ATTACHMENT 11
Procedures and Training Material on Maintaining RPV Pressure Low

Contents

LOSS OF AC POWER

SCOPE OF REVISION:

- Incorporated revisions 25 - 25b. Revision marks not retained.

➊ IR 04122939-02 - EDITORIAL - Removed erroneous statement regarding Div III DG as an "alternate AC power source" from section 1.4. Converted all "☞" statements to NOTEs. Added wording to step 4.2.5.2 for consistency with step 4.2.1.6. Minor formatting adjustments - no revision marks used.

IR 04172512-02 - EDITORIAL - Reworded step 4.1.1 for consistency with direction in section 4.4.

Affected Pages: 1, 3-15, 18—32, 40-50

CONTINUOUS USE

ORIGINATOR: *Steven M. Frederick* **CLASS CODE:** *SNNN*

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CURRENT CHANGES TO GENERAL REVISION

	Change #	*Date*	*List of Affected Pages*
➊			
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➎			

TABLE OF CONTENTS

1.0 SYMPTOMS

1.1 Generic

1. Any interruption of power on an AC bus which results in:

    1. Automatic transfer of the bus to any alternate source,

    2. Loss of voltage, current and watts on the bus, or

    3. Bus under voltage, auto transfer of feeder breaker, breaker tripped, breaker not available, and transfer blocked alarms on the bus(es).

1.2 4160V Bus 1A1, 1B1, and/or 1C1 (ECCS)

1. Loss of all operating AC equipment powered from ECCS bus, including partial lighting loss.

1.3 6900V Bus 1A(1B) and/or 4160V Bus 1A(1B) (Non-ECCS)

NOTE
O RC&IS Full Core Display will be lost shortly after the bus deenergizes. Failure to verify Shutdown Criteria before losing the Full Core Display will require alternate means of verifying rod position per CPS 4100.01, Reactor Scram. «CM-4»

1. Loss of all operating AC equipment, including:
    - RC&IS Full Core Display (Feed from 6.9KV Bus 1A, Unit Sub O, MCC C):
    - Nuclear instruments (excluding APRMs)
    - Level indication (P678 - Standby Info Pnl)
    - RPV metal temperatures (P614 - NSSS Recorder Pnl) powered from the non-ECCS bus
    - Partial lighting loss

2. Reactor scram, turbine trip and Group 1 isolation.

1.4 **Station Blackout (SBO)** *«CM-1»*

1. A total loss of offsite AC power sources (including main generator), and failure of Div 1 & Div 2 DG power sources.
    1. Loss of all operating AC equipment including nuclear instruments, level indication and RPV metal temperatures powered from the ECCS and non-ECCS busses, and a loss of all AC lighting.
    2. Reactor scram, turbine trip and MSIV closure.
    3. As long as DC busses are available, instrumentation may be available where powered by UPS supplies, such as the NSPS ATMs.

1.5 **Extended Loss of AC Power (ELAP)**

1. A total and sustained (>1 hour) loss of both offsite and onsite AC power sources as a result of a postulated Beyond Design Basis External Event (BDBEE) which is expected to exceed the 4 hour SBO coping period.

2.0 **AUTOMATIC ACTIONS**

2.1 **4160V Bus 1A1, 1B1 and/or 1C1 (ECCS)**

1. The loss of voltage relays will trip RAT 'B' (ERAT), and close in ERAT (RAT 'B'), if sufficient voltage exists on the standby bus.

2. After a 15 sec time delay with degraded voltage, the secondary under voltage relays will strip the 4.16KV Bus 1A1 (1AP07E), 1B1 (1AP09E), or 1C1 (1E22-S004), start the associated DG, and will tie the DG onto the bus within 12 seconds, even if the alternate off site source is available. Loads will be automatically connected to the ECCS bus as required by ECCS initiation logic, if power is available.

3. If ECCS bus 1B1 is de-energized, the Emergency Seal Oil Pump, 1TO08P and the Emergency Bearing Oil Pump, 1TO05P will start.

2.2 **6900V Bus 1A(1B) and/or 4160V Bus 1A(1B) (Non-ECCS)**

1. When the UAT is the lost bus and the RAT(s) are available, non-ECCS bus(es) on the UAT will transfer to the RAT(s) (6.9KV 1A and 1B to RAT 'A';
   4.16KV 1A to RAT 'B';
   4.16KV 1B to RAT 'C').

2. If one 6900V bus is available, the following 480V bus's cross-tie breakers auto close to re-energize the associated 480V busses.
   - 480V Bus 1D/1E, 1AP14E/15E
   - 480V Bus 1H/1I, 1AP18E/19E
   - 480V Bus 1L/1M, 1AP24E/25E
   - 480V Bus C/D, 0AP43E/44E
   - 480V Bus O/P, 0AP91E/92E

3. If both 6900V busses are **NOT** available or a bus under-voltage condition is reached, all associated bus load breakers will trip.

4. Reactor scram, turbine trip and Group 1 isolation may occur depending on which bus is de-energized.

5. If 6900V Bus 1A(1B) is de-energized, then Diesel Fire Pump 0FP01PA(B) will start.

3.0 **IMMEDIATE OPERATOR ACTIONS**

1. Within a maximum of 1 hour, the Shift Manager SHALL determine if an Extended Loss of AC Power (ELAP) exists.

NOTE

1. Throughout the use of this procedure, refer to as needed:
   - CPS Emergency Plan Annex (EP-AA-1003)
   - CPS 4001.02, Automatic Isolation
   - CPS 4100.01, Reactor Scram
   - CPS 3514.01Cxxx, Bus/Unit Sub Outages checklists
   - CPS 3703.02C001, Irradiated Fuel Handling Checklist
   - ITS LCO section 3.8
   - LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements for applicability
2. During performance of CPS 4001.02, Automatic Isolation:
   - Local verification may be necessary.
   - Resetting of shunt trips, especially TB MCC 1M, is essential to system recovery actions.

4.0 SUBSEQUENT ACTIONS

NOTE

1. Security SHALL be notified any time the 138 kV system, the 12kV system, or circuit switchers 4508/4538 are de-energized/re-energized and to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.
2. Ensure appropriate Security actions are taken for a loss of AC power.

[CA#4010227-60] <<CM-10>>

4.1 Global Subsequent Actions

1. **IF** An ELAP exists (see step 1.5 for Definition)

   THEN STOP executing Station Blackout actions

   AND

   Immediately execute CPS 4306.01 Extended Loss of AC Power/Loss of UHS.

2. **IF** 4160V Bus 1A1 OR 1B1 auto transferred to the alternate power supply and re-energized

   THEN Proceed quickly to section 4.2.1, **4160v 1A1(1B1) Dead Bus Transfer.**

4.1 **Global Subsequent Actions** (Cont'd)

3. Deleted.

4. Determine which AC busses were transferred/lost and perform applicable sections below:

   - Loss/transfer of 4160V Bus 1A1(1B1) 4.2
   - Loss of Non-ECCS Bus 4.3
   - Station Blackout (SBO) 4.4

4.2 Loss/Transfer of 4160V Bus 1A1(1B1)

4.2.1 4160v 1A1(1B1) Dead Bus Transfer

NOTE
This section is written assuming that, from normal plant conditions, 4160V Bus 1A1(1B1) has properly transferred to the other off site source or its respective DG (i.e., bus was dropped and picked up).

1. Deleted.

2. Verify status of Fuel Pool Cooling (FC):

   IF FC has tripped,

   THEN Isolate the Upper Containment pools per CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).

   AND

   Monitor Pool Temperature per CPS 3317.01, Abnormal section "High Temperature Spent Fuel Storage Pool."

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

NOTE
Fuel Building Ventilation (VF) should restart without operator action on the STANDBY fans if power is lost for less than ~6 seconds.

3. Verify running/restore Fuel Building Ventilation (VF).

   1. Open/verify open 1VF04Y/9Y, Fuel Bldg Sply Outbd Isol Dmprs

   2. Open/verify open 1VF06Y/7Y, Fuel Bldg Sply Inbd Isol Dmprs

   3. Verify 1VF04CA(B), Fuel Bldg Exh Fan running/starts

   4. Verify 1VF03CA(B), Fuel Bldg Sply Fan running/starts

   5. **IF** Div 1(Div 2) Sec CNMT Isolation Damper(s) has closed and can **NOT** be reopened,

      AND/OR

      VF fans do **NOT** start when the isolation dampers open,

      THEN Maintain secondary containment dP using Standby Gas (VG) per CPS 3319.01 (VG).

NOTE
Running a VP train does **NOT** require Non-ECCS power available (IA, WS, etc.)

4. Verify status of Drywell Cooling (VP).

   IF VP has tripped,

   THEN: 1) Control drywell pressure using Mixing Compressors per CPS 3316.01, CNMT Combustible Gas Control (HG).

   2) **IF** Div 2(Div 1) ECCS Bus is energized,

   THEN Attempt to restore VP.

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

NOTE

VC fans should automatically restart approximately 40 seconds after the 480 V bus is reenergized. The control switch for 0VC03CA must remain in the Auto-After Start position for the fans to restart. The amber lights will **NOT** energize when the fans trip.

5. Verify status of Control Room Ventilation (VC).

   IF The VC fans and/or chiller do **NOT** restart,

   THEN Start one train of VC per CPS 3402.01, CONTROL ROOM HVAC (VC).

CAUTION

1. The solenoid valves fail shut on loss of power.
2. The valves do **NOT** automatically reopen when power is restored.
3. The FPM pumps restart when power is restored.
4. Failure to promptly reopen the valves or deenergize the FPM pumps may result in pump damage. (ITS LCO 3.4.7.b impact)

6. Restore **OR** secure the Fission Product Monitor [CPS 3315.02 (LD)] per one of the following steps: «CM-3»

   1) [CNMT 781'] Open/verify open 1E31-F014/15/17/18, LD Drywell Isol Valves.

   OR

   2) Deenergize FPM Pumps by opening following breakers at AB MCC 1A1-8C (1AP72E) AB 781' East [Dbl Bkrs]:

      - Ckt #43: Feed to 1E31-P001 Iodine-Noble Gas Sample Panel.
      - Ckt #47: Feed to 1E31-P002 Iodine-Noble Gas Sample Panel.

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

NOTE
Aux Seal Injection Pump may **NOT** be available if LOCA shunt trips have occurred.

7. Verify status of the RR Pumps/seals.

   IF An RR pump has tripped,

   OR

   Shows signs of degraded seals,

   THEN Take actions per CPS 3302.01, Reactor Recirculation (RR).

8. Ensure that the Div 1(2) Battery Charger is operating or restart it per CPS 3503.01, BATTERY AND DC DISTRIBUTION (DC).

NOTE
Shunt Trips are to be expected due to the deenergization of the ECCS busses, especially if NSPS is **NOT** being supplied from its normal source(s). Resetting of shunt trips is essential to system recovery actions.

9. Shunt Trips «CM-5»

   For the Div 1(Div 2) bus(es),

   1) Perform a walkdown of the Div 1(Div 2) shunt trips using CPS 4001.02, Automatic Isolation, Table 1, SHUNT TRIPS.

   2) Notify the CRS of any shunt trip breakers found in the tripped position.

   3) Tripped breakers shall be reset per CRS direction.

10. Verify all MSIV Solenoids are still energized.
    - > 113 mA at MSIV Solenoid Current meters:

    Outboard (1B21-F028's meters 1B21-661/662 A-D) located in 1H13-P661A/C.

    Inboard (1B21-F022's meters 1B21-659/660 A-D) located in 1H13-P662B/E.

11. Verify no NSPS 'blind trips' exist.
    - 1L1 & 1L2 lights energized in 1H13-P661 Bay B, 1H13-662 Bay C, 1H13-663 Bay B, 1H13-664 Bay C

4.2.1 **4160v 1A1(1B1) Dead Bus Transfer** (Cont)

NOTE

0 During performance of CPS 4001.02, Automatic Isolation, local verification may be necessary.

12. Refer to as needed:
    - CPS Emergency Plan Annex (EP-AA-1003)
    - CPS 4001.02, Automatic Isolation
    - CPS 4100.01, Reactor Scram
    - ITS LCO section 3.8
    - CPS 3514.01Cxxx, Bus/Unit Sub Outages checklists
    - LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements for applicability

13. Verify the status of Div 1(Div 2) Shutdown Service Water (SX) [CPS 3211.01 (SX)]

14. Coordinate with Transmission Supply Services Dispatch) for switchyard status, and for restoration information/support.

15. As resources permit, verify in-service/restore the CNMT SA Header per CPS 3214.01 (IA & SA): Pressurizing the CNMT and DW SA Header section.

4.2.2 **4160V Bus 1A1(1B1) De-Energized**

1. Deleted.

> **NOTE**
>
> Aux Seal Injection Pump may **NOT** be available if LOCA shunt trips have occurred.

2. Verify status of the RR Pumps/seals.

   IF An RR pump has tripped

   OR

   Shows signs of degraded seals,

   THEN Take actions per CPS 3302.01, Reactor Recirculation (RR).

> **NOTE**
>
> Running a VP train does **NOT** require Non-ECCS power available (IA, WS, etc.).

3. Verify status of Drywell Cooling (VP).

   IF VP has tripped,

   THEN: 1) Control drywell pressure using Mixing Compressors per CPS 3316.01, CNMT Combustible Gas Control (HG).

   2) **IF** Div 2(Div 1) ECCS Bus is energized,

   THEN Attempt to restore the VP train on the opposite bus to service.

4. Maintain secondary containment dP using Standby Gas (VG) per CPS 3319.01 (VG).

5. Verify status of Fuel Pool Cooling (FC):

   IF FC has tripped,

   THEN Isolate the Upper Containment pools per CPS 3317.01, Fuel Pool Cooling And Cleanup (FC).

   AND

   Monitor Pool Temperature per CPS 3317.01, Abnormal section "High Temperature Spent Fuel Storage Pool."

4.2.2 **4160V Bus 1A1(1B1) De-Energized** (Cont)

NOTE
Loss of DC power significantly complicates plant operation. Charger restoration and extending existing DC capability should be pursued aggressively.

6. Reduce non-essential DC loads on the Div 1(Div 2) Battery as necessary to minimize battery discharge rate.
   Use CPS 4200.01C002, DC Load Shedding During A SBO.

CAUTION
A loss of power to 4160V Bus 1A1 (1B1) with a concurrent loss of power to 125VDC MCC 1A (1B) will cause 1IA005 and 1IA008 (1IA006 and 1IA007) to fail closed. Closure of either set of valves will isolate the 3" instrument air ring headers in containment and the drywell, leading to gradual depressurization of the air headers and opening of scram valves at the hydraulic control units.

7. **IF** At any point during this procedure, IA to the Primary Containment is lost and can **NOT** be immediately restored,

   AND

   The reactor is critical,

   THEN: 1) Place Mode Switch in SHUTDOWN.

   2) Enter CPS 4100.01, Reactor Scram.

NOTE
⓿ During performance of CPS 4001.02, Automatic Isolation, local verification may be necessary.

8. Refer to as needed:
   - CPS Emergency Plan Annex (EP-AA-1003)
   - CPS 4001.02, Automatic Isolation
   - CPS 4100.01, Reactor Scram
   - ITS LCO section 3.8
   - CPS 3514.01Cxxx, Bus/Unit Sub Outages checklists
   - LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements for applicability

4.2.2 **4160V Bus 1A1(1B1) De-Energized** (Cont)

NOTE
Refer to CPS 3312.03 (RHR-SDC) for Alternate SDC Temperature Monitoring when necessary.

9. Determine remaining operable critical instrumentation per APPENDIX B, Instrument Availability.

10. Coordinate with Transmission Supply Services (Dispatch) for switchyard status, and for restoration information and support.

11. Record TRIP DATA on the appropriate TRIP DATA SHEET listed in section 8.0, DOCUMENTS.

12. As time and resources permit, de-energize rad monitor trip logic power supplies per APPENDIX C prior to restoring 4160V Bus 1A1(1B1) to prevent inadvertent actuation/isolations. «CM-2»

13. **IF** IA is lost to the Primary Containment and Drywell and can **NOT** be restored

    AND

    It is necessary to increase the ability to remove decay heat from the reactor (to achieve COLD SHUTDOWN or avoid lifting Safety Relief Valves, etc.).

    THEN Consider gagging open IA to the Containment to allow reopening the MSIVs (reference IR 1630318 and EC 396365).

4.2.3 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using RAT 'B'(ERAT)**

1. Place breakers for the dead bus in PULL-TO-LOCK:
   - DG: DG 1A(B)[C] Output Bkr
   - RAT: 4160V Bus 1A1(1B1)[1C1] Mn Bkr
   - ERAT: 4160V Bus 1A1(1B1)[1C1] Res Bkr

2. Make the RAT 'B' (ERAT) and 1RT4 (1ET4) bus ready as appropriate for plant conditions per CPS 3505.01, 345 & 138 KV Switchyard (SY) and ERO recommendations.

3. (Local) For applicable Bus 1A1(1B1) re-energization:

   Verify Ckt 32 (RHR control) on DC MCC 1A(1B) is re-energized if turned off by CPS 4200.01C002, DC Load Shedding During A SBO.

4. (Local) Reset any ECCS Bus and/or RAT 'B' (ERAT) lockouts.

NOTE

⓿ Reference to "RAT 1" is associated with all Plant 1 RATs, including RAT 'A', 'B' and 'C'.

5. Close RAT 1 (ERAT) Circuit Switcher 4538 (B018).

6. Place 4160V Bus 1A1(1B1)[1C1] Mn (Res) Bkr Sync switch to ON.

CAUTION

ECCS systems may auto start without an adequate fill & vent, resulting in potential water hammer damage and unavailability of the ECCS function. The systems will be restored/restarted as required after the bus is re-energized.

7. As resources are available, prevent the Divisional ECCS system(s) from starting by either:
   - Holding the ECCS pump switch in OFF

   OR

   - Pulling the ECCS pump's control power fuses.

Div 1:	RHR A	[4160V Bus 1A1 (1AP07E), 1AP07EG]
	LPCS	[4160V Bus 1A1 (1AP07E), 1AP07EE]
Div 2:	RHR B	[4160V Bus 1B1 (1AP09E), 1AP09ED]
	RHR C	[4160V Bus 1B1 (1AP09E), 1AP09EF]
Div 3:	HPCS:	[HPCS Switchgear ESF Division 3, 1E22-S004, 1E22-C001]

4.2.3 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using RAT 'B'(ERAT)** (Cont)

8. Re-energize the bus by holding the 4160V Bus 1A1(1B1)[1C1] Mn (Res) Bkr in the CLOSE position, **then** return the breaker to the AUTO position.

9. Place 4160V Bus 1A1(1B1)[1C1] Mn (Res) Bkr Sync switch to OFF.

10. Proceed to section 4.2.5, **Actions After 4160V Bus 1A1(1B1)[1C1] Reenergized.**

4.2.4 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using DG 1A(1B)[1C]**

1. Place breakers for the dead bus in PULL-TO-LOCK:
   - DG: DG 1A(B)[C] Output Bkr
   - RAT 'B': 4160V Bus 1A1(1B1)[1C1] Mn Bkr
   - ERAT: 4160V Bus 1A1(1B1)[1C1] Res Bkr

2. (Local) Place DG 1A(B)[C] Engine Maintenance Switch to LOCKOUT [MAINTENANCE - DG 1C] position.

3. Make DG ready as appropriate for plant conditions per CPS 3506.01, Diesel Generator And Support Systems (DG) and ERO recommendations.

4. (Local) For applicable Bus 1A1(1B1) re-energization:

   Verify Ckt #13(14) [DG 1A(1B) control] & Ckt #32 (RHR control) on DC MCC 1A(1B) [1DC13(14)E] are re-energized if turned off by CPS 4200.01C002, DC Load Shedding During A SBO.

5. (Local) Reset any ECCS Bus and/or DG lockouts.

6. Place DG 1A(B)[C] Output Bkr in AUTO.

7. Place DG 1A(B)[C] Control in AUTO-AFTER-STOP.

8. For DG 1A start during a SBO:

   Stop the RCIC Gland Seal Air Compressor to ensure sufficient DG 1A field flashing current on the DG 1A start sequence.

CAUTION

ECCS systems may auto start without an adequate fill & vent, resulting in potential water hammer damage and unavailability of the ECCS function. The systems will be restored/restarted as required after the bus is re-energized.

9. As resources are available, prevent the Divisional ECCS system(s) from starting by either:
   - Holding the ECCS pump switch in OFF

   OR

   - Pulling the ECCS pump's control power fuses.

Div 1:	RHR A	[4160V Bus 1A1 (1AP07E), 1AP07EG]
	LPCS	[4160V Bus 1A1 (1AP07E), 1AP07EE]
Div 2:	RHR B	[4160V Bus 1B1 (1AP09E), 1AP09ED]
	RHR C	[4160V Bus 1B1 (1AP09E), 1AP09EF]
Div 3:	HPCS:	[HPCS Switchgear ESF Division 3, 1E22-S004, 1E22-C001]

4.2.4 **Re-Energizing 4160V Bus 1A1(1B1)[1C1] Using DG 1A(1B)[1C]** (Cont)

10. (Local) Start DG 1A(B)[C] on a bus under voltage signal by placing DG 1A(B)[C] Engine Maintenance Switch to OPERATE [AUTO - DG 1C] position.

NOTE

⓪
1. If DG fails to start due to active trip signals, a manually initiated LOCA signal should be considered which will bypass most DG trip signals.
2. If SX pump failed to start, placing the SX pump C/S in AFTER-STOP may reset its logic to allow it to be started.

11. Verify DG auto start actions per CPS 3506.01 (DG) including SX pump start and lineup configuration. «CM-6»

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized**

> **NOTE**
>
> Section 4.2.5 steps may be performed in any order or concurrently. N/A steps which are **NOT** applicable to bus re-energization event/plant conditions.

1. CNMT/DW Instrument & Service Air (IA & SA)

   1) At 1H13-P800 (Section 5041), verify open/re-open:

      - DW IA Hdr Inbd Isol Vlv, 1IA008.
      - CNMT IA Outbd Isol Vlv, 1IA005.
      - DW IA Outbd Isol Vlv, 1IA007.
      - CNMT IA Inbd Isol Vlv, 1IA006.

   2) As needed, perform any additional actions as described in CPS 3214.01 (IA & SA): Pressurizing the CNMT and DW IA Header section. (i.e., ADS).

   3) As resources permit, verify in-service/restore the CNMT SA Header per CPS 3214.01 (IA & SA): Pressurizing the CNMT and DW SA Header section.

> **CAUTION**
>
> 1. The solenoid valves fail shut on loss of power.
> 2. The valves do **NOT** automatically reopen when power is restored.
> 3. The FPM pumps restart when power is restored.
> 4. Failure to promptly reopen the valves or deenergize the FPM pumps may result in pump damage. (ITS LCO 3.4.7.b impact)

2. Restore **OR** secure the Fission Product Monitor [CPS 3315.02 (LD)] per one of the following steps. «CM-3»

   1) [CNMT 781'] Open/Verify Open 1E31-F014/15/17/18, LD Drywell Isol Valves.

      OR

   2) Deenergize FPM Pumps by opening following breakers at AB MCC 1A1-8C (1AP72E) AB 781' East [Dbl Bkrs]:

      - Ckt #43: Feed to 1E31-P001 Iodine-Noble Gas Sample Panel.
      - Ckt #47: Feed to 1E31-P002 Iodine-Noble Gas Sample Panel.

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized** (Cont)

NOTE
1. Restarting ECCS systems without a complete fill & vent may be required when ACC is **NOT** available per the EOPs.
2. Water hammer in the system should be expected.
3. ECCS room access may **NOT** be available for fill & vent due to radiation or temperature levels.

3. Perform applicable ECCS fill & vent surveillances.

   Evaluate if any other surveillances or lineups should be performed.

4. Re-energize appropriate DC loads which may have been shed by CPS 4200.01C002, DC Load Shedding During A SBO.

NOTE
Shunt Trips are to be expected due to the deenergization of the ECCS busses and relay races upon ECCS bus reenergization.

5. Shunt Trips «CM-5»

   For the affected divisional bus(es),

   1) Perform a walkdown of the divisional shunt trips using CPS 4001.02, Automatic Isolation, Table 1, SHUNT TRIPS.
   2) Notify the CRS of any shunt trip breakers found in the tripped position.
   3) Tripped breakers shall be reset per the CRS direction.

6. Verify all MSIV Solenoids are still energized.

   - > 113 mA at MSIV Solenoid Current meters:

     Outboard (1B21-F028's meters 1B21-661/662 A-D) located in 1H13-P661A/C.

     Inboard (1B21-F022's meters 1B21-659/660 A-D) located in 1H13-P662B/E.

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized** (Cont)

7. Verify no NSPS 'blind trips' exist.
   - 1L1 & 1L2 lights energized in 1H13-661B/2C/3B/4C

8. Notify Chemistry of bus restoration (may impact Post Accident Sample Panel or other Chemistry sampling capabilities).

9. **WHEN** Loss of AC event is stabilized, and as resources allow (do **NOT** delay critical system restoration),

   1) Restore ECCS bus power sources to the RAT 'B' (ERAT) per CPS 3506.01 (DG) and/or CPS 3501.01, High Voltage Auxiliary Power System. «CM-7»

   2) Perform:

      a) A detailed MCR panel & alarm window walkdown to ensure no other unidentified issues exist.

      b) A relay house walkdown, preferable concurrent with CPS 4200.01D011, Switchyard Trip Data Sheet.

      c) CPS 9082.01, Offsite Source Verification

      d) CPS 9082.02, Electrical Distribution Verification

4.2.5 **Actions After 4160V Bus 1A1(1B1)[1C1] Re-Energized** (Cont)

10. System Restorations

As applicable, verify/complete shutdown of affected systems, and as time/resources permit, recover the system per the CRS direction and system procedure.

This may include, but is **NOT** limited to:

> **NOTE**
>
> Concern - ECCS initiation on hi DW pressure.

- Drywell Ventilation (VP) [CPS 3320.01 (VP)]

> **NOTE**
>
> May need to start VG [CPS 3319.01) until VF is restored to support Secondary CNMT dP.

- Fuel Bldg Ventilation (VF) [CPS 3404.01 (VF)]

> **NOTE**
>
> FC Surge Tank will increase when FC trips. CNMT Upper Pool level will lower.

- Fuel Pool Cleanup (FC) [CPS 3317.01 (FC)]

> **NOTE**
>
> RACS 5 VDC Power Supply may 'crow bar' - an OV/Spike protection feature which opens the supply ckt, but does **NOT** cause the power supply breaker to trip open. IMD support required to reset.

- Rod Control via RC&IS / RACS [CPS 3304.01 (RC&IS)]
- Main Control Room HVAC (VC) [CPS 3402.01 (VC)]
- DG Air Compressors [shunt trip item]
- Containment Monitoring and Process Sampling/Post Accident Sampling (CM/PS/PASS) [shunt trip item]
- Reactor Water Cleanup (RT) [CPS 3303.01 (RT)]
- E32/E51 Rosemount ACU Meter Gross Failures (reset)

> **NOTE**
>
> Should return to NORMAL To LOAD. Need EMD support to reset NSPS Latching Relay.

- Loss of Sync to NSPS Inverters. [CPS 3509.01 (IP)]
- Shutdown Service Water (SX) [CPS 3211.01 (SX)]

4.3 **Loss of Non-ECCS Bus**

NOTE
Aux Seal Injection Pump may **NOT** be available if LOCA shunt trips have occurred.

0

1. **IF** CRD pumps are **NOT** available,

   THEN Within one hour **AND** as resources permit, initiate Recirc Pump Auxiliary Seal Injection Pump Operation per CPS 3304.01, Control Rod Hydraulic & Control (RD).

2. **IF** Feedwater is unavailable or unnecessary,

   THEN Shut 1B21-F065A(B), RPV Inlet Vlvs.

3. **IF** CW is lost or reduced in flow,

   THEN Notify Security to implement compensatory measures in accordance with SY-CL-101-102 and SY-AA-1010-102.

4. Prepare affected busses for re-energization as follows:

   1) Place equipment control switches in PULL-TO-LOCK or LOCKED for the de-energized busses per APPENDIX A (page 27).

   2) For 6900V Bus 1A: 480V Unit Sub C or RW MCC E only:
      As time and resources permit, de-energize rad monitor trip logic power supplies per APPENDIX C prior to restoring the effected bus(es), to prevent inadvertent actuation/isolations. *«CM-2»*

   3) Prepare applicable de-energized 6900V bus(es), 4160V bus(es) or 480V unit sub-station(s):

      a. Place Mn & Res Feed Brk(s) for the bus(es) in PULL-TO-LOCK.

      b. If normal DC control power is **NOT** available, transfer DC control power at the associated bus(es) by inserting control power fuses to the reserve supply receptacles locally at the bus(es).
         [Cubicles: 6900V 1A: 1AP04EA; 6900V 1B: 1AP05EK;
         4160V 1A: 1AP06EH; 4160V 1B: 1AP08EL]

5. **WHEN** An offsite electrical power source is available,

   THEN Energize the affected bus(es) per:

   - CPS 3505.01, 345 & 138 KV Switchyard (SY)
   - CPS 3501.01, High Voltage Auxiliary Power System
   - CPS 3502.01, 480 VAC Distribution

4.3 **Loss of Non-ECCS Bus** (Cont)

NOTE
Secure one pump to conserve fuel while maintaining the FP header pressurized.

6. **WHEN** Fire protection jockey pump is restored,

   THEN Return Diesel Fire Pumps, 0FP01PA(B) to STANDBY per CPS 3213.01, Fire Detection And Protection.

NOTE

1. Loss of DC power significantly complicates plant operation. Charger restoration and extending existing DC capability should be pursued aggressively.
2. It is permissible to use CPS 4200.01C002, DC Load Shedding During a SBO.
3. Per TG Engineer, a turbine coast down takes ~ 2.5 hrs, plus 30 min for bearing cooldown.
4. Use 3509.01C005 (3509.01C006) Appendix A for load list/impacts of UPS 1A (UPS 1B) load shedding. May be desired to keep PPC computers and DCS screens to provide MCR key information as long as possible. UPS 1A (UPS 1B) still assumed to be secured within 90 minutes.

7. Reduce non-essential DC loads as necessary to minimize battery discharge rate.

   The following loads are assumed to be secured in noted time frame: *«CM-9»*

   - BOP 1E: EBOP, 1TO05P [30 minutes]
   - BOP 1E: UPS 1A, 1IP06E [90 minutes]
   - BOP 1F: Emer Ltg Cab 162, 1LL62E [60 minutes]
   - BOP 1F: UPS 1B, 1IP07E [90 minutes]

NOTE
BOP battery life is expected to be ~2 hours; after which the EBOP & ESOP will be lost, and hydrogen in the Turb Bldg will then be a concern.

8. Securing ESOP:
   1) Vent HY from Generator per 3111.01 (HY) Emergency Generator HY Venting section
   2) Secure ESOP.

9. Secure EBOP as soon as practical.

4.3 **Loss of Non-ECCS Bus** (Cont)

NOTE
1. SDC Temperature recorders 1E12-R601, 1B33-R604 and 1B21-R643 are lost when 6900V Bus 1A is lost.
2. Refer to CPS 3312.03 (RHR-SDC) for Alternate SDC Temperature Monitoring when necessary.

10. Determine operable critical instrumentation per APPENDIX B, Instrument Availability (page 28).

11. Evaluate loss of power impact on communication needs:

NOTE
1. Step 4.3.11.1 is required to support LAN router data links for EOF, State and ERDS after UPS is discharged (~ 2 hours).
2. Security support is required to access Door 22: SB Basement Telephone Room.

1) Standard Telephone Service
PCS Phone Service
SBB LAN Core Routers (0CQ04E)

Upon Loss of 6900V Bus 1A or CB MCC C (0AP22E):

In the SB Basement Telephone Room (Door 22):

Swap 0CQ04EA, 208V Transfer Sw (on East Wall)
FROM Main Feed [0CQ07EA: CB MCC C-4BL (0AP22E)]
TO Reserve Feed [0CQ07EB: AB MCC 1A1-8B (1AP72E)].

2) **IF** PCS Phone system is **NOT** available,

THEN Use Operations Radios for communication.

3) Refer to Appendix E- Loss of Power Impact on Communications for more information.

12. Coordinate with Transmission Supply Services (Dispatch) for switchyard status, and for restoration information/support.

13. Refer to APPENDIX D - Loss of Offsite Power Site Support Activities for actions that may be appropriate.

14. Record TRIP DATA on the appropriate TRIP DATA SHEET listed in section 8.0, DOCUMENTS.

15. Notify Chemistry of bus restoration (may impact Post Accident Sample Panel or other Chemistry sampling capabilities).

4.3 **Loss of Non-ECCS Bus** (Cont)

NOTE

1. Sub-steps of 4.3.16 may be performed in any order or concurrently.
2. Step 4.3.16.1 is required to close 1CD039, SJAE Min Flow Valve, when condensate system is lost.
3. Notify security when CW is AVAILABLE and to evaluate removal of compensatory actions in accordance with SY-CL-101-102 and SY-AA-101-102. [CA 4010227-60] «CM-10»

16. Non-ECCS Bus Re-energized Actions

WHEN Power is restored to a non-ECCS bus,

THEN Perform the following:

1. Place 1B21-F304A and F304B, MS To SJAE 1A(1B) in NEUTRAL/AFTER-CLOSED.

NOTE

Plant conditions may require restoring systems in a different order than listed. However, 1E/1F BOP batteries/battery chargers (DC) should be restored first. Instrument Power from UPS 1A/1B busses is needed to recover remaining systems.

