubleshooting will be required.

3. As Electrical Maintenance directed to investigate the failure of the RWCU F001 valve to close, wait ~3 minutes and report suspected logic failure; additional time is needed to identify the exact failure.

SCENARIO EVENT FORM

Event No: 2
Brief Description: Control Rod 30-47 Drift Out

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Recognizes/reports ROD DRIFT alarm AR-104-H05. Monitors Reactor Power for power increase. Restores power to previous level if necessary using Recirc Flow.
PCOM		Perform ON-155-001, CONTROL ROD PROBLEMS: • Check Full Core Display for identification of drifting Control Rod 30-47 by Depressing DISPLAY RODS DRIFTING Pushbutton. • Check for any open scram valves by Depressing DISPLAY SCRAM VALVES OPEN pushbutton. • Select 30-47 to determine rod drifting out. • Reset the Rod Drift Alarm as follows: a. Depress the Rod Drift Reset pushbutton. b. Verify Rod Drift Alarm clears. • Alerts shift of caution: IF three or more rods have drifted or scrammed from their target positions, Immediately Scram Reactor IAW ON-100-101, SCRAM, SCRAM IMMINENT. • Ensure proper cooling water diff/pressure being maintained by observing PDI-C12-1R603 Cooling Water Diff Pressure indicator and FI-C12-1R605 Cooling Water Flow. • Promptly Insert rod to Position 00. Dispatch a NPO to hydraulically disarm the HCU.
US		• Contact Reactor Engineering. • Informs Shift Manager/Operation Management of plant conditions. • Obtain assistance from Workweek Manager. Declare Control Rod INOP in accordance with TS 3.1.3, and take the required actions per CONDITION C.
US		When instructed by reactor engineering, direct the crew to insert the three symmetrical Control Rods 14-31, 46-31, and 30-15 to Position 00.
PCOM/P		When directed by Reactor Engineer, Insert Rods 14-31, 46-31, 30-15 to Position 00.

★ Denotes Critical Task

NOTES:	

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

Event No: 2
Brief Description: CONTROL ROD 30-47 DRIFT OUT

INSTRUCTOR ACTIVITY:

When the crew has completed actions for the loss of RPS and has isolated RWCU, or upon Evaluator direction, drift Control Rod **30-47** activate:

{Key[2]} IMF mfRD1550053047

After PCOM has begun inserting that control rod, delete the malfunction:

{Key[3]} DMF mfRD1550053047

When directed to hydraulically disarm HCU **30-47**, activate:

{Key[4]} IRF rfRD1550073047 f:DISARM

As RE prepare rod manipulation directions for the 3 symmetrical rods to 30-47 AND for the next group of rods in the sequence (22-39, 22-23, 38-23 and 38-39).

ROLE PLAY:

1. As Work Week Manager/I&C dispatched to investigate, wait ~5 minutes and report as I&C:

   "There appears to be a failure in the HCU Transponder Card, and it will take at least an hour to get a replacement. After replacement we'll have to perform some checks before we can feel certain that the Transponder card is the only problem with the HCU.

2. As NPO dispatched to the HCU, report no unusual conditions at the HCU if asked.

3. As NPO, report HCU Hydraulically Disarmed.

4. As Reactor Engineer, report no problems with the current rod pattern, but direct crew to insert the following three control rods to Position 00 for the purposes of core symmetry: **14-31, 46-31, and 30-15**. The Reactivity package is on its way to the Control Room.

5. As RE when arriving in the Control Room, deliver both sets of rod insertion directions and explain the first set is for the symmetrical rods to 30-47 and the second set is for any near future emergency rod insertions required. As part of the discussion, remove the CRC book from the Control Room.

SCENARIO EVENT FORM

Event No: 3
Brief Description: RRP '1B' #1 (LOWER) SEAL FAILURE

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Recognizes/reports AR-102-G05 Recirc Pump B SEAL STAGE HI-LO FLOW .
		Monitors seal cavity pressures on SIP PANEL 1C652 and diagnoses #1 (lower) seal failed.
		Monitors seal cavity temperature for trend on 1C614.
		Monitors DWEDT level recorder for a change in leakage rate on 1C601.
		Monitors Containment radiation levels on Panel 1C693.
US		Directs continuous monitoring for changes in leakage rate and containment parameters.
		Refers to ON-164-003, RRP DUAL SEAL FAILURE, and briefs crew on actions if second stage seal failure and potential for single loop operations.
		Notifies Workweek Manager and System Engineer of Recirc Pump seal failure.

★ Denotes Critical Task

NOTES:	

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

Event No: 3
Brief Description: RRP '1B' #1 (LOWER) SEAL FAILURE

INSTRUCTOR ACTIVITY:

After the three symmetrical rods have been inserted, initiate the RRP '1B' #1 (Lower) seal failure malfunction:

{Key[5]} IMF mfRR164003B r:45:00 i:0 f:5

Monitor seal parameters on **RR4**.

NOTE: Takes about 1 Minute for Annunciator to Alarm.

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 4
Brief Description: RRP '1B' #2 (UPPER) SEAL FAILURE/DUAL SEAL FAILURE

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Implements AR-102-G04, RECIRC PUMP B SEAL LEAKAGE HI FLOW.
		Refers to AR-102-G03, reports RECIRC PUMP MOTOR HI TEMPERATURE.
		When Seal Cavity temperature reaches 200 °F, trip the pump. SEE NOTE
PCOM		Perform ON-164-002 LOSS OF REACTOR RECIRCULATION FLOW IF operating recirculation pump speed is < 75 percent rated speed (1,260 rpm), Determine actual core flow by • Display Core Pressure Drop via PICSY computer point NJP51 - Core PL Press OR if PICSY unavailable via XR-B21-1R613, Blue Pen: Core Plate DP. • Determine actual core flow using "Core Flow vs. Core Pressure Drop" curve. • Plot position on Power/Flow Map. • Ensure thermal power REDUCED to < 70 percent rod line. Perform ON-178-00,2 CORE FLUX OSCILLATIONS, per OPRM ALARM as appropriate.
US		Directs implementation of ON-164-003, RRP DUAL SEAL FAILURE.
		Directs PCOP to monitor Drywell parameters.
		Directs the shutdown and isolation of RRP '1B'.
		Refers to TS 3.4.4, RCS Operational Leakage. Complies with Tech Spec LCOs 3.4.1.
		Ensures PCOP/PCOM perform ON-178-002, CORE FLUX OSCILLATIONS.
		Refers to with COLR Section 8.0 Limits in TRM.
PCOP		Refers to ON-164-003, RRP DUAL SEAL FAILURE: and Isolates Recirc Pump 1P401B.

★ Denotes Critical Task

NOTES:	Crew may elect to trip the pump or shutdown the Reactor Recirculation Pump in accordance with ON-164-003.

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

Event No: 4
Brief Description: RRP '1B' #2 (UPPER) SEAL FAILURE/DUAL SEAL FAILURE

INSTRUCTOR ACTIVITY:

1. When the crew has evaluated the loss of the #1 seal failure (~6minutes after the lower seal failure), insert the RRP '1B' #2 (Upper) seal failure:

   {Key[6]} IMF mfRR164004B r:10:00 i:0 f:10

   NOTE: Inserting the previous malfunction will slowly raise Drywell pressure and eventually require a manual reactor scram if the RRP is not shutdown and isolated.

2. When directed, close CRD WTR SUPPLY TO RRP B SEAL WATER ISO VLV 143F008B by depressing:

   {Key[7]} IRF rfRR164041 f:CLOSE

   NOTE: Key 7 also inserts a small Drywell Leak

   {Key[7]} IMF mfRR164010 f:20 d:3:30 r:5:30

   Monitor Instructor Display **RR4** for Seal Purge Valve position.

ROLE PLAY:

As NPO dispatched to isolate CRD to the 1B RRP, wait ~ 2 minutes and report valve 143F008B is closed.

SCENARIO EVENT FORM

Event No: 5, 6
Brief Description: LOCA INSIDE DRYWELL/HPCI AUTO START FAILURE/TRIP

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Reports DW pressure is continuing to increase.
US		May enter ON-100-101 SCRAM, SCRAM IMMINENT, and direct scram imminent actions.
		Directs manual Reactor scram before Drywell pressure reaches 1.72.
		Enters EO-100-102, RPV CONTROL when RPV level reaches +13 inches.
		Re-enters EO-100-102 and Enters EO-100-103, PRIMARY CONTAINMENT CONTROL when Drywell pressure reaches 1.72 psig.
		With RPV level normal, may direct PCOP to Override all Low Pressure ECCS prior to reaching Drywell Pressure 1.72 psig.
PCOM		Manually scrams Reactor: 1. Places Mode Switch to SHUTDOWN. 2. Verifies/reports all rods fully inserted . 3. Inserts SRMs and IRMs. 4. Aligns FW for Startup Level Control.
PCOP		Reports Drywell pressure >1.72 psig.
		Verify Isolations, ECCS Initiations, DG starts.
		Recognizes/reports HPCI failed to start, attempts component by component start of HPCI and reports HPCI trips on start up and cannot be recovered.
		Recognizes/reports D/G 'C' has failed to start. Selects Isoch and presses start pushbutton, recognizes reports D/G 'C' starts.
		Verifies ESW cooling to D/Gs
		Initiates RCIC injection to maintain +13 inches to +54 inches.
		Directs RPV water level control +13 inches to +54 inches with RCIC, CRD, Condensate.
US		Directs RPV pressure control 800-1,087 psig.

★ Denotes Critical Task

NOTES:	

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

Event No: 5, 6
Brief Description: LOCA INSIDE DRYWELL/HPCI AUTO START FAILURE/TRIP

INSTRUCTOR ACTIVITY:

When HPCI is started component by component, ensure Event Trigger actuates to insert a HPCI turbine trip when flow is greater than 2,000 gpm:

ROLE PLAY:

As necessary.

SCENARIO EVENT FORM

Event No: 6, 7, 8,
Brief Description: LOSS OF OFFSITE POWER / 1A201 & 1A203 BUS LOCKOUTS

POSITION	TIME	STUDENT ACTIVITIES
US		Directs cool down at <100 °F/hr.
		Enters EO-100-103, PRIMARY CONTAINMENT CONTROL.
		Directs placing one loop of RHR in Suppression Chamber Spray.
PCOP		Recognizes/reports Loss of Offsite Power.
		Recognizes 4 kV Bus 1A201 and 1A203 BUS LOCKOUTS.
		Reports 4 kV Buses 1B and 1D are energized.
US		Directs a 1C601 walkdown for Isolations, ECCS Initiations, and D/G starts.
		Directs restarting CRD Pump '1B'.
		Directs maintaining RPV pressure <1,087 psig with SRVs.
		Contacts TCC and Electrical Maintenance to investigate the loss of power.
PCOP		Starts CRD Pump '1B' as directed.
		Maintains RPV pressure <1,087 psig with SRVs.
		Verifies available low pressure ECCS Pumps start when level drops below -129 inches.
		Transitions to Fuel Zone Level indication when wide range level drops below -145 inches.
		Reports corrected Fuel Zone RPV level is < -161 inches.

★ Denotes Critical Task

NOTES:	

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

Event No: 6, 7, 8,
Brief Description: LOSS OF OFFSITE POWER / 1A201 & 1A203 BUS LOCKOUTS

INSTRUCTOR ACTIVITY:

After Drywell pressure exceeds 1.72 psig, RCIC has been initiated to restore and maintain RPV level and the C DG is started, or when use of the Condensate system is discussed, insert a LOOP and ESS BUS LOCKOUTS:

{Key[8]} SCN BATCH1\DSB_LOOPT21

{Key[9]} IMF mfDS104001A
{Key[9]} IMF mfDS104001C

When the crew completes the assessment of the electric plant lineup, increase the leakage from the RPV.

{Key[10]} MMF mfRR164010 r:4:00 i:1 f:100

ROLE PLAY:

As TCC/GCC if contacted about the LOOP, report the 230-500 kV Tie Line has Supervisory Information that indicates a fault on AutoTransformer T-21. Hazleton Dispatch reports sending a crew to the 230 kV Switchyard to investigate why the 230 kV Breakers 1W and 1T failed to auto re-close. The bus 10 loss is due to a Transformer T10 fault.

SCENARIO EVENT FORM

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

POSITION	TIME	STUDENT ACTIVITIES
★ US	70	Directs Rapid Depressurization when RPV level drops to -161 inches. 1. Enters EO-100-112, RAPID DEPRESSURIZATION. 2. Directs preventing uncontrolled Condensate injection. 3. Verifies Suppression Pool level > 5 feet. 4. Directs opening all ADS SRVs. 5. Verifies all ADS SRVs are open. 6. Directs maximizing ECCS injection to restore RPV level > -161 inches.
★ PCOP		**Performs Rapid Depressurization by opening all ADS SRVs.** 1. Arms and depresses Division 1 and/or Division 2 ADS manual pushbuttons and verifies three red lights lit for ADS Solenoids, or 2. Places individual control switch to open for each ADS SRV (G, J, K, L, M, and N), and verifies red light lit and amber light not lit for each valve solenoid. 3. Verifies six ADS SRVs are open: • Observes three ADS SRVs open on Div 2 acoustic monitor status light indication. • Observes RPV pressure decrease. • Observes elevated tail pipe temperatures on TRS-B21-1R614. 4. Verifies Core Spray and LPCI injection valves open when RPV pressure decreases to < 420 psig. 5. Reports Core Spray and LPCI injection flow to the RPV. 6. Restores RPV level above -161 inches with low-pressure ECCS Injection Systems.
		Transfers back to Wide Range Level Indication when Fuel Zone Level Indication is >-110 inches.

★ Denotes Critical Task

NOTES:	

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

Event No: 9
Brief Description: RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 10
Brief Description: RPV FLOODING/TERMINATION

POSITION	TIME	STUDENT ACTIVITIES
US		Directs throttling injection to restore and maintain RPV level +13 inches to +54 inches.
		Directs Core Spray injection for RPV level control.
★ US		**Declares RPV level indication indeterminate due to violation of RPV Saturation Curve.**
★ US		**Performs EO-100-114, RPV FLOODING** **Directs RPV Flooding when RPV water level becomes indeterminate by establishing RPV Flooded to Steamlines.** Verifies: • MSIVs and MSL drains closed • RCIC isolation valves HV-149-F007 and HV-149-F008 closed
★ PCOP		**Performs RPV Flooding when RPV water level becomes indeterminate by establishing RPV Flooded to Steamlines.** Ensures maximum injection from Core Spray and LPCI pumps.
US		Determines RPV flooded to the Main Steam Lines.
		Records time conditions are met.
		Contacts TSC to enter EP-DS-003, RPV LEVEL DETERMINATION.
US		***After the scenario is complete, classifies the event as a SITE AREA EMERGENCY under EAL FS1 due to a Potential Loss of the Fuel Clad Barrier and a Loss of the RCS Barrier.***

★ Denotes Critical Task

NOTES:	

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

Event No: 10
Brief Description: RPV FLOODING/TERMINATION

INSTRUCTOR ACTIVITY:

None

ROLE PLAY:

As necessary

TERMINATION CUE:

The crew has established injection to flood the RPV to the Main Steam Lines.

EVENT CLASSIFICATION:

After the Scenario is complete, have the US classify the scenario for the HIGHEST EAL. Provide the US with any requested information needed to perform the classification.

SITE AREA EMERGENCY EAL FS1 due to a Potential Loss of the Fuel Clad Barrier and a Loss of the RCS Barrier.

PPL SUSQUEHANNA LLC
LEARNING CENTER

SIMULATOR SCENARIO

Scenario Title:	**ILO CERTIFICATION / NRC EXAM SCENARIO**
Scenario Duration:	**90 Minutes**
Scenario Number:	**ILO-502A**
Revision/Date:	**Rev. 3, 11/14/2007**
Course:	**PC007/PC008, Initial License RO/SRO Certification Examination** **PC017/PC018, Initial License RO/SRO NRC Examination**

Operational Activities:

1. **APRM Critical Self-Test Fault**
2. **EHC Pump Trip**
3. **Transfer SUB 10 to SUT 10**
4. **Increase Reactor Power**
5. **Loss of Instrument Bus 1Y125**
6. **Steam Leak Detection Failure / HPCI Isolation.**
7. **Loss of Instrument Air**
8. **Recirc Loop B Suction Line Break**
9. **ADS Logic Failure /Rapid Depress**
10. **LPCI Injection Valve HV-F015B Fails to Auto Open**
11. **RPV Flooding**

Prepared By:	_____ Instructor	_____ Date
Reviewed By:	_____ Nuclear Operations Training Supervisor	_____ Date
Approved By:	_____ Supervising Manager/Shift Manager	_____ Date

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SCENARIO SUMMARY

Unit 1 is approximately 48% power and Unit 2 is at 100% power. Power ascension was suspended to allow Electrical Maintenance to perform an inspection of Startup Transformer 10 following a report of a small oil leak. Startup Bus 10 is currently supplied from Startup Bus 20 with Tie Breaker 0A10502 closed. Electrical Maintenance has successfully completed the repair and inspection of Startup Transformer 10. The shift will be directed to restore the electric plant lineup to normal by transferring Startup Bus 10 to Startup Transformer 10.

Shortly after the crew assumes the shift, APRM 3 NUMAC drawer fails INOP. The crew responds to the alarms and determines the instrument has a Critical Self-test fault. The CRS consults Tech Specs and the crew bypasses the failed APRM.

After the APRM failure is addressed, the 1A EHC pump motor will trip on overcurrent. Due to a circuit failure, the standby pump will fail to automatically start. The crew must manually start 1B EHC pump to avoid a turbine trip and reactor scram.

When EHC is restored, the crew will continue to place Startup Buses in a normal alignment and complete the evolution. The crew will continue power ascension by pulling control rods to raise power ~10%.

After reactor power has been raised, breaker 1D624030 will trip, resulting in a loss of power to Inverter 1D125 and power to Instrument Bus 1Y125. This will require the crew to implement ON-117-001, LOSS OF INSTRUMENT BUS. The crew will be directed to transfer instruments to ALTERNATE power. The crew may augment their investigation through the use of ON-145-004 RPV WATER LEVEL ANOMALY in order to determine the power source for the instruments. Technical Specifications for PAM Instrumentation will have to be addressed due to the loss of Division 2 of SPOTMOS and RPV Water Level instruments.

When ALTERNATE power has been re-established for the 1Y125 Instruments, a failure in the HPCI Steam Leak Detection System causes the HPCI Steam Supply Outboard Isolation Valve HV-155-F003 to automatically close, making the HPCI system inoperable. HPCI will not be restored for the remainder of the scenario. Technical Specifications for HPCI INOPERABLE as well as PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION will have to be addressed.

After the Steam Leak Detection problem, the Instrument Air header will develop a leak. The leak will be unisolable and worsen over time. The crew will implement ON-118-001, LOSS OF INSTRUMENT AIR and eventually scram the Reactor before Air header pressure reaches 65 psig. Due to the design of the Condensate and Feedwater valves, the loss of IA prevents feed to the RPV and recirculates flow back to the Condenser. Additionally, RPV pressure control will be limited to the SRVs. Main Turbine BPV will be available until the Outboard (air-operated) MSIVs fail closed. MSL drains may be used to augment pressure control, if manually opened, until RPV level reaches -129". At that point MSL drains will auto isolate.

Following the manual scram and stabilization of plant parameters, a small Recirc loop suction line break will occur requiring the crew to implement EO-100-103, PRIMARY CONTAINMENT CONTROL. Shortly after the crew initiates Suppression Chamber Spray, the leak will increase in size and will eventually require the crew to perform EO-100-112 RAPID DEPRESSURIZATION due to water level reaching TAF. The combination of high Drywell temperature and low RPV pressure causes violation of the RPV Saturation Temperature Curve, requiring the crew to perform EO-100-114, RPV FLOODING. Additionally, Fuel Zone water level may decrease below the useable value limit of –290" which also requires entry into RPV Flooding. The injection valve on the '1B' loop of RHR will fail to auto-open, requiring the crew to manually open the valve in order to achieve flooding pressure.

The scenario will be terminated when the crew has successfully flooded the RPV to the level of the Main Steam Lines.

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SCENARIO OBJECTIVES

The objective of this scenario is to evaluate the licensed operator candidate's ability to respond to the scenario events. These events will require each candidate to demonstrate the following:

- Knowledge of integrated plant operations
- Ability to diagnose abnormal plant conditions
- Ability to work together as a team
- Ability to mitigate plant transients that exercise their knowledge and use of ONs and EOPs
- Ability to utilize Technical Specifications (SRO Only)

To meet this objective, the licensed operator candidates must demonstrate proficiency in the following competencies:

Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings
2. Comply with and use procedures, references, and Technical Specifications
3. Operate the control boards
4. Communicate and interact with other crew members

Senior Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings
2. Comply with and use procedures and references
3. Operate the control boards (N/A to upgrade candidates)
4. Communicate and interact with the crew and other personnel
5. Direct shift operations
6. Comply with and use Technical Specifications

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CRITICAL TASKS

★ **Perform Rapid Depressurization when RPV level drops to –161 inches**

Safety Significance

RPV leakage or loss of injection systems impacts the ability to provide continued adequate core cooling through core submergence based on inventory loss.

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:

The following steps provide the operating crew guidance to line up injection systems as available to maintain level >-129". If these actions are unsuccessful, the crew receives additional direction when it is determined that level can not be maintained above TAF.

RC/L- 4 RESTORE AND MAINTAIN LVL BETWEEN
+13" AND **+54"**
USING TABLE **3** SYSTEMS

RC/L-5 **IF** LVL CANNOT BE RESTORED AND MAINTAINED **> +13"**
MAINTAIN LVL **> -129"** USING TABLE **3** SYSTEMS
AUGMENTING AS DESIRED WITH
TABLE **5** ALTERNATE SUBSYSTEMS

RC/L-10 IRRESPECTIVE OF VORTEX LIMITS
WITH TABLE **3** SYSTEMS
PERFORM ALL
1 LINE UP FOR INJECTION
2 START PUMPS
3 INCREASE INJECTION TO MAX

RC/L-11 **IF** LESS THAN 2 TABLE **4** SUBSYSTEMS CAN BE LINED UP
COMMENCE LINING UP AS MANY AS POSSIBLE
TABLE **5** ALTERNATE SUBSYSTEMS

RC/L-13 WITH TABLE **5** ALTERNATE SUBSYSTEMS PERFORM ALL:
1 LINE UP FOR INJECTION
2 START PUMPS
3 INCREASE INJECTION TO MAX

CRITICAL TASKS

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)

Indications/Cues for Event Requiring Critical Task

Reactor water level trending downward, eventually indicating less than the top of active fuel height on the Fuel Zone Level Indicator.

Performance Criteria

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

Initiate ADS / 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.

CRITICAL TASKS

★ **Declare RPV level indication indeterminate due to violation of the RPV Saturation Curve**

★ **Performs RPV Flooding when RPV water level becomes indeterminate by establishing RPV Flooded to Steamlines.**

★ **Manually open RHR F015B valve to inject to the RPV** (*Division 2 RHR is needed for injection and the injection valve fails to auto open)*

Safety Significance
Adequate core cooling may be challenged if core submergence cannot be verified.

Consequences for Failure to Perform Task
Failure to take the EOP actions may result in uncovering the core and breach of the fuel clad due to overheating.

SSES EOP Basis for:

RC/L-2 **IF** LVL CANNOT BE DETERMINED
GO TO RPV FLOODING

If RPV water level cannot be determined, the actions specified in the subsequent [E0-102] steps cannot be performed, since RPV water level and water level trend information is required for determining which actions to take. The transition to EO-000-114, RPV Flooding, is necessary ***to assure continued adequate core cooling*** *under conditions where RPV water level cannot be determined.*
These systems consist of all motor-driven systems, which are available to flood the RPV. As many of these systems as necessary must be used to establish and maintain the conditions required to verify RPV flooding. Establishing adequate core cooling conditions dictates that adherence to Vortex limits not be required.

Indications/Cues for Event Requiring Critical Task
Violation of the RPV Saturation Curve is indicated by PICSY format (RPVSAT) showing purple indication on the curve, plot on the unsafe side by the Crew and/or RPV level instrumentation failing in the upscale direction.

Performance Criteria
Recognize failure of RPV level indicators due to reaching saturation conditions on the instrument runs, initiate rapid depressurization by opening ADS Valves, and then increasing RPV injection until RPV flooded as indicated by a combination of conditions as shown in FLOODED TO STEAMLINES TABLE.

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 to the point that RPV pressure will increase to a value that is 82 psid above Suppression Chamber. At this point injection should be stabilized to maintain the DP.
Verify ADS Valves are open using light red light indication, acoustic monitoring and lowering Reactor pressure.

★ Denotes Simulator Critical Task

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SCENARIO REFERENCES

1. APRM INOP

AR-103-A06	APRM UPSCALE OR INOP TRIP
AR-103-D06	APRM TROUBLE
OP-178-002	POWER RANGE NEUTRON MONITORING SYSTEM

2. LOSS OF EHC

AR-105-I03	EHC HYD FLUID PUMP DSCH LO PRESS
AR-118-A01	HYD FLUID PUMP A OVERLOAD

3. TRANSFER STARTUP BUS 10 TO STARTUP TRANSFORMER 10

OP-003-001	13.8KV COMMON ELECTRICAL EQUIPMENT

4. INCREASE REACTOR POWER

CORE REACTIVITY CONTROL (CRC) BOOK

GO-100-002	PLANT STARTUP, HEATUP AND POWER OPERATION
OP-AD-338	COMMUNICATION REQUIREMENTS FOR REACTIVITY MANIPULATIONS

5. LOSS OF INSTRUMENT BUS 1Y125

ON-117-001	LOSS OF INSTRUMENT BUS
TS 3.3.3.1	PAM INSTRUMENTAION

6. STEAM LEAK DETECTION FAILURE / HPCI ISOLATION

AR-114-C02	HPCI TURBINE TRIP SOLENOID ENERGIZED
AR-114-F05	HPCI LEAK DETECT LOGIC B HI TEMP
AR-114-B05	HPCI OUT OF SERVICE
TS 3.5.1	ECCS OPERATING
TS 3.3.6.1	PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

7. LOSS OF INSTRUMENT AIR

AR-124-A01	INSTRUMENT AIR LOOP A LO PRESSURE
AR-124-B01	INSTRUMENT AIR HEADER LO PRESSURE
AR-124-E01	SERVICE AIR LO PRESSURE
ON-118-001	LOSS OF INSTRUMENT AIR
ON-100-101	SCRAM, SCRAM IMMINENT

8. RECIRC LOOP B SUCTION LINE BREAK / RAPID DEPRESSURIZATION / RPV FLOODING

EO-100-102	RPV CONTROL
EO-100-103	PRIMARY CONTRAINMENT CONTROL
OP-149-004	RHR CONTAINMENT SPRAY
AR-112-D03	DRWL/SUPP CHAMBER HI-LOW PRESS
AR-104-B03	PRIMARY CONTAINMENT HI-LO PRESS
EO-100-112	RAPID DEPRESSURIZATION
EO-100-114	RPV FLOODING

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SCENARIO SPECIAL INSTRUCTIONS

1. Initialize the simulator to **IC-377:** Unit 1 at 48% power EOL, Unit 2 at 100% power EOL.

2. Load SCN file **SCN_ILO-502A**

3. Place simulator in run and verify the following pre-inserts and Program Button assignments.

4. Verify the Environment window:

MF	RF	OR	SCN	ET	Conditions
9:9	1:1	0:0	0	2:0	13

IMF cmfMV06_HV151F015B
IMF cmfPM04_1P202A
IMF cmfPM04_1P202B
IMF cmfPM04_1P202C
IMF cmfPM04_1P202D
aet ETILO_501A
aet ETILO_510B
IMF cmfPM04_1P113B
IRF rfDB106723 f:OPEN
IMF cmfRL01_B21C1K5A
IMF cmfRL01_B21C1K5B
{Key[9]} mfNM178022
{Key[10]} IMF cmfPM03_1P113A
{Key[1]} IRF rfDC102114 f:OPEN
{Key[2]} IRF rfDB157002 f:ALTERNATE
{Key[3]} IMF cmfTH02_TEE41N24B i:ASIS f:350
{Key[4]} IMF mfIA118002 f:5
{Key[5]} MMF mfIA118002 f:20
{Key[6]} IMF mfRR164011B r:300 f:0.5
{Key[7]} MMF mfRR164011B r:300 i:0.5 f:40
{Key[8]} MMF mfRR164011B r:120 i:40 f:5
{Key[23]} SCN BATCH1\FWB_101ALARM
{Key[24]} SCN BATCH1\FWB_102ALARM
{Key[25]} SCN BATCH1\FWB_103ALARM

5. Verify LEFM is selected as the Feedwater flow input to PICSY IAW OI-TA-021.

SCENARIO SPECIAL INSTRUCTIONS

6. Prepare a turnover sheet indicating:

   - Unit 1 is at 48% power; Unit 2 is at 100% power EOL.
   - Power ascension on Unit 1 on hold to allow Electrical Maintenance to inspect Startup Transformer T10 following a report of a small oil leak.
   - Startup Transformer T10 was removed from service IAW OP-003-001 section 2.7 approximately 3 hours ago.
   - Maintenance has now completed the inspection of Startup Transformer T10. All Clearances are closed. Restore Startup Bus 10 to Startup Transformer 10 IAW OP-003-001 Section 2.8. The pre-job brief has been completed; personnel are in place to support this restoration.
   - DO NOT transfer 4Kv buses to normal lineup until Maintenance calls back and concurs with that activity.
   - When T10 is returned to service, continue with the power ascension by pulling Control Rods starting at GO-100-002 step 5.78. Reactor Engineering is on site and available if needed.
   - 1B SLC pump O/S for Maintenance to investigate high motor vibration.

7. Prepare an LCO sheet (TS 3.8.1) identifying that Startup Transformer 10 has been out of service for 3 hours and a Repetitive Required Action Completion Sheet.

8. Prepare an LCO sheet (TS 3.1.7 and 3.3.6.1, Table 3.3.6.1-1, Function 5.e) identifying that SLC has been out of service for 2 hours.