CAUTION

1. Water hammer and lifting of relief valves is a concern during system restoration.
2. Fluid systems should be checked, filled, and vented prior to restoring to service.

2. Restore following plant systems to service:
   - 1E/1F BOP batteries/battery chargers (DC)
   - Component Cooling Water (CCW)
   - Plant Service Water (WS)
   - Service and Instrument Air (SA/IA)
   - Reactor Water Cleanup (RT): as needed to support RPV forced circulation/normal heat sink
   - Turbine Building Closed Cooling Water (WT)
   - Control Rod Drive Hydraulics (RD)
   - Reactor Recirculation (RR): as needed to support RPV forced circulation/normal heat sink
   - Makeup/Cycled Condensate (MC/CY)
   - Plant Chill Water (WO)
   - Circulating Water (CW)
   - Feedwater/Condensate (FW/CB/CD)
   - Turbine and Generator Auxiliaries (TG)
   - HVAC systems

4.4 STATION BLACKOUT (SBO) *«CM-1»*

NOTE

Executing CPS 4306.01, Extended Loss of AC Power/Loss of UHS, takes precedence over attempts to restore offsite AC and/or DGs.

1. The Shift Manager shall conduct a continuous assessment of the prognosis for restoration of power to Div 1 and/or Div 2.

   IF Within 1 HOUR of the Station Blackout, there has **NOT** been action taken that would provide a HIGH ASSURANCE of restoration of Div 1 and/or Div 2 power within the 4 hour SBO coping period,

   THEN STOP executing Station Blackout actions

   AND

   Immediately execute CPS 4306.01 Extended Loss of AC Power/Loss of UHS.

2. The Shift Manager shall continue to monitor SBO recovery actions.

   IF While executing SBO actions, recovery actions prove to be unsuccessful

   THEN STOP executing Station Blackout actions

   AND

   Immediately execute CPS 4306.01 Extended Loss of AC Power/Loss of UHS.

3. ***TIME CRITICAL ACTIONS***

NOTE

1. Divisional Battery distribution panel load shedding should be completed first followed by BOP 1E/1F.
2. The one-hour time to complete load shedding begins at the onset of the SBO.

CAUTION

Equipment losses or malfunctions can occur when battery voltages are ≤ 105 VDC.

1. Initiate and complete within 1 hour, CPS 4200.01C002, DC Load Shedding During A SBO.
2. Bypass RCIC trips/isolations per CPS 4410.00C001 DEFEATING RCIC INTERLOCKS.

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

3. ***TIME CRITICAL ACTIONS*** *(Cont)*

NOTE

O The following actions for section 4.4.3.3 are referenced from section 8.2.4 of CPS 3101.01. Local manual valve operation may be necessary.

3. Place ADS Backup Air Bottles in service by performing the following:

   a. Open 1IA012A - AB 762′ East Gas Control Boundary

   b. Open 1IA013A - FB 781′ West above Div 1 H_2O_2 skid

NOTE

O Performance of steps 4.4.3.3.c - 4.4.3.3.d may be delayed if containment is inaccessible.

   c. Close/Verify Closed 1IA012B - Located AZM 50 - 788

   d. Close/Verify Closed 1IA013B - Located AZM 240 - C788 - Above BW Recv Tnk Room

4.4 **STATION BLACKOUT (SBO)** *«CM-1»*

3. ***TIME CRITICAL ACTIONS*** *(Cont)*

NOTE

1. Preferred HPCS suction source for injection during a SBO is the suppression pool.
2. Minimize HPCS operations which pump the RCIC storage tank into the suppression pool.
3. Preferred RCIC suction source is the suppression pool when utilized for level control.
4. RCIC isolations are bypassed per step 4.4.3.2.
5. Use of suppression pool as a RCIC suction source is limited to 197°F suppression pool temperature during a SBO.

4. **Level Control Actions**

Control RPV water level Level 3 (8.9 in.) to Level 8 (52 in.) using HPCS or RCIC.

IF RPV level can **NOT** be stabilized,

THEN Expand level band to –30 in. to +40 in. Wide Range with a target of 0 in. to +10″ Wide Range.

Expanding the pressure band to 600 - 1065 psig will assist with pressure/level coordination efforts.

IF HPCS is available or in service

THEN Secure RCIC (if running)

AND

ENSURE RCIC DC Loads are secured within 10 minutes of event.

- HPCS [preferred] (CPS 3309.01 - HPCS)
- RCIC [alternate] (CPS 3310.01 - RCIC, or (if required) CPS 4003.01C002, RSP - RCIC Operation)

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

3. ***TIME CRITICAL ACTIONS*** *(Cont)*

NOTE
Minimize depressurization to maximize RCIC availability and to minimize suppression pool heat-up.

5. **Pressure Control Actions**

Stabilize RPV pressure below 1065 psig using SRV's or RCIC.

- SRVs (CPS 3101.01 - MS/SRVs)
  [Ref. Fig 1, SRV DISCHARGE LOCATIONS, page 25]

  Use non-ADS SRVs first, followed by ADS SRVs in a manner that:
  - Precludes uneven suppression pool heating, and
  - Avoids the running HPCS or RCIC pump suction.

- RCIC (CPS 3310.01 or CPS 4003.01C002)

  Maintain RPV pressure > 150 psig when using RCIC.

4. **Additional Actions**

NOTE
Some of the following actions may require support from the ERO and IMD. The CRS is expected to initiate these actions.

1. Initiate IMD actions to remotely monitor suppression pool, CNMT and DW temperatures per CPS 4200.01C003, Monitoring CNMT Temperatures During A SBO. *«CM-8»*

2. Initiate manual CNMT isolation actions per CPS 4200.01C004, Manual CNMT Isolation During A SBO.

3. Refer to step 4.3 **Loss of Non-ECCS Bus**, for action required to further reduce loads on BOP DC Busses.

4. To provide cooling to an operating Div 1 or 2 inverter, block open the inverter room door and the door from the cable spreading area to the insulation lay-down area.

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

4. **Additional Actions** (Cont)

NOTE
1. It is expected during a SBO that a High Drywell Pressure will occur. Performing an upper suppression pool dump at the one hour point is performing action that would be expected to occur if power were available.
2. The upper pool dump should be performed promptly at the one hour point; containment conditions are expected to degrade as time progresses.

5. **IF** CPS 4306.01 Extended Loss of AC Power/Loss of UHS has **NOT** been entered

AND

Entry is **NOT** anticipated.

THEN **WHEN** the SBO reaches the one (1) hour point, dump the upper containment pools by manually opening both of the valves in either set below:

1) 1SM001A **AND** 1SM002A (Containment 803' elev, AZM 45)

OR

2) 1SM001B **AND** 1SM002B (Containment 803' elev, AZM 315)

NOTE
Portable lighting designated for fire protection should be used during the SBO.

6. Keep trying to make any power source available per:
   - CPS 4200.01, Section 4.2, **Loss/Transfer of 4160V Bus 1A1/1B1**
   - Consider using 'Backfeed Using MPTs & UATS' per CPS 3501.01, High Voltage Auxiliary Power System.

4.4 **STATION BLACKOUT (SBO)** (Cont) *«CM-1»*

4. **Additional Actions** (Cont)

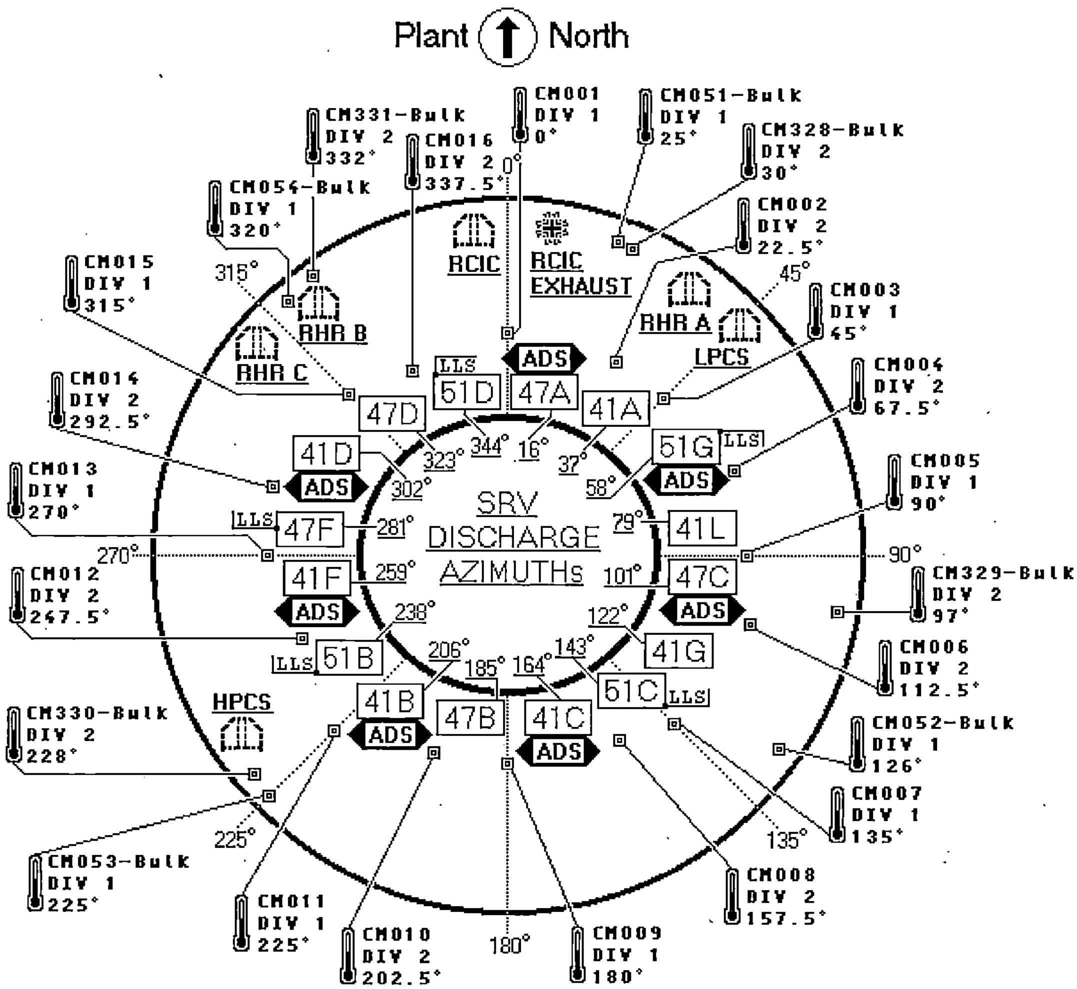
NOTE

1. Habitability concerns are based on prolonged exposure to > 120°F. Peak worst case MCR area temperatures are expected to be 107°F.
2. This action also includes deenergizing non-essential computer equipment in the computer room.
3. The DCS/PMS computer is left in-service until it has failed due to high heat conditions. DCS/PMS should be de-energized after it is no longer functioning.

7. When ERO support is available, initiate supplemental MCR cooling per CPS 4200.01C001, MCR Cooling During A SBO.
8. CPS 4303.01P023, Cross Connecting Div 3 DG to Div 1(2) ECCS Electrical Busses, was written for extensive damage/beyond design basis events.

   For extended SBO conditions, it should be referenced for strategies the ERO could employ to supply Div 1 or 2 ECCS busses from the Division 3 diesel generator to support decay heat removal.

Figure 1
SRV DISCHARGE LOCATIONS



NOTE
If pool level drops below 18 ft 6 in., read pool temperature on bulk locations.

Relative Thermocouple Location

ECCS Ring Header Suction - Relative Suction Pipe Location

5.0 **FINAL CONDITIONS**

5.1 Affected bus/busses have been re-energized.

5.2 Notify CMO Group to perform thermography on any recently closed and energized:

1. SY Disconnect (4501/4503, 4505/4507, 4509/4511, 4513/4515, 4517/4519, 4521/4523, 4520, 4525).
2. Circuit Switcher 4538 (RAT) & B018 (ERAT) if transformer assumed any significant loading.

5.3 Restoration activities being developed by the Emergency Plan Recovery Phase.

6.0 **DISCUSSION**

6.1 **SBO: Switchyard Concerns**

Contact the Transmission Services Operator for information on grid restorations and priorities.

It will assist the TSO to provide them information regarding plant electrical status (such as diesel status and switchyard status) and plans for use of site power when restored (would we tie on emergency buses if grid is still degraded?).

If the grid is degraded, site personnel may be requested to perform high voltage switching based on availability of transmission personnel and travel conditions.

See Appendix D.11 for more information.

6.2 **SBO: Technical Bases Summary** *«CM-1»*

1. All SBO actions are based on the Extended Power Uprate Report - Station Blackout EPU-T0903, which assures equipment operability and adequate core cooling for a 4 hour coping period.

   Restoration of an offsite, or a Div 1 or Div 2 power source is expected within the 4 hour period.

   The Report analyzes 2 cases:
   - SBO with only HPCS available (Case 1)
   - SBO with only RCIC available (Case 2)

   The licensing analyzes are based on conservative worst case initial assumptions, and does **NOT** credit the RCIC Storage Tank, or operator responses prior to 10 mins.

   Actual plant response should be well below any of the worst case conclusions listed below.

6.2 **SBO: Technical Bases Summary** (Cont) *«CM-1»*

To avoid an unnecessary delay in taking actions for a ELAP, the SM must continually access recovery efforts. If power can **NOT** be restored to Div 1 or Div 2 equipment capable of removing heat from the Containment in a timely manner, direction is provided to cease SBO directed actions and immediately commence actions IAW CPS 4306.01 Extended Loss of AC Power/Loss of UHS. These actions parallel SBO actions through the 4 hour assumed coping period. These actions will provide alternate power and water sources and allow Containment heat removal.

2. Level 3 to Level 8:

This is a ***TIME CRITICAL ACTION.***

Maintain consistent with EOP and Reactor SCRAM actions.

System leakage for a SBO, including RR pump seals (~ 38 gpm) and inventory loss from SRVs, is assumed to be ~ 100 gpm for the duration of the SBO.

RR Pump seals are expected to remain intact. The analysis assumes an initial 19 gpm seal leakage per pump, which does **NOT** change during the SBO event. However, seal failure may occur upon RR pump restart.

3. RPV Pressure

This is a ***TIME CRITICAL ACTION.***

1) Below 1065 psig: consistent with EOP parameters.

2) > 150 psig when using RCIC: Analysis bounded at the ITS LCO 3.5.1 pressure for normal operability, while ensuring suppression pool temperature does **NOT** exceed 185°F in the 4 hour coping analysis.

4. DC load shedding within 1 hour:

This is a ***TIME CRITICAL ACTION.***

Essential control circuits will be powered from station batteries.

Battery loads are reduced to insure a 4 hour DC supply.

DC power is needed to maintain manual SRV control and RCIC operation.

5. Bypass RCIC LD logic:

This is a ***TIME SENSITIVE ACTION*** taken to prevent a RCIC turbine trip during SBO conditions, and to prevent an inadvertent isolation when power is restored.

6.2 **SBO: Technical Bases Summary** (Cont) *«CM-1»*

6. RCIC/HPCS suction on pool:

   Preferred source to maximize RCIC water availability.

   Maintains RCIC storage tank as a reserve supply of cool water for cooling the RCIC lube oil, thereby extending the survivability duration of the event beyond 4 hours.

7. Supplemental MCR Cooling:

   Habitability concerns are based on prolonged exposure to > 120°F.

   Peak worst case MCR area temperatures are expected to be 107°F.

(SBO: Technical Bases Summary continued next page)

6.2 **SBO: Technical Bases Summary** (Cont) *«CM-1»*

8. SBO Plant Parameter Responses:
Following Table summarizes the 'worst case' SBO analyses values (Case 1 - HPCS or Case 2 - RCIC). This information should be used to help prioritize actions based upon actual plant response.

Item/Area	Initial Value	Worst Case SBO Value	Limiting Value
Outside Air Temperature	96°F	N/A	N/A
Main Control Room	86°F	107°F	120°F
MCR - Computer Area (4) *(DCS/PMS failure is expected)*	86°F	176°F @ 60 minutes 105°F @ 4 hours	120°F
RCIC Pump Room (1)	110°F	148°F	180°F
RCIC Instrument Panel Room Area	110°F	168°F	180°F
Main Steam Tunnel	148°F	~ 250°F	300°F
Suppression Pool Temp (2)	95°F	~ 177°F	197°F (3)
Drywell Pressure	1 psig	7.0 psig	23.2 psig (LOCA)
Containment Pressure	1 psig	3.7 psig	7 psig (LOCA)
Electrical Panel Areas Div 1/2 DC MCCs Battery Rms - Div 1/2 Battery Rms - Div 3/4 Inverter Rms - Div 1/2 Inverter Rms - Div 3/4	 95°F 95°F 95°F 104°F 104°F	 104°F 104°F 95°F ~ 141 / ~ 139°F ~ 108 / ~ 125°F	178°F (short intervals) 122°F (continuous) *Analyses allows for exceeding the continuous limit.*
Battery Capacity - Div 1/2	100%	Div 1: 15.4% (Case 1) 5.3% (Case 2) Div 2: 2.3% (Case 1/2)	N/A
Battery Capacity - Div 3/4	100%	> 5% margin @ 4 hours	N/A
SRV Lifts (Air capacity)	N/A	37 lifts w/o backup air	100 lifts

(1) RCIC room temperature assumes the RCIC turbine gland seal air compressor is operating for the duration of the SBO. If the gland seal air compressor is **NOT** operating, steam leakage from the RCIC turbine gland seals will raise RCIC room temperature > 200°F.

(2) Suppression Pool Temperature will exceed the EOP-6 Heat Capacity Temperature Limit (HCTL) at ~ 3 hours. However, for a SBO event, Emergency Depressurization is **NOT** required (EOP-6 allows for this) since the intent of HCTL is to mitigate an irreversible trend in pool temperature by blowing down before the pool condensing capability is lost. At the end of the SBO, suppression pool temperature is restored below the HCTL via RHR Suppression Pool Cooling.

(3) SBO analysis shows the pool temperature will **NOT** exceed 185°F (SP design limit), however for continued RCIC operation, the EOP limit of 197°F (oil cooling) is used, thereby extending the survivability duration of the event beyond 4 hours.

(4) Computer equipment is left running until heat induced failure occurs to maximize operator ability to respond to the SBO event using valid DCS/PMS indications.

(DISCUSSION Section continued on next page)

6.0 **DISCUSSION**

6.3 For abnormal or emergency operations (EOPs, Off Normal, etc.), promptly notify Security to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.

Verify with Security that appropriate actions are taken. *(CA#4010227-60) «CM-10»*

7.0 **REFERENCES**

7.1 **Licensing Basis Documents**

7.1.1 ITS LCO section 3.8

7.1.2 USAR 8.3.1, 8.3.2, 15.2.6.2.1.3; APPENDIX D, II, K.3.2.5

7.2 **Procedures**

7.2.1 CPS 3101.01, Main Steam (MS, IS & ADS)
7.2.2 CPS 3105.01, Turbine (TG, EHC, TS)
7.2.3 CPS 3109.01, Generator Seal Oil
7.2.4 CPS 3111.01, Generator Gas (HY, CO)
7.2.5 CPS 3211.01, Shutdown Service Water (SX)
7.2.6 CPS 3213.01, Fire Detection And Protection
7.2.7 CPS 3303.01, Reactor Water Cleanup (RT)
7.2.8 CPS 3304.01, Control Rod Hydraulic & Control (RD)
7.2.9 CPS 3304.02, Rod Control And Information System (RC&IS)
7.2.10 CPS 3309.01, High Pressure Core Spray System (HPCS)
7.2.11 CPS 3310.01, Reactor Core Isolation Cooling (RI)
7.2.12 CPS 3317.01, Fuel Pool Cooling And Cleanup (FC)
7.2.13 CPS 3319.01, Standby Gas Treatment (VG)
7.2.14 CPS 3320.01, Drywell Cooling System (VP)
7.2.15 CPS 3402.01, Control Room HVAC (VC)
7.2.16 CPS 3404.01, Fuel Building HVAC (VF)
7.2.17 CPS 3501.01, High Voltage Auxiliary Power System
7.2.18 CPS 3502.01, 480 VAC Distribution
7.2.19 CPS 3505.01, 345 & 138 KV Switchyard (SY)
7.2.20 CPS 3506.01, Diesel Generator And Support Systems (DG)
7.2.21 CPS 3509.01, Instrument Power System (IP)
7.2.22 CPS 3512.03, 3D Monicore System
7.2.23 CPS 3514.01, Bus/Unit Sub Outages
7.2.24 CPS 4001.01, Reactor Scram
7.2.25 CPS 4001.02, Automatic Isolation
7.2.26 CPS 4003.01C002, RSP - RCIC Operation
7.2.27 CPS 4201.01, Loss Of DC Power
7.2.28 CPS 4410.01C001, Defeating RCIC Interlocks
7.2.29 EP-AA-1003: CPS Emergency Plan Annex
7.2.30 LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements

7.0 **REFERENCES** (Cont)

7.3 **Design/Vendor/Print/Other**

7.3.1 SOER 90-01, Rec. 5: Gnd Faults on AC Elec Dist Systems

7.3.2 HRA Calc A.1.94 DC Load Shedding Per CPS 4200.01 Not Successful, Calculation 19-D-42

7.4 **Commitments**

7.4.1 CM-1: Extended Power Uprate Report - Station Blackout EPU-T0903 *«1.4, 4.4, 6.2»*

7.4.2 CM-2: CR1-89-02-034 *«4.2.2.11, 4.3.3.2, APP. C»*

7.4.3 CM-3: CR1-96-04-022 (FPM ITS impact) *«4.2.1.6, 4.2.5.2»*

7.4.4 CM-4: CR1-97-07-222 (RC&IS impact) *«1.3.1 1st bullet ☞»*

7.4.5 CM-5: CR1-99-01-001 (Tripped Shunt Trip Brks) *«4.2.1.8, 4.2.5.5»*

7.4.6 CM-6: EDSFI #189 *«4.2.4.11»*

7.4.7 CM-7: EDSFI #39 & #102 *«4.2.5.8»*

7.4.8 CM-8: IP Ltr Y-213978 *«4.4.3.2, C003»*

7.4.9 CM-9: EC 370851 (Calc 19-D-35/36) *«4.3.1.6»*

7.4.10 CM-10: IR 4010227-60 (CA): Communication to Security *«4.11, Finger in 4.3.2, 6.3»*

8.0 **DOCUMENTS**

CPS 4200.01C001, MCR Cooling During A SBO

CPS 4200.01C002, DC Load Shedding During A SBO

CPS 4200.01C003, Monitoring CNMT Temperatures During A SBO *«CM-8»*

CPS 4200.01C004, Manual CNMT Isolation During A SBO

CPS 4200.01D001, Main Generator Trip Data Sheet

CPS 4200.01D002, RAT Trip Data Sheet

CPS 4200.01D003, ERAT Trip Data Sheet

CPS 4200.01D004, 6900V Bus 1A Trip Data Sheet

CPS 4200.01D005, 6900V Bus 1B Trip Data Sheet

CPS 4200.01D006, 4160V Bus 1A Trip Data Sheet

CPS 4200.01D007, 4160V Bus 1B Trip Data Sheet

CPS 4200.01D008, Emergency Bus 1A1 Trip Data Sheet

CPS 4200.01D009, Emergency Bus 1B1 Trip Data Sheet

CPS 4200.01D010, Emergency Bus 1C1 Trip Data Sheet

CPS 4200.01D011, Switchyard Trip Data Sheet

CPS 4303.01P023, Cross Connecting Div 3 DG to Div 1(2) ECCS Electrical Busses,

APPENDIX A
Equip Control Switches To Be Placed In PULL-TO-LOCK Or LOCKED

(for the applicable de-energized bus)
Page 1 of 1

NOTE

1. This list only identifies loads that may Auto Start on bus re-energization and loads which can be quickly attended to by the MCR crew.

2. A simple check of the other bus loads to verify components are tripped or stopped is sufficient.

6900V Bus 1A	6900V Bus 1B
None	Reactor Feed Pump 1C, 1FW01PC

4160V Bus 1A	4160V Bus 1B
Plant Service Water Pump 1A, 1WS01PA Plant Service Water Pump 1C, 1WS01PC	Plant Service Water Pump 1B, 1WS01PB
Service Air Compressor 0, 0SA01C	Service Air Compressor 1, 1SA01C Service Air Compressor 2, 2SA01C
Condensate Pump 1A, 1CD01PA Condensate Pump 1C, 1CD01PC	Condensate Pump 1B, 1CD01PB Condensate Pump 1D, 1CD01PD
CC Pump 1A, 1CC01PA CC Pump 1C, 1CC01PC	CC Pump 1B, 1CC01PB

480V Unit Sub 1F (1AP16E)	480V Unit Sub 1G (1AP17E)
Suppression Pool Cleanup Pump 1A, 1SF01PA	Suppression Pool Cleanup Pump 1B, 1SF01PB
Plant Chill Water Pump A, 0WO03PA Plant Chill Water Pump C, 0WO03PC	Plant Chill Water Pump B, 0WO03PB Plant Chill Water Pump D, 0WO03PD Plant Chill Water Pump E, 0WO03PE

480V Unit Sub 1J (1AP20E)	480V Unit Sub 1K (1AP21E)
EHC Fluid Pump 1A, 1EH01PA	EHC Fluid Pump 1B, 1EH01PB
Stator Cooling Water Pump 1A, 1GC01PA	Stator Cooling Water Pump 1B, 1GC01PB
Turb Bldg CCW Pump 1A, 1WT01PA	Turb Bldg CCW Pump 1B, 1WT01PB
Cyc Cond Xfer Pump 0A, 0CY01PA Cyc Cond Xfer Pump 0C, 0CY01PC	Cyc Cond Xfer Pump 0B, 0CY01PB
Make Up Cond Xfer Pmp, 0MC01PA	Make Up Cond Xfer Pmp, 0MC01PB
Reactor Feed Pump Turbine Auxiliary Oil Pump, 1TO10P	

APPENDIX B
Instrument Availability
Page 1 of 2

Parameter	Bus 1A1	Bus 1B1	Non AC Dependent Equipment (SBO)
RPV Water Level	B21-R623A (P601, 5064) B21-R615 (P601, 5064) Fuel Zone Recorder C61-R010 (RSP)	B21-R623B (P601, 5065) C61-R509 (RSP)	B21-R604 (P678) Div 3 Wide Range B21-R610 (P601, 5065) Fuel Zone Meter ATMs (NSPS Keypad) B21-N673C/D/G/H (HPCS) B21-N691A/B/E/F (LPCS) B21-N680A/B/C/D (RPS) B21-N692A/B/E/F (RCIC) B21-N681A/B/C/D (NS4) B21-N693A/B (RCIC) B21-N695A/B (ADS)
Reactor Power			APRMs (P669-P672) IRMs (Drive AC Power) SRMs (Drive AC power, will indicate period) GETARs (TT)
RPV Pressure	B21-R623A (P601, 5064) 1LR-SM014 (P601, 5064) C61-R011 (RSP)	B21-R623B (P601, 5065) 1LR-SM016 (P601, 5066) C61-R510 (RSP)	ATMs (NSPS Keypad) B21-N678A/B/C/D (RPS) B21-N679A/B/C/D (NS4) B21-N697A/B/E/F (LPCS)
Suppression Pool Temperature	1LR-CM240 (P601, 5067) 1TR-CM334 (P678) 1TR-CM017 (P638)	1LR-CM241 (P601, 5067) 1TR-CM335 (P678) 1TR-CM018 (P639)	Remote per CPS 4200.01C003

APPENDIX B
Instrument Availability
Page 2 of 2

Parameter	Bus 1A1	Bus 1B1	Non AC Dependent Equipment (SBO)
Suppression Pool Level	1LR-SM014 (P601, 5064) 1LR-CM030 (P601, 5064) 1LR-CM240 (P601, 5067) 1LI-CM260 (P601, 5063) C61-R504 (RSP)	1LR-SM016 (P601, 5066) 1LR-CM031 (P601, 5066) 1LR-CM241 (P601, 5067) 1LI-CM261 (P601, 5063) C61-R511 (RSP)	ATM (NSPS Keypad) E22-N655C/G (HPCS) E51-N636A/E (RCIC)
Containment Pressure	1LR-SM014 (P601, 5064) 1PR-CM256 (P601, 5066) 1LR-CM030 (P601, 5064)	1LR-SM016 (P601, 5066) 1PR-CM257 (P601, 5066) 1LR-CM031 (P601, 5066)	ATM (NSPS Keypad) E12-N662A/B/C/D (RHR)
Containment Temperature	1PR-CM256 (P601, 5066)	1PR-CM257 (P601, 5066)	Remote per CPS 4200.01C003
Drywell Pressure	1PR-CM063 (P601, 5067)	1PR-CM064 (P601, 5067)	ATMs (NSPS Keypad) B21-N694A/B/E/F (LPCS) E22-N667C/D/G/H (HPCS) C71-N650A/B/C/D (RPS)
Drywell Temperature	1PR-CM063 (P601, 5067) C61-R501 (RSP) C61-R502 (RSP)	1PR-CM064 (P601, 5067)	Remote per CPS 4200.01C003
RCIC Pump Flow/Discharge Pressure			E51-R601 (P601, 5063) E51-R606 (P601, 5063) C61-R001-1 (RSP)

APPENDIX C *«CM-2»*

Rad Monitor Trip Logic Power Supplies

Page 1 of 1

CAUTION

Inadvertent actuations and/or isolations can occur if the trip logic power is available when the rad monitor devices are re-energized.

1. As time and resources permit, open the trip logic power supply breaker associated with the bus that is to be re-energized.

Bus being restored	Trip Logic Power Supply	Monitors Impacted
4160V Bus 1A1, or 480V Unit Sub A, or AB MCC 1A1	CB MCC E2-2B (0AP54EB) 208/120V Dist Pnl, Ckt 24 (CB 825′, V-133)	1RIX-PR001A/C 1RIX-PR006A/C 1RIX-PR008A/C 1RIX-PR009A/C 1RIX-PR042A/C
4160V Bus 1B1, or 480V Unit Sub B, or AB MCC 1B1	CB MCC F2-1B (0AP55EB) 208/120V Dist Pnl, Ckt 12 (CB 825′, V-128)	1RIX-PR001B/D 1RIX-PR006B/D 1RIX-PR008B/D 1RIX-PR009B/D 1RIX-PR042B/D
6900V Bus 1A, or 480V Unit Sub C, or RW MCC E	CB MCC D-3B (0AP23E) 208/120V Dist Pnl, Ckt 16 (CB 825′, Y-129)	1RIX-PR035 1RIX-PR041

2. Re-energize the applicable bus.

3. Shut the trip logic power supply breaker that was previously opened.

APPENDIX D
LOSS OF OFFSITE POWER SITE SUPPORT ACTIVITIES
Page 1 of 5

NOTE

1. This Appendix serves as a checklist of activities the OCC and/or ERO should use to help minimize the site impact due to an extended Loss of Offsite Power (LOOP)[> 2 hours].
2. Evaluate and implement those items as necessary to achieve the desired objective.

1. **Service Building** (Loss of 12KV Power)

   Service Building basement sump pumps will overflow without power.

   Evaluate consequences and initiate appropriate actions.

   Comments/Notes: ______________________

2. **Security Equipment** (Loss of Non-Safety and 12KV Power)

   Implement contingency actions for processing site personnel and visitors.

   Implement contingency actions for loss of security measures and BRE power supplies.

   Reference CPS 3511.01, Security Electrical Distribution.

   Comments/Notes: ______________________

3. **Communications** (in addition to step 4.1.5)

   Establish a communication line with AmerenIP.

   Establish a charging location for radio chargers and radio batteries so that the batteries will be able to be charged.

   Initiate actions to obtain additional diesel fuel for the LAN Central Server backup generator at the Nuclear Support Annex.

   Comments/Notes: ______________________

4. **Main Generator**

   Perform an Emergency Generator Hydrogen Venting per CPS 3111.01, Hydrogen Gas (HY, CO). See step 4.1.3.2.

   Comments/Notes: ______________________

5. **DC Load Shedding** - See step 4.1.3.2.

   Comments/Notes: ______________________

5.0 **FINAL CONDITIONS**

5.1 Affected bus/busses have been re-energized.

5.2 Notify CMO Group to perform thermography on any recently closed and energized:

1. SY Disconnect (4501/4503, 4505/4507, 4509/4511, 4513/4515, 4517/4519, 4521/4523, 4520, 4525).
2. Circuit Switcher 4538 (RAT) & B018 (ERAT) if transformer assumed any significant loading.

5.3 Restoration activities being developed by the Emergency Plan Recovery Phase.

6.0 **DISCUSSION**

6.1 **SBO: Switchyard Concerns**

Contact the Transmission Services Operator for information on grid restorations and priorities.

It will assist the TSO to provide them information regarding plant electrical status (such as diesel status and switchyard status) and plans for use of site power when restored (would we tie on emergency buses if grid is still degraded?).

If the grid is degraded, site personnel may be requested to perform high voltage switching based on availability of transmission personnel and travel conditions.

See Appendix D.11 for more information.

6.2 **SBO: Technical Bases Summary** *«CM-1»*

1. All SBO actions are based on the Extended Power Uprate Report - Station Blackout EPU-T0903, which assures equipment operability and adequate core cooling for a 4 hour coping period.

   Restoration of an offsite, or a Div 1 or Div 2 power source is expected within the 4 hour period.

   The Report analyzes 2 cases:
   - SBO with only HPCS available (Case 1)
   - SBO with only RCIC available (Case 2)

   The licensing analyzes are based on conservative worst case initial assumptions, and does **NOT** credit the RCIC Storage Tank, or operator responses prior to 10 mins.

   Actual plant response should be well below any of the worst case conclusions listed below.

6.2 **SBO: Technical Bases Summary** (Cont) *«CM-1»*

To avoid an unnecessary delay in taking actions for a ELAP, the SM must continually access recovery efforts. If power can **NOT** be restored to Div 1 or Div 2 equipment capable of removing heat from the Containment in a timely manner, direction is provided to cease SBO directed actions and immediately commence actions IAW CPS 4306.01 Extended Loss of AC Power/Loss of UHS. These actions parallel SBO actions through the 4 hour assumed coping period. These actions will provide alternate power and water sources and allow Containment heat removal.

2. Level 3 to Level 8:

   This is a ***TIME CRITICAL ACTION.***

   Maintain consistent with EOP and Reactor SCRAM actions.

   System leakage for a SBO, including RR pump seals (~ 38 gpm) and inventory loss from SRVs, is assumed to be ~ 100 gpm for the duration of the SBO.

   RR Pump seals are expected to remain intact. The analysis assumes an initial 19 gpm seal leakage per pump, which does **NOT** change during the SBO event. However, seal failure may occur upon RR pump restart.

3. RPV Pressure

   This is a ***TIME CRITICAL ACTION.***

   1) Below 1065 psig: consistent with EOP parameters.
   2) > 150 psig when using RCIC: Analysis bounded at the ITS LCO 3.5.1 pressure for normal operability, while ensuring suppression pool temperature does **NOT** exceed 185°F in the 4 hour coping analysis.

4. DC load shedding within 1 hour:

   This is a ***TIME CRITICAL ACTION.***

   Essential control circuits will be powered from station batteries.

   Battery loads are reduced to insure a 4 hour DC supply.

   DC power is needed to maintain manual SRV control and RCIC operation.

5. Bypass RCIC LD logic:

   This is a ***TIME SENSITIVE ACTION*** taken to prevent a RCIC turbine trip during SBO conditions, and to prevent an inadvertent isolation when power is restored.

6.2 **SBO: Technical Bases Summary** (Cont) *«CM-1»*

6. RCIC/HPCS suction on pool:

   Preferred source to maximize RCIC water availability.

   Maintains RCIC storage tank as a reserve supply of cool water for cooling the RCIC lube oil, thereby extending the survivability duration of the event beyond 4 hours.

7. Supplemental MCR Cooling:

   Habitability concerns are based on prolonged exposure to > 120°F.

   Peak worst case MCR area temperatures are expected to be 107°F.

(SBO: Technical Bases Summary continued next page)

6.2 **SBO: Technical Bases Summary** (Cont) *«CM-1»*

8. SBO Plant Parameter Responses:

Following Table summarizes the 'worst case' SBO analyses values (Case 1 - HPCS or Case 2 - RCIC).

This information should be used to help prioritize actions based upon actual plant response.

Item/Area	Initial Value	Worst Case SBO Value	Limiting Value
Outside Air Temperature	96°F	N/A	N/A
Main Control Room	86°F	107°F	120°F
MCR - Computer Area (4) *(DCS/PMS failure is expected)*	86°F	176°F @ 60 minutes 105°F @ 4 hours	120°F
RCIC Pump Room (1)	110°F	148°F	180°F
RCIC Instrument Panel Room Area	110°F	168°F	180°F
Main Steam Tunnel	148°F	~ 250°F	300°F
Suppression Pool Temp (2)	95°F	~ 177°F	197°F (3)
Drywell Pressure	1 psig	7.0 psig	23.2 psig (LOCA)
Containment Pressure	1 psig	3.7 psig	7 psig (LOCA)
<u>Electrical Panel Areas</u> Div 1/2 DC MCCs Battery Rms - Div 1/2 Battery Rms - Div 3/4 Inverter Rms - Div 1/2 Inverter Rms - Div 3/4	 95°F 95°F 95°F 104°F 104°F	 104°F 104°F 95°F ~ 141 / ~ 139°F ~ 108 / ~ 125°F	178°F (short intervals) 122°F (continuous) *Analyses allows for exceeding the continuous limit.*
Battery Capacity - Div 1/2	100%	Div 1: 15.4% (Case 1) 5.3% (Case 2) Div 2: 2.3% (Case 1/2)	N/A
Battery Capacity - Div 3/4	100%	> 5% margin @ 4 hours	N/A
SRV Lifts (Air capacity)	N/A	37 lifts w/o backup air	100 lifts

(1) RCIC room temperature assumes the RCIC turbine gland seal air compressor is operating for the duration of the SBO. If the gland seal air compressor is **NOT** operating, steam leakage from the RCIC turbine gland seals will raise RCIC room temperature > 200°F.

(2) Suppression Pool Temperature will exceed the EOP-6 Heat Capacity Temperature Limit (HCTL) at ~ 3 hours. However, for a SBO event, Emergency Depressurization is **NOT** required (EOP-6 allows for this) since the intent of HCTL is to mitigate an irreversible trend in pool temperature by blowing down before the pool condensing capability is lost. At the end of the SBO, suppression pool temperature is restored below the HCTL via RHR Suppression Pool Cooling.

(3) SBO analysis shows the pool temperature will **NOT** exceed 185°F (SP design limit), however for continued RCIC operation, the EOP limit of 197°F (oil cooling) is used, thereby extending the survivability duration of the event beyond 4 hours.

(4) Computer equipment is left running until heat induced failure occurs to maximize operator ability to respond to the SBO event using valid DCS/PMS indications.

(DISCUSSION Section continued on next page)

6.0 **DISCUSSION**

6.3 For abnormal or emergency operations (EOPs, Off Normal, etc.), promptly notify Security to evaluate for the implementation of compensatory measures in accordance with SY-CL-101-102 and SY-AA-101-102.

Verify with Security that appropriate actions are taken. *(CA#4010227-60) «CM-10»*

7.0 **REFERENCES**

7.1 **Licensing Basis Documents**

7.1.1 ITS LCO section 3.8

7.1.2 USAR 8.3.1, 8.3.2, 15.2.6.2.1.3; APPENDIX D, II, K.3.2.5

7.2 **Procedures**

7.2.1 CPS 3101.01, Main Steam (MS, IS & ADS)
7.2.2 CPS 3105.01, Turbine (TG, EHC, TS)
7.2.3 CPS 3109.01, Generator Seal Oil
7.2.4 CPS 3111.01, Generator Gas (HY, CO)
7.2.5 CPS 3211.01, Shutdown Service Water (SX)
7.2.6 CPS 3213.01, Fire Detection And Protection
7.2.7 CPS 3303.01, Reactor Water Cleanup (RT)
7.2.8 CPS 3304.01, Control Rod Hydraulic & Control (RD)
7.2.9 CPS 3304.02, Rod Control And Information System (RC&IS)
7.2.10 CPS 3309.01, High Pressure Core Spray System (HPCS)
7.2.11 CPS 3310.01, Reactor Core Isolation Cooling (RI)
7.2.12 CPS 3317.01, Fuel Pool Cooling And Cleanup (FC)
7.2.13 CPS 3319.01, Standby Gas Treatment (VG)
7.2.14 CPS 3320.01, Drywell Cooling System (VP)
7.2.15 CPS 3402.01, Control Room HVAC (VC)
7.2.16 CPS 3404.01, Fuel Building HVAC (VF)
7.2.17 CPS 3501.01, High Voltage Auxiliary Power System
7.2.18 CPS 3502.01, 480 VAC Distribution
7.2.19 CPS 3505.01, 345 & 138 KV Switchyard (SY)
7.2.20 CPS 3506.01, Diesel Generator And Support Systems (DG)
7.2.21 CPS 3509.01, Instrument Power System (IP)
7.2.22 CPS 3512.03, 3D Monicore System
7.2.23 CPS 3514.01, Bus/Unit Sub Outages
7.2.24 CPS 4001.01, Reactor Scram
7.2.25 CPS 4001.02, Automatic Isolation
7.2.26 CPS 4003.01C002, RSP - RCIC Operation
7.2.27 CPS 4201.01, Loss Of DC Power
7.2.28 CPS 4410.01C001, Defeating RCIC Interlocks
7.2.29 EP-AA-1003: CPS Emergency Plan Annex
7.2.30 LS-AA-1110 REPORTABLE EVENT SAF 1.54: Reporting of NERC Standard Requirements

7.0 **REFERENCES** (Cont)

7.3 **Design/Vendor/Print/Other**

7.3.1 SOER 90-01, Rec. 5: Gnd Faults on AC Elec Dist Systems

7.3.2 HRA Calc A.1.94 DC Load Shedding Per CPS 4200.01 Not Successful, Calculation 19-D-42

7.4 **Commitments**

7.4.1 CM-1: Extended Power Uprate Report - Station Blackout EPU-T0903 *«1.4, 4.4, 6.2»*

7.4.2 CM-2: CR1-89-02-034 *«4.2.2.11, 4.3.3.2, APP. C»*

7.4.3 CM-3: CR1-96-04-022 (FPM ITS impact) *«4.2.1.6, 4.2.5.2»*

7.4.4 CM-4: CR1-97-07-222 (RC&IS impact) *«1.3.1 1st bullet ☞»*

7.4.5 CM-5: CR1-99-01-001 (Tripped Shunt Trip Brks) *«4.2.1.8, 4.2.5.5»*

7.4.6 CM-6: EDSFI #189 *«4.2.4.11»*

7.4.7 CM-7: EDSFI #39 & #102 *«4.2.5.8»*

7.4.8 CM-8: IP Ltr Y-213978 *«4.4.3.2, C003»*

7.4.9 CM-9: EC 370851 (Calc 19-D-35/36) *«4.3.1.6»*

7.4.10 CM-10: IR 4010227-60 (CA): Communication to Security *«4.11, Finger in 4.3.2, 6.3»*

8.0 **DOCUMENTS**

CPS 4200.01C001, MCR Cooling During A SBO

CPS 4200.01C002, DC Load Shedding During A SBO

CPS 4200.01C003, Monitoring CNMT Temperatures During A SBO *«CM-8»*

CPS 4200.01C004, Manual CNMT Isolation During A SBO

CPS 4200.01D001, Main Generator Trip Data Sheet

CPS 4200.01D002, RAT Trip Data Sheet

CPS 4200.01D003, ERAT Trip Data Sheet

CPS 4200.01D004, 6900V Bus 1A Trip Data Sheet

CPS 4200.01D005, 6900V Bus 1B Trip Data Sheet

CPS 4200.01D006, 4160V Bus 1A Trip Data Sheet

CPS 4200.01D007, 4160V Bus 1B Trip Data Sheet

CPS 4200.01D008, Emergency Bus 1A1 Trip Data Sheet

CPS 4200.01D009, Emergency Bus 1B1 Trip Data Sheet

CPS 4200.01D010, Emergency Bus 1C1 Trip Data Sheet

CPS 4200.01D011, Switchyard Trip Data Sheet

CPS 4303.01P023, Cross Connecting Div 3 DG to Div 1(2) ECCS Electrical Busses,

APPENDIX A

Equip Control Switches To Be Placed In PULL-TO-LOCK Or LOCKED

(for the applicable de-energized bus)

Page 1 of 1

NOTE

1. This list only identifies loads that may Auto Start on bus re-energization and loads which can be quickly attended to by the MCR crew.
2. A simple check of the other bus loads to verify components are tripped or stopped is sufficient.

6900V Bus 1A	6900V Bus 1B
None	Reactor Feed Pump 1C, 1FW01PC

4160V Bus 1A	4160V Bus 1B
Plant Service Water Pump 1A, 1WS01PA Plant Service Water Pump 1C, 1WS01PC	Plant Service Water Pump 1B, 1WS01PB
Service Air Compressor 0, 0SA01C	Service Air Compressor 1, 1SA01C Service Air Compressor 2, 2SA01C
Condensate Pump 1A, 1CD01PA Condensate Pump 1C, 1CD01PC	Condensate Pump 1B, 1CD01PB Condensate Pump 1D, 1CD01PD
CC Pump 1A, 1CC01PA CC Pump 1C, 1CC01PC	CC Pump 1B, 1CC01PB

480V Unit Sub 1F (1AP16E)	480V Unit Sub 1G (1AP17E)
Suppression Pool Cleanup Pump 1A, 1SF01PA	Suppression Pool Cleanup Pump 1B, 1SF01PB
Plant Chill Water Pump A, 0WO03PA Plant Chill Water Pump C, 0WO03PC	Plant Chill Water Pump B, 0WO03PB Plant Chill Water Pump D, 0WO03PD Plant Chill Water Pump E, 0WO03PE

480V Unit Sub 1J (1AP20E)	480V Unit Sub 1K (1AP21E)
EHC Fluid Pump 1A, 1EH01PA	EHC Fluid Pump 1B, 1EH01PB
Stator Cooling Water Pump 1A, 1GC01PA	Stator Cooling Water Pump 1B, 1GC01PB
Turb Bldg CCW Pump 1A, 1WT01PA	Turb Bldg CCW Pump 1B, 1WT01PB
Cyc Cond Xfer Pump 0A, 0CY01PA Cyc Cond Xfer Pump 0C, 0CY01PC	Cyc Cond Xfer Pump 0B, 0CY01PB
Make Up Cond Xfer Pmp, 0MC01PA	Make Up Cond Xfer Pmp, 0MC01PB
Reactor Feed Pump Turbine Auxiliary Oil Pump, 1TO10P	

APPENDIX B
Instrument Availability
Page 1 of 2

Parameter	Bus 1A1	Bus 1B1	Non AC Dependent Equipment (SBO)
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Reactor Power			APRMs (P669-P672) IRMs (Drive AC Power) SRMs (Drive AC power, will indicate period) GETARs (TT)
RPV Pressure	B21-R623A (P601, 5064) 1LR-SM014 (P601, 5064) C61-R011 (RSP)	B21-R623B (P601, 5065) 1LR-SM016 (P601, 5066) C61-R510 (RSP)	ATMs (NSPS Keypad) B21-N678A/B/C/D (RPS) B21-N679A/B/C/D (NS4) B21-N697A/B/E/F (LPCS)
Suppression Pool Temperature	1LR-CM240 (P601, 5067) 1TR-CM334 (P678) 1TR-CM017 (P638)	1LR-CM241 (P601, 5067) 1TR-CM335 (P678) 1TR-CM018 (P639)	Remote per CPS 4200.01C003

APPENDIX B
Instrument Availability
Page 2 of 2

Parameter	Bus 1A1	Bus 1B1	Non AC Dependent Equipment (SBO)
Suppression Pool Level	1LR-SM014 (P601, 5064) 1LR-CM030 (P601, 5064) 1LR-CM240 (P601, 5067) 1LI-CM260 (P601, 5063) C61-R504 (RSP)	1LR-SM016 (P601, 5066) 1LR-CM031 (P601, 5066) 1LR-CM241 (P601, 5067) 1LI-CM261 (P601, 5063) C61-R511 (RSP)	<u>ATM</u> (NSPS Keypad) E22-N655C/G (HPCS) E51-N636A/E (RCIC)
Containment Pressure	1LR-SM014 (P601, 5064) 1PR-CM256 (P601, 5066) 1LR-CM030 (P601, 5064)	1LR-SM016 (P601, 5066) 1PR-CM257 (P601, 5066) 1LR-CM031 (P601, 5066)	<u>ATM</u> (NSPS Keypad) E12-N662A/B/C/D (RHR)
Containment Temperature	1PR-CM256 (P601, 5066)	1PR-CM257 (P601, 5066)	Remote per CPS 4200.01C003
Drywell Pressure	1PR-CM063 (P601, 5067)	1PR-CM064 (P601, 5067)	<u>ATMs</u> (NSPS Keypad) B21-N694A/B/E/F (LPCS) E22-N667C/D/G/H (HPCS) C71-N650A/B/C/D (RPS)
Drywell Temperature	1PR-CM063 (P601, 5067) C61-R501 (RSP) C61-R502 (RSP)	1PR-CM064 (P601, 5067)	Remote per CPS 4200.01C003
RCIC Pump Flow/Discharge Pressure			E51-R601 (P601, 5063) E51-R606 (P601, 5063) C61-R001-1 (RSP)

APPENDIX C *«CM-2»*
Rad Monitor Trip Logic Power Supplies
Page 1 of 1

CAUTION

Inadvertent actuations and/or isolations can occur if the trip logic power is available when the rad monitor devices are re-energized.

1. As time and resources permit, open the trip logic power supply breaker associated with the bus that is to be re-energized.

Bus being restored	Trip Logic Power Supply	Monitors Impacted
4160V Bus 1A1, or 480V Unit Sub A, or AB MCC 1A1	CB MCC E2-2B (0AP54EB) 208/120V Dist Pnl, Ckt 24 (CB 825', V-133)	1RIX-PR001A/C 1RIX-PR006A/C 1RIX-PR008A/C 1RIX-PR009A/C 1RIX-PR042A/C
4160V Bus 1B1, or 480V Unit Sub B, or AB MCC 1B1	CB MCC F2-1B (0AP55EB) 208/120V Dist Pnl, Ckt 12 (CB 825', V-128)	1RIX-PR001B/D 1RIX-PR006B/D 1RIX-PR008B/D 1RIX-PR009B/D 1RIX-PR042B/D
6900V Bus 1A, or 480V Unit Sub C, or RW MCC E	CB MCC D-3B (0AP23E) 208/120V Dist Pnl, Ckt 16 (CB 825', Y-129)	1RIX-PR035 1RIX-PR041

2. Re-energize the applicable bus.

3. Shut the trip logic power supply breaker that was previously opened.

APPENDIX D
LOSS OF OFFSITE POWER SITE SUPPORT ACTIVITIES
Page 1 of 5

NOTE

1. This Appendix serves as a checklist of activities the OCC and/or ERO should use to help minimize the site impact due to an extended Loss of Offsite Power (LOOP)[> 2 hours].
2. Evaluate and implement those items as necessary to achieve the desired objective.

1. **Service Building** (Loss of 12KV Power)

   Service Building basement sump pumps will overflow without power.

   Evaluate consequences and initiate appropriate actions.

   Comments/Notes: ____________________

2. **Security Equipment** (Loss of Non-Safety and 12KV Power)

   Implement contingency actions for processing site personnel and visitors.

   Implement contingency actions for loss of security measures and BRE power supplies.

   Reference CPS 3511.01, Security Electrical Distribution.

   Comments/Notes: ____________________

3. **Communications** (in addition to step 4.1.5)

   Establish a communication line with AmerenIP.

   Establish a charging location for radio chargers and radio batteries so that the batteries will be able to be charged.

   Initiate actions to obtain additional diesel fuel for the LAN Central Server backup generator at the Nuclear Support Annex.

   Comments/Notes: ____________________

4. **Main Generator**

   Perform an Emergency Generator Hydrogen Venting per CPS 3111.01, Hydrogen Gas (HY, CO). See step 4.1.3.2.

   Comments/Notes: ____________________

5. **DC Load Shedding** - See step 4.1.3.2.

   Comments/Notes: ____________________

6. **Diesel Generators**

Initiate actions to obtain additional diesel fuel (normally a 7 day supply is maintained on-site).

Comments/Notes: ______

7. **Fire Pump Diesel Engine Pumps**

Initiate actions to obtain additional diesel fuel

☞*Secure one pump to conserve fuel while maintaining the FP header pressurized.*

Comments/Notes: ______

8. **Sewage Treatment Plant**

Initiate actions to obtain additional diesel fuel for the STP generator.

Comments/Notes: ______

9. **MET Tower**

Initiate actions to obtain additional propane supply for the MET Tower Backup Generator.

MET Tower beacon lights will be out.
Refer to CPS 3323.01 (EM) for FAA Notifications.

Comments/Notes: ______

10. **NRC/IEMA Support**

Initiate actions to obtain a portable diesel supply for the IEMA diesel generator on their stack monitoring system.

Verify NRC/IEMA phones functioning (part of Station Telephone System - see 4.1.5.1), or establish alternate communications for them.

Comments/Notes: ______

11. **Switchyard**

Switchyard DC loads will last 4 - 5 hours.

Work with AmerenIP to evaluate the protective relaying in the Switchyard and initiate appropriate actions, including the installation of additional DC batteries.

The following information may be important to the restoration of off site power (IR 1137890, Lessons Learned From Joint Ameren Training):

1. It is likely that the 138 KV source will be restored prior to the 345 KV source if large portions of the grid were lost. Efforts should focus on the ERAT being ready for restoration unless informed otherwise by Ameren.

2. Ameren may ask for an estimate of how much load will be picked up when the 138 KV line is energized.

   - With the Division 1, 2, and 3 busses either de-energized or on their respective Diesel Generators (DGs), this leaves the 12 KV loop, which is ~4 MW load.
   - The town of DeWitt and other loads on the 138 KV line will have to be estimated by Ameren.

3. Once a source is restored, ECCS busses should stay on the DGs until the 138 KV source is deemed reliable enough that subsequent losses of ECCS busses are **NOT** likely (assuming proper DG operation).

3. Ameren may ask for an estimate of how long it will take to return CPS to service. Due to having to recover all BOP systems prior to plant startup, a time of 96 hours from return of the 345 KV source to the non-safety busses is reasonable (nuclear units are **NOT** part of Ameren's restoration strategy for this reason).

4. The switchyards should be physically walked down for status of components and for any damage and the results of these walkdowns conveyed to Ameren. Ameren's indication and control system may **NOT** be functional during these conditions.

NOTE

0 This estimate will provide enough power to operate battery chargers, station lighting, and other relatively low power loads.

5. Ameren may ask for an estimate of how much load will be picked up when the RAT(s) is/are energized. An estimate of less than 10 MW should be conservative (large motors should be prevented from starting per Appendix A: Equip Control Switches To Be Placed In PULL-TO-LOCK Or LOCKED).

11. **Switchyard** (cont'd)

    6. CPS Operations should be prepared to perform switching orders at Ameren's direction due to Ameren's sources being dispatched to other restoration activities.

    7. Once a source is restored, do **NOT** change load on that source significantly without permission from Ameren. Increasing load may cause a loss of the source, hampering further restoration activities.

    8. Perform thermography as components are restored, especially if there has been any physical challenge to components from severe weather, seismic activity, etc.

    Comments/Notes: ____________________

12. **Station Vehicles**

    Initiate actions to obtain a portable gasoline supply for station vehicles since the site pump will **NOT** be working.

    Comments/Notes: ____________________

13. **Drinking Water**

    Initiate actions to obtain additional drinking water (normally a 3 day supply is maintained on-site).

    Comments/Notes: ____________________

14. **Food**

    Initiate actions to obtain additional food for on-site personnel

    Comments/Notes: ____________________

15. **Sleeping**

    Initiate actions to obtain on-site sleeping arrangements.

    Comments/Notes: ____________________

APPENDIX D
LOSS OF OFFSITE POWER SITE SUPPORT ACTIVITIES
Page 5 of 5

16. **Other:** ______

Comments/Notes: ______

17. **Other:** ______

Comments/Notes: ______

18. **Other:** ______

Comments/Notes: ______

APPENDIX E
LOSS OF POWER IMPACT ON COMMUNICATIONS
Page 1 of 2

NOTE

1. Communications systems, both onsite and offsite are impacted by losses of power.
2. The following is a partial list. Some items are Safeguards Information and are **NOT** included.
3. Following ANY loss of power, plant communications systems are suspect until proven functional. Some systems have battery backup and will be initially available but suffer loss over time.

1.0 **IF** Aux Building MCC 1A1(Division 1 AC)is impacted

THEN the following areas will lose Gai-Tronics speakers and/or stations, requiring Security to make announcements with bullhorns as appropriate (ERO announcements, hazards, protective actions, etc.):

- Main Control Room
- Control Building
- Diesel Generator Building
- Containment and Drywell
- Screen House

2.0 **IF** Aux Building MCC 1B1(Division 2 AC)is impacted

THEN the following areas will lose Gai-Tronics speakers and/or stations, requiring Security to make announcements with bullhorns as appropriate (ERO announcements, hazards, protective actions, etc.):

- Auxiliary Building
- Radwaste Building

3.0 **IF** Turbine Building MCC 1M (Division 2 AC or shunt trip)is impacted

THEN the following areas will lose Gai-Tronics speakers and/or stations, requiring Security to make announcements with bullhorns as appropriate (ERO announcements, hazards, protective actions, etc.):

- Turbine Building

APPENDIX E
LOSS OF POWER IMPACT ON COMMUNICATIONS

4.0 Loss of power to the following busses can impact radio capabilities within the plant. It is possible that some repeaters are lost, or base stations do **NOT** function. Be aware of possible radio use limitations on any loss of power due to the impact on repeaters:

- Aux Building MCC 1A1
- Aux Building MCC 1B1
- Tech Support Center Load Center 0AP08E
- Control Bldg MCC C

APPENDIX D
LOSS OF OFFSITE POWER SITE SUPPORT ACTIVITIES
Page 2 of 5

6. **Diesel Generators**

Initiate actions to obtain additional diesel fuel (normally a 7 day supply is maintained on-site).

Comments/Notes: ______________________________

____

7. **Fire Pump Diesel Engine Pumps**

Initiate actions to obtain additional diesel fuel

☞*Secure one pump to conserve fuel while maintaining the FP header pressurized.*

Comments/Notes: ______________________________

____

8. **Sewage Treatment Plant**

Initiate actions to obtain additional diesel fuel for the STP generator.

Comments/Notes: ______________________________

____

9. **MET Tower**

Initiate actions to obtain additional propane supply for the MET Tower Backup Generator.

MET Tower beacon lights will be out.
Refer to CPS 3323.01 (EM) for FAA Notifications.

Comments/Notes: ______________________________

____

10. **NRC/IEMA Support**

Initiate actions to obtain a portable diesel supply for the IEMA diesel generator on their stack monitoring system.

Verify NRC/IEMA phones functioning (part of Station Telephone System - see 4.1.5.1), or establish alternate communications for them.

Comments/Notes: ______________________________

____

11. **Switchyard**

Switchyard DC loads will last 4 - 5 hours.

Work with AmerenIP to evaluate the protective relaying in the Switchyard and initiate appropriate actions, including the installation of additional DC batteries.

The following information may be important to the restoration of off site power (IR 1137890, Lessons Learned From Joint Ameren Training):

1. It is likely that the 138 KV source will be restored prior to the 345 KV source if large portions of the grid were lost. Efforts should focus on the ERAT being ready for restoration unless informed otherwise by Ameren.

2. Ameren may ask for an estimate of how much load will be picked up when the 138 KV line is energized.

    - With the Division 1, 2, and 3 busses either de-energized or on their respective Diesel Generators (DGs), this leaves the 12 KV loop, which is ~4 MW load.

    - The town of DeWitt and other loads on the 138 KV line will have to be estimated by Ameren.

3. Once a source is restored, ECCS busses should stay on the DGs until the 138 KV source is deemed reliable enough that subsequent losses of ECCS busses are **NOT** likely (assuming proper DG operation).

3. Ameren may ask for an estimate of how long it will take to return CPS to service. Due to having to recover all BOP systems prior to plant startup, a time of 96 hours from return of the 345 KV source to the non-safety busses is reasonable (nuclear units are **NOT** part of Ameren's restoration strategy for this reason).

4. The switchyards should be physically walked down for status of components and for any damage and the results of these walkdowns conveyed to Ameren. Ameren's indication and control system may **NOT** be functional during these conditions.

NOTE
This estimate will provide enough power to operate battery chargers, station lighting, and other relatively low power loads.

5. Ameren may ask for an estimate of how much load will be picked up when the RAT(s) is/are energized. An estimate of less than 10 MW should be conservative (large motors should be prevented from starting per Appendix A: Equip Control Switches To Be Placed In PULL-TO-LOCK Or LOCKED).

APPENDIX D
LOSS OF OFFSITE POWER SITE SUPPORT ACTIVITIES
Page 4 of 5

11. **Switchyard** (cont'd)

6. CPS Operations should be prepared to perform switching orders at Ameren's direction due to Ameren's sources being dispatched to other restoration activities.
7. Once a source is restored, do **NOT** change load on that source significantly without permission from Ameren. Increasing load may cause a loss of the source, hampering further restoration activities.
8. Perform thermography as components are restored, especially if there has been any physical challenge to components from severe weather, seismic activity, etc.

Comments/Notes: ______________________________

12. **Station Vehicles**

Initiate actions to obtain a portable gasoline supply for station vehicles since the site pump will **NOT** be working.

Comments/Notes: ______________________________

13. **Drinking Water**

Initiate actions to obtain additional drinking water (normally a 3 day supply is maintained on-site).

Comments/Notes: ______________________________

14. **Food**

Initiate actions to obtain additional food for on-site personnel

Comments/Notes: ______________________________

15. **Sleeping**

Initiate actions to obtain on-site sleeping arrangements.

Comments/Notes: ______________________________

APPENDIX D
LOSS OF OFFSITE POWER SITE SUPPORT ACTIVITIES
Page 5 of 5

16. **Other:** ______________________

Comments/Notes: ______________________

____

____

17. **Other:** ______________________

Comments/Notes: ______________________

____

____

18. **Other:** ______________________

Comments/Notes: ______________________

____

____

APPENDIX E
LOSS OF POWER IMPACT ON COMMUNICATIONS

NOTE

1. Communications systems, both onsite and offsite are impacted by losses of power.
2. The following is a partial list. Some items are Safeguards Information and are **NOT** included.
3. Following ANY loss of power, plant communications systems are suspect until proven functional. Some systems have battery backup and will be initially available but suffer loss over time.

1.0 **IF** Aux Building MCC 1A1(Division 1 AC)is impacted

THEN the following areas will lose Gai-Tronics speakers and/or stations, requiring Security to make announcements with bullhorns as appropriate (ERO announcements, hazards, protective actions, etc.):

- Main Control Room
- Control Building
- Diesel Generator Building
- Containment and Drywell
- Screen House

2.0 **IF** Aux Building MCC 1B1(Division 2 AC)is impacted

THEN the following areas will lose Gai-Tronics speakers and/or stations, requiring Security to make announcements with bullhorns as appropriate (ERO announcements, hazards, protective actions, etc.):

- Auxiliary Building
- Radwaste Building

3.0 **IF** Turbine Building MCC 1M (Division 2 AC or shunt trip)is impacted

THEN the following areas will lose Gai-Tronics speakers and/or stations, requiring Security to make announcements with bullhorns as appropriate (ERO announcements, hazards, protective actions, etc.):

- Turbine Building

APPENDIX E
LOSS OF POWER IMPACT ON COMMUNICATIONS
Page 2 of 2

4.0 Loss of power to the following busses can impact radio capabilities within the plant. It is possible that some repeaters are lost, or base stations do **NOT** function. Be aware of possible radio use limitations on any loss of power due to the impact on repeaters:

- Aux Building MCC 1A1
- Aux Building MCC 1B1
- Tech Support Center Load Center 0AP08E
- Control Bldg MCC C

RPV PRESSURE CONTROL SOURCES

SCOPE OF REVISION:

❶ Specific Revision 6a [Baker] EC 380150, EDITORIAL Updated procedure to reflect digital feedwater changes.

REFERENCE USE

ORIGINATOR: *Lee Anderson* **CLASS CODE:** *SNND*

SQR: *Matthew E. Baker* **APPROVAL DATE:** *07/05/2012*

CURRENT CHANGES TO GENERAL REVISION

	Change #	*Date*	*List of Affected Pages*
❶	6a	10/26/13	1, 7
❷			
❸			
❹			
❺			

TABLE OF CONTENTS

1.0 ENTRY CONDITIONS

This procedure is entered when directed by the EOP/SAGs, and provides appropriate instructions for utilization of available RPV pressure control sources.

☞ EOP events which require use of the Remote Shutdown Panel (RSP) shall default to the applicable CPS 4003.01 (RSP) series checklist for pressure control system procedure guidance.

2.0 OPERATOR ACTIONS

2.1 PRESSURE CONTROL STRATEGIES

1. Based on plant conditions, resource availability and EOP/SAG directives, select a method to perform RPV pressure control (STABILIZATION or DEPRESSURIZATION).

2. Utilize as many sources as required in order to perform the directed RPV pressure control actions.

3. Maximize the use of RPV pressure control methods which release the energy to outside primary CNMT.

4. Lowering RPV pressure early in the event will simplify long term RPV inventory control.
   - Evaluate using entire 100°F/hr range when lowering pressure.

5. Lower RPV pressure as necessary to:
   - Minimize effects from leaks.
   - Maximize available injection sources.

6. Lowering RPV pressure will deplete RPV inventory.

7. Lowering RPV pressure to make CD/CB injection available (< 725 psig) will most likely be successful if adequate inventory (RPV level > Level 2, -45") and/or injection exists to support the depressurization.

   CAUTION: Over injecting cold water may exceed 100°F/hr C/D.

   NOTE: EOP-1A reactivity shutdown conditions (Pressure Leg WAIT) may prohibit this strategy due to initial ATWS stabilization band being above the CD/CB injection pressure (e.g., 800 - 1065 psig).

   - Unless required by plant conditions or event progression, a high pressure injection source should be in-service until the low pressure system is capable of maintaining RPV level.
   - A rapid pressure reduction (2 - 3 SRVs or BPVs) will use less RPV inventory in order to achieve the desired pressure, but may result in a more dramatic level transient.
   - Lower pressure steam removes more energy per lbm of steam than does steam at high pressure.