9. Prepare a Loss of Safety Function Work Sheet for PCIV

SCENARIO EVENT DESCRIPTION FORM

Initial Conditions: Initialize the Simulator to **IC-377.** Place the Simulator to RUN. Ensure the Keys are assigned as indicated on the Special Instructions sheet via the appropriate SCN File. Assign Shift positions; direct the start of the 5-minute panel walkdown.

EVENT	TIME	DESCRIPTION
1		APRM CRITICAL SELF-TEST FAULT
2		LOSS OF EHC PUMP
3		TRANSFER SUB 10 TO SUT 10
4		INCREASE REACTOR POWER WITH CONTROL RODS
5		FAILURE OF INVERTER 1D125 (SUPPLY TO INSTRUMENT BUS 1Y125)
6		STEAM LEAK DETECTION FAILURE / HPCI ISOLATION
7		LOSS OF INSTRUMENT AIR
8		RECIRC LOOP B SUCTION LINE BREAK
9		ADS LOGIC FAILURE / RAPID DEPRESSURIZATION
10		LPCI INJECTION VALVE HV-F015B FAILS TO AUTO-OPEN
11		RPV FLOODING

SCENARIO EVENT FORM

Event No: 1
Brief Description: APRM CRITICAL SELF-TEST FAULT

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports AR-103-A06 APRM UPSCALE/INOP TRIP alarm and the AR-103-D06 APRM TROUBLE alarm. (Also have a concurrent rod block alarm)
		Refers to the alarm response and verifies the indications on 1C651 and ODAs.
PCOP		Directs an operator to the Lower Relay Room, Panel 1C608 to perform OP-178-002, Section 2.7 for Self-Test Faults.
		Refers to OP-178-002, PRNMS procedure and attachment.
PCOM		Based on control room indications, reports a Fault on APRM 3 with an INOP trip and rod block.
US		Consults Tech Specs 3.3.1.1 and TRO 3.1.3 and 3.3.9.
		Declares APRM 3 Inoperable and recognizes the failed APRM should be bypassed.
		Directs bypassing APRM 3.
PCOM		Bypasses APRM 3 at Panel 1C651 and reports.

★ Denotes Critical Task

NOTES:	

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

Event No: 1
Brief Description: APRM CRITICAL SELF-TEST FAULT

INSTRUCTOR ACTIVITY:

Shortly after the crew assumes the shift, initiate an APRM 3 Critical Self-Test Fault; activate:

{Key[9]} IMF mfNM178022

NOTE: There is a short delay between the insertion of the malfunction and the alarms. This delay replicates the GE NUMAC system delay where it make take several minutes for the self-test function to cycle through the module and detect the fault.

ROLE PLAY:

When directed to the Lower Relay Room, Panel 1C608, wait a few minutes and report that APRM 3 has an INOP trip and one vote on all the 2-out-of-4 Logic Modules. APRM 3 has a message on the "Self-test" display that states "Bad EPROM".

As Work Week Manager/FIN, report that I&C FIN will investigate the problem.

SCENARIO EVENT FORM

Event No: 2
Brief Description: LOSS OF EHC PUMP

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports PICSY computer alarm for low EHC fluid pressure.
		Reports AR-105-001 I03 EHC HYD FLUID PUMP DSCH LO PRESS
PCOP		Reports AR-118-001 A01 HYD FLUID PUMP A OVERLOAD
		Monitors EHC fluid pressure, reports lowering trend.
		Recognizes and reports 1A EHC pump trip and 1B EHC not in operation.
US		Directs starting 1B EHC pump to restore EHC pressure.
PCOP		Starts 1B EHC pump; verifies EHC pressure rising to normal.
		Verify EHC system operation per OP-193-003 MAIN TURBINE EHC OIL SYSTEM.
		Dispatch NPO to check EHC system for abnormal conditions.
US		Contacts Work Week Manager to provide assistance with investigation.

★ Denotes Critical Task

NOTES:	

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

Event No: 2
Brief Description: LOSS OF EHC PUMP

INSTRUCTOR ACTIVITY:

Shortly after the crew assumes the shift, initiate a loss of EHC system pressure; activate:

{Key[10]} IMF cmfPM03_1P113A

NOTE:
The crew should be able to restore EHC hydraulic pressure and avoid the turbine trip. If a turbine trip or scram occurs, the scenario is designed to be picked up from Event 3 and started from the same IC, and continued from that point on.

ROLE PLAY:

As NPO dispatched to check EHC, report that 1A EHC pump motor appears to have overheated; there is some discoloration of the motor. The 1B EHC pump appears to be running normally.

As Work Week Manager/FIN, report that the 1A EHC pump motor has failed on an internal fault. The motor will need to be replaced.

SCENARIO EVENT FORM

Event No: 3, 4
Brief Description: TRANSFER SUB 10 TO SUT 10 / INCREASE REACTOR POWER

POSITION	TIME	STUDENT ACTIVITIES
US		Directs PCOP to transfer Startup Bus 10 to Startup Transformer 10.
PCOP		Implements OP-003-001, 13.8KV COMMON ELECTRICAL EQUIPMENT, Section 2.8. 1. Notifies Transmission Control Center. 2. Closes MOAB 1R105. 3. Places SU XFMR 10 TO BUS 10 SYNC SEL HS-00014 to ON. 4. Verifies SUT 10 and SUB 10 voltages are matched and in phase. 5. Closes breaker 0A10301. 6. Verifies Tie Breaker 0A010502 OPENS. 7. Places SU XFMR 10 TO BUS 10 SYNC SEL HS-00014 to OFF. 8. Aligns all control switch flags to actual breaker position. 9. Notifies Transmission Control Center SUT 10 is in service.
US		Directs continuing the power ascension with Control Rods.
		Briefs the crew for the upcoming power increase.
		Directs implementation of Reactor Engineer Instruction in the CRC Book.
		Directs the implementation of GO-100-102, PLANT STARTUP, HEATUP AND POWER OPERATION.
PCOM		Increases reactor power as directed by the US and CRC Book.
		Plots power change on the power-to-flow map.
		Maintains LOAD SET ≈100 MWe above existing load.
PCOP		Notifies GCC before the power increase begins.

★ Denotes Critical Task

NOTES:	Per turnover, RE will request rod withdrawal to the 100% rod line.

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

Event No: 3,4
Brief Description: TRANSFER SUB 10 TO SUT 10 / INCREASE REACTOR POWER

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

Transmission Control Center: ready to re-energize Startup Transformer 10; all inspections in the Switchyard have been completed and power is available to Startup Transformer 10.

As Maintenance, role play that you are standing by ready to perform final inspections once Startup Transformer 10 is restored to service.

SCENARIO EVENT FORM

Event No: 5
Brief Description: FAILURE OF INVERTER 1D125 (SUPPLY TO INSTRUMENT BUS 1Y125)

POSITION	TIME	STUDENT ACTIVITIES
PCOM/P		Reports AR-107-C06, BIS SYS DIV 2 INOP ECCS/ESF SYS Reports AR-150-D01 CONTN INSTR GAS SYSTEM
		Recognize and report loss of multiple instruments: • Post Accident Monitoring RPV Water Level • SPOTMOS Division 2
US		Directs PCO to perform ON-117-001, LOSS OF INSTRUMENT BUS
		Contacts Work Week Manager to provide assistance with investigation.
		Refers to TS 3.3.3.1 table 3.3.3.1-1 • Determines Reactor Vessel Level and Suppression Chamber Water Temperature required Channels are not met. Enters CONDITION A. REQUIRED ACTION A.1: Restore required channel to OPERABLE status within 30 days Refers to TRM 3.6.3 • Determines that SPOTMOS Division 2 instrumentation is inoperable Enters CONDITION A REQUIRED ACTION A.1 Restore required channel to OPERABLE status within 24 hours
PCOP		Implements ON-117-001, LOSS OF INSTRUMENT BUS: (May implement ON-145-004 RPV WATER LEVEL ANOMALY to determine power source to RPV Level Instruments.) • Refer to Attachment N for functions/instrumentation lost and recommended actions. • Ensure 1D624030 CLOSED. • Dispatch Operator to 1D125. • Observe 1D125 Master Unit Indicating Light ILLUMINATED. • Observe 1D125 Slave Unit Indicating Light ILLUMINATED. • IF 1D125 Indicating Lights EXTINGUISHED: • At 1C661-B1, PLACE HSE-112505 in ALTERNATE position. • At 1C690B, PLACE HSE-112502 in ALTERNATE position. • At 1C601-22B, PLACE HSE-112501 in ALTERNATE position.

★ Denotes Critical Task

NOTES:	

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

Event No: 5
Brief Description: FAILURE OF INVERTER 1D125 (SUPPLY TO INSTRUMENT BUS 1Y125)

INSTRUCTOR ACTIVITY:

After Reactor power is raised to ≈ 60%, or when directed by Lead Examiner, insert a loss of power to Inverter 1D125, activate:

{Key[1]} IRF rfDC102114 f:OPEN

When dispatched to URR to 1C661-B1, PLACE HSE-112505 in **ALTERNATE,** activate:

{Key[2]} IRF rfDB157002 f:ALTERNATE

ROLE PLAY:

1. As NPO dispatched to 1D125, report that both Master and Slave Units are extinguished.
2. As NPO dispatched to 1D624030, report that the breaker is tripped open. If requested to re-close the breaker, report that the breaker **will not** reset.
3. As NPO dispatched to transfer HSE-112505, report the transfer switch is in Alternate position.
4. As Work Week Manager, assemble team to diagnose problem, and take no further action.
5. As FIN report that the Master Slave unit evaluation at 1D125, looks like 1D624 Breaker 030.

SCENARIO EVENT FORM

Event No: 6
Brief Description: STEAM LEAK DETECTION FAILURE / HPCI ISOLATION

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Reports HPCI LEAK DETECT LOGIC B HI TEMP, refers to AR-114-F05.
		Reports HPCI TURBINE TRIP SOLENOID ENERGIZED refers to AR-114-C02.
		Reports HPCI OUT OF SERVICE, refer to AR-114-B05.
		Reports HPCI STM SUPPLY OB ISO valve HV-155-F003 is CLOSED.
		Determines TSH-E41-1N600B is tripped and indicates 350°F.
		Dispatches Plant Operator to HPCI Equipment Room to investigate potential high temperature condition, using appropriate safety precautions.
US		Contacts I&C to investigate TSH-E41-1N600B.
		Declares HPCI System inoperable.
		Refers to TS 3.5.1, ECCS–Operating; determines Condition 'D' applies. • REQUIRED ACTION D.1: Verify by administrative means RCIC System is OPERABLE Immediately AND D.2: Restore HPCI System to OPERABLE status within 14 days
		Verifies RCIC is OPERABLE by Administrative means.
		Refers to TS 3.3.6.1, Primary Containment Isolation Instrumentation; determines Condition A applies. • REQUIRED ACTION: A.1: Place channel in trip within 24 hours.

★ Denotes Critical Task

NOTES:	

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

Event No: 6
Brief Description: STEAM LEAK DETECTION FAILURE / HPCI ISOLATION

INSTRUCTOR ACTIVITY:

After Instrument power has been restored, and upon direction from Lead Evaluator, initiate Steam Leak Detection failure and HPCI auto isolation, activate:

{Key[3]} IMF cmfTH02_TEE41N24B i:ASIS f:350

ROLE PLAY:

1. As Plant Operator sent to investigate HPCI Equipment Area, wait 2 minutes and report all conditions in the HPCI room are normal.

2. As I&C sent to investigate TE-E41-1N600B, acknowledge the direction to investigate; no further actions will be taken.

SCENARIO EVENT FORM

Event No: 7
Brief Description: LOSS OF INSTRUMENT AIR

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Reports lowering Instrument Air pressure.
		Reports SERVICE AIR LO PRESS; refers to AR-124-E01.
		Reports INSTRUMENT AIR LOOP A LO PRESS; refers to AR-124-A01.
		Dispatches a Plant Operator to investigate IA system.
		Implements ON-118-001, LOSS OF INSTRUMENT AIR.
US		Directs performance of ON-118-001, LOSS OF INSTRUMENT AIR Directs/ensures PCOM to scram the Reactor when IA header pressure ≥ 65 psig. Ensures local investigation of air system to determine severity of leak.
PCOM		Ensures/Reduces Recirc flow to ≈ 65 Mlbm/hr.
US		Enters EO-100-102, RPV CONTROL when RPV Level goes below +13". Directs RPV level maintained +13" to +54" with available systems. Directs RPV pressure stabilized <1087 psig using available systems • For RPV Level Control, Condensate and FW will not be available due to Air Operated valves failing open/closed such that feed is not directed to RPV. CRD, RCIC, LP ECCS and other secondary systems will be available. • For RPV Pressure Control, MT BPV will be available until OB MSIVs close, requiring use of SRVs in. May also use MSL drains until -129" isolation removes that capability.
PCOM		Places Mode Switch to SHUTDOWN. Performs actions of ON-100-101, SCRAM, SCRAM IMMINENT Inserts SRMs and IRMs

★ Denotes Critical Task

NOTES:	

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

Event No: 7
Brief Description: LOSS OF INSTRUMENT AIR

INSTRUCTOR ACTIVITY:

1. When the crew has completed addressing Steam Leak Detection System failure and HPCI Isolation, insert an instrument air leak, activate:

   {Key[4]} IMF mfIA118002 f:5

2. When the crew discusses requirement to shutdown/scram prior to scram air header low pressure, increase the severity of the rupture to 20%, activate:

   {Key[5]} MMF mfIA118002 f:20

ROLE PLAY:

1. As Plant Operator sent to IA, wait 2 minutes and report that all IA and SA compressors are running, the SA cross tie appears to be operating normally but IA pressure is slowly decreasing. If asked, inform the crew that "I will investigate the system for a possible leak."

2. As Plant Operator sent to IA, report "I have located a large air leak at the common IA header piping just downstream of the receivers; I do not see any way to isolate the leak, and header pressure is dropping rapidly."

SCENARIO EVENT FORM

Event No: 8
Brief Description: RECIRC LOOP B SUCTION LINE BREAK

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Reports increasing Drywell Pressure and Drywell Temperature.
US		Enters EO-100-103, PRIMARY CONTAINMENT CONTROL. Directs one loop of RHR placed in Suppression Chamber Spray.
PCOP		Places one loop of RHR in Suppression Chamber Spray IAW OP-149-004, RHR CONTAINMENT SPRAY. 1. Ensures ESW in service. 2. Places LOCA OVERRIDE MANUAL OVERRIDE switch to OVERRIDE. 3. Closes LPCI injection valve HV-151-F017A (B). 4. Opens Suppression Chamber test valve HV-151-F028A (B). 5. Starts RHR pump 1P202A(B)(C)(D). 6. Throttles open Suppression Chamber spray valve HV-151-F027A (B) to maintain ≤ 500 gpm as indicated on FI-15120A(B). 7. Places RHRSW in service to RHR heat exchanger A (B).
PCOP/M		Reports rapidly decreasing RPV water level.
US		Re-enters EO-100-102 due to high Drywell pressure.
		Directs injection with all available systems.
PCOP/M		Attempts to maintain RPV water level +13" to +54" with available systems.
		Verifies isolations, ECCS initiations, and DG starts as directed.

★ Denotes Critical Task

NOTES:	Crew may be able to perform Drywell Sprays before level drops due to the leak.