8. Lowering RPV pressure to make low pressure ECCS pumps available is not recommended due to the potential challenge to the cooldown rate, and approach to TAF.

   Long term fuel cooling is enhanced by delaying the time to BLOWDOWN at TAF for as long as possible.

2.2 **NORMAL MCR SYSTEM LINEUP/OPERATION**

NOTE

This section is N/A if recovering MSL/Condenser per CPS 3101.01, Main Steam (MS, IS & ADS), or CPS 4100.01, Reactor Scram.

When using the Condenser as a 'heat sink' (i.e., EOP-1A) as opposed to a pressure control 'vent path', Circ Water and condenser vacuum is required.

2.2.1 **MAIN STEAM - CONDENSER/BYPASS VALVES/MSL DRAINS**

☞ Use sub-steps 2.2.1.1 - 2.2.1.9 to re-open the MSIVs. Use sub-step 2.2.1.10 for Bypass Valve operation. Use sub-step 2.2.1.11 for MSL Drain operation.

1. **IF** This section was entered from EOP-2, EOP-3 or SAG-2,

   THEN 1) OK to defeat isolations per CPS 4410.00C007, Defeating RPV Vent Interlocks.

   2) OK to exceed 100°F/hr cooldown.

2. Reset any cleared GROUP 1 isolations.

   ☞ OK to position Div 1(2,3,4) Condenser Low Vacuum Bypass switches to BYPASS to clear Gr 1 interlocks.

3. Regardless if Circ Water (CW) is available or not:

   1) Establish vacuum per CPS 3112.01, Condenser Vacuum (CA), or

   2) If vacuum cannot be established, open 1CA007, Condenser Vacuum Breaker Valve.

4. Verify pressure set at least 15 psig > RPV pressure to prevent inadvertent BPV operation.

5. Shut/verify shut:

   1) 1B21-F022B(D,A,C), Main Steam Line B(D,A,C) Inbd MSIV.

   2) 1B21-F016, MS Drn & MSIV Byp Inbd Isol Valve.

   3) 1B21-F019, MS Drn & MSIV Byp Outbd Isol Valve.

   4) 1B21-F020, MSIV Byp Vlv For MS Line Warm Up.

6. Open/verify open:

   1) 1B21-F098B(D,A,C), Main Steam Shutoff Valves.

   2) 1B21-F028B(D,A,C), Main Steam Line Outbd MSIVs.

      ☞ OK to open following drains to assist in the attempt.

      - 1B21-F067B(D,A,C), MSL Outbd MSIV Before Seat Drn Vlvs.
      - 1B21-F068, Outbd MSIV Before Seat Warmup Drn Vlv.
      - 1B21-F069, Outbd MSIV Before Seat Norm Drn Vlv.

2.2.1 **MAIN STEAM - CONDENSER/BYPASS VALVES/MSL DRAINS** (cont'd)

7. Equalize around the Inbd MSIVs (F022s) to establish a $\Delta P \leq 200$ psid across the MSIVs by opening:
   1) 1B21-F016, MS Drn & MSIV Byp Inbd Isol Valve.
   2) 1B21-F019, MS Drn & MSIV Byp Outbd Isol Valve.
   3) 1B21-F020, MSIV Byp Vlv For MS Line Warm Up.

   ☞ OK to shut following drains to assist in the dP attempt.

   - 1B21-F015, MS Low Points Drn Shutoff Valve.
   - 1B21-F021, Inbd MSIV Before Seat Warmup Drn Valve.
   - 1B21-F033, Inbd MSIV Before Seat Warmup Drn Valve.
   - 1B21-F068, Outbd MSIV Before Seat Warmup Drn Vlv.
   - 1B21-F069, Outbd MSIV Before Seat Norm Drn Vlv.
   - 1B21-F070, MS Low Point Warm Up Drn Vlv.
   - 1B21-F071, MS Low Point Normal Drn Vlv.
   - 1TD-SV1(3,5,7), Mn Turb Stop Vlv #1(2,3,4) Drn Vlv.

     ☞ TG needs to be reset per CPS 3105.01 (TG, EHC, TS) to shut. (OK to reset when the turbine speed is > zero.)

8. Re-verify pressure set at least 15 psig > RPV pressure to prevent inadvertent BPV operation when Inbd F022s open.

9. When < 200 psid dP is achieved, open 1B21-F022B(D,A,C), Main Steam Line B(D,A,C) Inbd MSIVs.

10. **Bypass Valve Operation**
    1) If necessary, on the 1H13-P680 panel, Stm Bypass Control section, depress the COND VACUUM TRIP push-button to reset the COND VACUUM LOW TRIP.
    2) Open Main Turbine Bypass Valves as necessary to establish and maintain the desired pressure by using either of the following methods:
       - Depress Bypass Valve Opening Jack INCREASE push-button to open bypass valves as needed.

         ☞ Fastest method, but no auto pressure control is available when using the Jack.

         ☞ When Pressure Set control is desired/ obtained, return the jack to full down.
       - Depress Pressure Set Point DECREASE push-button and lower the setpoint to below RPV pressure.

         ☞ Slower method, but provides auto pressure control.

         ☞ Lowering Pressure Set maximizes Bypass Valve availability, and causes the SRVs to close.

2.2.1 **MAIN STEAM - CONDENSER/BYPASS VALVES/MSL DRAINS** (cont'd)

11. **Main Steam Line Drains**

Open following drains as necessary.

MSL Inboard Drains

- 1B21-F016, MS Drn & MSIV Byp Inbd Isol Valve
- 1B21-F019, MS Drn & MSIV Byp Outbd Isol Valve
- 1B21-F020, MSIV Byp Vlv For MS Line Warm Up
- 1B21-F021, Inbd MSIV Before Seat Warmup Drn Vlv
  ☞ Shut/Verify Shut breaker at: AB MCC 1E (1AP28E) Cub 1C
- 1B21-F033, Inbd MSIV Before Seat Warmup Drn Vlv

MSL Outboard Drains (when any Inboard MSIV F022 is open)

- 1B21-F067B(D,A,C), MSL B(D,A,C) Outbd MSIV Before Seat Drn Vlv
- 1B21-F068, Outbd MSIV Before Seat Warmup Drn Vlv
- 1B21-F069, Outbd MSIV Before Seat Norm Drn Vlv

MSL Downstream Drains
(when any Inboard F022 and Outboard MSIV F028 pair is open, or 1B21-F016, F019 and F020 are open)

- 1B21-F015, MS Low Points Drn Shutoff Valve
- 1B21-F066B(D,A,C), Main Steam Line B(D,A,C) Low Point Drn Vlv
- 1B21-F070, MS Low Point Warm Up Drn Vlv
- 1B21-F071, MS Low Point Normal Drn Vlv

2.2.2 **SRVs**

No unique lineups or operating modes exist when using the SRVs for pressure control.

Operate the SRVs per CPS 3101.01, Main Steam (MS, IS & ADS) and within the guidelines specified in the entry EOP/SAGs.

SRVs may be operated from the Remote Shutdown Panel per CPS 4003.01, Remote Shutdown and 4003.01C001, RSP - Pressure Control, if needed to perform steps of the EOPs.

2.2.3 **RFPTs**

1. **IF** This step was entered from EOP-2, EOP-3 or SAG-2,

   THEN 1) OK to defeat isolations per CPS 4410.00C007, Defeating RPV Vent Interlocks.

   2) OK to exceed 100°F/hr cooldown.

2. Regardless if Circ Water (CW) is available or not:

   ☞ OK to position Div 1(2,3,4) Condenser Low Vacuum Bypass switches to BYPASS to clear Gr 1 interlocks.

   1) Establish vacuum per CPS 3112.01, Condenser Vacuum (CA), <u>or</u>

   2) If vacuum cannot be established, open 1CA007, Condenser Vacuum Breaker Valve.

❶ 3. Verify operation of one or both TDRFP's per CPS 3103.01, Feedwater (FW).

   ☞ When < 20" vac, OK to bypass the RFPT Low Vacuum Trip by depressing Low Vacuum Trip Reset push-button (Low vacuum trip window indicates RESET PERM).

4. Open, as needed to support level control, either:

   ° 1FW002A(B), RFP 1A(B) Disch Vlv, <u>or</u>

   ° 1FW003A(B), RFP Discharge Bypass Valve.

5. Open as necessary to assist with RFPT flow, 1FW014, HP Htrs 6A & 6B Bypass Vlv.

2.2.3 **RFPTs (cont.)**

6. Control desired RPV pressure/level, cooldown rate, and TDRFP flow by any of the listed methods:
   - Adjust TDRFP 1A(B) speed using Manual Speed Control.
   - Throttle 1FW010A(B), RFP 1A(B) Min Flow Vlv.
   - Shut/Verify Shut breakers for:
     1) 1FW016, Flushing Line Inbd Isolation Valve TB MCC 1I (1AP56E) Cub 3D
     2) 1FW021, Flushing Line Outboard Isol Valve TB MCC 1I (1AP56E) Cub 6B
     3) Open 1FW016, and throttle as necessary, 1FW021, Flushing Line To Cdsr Vlvs.
   - Throttle 1B21-F065A(B), RPV Inlet Vlvs using RPV Inlet Vlv stop button after initiating valve operation.

     ☞ The valves may need to be shut to prevent over-feeding the RPV.
   - Free spin the TDRFP 1A(B) using any following lineup:
     1) 1FW002A(B) shut; 1B21-F065A & B shut, <u>or</u>
     2) 1FW002A(B) shut; 1B21-F065A(B) open, <u>or</u>
     3) 1FW002A(B) open; 1B21-F065A & B shut.

2.2.4 **SHUTDOWN COOLING**

No unique lineups or operating modes exist when using RHR in shutdown cooling mode for pressure control.

Operate the system in accordance with the normal operating procedure and within the guidelines specified in the entry EOP/SAGs.

- Shutdown Cooling, CPS 3312.03, RHR - Shutdown Cooling (SDC) & Fuel Pool Cooling And Assist
- Alternate SDC, CPS 3312.02, Alternate Shutdown Cooling Methods (A-SDC)

CAUTION

This method vents directly into the drywell space. A drywell pressure increase should be expected.

2.2.5 **HEAD VENT**

1. (Local) At AB MCC 1F-2A (1AP41E), place both breakers to ON for 1B21-F001, Rx Press Vessel Head Ventilation Valve. (AB 762' East, X-119)(Need 3210 Key)
2. Open 1B21-F001, Rx Head To DW Locked Vent Valve. (Key operated switch)
3. Open 1B21-F002, Rx Head To DW Vent Valve.

2.3 **ABNORMAL SYSTEM LINEUP/OPERATION**

When directed by the EOP/SAGs, operate following systems per the instructions detailed in the listed appendix:

		Page
RCIC	Appendix A, 1.0	10
RCIC Steam Line	Appendix A, 2.0	11
RWCU (recirculation mode)	Appendix B, 1.0	12
RWCU (reject mode) - To the Main Condenser	Appendix B, 2.0	15
RWCU (reject mode) - To the Waste Surge Tank	Appendix B, 3.0	17

3.0 **FINAL CONDITIONS**

RPV pressure control is established and maintained by existing system lineup/operation and per the EOP/SAGs.

4.0 **DISCUSSION**

4.1 **STABILIZATION:** Establishing and maintaining a defined pressure control band below 1065 psig with the intent of keeping RPV pressure from changing until DEPRESSURIZATION is desired.

An initial band of 800 - 1065 psig is recommended, with a preferred 50 - 200 psig range as pressure is lowered.

Larger pressure bands (e.g., 600 - 1065 psig) may assist with pressure/level coordination efforts until conditions are stabilized.

The 50 - 200 psig band reflects the nominal SRV cycle range, minimizes operator burden, and maximizes the efficient coordination of level/pressure control actions.

4.2 **DEPRESSURIZATION:** The lowering of RPV pressure to a new lower STABILIZATION band, or to cold shutdown conditions.

DEPRESSURIZATION supports RPV cool down, maximizes injection sources, and minimizes pressure boundary leaks.

DEPRESSURIZATION also occurs when decay heat cannot maintain RPV pressure.

EOP-1 permits DEPRESSURIZATION once RPV pressure has been STABILIZED.

EOP-1A prohibits the intentional DEPRESSURIZATION until specific reactivity shutdown conditions have been established.

EOP-1A does not prohibit lowering RPV pressure if required due to a CRITICAL PARAMETER RESPONSE.

4.3 **CRITICAL PARAMETER RESPONSE:** An EOP flowchart directed action (e.g., EOP-2/3 BLOWDOWN, EOP-6 Fig P/Q) to lower RPV pressure to maintain within prescribed limits.

These EOP actions prevail over the current STABILIZATION band, and will require a new band to be established once the limit is no longer directing a pressure reduction.

5.0 **RESPONSIBILITIES**

Operations Department Head shall be responsible for ensuring the proper implementation of the procedure.

6.0 **REFERENCES**

6.1 CPS 3101.01, Main Steam (MS, IS & ADS)
6.2 CPS 3103.01, Feedwater (FW)
6.3 CPS 3112.01, Condenser Vacuum (CA)
6.4 CPS 3203.01, Component Cooling Water
6.5 CPS 3303.01, Reactor Water Cleanup (RT)
6.6 CPS 3310.01, Reactor Core Isolation Cooling (RI)
6.7 CPS 3312.02, Alternate Shutdown Cooling Methods (A-RHR)
6.8 CPS 3312.03, RHR-Shutdown Cooling (SDC) & Fuel Pool Cooling And Assist
6.9 CPS 4003.01 series: Remote Shutdown Panel (RSP)
6.10 CPS 4100.01, Reactor Scram
6.11 CPS 4403.01, EOP-2 RPV Flooding
6.12 CPS 4407.01, EOP-3 Emergency RPV Depressurization
6.13 CPS 4410.00C005, Defeating RWCU Interlocks
6.14 CPS 4410.00C007, Defeating RPV Vent Interlocks
6.15 CPS 4702.01, SAG-2 RPV, Containment, And Radioactive Release Control

APPENDIX A: RCIC PRESSURE CONTROL

Initial

METHOD 1.0:	RCIC	(Page 10)
METHOD 2.0:	RCIC Steam Line	(Page 11)

NOTE

RCIC operating limits and cautions specified on the EOP flowcharts take precedence over RCIC normal operating limits.

A.1.0 **RCIC**

A.1.1 If not already operating, manually start RCIC per CPS 3310.01, Reactor Core Isolation Cooling (RI) to establish a flow path from tank to tank. ________

- ☞ OK to clear RCIC Initiation signal (reset PB).
- ☞ OK to defeat RCIC interlocks (4410.00C001).

A.1.2 Control RPV depressurization/cooldown at the desired rate by means of manual control of the RCIC Pump Flow Cont, 1E51-R600. ________

A.1.3 If desired to initiate flow into the RPV to support level control and/or pressure control,

1. Open 1E51-F013, RCIC Pump Disch To Rx Outbd Isol Valve. ________
2. Slowly throttle shut 1E51-F022, RCIC Pmp First Test Valve To Stor Tank, until flow into the RPV is observed. ________
3. Control RPV depressurization/cooldown by throttling 1E51-F022 and/or by controlling the RCIC Pump Flow Cont, 1E51-R600. ________

A.1.4 When RPV injection is no longer desired,

1. Slowly throttle open 1E51-F022, RCIC Pmp First Test Valve To Stor Tank. ________
2. Shut 1E51-F013, RCIC Pump Disch To Rx Outbd Isol Valve. ________
3. Control RPV depressurization/cooldown by throttling 1E51-F022 and/or by controlling the RCIC Pump Flow Cont, 1E51-R600. ________

APPENDIX A: RCIC PRESSURE CONTROL (cont'd)

Initial

NOTE

RCIC operation per App. A, Method 1 is preferred if possible, since it provides better pressure control and it satisfies the intent of EOP-3 or SAG-2 listing of 'RCIC steam line' method.

A.2.0 **RCIC STEAM LINE**

A.2.1 **IF** This step was entered from EOP-3 or SAG-2,

THEN 1. OK to defeat isolations per CPS 4410.00C007, Defeating RPV Vent Interlocks.

2. OK to exceed 100°F/hr cooldown.

A.2.2 Shut 1E51-F045, RCIC Turb Stm Supp Shutoff Valve. ________

A.2.3 Open 1E51-F064, RHR & RCIC Stm Supp Outbd Isol Valve. ________

A.2.4 Open 1E51-F076, RHR & RCIC Stm Supp Warm Up Isol Valve. ________

A.2.5 Open 1E51-F063, RHR & RCIC Stm Supp Inbd Isol Valve. ________

A.2.6 Open 1E51-F025, RHR & RCIC Stm Supp First Drn Isol Valve. ________

A.2.7 Open 1E51-F026, RHR & RCIC Stm Supp Second Drn Isol Valve. ________

A.2.8 Open 1E51-F054, RHR & RCIC Stm Supp Drn Trap Byp Vlv. ________

APPENDIX B: RWCU PRESSURE CONTROL

Initial

NOTE

RWCU (recirculation mode) pressure reduction can be enhanced by performing RWCU (reject mode) in conjunction with these actions.

This will allow for more head spray (injection) from RCIC (if running) which will provide for a faster pressure reduction.

B.1.0 **RWCU (recirculation mode)**

B.1.1 **IF** RWCU system isolations have occurred or are anticipated,

THEN Perform CPS 4410.00C005, Defeating RWCU Interlocks.

B.1.2 Determine status of RWCU system.

- If RWCU is operating, go to B.1.3. (Page 13) ________
- If RWCU is shutdown, go to B.1.4. (Page 14) ________

Initial

RWCU (recirculation mode)

B.1.3 **RWCU (recirculation mode) when RWCU Operating:**

1. Open 1G33-F101, Bot Hd Drn Suct. ________

2. To prevent pump run-out while establishing control of RT flow:

3. Throttle shut 1G33-F042A(B), Regen Hx A(B) Outlet Throt, while concurrently opening 1G33-F044, RWCU Filter/Demin Bypass. ________

CAUTION

Monitor NRHX outlet temperature during recirculation. Maximum NRHX shell (Component Cooling Water) side outlet temperature shall not exceed 180°F.

4. Throttle 1G33-F107, Regen Heat Exch Bypass to control cooldown rate < 100°F/hr. ________

5. When 1G33-F107, Regen Heat Exch Bypass is fully open, shut 1G33-F042A(B) Regen Hx A(B) Outlet Throt. ________

6. When RWCU (recirculation mode) is no longer required by the EOP/SAGs, return RWCU system to normal per CPS 3303.01, Reactor Water Cleanup (RT). ________

APPENDIX B: RWCU PRESSURE CONTROL (cont'd)

Initial

RWCU (recirculation mode) (cont'd)

B.1.4 **RWCU (recirculation mode) when RWCU Shutdown:**

1. Verify CCW operating per CPS 3203.01, Component Cooling Water (CC). ________

2. Shut:
   1) 1G33-F042A, Regen Hx A Outlet Throt. ________
   2) 1G33-F042B, Regen Hx B Outlet Throt. ________
   3) 1G33-F028, Drn Flow Inbd Isol. ________
   4) 1G33-F034, Drn Flow Outbd Isol. ________

3. Open:
   1) 1G33-F001, RWCU Suct Inbd Isol. ________
   2) 1G33-F004, RWCU Suct Outbd Isol Vlv. ________
   3) 1G33-F039, RWCU Outbd Rtn Isol. ________
   4) 1G33-F040, RWCU Inbd Rtn Isol. ________
   5) 1G33-F053, Pump Disch Inbd Isol. ________
   6) 1G33-F054, Pump Disch Outbd Isol. ________

4. Open 1G33-F101, Bot Hd Drn Suct. ________

5. Open 1G33-F044, RWCU Filter/Demin Bypass. ________

6. Start RWCU Recirc Pump(s), 1G33-C001A(B,C) per CPS 3303.01, Reactor Water Cleanup (RT). ________

CAUTION

Opening valves 1G33-F046, Drn Flow to Cdsr, or 1G33-F041, Drn Flow to Cdsr Bypass with 1G33-F035, Drn Flow to Rad Waste open will connect the Waste Surge Tank to the Main Condenser, causing a loss of vacuum.

7. Throttle open 1G33-F107, Regen Heat Exch Bypass to control cooldown rate < 100°F/hr. If unable to maintain > 70 gpm or < 180°F NRHX CCW Outlet, throttle open as necessary 1G33-F042A(B), Regen Hx A(B) Outlet Throt. ________

8. When RWCU (recirculation mode) is no longer required by the EOP/SAGs, return RWCU system to normal per CPS 3303.01 (RT). ________

Initial

NOTE

RWCU (reject mode) pressure reduction can be enhanced by performing RCIC operations in conjunction with these actions.

This will allow for more head spray (injection) from RCIC which will provide for a faster pressure reduction.

B.2.0 **RWCU (reject mode) - To the Main Condenser**

➭ This section/line-up relies on RWCU Recirculation Mode being in operation prior to using this method.

B.2.1 **IF** Boron has been injected for power control,

THEN **STOP.** This section is not authorized for use.

CAUTION

Opening valves 1G33-F046, or 1G33-F041, with 1G33-F035 open will connect the Waste Surge Tank to the Main Condenser causing a loss of vacuum.

B.2.2 Shut:

1. 1G33-F035, Drn Flow To Rad Waste. ________
2. 1G33-F046, Drn Flow To Cdsr. ________
3. 1G33-F041, Drn Flow To Cdsr Bypass. ________
4. 1G33-F033, Drain Flow Regulator. ________
5. 1G33-F031, Drn Flow Orifice Bypass. ________

B.2.3 Open:

1. 1G33-F028, Drn Flow Inbd Isol. ________
2. 1G33-F034, Drn Flow Outbd Isol. ________

Initial

RWCU (reject mode) - To the Main Condenser (cont'd)

NOTE

Monitor NRHX outlet temperature during reject.

Do not exceed 120°F to the Waste Surge Tank.

Maximum NRHX shell (Component Cooling Water) side outlet temperature shall not exceed 180°F.

B.2.4 **IF** RPV pressure ≤ 50 psig,

THEN 1. Open 1G33-F031, Drn Flow Orifice Bypass. ________

2. Open 1G33-F046, Drn Flow To Cdsr. ________

B.2.5 **IF** RPV pressure > 50 psig,

THEN 1. Verify shut 1G33-F031, Drn Flow Orifice Bypass. ________

2. Open 1G33-F046, Drn Flow To Cdsr. ________

B.2.6 Initiate RWCU reject flow as follows:

1. Slowly open 1G33-F033, Drain Flow Regulator, to control RPV cooldown rate < 100°F/hr. ________

NOTE

Excessive 1G33-F031 opening may result in 1G33-F033 auto closure.

2. To maintain a stable reject flow rate, throttle open 1G33-F031, Drn Flow Orifice Bypass. ________

B.2.7 When RWCU reject to the Main Condenser is no longer desired, shut the following valves:

1. 1G33-F033, Drain Flow Regulator. ________
2. 1G33-F031, Drn Flow Orifice Bypass. ________
3. 1G33-F028, Drn Flow Inbd Isol. ________
4. 1G33-F034, Drn Flow Outbd Isol. ________
5. 1G33-F046, Drn Flow To Cdsr. ________
6. 1G33-F041, Drn Flow To Cdsr Bypass. ________

APPENDIX B: RWCU PRESSURE CONTROL (cont'd)

Initial

NOTE

RWCU (reject mode) pressure reduction can be enhanced by performing RCIC operations in conjunction with these actions.

This will allow for more head spray (injection) from RCIC which will provide for a faster pressure reduction.

B.3.0 **RWCU (reject mode) - To the Waste Surge Tank**

B.3.1 **IF** Boron has been injected for power control,

THEN **STOP.** This section is not authorized for use.

CAUTION

Monitor NRHX outlet temperature during reject.

Do not exceed 120°F to the Waste Surge Tank.

Maximum NRHX shell (Component Cooling Water) side outlet temperature shall not exceed 180°F.

B.3.2 Shut:

1. 1G33-F035, Drn Flow To Rad Waste. ________
2. 1G33-F046, Drn Flow To Cdsr. ________
3. 1G33-F041, Drn Flow To Cdsr Bypass. ________
4. 1G33-F033, Drain Flow Regulator. ________

B.3.3 Open:

1. 1G33-F028, Drn Flow Inbd Isol. ________
2. 1G33-F034, Drn Flow Outbd Isol. ________

APPENDIX B: RWCU PRESSURE CONTROL (cont'd)

Initial

RWCU (reject mode) - To the Waste Surge Tank (cont'd)

CAUTION

Opening valves 1G33-F046 or 1G33-F041 with 1G33-F035 open will connect the Waste Surge Tank to the Main Condenser, causing a loss of vacuum.

B.3.4 **IF** RPV pressure is ≤ 50 psig,

THEN Open:

1. 1G33-F031, Drn Flow Orifice Bypass. ________
2. 1G33-F035, Drn Flow To Rad Waste. ________

B.3.5 **IF** RPV pressure is > 50 psig,

THEN

1. Shut 1G33-F031, Drn Flow Orifice Bypass. ________
2. Open 1G33-F035, Drn Flow To Rad Waste. ________

B.3.6 Initiate RWCU reject flow as follows:

Slowly open 1G33-F033, Drain Flow Regulator, to control RPV cooldown rate < 100°F/hr. ________

B.3.7 When RWCU reject to the Waste Surge Tank is no longer desired, shut the following valves:

1. 1G33-F033, Drain Flow Regulator. ________
2. 1G33-F031, Drn Flow Orifice Bypass. ________
3. 1G33-F028, Drn Flow Inbd Isol. ________
4. 1G33-F034, Drn Flow Outbd Isol. ________
5. 1G33-F035, Drn Flow To Rad Waste. ________

Extended Loss of AC Power / Loss of Ultimate Heat Sink

Approval Documentation on File

GENERAL GUIDELINES

1. Consider the need to invoke §50.54(x) during the performance of this procedure. *[4303.01P021]*
2. Loss of normal ventilation will establish the potential for airborne contamination in the plant.
3. Plant radiation monitors fail during a Station Blackout. Battery powered portable radiation monitoring instruments must be used to monitor plant radiological conditions.
4. Personnel in the plant may require assistance to evacuate due to the loss of lighting and potential loss of communications.
5. Maintain communications with the dispatcher as required during the event.
6. Minimize cycling DC motor operated valves. Excessive valve operation may exhaust battery reserve capacity.
7. The Drywell Weir Wall is expected to overflow. It will not be possible to lower Suppression Pool level per EOP-6 Primary Containment Control.

ENTRY CONDITION

STATION BLACKOUT

■ **ENTER** 4200.01 Loss of AC Power, Section, 4.4 Station Blackout

STOP Do **NOT** continue in this procedure until directed by 4200.01.

(OK to pre-stage equipment)

Perform steps concurrently

A	RPV Water Level Control Systems

■ RCIC *[4306.01P005]*
  Defeat RCIC Interlocks *[4410.00C001]:*
  - RCIC Area Temperature Isolation Signals
  - RCIC Suction Transfer
  - Low RCIC Steam Supply Pressure Isolation
  - Level 8 Isolation
  - RCIC Exhaust Diaphram High Pressure Isolation
  - RCIC High Exhaust Pressure Trip

  Black start RCIC if necessary [*4303.01P013*]

■ SF *[4306.01P004]*

■ B.5.b Pump *[4306.01P004]*
- Use CY Tank if available

■ Fire Protection System *[4306.01P004]*

■ FLEX Pump *[4306.01P004]*

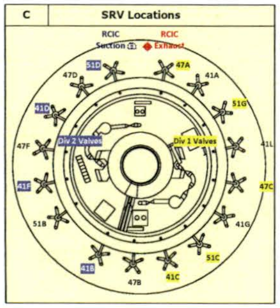
B	RPV Pressure Control Systems

■ SRVs
- Operate from outside the control room if necessary *[4303.01P004]*

■ RCIC *[4306.01P005]*
  Defeat RCIC Interlocks *[4410.00C001]:*
  - RCIC Area Temperature Isolation Signals
  - RCIC Suction Transfer
  - Low RCIC Steam Supply Pressure Isolation
  - Level 8 Isolation
  - RCIC Exhaust Diaphram High Pressure Isolation
  - RCIC High Exhaust Pressure Trip

  Black start RCIC if necessary [*4303.01P013*]

C	SRV Locations



Safety Functions

RPV WATER LEVEL

■ **CONTROL** RPV water level per EOP 1 RPV Control.
- Use Detail A systems.

■ **INHIBIT** ADS.

■ **PREPARE** for low pressure RPV injection. *[4306.01P004]*
- SF pump to the LPCI line (*preferred*).
- B.5.b pump from the CY tank, if available.
- [6 hrs] → Makeup to the RPV with a FLEX pump, if necessary.

RPV PRESSURE

■ **CONTROL** RPV pressure per EOP 1 RPV Control.
- Use Detail B systems.
- If possible, use non-ADS SRVs first, then ADS SRVs in a manner that precludes uneven pool heating, and avoids the RCIC pump suction. (Detail C)

■ **COMMENCE** a cooldown to 150 – 250 psig using SRVs at < 100 °F/hr.

PRIMARY CONTAINMENT

[ASAP] → ■ **COMMENCE** preparatory actions to place a Suppression Pool Cleanup and Transfer (SF) pump and RHR HX in suppression pool cooling. *[4306.01P003]*

■ **WHEN** AC power is available to 1SM001A/2A(1B/2B) Supp Pool Make-Up Sys Dump Shutoff Valves,

[5.5 hr] → **THEN** **DUMP** the upper containment pool to the suppression pool.

AND

[8 hr] → **MAINTAIN** suppression pool level between 23' 0" and 23' 9". *[4306.01P006]*

■ **WHEN** AC power and SX are available for FLEX Suppression Pool Cooling

[8 hr] → **THEN** **PLACE** FLEX Suppression Pool Cooling in service. *[4306.01P003]*

■ **PERFORM** manual containment isolation. *[4200.01C004]*

SPENT FUEL POOL

■ **OBTAIN** a Spent Fuel Pool (SFP) level reading/trend and determine the need to initiate immediate makeup flow to the SFP. *[4306.01P007]*
- Use readout on 1PL115JA (Aux Bldg 762 East) or 1PL115JB (Control Bldg 762 by West stairway).

[11 hr] → ■ **DEPLOY** SFP Spray hoses and nozzles while Fuel Building habitability conditions are favorable. *[4306.01C002]*

[12 hr] → ■ **MAKEUP** for SFP boiloff. *[4306.01P007]*

Electrical/Water Restoration

■ **DETERMINE** which division of 480 VAC power and SX to restore (*Division 1 is the Primary/Preferred Strategy*).

ELECTRICAL POWER

[1 hr] → ■ **COMPLETE** DC Load Shedding. *[4200.01C002]*

☞ Highest priority is DC MCC 1A (preserve RCIC valves and controls, SRV solenoids, and NSPS instrumentation).

[ASAP] → ■ **SUPPLY** 480 VAC power to vital loads with a FLEX generator. *[4306.01P001]*
- Use 4306.01C001 FLEX ELECTRICAL CONNECTIONS HARD CARDS and any available personnel to assist deploying electrical cables.
- Primary Strategy – supply Unit Sub 1A, Unit Sub A, and Unit Sub 1F or 1G
- Alternate Strategy– supply Unit Sub 1B, Unit Sub B, Unit Sub 1L and Unit Sub 1F or 1G
- [5.5 hr] → ENERGIZE the Div 1 (or Swing) Battery Charger and supply DC MCC 1A.

UHS WATER

[ASAP] → ■ **SUPPLY** UHS to the DG Building FLEX Manifold. *[4306.01P002]*
- Use 4306.01C002 FLEX UHS WATER SUPPLY HARD CARDS and any available personnel to assist deploying hoses.

■ **RESTORE** the selected division of SX from the DG Building FLEX Manifold. *[4306.01P002]*
Needed for:
- Suppression Pool cooling
- Spent Fuel Pool makeup

[6 hrs] → ■ **PRESSURIZE** the LPCS or RHR-C injection header from the DG Building FLEX Manifold. *[4306.01P002]*
Needed for:
- Suppression Pool makeup
- RPV makeup

Infrastructure

INSTRUMENTATION

■ **MONITOR** suppression pool, containment and drywell temperatures. *[4200.01C003]*

■ **IF** The ability to monitor essential RPV and/or containment parameters in the MCR is lost,

THEN **MONITOR** RPV Level and Pressure, Containment Pressure, Suppression Pool Temperature, and Suppression Pool Level locally if necessary. *[4303.01P015]*

PNEUMATICS

■ **PLACE** ADS Backup Air Bottles in service. *[4306.01P009]*

[2 hrs] → ☞ Open 1IA013A first (781 Fuel Bldg West, 8 ft. ladder).

■ **WHEN** ADS Backup Air Bottles are exhausted,

THEN **SUPPLY** ADS air from the installed DG Starting Air Receivers. *[4306.01P009]*

COMMUNICATIONS

■ **ESTABLISH** effective communication methods within the plant. *[4306.01P012]*
- Ops Radios
- Sound-powered phones
- Bull Horns
- Face-to-face

COOLING and VENTILATION

■ **ESTABLISH** ventilation in required areas. *[4306.01P010]*

[6 hrs] →
- RCIC pump room
- Main Control Room
- Inverter Room
- Battery Room
- Fuel Handling Floor
- Switchgear Room

LIGHTING

■ **ESTABLISH** lighting as necessary in required areas. *[4306.01P011]*

☞ Electrical strategies restore some lighting
- Div 1 → Control and DG Bldgs
- Div 2 → Aux and Fuel Bldgs

FUEL OIL

[14 hrs] → ■ **OBTAIN** fuel oil from the installed DG Fuel Oil Storage tanks as needed. *[4306.01P008]*

☞ Allow time for ERO resources to establish the strategy

WATER REMOVAL

■ **PERFORM** dewatering operations in areas impacted by system leakage. *[4306.01P019]*

Balance of Plant

TURBINE GENERATOR

■ **WHEN** The main turbine has coasted to a stop,

THEN **SECURE** Emergency Bearing Oil Pump, 1TO05P.

■ **VENT** hydrogen from the main generator. *[4306.01P021]*

■ **WHEN** Generator hydrogen pressure is as low as can be achieved,

THEN **SECURE** Gen. Emergency Seal Oil Pump, 1TO08P.

Resources

PERSONNEL

[ASAP] → ■ **DISPATCH** teams promptly to complete required tasks

☞ Use the Resource Management table below as a guide

[ASAP] → ■ **NOTIFY** Security to:
1. Support operator access to FLEX pumps
2. Dispatch 6 SFMs to 762 Control Bldg for cable and hose deployment under Ops direction, if additional resources are needed.

   ☞ Release SFMs first as people arrive from offsite.

NOTIFICATIONS

■ **NOTIFY** the NDO that an ELAP/LUHS event has occurred.
Phone: 630-657-2202 Pager: 800-307-0543

☞ Use Iridium phones if MCR satellite system is unavailable.

■ **ESTABLISH** communications with the TSC and EOF. *[4306.01P012]*

ASSESSMENT

■ **PERFORM** initial damage assessment. *[4306.01C003]*

Resource Management (Example for Primary Strategy, Minimum Staffing, Inclement Weather – First 8 hours)

		OP 1	OP 2	OP 3	OP 4	OP 5	OP 6	SFM 1	SFM 2	SFM 3	SFM 4	SFM 5	SFM 6	RP 1	RP 2	CH	IM/EM
	00:00	SBO Activities															
	00:15																
	00:30	DC Load Shed															
	00:45																
DC Load Shed	01:00		Vent Generator	Brief	ADS BU Air	Assemble team and procedures, brief, gather parts		Assemble Control Bldg 762'						Assist OP 5	Assist OP 6	Brief	
	01:15			Dress out for inclement weather													
	01:30	Brief SFMs						Briefing from OP 1								Dress out	
	01:45																
ADS B/U Air	02:00	4306.01 C001 Supervise Cable Work	4306.01 P001 Connect Gen Cables	Travel to UHS	4306.01C002 Att 1	Open 1SF011	Deploy hose from HX Room Mezz to SF tie-in Aux Bldg 737	4306.01C001 Att 1 (generator cables)								Assist OP 3	
	02:15																
	02:30			Deploy Booster Pumps				4306.01C001 Att 2 1F(1G)		4306.01C001 Att 3 1A		4306.01C001 Att 4 A					
	02:45																
	03:00	Setup DG Ventilation	Sub 1A Work	Disch Hoses	Brief SFMs	SF Pump Lineup		Break									
	03:15				Connect SX Hose			4306.01C002 Att 2			4306.01C002 Att 3						MCR Temp Readings
	03:30	Start DG	AB MCC 1A1/1A4 Work	Blast Doors													
	03:45			Start Pump													
	04:00	Start Div 1 Charger	AB MCC 1A3 Work	SH SX Lineup	Vent 30" Line												
	04:15																
	04:30	DG MCC 1A Work	AB MCC 1A2 Work		Connect LPCS Hose												
	04:45																
	05:00				SX Lineup	SX Lineup											
Div 1 Charger Upper Pool Dump	05:15			SX Lineup										Assist OP 4			
	05:30	Sub 1F(1G) Work	Sub A Work														
	05:45																
RPV UHS M/U Available	06:00		CB MCC E1/E2 Work														
	06:15						Initiate HX flow on HX Room Mezz								Assist OP 6		
	06:30																
	06:45																
	07:00	Start SF		Open 1SF041		Open 1SF010											
	07:15																
	07:30																
	07:45																
Supp Pool Cooling Supp Pool M/U	08:00																

(red)	Electrical Restoration (4306.01P001)
(green)	UHS Water Restoration (4306.01P002)
(blue)	Suppression Pool Cooling (4306.01P003)

	30 min · 1 hr · 2 hr · 3 hr · 4 hr · 8 hr · 12 hr · 16 hr · 24 hr
Within 1 hr	Complete DC Load Shedding
Within 2 hrs	Place ADS Backup Air Bottles in service
Within 5.5 hrs	Supply DC MCC 1A from the FLEX generator via the Div 1 or Swing Charger
Within 5.5 hrs	Dump the upper containment pool
Within 6 hrs	Have a FLEX pump ready for RPV makeup (*in case RCIC fails*)
Within 6 hrs	Open RCIC Room doors
Within 8 hrs	Have FLEX Suppression Pool Cooling in service
Within 8 hrs	Makeup to the Suppression Pool with a FLEX pump
Within 11 hrs	Deploy SFP spray hoses and nozzles
Within 12 hrs	Makeup to the Spent Fuel Pool with a FLEX pump
Within 14 hrs	Commence FLEX Pump and Generator refueling operations
Within 24 hrs	Commence recharging ADS backup air bottles

30 min 1 hr 2 hr 3 hr 4 hr 8 hr 12 hr 16 hr 24 hr

EOP-1 RPV CONTROL

ENTRY CONDITIONS			
RPV water level below Level 3 (8.9 in.)	**RPV pressure** above 1065 psig	**Drywell pressure** above 1.68 psig	**Reactor power** above 5% or unknown when scram required

Turn mode switch to SHUTDOWN.

Shutdown criteria met (4100.01) ?

No/Unknown → **ENTER ATWS RPV CONTROL:** Leave this procedure → Enter EOP-1A.

Yes → Enter 4100.01, "Reactor Scram," while continuing here. ↓

RPV WATER LEVEL

☛ RPV water level indications are affected by instrument leg temperatures and RPV pressure. Check Detail A.

1

Verify needed auto actions:
- Isolations
- ECCS start
- Diesel generators start

IF	THEN
RPV water level unknown (4411.07)	**FLOOD THE RPV:** Leave this procedure → Enter EOP-2 at Ⓣ.
Loss of injection is anticipated **OR** High RPV water level is needed for use of Alternate Injection Systems (Detail E) or Shutdown Cooling	Control RPV water level -162 in. (TAF) to 101 in.
Cannot stay below Fig D, Primary Containment Pressure Limit	Stop adding water from outside primary containment not needed for core cooling.

CAUTION: Exceeding NPSH / Vortex Limits (Detail Z) may damage systems.

Control RPV water level Level 3 (8.9 in.) to Level 8 (52 in.) using any of the Preferred Injection Systems (4411.03):

☛ RPV water level indications are affected by instrument leg temperatures and RPV pressures. Check Detail A.

☛ OK to throttle ECCS (4411.04).

Preferred Injection Systems

- Feedwater
- Condensate / Condensate Booster
- CRD
- RCIC
  - ☛ **CAUTION: Elevated containment pressure may trip RCIC on high exhaust pressure.**
  - ☛ RCIC injection will trip main turbine and TDRFPs.
  - ☛ Use RCIC storage tank suction if you can.
  - ☛ OK to defeat RCIC interlocks (4410.00C001).
- HPCS
  - ☛ Use RCIC storage tank suction if you can.
  - ☛ OK to defeat HPCS interlocks (4410.00C002).
- LPCS
- LPCI
  - ☛ Use HXs as soon as you can.
- RHR through shutdown cooling
  - ☛ Use HXs as soon as you can.
  - ☛ OK to defeat 1E12-F053 interlocks (4410.00C009).

IF	THEN
Cannot get RPV water level back between Level 3 (8.9 in.) and Level 8 (52 in.) and hold it there	Control RPV water level above −162 in. (TAF). ☛ Use Alternate Injection Systems if needed (Detail E). ☛ If permitted by EOP-6, start igniters and mixers (4411.11).

WAIT until RPV water level drops to −162 in. (TAF).

BLOW DOWN: Enter EOP-3 while continuing here. ↓

CAUTION: Exceeding NPSH / Vortex Limits (Detail Z) may damage systems.

Maximize injection using Preferred and Alternate Injection Systems (Detail E) (4411.03).

IF	THEN
Cannot get RPV water level above −187 in. and hold it there	**ENTER SAGs:** Exit all EOP flowcharts → Enter all SAG flowcharts.

WAIT until RPV water level is above −162 in. (TAF) and rising.

RPV PRESSURE

IF	THEN
Drywell pressure above 1.68 psig	Before RPV pressure drops to 472 psig, prevent LPCS and LPCI injection not needed for core cooling (4411.02).
Anticipate doing blowdown (EOP-3) **AND** RPV depressurization will not result in loss of injection needed for core cooling	Depressurize RPV rapidly using main turbine bypass valves (4411.09). ☛ OK to exceed 100°F/hr cooldown.
Reactor is critical	**ENTER ATWS RPV CONTROL:** Leave this procedure → Enter EOP-1A.

Stabilize RPV pressure below 1065 psig using main turbine bypass valves.

☛ Use other methods below if needed (4411.09).

- SRVs...only if suppression pool level is above 8 ft.
  - ☛ Use preferred sequence if you can.
  - ☛ If IA to SRVs is lost, turn all switches to OFF.
  - ☛ OK to defeat IA interlocks (4410.00C003).
- RCIC
  - ☛ **CAUTION: Exceeding NPSH / Vortex Limits (Detail Z) may damage RCIC.**
  - ☛ **CAUTION: Elevated containment pressure may trip RCIC on high exhaust pressure.**
  - ☛ RCIC injection will trip main turbine and TDRFPs.
  - ☛ Use RCIC storage tank suction if you can.
  - ☛ OK to defeat RCIC interlocks (4410.00C001).
- TDRFPs
- MSL drains
- RWCU (recirculation mode)
  - ☛ Bypass regen HX and filter/demins.
  - ☛ OK to defeat RWCU interlocks (4410.00C005).
- RWCU (reject mode)
- SRVs from remote shutdown panel (4003.01C001)...only if suppression pool level is above 8 ft.
- SRVs from outside the control room (4303.01P004)...only if suppression pool level is above 8 ft.

IF	THEN
RPV depressurization will result in loss of injection needed for core cooling	Control RPV pressure as low as possible while maintaining adequate core cooling (150-250 psig). ☛ Reset and inhibit ADS if necessary (3101.01/MS).

Depressurize the RPV.

☛ Hold cooldown rate below 100°F/hr.

☛ If IA to SRVs lost, minimize number of SRV cycles.

☛ OK to defeat IA interlocks (4410.00C003).

WAIT until: shutdown cooling pressure interlock clears (104 psig) **AND** further cooldown required

Cool down to cold shutdown using shutdown cooling (3312.03/RHR-SDC).

☛ Do not use RHR pumps you need for holding RPV water level above Level 3 (8.9 in.).

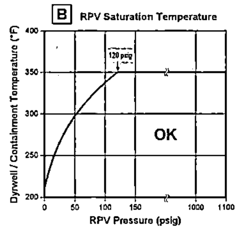
☛ Hold cooldown rate below 100°F/hr.

IF	THEN
Shutdown cooling does not work (3312.03/RHR-SDC)	Hold RPV pressure below shutdown cooling interlock (104 psig) using other pressure control systems (4411.09).

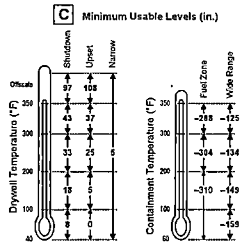
A RPV Water Level Instruments (4411.07)

- RPV water level instruments may be unreliable due to boiling in the instrument legs if drywell or containment temperature is above Fig B, RPV Saturation Temperature.
- Do not use an RPV water level instrument if level is at or below Fig C, Minimum Usable Levels.
- Use the Fuel Zone instrument only if the Wide Range instrument is unavailable.

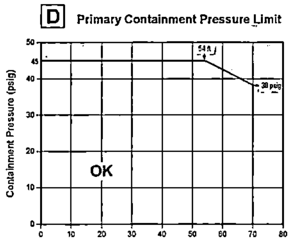
B RPV Saturation Temperature



C Minimum Usable Levels (in.)



D Primary Containment Pressure Limit



E Alternate Injection Systems

- **Installed electric power required (4411.03)**
  - RCIC from remote shutdown panel (4003.01C002)
  - SLC (test or storage tank)
  - FP
  - SX through RHR B
  - FC
  - ECCS water leg pumps
  - CY
- **No installed electric power**
  - B.5.b pump from CY tank (4303.01P007)
  - B.5.b pump from FP hose house (4303.01P007)
  - FLEX pump to LPCS (4306.01P004)
  - FLEX pump to RHR-C (4306.01P004)
  - RCIC black start (4303.01C001)
- **FLEX diesel generator**
  - FLEX suppression pool cooling to LPCI (4306.01P003)

Z NPSH / Vortex Limits

NOTE: Limits apply only when suction is from suppression pool.

HPCS, LPCS, RHR limits:
- Minimum suppression pool level.......................11 ft

RCIC limits:
- Minimum suppression pool level.......................11 ft
- Maximum suppression pool temperature..........197°F
- Maximum RCIC flow......................................700 gpm

EMERGENCY OPERATING PROCEDURE	CLINTON POWER STATION	
RPV CONTROL	PROCEDURE NO. 4401.01	REV. 30
Approval Documentation on File	SHEET 1 OF 1	

FLEX LOW PRESSURE RPV MAKEUP

SCOPE OF REVISION:

New procedure to support FLEX strategies.

❶ Specific Rev [Dodds] Provided clarifying information for phone jack locations; amplified instructions for providing water from CY tank to B.5.b pump and updated Tools and Equipment; provided instructions to supply RHR-C from B.5.b pump

CONTINUOUS USE

ORIGINATOR: ***P.K. Ryan*** **CLASS CODE:** ***SNND1***

SQR: ***Ken Leffel*** **APPROVAL DATE:** ***05/06/2015***

CURRENT CHANGES TO GENERAL REVISION

	Change #	Date	List of Affected Pages
❶	0a	05/09/16	1, 2, 3, 4, 5, 6
❷			
❸			
❹			
❺			

FLEX Low Pressure RPV Makeup

1.0 Purpose

1.1 The purpose of this procedure is to establish low pressure RPV makeup capability to be utilized when RCIC is no longer a viable RPV makeup source.

2.0 Requirements

2.1 Tools and Equipment

Tool/Equipment	Location
❶2.1.1 Door Stops	DG Bldg 762' FLEX Gang Box
❶2.1.2 Wrenches for Capped Storz Couplings	DG Bldg 762' FLEX Gang Box
❶2.1.3 6" Spanner Wrench	DG Bldg 762' FLEX Gang Box
❶2.1.4 3" NPT to 6" Storz Adapter	DG Bldg 762' FLEX Gang Box / Aux Bldg 737' FLEX Tool Box
❶2.1.5 Ladder for RHR-C Connection	Vicinity of RHR-C Connection
❶2.1.6 6" to 5" Storz Transition Piece	DG Bldg 762' FLEX Gang Box / Aux Bldg 737' FLEX Tool Box
B.5.b Equipment (if available)	
2.1.7 B.5.b pump	Warehouse 3
2.1.8 B.5.b Hose Trailer	Warehouse 3
❶2.1.9 3" Storz to 2 ½' NST Rigid Connections	B.5.b Pump Cabinet
❶2.1.10 (2) 3" by 100' hose	B.5.b Trailer
❶2.1.11 Rigid Hose Stand	B.5.b Trailer
❶2.1.12 8" by 10' Hard Suction Hose	B.5.b Trailer
❶2.1.13 Suction Strainer	B.5.b Trailer
❶2.1.14 5000 gallon portable tank	B.5.b Trailer
❶2.1.15 1 3/16' socket / 1 3/16" wrench	B.5.b Trailer

3.0 Contents

4.0 Procedure

NOTE:

➊The MCR will be patched in to the sound-powered phone jacks listed below. Phone kits are staged in the DG Bldg 762' FLEX Gang Box.

Jack #	Jack Station	Location
F17	1PL04J	SF Pump Instrument Panel (707 Aux Bldg, LPCS Room)
H18	1PL65JB	Swgr Heat Removal 1B Control Panel (781 Aux Bldg West)
➊I16	1PL65JA	Across from Swgr Heat Removal 1A Control Panel (781 Aux Bldg East)
J14	1PR39S	SX Effluent Rad Monitor (702 Control Bldg)
➊G18	1H22-P043	Behind 1H22P043, FW Temperature Monitoring Inst Rack (737 Aux Bldg Under Steam Tunnel)
L18	1PL12JA	Div 1 DG Control Panel (737 DG Bldg)
M5	P680/161	Main Control Room
➊016	0PL72JA	Adjacent to Control Room HVAC System Train A (825 Control Bldg West)
➊018	0PL72JB	Adjacent to Control Room HVAC System Train B (825 Control Bldg East)
➊06	1PR37S	CCW Rad Monitor (762 Control Bldg)
➊09	1PL55J	DG Bldg HVAC System Panel (762 DG Bldg)
➊F16	1F16	Wall outside RCIC room (adjacent to 1PL62J)

4.1 RPV Makeup from Suppression Pool with SF Pump (Preferred)

NOTE:

The presence of a LPCI initiation signal may have caused a LPCI lineup to be established automatically when the associated MCCs were repowered.

4.1.1 **PLACE** Suppression Pool Cooling in service per 4306.01P003, FLEX SUPPRESSION POOL COOLING. ☐

- ☞ OK to continue in this procedure before RHR HX tube side (SX side) flow is established.

4.1.2 **OPEN/VERIFY OPEN** 1E12-F027A(B) RHR Pump 1A(1B) LPCI Inj Shutoff Valve. ☐

- ☞ If a LPCI initiation signal is not present, 1E12-F042A(B) and 1E12-F028A(B) have to be shut in order to open 1E12-F027A(B).
- ☞ Open this valve manually if required (1E12-F027A – Aux Bldg 762' East Side of Gas Boundary Room, 7' up, 1E12-F027B - RHR B HX Room 737' SW Corner on Mezz)

4.1.3 **MAKE** 1E12-F042A(B), RHR Pump 1A(B) LPCI Inj Spray Valve throttlable per 4411.04, THROTTLING ECCS FLOW. ☐

4.1.4	**THROTTLE OPEN** 1E12-F042A(B) as needed to feed the RPV at the required rate. ☞ May need to throttle shut 1E12-F024A(B) RHR Pump 1A(B) Test Ret To Sup Pool Valve or further reduce RPV pressure to achieve the required ΔP. ☞ Maintain total SF flow as high as possible to maximize suppression pool cooling.	☐

4.2 RPV Makeup from the CY Tank (if available)

NOTE:

❶Two B.5.b connection nozzles are provided on the CY tank in the annular space between the water storage tank and the secondary containment tank. These valves are accessible via the manway on the west side of the outer tank and requires manways bolts to be removed..

4.2.1 **IF** B.5.b equipment is available

THEN **SUPPLY** the LPCS or RHR-C injection header from the CY Tank as follows:

❶4.2.1.1	**CONNECT** 2 ½″ to 3′ rigid connections to the CY Tank pipe connections downstream of 0CY162A and 0CY162B, B.5.B Connection Valves.	☐
❶4.2.1.1.1	Route two (2) hoses from from B.5.b connections to the 5000 gallon portable storage tank and **OPEN** 0CY162A and 0CY162B	☐
❶4.2.1.1.2	**ESTABLISH** suction to B.5.b by connecting suction strainer to B.5.b pump utilizing the hard suction hose supported by the hose stand	☐
4.2.1.2	**ROUTE** a 5″ hose from the B.5.b pump to the LPCS injection header (Fuel Bldg 755′ elevation). ☞ Use the Unit 2 DG vent fan opening to route the hose into the plant.	☐

CAUTION:

Fuel Handling Floor habitability will be challenged after ~11 hours and the pool begins to boil.

Do **NOT** fully block open the airlock doors when routing the hose into the Fuel Building. Protect the hose with foam pipe insulation staged in the Control Building 781′ Lagging Storage Area. Use sections of the insulation to fill in the door opening to keep the heat from the SFP from migrating into the Aux Building.

❶4.2.1.2.13	**REMOVE** the pipe cap and **CONNECT** the 6″ Storz connection on the LPCS CY flush line. ☞ Storz connection stored in the FLEX tool box on 762′ DG Building.	☐
❶4.2.1.2.24	**CONNECT** a Storz 5″ to 6″ transition piece to the LPCS connection and connect the 5″ hose from the B.5.b pump. ☞ Storz transition piece stored in the FLEX tool box on 737′ Aux Building	☐
❶4.2.1.2.3	**START** the B.5.b pump and pressurize the discharge hose.	☐
❶4.2.1.2.4	**OPEN** 1E21-F374 LPCS FLEX Water Inject to RPV and Suppression Pool to pressurize the LPCS injection header.	☐
4.2.1.2.5	**OPEN** 1E21-F005 to feed the RPV as required.	☐
❶4.2.1.2.6	**MAKE** 1E21-F005, LPCS Injection Shutoff Valve throttlable per 4411.04, THROTTLING ECCS FLOW.	☐

❶4.2.1.3	**ROUTE** a 5″ hose from the B.5.b pump to the RHR-C injection header (Fuel Bldg 737′ elevation). ☞ Use the Unit 2 DG vent fan opening to route the hose into the plant.	☐

➊4.2.1.3.1	**REMOVE** the 3" pipe cap downstream of1E12-F088 FLEX Water Inject to RPV and Suppression Pool on 737' Fuel Building west side (ladder required).	☐
➊4.2.1.3.2	**INSTALL** the pre-staged 3" female NPT x 6" Storz coupling in place of the pipe cap.	☐
➊4.2.1.3.3	**CONNECT** a Storz 5" to 6" transition piece to the LPCS connection and connect the 5" hose from the B.5.b pump. ☞ Storz transition piece stored in the FLEX tool box on 737' Aux Building	☐
➊4.2.1.3.4	**START** the B.5.b pump and pressurize the discharge hose	☐
➊4.2.1.3.5	**OPEN** 1E12-F088 RHR-C FLEX Water Inject to RPV and Suppression Pool to pressurize the LPCS injection header.	☐
➊4.2.1.3.6	**OPEN** 1E12-F042C, RHR Pump 1C LPCI Inj Spray Valve to feed the RPV as required	☐
➊4.2.1.3.7	**MAKE** 1E12-F042, RHR Pump 1C LPCI Inj Spray Valve throttlable per 4411.04, THROTTLING ECCS FLOW.	☐

➊4.2.1.4	**CONSIDER** sluicing water from the MC tank to the CY tank per 4303.01P010 EMERGENCY MAKEUP TO THE CY TANK to maintain a clean source of RPV makeup water. ☞ Take into account the resources needed to implement other FLEX strategies.	☐

4.3 RPV Makeup from Fire Protection (if FP header is pressurized)

4.3.1 **IF** B.5.b equipment is available,
THEN **SUPPLY** the LPCS or RHR-C injection header from fire protection as follows:

4.3.1.1	**CONNECT** the B.5.b pump suction to a fire hydrant south of the DG Building using a 5" suction hose.	☐

CAUTION:

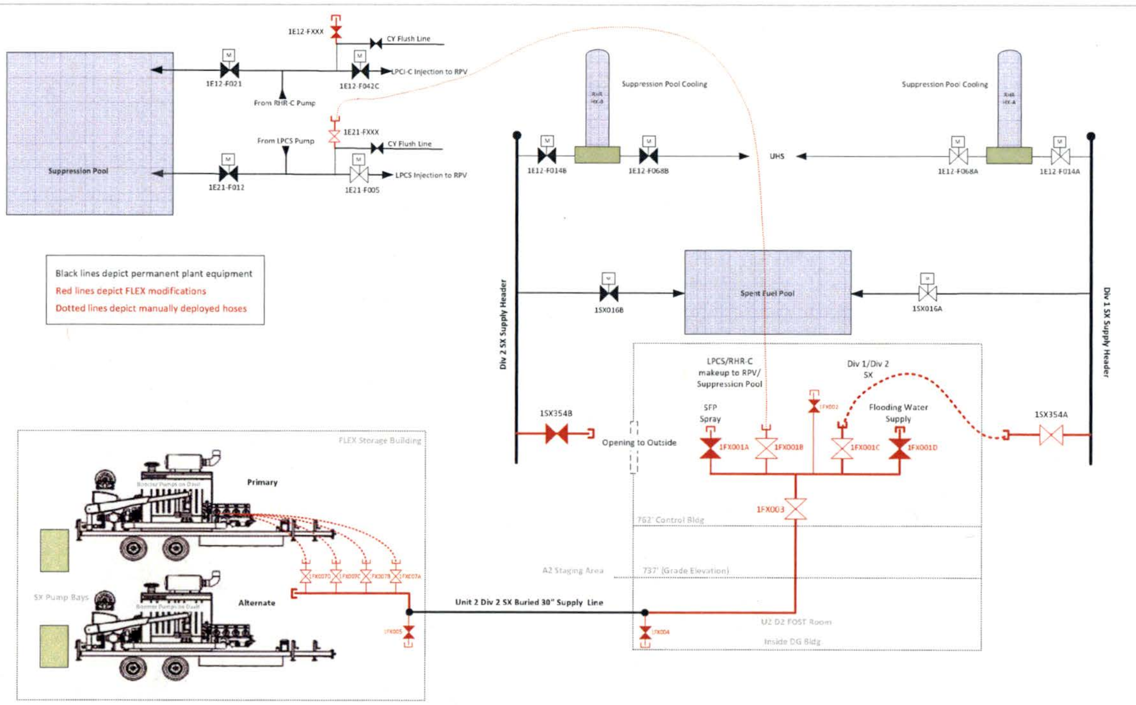
Fuel Handling Floor habitability will be challenged after ~11 hours and the pool begins to boil.

Do **NOT** fully block open the airlock doors when routing the hose into the Fuel Building. Protect the hose with foam pipe insulation staged in the Control Building 781' Lagging Storage Area. Use sections of the insulation to fill in the door opening to keep the heat from the SFP from migrating into the Aux Building.

4.3.1.2	**ROUTE** a 5" hose from the B.5.b pump to the LPCS injection header (Fuel Bldg 755' elevation). ☞ Use the Unit 2 DG vent fan opening to route the hose into the plant.	☐
➊4.3.1.2..1	**REMOVE** the pipe cap and **CONNECT** the 6" Storz connection on the LPCS CY flush line. ☞ Storz connection stored in the FLEX tool box on 762' DG Building	☐
➊4.3.1.2.2	**CONNECT** a Storz 5" to 6" transition piece to the LPCS connection and connect the 5" hose from the B.5.b pump. ☞ Storz transition piece stored in the FLEX tool box on 737' Aux Building.	☐
➊4.3.1.2.3	**START** the B.5.b pump and pressurize the discharge hose.	☐
➊4.3.1.2.4	**OPEN** 1E21-F374 LPCS FLEX Water Inject to RPV and Suppression Pool to pressurize the LPCS injection header.	☐
➊4.3.1.2.5	**OPEN** 1E21-F005 to feed the RPV as required.	☐

❶4.3.1.2.6	**MAKE** 1E21-F005, LPCS Injection Shutoff Valve throttlable per 4411.04, THROTTLING ECCS FLOW.	☐
❶4.3.1.3	**ROUTE** a 5″ hose from the B.5.b pump to the RHR-C injection header (Fuel Bldg 737′ elevation). ☞ Use the Unit 2 DG vent fan opening to route the hose into the plant.	☐
❶4.3.1.3.1	**REMOVE** the 3″ pipe cap downstream of1E12-F088 FLEX Water Inject to RPV and Suppression Pool on 737′ Fuel Building west side (ladder required).	☐
❶4.3.1.3.2	**INSTALL** the pre-staged 3″ female NPT x 6″ Storz coupling in place of the pipe cap.	☐
❶4.3.1.3.3	**CONNECT** a Storz 5″ to 6″ transition piece to the RHR-C connection and connect the 5″ hose from the B.5.b pump. ☞ Storz transition piece stored in the FLEX tool box on Aux Building 737′ elevation	☐
❶4.3.1.3.4	**START** the B.5.b pump and pressurize the discharge hose	☐
❶4.3.1.3.5	**OPEN** 1E12-F088 RHR-C FLEX Water Inject to RPV and Suppression Pool to pressurize the LPCS injection header.	☐
❶4.3.1.3.6	**OPEN** 1E12-F042C, RHR Pump 1C LPCI Inj Spray Valve to feed the RPV as required	☐
❶4.3.1.3.7	**MAKE** 1E12-F042, RHR Pump 1C LPCI Inj Spray Valve throttlable per 4411.04, THROTTLING ECCS FLOW.	☐

4.4 RPV Makeup from the UHS



4.4.1	**PRESSURIZE** the LPCS or RHR-C injection header per 4306.01P002, FLEX UHS WATER SUPPLY. ☞ Use the cleanest water available.	☐

4.4.2		**ENSURE** RPV pressure is lower than the LPCS or RHR-C injection header pressure. ☞ Use ATM 1E21-N654 for LPCS ☞ Use ATM 1E12-N655C for RHR-C		☐

CAUTION:

The following steps create the potential for pressurizing the hose supplying LPcS or RHR-C from the RPV (only a check valve in the flowpath). **Do not allow RPV pressure to rise above 100 psig with the injection valve open.**

4.4.3		**IF**	LPCS is being used for RPV makeup,	
	4.4.3.1	**THEN**	**OPEN** 1E21-F005 to feed the RPV as required.	☐
	4.4.3.2	**MAKE** 1E21-F005, LPCS Injection Shutoff Valve throttlable per 4411.04, THROTTLING ECCS FLOW.		☐
4.4.4		**IF**	RHR-C is being used for RPV makeup,	
	4.4.4.1	**THEN**	**OPEN** 1E12-F042C to feed the RPV as required.	☐
	4.4.4.2	**MAKE** 1E12-F042C, RHR Pump 1C LPCI Inj Spray Valve throttlable per 4411.04, THROTTLING ECCS FLOW.		☐

4.5 RPV Makeup from the Div 2 SSW to RHR Crosstie

4.5.1	**PRESSURIZE** Div 2 SX per 4306.01P002, FLEX UHS WATER SUPPLY.	☐
4.5.2	**OPEN** 1E12-F094 RHR/SSW Cross Tie Valve	☐
4.5.3	**OPEN** 1E12-F096 RHR/SSW Cross Tie Valve	☐
4.5.4	**MAKE** 1E12-F042B, RHR Pump 1B LPCI Inj Spray Valve throttlable per 4411.04, THROTTLING ECCS FLOW.	☐
4.5.5	**THROTTLE OPEN** 1E12-F042B as needed to feed the RPV at the required rate.	☐

5.0 Discussion

5. 1 RCIC should be used for RPV makeup for as long as possible or until conditions allow the plant to transition into the recovery phase. This procedure establishes low pressure RPV makeup capability to be utilized when RCIC is no longer a viable RPV makeup source.

5. 2 The procedure covers several methods that may be available. These priorities should be applied to the method chosen:

1. Ability to achieve the required RPV makeup flow before core uncovery occurs (Refer to Appendix A, Required Vessel Inventory Makeup Rate vs. Decay Heat)
2. Water quality – this is a concern because boiling in the RPV can potentially cause fouling of the heat transfer surfaces and overheating of the fuel.

5.3 The preferred method for low pressure RPV makeup is available once 480 VAC power is available to a Suppression Pool Cleanup and Transfer (SF) Pump. The SF pump can supply a sufficient amount of suppression pool water to the RPV via LPCI or the shutdown cooling return line to makeup for boil-off and system leakage. The RPV leakage rate assumed in the computer analysis (MAAP) is 100 gpm initially from RR pump seals. The leakage rate will diminish as RPV pressure is reduced.

The suppression pool initial water quality is good and will only gradually degrade if lake water is used to maintain suppression pool level while there is system leakage into the drywell basement.

5.4 The are several alternate methods for low pressure RPV makeup to consider:

1. A B.5.b pump and clean water source, if available, can supply the LPCS and/or RHR injection line hose connections from a dedicated hose connected to the B.5.b pump. Water sources to consider include:
   - CY tank
   - RCIC Storage Tank
   - MC Tank (consider sluicing the MC tank to CY tank per 4303.01P010 Emergency Makeup To The CY Tank)
   - Filtered Water Storage Tank
   - Clearwell Tank
2. A FLEX pump connected to the UHS and supplying the LPCS and/or RHR injection line hose connections can makeup to the RPV via the LPCS/RHR-C injection lines.
3. A FLEX pump connected to the UHS and supplying Div 2 SX can makeup to the RPV via 1E12-F094 and 1E12-F096, RHR/SSW Cross Tie Valves.