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

Event No: 8
Brief Description: RECIRC LOOP B SUCTION LINE BREAK

INSTRUCTOR ACTIVITY:

When the crew scrams the Reactor and RPV water level is stable at +13" to +54", initiate a small break inside the primary containment, activate:

{Key[6]} IMF mfRR164011B r:300 f:0.5

After the crew has commenced Suppression Chamber Spray, increase the severity of the Recirc loop rupture to 40%, activate:

{Key[7]} MMF mfRR164011B r:300 i:0.5 f:40

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 9
Brief Description: ADS LOGIC FAILURE / RAPID DEPRESSURIZATION

POSITION	TIME	STUDENT ACTIVITIES
PCOP/M		As level lowers, recognizes and reports ADS did **not** auto initiate.
		Reports RPV water level is approaching/at –161".
★ US		**Directs Rapid Depressurization when RPV level drops to –161 inches.** 1. Enters EO-100-112, RAPID DEPRESSURIZATION. 2. Directs preventing uncontrolled Condensate injection. 3. Verifies Suppression Pool level > 5 feet. 4. Directs opening all ADS SRVs. 5. Verifies all ADS SRVs are open.
★PCOP/M		**Performs Rapid Depressurization by opening all ADS SRVs.** 1. Arms and depresses Division 1 and/or Division 2 ADS manual pushbuttons **OR** 2. Places individual control switch to open for each ADS SRV (G, J, K, L, M, & N) and verifies red light lit and amber light not lit for each valve solenoid. 3. Verifies 6 ADS SRVs are open by observing : • 6 ADS SRVs open on acoustic monitor status light indication. • RPV pressure decrease. • Suppression Pool Temperature rise. • SRV Tailpipe temperatures rise on TRS-B21-1R614.

★ Denotes Critical Task

NOTES:	

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

Event No: 9
Brief Description: ADS LOGIC FAILURE / RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 10,11
Brief Description: LPCI INJECTION VALVE HV-F015B FAILS TO AUTO-OPEN / RPV FLOODING

POSITION	TIME	STUDENT ACTIVITIES
US		Plots Drywell Instrument Run Temperature and RPV Pressure on the SAT curve.
★ US (Note 1)		**Declares RPV level indication indeterminate due to violation of the RPV Saturation Curve.**
★ US (Note 2)		**Performs EO-100-114, RPV FLOODING** **Directs RPV Flooding when RPV water level becomes indeterminate by establishing RPV Flooded to Steamlines.** Verifies: • MSIVs and MSL drains closed • RCIC isolation valves HV-149-F007 and HV-149-F008 closed
★ PCOP		**Manually opens RHR F015B to inject to the RPV after identifying RHR F015B failed to auto-open.** **Performs RPV Flooding when RPV water level becomes indeterminate by establishing RPV Flooded to Steamlines.** Ensures maximum injection from Core Spray and LPCI pumps.
US		Determines RPV flooded to the Main Steam Lines.
		Records time conditions are met.
		Contacts TSC to enter EP-DS-003, RPV LEVEL DETERMINATION.
US		***After the scenario is complete, classifies the event as a SITE AREA EMERGENCY under EAL FS1 due to a Loss or Potential Loss of the Fuel Clad Barrier and a Loss of the RCS Barrier.***

★ Denotes Critical Task

NOTES:	**NOTE 1**: Fuel Zone level may decrease <-290" requiring entry into RPV Flooding.
NOTE 2: Crew must terminate Containment Sprays, if in progress, and direct all ECCS flow to the	
RPV in order to establish RPV Flooding Conditions.	

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

Event No: 10,11
Brief Description: LPCI INJECTION VALVE HV-F015B FAILS TO AUTO-OPEN / RPV FLOODING

INSTRUCTOR ACTIVITY:

When the crew has commenced RPV flooding with RHR F015B open, decrease the size of the Recirc rupture to allow achieving flooding pressure by depressing:

{Key[8]} MMF mfRR164011B r:120 i:40 f:5

ROLE PLAY:

As necessary

TERMINATION CUE:

The crew has established injection to flood the RPV to the Main Steam Lines.

EVENT CLASSIFICATION:

After the Scenario is complete, have the US classify the scenario for the HIGHEST EAL. Provide the US with any requested information needed to perform the classification.

PPL SUSQUEHANNA LLC
LEARNING CENTER

SIMULATOR SCENARIO

Scenario Title:	**ILO CERTIFICATION / NRC EXAM SCENARIO**
Scenario Duration:	**90 Minutes**
Scenario Number:	**ILO-402**
Revision/Date:	**Rev. 1; 11/14/2007**
Course:	**PC007/PC008, Initial License RO/SRO Certification Examination** **PC017/PC018, Initial License RO/SRO NRC Examination**

Operational Activities:

1. Trip of 1B Service Water Pump
2. Loss of Power to Seismic Monitor
3. Place 1C RFP In Service
4. Increase Power by Rod Withdrawal
5. Stuck Control Rod
6. 3B FW Heater Level Control Failure
7. Dual Recirc Pump Trip
8. Loss of ALL Condensate Pumps
9. Instrument Line Break Inside DW
10. HPCI Auto Start Failure
11. RHR Suction Line Leak

Prepared By:	_____ Instructor	_____ Date
Reviewed By:	_____ Nuclear Operations Training Supervisor	_____ Date
Approved By:	_____ Supervising Manager/Shift Manager	_____ Date

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SCENARIO SUMMARY

Unit 1 is 50% power EOL; Unit 2 is 100% power EOL. Power ascension is in progress on Unit 1. After the crew takes the shift, a trip of the 1B Service Water pump occurs. At this power level, the crew must take actions in the Off Normal procedure and start the 1C Service Water pump.

A few minutes later, an input power supply failure occurs on the Seismic Monitoring Panel (0C696). The crew will respond to the alarms and investigate the problem. The CRS will declare the system inoperable and take appropriate actions as stated in Technical Specifications.

Returning to power ascension, the crew will place RFP 1C in service then continue raising power by withdrawing control rods. After several rods are withdrawn, control rod 42-35 will fail to move. The crew will respond using the applicable Off Normal procedure and will eventually raise drive water differential pressure which will free the stuck rod.

After rod motion is recommenced, an instrument failure will cause a level control problem in feedwater heater 3B resulting in automatic extraction steam isolation to heater 3B. The crew will respond using the applicable Off Normal procedure requiring the manual isolation of extraction steam to feedwater heaters 4B and 5B. The Technical Specification for MCPR is impacted by the loss of extraction steam.

When the plant is stabilized, both Recirc MG drive motor breakers trip resulting from a 125 VDC breaker trip. Immediate Operator action is to place the Mode Switch to Shutdown, no other equipment is affected by the 125 VDC breaker trip. The crew will respond to the reactor scram.

When the reactor mode switch is placed in shutdown, a loss of all condensate pumps occurs resulting in a loss of feedwater injection. The crew will respond by establishing RPV level control with HPCI and RCIC. An auto start failure in the HPCI system requires a component by component startup to allow injection.

Also following the scram, an instrument line break inside the drywell will result in a loss of numerous reactor water level and pressure instruments in Division 1. Drywell pressure and temperatures will increase and require Emergency Operating Procedure entry, which will direct initiation of Suppression Chamber spray. The RHR loop chosen to initiate containment spray will experience a suction line leak and Reactor Building flooding. Entry into EO-104 will direct shutdown and isolation of the RHR system discharging into the Secondary Containment. The crew will successfully isolate the RHR leakage and perform containment sprays with the other loop of RHR. This delay in starting sprays will result in Suppression Chamber pressure exceeding 13 psig, requiring the crew to initiate drywell sprays. Containment parameters will improve following spray initiation.

The scenario will be terminated after Drywell sprays have been initiated and RPV water level is maintained +13" to +54".

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SCENARIO OBJECTIVES

The objective of this scenario is to evaluate the licensed operator candidate's ability to respond to the scenario events. These events will require each candidate to demonstrate the following:

- Knowledge of integrated plant operations
- Ability to diagnose abnormal plant conditions
- Ability to work together as a team
- Ability to mitigate plant transients that exercise their knowledge and use of ONs and EOPs
- Ability to utilize Technical Specifications (SRO Only)

To meet this objective, the licensed operator candidates must demonstrate proficiency in the following competencies:

Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings
2. Comply with and use procedures, references, and Technical Specifications
3. Operate the control boards
4. Communicate and interact with other crew members

Senior Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings
2. Comply with and use procedures and references
3. Operate the control boards (N/A to upgrade candidates)
4. Communicate and interact with the crew and other personnel
5. Direct shift operations
6. Comply with and use Technical Specifications

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CRITICAL TASKS

★ **Manually scram the Reactor due to a dual Recirc pump trip**

Safety Significance
IMMEDIATE operator actions are required to scram the reactor following a dual Recirculation Pump trip or entry into Region One of the Power/Flow Map. These actions are taken to avoid condition and potential for core flux oscillations (high reactor power/ with minimal core flow) and the threat of core damage.

Consequences of Failure to Perform the Task
Potential core damage.

In accordance with ON-164-002, Loss of Reactor Recirculation Flow, Section 5, Discussion states: "Loss of Reactor recirculation flow can be caused by the unexpected tripping of one or both Reactor Recirculation Pumps. Tripping of both pumps has the greatest impact on plant operation. At high power levels, the Main Turbine may trip automatically because of RPV water level swell and result in a Reactor scram. If the Reactor does not scram automatically following trip of both Reactor Recirculation Pumps, the reactor is immediately scrammed manually to avoid potential for core flux oscillations."

> Also, OP-AD-055, "Operations Procedure Program", Section 9 – Immediate Operator Actions has the following definition: "Actions required immediately after the start of an event to stop the degradation of and mitigate the consequences of conditions that threaten fuel, RPV, or primary containment...." Attachment C lists a trip of both Recirculation Pumps as an event requiring an immediate reactor scram.

From Appendix D of NUREG-1021, Draft Revision 9, the critical task listed above has essential safety action that correctly completed, will prevent "a significant reduction of safety margin beyond that irreparably introduced by the scenario" and the crew will take "one or more actions that would prevent a challenge to plant safety."

Indications/Cues for the Event Requiring Critical Task
The PCO will receive multiple alarms on 1C651 for the dual Recirc Pump trip as well as digital and analog indication of loss of flow in both loops.

Indication of operation in a controlled region of the Power/Flow Map occurs after a Reactor Recirc system transient affecting flow and the operating crew manually plots a position on the Map.

Performance Criteria
Place the Reactor Mode Switch in "Shutdown".

Performance Feedback
Rods inserted
Power lowering

CRITICAL TASKS

★ **Initiate Drywell sprays when Suppression Chamber pressure exceeds 13 psig**

Safety Significance
Maintenance of primary containment integrity.

Actions are taken to spray the Drywell during a LOCA when the Suppression Chamber pressure exceeds 13 psig. From the Susquehanna Emergency Operating Procedures basis document, EO-000-103, "The value of 13 psig is the lowest suppression chamber pressure which can occur when 95% of the non-condensables (Nitrogen) in the drywell have been transferred to the suppression chamber." At 13 psig suppression chamber pressure, 5% of the non-condensables remain in the drywell. This 5% value is the limit established to preclude "chugging" – the cyclic condensation of steam at the downcomer openings of the drywell vents. Values in excess of 13 psig are indicative of more non-condensables in the drywell; meaning chugging is more probable.

Chugging (steam bubble collapse at the downcomer exit resulting in a water in-rush to fill the voided areas) induces stresses at the junction of the downcomers and the drywell floor. Repeated such stresses may result in failure of these joints, creating a direct bypass from drywell to suppression chamber. Bypassing the suppression pool will directly pressurize the primary containment during a LOCA may result in failure.

By requiring drywell sprays at 13 psig in the suppression chamber (5% non-condensables in the drywell), a drywell non-condensable value of >1% will be maintained and chugging should not occur.

From Appendix D of NUREG-1021, Draft Revision 9, the critical task listed above has essential safety action that correctly completed, will prevent "degradation of any barrier to fission product release" and the crew will take action to "effectively direct or manipulate engineered safety feature (ESF) controls that would prevent any condition describe in the previous paragraph."

Consequences of Failure to Perform the Task
Potential failure of primary containment.

SSES EOP Basis for:

PC/P-5 **WHEN** SUPP CHMBR PRESS **> 13 PSIG**
CONTINUE
[Directions to initiate drywell sprays]

Drywell spray operation may affect the availability of electrical equipment located in the drywell. Therefore, suppression chamber sprays are given the maximum time allowable to reduce primary containment pressure before operation of drywell sprays is required. The allowable time is determined by the suppression chamber pressure which is equated to the amount of non-condensables remaining in the drywell.

CRITICAL TASKS

The value of 13 psig is the lowest suppression chamber pressure which can occur when 95% of the non-condensables (N_2) in the drywell have been transferred to the suppression chamber. That is, at least 5% non-condensables remain in the drywell when suppression chamber pressure reaches 13 psig. This non-condensable concentration limit is established to preclude chugging - the *cyclic condensation of steam at the downcomer openings of the drywell vents. A suppression chamber pressure greater than 13 psig could be indicative of a lower concentration of non-condensables in the drywell, thereby meaning that chugging is more probable.*

Chugging occurs when a steam bubble collapses at the exit of the downcomers; the rush of water drawn into the downcomers to fill the void induces stresses at the junction of the downcomers and the drywell floor. Repeated occurrence of such stresses could cause fatigue failure of these joints, thereby creating a direct path between the drywell and suppression chamber. Steam discharged through the downcomers could then bypass the suppression pool and directly pressurize the primary containment. Scale model tests have demonstrated that chugging will not occur so long as the drywell contains at least 1% non-condensables. To preclude conditions under which chugging may occur, drywell sprays are conservatively required when at least 5% non-condensables remain in the drywell, i.e., suppression chamber pressure reaches 13 psig.

Both wide range and narrow range suppression chamber pressure indication is available in the control room. Wide range suppression chamber pressure indication is available locally on Containment H_2/O_2 Analyzer Panel if analyzer is selected to suppression chamber.

Indications/Cues for the Event Requiring Critical Task
Multiple control board and control room indications of suppression chamber and drywell pressures.

Performance Criteria
Start an operable RHR loop
Perform a valve alignment to provide a flowpath for spray.

Performance Feedback
RHR pump, valve, and system flow indications are available.
Multiple indications of Drywell pressure dropping

CRITICAL TASKS

★ **Limit Drywell spray flow to between 1000 and 2800 gpm for the first 30 seconds**

Safety Significance
Maintenance of primary containment integrity.

Actions are taken to limit the system flowrates when first initiating drywell sprays (1000 to 2800 gpm for the first 30 seconds). The reason for this restriction is to limit the magnitude of the drywell pressure reduction such that it will not go less than atmospheric (prevents air from being drawn in to containment) and ensures a margin to the negative design pressure of the containment.

The BWR Owners Group Emergency Operating Procedures Basis document discusses drywell spray limitations utilizing a Drywell Spray Initiation Limit Curve to protect against containment damage from exceeding the design drywell to suppression chamber differential pressure. From the Susquehanna Emergency Operating Procedures basis document, EO-000-103, "A drywell spray initiation limit has been developed by PPL" which provides the same protection guarantees without necessitating the use of an additional curve on the EOP flowcharts. "By limiting drywell spray flow to between 1000 and 2800 gpm for the first 30 seconds of drywell spray operation, drywell sprays can be initiated without concern" in all regions of the BWR Owners Group curve. "After 30 seconds of operation, the drywell atmosphere contains sufficient vapor to allow full drywell spray flow." In other words, spraying the drywell within these limits will not result in a drywell pressure rapid reduction such that the differential pressure limit would be challenged.

From Appendix D of NUREG-1021, Draft Revision 9, the critical task listed above has essential safety action that correctly completed, will prevent "degradation of any barrier to fission product release" and the crew will take action to "effectively direct or manipulate engineered safety feature (ESF) controls that would prevent any condition describe in the previous paragraph."

Consequences of Failure to Perform the Task
Potential failure of primary containment.

SSES EOP Basis for:

PC/P-7
SHUT DOWN DW COOLERS
SHUT DOWN RECIRC PUMPS
INITIATE DW SPRAYS
UNLESS PUMPS CONTINUOUSLY NEEDED
FOR ADEQUATE CORE COOLING
LIMITING FLOW TO BETWEEN **1000** AND **2800 GPM**
FOR FIRST **30 SEC**

CRITICAL TASKS

A DWSIL (Drywell Spray Initiation Limit) has been developed by PP&L which provides protection against containment damage from exceeding the design differential pressure, yet does not restrict operation of the drywell sprays. By limiting drywell spray flow to between 1000 and 2800 gpm for the first 30 seconds of drywell spray operation, drywell sprays can be initiated without concern in all regions of this curve. After 30 seconds, the drywell atmosphere contains sufficient vapor to allow full drywell sprays flow. For this reason, the curve is not included.

Indications/Cues for the Event Requiring Critical Task
The Unit Supervisor will direct drywell sprays be initiated, limiting flow to between 1000 and 2800 gpm for the first 30 seconds. The PCO will initiate drywell sprays monitoring the flowrate on available digital and analog indications on 1C601, limiting flow to between 1000 and 2800 gpm for at least the first 30 seconds of operation before increasing flow.

Performance Criteria
Manually throttle HV151-F016A and B and monitor drywell spray
Use clock to determine 30 seconds has elapsed

Performance Feedback
Monitor Drywell spray flow indications during first 30 seconds of drywell spray operation

★ Denotes Simulator Team Critical Task

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SCENARIO REFERENCES

1. TRIP OF SERVICE WATER PUMP
   - AR-123-A03 SERVICE WATER PUMP B TRIP
   - AR-123-A04 SERVICE WATER PUMP B MOTOR OVERCURRENT
   - ON-111-001 LOSS OF SERVICE WATER
   - OP-111-001 SERVICE WATER SYSTEM

2. LOSS OF POWER TO SEISMIC MONITORING PANEL
   - AR-016-H06 SEISMIC MON PANEL 0C696 SYSTEM TROUBLE
   - TRM 3.3.2 SEISMIC MONITORING INSTRUMENTATION

3. PLACE 1C RFP IN SERVICE
   - GO-100-002 PLANT STARTUP, HEATUP AND POWER OPERATION
   - OP-145-001 RFP AND RFP LUBE OIL SYSTEM
   - OP-145-002 HYDROGEN WATER CHEMISTRY

4. INCREASE POWER BY ROD WITHDRAWAL / STUCK CONTROL ROD
   CORE REACTIVITY CONTROL BOOK
   - OP-AD-338 COMMUNICATION REQUIREMENTS FOR REACTIVITY MANIPULATIONS
   - SO-156-007 CONTROL ROD COUPLING / FULL IN INDICATOR CHECKS
   - ON-155-001 CONTROL ROD PROBLEMS

5. 3B FW HEATER LEVEL CONTROL FAILURE
   - AR-120-H07 FW LOOP B PANEL 1C102 TROUBLE
   - AR-120-D07 FW HTR STRING B DUMP VLV OPEN
   - ON-147-001 LOSS OF FEEDWATER HEATING EXTRACTION STEAM
   - TS 3.2.2 MCPR

6. DUAL REACTOR RECIRC PUMP TRIP / LOSS OF ALL CONDENSATE PUMPS
   - AR-102-B02 RECIRC MG A DRIVE MTR TRIP
   - AR-102-B05 RECIRC MG B DRIVE MTR TRIP
   - OP-AD-055 OPERATIONS PROCEDURE PROGRAM
   - ON-164-002 LOSS OF REACTOR RECIRCULATION FLOW
   - ON-100-101 SCRAM, SCRAM IMMINENT
   - EO-000-102 RPV CONTROL

7. INSTRUMENT LINE BREAK INSIDE DRYWELL / HPCI AUTO START FAILURE
   - EO-000-103 PRIMARY CONTAINMENT CONTROL
   - OP-116-001 RHR SERVICE WATER
   - OP-149-004 RHR CONTAINMENT SPRAY
   - OP-152-001 HPCI SYSTEM

8. RHR SUCTION LINE BREAK
   - AR-109-H08 RHR LOOP A PUMP ROOM FLOODED
   - AR-113-H08 RHR LOOP B PUMP ROOM FLOODED
   - ON-169-002 FLOODING IN REACTOR BUILDING
   - EO-000-104 SECONDARY CONTAINMENT CONTROL

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SCENARIO SPECIAL INSTRUCTIONS

1. Initialize to **IC-378.**

2. Load SCN file **SCN_ILO-402**; verify the following pre-inserts and Key assignments. **Verify the Environment Window:**

MF	RF	OR	SCN	ET	Conditions
6 : 6	0	3:3	0	2:0	11

IMF mfRD1550064235 i:42 f:42
IMF mfRD1550204235
IMF cmfRL01_E411K2
cmfBR04 1A10113
cmfBR04 1A10213
aet ETILO402A
aet ETILO402B
{Key [10]} cmfPM03_1P502B
{Key[1]} DMF mfRD1550064235
{Key[2]} SCN BATCH1\FWB_ILO-402A
{Key[3]} IRF rfDC102140 f:OPEN
{Key[4]} SCN BATCH1\RRB_ILO-402B
{Key[5]} IMF mfRH149004A f:10
{Key[6]} IMF mfRH149004B f:10
{Key[7]} IOR diSW1RSA50 f:OFF
{Key[23]} SCN BATCH1\FWB_101ALARM
{Key[24]} SCN BATCH1\FWB_102ALARM
{Key[25]} SCN BATCH1\FWB_103ALARM

3. Verify VENTURI is selected as the Feedwater flow input to PICSY IAW OI-TA-021.

4. Prepare a turnover sheet indicating:
   a. Unit 1 is at 50% power; Unit 2 is in MODE 1 at 100% power EOL.
   b. Using A2 Startup Sequence at step 483.
   c. Power ascension is suspended while BOP equipment is placed into service.
   d. Place 1C RFP in service IAW GO-100-002 step 5.78.3, continue with rod withdrawal to 75% power.

5. Ensure the A2SU Sequence CRC Book is placed in the simulator; remove the A2SD.

6. Copy GO-100-002 completed up to step 5.78.3. Sign off applicable confirmation for the following steps.

7. Copy SO-156-007 signed off to support rod withdrawal starting at step 483. Prepare a surveillance coversheet.

8. Copy OP-145-001 signed off showing '1C' RFP warmed and on min-flow.

9. Make a copy of shift assignments.

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SCENARIO EVENT DESCRIPTION FORM

Initial Conditions: Initialize the Simulator to **IC-378**. Place the Simulator to RUN. Ensure the Keys are assigned as indicated on the Special Instructions sheet via the appropriate SCN File. Assign shift positions; direct the start of the 5-minute panel walkdown.

EVENT	TIME	DESCRIPTION
1		TRIP OF 1B SERVICE WATER PUMP
2		LOSS OF POWER TO SEISMIC MONITORING PANEL
3		PLACE 1C RFP IN SERVICE
4		INCREASE POWER BY ROD WITHDRAWAL
5		STUCK CONTROL ROD
6		3B FW HEATER LEVEL CONTROL FAILURE
7		DUAL REACTOR RECIRC PUMP TRIP
8		LOSS OF ALL CONDENSATE PUMPS
9		INSTRUMENT LINE BREAK INSIDE DRYWELL
10		HPCI AUTO START FAILURE
11		RHR SUCTION LINE BREAK

SCENARIO EVENT FORM

Event No: 1
Brief Description: TRIP OF 1B SERVICE WATER PUMP

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Acknowledges and reports AR-123-A03 SERVICE WATER PUMP TRIP and AR-123-A04 SERVICE WATER PUMP B MOTOR OVERCURRENT.
		Monitors and reports Service Water Header pressure.
US		Recognizes Off Normal condition and enters ON-111-001 LOSS OF SERVICE WATER.
		Assesses plant conditions and the need to start the second Service Water pump. Directs starting the 1C Service Water pump.
PCOP		Starts the 1C Service Water Pump in accordance with OP-111-001 Service Water System. 1) Transfers the 1C breaker to the opposite 13.8 kV Aux Bus. 2) Performs a normal manual start of the 1C SW pump IAW OP section.

★ Denotes Critical Task

NOTES:	

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

Event No: 1
Brief Description: TRIP OF 1B SERVICE WATER PUMP

INSTRUCTOR ACTIVITY:

After the crew has assumed the shift, insert a trip of the running 1B Service Water Pump. Activate:

{Key[10] cmfPM03_1P502B 'B' SW Pump

ROLE PLAY:

1. If dispatched as NPO to check the status of 1B pump breaker, report the 50/51 flags are tripped on the breaker and you smell an acrid electrical odor.

2. Role play as NPO as necessary to support the pump start IAW OP-111-001.
3.
4. When contacted, role play as WWM and FIN Electrical and state you will investigate the problem and report back as soon as possible.

SCENARIO EVENT FORM

Event No: 2
Brief Description: LOSS OF POWER TO SEISMIC MONITORING PANEL

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Acknowledges/responds to AR-016-H06, SEISMIC MON PANEL 0C696 SYSTEM TROUBLE.
		Checks 0C696 to determine status of the Seismic Monitor, recognizes/reports VR-05703 status light is green.
		May dispatch NPO to check breakers 1Y629016 and 0Y50002.
US		Contacts I&C/Electrical Maintenance to trouble-shoot the failure.
		Declares Seismic Monitoring System inoperable and consults TRO 3.3.2; performs action a; (30 day Dual Unit TRO).

★ Denotes Critical Task

NOTES:	

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

Event No: 2
Brief Description: LOSS OF POWER TO SEISMIC MONITORING PANEL

INSTRUCTOR ACTIVITY:

Initiate power failure of the Seismic Monitoring Panel:

{Key[7]} IOR diSW1RSA50 f:OFF RSA50 Power Off

ROLE PLAY:

1. If dispatched as NPO to check the status of breakers 1Y629016 and 0Y50002, wait ~2 minutes and report that both breakers have been checked-closed.

2. As I&C dispatched to investigate the Seismic Monitoring Panel failure, wait ~3 minutes and report that the fault is internal to the Monitor and is most likely a failure of the power supply feeding the RSA50 portion of the system/cabinet. The problem will require additional troubleshooting. You will provide a repair strategy and time estimate when available.

SCENARIO EVENT FORM

Event No: 3
Brief Description: PLACE 1C RFP IN SERVICE

POSITION	TIME	STUDENT ACTIVITIES
US		Directs implementation of OP-145-001, RFP AND RFP LUBE OIL SYSTEM.
PCOM		Implements OP-145-001, RFP AND RFP LUBE OIL SYSTEM: 1. Verifies RFP discharge pressure 50-100 psig below Reactor pressure. 2. Maintains RFP minimum flow on FI-10604C greater than minimum flow setpoint FI-10612C by manually throttling FIC-10604C. 3. Verifies RFP C discharge temperature is approximately equal to RFP A & B discharge temperatures on TR-10608. 4. Directs Plant Operator to align Hydrogen Water Chemistry System for placing C RFP in service IAW OP-145-002, HYDROGEN WATER CHEMISTRY. 5. Raises RFP speed using SIC-C32-1R601C until injection flow just begins. 6. Slowly reduces RFP C minimum flow by depressing CLOSE button on FIC-10604C while observing: • RFP C minimum flow decreasing. • RFP C discharge flow increasing. • RFP A & B discharge flow decreasing to match RFP C flow increase. 7. CLOSES minimum flow valve. 8. Matches RFP C output meter (horizontal) with the demand meter (vertical) by adjusting SIC-C32-1R601C. 9. Places RFP C SIC-C32-1R601C to AUTO. 10. Adjusts RFP A & B flows using bias thumbwheel until discharge flows on 3 RFPs are approximately equal. 11. Places FIC-10604C in AUTO when discharge flow is > 1.5 mlbm/hr. 12. Directs Plant Operator to close 106155, RFP C OB Seal Drain Ctl Vlv Bypass. 13. Directs STA to select LEFM in PICSY for calculation of Core Thermal Power.
		Directs Plant Operator to establish automatic flow balancing for condensate filters.

★ Denotes Critical Task

NOTES:	

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

Event No: 3
Brief Description: PLACE 1C RFP IN SERVICE

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

1. As Plant Operator sent to align HWC System for placing RFP 1C in service, wait ~5 minutes and report HWC System is aligned to support placing RFP 1C is service. (OP-145-002, flow is reduced to ~3 until RFP placed in service then ramped back to ~38 SCFH.)

2. As Plant Operator sent to close 106155, wait 2 minutes and report 106155 is closed.

3. As STA directed to select LEFM in PICSY for calculation of core thermal power acknowledge the direction and select LEFM as the Feedwater flow input as follows (OI-TA-021):

   - Type LEFMP in the Turn-On Code (TOC) field and press ENTER
   - Type FWFETOGL in the TOC field and press ENTER
   - Type Y at the prompt and press ENTER
   - Ensure the LEFMP status screen changes to indicate LEFM as the feedwater flow input signal

4. As Plant Operator directed to establish automatic flow balancing for the condensate filters, acknowledge the direction and take no further action.

SCENARIO EVENT FORM

Event No: 4
Brief Description: INCREASE POWER BY ROD WITHDRAWAL

POSITION	TIME	STUDENT ACTIVITIES
US		Conducts Reactivity Manipulation Briefing for the upcoming power increase.
		Directs the power increase.
		Directs implementation of Reactor Engineer Instructions in the CRC Book.
		Directs implementation of GO-100-002, PLANT STARTUP, HEATUP AND POWER OPERATION.
PCOM		Increases reactor power as directed by the US and CRC Book.
		Plots power change on the power-to-flow map.
		Maintains LOAD SET ~100 MWe above existing load.
PCOP		Notifies GCC before the power increase begins.
PCOM		Recognizes and reports control rod 42-35 failed to move after a withdraw command.
US		Directs implementation of ON-155-001, CONTROL ROD PROBLEMS.
		Notifies Reactor Engineering.

★ Denotes Critical Task

NOTES:	

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

Event No: 4
Brief Description: INCREASE POWER BY ROD WITHDRAWAL

INSTRUCTOR ACTIVITY:

As necessary

NOTE: Stuck rod **42-35** is a pre-inserted malfunction.

ROLE PLAY:

As Reactor Engineer notified about stuck rod 42-35, acknowledge the condition and state no further notification is necessary if the rod moves during implementation of procedure actions.