Appendix A

Required Vessel Inventory Makeup Rate vs. Decay Heat

Time (hr)	1979 ANS 5.1 Bounding Decay Heat Fraction	Required Vessel Inventory Makeup Rate (gpm) 1000 MWt	2000 MWt	3000 MWt	3473 MWt
0.0000	1.000E+00	7400	14800	22200	25700
0.0222	3.327E-02	246	492	739	856
0.0278	3.194E-02	236	473	709	821
0.0417	2.962E-02	219	438	658	762
0.0556	2.810E-02	208	416	624	722
0.0833	2.610E-02	193	386	579	670
0.1111	2.474E-02	183	366	549	636
0.1667	2.282E-02	169	338	507	587
0.2222	2.142E-02	159	317	476	551
0.2778	2.029E-02	150	300	450	521
0.4167	1.823E-02	135	270	405	469
0.5000	1.728E-02	128	256	384	445
0.5556	1.675E-02	124	248	372	431
0.8333	1.478E-02	109	219	328	380
1.1111	1.353E-02	100	200	300	347
1.3333	1.280E-02	95	189	284	329
1.67	1.200E-02	89	178	266	308
2.22	1.110E-02	82	164	246	285
2.78	1.048E-02	78	155	233	270
4.17	9.489E-03	70	140	211	244
5.56	8.866E-03	66	131	197	228
8.33	8.054E-03	60	119	179	207
11.11	7.516E-03	56	111	167	193
16.67	6.788E-03	50	100	151	175
22.22	6.288E-03	47	93	140	162
24.00	6.155E-03	46	91	137	159
27.78	5.909E-03	44	87	131	152
41.67	5.242E-03	39	78	116	134
48.06	5.011E-03	37	74	111	129
50.00	4.948E-03	37	73	110	127

Exelon Generation.

Course/Program:	ILT/NLO/LORT	Module/LP ID:	LP87552
Title:	© RPV CONTROL (EOP-1)	Course Code:	N/A AR 158 5098-87 Partial change 6/10/15
Author:	K. Leffel	Revision/Date:	011 / 05/29/14
Prerequisites:	None	Revision By:	Mark McClure
		Est. Teach Time:	6.0 Hours

Qualified Nuclear Engineer Review (If applicable):	N/A	Date:	N/A
Training Supervision Review: (Print name / Signature)	Steve Minya /S/	Date:	05/29/14
Program Owner Approval: (Print name / Signature)	N/A – Minor Rev	Date:	N/A

TABLE OF CONTENTS — Pg. #

Exelon Generation

OBJECTIVES

Initial: From memory, unless otherwise stated, and with 100% accuracy, in accordance with the course reference materials and procedures, the trainee shall: be able to:

Continuing: Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.1	From memory, recall the plant conditions (parameters and setpoints) which require entry or reentry to Emergency Operating Procedure (EOP)-1, RPV CONTROL per EOP-1 without error.	x	x		x	5
.1.2	Given a diagram of EOP-1:					
	.1 Describe the conditions for exiting/transferring from EOP-1 per CPS 1005.09 without error.	x	x		x	4
	.2 Recall the bases for each individual step/action of EOP-1 per CPS EOP Technical Bases without error.	x	x		x	5-36
	.3 State the minimum suppression pool water level required for the operation of SRVs per EOP-1 without error.	x	x		x	29
	.4 From memory, recall the preferred and alternate methods that can be used to stabilize RPV pressure below 1065 psig as listed on EOP-1 without error.	x	x		x	26
	.5 And given plant conditions involving elevated Drywell/Containment temperatures, determine RPV level instrument availability per Detail A, RPV Water Level Instruments, without error.	x	x		x	10
	.6 And given plant conditions and a copy of 4411.09, identify which methods of pressure control are available for use per EOP-1 without error.	x	x		x	26

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.3	From memory, recall the importance of verifying that the appropriate automatic actions occur as required per the EOP Technical Bases without error.	x	x		x	11
.1.4	From memory, recall the reason(s) for having a wide pressure control band when controlling RPV pressure with the Safety Relief Valves (SRV's) per EOP-1 without error.	x	x		x	29
.1.5	From memory, recall three (3) methods of determining SRV position, based on using three (3) different parameters (one method or parameter may have more than one type of control room display) per CPS 3103.01, MAIN STEAM (MS) without error.	x	x		x	29
.1.6	Given a set of EOP flowcharts, recall 4 of the rules for using the EOP flowcharts, in accordance with CPS No. 1005.09, EMERGENCY OPERATING PROCEDURE PROGRAM section 8.13 without error.	x	x		x	4
.1.7	Given specified plant conditions and a diagram of EOP-1, be able to properly implement the following inserts per EOP-1 without error:					
	.1 Detail A, RPV Water Level Instruments.	x	x		x	10
	.2 Detail E, Alternate Injection Systems.	x	x		x	18
	.3 Detail Z, NPSH/Vortex Limits.	x	x		x	16,17, 22,31, 32
	.4 Figure B, RPV Saturation Temperature.	x	x		x	10
	.5 Figure C, Minimum Usable Levels.	x	x		x	10
	.6 Figure D, Primary Containment Pressure Limit.	x	x		x	12

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.8	Given specified plant conditions and a diagram of EOP-1, be able to properly prioritize and implement the following actions for EOP-1 without error:					
	.1 Verifying needed auto actions.	x	x		x	11
	.2 Establishing an initial level band.	x	x		x	14
	.3 Establishing an initial pressure band.	x	x		x	27
	.4 Deciding when you may anticipate Blowdown, and when you should perform Blowdown	x	x		x	25
	.5 Determining the appropriate time to start to depressurize the reactor.	x	x		x	34
.1.9	Given plant conditions, correctly determine which equipment would be available for core cooling, based solely on available power supplies without error.	x	x		x	35
.1.10	Without references, be able to recall the key features of injection systems, including a functional description of the procedures and equipment needed to cross-connect all available sources of makeup or cooling water under emergency conditions per 4411.03 without error.	x	x		x	15
.1.11	Given plant conditions, a diagram of EOP-1 and a copy of CPS 4411.09, evaluate those conditions and determine whether or not to use the normal Shutdown Cooling mode per EOP-1 without error.	x	x		x	35
.1.12	Given plant conditions and a copy of the EOPs, evaluate those conditions and determine the appropriate actions for those conditions per EOP-1 without error.	x	x		x	5-36

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.13	Given plant conditions and without error, evaluate those conditions and determine whether or not to reset a TRDFP for the purpose:					
	.1 Level Control per 4411.03.	x	x		x	14
	.2 Pressure Control per 4411.09.	x	x		x	33

Evaluation Method & Passing Criteria:
Pass a written exam with at least 80% score

References:

- CPS No. 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS No. 3103.01, MAIN STEAM (MS)
- CPS No. 4100.01, REACTOR SCRAM
- CPS No. 4401.01, RPV CONTROL
- CPS No. 4403.01, RPV FLOODING
- CPS No. 4404.01, ATWS RPV CONTROL
- CPS No. 4407.01, EMERGENCY RPV DEPRESSURIZATION
- CPS No. 4410.00, DEFEATING SYSTEM INTERLOCKS
- CPS No. 4410.00C001, DEFEATING RCIC INTERLOCKS
- CPS No. 4410.00C002, DEFEATING HPCS INTERLOCKS
- CPS No. 4410.00C003, DEFEATING IA INTERLOCKS
- CPS No. 4410.00C005, DEFEATING RWCU INTERLOCKS
- CPS No. 4410.00C009, DEFEATING INJECTION/FLOODING INTERLOCKS
- CPS No. 4411.02, TERMINATING AND PREVENTING INJECTION
- CPS No. 4411.03, INJECTION/ FLOODING SOURCES
- CPS No. 4411.04, THROTTLING ECCS FLOW
- CPS No. 4411.07, RPV LEVEL INSTRUMENTATION
- CPS No. 4411.09, RPV PRESSURE CONTROL SOURCES
- EMERGENCY OPERATING PROCEDURES (EOP) TECHNICAL BASES
- NRC INFORMATION NOTICE 2000-01: OPERATIONAL ISSUES IDENTIFIED IN BOILING WATER REACTOR TRIP AND TRANSIENT
- SOER 10-02, ENGAGED, THINKING ORGANIZATIONS
- IER 11-3, WEAKNESSES IN OPERATOR FUNDAMENTALS

Commitments: None

LESSON PLAN HISTORY PAGE		
REV.	**DATE**	**DESCRIPTION**
0-6	Unknown	Unknown
7	11/04/04	Updated format. A large amount of technical content in the Training Guide has been added from the Clinton EOP Technical Bases. Corrected LP as needed.
8	09/27/06	Incorporated TRACER 2006-04-0140A. Removed EOP-7 from LP due to deletion.
9	04/04/08	Incorporated TRACER 2007-09-0116A to update to match revision 28 of the EOP's. Also, incorporated TRACER 2007-03-0079A to ensure remaining references to EOP-7 have been removed.
10	03/11/13	Incorporated changes to update the LP to match revision 29 of the EOP's. Added other enhancements.
11	05/29/14	Incorporated 01401784-77; RPV Control (EOP-1) LP87552 enhancement from LORT 13-02 feedback. (Page 30)

Instructional Methods:

- lecture/discussion
- activities
- simulations
- small group activities

Media:

- PowerPoint
- white board
- flip charts
- handouts
- trainee text

I. Introduction

A. Review objectives

1. RPV CONTROL (EOP-1) gives procedural direction for controlling reactor pressure vessel (RPV) level and pressure. If normal pressure and level control systems are available, EOP-1 directs their use. If conditions degrade, EOP-1 directs the use of other systems and directs the operator to procedures that govern the operation of those systems. EOP-1 also provides transition points to other EOPs if conditions warrant. Familiarity with EOP-1 will aid the operator in dealing with a wide variety of transients successfully.

Before class:

- **Review Instructor Lesson Plan**
- **Make student copies of Lesson Plans including figures**
- **Obtain transparencies and/or PowerPoint**
- **Check the INPO web page for any current SOERs, SERs or SENs. If any applicable information is found include that information in the presentation.**
- **Persistent search for applicable OPEX to EOP utilization has not yielded credible examples.**

B. Overview of training session

1. *RPV Control* is entered whenever any of its entry conditions occur; it is exited when an emergency no longer exists. The absence of entry conditions does not necessarily mean that an emergency no longer exists, however. Nor does the continued presence of an entry condition necessarily mean that an emergency *does* exist.

   a. *RPV Control* (EOP-1) gives procedural direction for controlling reactor pressure vessel (RPV) level and pressure. If normal pressure and level control systems are available, EOP-1 directs their use. If conditions degrade, EOP-1 directs the use of other systems and directs the operator to procedures that govern the operation of those systems. EOP-1 also provides transition points to other EOPs if conditions warrant. Familiarity with EOP-1 will aid the operator in dealing with a wide variety of transients successfully.

2. RPV *Control* is entered whenever any of its entry conditions occur or when a branch in another procedure specifically requires entry. It is exited when an emergency no longer exists or when a step requires a transfer to another EOP

3. The initial steps of *RPV Control* verify that the reactor is shutdown. If the reactor is not shutdown, control of the three key parameters transfers to EOP-1A, *ATWS RPV Control.* If the reactor *is* shutdown, the scram procedure is executed concurrently with EOP-1.

4. The remainder of *RPV Control* comprises two major branches, one addressing RPV water level, the other addressing RPV pressure. The water level control actions establish adequate core cooling. The pressure control actions first stabilize RPV pressure to help in controlling RPV water level, then cool down the RPV to cold shutdown conditions.

Before class:
- **Obtain and test required equipment for transparency and/or PowerPoint viewing**
- **Put items on board**
  - **Instructor Name**
  - **Discipline (OPS)**
  - **Program (ILT, NLO, LORT, etc.)**
  - **Subject**
  - **Current Date**

At the start of class, if appropriate, introduce yourself and establish rapport with the class.

Remind observers and evaluators to turn off personal communications devices.

C. Evaluation

1. A check for understanding of objectives will be evaluated by one or more of the following:

   a. The instructor periodically throughout the presentation in the form of an interim summary.

   b. A written examination with minimum score of 80%.

   c. The instructor throughout the presentation using questions.

D. Management Expectations

1. Safe nuclear power plant operation is based upon the principle that each individual accepts the unique and grave responsibility inherent in using nuclear technology.

2. When operations personnel are faced with unexpected or anomalous system behavior, they are expected to take conservative action to place the system/plant in a safe condition.

3. A thorough understanding of EOP-1 is desired for an operator to recognize the actions required, that are designed to restore the parameter values to within normal operating bands.

Principles for a Strong Nuclear Safety Culture (PSNSC) provide behaviors and actions that support a culture of safety in all aspects of plant operation. The cornerstones of these principles are:

- **Everyone is personally responsible for nuclear safety.**
- **Leaders demonstrate. commitment to safety**
- **Trust permeates the organization.**
- **Decision-making reflects safety first.**
- **Nuclear technology is recognized as special and unique.**
- **A questioning attitude is cultivated.**
- **Organization learning is embraced.**
- **Nuclear safety undergoes constant examination.**

In addition, SER 03-05, IER 11-3 and SOER 10-02 discuss weaknesses in operator fundamentals which have led to many significant industry events. The Operations Fundamentals (as outlined in HU-AA-1081-F-05) provide specific guidance on how to address the weaknesses identified in SER 03-05, IER 11-3 and SOER 10-02 to help ensure a safe nuclear culture.

II. PURPOSE OF PROCEDURE

A. The purpose of EOP-1, *RPV Control*, is to:

- Maintain adequate core cooling through core submergence.
- Cool down the RPV to cold shutdown conditions
- Ensure that the reactor is shutdown

1. Three key parameters are controlled:
    - RPV water level
    - RPV Pressure
    - Reactor Power

B. Review 1005.09, EOP / SAG Procedure Useage, section 8.13

1. Review Section 8.13, "EOP/SAG Procedure Usage," in CPS No. 1005.09, Emergency Operating Procedure (EOP) and Severe Accident Guideline (SAG) Program."

.1.6, .1.2

Ask the students what the advantages are of having the EOPs as flowcharts instead of regular text procedures.

- **Easier to see what possible actions are to be performed next.**
- **Easier to implement overrides.**
- **Easier to see what actions have been taken.**
- **Provides a surface to write and trend data.**
- **Several parameters can be tracked and controlled more easily.**
- **Easier for someone to back up the Control Room Supervisor's actions.**
- **Others that the students come up with.**

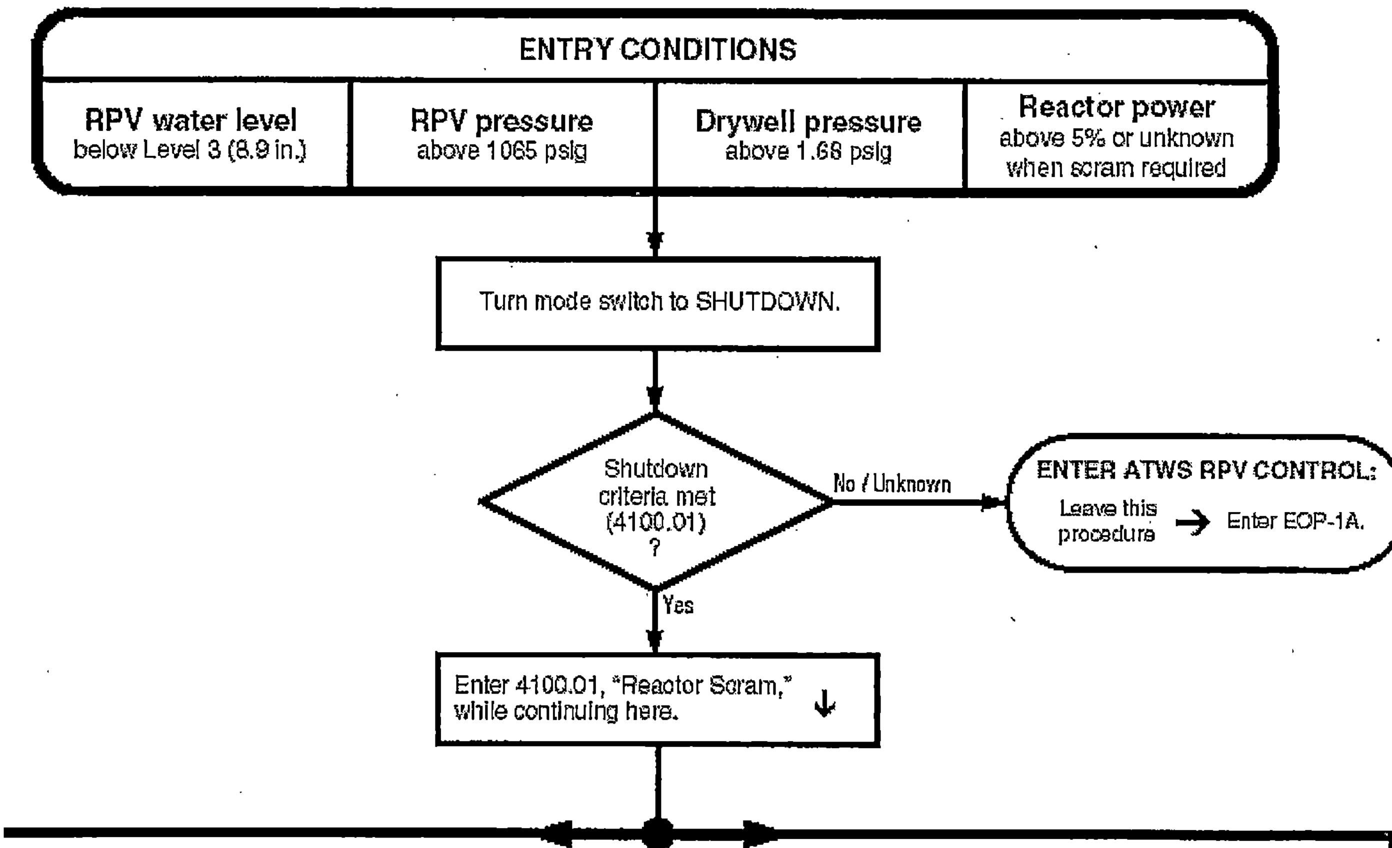
III. General Overview of Procedure

A. Entry Conditions

.1.1

1. EOP-1, Part A

Have student follow path thru flow chart and along in CPS EOP Technical Bases.



a. Entry Conditions

1) The *RPV Control* entry conditions are symptomatic of an emergency affecting the RPV or a condition that could become an emergency. The specified parameters are the same as the key parameters controlled by the procedure or are closely related to them. The specified setpoints have been chosen to be operationally significant, unambiguous, readily identifiable, and familiar to operators. In general, they are also setpoints for scrams, alarms, trips, and ECCS initiation.

While each of the entry conditions requires a scram (or causes a trip of the RPS logic), a scram by itself is *not* an entry condition for the procedure.

2) The RPV water level entry condition corresponds to the low RPV water level scram setpoint (Level 3, or 8.9 inches Narrow Range). A low RPV water level is a symptom of events which may jeopardize adequate core cooling, including:

- Loss of coolant
- Loss of feedwater

3) The RPV pressure entry condition corresponds to the high RPV pressure scram setpoint (1065 psig). A high RPV pressure is a symptom of events which may jeopardize RPV integrity (and thereby adequate core cooling) such as:

- SRV failure
- Turbine trip with bypass failure
- MSIV closure
- ATWS

4) The drywell pressure entry condition corresponds to the high drywell pressure scram setpoint (1.68 psig). Although drywell pressure is not directly controlled by EOP-1, a high drywell pressure is a symptom of a break in the drywell, and thus of events which may jeopardize adequate core cooling.

5) The reactor power entry condition is defined to be a power above the APRM downscale setpoint (5%) or unknown when a reactor scram is required. This condition includes both ATWS events and operational situations in which technical specifications, administrative procedures, or plant policies require a manual scram. Control of reactor power is addressed in the initial steps of EOP-1 which ensure that the reactor is shutdown.

6) If power is "unknown," it must be assumed to be above 5% and *ATWS RPV Control* must be entered. Loss of direct power indications does not necessarily mean that reactor power is unknown, however. Other parameters, such as reactor period, steam flow, RPV pressure, SRV position, and suppression pool heatup rate, provide indirect indications of reactor power. These indications may also be used to determine whether power is above the APRM downscale setpoint.

7) *RPV Control* must be entered at the beginning of the flowchart whenever any entry condition occurs, or clears and then occurs again, even if the procedure is already being executed.

b. "Turn mode switch to SHUTDOWN"

1) Placing the reactor mode switch in SHUTDOWN is the normal method of performing a manual scram at Clinton. In *RPV Control*, the action has two purposes:

a) It trips the RPS logic. If a scram signal already exists but a scram has not occurred, the manual scram may obviate entry of EOP-1A, *ATWS RPV Control*. If a scram signal does not already exist (i.e., *RPV Control* was entered because another procedure required a scram),the desired scram is initiated.

b) It bypasses the MSIV closure on low RPV pressure, thus avoiding possible loss of the preferred heat sink.

2) *RPV Control* must be reentered if an entry condition clears and then reoccurs. The mode switch scram does not have to be repeated, however. This allows the scram accumulators to recharge and the scram discharge volume to drain after the scram is reset.

Question: What actions are required of the A CRO when Shutdown Criteria is NOT met?

Answer: Insert a Manual Scram and ARI in attempts to insert all rods per the SCRAM procedure.

c. "Shutdown criteria met?"

1) Procedure 4100.01, *Reactor Scram,* lists the ~~following~~ criteria (cycle specific) for evaluating whether the reactor is shutdown and will remain shutdown due to control rod insertion alone.

TBS 6/10/15

Pen & ink change per TQ-AA-223, step 4.1.8.5.E.3.

a) All control rods are inserted to at least position 02,

or

b) No more than one rod out past 02, with all other rods in at position 00,

or

c) A qualified reactor engineer has determined that the reactor will remain shutdown under all ~~conditions without boron~~

AR# 1585098-87

2) The first criterion gives the best confirmation that the reactor will remain shutdown. Position ~~02~~ 00 is the Maximum Subcritical Banked Withdrawal Position, defined to be the greatest banked rod position at which the reactor will remain shutdown under all conditions. If no more than one rod is out past position ~~02~~ 00, analyses prove that sufficient shutdown margin is still available if all other rods are at position 00. Other rod patterns must be evaluated by a qualified reactor engineer, as specified in the third criterion. Note that the evaluation must address not only whether the reactor *is* shutdown, but whether the reactor will *remain* shutdown under worst-case conditions following the cooldown prescribed in the Pressure branch of *RPV Control.*

TBS 6/10/15

TBS 6/10/15

d. "Enter ATWS RPV Control"

1) If the shutdown criteria are not met, there is a possibility that the reactor could return to criticality as the RPV cools down. EOP-1A, *ATWS RPV Control*, prescribes appropriate control methods for RPV water level, RPV pressure, and reactor power under these conditions.

e. "Enter 4100.01, 'Reactor Scram'"

1) If one or more of the shutdown criteria are met, the reactor will remain shutdown and further efforts to control reactor power are unnecessary. The scram procedure is then executed concurrently with the Level and Pressure branches of EOP-1.

f. Concurrent branch

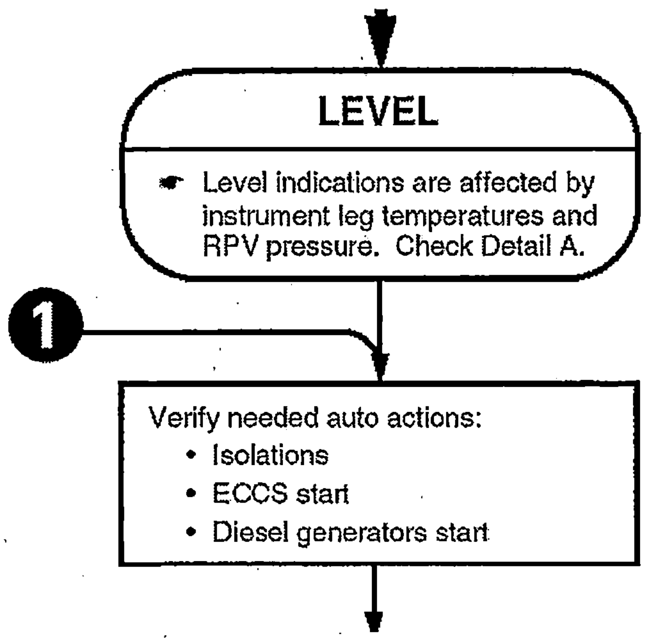
1) The thermodynamic relationship between RPV pressure and RPV water level requires that these parameters be controlled concurrently. RPV water level cannot be stabilized if RPV pressure is oscillating, since pressure transients induce level shrink and swell. Similarly, RPV pressure cannot be stabilized if RPV water level is cycling, since level transients may result in system initiations and isolations that directly affect RPV pressure.

2) The symptom-oriented structure of the EOPs precludes any advance definition of the relative priorities of the Level and Pressure branches. Rather, the importance of individual steps and the priority with which they should be performed must be judged based on observed parameter values and trends, the availability of plant systems, and an overall assessment of plant conditions.

B. Level Leg Overview

1. EOP-1, Part B Level/ Automatic Actions

Have student follow path thru flow chart and along in CPS EOP Technical Bases.



a. LEVEL

1) The primary objective of the Level branch of *RPV Control* is to keep the core submerged and thus adequately cooled. Initial steps define preferred and alternate level control bands and specify the systems to be used. Later steps provide contingency actions if level cannot be maintained within the prescribed bands.

b. "Check Detail A"

.1.2.5, .1.7.1, .1.7.4, .1.7.5

1) Decisions which must be made in later steps of the Level branch require knowledge of the value and trend of RPV water level. RPV water level instruments, however, are sensitive to changes in RPV pressure, drywell temperature, and containment temperature."Detail A" defines conditions under which water level indications may be unreliable or must be considered invalid due to these effects.

c. "Verify needed auto actions"

.1.3, .1.8.1

1) The verification of automatic actions prescribed in this step is intended to be a relatively quick confirmation of proper system operation. Time consuming valve lineup checks and manual initiation procedures are not appropriate at this point in the procedure.

2) "Isolations" terminate any loss of reactor coolant through a break. All required isolations of lines connected directly to the RPV and penetrating the drywell should be verified.

3) "ECCS start" ensures that emergency injection sources are available. "Start" means that all pumps, valves, and auxiliary equipment are properly lined up for existing plant conditions; a given system may or may not be injecting. Later steps in *RPV Control* provide more detailed ECCS operating instructions, including authorization to shut down a system that automatically starts but is not needed.

4) "Diesel generators start" ensures that electrical power is available for operating injection systems.

5) All automatic actions do not have to be verified in this step, only those most important to RPV water level control. "Verify" means to confirm that necessary responses occur and that appropriate system states exist. Actions that should have occurred but did not should be manually performed.

2. EOP-1, Part C Level Overrides

IF	THEN
RPV water level unknown (4411.07)	**FLOOD THE RPV:** Leave this procedure → Enter EOP-2 at ⑬.
Cannot stay below Fig D, Primary Containment Pressure Limit	Stop adding water from outside primary containment not needed for core cooling.

a. "RPV water level unknown (4411.07)" If RPV water level is "unknown," there is no assurance that the core is submerged. The RPV must then be flooded to ensure that the core remains adequately cooled. Both level and pressure control transfer to EOP-2, *RPV Flooding*.

Review CPS No. 4411.07. Stress that elevated Drywell or Containment temperatures require increased attention on the part of the operator

b. "Unknown" in this step means that the value of RPV water level cannot be determined relative to a prescribed limit or action level. Detailed guidance on evaluating the usability of available level indications is provided in 4411.07.

.1.7.6

c. "Cannot stay below Fig D, Primary Containment Pressure Limit" The Primary Containment Pressure Limit is a function of primary containment water level and is defined to be the lesser of:

1) The pressure capability of the primary containment.

2) The maximum containment pressure at which vent valves sized to reject all decay heat from the containment can be opened and closed.

3) The maximum containment pressure at which SRVs can be opened and will remain open.

4) The maximum containment pressure at which RPV vent valves can be opened and closed.

Question When is Fuel Zone Used?

Answer: When level is below Wide Range

d. If an unisolable break exists inside the drywell, continued RPV injection from sources external to the primary containment will increase primary containment water level after RPV water level reaches the elevation of the break. The increasing primary containment water level will, in turn, increase the hydrostatic pressure over submerged components and compress the primary containment airspace, thereby increasing the atmospheric pressure. The combination of these effects tends to decrease the margin to the Primary Containment Pressure Limit as the water level rises.

e. If the core will remain adequately cooled, continuing injection above the Primary Containment Pressure Limit is unnecessary. Injection is therefore terminated to preserve containment integrity and operability of SRVs and pneumatic vent valves.

f. Injection needed for core cooling is *not* terminated. The Drywell/Containment Pressure branch of EOP-6 vents the containment to control pressure below the Primary Containment Pressure Limit. Containment pressure can thus exceed the Primary Containment Pressure Limit only if the capacity of available vent paths is less than the rate of heat addition to the primary containment. Terminating injection under these conditions cannot preclude primary containment failure. Injection needed to maintain the core adequately cooled is therefore continued. Otherwise, both core *and* containment integrity could be challenged.

g. Note that this override terminates injection only from sources outside the primary containment. Injection from the suppression pool need *not* be terminated.

3. EOP-1, Part D Level Control Systems

Review CPS No. 4411.03, "Injection/Flooding Sources," for instructions for Preferred and Alternate Systems

.1.13

CAUTION: Exceeding NPSH / Vortex Limits (Detail Z) may damage systems.

Control RPV water level Level 3 (8.9 in.) to Level 8 (52 in.) using any of the Preferred Injection Systems (4411.03):

- Level indications are affected by instrument leg temperatures and RPV pressures. Check Detail A.
- OK to throttle ECCS (4411.04).

Preferred Injection Systems

- Feedwater
- Condensate / Condensate Booster
- CRD
- RCIC
  - RCIC injection will trip main turbine and RFPTs.
  - Use RCIC storage tank suction if you can.
  - OK to defeat RCIC interlocks (4410.00C001).
- HPCS
  - Use RCIC storage tank suction if you can.
  - OK to defeat HPCS interlocks (4410.00C002).
- LPCS
- LPCI
  - Use HXs as soon as you can.
- RHR through shutdown cooling
  - Use HXs as soon as you can.
  - OK to defeat 1E12-F053 interlocks (4410.00C009).

IF	THEN
Cannot get level back above Level 3 (8.9 in.) and hold it there	Hold level above –162 in. (TAF). • Use Alternate Injection Systems if needed (Detail E). • If permitted by EOP-8, start igniters and mixers (4411.11).

a. "Control RPV water level Level 3 to Level 8…"

.1.8.2

1) If possible, RPV water level should be maintained between Level 3 (8.9in.) and Level 8 (52 in.) using the Preferred Injection Systems. This control band provides assurance of adequate core cooling while avoiding unwarranted demands on the control room operators. Controlling RPV water level above Level 3 permits the scram to be reset and allows later use of shutdown cooling. Controlling RPV water level below Level 8 preserves the availability of feedwater, RCIC, and the main turbine bypass valves and avoids

Question: What auto actions occur at Level 8?
Answer:
- **Main Turbine Trips**
- **Feedwater Pumps Trip**
- **Reactor Scram (mode dependent)**
- **RCIC cycles off**
- **HPCS cycles off.**

moisture carry-over into the main steam lines. Water hammer caused by filling hot steam lines with cooler water could damage the SRVs, main steam piping, or steam line isolation valves.

b. "...using any of the Preferred Injection Systems"

.1.10

1) Most of the preferred injection systems start and/or operate automatically, and in many cases verifying system lineups will be the only action required in this step . If, for example, RPV water level is low due to shrink following a turbine trip, the feedwater system is capable of restoring water level automatically. If a break occurs with the RPV at high pressure, the high pressure ECCS is designed to automatically inject.

Review and discuss Attachment A

2) As a transient progresses, the most effective modes of system operation may change. For example, all ECCS pumps may inject following a large pipe break, but a single pump may be sufficient once RPV water level is restored within the specified range. Continued adjustment of system lineups and injection flows may thus be required in order to remain within the preferred RPV water level control band. Note that this step may also be reached when a high RPV water level condition exists. In this situation, RPV water level would have to be lowered by appropriate control of the listed systems.

3) The preferred injection systems include both those used for RPV water level control during normal plant operations and those categorized as emergency makeup. Since the EOPs must address a full spectrum of initial plant conditions and postulated transients, individual systems are not prioritized. Pump capacities, water quality, power availability, suction location, RPV pressure, and systems operating characteristics should be considered, however, when deciding which injection sources to use.

c. "Check Detail A"

1) The reference to Detail A is repeated to emphasize its significance and continued applicability to the prescribed actions.

d. "OK to throttle ECCS"

1) Throttling ECCS flow to control RPV water level could be problematic following an ECCS initiation signal. Detailed instructions for doing so are provided in 4411.04.

e. *"CRD"*

1) CRD is a relatively low capacity injection source, but is normally operating and supplies high quality water. Following an isolation or a small break, it may by itself be sufficient to maintain level. Both pumps can be started to maximize flow, as specified in Procedure 4411.03.

f. "RCIC"

1) A supplementary instruction provides a reminder that RCIC initiation will trip the main turbine and RFPTs if they are still on-line. Since the trips may complicate RPV water level and RPV pressure control, RCIC initiation should be avoided when the RFPTs are in use or the main turbine is on-line.

2) The preferred suction source for RCIC and HPCS is the RCIC storage tank. This source provides higher quality water than the suppression pool, is at a higher elevation, and is not affected by containment heatup. NPSH, vortex, and component cooling limitations are therefore not of concern. If necessary, the RCIC high suppression pool water level suction transfer may be defeated to permit continued use of the RCIC storage tank suction as suppression pool water level rises. If the RCIC storage tank is unavailable, RCIC and HPCS suctions may be aligned to the suppression pool, but NPSH and vortex limits (Detail Z) must then be considered.

3) The RCIC storage tank may be considered to be "unavailable" if an event-specific off-normal procedure (e.g., Station Blackout) requires the use of suppression pool suction over RCIC tank suction as part of the licensing design bases mitigation response.

Review CPS No. 4411.04

Review CPS No. 4410.00, "Defeating System Interlocks," and 4410.00 C002 for defeating HPCS interlocks.