SCENARIO EVENT FORM

Event No: 5
Brief Description: STUCK CONTROL ROD

POSITION	TIME	STUDENT ACTIVITIES
PCOM		From ON-155-001: 1. Confirms rod position using any 3 of the following: • CRT and SIP 4 ROD DISPLAY • FULL-IN/FULL-OUT DISPLAY pushbutton • OD-7 (RWM) • Alarm Logger System Event Display (SED) 2. Depresses withdraw rod pushbutton and simultaneously momentarily depresses the continuous insert pushbutton. Releases continuous insert pushbutton and checks for single notch withdrawal. 3. Confirms rod position again using available rod position indications – determines no movement. 4. Attempts to move control rod as follows: • Completes rod data on Attachment A. • Increases drive water pressure in 50 psid increments. • Withdraws rod one notch while observing drive water flow. • If no rod motion, depresses withdraw pushbutton and simultaneously momentarily depresses the continuous insert pushbutton. • Releases continuous insert pushbutton and checks for single notch withdrawal. • Repeats above steps until a maximum of 350 psid is reached. 5. Records drive water pressure and flow required to move rod. 6. Returns drive water pressure to ~250 psid.
		With US concurrence, continues power increase by rod withdrawal.

★ Denotes Critical Task

NOTES:	

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

Event No: 5
Brief Description: STUCK CONTROL ROD

INSTRUCTOR ACTIVITY:

When Drive Water pressure is increased above 330 psid, verify trigger fires to delete the stuck rod malfunction.

OR

After the ON-155-001 actions are implemented to raise drive water d/p to >330 psid, permit continued rod movement; **activate Key1:**

{Key[1]} DMF mfRD1550064235

Monitor CRD parameters on **RD3**.

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 6
Brief Description: 3B FW HEATER LEVEL CONTROL FAILURE

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Responds to FW LOOP B PANEL 1C102 TROUBLE alarm IAW AR-102-H07.
		Responds to FW HTR STRING B DUMP VALVE OPEN alarm IAW AR-102-D07.
		Reports HTR 3B LP EXTR ISO HV-10240B is closing.
		Checks heater levels on 1C668b and determines FW HTR 103B and 104B have high level indication.
		Dispatches a Plant Operator to 1C102 to investigate heater problem.
US		Directs implementation of ON-147-001, LOSS OF FEEDWATER HEATING EXTRACTION STEAM.
PCOM		Plots position on power to flow map.
US		Refers to TS 3.2.2 (restore MCPR to within limits within 2 hours).
		Notifies Reactor Engineering.
		Contacts Work Week Manager about FW HTR level control problem.
PCOP		Implements ON-147-001, LOSS OF FEEDWATER HEATING EXTRACTION STEAM. 1. Notifies PCOM to be aware of lower feedwater temperatures. 2. Closes MSEP A DRN TO HTR 4B HV-10213B. 3. Closes MSEP B DRN TO HTR 4B HV-10216B. 4. Closes HTR 4B LP EXTR ISO HV-10241B. 5. Closes HTR 5B HP EXTR ISO HV-10242B.
		Directs Plant Operator to check normal and emergency drain from heater 3B OPEN and drain inlet from heater 4B CLOSED.
PCOM		Monitors reactor power as feedwater heating is reduced.
US		Recognizes requirement to isolate feedwater heater string B if feedwater heating not restored within 2 hours.

★ Denotes Critical Task

NOTES:	

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

Event No: 6
Brief Description: 3B FW HEATER LEVEL CONTROL FAILURE

INSTRUCTOR ACTIVITY:

After actions for stuck rod are complete and the rod is being moved to its bank position, insert a loss of extraction steam to heater 3B:

{Key[2]} SCN BATCH1\FWB_ILO-402A

NOTE: Heater 3B extraction steam isolates in ~3.5 minutes.
Monitor **1C102** for heater alarms and indications.

ROLE PLAY:

1. As Plant Operator sent to 1C102 wait ~1 minute and report you have:
   HTR 3B & 4B HI LEVEL ALARMS
   HTR 4B DUMP VALVE NOT 100% CLOSED ALARM
   HTR 4B level is controlling on the dump valve

   Monitor FWHTR status on **FW20**.

2. As Plant Operator sent to determine valve status at 1C102 on heater string B, report the normal and emergency drain valves status as shown on **FW20**.

3. As Reactor Engineer, report you will run a thermal limits report and notify the Control Room of the results.

SCENARIO EVENT FORM

Event No: 7,8
Brief Description: DUAL RRP TRIP / LOSS OF ALL CONDENSATE PUMPS

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports Recirc MG A & B Drive Motor Trip.
★ PCOM		**Places Reactor mode switch to SHUTDOWN due to a dual Recirc pump trip.**
NOTE 1		Performs actions of ON-100-101, SCRAM: 1. Reports all control rods are fully inserted. 2. Inserts SRMs and IRMs.
		Reports loss of Condensate and Feedwater pumps.
★ US		**Directs Reactor mode switch to SHUTDOWN due to a dual Recirc pump trip.**
		Enters EO-000-102, RPV CONTROL.
		Directs implementation of ON-100-101, SCRAM.
		Directs a panel walkdown for Isolations, ECCS Initiations, and D/G Starts.
		Directs RPV level restored and maintained +13" to +54" with HPCI and RCIC.
		Directs RPV pressure stabilized <1087 psig with Bypass Valves.
NOTE 2		Refers to ON-164-002, LOSS OF REACTOR RECIRCULATION FLOW.
PCOP		Performs panel walkdown and reports status of Isolations, ECCS Initiations and D/G starts.

★ Denotes Critical Task

NOTES:	(1) This is an Immediate Operator Action from OP-AD-055.
(2) The only action in this ON for a trip of both Recirc pumps is to immediately scram the reactor.	

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

Event No: 7,8
Brief Description: DUAL RRP TRIP / LOSS OF ALL CONDENSATE PUMPS

INSTRUCTOR ACTIVITY:

1. When actions are complete for loss of Seismic Panel power failure, insert a dual Reactor Recirc pump trip:

   {Key[3]} IRF rfDC102140 f:OPEN

2. When the Mode Switch is placed to Shutdown verify trigger activates a trip of all condensate pumps.

3. When EO-102 is entered, insert an instrument line break inside the drywell:

   {Key[4]} SCN BATCH1\RRB_ILO-402B

ROLE PLAY:

1. As Plant Operator sent to Recirc MG A & B drive motor breakers, wait ~2 minutes and report breaker 1A10110 and 1A10210 are tripped and there are no flags for any protective relays.

SCENARIO EVENT FORM

Event No: 9,10
Brief Description: INSTRUMENT LINE BREAK INSIDE DRYWELL / HPCI AUTO START FAILURE

POSITION	TIME	STUDENT ACTIVITIES
US		Contacts Work Week Manager concerning Recirc MG A & B drive motor breaker trips.
		Contacts Work Week Manager concerning loss of all condensate pumps.
PCOP		Reports HPCI auto start failure.
		Performs HPCI component by component startup IAW OP-152-001, HPCI SYSTEM, Attachment A: 1. Places Flow Controller FC-E41-1R600 in MANUAL, set to minimum 2. Opens cooling water valve HV-156-F059 3. Starts barometric condenser vacuum pump 1P216 4. Simultaneously starts HPCI auxiliary oil pump 1P213 and opens steam supply valve HV-155-F001 5. Accelerates HPCI turbine with FC-E41-1R600 until HPCI pump discharge header pressure is within 50 psig of Reactor pressure 6. Opens HPCI injection valve HV-155-F006 7. Establishes flow to the Reactor; transfers FC-E41-1R600 to AUTO 8. Ensures: • Steam line drain valves HV-155-F028 and HV-155-F029 close • Barometric condenser condensate pump discharge valve HV-155-F026 closes • HPCI pump room unit cooler 1V209A(B) starts
		Controls HPCI injection to restore and maintain RPV water level +13" to +54".
PCOM/P		Reports drywell pressure and temperature rising.
		Reports loss of Division 1 level and pressure indicators.
		Verifies RPV level using redundant level indicators.
US		Enters EO-000-103, PRIMARY CONTAINMENT CONTROL, when drywell pressure exceeds 1.72 psig.

★ Denotes Critical Task

NOTES:	

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

Event No: 9,10
Brief Description: INSTRUMENT LINE BREAK INSIDE DRYWELL / HPCI AUTO START FAILURE

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

1. As WWM sent to investigate the Recirc MG A & B drive motor breaker trip, wait ~10 minutes and report a trip signal from RPT breakers 3A (20501) and 3B (20601) is present. "We will continue to investigate."

2. As WWM sent to investigate the Condensate pumps, wait ~10 minutes and report a trip signal is present from the Plant Aux Load Shed circuit—further trouble shooting is required. "When anything new develops we will notify you in the control room."

SCENARIO EVENT FORM

Event No: 10,11
Brief Description: INSTRUMENT LINE BREAK INSIDE DRYWELL / RHR SUCTION LINE BREAK

POSITION	TIME	STUDENT ACTIVITIES
US		Re-enters EO-000-102 when drywell pressure exceeds 1.72 psig.
		Directs Suppression Chamber sprays placed in service.
PCOP NOTE		Places one loop of RHR in Suppression Chamber Spray IAW OP-149-004, RHR CONTAINMENT SPRAY. 1. Ensures ESW in service. 2. Places LOCA OVERRIDE MANUAL OVERRIDE switch to OVERRIDE. 3. Closes LPCI injection valve HV-151-F017A(B). 4. Opens Suppression Chamber test valve HV-151-F028A(B). 5. Starts RHR pump 1P202A(B)(C)(D). 6. Throttles open Suppression Chamber spray valve HV-151-F027A(B) to maintain ≤ 500 gpm as indicated on FI-15120A(B). 7. Places RHRSW in service to RHR heat exchanger A (B).
		Reports RHR LOOP A(B) ROOM FLOODED alarm; refers to AR-109(111)-H08.
		Verifies Suppression Pool level dropping.
		Dispatches Plant Operator to investigate room flooding.
US		Enters EO-000-104, SECONDARY CONTAINMENT CONTROL.
		Enters ON-169-002, FLOODING IN REACTOR BUILDING.
		Directs isolating RHR System discharging into the Secondary Containment (before violating the HCTL or PSL curves).
		Directs start of ESW and unit coolers with a cooling source.
		Re-enters EO-000-103, PRIMARY CONTAINMENT CONTROL, when (if) Suppression Pool level drops to <22'.

★ Denotes Critical Task

NOTES:	The RHR suction break will occur on whichever RHR loop is initially started for sprays.

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

Event No: 10,11
Brief Description: INSTRUMENT LINE BREAK INSIDE DRYWELL / RHR SUCTION LINE BREAK

INSTRUCTOR ACTIVITY:

Whichever loop of RHR is chosen to initiate sprays will incur a failure. Monitor for the loop chosen to insert the correct failure below.

1. If the '1A' loop of RHR is placed in service, after either A or C pump is started, initiate suction line break:

   {Key[5]} IMF mfRH149004A f:10

2. If the '1B' loop of RHR is placed in service; after either B or D pump is started, initiate suction line break:

   {Key[6]} IMF mfRH149004B f:10

   Monitor on **RH1** (A&C loops) and **RH2** (B&D loops).

ROLE PLAY:

As NPO dispatched to investigate RHR/CS pump rooms, wait ~2 minutes and report you are unable to enter either RHR room because something is blocking the door; you hear a loud noise like water rushing into the room. If asked, report you are unable to determine water levels in the rooms.

SCENARIO EVENT FORM

Event No: 11
Brief Description: RHR SUCTION LINE BREAK

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Isolates RHR System discharging into the Secondary Containment before violating the HCTL or PSL curves): 1. Stops RHR pump A(B)(C)(D). 2. Closes RHR pump suction valve HV-151-F004A(B)(C)(D). 3. Reports Suppression Pool level has stopped dropping.
		Starts ESW and unit coolers with a cooling source.
US		Directs other loop of RHR placed in Suppression Chamber sprays.
PCOP		Places one loop of RHR in Suppression Chamber spray IAW OP-149-004, RHR CONTAINMENT SPRAY. 1. Ensures ESW in service. 2. Places LOCA OVERRIDE MANUAL OVERRIDE switch to OVERRIDE. 3. Closes LPCI injection valve HV-151-F017A(B). 4. Opens Suppression Chamber test valve HV-151-F028A(B). 5. Starts RHR pump 1P202A(B)(C)(D). 6. Throttles open Suppression Chamber spray valve HV-151-F027A(B) to maintain ≤ 500 gpm as indicated on FI-15120A(B). 7. Places RHRSW in service to RHR heat exchanger A (B).
★ US		**Directs initiating Drywell sprays when Suppression Chamber pressure > 13 psig.** 1. Directs shutting down Drywell coolers (as necessary). 2. Directs shutting down Recirc pumps (as necessary). **Directs limiting Drywell spray flow to between 1000 and 2800 gpm for the first 30 seconds.**

★ Denotes Critical Task

NOTES:	

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

Event No: 11
Brief Description: RHR SUCTION LINE BREAK

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 8,10
Brief Description: INSTRUMENT LINE BREAK INSIDE DRYWELL / RHR SUCTION LINE BREAK

POSITION	TIME	STUDENT ACTIVITIES
★ PCOP		**Initiates Drywell sprays IAW OP-149-004, RHR CONTAINMENT SPRAY.** 1. Places LOCA OVERRIDE MANUAL OVERRIDE switch to OVERRIDE. 2. Closes LPCI injection valve HV-151-F017A(B). 3. Starts RHR pump 1P202A(B)(C)(D). 4. Opens Drywell spray inboard isolation valve HV-151-F021A(B). **Limits Drywell spray flow to between 1000 and 2800 gpm for the first 30 seconds.** 5. Throttles open Drywell spray outboard isolation valve HV-151-F016A(B) to establish a flowrate between 1000 and 2800 gpm for the first 30 seconds as indicated on FI-15120A(B). 6. After 30 seconds, throttles open HV-151-F016A(B) to establish ≤ 10,000 gpm as indicated on FI-15120A(B). 7. Places RHRSW in service to RHR heat exchanger A (B).
US		***After the scenario is complete, determines TS 3.5.1 RA E.1 (restore HPCI to OPERABLE status within 72 hours) OR E.2 (restore RHR to OPERABLE status within 72 hours) is applicable due to the failure of HPCI to automatically initiate along with the failure of RHR Loop A (B).***
US		***After the scenario is complete, classifies the event as an UNUSUAL EVENT under EAL OU3 due to flooding that exceeds the maximum normal water level in RHR Pump Room A (B).***

★ Denotes Critical Task

NOTES:	

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

Event No: 8,10
Brief Description: INSTRUMENT LINE BREAK INSIDE DRYWELL / RHR SUCTION LINE BREAK

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

As necessary

TERMINATION CUE:

Drywell sprays have been initiated and RPV water level is being maintained +13" to +54".

TECHNICAL SPECIFICATION DETERMINATION:

After the scenario is complete, have the US determine any Technical Specification requirements due to the failure of A (B) RHR Loop.

EVENT CLASSIFICATION:

After the Scenario is complete, have the US classify the scenario for the HIGHEST EAL. Provide the US with any requested information needed to perform the classification.

PPL SUSQUEHANNA, LLC
LEARNING CENTER

SIMULATOR SCENARIO

Scenario Title:	ILO CERTIFICATION/NRC EXAM SCENARIO
Scenario Duration:	60 Minutes
Scenario Number:	ILO-302A
Revision/Date:	Rev. 4, 10/25/07
Course:	PC007/PC008, Initial License RO/SRO Certification Examination PC017/PC018, Initial License RO/SRO NRC Examination

Operational Activities:

1. Loss of SGTS Fan during Venting
2. Shutdown 1B Condensate Pump
3. Cond Min Flow Recirc Valve Failure
4. A NR Level Instrument Fails Upscale
5. Fuel Clad Failure
6. RPS A Failure to Trip
7. D MSL Failure to Isolate
8. MSL Leak in Turbine Building
9. Radioactivity Release
10. Rapid Depressurization

Prepared By:	_____ Instructor	_____ Date
Reviewed By:	_____ Nuclear Operations Training Supervisor	_____ Date
Approved By:	_____ Supervising Manager/Shift Manager	_____ Date

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SCENARIO SUMMARY

The scenario begins with Unit 1 at approximately 74 percent power EOL and Unit 2 in MODE 4. 1B CRD Pump is out of service for breaker maintenance. Condensate Pump 1B has a possible ground; the crew will be required to shut down Condensate Pump 1B for inspection. The A SGTS train is in service to vent the Unit 1 Suppression Chamber; the crew will also be directed to terminate the ventilation lineup.

Shortly after the crew assumes the shift, the A SGTS fan will fail and will eventually trip. The crew will address the loss of SGTS using appropriate alarm response procedures and will evaluate Technical Specifications for the failure. Since only one train of SGTS is operable, the crew must secure the ventilation lineup per the OP.

When the crew has restored the venting lineup, their attentions will be directed to shutting down the 1B Condensate pump for maintenance. Following the shutdown of the pump, the crew will recognize the Condensate Pump minimum flow recirc valve failed open and will manually close the valve to maintain proper condensate pump header pressure/RFP suction pressure.

Following the shutdown of 1B Condensate Pump the 'A' Narrow Range Level instrument will fail upscale. Feedwater level control system response will stabilize RPV water level at ≈ +23 inches in automatic. The crew will implement an Off-Normal Procedure to transfer RPV water level control from averaged level control to selected level control and return RPV water level control to automatic.

Following the water level perturbation a fuel clad failure will result in Turbine Building area high radiation and increasing main steam line radiation. The crew will respond by decreasing Reactor power. Radiation levels will continue to rise requiring the crew to manually scram the Reactor and manually close the MSIVs and MSL drains. When the mode switch is placed to shutdown a failure to scram will occur when RPS 'A' fails to trip. The control rods will insert when the crew initiates ARI.

Following the scram a main steam line break will occur in the Turbine Building Steam Tunnel. The 'D' MSL fails to isolate resulting in a sustained release to the Turbine Building. Release rates from the Turbine Building Vent Stack will increase above the ALERT level requiring entry into Radioactive Release Emergency Operating Procedure, EO-100-105. The crew will request performance of dose calculations and conduct a Reactor cooldown at < 100 °F/hr. When Offsite dose calculations exceed the General Emergency level the crew will rapidly depressurize the Reactor.

The scenario will be terminated when the crew has performed a Rapid Depressurization and restored RPV water level to +13 inches to +54 inches.

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SCENARIO OBJECTIVES

The objective of this scenario is to evaluate the Licensed Operator Candidate's ability to respond to the scenario events. These events will require each candidate to demonstrate the following:

- Knowledge of integrated plant operations
- Ability to diagnose abnormal plant conditions
- Ability to work together as a team
- Ability to mitigate plant transients that exercise their knowledge and use of ONs and EOPs
- Ability to utilize Technical Specifications (SRO Only)

To meet this objective, the Licensed Operator Candidates must demonstrate proficiency in the following competencies:

Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings.
2. Comply with and use procedures, references, and Technical Specifications.
3. Operate the control boards.
4. Communicate and interact with other crew members.

Senior Reactor Operator Candidates:

1. Interpret/diagnose events and conditions based on alarms, signals, and readings.
2. Comply with and use procedures and references.
3. Operate the control boards (N/A to upgrade candidates).
4. Communicate and interact with the crew and other personnel.
5. Direct shift operations.
6. Comply with and use Technical Specifications.

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CRITICAL TASKS

★ **INITIATE ARI TO INSERT ALL CONTROL RODS**

Safety Significance

Initiation of ARI provides an independent and redundant means of depressurizing the reactor scram air header and operating the scram discharge volume vent and drain valves, causing rapid control rod insertion.

Rapid control rod insertion initiates an immediate power reduction and, in the case of a fuel clad failure, will quickly reduce the amount of radiation being released from the Reactor.

Consequences for Failure to Perform Task

Failure to insert control rods allows power to remain elevated with continued release of radiation from the Reactor and also increases the potential for additional fuel damage.

Also, OP-AD-055, "OPERATIONS PROCEDURE PROGRAM", Section 9, defines Immediate Operator Actions as: "Actions required immediately after the start of an event to stop the degradation of and mitigate the consequences of conditions that threaten fuel, RPV, or primary containment...". Attachment B of this procedure lists the following Immediate Operator Action:

Existing Scram Condition	• PLACE Mode SW to S/D • OBSERVE all-rods-in • If More than 1 Rod > 00 – Arm and Depress Manual Scram PBs AND – Initiate ARI –

CRITICAL TASKS

Indications/Cues for Event Requiring Critical Task

Manual insertion of an RPS scram with NO control rod motion.

Performance Criteria

Insert control rods by manually initiating ARI.

Performance Feedback

Successful insertion of control rods will be indicated by rod position full-in indication following manual initiation of ARI.

★ **PERFORM RAPID DEPRESSURIZATION BEFORE EPB PROJECTED DOSE/DOSE RATES REACH GENERAL EMERGENCY DECLARATION CRITERIA**

Safety Significance

In order to minimize radiation exposure to the public, Rapid Depressurization of the RPV is required if a primary system is discharging and the radioactivity release rate cannot be controlled below the release rate that requires a General Emergency.

Consequences for Failure to Perform Task

Failure to take the EOP actions will result in increased dose and/or dose rates at the EPB.

SSES EOP Basis for:

RR-6	**BEFORE**	EPB PROJECTED DOSE/DOSE RATE REACHES GENERAL EMERGENCY DECLARATION CRITERIA
		RAPID DEPRESS IS REQ'D

An Offsite radioactivity release rate above the General Emergency action level represents a substantial increase in the severity of the Offsite radioactivity release, relative to the entry condition, and accordingly presents a more immediate threat to the continued health and safety of the public. Rapid depressurization is directed before the release rate reaches the General Emergency level to reduce the radioactivity release rate.

CRITICAL TASKS

Indications/Cues for Event Requiring Critical Task

Offsite radiation exposures and radiation release rates are obtained from dose projections normally performed by NERO personnel. The results of these projections are then transmitted to the Control Room Crew. The Crew must determine that the calculated results exceed the limits for General Emergency level releases (1R or 1R/hour TEDE or 5R or 5R/hour Thyroid CDE at the EPB) as noted on EO-100-105 Table 13.

Performance Criteria

Perform a Rapid Depressurization per EO-100-112 when EPB dose or dose rates are projected to exceed EO-100-105 Table 13 values.

Initiate ADS / Manually open all six ADS Valves.

Performance Feedback

Initiating a rapid depressurization causes Reactor pressure to lower which lowers the driving force of any primary system breach.

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

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SCENARIO REFERENCES

1. SGTS FAN FAILURE/SHUTDOWN VENT LINEUP

AR-016-F16	HVAC DIV 1 CONTROL PANEL 0C681 SYSTEM TROUBLE.
AR-029-A11	SGTS A FILT TRAIN FAILED
OP-173-001	PRIMARY CONTAINMENT NITROGEN MAKEUP AND VENTING
T.S. 3.6.4.3	STANDBY GAS TREATMENT SYSTEMS
T.R. 3.6.1	VENTING OR PURGING

2. SHUTDOWN 1B CONDENSATE PUMP/CONDENSATE MIN FLOW RECIRC VALVE FAILURE

OP-144-001	CONDENSATE AND FEEDWATER SYSTEM

3. 'A' NARROW RANGE INSTRUMENT FAILS UPSCALE

AR-101-A17	RX WATER HI LEVEL
AR-101-B17	RX WATER HI-LO LEVEL
ON-145-001	RPV LEVEL CONTROL SYSTEM MALFUNCTION
TS 3.3.2.2	FEEDWATER / MAIN TURBINE HIGH WATER LEVEL TRIP

4. FUEL CLAD FAILURE

AR-101-B05	RX BLDG AREA PANEL 1C605 HI RADIATION
AR-101-C05	TURB BLDG AREA PANEL 1C605 HI RADIATION
AR-103-D01	MN STM LINE HI HI RADIATION
AR-111-C03	MN STM LINE RAD MONITOR HI RADIATION
ON-100-101	SCRAM, SCRAM IMMINENT
ON-159-002	CONTAINMENT ISOLATION
ON-179-001	INCREASING OFFGAS/MSL RAD LEVELS
EO-100-102	RPV CONTROL
EO-100-104	SECONDARY CONTAINMENT CONTROL

5. RPS 'A' FAILURE TO TRIP

OP-AD-055	OPERATIONS PROCEDURE PROGRAM
EO-100-113	LEVEL/POWER CONTROL

6. 'D' MSL FAILURE TO ISOLATE / MSL LEAK IN TURBINE BUILDING

AR-015-D04	STACK MONITORING SYS 0C630/0C677 HI-HI RADIATION
AR-015-E04	STACK MONITORING SYS 0C630/0C677 HI RADIATION
AR-111-B03	MN STM LINE LEAK DETECTION HI TEMP
AR-112-B03	MN STM LINE LEAK DETECTION HI TEMP
ON-070-001	ABNORMAL GASEOUS RADIATION RELEASE/CAM ALARMS
TS 3.6.1.3	PRIMARY CONTAINMENT ISOLATION VALVES

7. RADIOACTIVITY RELEASE / RAPID DEPRESSURIZATION

EO-100-105	RADIOACTIVITY RELEASE CONTROL
EO-100-112	RAPID DEPRESSURIZATION
EO-100-103	PRIMARY COMTAINMENT CONTROL
OP-149-005	RHR SUPPRESSION POOL COOLING

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SCENARIO SPECIAL INSTRUCTIONS

1. Initialize the simulator to **IC-379**: Unit 1 at 74 percent power EOL, Unit 2 in MODE 4.

2. Load SCN file **SCN_ILO-302A**

3. Place simulator in **RUN** and verify the following pre-inserts and Key assignments

MF	RF	OR	SCN	ET	Conditions
7:7	4:4	2:2	0	3:0	7

IRF rfEN100002 f:2
IRF rfEN100009 f:0.3
IOR aoXR03705A f:2
IMF cmfTR02_XTT03701 f:2
IMF cmfTR02_XTT03730 f:2
IRF crfPM13_1P132B f:OUT
IMF mfRP158007A
IMF cmfAV06_HV141F022D f:100
IMF cmfAV06_HV141F028D f:100
IMF cmfAV04_LV-10641 f:0
{Key[1]} IMF cmfPM05_0V109A
{Key[2]} IMF cmfTR02_PDTC321N004A i:ASIS f:60
{Key[3]} IMF mfRR179003 r:15:00 f:90
{Key[4]} SCN BATCH1\YPB_ILO-302A
aet ETILO302A
aet ETILO302B
aet ETILO302C
{Key[23]} SCN BATCH1\FWB_101ALARM
{Key[24]} SCN BATCH1\FWB_102ALARM
{Key[25]} SCN BATCH1\FWB_103ALARM

4. Verify LEFM is selected as the Feedwater flow input to PICSY IAW OI-TA-021.

5. Prepare a Reactor Engineering Instructions package.

6. GO-100-012, Rev. 20 up through step 5.78

7. Prepare a turnover sheet indicating:

   a. Unit 1 is at 74 percent power EOL.
   b. CRD Pump 1B is out of service for breaker maintenance, it is not expected to return this shift.
   c. Condensate Pump 1B has a possible ground; shutdown Condensate Pump 1B for inspection after shift turnover.
   d. Contact Reactor Engineer when Condensate pump has been returned to service.
   e. Unit 2 is in MODE 4.

8. Prepare a MIDAS DOSE SUMMARY REPORT form.

9. Make a copy of shift assignments.

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SCENARIO EVENT DESCRIPTION FORM

Initial Conditions: Initialize the Simulator to IC-379. Place the Simulator to RUN. Ensure the Keys are assigned as indicated on the Special Instructions sheet via the appropriate SCN File. Assign shift positions; direct the start of the five-minute panel walkdown.

EVENT	TIME	DESCRIPTION
1		SGTS FAN FAILURE/SHUTDOWN VENT LINEUP
2		SHUTDOWN 1B CONDENSATE PUMP
3		CONDENSATE MIN FLOW RECIRC VALVE FAILURE
4		'1A' NR LEVEL INSTRUMENT FAILS UPSCALE
5		FUEL CLAD FAILURE
6		RPS '1A' FAILURE TO TRIP
7		'D' MSL FAILURE TO ISOLATE
8		MSL LEAK IN TURBINE BUILDING
9		RADIOACTIVITY RELEASE/ RAPID DEPRESSURIZATION

SCENARIO EVENT FORM

Event No: 1
Brief Description: SGTS FAN FAILURE/SHUTDOWN VENT LINEUP

POSITION	TIME	STUDENT ACTIVITIES
PCOP		Reports AR-016-F16, HVAC DIV 1 CONTROL PANEL 0C681 SYSTEM TROUBLE.
		Reports AR-029-A11, SGTS A FILT TRAIN FAILED
		Investigates 0C681 panel indications, reports "A" SGTS train indicates zero d/p.
		Dispatches NPO to investigate "A" SGTS train.
US		Directs Electrical/Mechanical to investigate failure of "A" SGTS train.
		Determines "A" SGTS inoperable, refers to Technical Specifications 3.6.4.3 and enters Condition A with a 7-day completion time for both Units.
		Directs terminating Suppression Chamber venting as required by T.R. 3.6.1.
PCOM/P		Terminates Suppression Chamber venting IAW OP-173-001

★ Denotes Critical Task

NOTES:	

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

Event No: 1
Brief Description: SGTS FAN FAILURE/SHUTDOWN VENT LINEUP

INSTRUCTOR ACTIVITY:

When the crew has assumed the shift, initiate the "A" SGTS Fan motor shaft to shear and subsequent trip on low flow:

{Key[1]} IMF cmfPM05_0V109A

NOTE: Monitor P&ID Display **IG15** for status of "A" SGTS fan 0V109A.

ROLE PLAY:

1. As NPO sent to investigate "A" SGTS train d/p problem, wait ~2 minutes and report that the train's fan motor is running but the fan belt from the motor to the fan is shredded.

2. As Mechanical/Electrical maintenance dispatched to investigate "A" SGTS train, wait ~3 minutes and report the train's fan belt has failed and will have to be replaced. Estimated time of repairs is ~4 hours.