Review 4410.00C009, "Defeating Injection/Flooding Interlocks," instructions for defeating 1E12-F053A(B) interlocks.

Review CPS No. 4410.00, "Defeating System Interlocks," and 4410.00C001 for defeating RCIC interlocks.

.1.7.2

4) The RCIC low pressure isolation may be bypassed to permit RCIC operation even after the RPV has been depressurized. The system can sustain some flow so long as pressure is above the value at which the turbine will stall.

g. NPSH/Vortex Limits

1.7.3

1) NPSH and vortex limits are defined for RCIC, HPCS, LPCS, and RHR. The limits apply, however, only when pump suctions are lined up to the suppression pool.

2) The NPSH Limit is defined to be the highest suppression pool temperature which provides adequate net positive suction head for pumps taking suction from the suppression pool. The Vortex Limit is the lowest suppression pool water level at which air entrainment is not expected to occur in the suction of pumps aligned to the suppression pool.

h. "LPCI / RHR through shutdown cooling"

1) The "RHR through shutdown cooling" flowpath is comparable to LPCI in flow and reassure capabilities. RHR may therefore be lined up through either LPCI or shutdown cooling in this step. The two flowpaths *cannot* be used concurrently, however.

i. "Use HXs as soon as you can"

1) Directing RHR flow through the RHR heat exchangers as soon as possible minimizes suppression pool heatup and prolongs the availability of the suppression pool as a heat sink. (The phrase "as soon as you can" means the earliest practicable time within the constraints imposed by system conditions, valve control logic, and concurrently required operator actions.) Although the heat exchangers introduce an additional pressure drop across the RHR system, the resulting decrease in flow rate is small. Thermal stresses which result from injecting through the heat exchangers have been considered in the design of the RHR System and are within acceptable limits.

j. "Cannot get level back above Level 3"

1) If RPV water level cannot be restored and maintained above Level 3, an alternate control band with a lower limit of the top of the active fuel is defined. The expanded RPV water level control band provides added operational flexibility, allowing additional time to line up injection systems, while still keeping the core adequately cooled by submergence. The wider band also accommodates breaks between Level 3 and the top of the active fuel when break flow cannot be overcome by injection flow.

2) **Expanded Level Band** - CPS 4100.01, Reactor Scram, provides guidance to use a wider level band in acknowledgement of not being able to maintain L3 to L8 while cycling SRV's. Shrink and swell due to SRV operation is about thirty inches. Therefore, if level is above about +20", opening an SRV will cause L8 to be reached. If level is below about +40", SRV closing will cause L3 to be reached. Therefore, 4100.01 allows a band of –30" to +40" on Wide Range to be used until pressure can be stabilized (which will probably require reopening the MSIV's or Main Steam Line Drains. Meanwhile, the scram should NOT be reset. The Scram procedure directs the operator to the Control Rod Drive operating procedure for guidance on how to reduce rod drive flow *without* resetting the scram if needed to control RPV level.

k. "Use Alternate Injection Systems if needed"

.1.7.2

1) The Alternate Injection Systems (Detail E) are those of lower capacity or which require more complex lineups than the preferred systems. Detailed instructions for aligning and using the alternate systems are provided in the identified system operating procedures.

Review and discuss Attachment A

2) Any one, or combination of the listed systems may be used as necessary to maintain RPV water level above the top of active fuel. Poor quality sources should generally be injected as a last resort, since their use could complicate plant recovery following the emergency. If RPV water level continues to decrease, *all* available injection sources should be employed in an attempt to reverse the level trend.

Low pressure systems will inject, however, only if RPV pressure is below their shutoff heads. Since the preferred RPV water level control band (Level 3 to Level 8) and the alternate RPV water level control band (from the top of active fuel to Level 8) are both contained in the same element, RPV water level should be restored to and maintained within the preferred band if possible.

l. Inhibit ADS – Not performed any more!

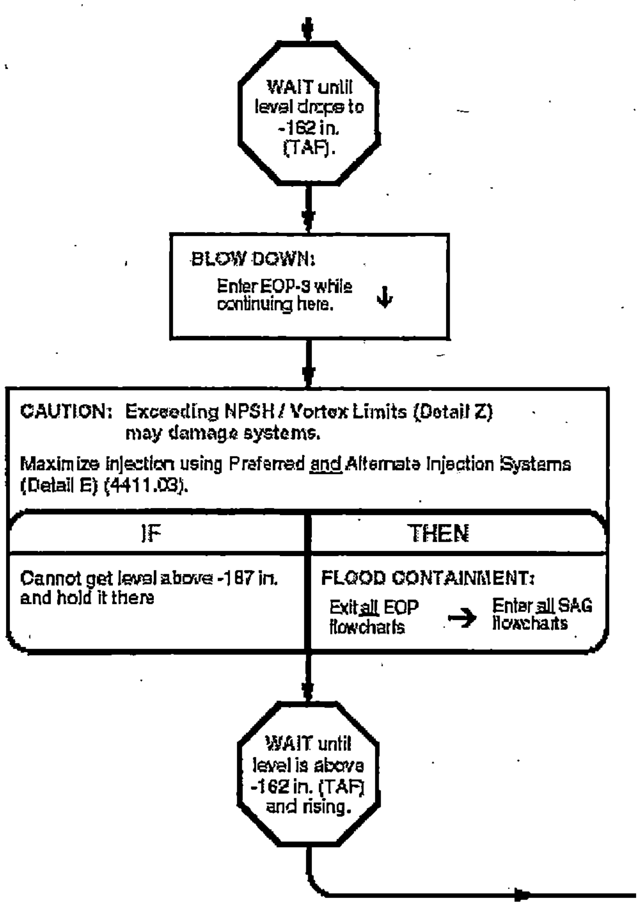
ADS is no longer Inhibited in EOP-1. This changed in Rev 29 to the EOPs and improves our Core Damage Frequency (CDF) margin for these events. If the conditions for an automatic ADS initiation are present, it will be allowed to automatically occur.

Note: With Rev 29 to the EOPs, we no longer inhibit ADS initiation.

m. "Start igniters and mixers"

1) If hydrogen production is anticipated, the igniters and mixers should be started as soon as possible, while the hydrogen concentration is still low. The Drywell/Containment Hydrogen branch of EOP–6 therefore requires that the igniters and mixers be started "before" RPV water level drops to the top of the active fuel. Supplementary instructions are provided in the RPV water level control paths of EOP-1, EOP-1A, and EOP-2 as a reminder to start and operate the igniters and mixers in accordance with EOP-6 as level approaches the top of the active fuel.

4. EOP-1, Part E Level Control



a. "WAIT until level drops to -162 in./ BLOWDOWN"

1) If RPV water level can be maintained above the top of the active fuel, no further action is required in the Level branch. If the decreasing RPV water level trend

cannot be reversed before RPV water level drops to the top of the active fuel, however, core cooling by submergence can no longer be ensured. A blowdown is then performed to maximize available injection flow and minimize break flow.

2) The blowdown is not initiated until RPV water level has dropped to the top of the active fuel because:

- Adequate core cooling through submergence exists so long as RPV water level remains above the top of the active fuel.
- The time required for RPV water level to decrease to the top of the active fuel can best be used to line up and start pumps, attempting to reverse the decreasing RPV water level trend.

3) The blowdown should be performed even if RCIC is the only source of RPV injection. Defeating the low RPV pressure isolation permits use of RCIC even after the RPV has been depressurized. The system can sustain some flow so long as pressure is above the value at which the turbine stalls.

4) No alternate RPV water level control band extending below the top of the active fuel is defined in EOP-1 for the following reasons:

- The Clinton Wide Range RPV water level instrument range does not extend down to the top of the active fuel and the Fuel Zone instruments are calibrated for an RPV pressure of 0 psig with no jet pump flow. Any flow through the jet pumps, including that caused by SRV actuation, will result in erratic Fuel Zone indication. Since no installed RPV water level instrument provides reliable indication below the top of the active fuel under pressurized conditions, steam cooling strategies establishing level control bands below the top of the active fuel with the RPV pressurized cannot be defined at Clinton.
- If RPV water level cannot be restored and maintained above the top of the active fuel with available injection systems, it is unlikely that efforts to avoid a blowdown by maintaining level within a wider band would be successful.

b. "Maximize injection using Preferred and Alternate Injection Systems"

1) All available injection sources should have been aligned in accordance with Part D before the RPV blowdown. If RPV pressure were high, however, injection from low pressure systems would not have been possible. Following the blowdown, injection into the RPV is maximized at the lower pressure using all available preferred and alternate systems. Low pressure injection will commence as soon as RPV pressure drops below the shutoff head for each of the listed systems.

2) The Preferred Injection Systems are listed earlier in the Level branch (Part D). The Alternate Injection Systems are listed in Detail E. Since some of the listed systems share common pumps or injection paths, all cannot be used simultaneously. The direction to "maximize injection" clarifies that the combination of available injection sources that provides the highest total flow should be aligned.

c. NPSH/Vortex Limits

.1.7.2

1) The Detail Z NPSH and vortex limits (see Part D) remain applicable to operation of RCIC, HPCS, LPCS, and RHR with suction from the suppression pool. The limits should be observed if possible, but may be exceeded if necessary to establish and maintain adequate core cooling. A judgment as to whether system operation beyond NPSH and vortex limits is warranted should consider such factors as:

- The availability of other systems
- The current trend of plant parameters
- The anticipated time such operation will be required
- The degree to which the limit will be exceeded
- The sensitivity of the system to operation beyond the limit
- The consequences of *not* operating a system beyond the limit Operation beyond the NPSH and vortex limits is not expected to result in immediate or catastrophic pump failure.

d. "FLOOD CONTAINMENT"

1) If all attempts to submerge the core through RPV injection prove unsuccessful, the only remaining option is to flood the containment. The EOPs are then exited and the SAGs entered. If a primary system break exists, flooding the containment will backfill the RPV through the break. While flooding will be possible only if a primary containment fill system of sufficient capacity is available, immediate transfer to the SAGs is prescribed in anticipation of possible core geometry changes and so that appropriate instructions will be in effect when the necessary injection or fill systems *are* available. The specified level of -187 in. is the "Minimum Steam Cooling RPV Water Level," defined to be the lowest RPV water level at which the covered portion of the reactor core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1500°F.

e. Wait until level is above -162 in. and increasing"

1) If RPV water level is above the top of the active fuel and increasing, efforts to reverse the decreasing trend have been successful and adequate core cooling by submergence has been restored. Level control then loops back to the step defining the preferred control band (Level 3 to Level 8; Part D).

<u>Interim Summary:</u>

1. What are the entry conditions for EOP-1?

1. Hi Drywell press –1.68#
2. Low RPV Level – 8.9"
3. High RPV Pressure – 1065#
4. Rx Power > 5% or unknown and a scram is required

2. What are the key parameters controlled in EOP-1?

1. Power, Pressure, Level

C. Pressure Leg Overview

1. EOP-1, Part F Pressure Control

Have student follow path thru flow chart and along in CPS EOP Technical Bases.

PRESSURE

IF	THEN
Drywell pressure above 1.68 psig	Before RPV pressure drops to 472 psig, prevent LPCS and LPCI injection not needed for core cooling (4411.02).
Anticipate doing blowdown (EOP-3)	Depressurize RPV rapidly using main turbine bypass valves (4411.09). ☛ OK to exceed 100°F/hr cooldown.
Reactor is critical	**ENTER ATWS RPV CONTROL:** Leave this procedure → Enter EOP-1A.

a. PRESSURE

1) The Pressure branch first stabilizes RPV pressure below the high RPV pressure scram setpoint and then depressurizes and cools down the RPV to cold shutdown conditions. Discharging steam to the main condenser using the main turbine bypass valves is the preferred method for controlling RPV pressure. Alternate methods are identified should the bypass valves or main condenser not be available.

b. "Drywell pressure above 1.68 psig"

1) LPCS and LPCI initiate automatically on high drywell pressure (1.68 psig) and automatically inject when RPV pressure decreases below the shutoff head of the pumps. If these systems are not needed for core cooling, injection may be prevented to facilitate RPV water level control.

2) Procedure 4411.02 contains detailed instructions for preventing LPCS and LPCI injection. The subsequent use of these systems is not prohibited by this override statement if plant conditions change such that system operation is required to assure adequate core cooling.

Review CPS No. 4411.02

c. "Anticipate doing blowdown"

.1.8.4

1) As conditions which will require a blowdown are approached it is appropriate to rapidly reject as much heat energy as possible from the RPV to a heat sink other than the suppression pool. Such action preserves the heat capacity of the suppression pool for as long as possible, until a requirement for a blowdown actually exists.

2) Once the decision to "anticipate doing blowdown" has been made and the depressurization has begun, the depressurization should continue until the RPV is depressurized even if the initiating condition has cleared.

Stress the direction provided in "Anticipate doing blowdown", which states that depressurization, once begun, <u>must</u> continue until the RPV is depressurized, even if the initiating condition has cleared. The actual BLOWDOWN may or may not be performed, depending on whether or not the parameter of concern exceeds the associated limits.

3) Discharging reactor steam to the main condenser through the main turbine bypass valves is the most viable method of rapidly reducing RPV pressure without adding heat to the suppression pool. Other mechanisms have less heat removal capacity or take longer to establish. Use of the turbine bypass valves requires the following:

- The MSIVs must be open.
- The main turbine bypass valves must be operational.
- The main condenser must be available.

4) Defeating isolation interlocks is not authorized by this override. Exceeding the 100°F/hr. cooldown rate is authorized since rapid depressurization of the RPV takes precedence over limiting the cooldown rate of the RPV to the maximum permitted by Technical Specifications.

Point out that depressurizing the RPV with Bypass Valves in anticipation of Blowdown is <u>not</u> performed for the purpose of "lowering RPV pressure to make low pressure systems available" (4411.09, Section 2.1). The CRS <u>may</u> set the RPV pressure band at a point low enough to accommodate CD/CB injection (4411.09, Section 2.1).

d. "Reactor is critical"

1) Part A of EOP-1 required an evaluation of the shutdown criteria in Procedure 4100.01. If one of the criteria was met, the reactor should stay shutdown during the cooldown prescribed in the pressure path. If the reactor returns to criticality, the determination

that the reactor would remain shutdown under all conditions must have been incorrect. RPV water level, RPV pressure, and reactor power should then be controlled in accordance with EOP-1A, *ATWS RPV Control.*

2. EOP-1, Part G Pressure Control Systems

.1.2.4, .1.2.6

Stabilize RPV pressure below 1065 psig using main turbine bypass valves.
- Use other methods below if needed (4411.09).

- SRVs... <u>only if</u> suppression pool level is above 8 ft.
  - Use preferred sequence if you can.
  - If IA to SRVs is lost, turn all switches to OFF.
  - OK to defeat IA interlocks (4410.00C003).
- RCIC
  - CAUTION: Exceeding NPSH / Vortex Limits (Detail Z) may damage RCIC.
  - RCIC injection will trip main turbine and RFPTs.
  - Use RCIC storage tank suction if you can.
  - OK to defeat RCIC interlocks (4410.00C001).
- RFPTs
- MSL drains
- RWCU (recirculation mode)
  - Bypass regen HX and filter/demins.
  - OK to defeat RWCU interlocks (4410.00C005).
- RWCU (reject mode)

a. "Stabilize RPV pressure below 1065 psig"

.1.8.3

1) RPV pressure is stabilized to facilitate control of RPV water level. If pressure is allowed to oscillate, RPV water level may fluctuate due to the effects of shrink and swell. Pressure is stabilized below the high RPV pressure scram setpoint to avoid SRV actuation and to permit the scram logic to be reset (provided no other scram signal exists). No minimum value is specified since the RPV pressure at which the EOPs are entered cannot be predefined. A target pressure should be selected close to the initial value and below the RPV pressure scram setpoint that permits use of available injection systems. An initial adjustment to establish an appropriate target pressure is permitted,

Review CPS No. 4411.09

provided the target can be reached expeditiously and the 100°F/hr cooldown rate limit is not exceeded. A large pressure reduction, such as from an intermediate pressure of 400 psig to below the shutdown cooling RPV pressure interlock (104 psig), should not be required and is not considered a permissible adjustment even if the depressurization is within the LCO cooldown rate.

2) "Stabilize" means to hold RPV pressure as constant as practicable within the constraints imposed by the nature of the event, the degree of control afforded by the systems used, and the availability of personnel to perform manual control functions. The intent is that pressure be held as constant as is practicable. The specific actions required and the degree to which the ideal of a constant pressure can be approached will vary according to these constraints. For example:

   a) If flow through a pressure control system is automatically regulated, the reactor is shutdown, and there is no break in the primary system, RPV pressure can usually be held within a fairly narrow control band with little operator action.

   b) If flow through a large capacity pressure control system cannot be throttled, the RPV pressure control band will necessarily be relatively wide.

c) If pressure is decreasing, it may be necessary to close SRVs, main turbine bypass valves, or the MSIVs. In some scenarios, however, it may not be possible to terminate depressurization. Inventory loss through a break or operation of steam driven injection systems may cause pressure to decrease.

d) Changing plant conditions may necessitate adjustments to the value at which pressure is initially stabilized. If the pressure control system in use becomes unavailable, an alternate system may not be capable of maintaining the same control band. Similarly, if an injection system in use becomes unavailable, pressure may need to be reduced to permit use of lower head systems.

e) Since EOP-1 permits RPV depressurization immediately after pressure is stabilized, extended efforts to terminate a pressure decrease are usually not warranted.

3) Both the rate and the magnitude of RPV pressure changes must be considered. A pressure that is slowly decreasing over a relatively wide control band may be more "stable" than short-period oscillations within a narrower control band. In general, the adequacy of steps taken to stabilize RPV pressure in EOP-1 must be judged by the effect of any continuing pressure variations on RPV water level and by whether additional actions are possible or likely to afford better control capability. If pressure variations are not interfering with RPV water level control actions, or cannot be stopped, pressure may be considered stabilized. If continuing pressure oscillations are complicating efforts to control RPV water level, or if the existing pressure prevents use of available injection systems, additional effort is warranted.

b. "...using main turbine bypass valves"

1) The main turbine bypass valves are the preferred means of controlling RPV pressure, since they provide good control capability, are of relatively large capacity, and do not add heat to the suppression pool. The direction to use the bypass valves implicitly permits opening the MSIVs and placing the main condenser in service if such actions are necessary and conditions permit. It does not, however, constitute authorization to defeat any MSIV isolation interlocks.

c. "Use other methods below if needed"

1) If the main turbine bypass valves cannot be used to control RPV pressure, or if the available capacity of the main turbine bypass valves is less than that required to control RPV pressure, additional systems must be employed to augment RPV pressure control. No prioritization of the listed RPV pressure control systems is specified since the EOPs must accommodate a full spectrum of initial plant conditions and event scenarios.

d. "SRVs"

1) The SRVs may be used to augment RPV pressure control only if suppression pool water level is above 8 feet, the minimum indicated suppression pool water level. An on-scale indication is required to ensure that the actual suppression pool level is above the top of the SRV discharge device. If the SRVs were opened with the discharge devices exposed, steam would pass directly into the containment airspace, bypassing the suppression pool. This direct discharge of steam could damage equipment needed for the safe shutdown of the plant and result in excessive containment pressures.

.1.2.2
Question: How much shrink and swell occurs when cycling SRVs?

Answer? With a full group one isolation, history shows that level may swing from thirty to fifty inches due to shrink and swell.

2) If SRVs are being used for pressure control in EOP-1, then the pressure band should be widened to minimize SRV lifts. Refer to Attachment B of Lesson Plan for additional information concerning SRV position indications.

.1.4, .1.5

Review the section in the Scram procedure concerning a wider level and pressure control band.

3) **Expanded Pressure Band** - CPS 4100.01, Reactor Scram, provides guidance to use a wider Pressure band, 600 to 1065# in acknowledgement of not being able to maintain L3 to L8 while cycling SRV's. Shrink and swell due to SRV operation is about thirty inches. Therefore, 4100.01 allows a level band of –30" to +40" on Wide Range to be used until pressure can be stabilized (which will probably require reopening the MSIV's or Main Steam Line Drains.

Refer to Attachment B

e. "Use preferred sequence..."

1) SRVs, if used, should generally be opened manually. Manual operation affords direct, positive control over valve operation. The preferred SRV opening sequence should be used if possible to distribute the heat load uniformly around the suppression pool and equalize the number of actuations among the SRVs.

f. "If IA to SRVs is lost..."

1) Loss of the Instrument Air supply to the SRVs limits the number of times that an SRV can be cycled. If all the IA supplies to the SRVs are lost (as defined below), all control switches must be placed in "OFF" to conserve pneumatic pressure in case a blowdown is later required. Even though the SRV accumulators contain a reserve pneumatic supply, leakage through in-line valves, fittings, and actuators may deplete the reserve capacity, leaving no assurance as to the number of SRV operating cycles remaining. With the control switches in "OFF," if RPV pressure cannot be maintained below the lowest SRV lift setpoint, SRVs will still lift at their Safety Valve setpoint.

SRV control switches on P-601 and P-642.

2) IA supply to the SRVs is normally via the non-safety related service air compressors or from at least one of the Div 1/2 bank of ADS backup air bottles (automatically or manually placed in service). Loss of IA to the SRVs is defined as either

a) NONE of the three (3) IA air supplies is available to the SRVs. IA supply to the SRVs is normally via the SA Compressors <u>or</u> from at least one of the Div 1/2 bank of ADS backup air bottles (automatically or manually placed in service).

NOTE:
Div 1 B/U air bottles supply SRVs F047A, F051C, F041G, F047C and F051G.
(3-ADS, 1-LLS & 1-ADS/LLS)

Div 2 B/U air bottles supply SRVs F041B, F041F, F041D and F051D.
(3-ADS & 1-LLS)

b) Low ADS IA air pressure is indicated on 1H13-P601 (<140 psig) on the Division 1 (2) indicators 1PI–IA078 (1PI–IA079). Supporting alarms include 5040–6F and 5067–7L).

3) Defeating IA interlocks, if necessary, promotes more stable pressure control should the SRVs be required to augment pressure stabilization. This action may be performed prior to or after the system isolation dependent upon time, manpower, and the need or anticipated need for SRV use.

Review CPS No. 4410.00C003, "Defeating IA Interlocks."

g. "RCIC"

Review CPS No. 4410.00C005, "Defeating RWCU Interlocks."

1) A supplementary instruction provides a reminder that RCIC initiation will trip the main turbine and RFPTs if they are still on-line. Since the trips may complicate RPV water level and RPV pressure control, RCIC initiation should be avoided when the RFPTs are in use or the main turbine is on-line.

2) The preferred suction source for RCIC is the RCIC storage tank. This source provides higher quality water than the suppression pool, is at a higher elevation, and is not affected by containment heatup. NPSH and vortex limits are therefore not of concern. If the RCIC storage tank is unavailable, RCIC suction may be aligned to the suppression pool, but NPSH and vortex limits must then be considered.

3) The NPSH Limit is defined to be the highest suppression pool temperature which provides adequate net positive suction head for pumps taking suction from the suppression pool. The Vortex Limit is the lowest suppression pool water level at which air entrainment is not expected to occur in the suction of pumps aligned to the suppression pool.

4) Parameter values bounding the RCIC NPSH and vortex limits are listed in Detail Z. The restrictions are specified in a caution rather than as explicit operating limits to provide necessary event-specific flexibility and to avoid potential conflicts between parallel parameter control paths:

.1.7.3

a) It is difficult to define in advance exactly when NPSH and vortex limits should be observed and when pumps should be operated irrespective of the limits.

b) Since RCIC operation may be prescribed in both the Level and Pressure branches, an explicit restriction in one path could conflict with contingency actions in other paths in which operation beyond NPSH and vortex limits may be appropriate.

c) Prohibiting pump operation below the bounding suppression pool water level may be overly restrictive in some situations.

5) Although the caution does not expressly prohibit use of RCIC beyond NPSH and vortex limits, operation outside the Detail Z restrictions should be considered only if the risk of equipment damage is warranted by the nature of the event. A judgment as to whether system operation is appropriate should consider such factors as: **.1.7.3**

a) The availability of other systems

b) The current trend of plant parameters

c) The anticipated time such operation will be required

d) The degree to which the limit will be exceeded

e) The consequences of *not* operating a system beyond the limit

6) Operation of RCIC beyond the NPSH and vortex limits is not expected to result in immediate or catastrophic pump failure.

h. "RWCU"

1) RWCU may be operated in either the recirculation mode or the reject mode in EOP-1. Since the shutdown criteria are satisfied, boron removal through the reject mode is not of concern.

2) In the recirculation mode, the RWCU regenerative heat exchanger is bypassed to increase the inlet temperature to the non-regenerative heat exchanger and maximize the heat energy removed by the system. The filter/demineralizers are bypassed to prevent chemical breakdown of the demineralizer resins while operating with elevated temperature to the non-regenerative heat exchanger.

i. "RFPTs / MSL drains"

The reactor feed pump turbines and main steam line drains may also be used to augment RPV pressure control. The main condenser must be available for use of either of these systems.

.1.13.2

3. EOP-1, Part H Depressurize the RPV

Depressurize the RPV. ☛ Hold cooldown rate below 100°F/hr. ☛ If IA to SRVs is lost, minimize number of SRV cycles. ☛ OK to defeat IA interlocks (4410.00C003).

a. "Depressurize the RPV"

.1.8.5
Review CPS No. 4411.09. Stress that EOP-1 ALWAYS drives us to cold shutdown if we stay in it.

1) After RPV pressure has been stabilized, one or more pressure control systems are used to depressurize the RPV and cool down to shutdown conditions.

2) All associated restrictions and limitations continue to apply. The maximum allowable cooldown rate is that allowed by Technical Specifications (100°F/hr). No low pressure limit is set; the RPV is depressurized to a pressure which allows the initiation of shutdown cooling (less than 104 psig).

b. "If IA to SRVs is lost"

1) If instrument air is lost while the SRVs are being used, the valves should be operated in a manner which conserves pneumatic pressure in case a blowdown is later required. Although the 100°F/hr cooldown rate limit must still be observed, the cooldown can be taken in larger steps, thus minimizing the number of SRV cycles.

2) Defeating IA interlocks, if necessary, promotes more stable pressure control should the SRVs be required to augment pressure stabilization. This action may be performed prior to or after the system isolation dependent upon time, manpower, and the need or anticipated need for SRV use.

4. EOP-1, Part I Depressurize the RPV

WAIT until shutdown cooling pressure interlock clears (104 psig).

Cool down to cold shutdown using shutdown cooling (3312.03/RH-SDC).

- Do <u>not</u> use RHR pumps you need for holding RPV water level above Level 3 (8.9 in.).
- Hold cooldown rate below 100°F/hr.

IF	THEN
Shutdown cooling does not work (3312.03/RH-SDC)	Hold pressure below shutdown cooling interlock (104 psig) using other pressure control systems (4411.09).

a. "Cool down to cold shutdown"

.1.9, .1.11

1) Shutdown cooling is the normal method of conducting a controlled cooldown of the RPV to cold shutdown conditions. It is placed in service when the RPV pressure shutdown cooling interlocks clear (104 psig). However, only those RHR pumps not required to maintain RPV water level above Level 3 by operation in the LPCI mode may be used.

b. "Shutdown cooling does not work"

1) If shutdown cooling cannot be established, continued RPV depressurization and cooldown may be accomplished using any combination of the systems listed in Step G. As RPV pressure and temperature decrease, it may be necessary to re-evaluate the most appropriate method for performing the cooldown.

2) The direction to "hold pressure below the shutdown cooling interlock" permits, but does not require, continued cooldown below the interlock pressure. If no RPV blowdown requirement exists, continued pressure reduction is expected to be of little benefit.

Summary:

1. How can RWCU be used to control RPV pressure?
2. What are the typical level and pressure bands following a scram from power?
3. What is the shutoff head for various injection sources?
4. Explain when we are allowed to break 100 degrees per hour cooldown rate?

1. In the Recirc mode with F/Ds off service or the reject mode.

2. Level 3 to level 8 and 800 to 1065 psig.

3. TDRFP-1950 psig
MDRFP-1780 psig
CB-725 psig
CD-250 psig
LP-350 psig
RH-250 psig
HP->1265 psig

4. When Anticipating B/D due to conditions requiring a B/D are being approached.

IV. Operating Experience

NRC INFORMATION NOTICE 2000-01:

OPERATIONAL ISSUES IDENTIFIED IN BOILING WATER REACTOR TRIP AND TRANSIENT

Description of Circumstances

On January 26, 2000, at Hatch Unit 1, the reactor automatically scrammed on low reactor water level after a partial loss of feedwater occurred. One of two main feedwater lines was isolated when a valve unexpectedly closed in the feedwater flow path to the reactor. The licensee later determined that the valve closed because of a problem with the valve control switch. As a result of the valve closure, feedwater flow was significantly decreased; therefore, reactor water level decreased, and the reactor automatically scrammed as expected. The high-pressure coolant injection (HPCI) system and the reactor core isolation cooling (RCIC) system automatically actuated and injected water into the reactor as designed. These systems, along with the feedwater system, increased reactor water level rapidly. The feedwater and RCIC systems tripped on high level as expected. However, the HPCI system did not immediately trip as designed on high level and continued to inject water into the reactor for about 1 minute before tripping. Reactor water level increased to the point that water entered the main steam lines. The licensee closed the main steam isolation valves (MSIVs) in accordance with the emergency operating procedure.

Pressure in the shutdown reactor began to slowly increase because of decay heat. A licensee operator attempted to open a safety relief valve to control reactor pressure but did not receive the expected indications on the control panel. The operator then actuated the control switches for other safety relief valves until he received the expected open indication on one valve. Subsequently, several safety relief valves were operated satisfactorily to control reactor pressure. Later, the licensee determined that the safety relief valves had opened properly when actuated. Safety relief valve tailpipe temperature indications, available on a control room back panel recorder, clearly indicated the valves had operated. Reactor pressure reached a maximum value slightly above normal operating pressure and did not approach an operational safety limit.

Have students review the Hatch event and compare it to what could happen at CPS:
The only part of the event that cannot happen at CPS is the failure of the SRV indication due to the presence of water. However, there are other failure mechanisms for acoustic monitors, such as loss of power.
Stress the importance of:

1. **Controlling RPV level as it goes above level 8, being aggressive to avoid the MSL lines.**
2. **Always verify automatic actions, such as injection sources shutting down on high level.**
3. **Verify SRV position by multiple indications. Even with the MSL's flooded, MSL line flow should indicate the status of the SRV.**
4. **If it appears that RPV level will approach the MSL's, the inboard MSIV's should be closed to protect downstream components.**

The licensee controlled the reactor water level using HPCI and RCIC. Although initial attempts to restart RCIC were unsuccessful, the licensee was able to use the system later in the event. HPCI was manually operated several times for water level control and the licensee observed that it tripped properly at the high-level setpoint twice during the recovery.

On January 30-February 5, 2000, the NRC conducted an augmented team inspection (AIT) of the circumstances of this event. The objectives of this inspection were to (1) determine the facts of the event, (2) assess the licensee's response to the event, (3) assess the licensee's event review and recovery actions, and (4) assess any generic aspects of the event.

Discuss the 5 Operator Fundamentals from IER 11-3 and SER 3-05 and how they apply to this event.

1. Monitoring plant indications and conditions closely
2. Controlling plant evolutions precisely
3. Operating the plant with a conservative bias
4. Working effectively as a team
5. Having a solid understanding of plant design, engineering principles, and sciences

Safety Relief Valves

The licensee's investigation into the response of the safety relief valves focused on the valve's position indication, the effect water has on the operation of the safety relief valve, and the effect that water passing through the safety relief valve has on the tailpipes, tailpipe vacuum breakers, and tailpipe pressure switches. The licensee was assisted by the nuclear steam supply system vendor, General Electric (GE), and the safety relief valve vendor, Target-Rock, in conducting this investigation and assessment. The licensee concluded that the safety relief valves operated each time the control switches were actuated in the control room. However, the operators were unaware that the safety relief valves were open because they did not receive the expected indicating light on the control panel. A pressure switch located in each safety relief valve tailpipe actuates due to increased tailpipe pressure when the safety relief valve is opened and, in turn, actuates an indicating light on the control panel. During this event, pressure in the tailpipes did not increase sufficiently to actuate the pressure switches while the safety relief valve was passing water. The licensee sent several of the safety relief valve control assemblies (topworks) to a valve test facility for testing and inspection. No abnormalities as a result of this event were identified. The licensee conducted inspections of the safety relief valve tailpipes and other plant components that may have been subjected to the water in the steam lines and did not identify any adverse conditions that resulted from this event.

CPS does not use a pressure switch for SRV position indication, but a loss of Division 1 AC or other problems could render the Acoustic Monitor unavailable. Steam flow could still be used as an indicator of SRV status.

Feedwater Valve Handswitches

The partial loss of feedwater occurred when a valve in the main feedwater flow path to the reactor closed unexpectedly. Later, the licensee determined that the valve closed because of a malfunction of a GE Type CR 2940 control switch. In 1977, GE issued Service Information Letter No. 217, which indicated that this model control switch was overly sensitive during positioning and that the switch contacts may close prematurely from the slightest movement of the selector switch.

At CPS, FW system valves on P870 are this type.

Attachment A

INJECTION SYSTEMS

<u>Preferred Injection Systems</u>

a. Feedwater, Condensate, Condensate Booster Pumps

MDRFP not available if power lost to 6.9KV Bus 1B (motor power), or to TB MCC 1M, which supplies power to the Aux Oil Pump and hydraulic control for 1FW004 (TB MCC 1M is shunt-tripped on a Div 2 LOCA signal).