SCENARIO EVENT FORM

Event No: 2,3
Brief Description: SHUTDOWN 1B CONDENSATE PUMP/MINIMUM FLOW RECIRC VALVE FAILURE

POSITION	TIME	STUDENT ACTIVITIES
US		Directs shutdown of 1B Condensate Pump IAW OP-144-001, CONDENSATE AND FEEDWATER SYSTEM.
PCOM		Implements OP-144-001, CONDENSATE AND FEEDWATER SYSTEM. 1. Depresses STOP pushbutton for 1B Condensate Pump. 2. Observes RPV water level and Feedwater System response.
PCOP		Implements OP-144-001, CONDENSATE AND FEEDWATER SYSTEM. 1. Ensures 1B Condensate pump discharge valve (HV10502B) closes. 2. Observes Condensate header pressure to ensure greater than 530 psig.
		Recognizes Condensate header pressure is less than 530 psig on PICSY format.
		Determines Condensate Recirc Valve FV-10508 is not fully closed.
		Places Condensate Recirc Valve Controller FIC-10508 in MANUAL and closes the valve due to mis-operation in automatic.
		Dispatches Plant Operator to investigate problem with FV-10508.
US		Notifies Workweek Manager/Maintenance 1B Condensate Pump is shut down.
		Notifies Workweek Manager/Maintenance of problem with Condensate Recirc Valve FV-10508.

★ Denotes Critical Task

NOTES:	

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

Event No: 2,3
Brief Description: SHUTDOWN 1B CONDENSATE PUMP / MINIMUM FLOW RECIRC VALVE FAILURE

INSTRUCTOR ACTIVITY:

1. When Condensate Pump 1B stopped, ensure event trigger actuates to fail Recirc Valve FV-10508 at 40 percent open.

2. When Condensate recirc valve controller FIC-10508 placed in MANUAL, ensure event trigger actuates to remove Recirc Valve FV-10508 malfunction.

   Monitor the Condensate System on **FW7**.

ROLE PLAY:

As Plant Operator dispatched to investigate Condensate Recirc Valve FV-10508, wait ~ 2 minutes and **IF** the valve has not yet been closed from the Control Room, report it sounds like there is flow in the recirc line. **IF** the valve has already been closed, report there is no indication on any problems associated with the valve.

SCENARIO EVENT FORM

Event No: 4
Brief Description: '1A' NR LEVEL INSTRUMENT FAILS UPSCALE

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports alarms RX WATER HI-LO LEVEL and RX WATER HI LEVEL.
		Reports '1A' NR level reading +60 inches.
		Observes FWLC response to stabilize RPV water level.
		Reports '1B' and '1C' NR level indication stabilizes at ~22.5 inches.
		Reports '1A' Hi Water Level Trip green status light is ON.
		Refers to AR-101-B17, RX WATER HI-LO LEVEL.
		Refers to AR-101-A17, RX WATER HI LEVEL.
US		Directs implementation of ON-145-001, RPV LEVEL CONTROL SYSTEM MALFUNCTION.
PCOM NOTE 1		Implements ON-145-001, RPV LEVEL CONTROL SYSTEM MALFUNCTION • Places FW LEVEL CTL/DEMAND SIGNAL LIC-C32-1R600 Controller in MAN. • Adjusts LIC-C32-1R600 to restore RPV water level to ~+ 35 inches. • Selects '1B' NR level signal input. • Transfers from AVERAGED to SELECTED level. • Nulls FW LEVEL CTL/DEMAND LIC-C32-1R600 Controller. • Places FW LEVEL CTL/DEMAND LIC-C32-1R600 Controller in AUTO.
US		Contacts WWM to investigate '1A' NR level instrument failure.
		Refers to TS 3.3.2.2; declares '1A' NR level channel inoperable, enters Condition A: A.1 Place channel in trip within 7 Days.

★ Denotes Critical Task

NOTES:	(1) If level not restored to ~ 35 inches (> 30 inches) prior to transfer to "B" SELECTED
level input signal, a #2 Recirc runback will occur.	

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

Event No: 4
Brief Description: '1A' NR LEVEL INSTRUMENT FAILS UPSCALE

INSTRUCTOR ACTIVITY:

When the actions are complete for the Condensate recirc valve failure, insert '1A' NR level instrument failure upscale:

{Key[2]} IMF cmfTR02_PDTC321N004A i:ASIS f:60

ROLE PLAY:

As WWM sent to investigate '1A' NR level problem, wait five minutes, and report the differential pressure transmitter is failed and must be replaced and calibrated. The repairs are expected to take approximately eight hours.

SCENARIO EVENT FORM

Event No: 5
Brief Description: FUEL CLAD FAILURE

POSITION	TIME	STUDENT ACTIVITIES
PCOM		Reports alarm TURB BLDG AREA PANEL 1C605 HI RADIATION.
		Observes Turbine building area radiation reading on PICSY format RADTB.
		Reports increasing radiation levels: TURBINE FRONT END, SJAE RM and FEEDWATER HEATER AREA.
		Refers to AR-101-C05, TURB BLDG AREA PANEL 1C605 HI RADIATION.
		Evacuates Unit 1 TB of all non-essential personnel.
		Contacts HP to perform HP-TP-441.
US		Directs PCOP to monitor MSL and Offgas radiation levels on PICSY and/or Panel 1C600.
PCOP		Reports radiation levels are increasing for MSL and Offgas.
		Reports alarm MN STM LINE RAD MONITOR HI RADIATION; refers to AR-111-C03.
		Evaluate entry into ON-179-001, INCREASING OFFGAS/MSL RAD LEVELS.
		Checks MSL and Offgas radiation monitors for indication and trend.
US		Directs ON-179-001, INCREASING OFFGAS/MSL RAD LEVELS or Immediate Operator Actions due to Increasing Steamline Radiation.
		Directs power reduction using Recirc flow in accordance with CRC book direction.
		May enter ON-100-101, SCRAM, SCRAM IMMINENT and direct scram imminent actions.
		Perform EO-100-104 Entry Condition due to UNEXPLAINED RX AREA RADIATION LEVEL ABOVE HIGH ALARM. (HPCI ROOM)
PCOM		Reduces power by reducing Recirc flow in accordance with CRC Book direction.
		Performs Scram Imminent actions if directed.
PCOM		Reports alarm RX BLDG AREA PANEL 1C605 HI RADIATION.
		Refers to AR-101-B05, RX BLDG AREA PANEL 1C605 HI RADIATION.
		Reports EO-100-104 Entry Condition due to UNEXPLAINED RX AREA RADIATION LEVEL ABOVE HIGH ALARM.

★ Denotes Critical Task

NOTES:	

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

Event No: 5
Brief Description: FUEL CLAD FAILURE

INSTRUCTOR ACTIVITY:

When FWLC master controller is restored to auto insert a fuel clad failure:

{Key[3]} IMF mfRR179003 r:15:00 f:90

NOTE: Turbine Building area high radiation alarm is received in < 1 minute.
Main steam line high radiation alarm is received in ~ 7 minutes.

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 5,6
Brief Description: FUEL CLAD FAILURE/RPS 'A' FAILURE TO TRIP

POSITION	TIME	STUDENT ACTIVITIES
PCOM/P		Monitors Reactor Building and Turbine Building radiation levels.
		Reports increasing radiation levels in Unit 1 TB and RB.
		Evacuates Unit 1 RB and TB of all non-essential personnel.
PCOM		Reports alarm AR-103-D01 MN STM LINE HI HI RADIATION.
US		Direct performance of ON-179-001, INCREASING OFFGAS/MSL RAD LEVELS.
		Directs power reduction (rod insertion) to reduce MSL radiation levels.
		Directs manual reactor scram; enters ON-100-101, SCRAM, SCRAM IMMINENT.
PCOM		When directed, performs ON-179-001 INCREASING OFFGAS/MSL RAD LEVELS.
		Inserts control rods to attempt to reduce MSL radiation levels.
		Places the Reactor mode switch to SHUTDOWN when directed.
PCOM		Recognizes and reports failure to scram. Arms and depresses manual scram pushbuttons.
		Inserts SRMs and IRMs.
US		Enters EO-100-102, RPV CONTROL; then exits EO-100-102 on report that all rods are not full-in.
★ **US**		Directs ARI initiation. May enter and immediately exit EO-100-113, LEVEL POWER CONTROL depending on timing of ARI Initiation.
★ **PCOP**		Initiates ARI to insert all Control Rods 1. Arms and depresses Division 1 and Division 2 ARI pushbuttons. 2. Reports ARI has actuated.
PCOM		Reports all control rods are fully inserted.

★ Denotes Critical Task

NOTES:	

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

Event No: 5,6
Brief Description: FUEL CLAD FAILURE / RPS 'A' FAILURE TO TRIP

INSTRUCTOR ACTIVITY:

When the crew places the Mode Switch to SHUTDOWN, verify trigger activates to initiate a steam leak in the Steam Tunnel.

ROLE PLAY:

As necessary

SCENARIO EVENT FORM

Event No: 7,8
Brief Description: '1D' MSL FAILURE TO ISOLATE/MSL LEAK IN TURBINE BUILDING

POSITION	TIME	STUDENT ACTIVITIES
US		Exits EO-100-113 and re-enters EO-100-102.
		Directs closure of MSIVs and drains.
		Directs RPV water level maintained +13 inches to +54 inches with RCIC and CRD.
		Directs RPV pressure maintained 800 - 1087 psig with SRVs.
		Directs PCOM to reset main generator lockouts.
PCOM		Resets Main Generator Lockouts
		Places Feedwater in Startup Level Control. Recognizes and reports the LV-10641 startup level control valve is failed closed and takes manual level control with the LV-10640.
PCOP		Manually closes MSIVs and drains.
		Reports '1D' MSL failed to isolate.
		Verifies '1D' MSL flow indication on 1C652 indication FI-C32-1R603D.
US		Enters EO-100-104, SECONDARY CONTAINMENT CONTROL, based upon Secondary Containment Hi Radiation and Stack Monitoring Hi Radiation alarms. • Directs/ensures start of ESW and Unit Coolers with cooling source. • Directs/ensures operation of all available RB HVAC.
		Contacts maintenance for the MSIV failures in '1D' MSL.
PCOP		Reports alarm STACK MONITORING SYS 0C630/0C677 HI RADIATION.
		Refers to AR-015-E04, STACK MONITORING SYS 0C630/0C677 HI RADIATION.
		Checks SPING, reports increasing TB Stack Noble Gas.
PCOP		Reports alarms MN STM LINE LEAK DETECTION HI TEMP DIVS 1/2.
		Verifies 1C614 temperature readings; reports high temperature in TB Steam Tunnel.

★ Denotes Critical Task

NOTES:	Common error is Rapid Depressurization when the radiation levels on Elevations 645' and 719'
increase to > max safe levels. No primary system is discharging to any Secondary Containment area during this scenario.	

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

Event No: **7,8**
Brief Description: **'1D' MSL FAILURE TO ISOLATE/MSL LEAK IN TURBINE BUILDING**

INSTRUCTOR ACTIVITY:

When the MSIVs and drains are closed increase TB release rates:

{Key[4]} SCN BATCH1\YPB_ILO-302A

ROLE PLAY:

As security if contacted about steam releases/blowout panel status; report visible steam is exiting the Unit 1 Turbine Building blowout panel.

SCENARIO EVENT FORM

Event No: **9,10**
Brief Description: **RADIOACTIVITY RELEASE/RAPID DEPRESSURIZATION**

POSITION	TIME	STUDENT ACTIVITIES
US		Enters EO-100-105, RADIOACTIVITY RELEASE, when TB Iodine or NG release rate exceeds ALERT Level or report of steam release.
		Requests Off-Site Dose Calculations.
		Directs Reactor cooldown < 100 °F/hr with SRVs.
PCOP		Initiates cooldown < 100 °F/hr using SRVs.
★ **US**		Directs Rapid Depressurization before EPB projected dose/dose rate reaches the General Emergency declaration criteria. Enters EO-100-112, RAPID DEPRESSURIZATION. • Directs preventing uncontrolled Condensate injection. • Verifies Suppression Pool level > 5 feet. • Directs opening all ADS SRVs. • Verifies all ADS SRVs are open.
★ **PCOP**		**Performs Rapid Depressurization by opening all ADS SRVs.** • Arms and depresses Division 2 ADS manual pushbuttons and verifies six red lights lit for ADS solenoids, or • Places individual control switch to open for each ADS SRV (G, J, K, L, M, and N), and verifies red light lit and amber light not lit for each valve solenoid. • Verifies six ADS SRVs are open: • Observes six ADS SRVs open on acoustic monitor status light indication. • Observes RPV pressure decrease. • Observes elevated tail pipe temperatures on TRS-B21-1R614.

★ Denotes Critical Task

NOTES:	

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

Event No: 9,10
Brief Description: RADIOACTIVITY RELEASE/RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

Approximately 10 minutes after the crew enters EO-100-105 and Offsite Dose Calculations have been requested, report to the Control Room as the TSC Dose Calculator and provide the crew the attached MIDAS report.

NOTE: Offsite dose is projected to reach 1.6 Rem TEDE based on existing release rate and plant conditions.

SCENARIO EVENT FORM

Event No: 9,10
Brief Description: RADIOACTIVITY RELEASE/RAPID DEPRESSURIZATION

POSITION	TIME	STUDENT ACTIVITIES
US		Directs RPV level restored and maintained +13 inches to +54 inches with Condensate.
		Enters EO-100-103, PRIMARY CONTAINMENT CONTROL, due to Suppression Pool temperature > 90 °F.
		Directs placing both loops of RHR in Suppression Pool Cooling.
PCOM		Restores and maintains RPV level at +13 inches to +54 inches with Condensate.
PCOP		Places both loops of Suppression Pool Cooling in service IAW OP-149-005, RHR SUPPRESSION POOL COOLING. • Ensures ESW in service. • Places RHRSW in service to RHR Heat Exchanger A/B. • Opens Suppression Chamber Test Shutoff Valve HV-151-F028A/B. • Starts RHR Pump 1P202A(C)/B(D). • Throttles open Test Line Control Valve HV-F024A/B to achieve ≤ 10,000 gpm on FI-E11-1R603 A/B. • Observes Minimum Flow Valve HV-151-F007A/B closes at ~ 3,000 gpm. • Closes Heat Exchanger bypass HV-151-F048A/B. • Checks RHR Pump Room coolers 1V210A(C)/B (D) started.
US		***After the scenario is complete, determines TS 3.6.1.3 RA B.1 is applicable for the failure of both MSIVs in "D" Main Steam Line. If RA B.1 not completed within one hour, the Unit must be in Mode 4 within 36 hours.***
US		***After the scenario is complete, classifies the event as a GENERAL EMERGENCY under EAL RG1 due to projected dose rates exceeding the limits at the EPB.***

★ Denotes Critical Task

NOTES:	

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

Event No: 9,10
Brief Description: RADIOACTIVITY RELEASE/RAPID DEPRESSURIZATION

INSTRUCTOR ACTIVITY:

As necessary

ROLE PLAY:

As necessary

TERMINATION CUE:

Rapid depressurization has been performed and RPV water level has been restored to +13 inches to +54 inches.

TECHNICAL SPECIFICATION DETERMINATION:

After the scenario is complete, have the US determine any Technical Specification requirements due to the failure to isolate the "D" Main Steam Line.

EVENT CLASSIFICATION:

After the Scenario is complete, have the US classify the scenario for the HIGHEST EAL. Provide the US with any requested information needed to perform the classification:

GENERAL EMERGENCY under EAL RG1 due to projected dose rates exceeding the limits at the EPB.