TDRFPs will not be available if MSIVs are shut, or if CB pumps are lost. A loss of IA results in 1FW003A(B) initially failing "as is." They may eventually be forced open by CB Pump discharge pressure as the reactor depressurizes.

CD/CB pumps will not be available if non-safety-related power (4.16Kv Buses 1A/1B) is lost. Loss of CB pumps will also result in loss of RFPs.

b. CRD

CRD pumps are not available if non-safety 4.16Kv Buses 1A(B) are lost (pump power supplies).

When TB MCC 1M shunt-tripped on Div 2 LOCA signal, power to Recirc Aux Seal Injection Pump is lost.

Div 1 Level 2 or High DW Pressure signal shunt trips 1C11-F370, Recirc Aux Seal Pump Valve.

c. ECCS: RCIC, HPCS, LPCS, LPCI and RHR thru Shutdown Cooling

Since these systems are powered from safety-related buses they should remain available through all but blackout conditions (RCIC should be available even in blackout)

Attachment A
(Continued)

INJECTION SYSTEMS

Alternate Injection Systems

a. **SLC**

Since SLC is powered from safety-related buses it should remain available through all but blackout conditions.

b. **Fire Protection**

Due to use of diesel fire pumps and RHR valves, FP should be available in all but blackout conditions.

c. **SX thru RHR B**

Since SX and RHR are safety-related systems, this method should be available under all but blackout conditions.

d. **FC**

FC pumps powered from 4.16Kv Buses 1A1 and 1B1, and should be available as long as buses powered by RAT/ERAT. In event that DG picks up bus on undervoltage, FC pump(s) are load shed.

e. **ECCS Water Leg Pumps**

ECCS water leg pumps powered from 1E buses and should be available when power available to ECCS busses.

f. **CY**

CY will not be available if power lost to non-safety 480 Volt Unit Subs 1J or 1K (power supplies to motors).

Attachment B

USE OF SAFETY RELIEF VALVES

1. If SRVs are being used for pressure control in EOP-1, then the pressure band should be widened to minimize SRV lifts.

2. The following methods may be used to determine SRV position:

   * Solenoid status
   * Acoustic monitors
   * Tailpipe temperatures
   * Indirect indications

   a. Solenoid status is directly displayed on P601 for both "A" and "B" solenoids; on P642 for "B" solenoids only.
   Disadvantage: Indicate status of opening/closing solenoids, not of valve.
   DCS screen 7B receives its SRV status signals from the "A" solenoids.

   b. Acoustic monitors consist of accelerometers on SRV discharge piping; preamplifiers; flow and alarm modules (MCR, P866). Indicators are LED bar graphs. Input to common annunciator SRV MONITORING TROUBLE.
   Disadvantage: Acoustic monitors are subject to cross-talk; may indicate more SRVs open than actual number.
   Acoustic monitors input to SPDS SRV count display, and to DCS screen 2H.

   c. Individual SRV tailpipe temperatures displayed on recorder on Panel P614.
   Disadvantages: Slow response. Tailpipe temperature may be high due to leaking SRV, or because SRV was previously open.

   d. Indirect indications of SRV status:
      * Main Steam Line flow
        Most reliable indication: each MSL should indicate an amount of flow which corresponds to the number of open SRVs on that line.
      * Suppression Pool temperature
        Disadvantage: Slow response; may be affected by RCIC operation; can't determine number of SRVs open.
      * RPV pressure
        Disadvantage: Can't determine number of SRVs open.
      * RPV water level
        Disadvantage: Can't determine number of SRVs open.

Exelon Nuclear

Course/Program:	ILT/NLO/LORT	Module/LP ID:	LP87594
Title:	©EOP Support Procedures	Course Code:	N/A
Author:	R. L. Price	Revision/Date:	02 / 1/4/07
Prerequisites:	NA	Revision By:	GD Setser
		Est. Teach Time:	8.0 hours

	TABLE OF CONTENTS	Pg. #

Exelon Nuclear

OBJECTIVES

While working in the plant, or on an exam, the trainee shall, in accordance with referenced plant procedures and training materials:

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.1	From memory, recall the relative position of the EOPs in the hierarchy of plant procedures	X	X	X	X	2
.1.2	Given the SA-AA-129, Electrical Safety procedure, recall the electrical safety practices applied to working on energized equipment during an emergency	X	X	X	X	5
.1.3	Given CPS 4410.00, recall;					
	.1 Documentation requirements for the checklist steps.	X	X		X	7
	.2 What is an electrical jumper	X	X		X	5
	.3 Actions to control exposed conducting parts of a disconnected wire	X	X		X	5
	.4 Reason to control exposed conducting parts of disconnected wire	X	X		X	5
	.5 Fastener tightening requirement	X	X		X	5
	.6 Precautions for manipulations performed in the MCR panels	X	X		X	6
	.7 Techniques used to locate ATM modules/P1 connectors	X	X		X	7
	.8 Consequences of improperly installing "backplane" jumpers	X	X		X	6

Exelon Nuclear

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.4	Given the following procedures explain the notes, cautions, tools, strategy and reasons for defeating interlocks.	X	X		X	
	.1 CPS 4410.00C001, DEFEATING RCIC INTERLOCKS	X	X		X	8
	.2 CPS 4410.00C002, DEFEATING HPCS INTERLOCKS	X	X		X	9
	.3 CPS 4410.00C003, DEFEATING IA INTERLOCKS	X	X		X	11
	.4 CPS 4410.00C004, DEFEATING MSL/OG INTERLOCKS	X	X		X	11
	.5 CPS 4410.00C005, DEFEATING RWCU INTERLOCKS	X	X	X	X	13
	.6 CPS 4410.00C006, DEFEATING VP/WO INTERLOCKS	X	X	X	X	14
	.7 CPS 4410.00C007, DEFEATING CNMT INTERLOCKS	X	X		X	15
	.8 CPS 4410.00C008, DEFEATING MDRFP INTERLOCKS	X	X		X	17
	.9 CPS 4410.00C009, DEFEATING INJECTION/FLOODING INTERLOCKS	X	X		X	18
	.10 CPS 4410.00C010, DEFEATING CNMT VENT INTERLOCKS	X	X		X	19
	.11 CPS 4410.00C011, DEFEATING VF INTERLOCKS	X	X		X	21
	.12 CPS 4410.00C012, DEFEATING ATWS INTERLOCKS	X	X		X	22

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.5	From memory, predict the consequences/impact on MDRFP and FW Injection Valve (1FW004) on an actuation of the Division 2 ECCS	X	X		X	28
.1.6	Given CPS 4411.02, explain notes, cautions, conditional requirements and/or describe actions taken to terminate and prevent injection for:					
	.1 HPCS	X	X		X	29
	.2 LPCI	X	X		X	
	.3 LPCS	X	X		X	
	.4 RCIC	X	X		X	
	.5 CD/FW	X	X		X	32
.1.7	Given CPS 4411.03, explain notes, cautions, conditional requirements and/or describe actions taken to initiate injection and flooding sources for:					
	.1 FW	X	X		X	35
	.2 CD/CB	X	X		X	36
	.3 Head Spray	X	X		X	38
	.4 RD	X	X	X	X	
	Water Leg Pump for:					
	.5 HPCS	X	X		X	36
	.6 RCIC	X	X		X	39
	.7 LPCS	X	X		X	39
	.8 LPCI	X	X		X	39
	Abnormal Lineups:					
	.9 RHR through shutdown cooling	X	X		X	40
	.10 SX through RHR B	X	X		X	40
	.11 SX through RHR B test return	X	X		X	40
	.12 SX through containment spray B	X	X		X	40
	.13 Fire Protection	X	X	X	X	40
	.14 FC injection	X	X	X	X	41
	.15 SLC injection	X	X	X	X	42
	Suppression Pool Makeup/Cleanup					
	.16 Dump upper pools	X	X		X	43
	.17 Containment flood through SF using CP Cycled Condensate	X	X	X	X	43
	.18 CY through ECCS fill path	X	X	X	X	43
	.19 CY to SM	X	X	X	X	43
	.20 CY through SM/SF	X	X	X	X	43

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.8	Given CPS 4411.04, explain precautions, conditional requirements, and describe which systems and actions must be taken to make ECCS injection valves throttleable.	X	X	X	X	45
.1.9	Given CPS 4411.05, explain precautions, conditional requirements and protective actions taken for High Containment Pool Level conditions.	X	X	X	X	47
.1.10	Given CPS 4411.06 explain precautions, notes, conditional requirements and/or describe actions taken for Emergency Containment Venting, Purging, and Vacuum Relief for:					
	.1 Vent Using Hydrogen Purge Supply Path	X	X		X	50
	.2 Vent to Condenser Using FC Return Header	X	X	X	X	50
	.3 Vent To Condenser Using RHR CNMT Spray Spargers	X	X	X	X	50
	.4 Vent To Spent Fuel Pool using FC Return Header	X	X	X	X	50
	.5 Vent To Spent Fuel Pool Using RHR A CNMT Spray Sparger	X	X	X	X	50
	.6 Vent Using CCP Supply Path Modification	X	X	X	X	50
	.7 CNMT Hydrogen Purge	X	X		X	50
	.8 Recovery	X	X		X	51
	.9 CNMT Vacuum Relief	X	X		X	51

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.11	Given CPS 4411.08 explain notes, cautions, conditional requirements and/or describe actions taken for Alternate Control Rod Insertion for:					
	.1 Manual Scram	X	X		X	53
	.2 Manual ARI	X	X		X	54
	.3 RPS Scram Solenoids	X	X	X	X	54
	.4 Manual Control Rod Insertion	X	X	X	X	54
	.5 Individual Rod Scram	X	X	X	X	55
	.6 Vent CRD Withdrawal Lines	X	X	X	X	55
.1.12	Given CPS 4411.09 explain notes, cautions, conditional requirements and/or describe actions taken for RPV Pressure Control Sources for:	X	X		X	
	.1 Main Steam	X	X		X	59
	.2 RFPT	X	X		X	60
	.3 Shutdown Cooling	X	X		X	61
	.4 Head Vent	X	X	X	X	61
	.5 RCIC	X	X		X	61
	.6 RCIC Steamline	X	X		X	62
	.7 RWCU – Recirc Mode	X	X		X	62
	.8 RWCU – Reject to Condenser	X	X		X	62
	.9 RWCU – Reject to Waste Surge Tank	X	X		X	62
.1.13	Given CPS 4411.10 explain notes, cautions, condition requirements and/or describe actions taken for SLC system operation for:					
	.1 SLC initiation	X	X		X	64
	.2 Plant actions for Alternate Boron	X	X	X	X	64
	.3 Control room actions for Alternate Boron	X	X		X	64

Objective #	Objective Description	SRO	RO	NLO	STA	Pg. #
.1.14	Given CPS 4411.11 explain notes, cautions, conditional requirements and/or describe actions taken for Hydrogen Control System Operation for:	X	X		X	67
	.1 H_2 /O_2 Monitor Operations	X	X		X	67
	.2 Hydrogen Igniters Operations	X	X	X	X	67
	.3 Drywell/Containment Mixing Compressor Operations	X	X	X	X	67
	.4 Hydrogen Recombiners Startup from the MCR	X	X	X	X	67
	.5 Hydrogen Recombiners Emergency Shutdown	X	X	X	X	67
	.6 Hydrogen Recombiners Startup from the Local Control Panel					
.1.15	Given the procedure explain notes, cautions, conditional requirements and/or describe actions taken for Chemistry sampling per:	X	X		X	70
	.1 CPS 4412.00					
	.2 CPS 4412.00C001					
	.3 CPS 4412.00C002					

References:

CPS 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND
SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
SA-AA-129, Electrical Safety
CPS 4410.00, DEFEATING SYSTEM INTERLOCKS
CPS 4410.00C001, DEFEATING RCIC INTERLOCKS
CPS 4410.00C002, DEFEATING HPCS INTERLOCKS
CPS 4410.00C003, DEFEATING IA INTERLOCKS
CPS 4410.00C004, DEFEATING MSL/OG INTERLOCKS
CPS 4410.00C005, DEFEATING RWCU INTERLOCKS
CPS 4410.00C006, DEFEATING VP/WO INTERLOCKS
CPS 4410.00C007, DEFEATING CNMT VENT INTERLOCKS
CPS 4410.00C008, DEFEATING MDRFP INTERLOCKS
CPS 4410.00C009, DEFEATING INJECTION/FLOODING INTERLOCKS
CPS 4410.00C010, DEFEATING CNMT VENT INTERLOCKS
CPS 4410.00C011, DEFEATING VF INTERLOCKS
CPS 4410.00C012, DEFEATING ATWS INTERLOCKS
CPS 4411.02, TERMINATING AND PREVENTING INJECTION
CPS 4411.03, INJECTION/FLOODING SOURCES
CPS 4411.04, THROTTLING ECCS FLOWS
CPS 4411.05, HIGH CONTAINMENT POOL LEVELS PROTECTIVE ACTIONS
CPS 4411.06, EMERGENCY CONTAINMENT VENTING, PURGING, AND VACUUM RELIEF
CPS 4411.08, ALTERNATE CONTROL ROD INSERTION
CPS 4411.09, RPV PRESSURE CONTROL SOURCES
CPS 4411.10, SLC SYSTEM OPERATION
CPS 4411.11, HYDROGEN CONTROL SYSTEM OPERATION
CPS 4412.00, CHEMISTRY SAMPLING
Operations Strategy Document

Exelon Nuclear

LESSON PLAN HISTORY PAGE		
REV.	**DATE**	**DESCRIPTION**
00	08/01/03	New Lesson Plan
01	03/08/05	Changes incorporated new Electrical Safety procedure and change to 4410.00C004 (no longer allowed to defeat all Group 1 isolations).
02	1/4/07	Corrected B Column information.

Instructional Methods

- Lecture/discussion

Media:

- white board
- handouts
- trainee text
- power point

I. Introduction

A. Introduction

This lesson will cover the EOP support procedures. These procedures provide guidance in the response during EOP implementation. Your understanding of these is very important for the protection of public health and safety if a transient or emergency should ever occur.

B. Presentation

The student will learn this particular topic by 8 hours of classroom instruction, composed of

1. Lecture/Discussion
2. Challenges in the form of questions

C. Objectives

1. Objectives provide the foundation for learning on this topic.
2. Review the objectives to familiarize yourself and or the students with the knowledge necessary to attain mastery of this topic.

D. Evaluation

A check on understanding of objectives will be evaluated by the instructor periodically throughout the presentation in the form of an interim summary. Additionally, knowledge of objectives may be evaluated with a weekly and a comprehensive written exam with a minimum score of 80%.

II. INSTRUCTION

A. BASICS (CPS 1005.09)

1. There are many EOP Support Procedures. These are issued separately from the flowcharts. Use of these procedures is directed from within the EOP flowcharts and the Severe Accident Guidelines (SAG), when required. The Support Procedures contain detailed instructions for performing specific evolutions. .1.1

2. By the nature of the EOPs, <u>every</u> plant procedure shares an interrelationship with the EOPs. The EOP program, however, specifically utilizes two categories of support procedures. See Appendix A.

   a. EOP Support Procedures are identified as CPS No. 441X and select 3XXX series procedures.

   b. ECCS systems by design are intended for use during conditions prescribed in the EOPs. It is not necessary to incorporate these procedures into 44XX.XX series EOP Support Procedures.

   c. There are other parallel support procedures which are used during EOP execution. These are plant procedures which provide normal guidance for operating equipment and systems, yet which may be referenced (directly or indirectly) in support of EOP steps and actions.

3. The specific EOP Support 441X.XX series procedures are categorized in the following manner:

   a. <u>CPS No. 4410.00 Series</u>: Procedures and checklists which provide instruction and documentation for wire, relay, jumper removal/installation, and Analog Trip Module (ATM) setpoint adjustment. The individual checklists are performed during emergency conditions in which interlocks must be defeated to allow the continued operation of equipment to safely mitigate the consequences of degraded conditions. These interlocks consist of those specifically allowed for by the Emergency Procedure Guidelines (EPGs), and those specified in other EOP support procedures.

b. CPS No. 4411.00 Series: Procedures, appendices, checklists, and line-ups which provide operators details that expand upon steps shown on the EOP flowcharts. This series provides an orderly transition from a symptom-based flowchart to an event-controlled text based document, which directly supports the use of available systems and methods described in the EPGs. 4411.00 series may include checklists using the same procedure numbers sequence. These checklists follow the same guidelines as those for 4410.00 series.

c. CPS No. 4412.00 Series: Procedures and checklists which provide instructions for sampling and analyzing containment/drywell hydrogen or gaseous radioactivity concentration levels in the event the installed instrumentation is inoperative.

B. Procedure Hierarchy.

1. When entry to the EOP(s) is required, the EOP instructions assume priority over other plant procedures. Other event-specific procedures may be executed concurrently with the EOPs, but the actions specified in such procedures shall not contradict or "override" the actions specified in the EOPs.

2. The instructions in the EOPs also take precedence over actions specified in Technical Specifications while operating in accordance with the EOPs. The NRC recognizes (reference: 10CFR50.54(x)) that, in an emergency, operation beyond Technical Specification limits may be required in order to properly mitigate the consequences of transients and accidents. This does not imply that operation beyond Technical Specification limits is necessarily recommended.

3. EOPs address conditions beyond those assumed in Technical Specifications. For example, defeating isolation interlocks and opening primary containment isolation valves required to automatically isolate per Technical Specifications. The limits specified in the EOPs establish boundaries (the extreme) within which continued safe operation of the plant can be assured. Therefore, conformance with the EOPs does not ensure strict conformance with Technical Specifications or other licensing bases of the plant.

4. Once the emergency is over, LCOs need to be entered and recovery actions taken. These actions are to be taken once the plant is stable and resources available. CPS 1005.09C001 provides the necessary LCO recovery actions.

5. Support procedures were also developed to provide necessary instructions for carrying out specific actions that are specified in the EOP flowcharts. Examples include:

   a. Defeating trip logic.

   b. Defeating isolation logic.

   c. Defeating auto-start logic.

   d. Alignment and operation of alternate systems/methods for injecting water into RPV.

   e. Alignment and operation of alternate systems/methods for depressurizing the RPV.

   f. Alignment and operation of an alternate boron injection method.

   g. Venting containment directly to atmosphere.

Interim Summary

- Once EOPs are entered, they are the controlling procedure
- 441X Support procedures only used when in EOP/SAGs
- Defeating interlocks is allowed based on the extent of an emergency
- LCO actions entered once emergency is over

III. Procedures

A. CPS 4410.00, DEFEATING SYSTEM INTERLOCKS

1. PURPOSE

   a. Provide specific guidance for performing and documenting actions performed during performance of EOPs.

   b. By performing such actions various interlocks are defeated to allow continued operation of selected equipment during EOP actions.

2. DISCUSSIONS/DEFINITIONS

   a. Procedure use and checklist permitted as directed by EOPs and SAGs, only.

   b. Exposed wiring shall have the exposed conducting parts taped or insulated to prevent inadvertent grounding or shorting. **.1.3.3 & .1.3.4**

   c. ELECTRICAL JUMPER - A wire used to connect or bypass a circuit or portion of a circuit. **.1.3.2**

   d. SNUG TIGHT - Force necessary to bring fasteners into contact/alignment and set the fastener so that it will not loosen by itself. **.1.3.5**

3. PRECAUTIONS

   When working around or near energized electrical terminals, wires, equipment, the following precautions should be adhered to as per SA-AA-129, Electrical Safety: **.1.2**

   - Review 4.1 for proper protective equipment.
   - Review 4.2 for electrical safety fundamentals.
   - Review 4.3 for work practices.

   While performing the EOP Checklist be attentive to the proximity of exposed terminals/busses that you could contact.

   a. Performing wire removal and/or jumper installation, follow applicable safety practices.

b. Wires loosened/removed during lifting leads and/or installing jumpers shall be tightened/terminated snug tight before performing the next step.

c. When entering the NSPS backplane, take extreme caution to prevent shorting and/or physically damaging the backplane pins.

4. Checklist Applications

   a. Checklists direct and document the following during EOP/SAG performance:

      1) Lifting and landing of leads.

      2) Installation of electrical jumpers.

      3) Removal of relays.

      4) Relay blocked.

      5) Some equipment manipulations.

      6) Adjustment of ATM setpoints.

   b. MCR actions are performed by an SRO/RO or qualified C&I Tech/Electricians as directed by an SRO.

   c. Completion of Checklists

      1) Some checklists may duplicate actions of other steps or checklists.

      2) When a step is already performed, only verify the action is complete and does not need to be performed again.

      3) When installing backplane jumpers, Pins 1 & 2 act as common ground and pins 3 & 4 act as the +12 V source. Remaining pin completes the trip circuit.

         - An inadvertent trip signal could occur across <u>any</u> two pins if the jumper accidentally touches a wrong pin. **.1.3.8**

- Minimize this possibility by connecting the jumper <u>first</u> to the trip circuit pin (i.e., 27, 35) and <u>last</u> to the common ground/voltage pin (Pins 1, 2, 3 or 4).
- Place keeping by filling in blanks for the checklist documents what actions have been performed to modify the plant for an emergency situation. The SM/CRS will review each checklist upon completion. From these, plant status will be determined, LCO's entered and recovery actions identified. (CPS 1005.09C001) **.1.3.1**
- Procedure provides guidance on how to monitor the ATM being adjusted.

5. Location of ATM Modules/P1 Connector **.1.3.7**

B. Checklists

NOTES

These notes apply to each Checklist of the 4410.00 series:

Permission to perform these actions does not imply that the operation needs to be performed under all plant conditions.

Perform only those items necessary for the degraded plant conditions, and to support EOP/SAG mitigation actions.

Controlled procedures, tools, & equipment are located in the EOP Supply Cabinet (Computer Room just off MCR).

All ATM Trip Circuit SET adjustment screws are either turned CLOCKWISE or COUNTERCLOCKWISE 26 full turns. Once completed, the setpoint is beyond the ATM's instrument range preventing actuation.

1. 4410.00C001, DEFEATING RCIC INTERLOCKS (EOP-1 Level Leg & EOP-1A Level Leg)

.1.4.1

   a. Bypassing RCIC Area Temperature Isolation Signals bypasses RCIC Group 5 and 6 isolation and its associated RCIC turbine trip.

      - Supports pressure control and RCIC injection.

      - 2 switches placed in "Bypass"

   b. Defeating RCIC Suction Transfer (EOP-6 SP Level) to allow usage of RCIC storage tanks cleaner water.

      - 2 ATM Trip Circuit adjustments preventing automatic opening of 1E51-F031, RCIC Pump Suppression Pool Suction Valve on high suppression pool level. 1E51-F031 will still open on a RCIC Storage Tank low level.

   c. Defeating Low RCIC Steam Supply Pressure Isolation (EOP-1 & EOP-2)

      - Supports pressure control and RCIC injection.

      - 2 ATM Trip Circuit adjustments for the Low RCIC Steam Supply Pressure Isolation, thus preventing automatic closure of Group 5 & 6 valves and preventing a RCIC turbine trip when RPV pressure < 60 psig.

   d. Defeating RCIC Level 8 Isolation (EOP-2, RPV Flooding)

      - This action will prevent instruments failed upscale from stopping injection.

      - This action is not recommended unless Adequate Core Cooling is challenged or can be challenged.

      - 2 ATM Trip Circuit adjustments preventing High RPV water level RCIC shutdown, which prevents 1E51-F045 from auto closing, which in turn allows 1E51-F013, RCIC Pump Disch To Rx Outbd Isol Valve to remain open.

e. Defeating RCIC Isolations to Support Alternate Boron Injection Mode

- This action is not recommended unless specifically directed by CPS No. 4411.10.
- Install 2 backplane jumpers defeats RCIC Isolations to Support Alternate Boron Injection Mode.
- Once installed 1E51-F031 will not automatically open on high suppression pool level or low RCIC storage tank level. 1E51-F022/59 will not automatically close on a system initiation logic signal.

2. CPS No. 4410.00C002, DEFEATING HPCS INTERLOCKS — .1.4.2

a. Defeating HPCS Suction Transfer (EOP-6, SP Level) to allow using RCIC Storage tanks cleaner water source.

- 2 ATM Trip Circuit adjustments preventing Div. 3 suppression pool high water level ATM trip, thus preventing automatic opening of 1E22-F015, HPCS Suppr Pool Suction Valve on high suppression pool level. 1E22-F015 will still open on a RCIC Storage Tank low level.

b. Defeating HPCS Level 8 Isolation (EOP-2, RPV Flooding)

- This action will prevent instruments failed upscale from stopping injection.
- This action is not recommended unless Adequate Core Cooling is challenged or can be challenged
- 2 ATM Trip Circuit adjustments preventing Divisions 3 & 4 High RPV water level HPCS Isolation ATMs trip, thereby preventing 1E22-F004, HPCS To CNMT Outbd Isln Valve closure on RPV Level 8.

c. Defeating HPCS Isolations to Support Alternate Boron Injection Mode (4411.10)

1) This action is not recommended unless specifically directed by 4411.10.

2) Allows HPCS to establish and maintain a suction on the RCIC storage tank when in alternate boron injection mode, and prevents automatic close function on recirc valves back to the storage tank.

Install 2 backplane jumpers to Support Alternate Boron Injection Mode.

3. CPS No. 4410.00C003, DEFEATING IA INTERLOCKS (EOP-1, Pressure Control, EOP-1A Pressure Control & EOP-3) — .1.4.3

   - remove 2 steel jumpers

   RPV Level 1 Instrument Air valves 1IA005, 1IA006, 1IA007, and 1IA008 isolation signal defeated. Allows instrument air (IA) supply to the MSIVs and SRVs to be re-established or maintained.

4. CPS No. 4410.00C004, DEFEATING MSL/OG INTERLOCKS — .1.4.4

   Perform the first two sections (quickest action to support ATWS level control strategy), then as time and resources permit, perform the last section.

   a. Defeat the IA isolations

      - Remove 2 steel jumpers

      - IA supply to the containment can be re-established or maintained

   b. Defeating RPV Level 1 Isolation Only (Supports maintaining the MSIV's Open)

      4 ATM Trip Circuit adjustments preventing Divs 1 - 4 Low RPV water level ATM trip, thus preventing MSIV Group 1 isolation on RPV Level 1

   c. Defeating Off-Gas Isolation

      1N66-F060 is failed open to allow continued use of main condenser as a heat sink during ATWS conditions.

      CAUTION - This step will defeat the HIGH radiation auto closure signal on 1N66-F060, Off Gas Vent Disch Isol Vlv.

There is no manual isolation capability during this time period, therefore the potential for an off-site release in excess of limits exists.

Monitor Off Gas Pre- and Post-treatment levels frequently when 1N66-F060 is defeated.

Requires:

- Obtain Station Emergency Director's authorization to defeat
- Pull fuse, resulting in a loss of 1N66-F060 valve indication
- Monitor 1RIX-PR035/41, Off Gas Post-Treatment approaches 1N66-F060 'auto closure' setpoint of 7 μCi/cc
- Obtain Station Emergency Director's authorization to continue to have the 1N66-F060 defeated when > 7 μCi/cc.
- Steps to restore fuse to allow isolation.

5. CPS No. 4410.00C005, DEFEATING RWCU INTERLOCKS (EOP-1, Pressure Control)

.1.4.5

   a. Defeat COMPONENT COOLING WATER (CCW) interlocks will result in all Group 8/15 isolations being defeated by performing 3 actions in both Divisions 1 & 2:

      1) Defeat relay by removing cover and contact plate upper stop arm, reposition contact plate and insert a blocking wedge under the contact plate to maintain contact position.

      2) Lift and tape a lead.

      3) Install a jumper.

      4) Open CC supply and return isolations.

   b. Defeat REACTOR WATER CLEANUP (RWCU) Interlocks.

      Installing 3 backplane jumpers in divisions 1 & 2 defeats all RWCU isolations.

6. CPS No. 4410.00C006, DEFEATING VP/WO INTERLOCKS (EOP-6, DW/CT Temperature Legs) — .1.4.6

   a. Lift and tape 2 leads and install 1 jumper in Divisions 1&2.

      These actions prevent closure of 1SX020A&B from MCR.

   b. Open the supplemental cooling isolations to restore cooling to the drywell.

   c. When the RPV Level 1, High Drywell Pressure, or a Divisional ECCS Manual Initiation has occurred:

      Required to reset applicable shunt trips per Table 1.

      - The DW Clg Fans 1A-1D, 1VP01CA-D will still indicate running with a red light even though one of the two circuit breakers has shunt tripped and will start when reset.

   d. Re-open 1SX020A(B), Drywell Chiller 1A (1B) Inlet Vlv.

      Chill water recovery concerns:

      Whenever the drywell is > 212°F, the potential for damaging water hammer exists when initially unisolating the drywell WO and VP penetrations.

      Whenever possible, the VP/WO drywell isolations should <u>not</u> be reopened until the following minimum conditions are established, thereby preventing the formation of vapor cavities and water hammer:

      <u>VP</u>: DW Chilled Water Tank 1VP05TA/B > 30 psig, <u>and</u> DW < 270°F.

      <u>WO</u>: WO Chilled Water Tank 1WO04TB > 40 psig, <u>and</u> DW < 285°F.

      The ERO may provide alternate saturation temperatures/pressures based on plant conditions.

      Water hammer is <u>not</u> a concern when the penetration is unisolated, only when reopening the valves.

   e. Restore Containment Isolations & Drywell Cooling per CPS No. 3320.01, DRYWELL COOLING SYSTEM (VP).

7. CPS No. 4410.00C007, DEFEATING RPV VENT INTERLOCKS (EOP-3) .1.4.7

   Allow continued use of various systems to depressurize the RPV in the event normal methods of reducing RPV pressure are ineffective or unavailable.

   a. Defeating RCIC Group 5/6 Isolations

      1) RCIC valves 1E51-F063, 64, 76 and 31 will not automatically shut on a Group 5/6 isolation.

      2) RCIC turbine will not trip upon an automatic group isolation signal.

      3) Defeated by installing 2 backplane jumpers.

   b. Defeating RCIC 1E51-F045 Level 2 Auto Open Feature

      1E51-F045 will not auto open on a Level 2 initiation signal, thereby allowing 1E51-F025/26 to be opened in support of establishing a RCIC vent path.

      1) Defeat the RCIC 1E51-F045 Level 2 Auto Open Feature by 2 ATM trip circuit adjustments.

   c. Defeat IA Isolation

      RPV Level 1 Instrument Air valves 1IA005, 1IA006, 1IA007, and 1IA008 isolation signal will be defeated.

      1) Defeat IA Isolations by removing two steel jumpers.

d. Defeating Entire Group 1 Isolation

MSIVs/MSL Drains will not be automatically/interlocked shut on an automatic or manual Group 1 isolation signal. The MSIV control switches need to be verified in shut.

1) To defeat the MSIV/MSL Drains Group 1 Isolations requires the installation of 3 backplane jumpers in 2 divisions of NSPS (total of 6 jumpers installed).

e. Defeating Main Turbine Bypass Valves Isolation

Main Turbine Bypass Valves will not close on low condenser vacuum.

1) To defeat the Main Turbine Bypass Valves Isolation requires two actions;

a) Lift and tape one lead.

b) On 1H13-P680, Steam Bypass & Pressure Regulation System panel, depress COND VACUUM TRIP push-button.

8. CPS No. 4410.00C008, DEFEATING MDRFP INTERLOCKS (EOP-2) — .1.4.8

   Allow the Motor Driven Reactor Feed Pump to flood the RPV when operating above RPV Level 8.

   Defeated by;

   a. Removal of a relay.

   b. Install a jumper

9. CPS No. 4410.00C009, DEFEATING INJECTION/FLOODING INTERLOCKS (EOP-1 & EOP-1A)

.1.4.9

Defeat necessary RPV injection flow path isolation logic in support of CPS No. 4411.03, INJECTION/FLOODING SOURCES directed actions.

a. 1E12-F053A(B), All Isolation Logic

1) 1E12-F053A, RHR A To Feedwater S/D Cooling Rtrn Vlv

- Also defeats auto isolation logic for

  1E12-F008, Shutdown Cooling Outbd Suct Isol Vlv and

  1E12-F023, RHR B Supp To Rx Head Spray Valve.

- Install one backplane jumper

2) 1E12-F053B, RHR B To Feedwater S/D Cooling Rtrn Vlv

- Also defeats auto isolation logic for 1E12-F009, Shutdown Cooling Inbd Suct Isol Vlv.

- Install one backplane jumper

b. 1E12-F027B, Seal-In Open Logic

Also defeats auto isolation logic for 1E12-F021, RHR C Test Valve To Suppr Pool

and

1E12-F028B, RHR B To CNMT Spray B Shutoff Vlv.

- After completion the 1E12-F027B - Injection signal seal-in open logic is defeated, thereby allowing the valve to be shut manually in order to support various RHR EOP injection flow path line-ups. Also supports line-ups which require 1E12-F028B operation.

After completion of the next three sections:

1SF001/2; 1CY016/17; 0MC009/10 - Applicable Group 8 auto isolation signal is defeated, thereby allowing valve operation in support of SF, CY or SLC injection/flooding line-ups.

c. 1SF001, SPCU Rtrn Line Outbd Isol Vlv and 1SF002, SPCU Rtrn Line Inbd Isol Vlv, Group 8 Auto Isolation Logic

- Lift and individually tape both leads from the same terminal.
- Install one jumper.

d. 1CY016, CY CNMT Outbd Isol Valve and 1CY017, CY CNMT Inbd Isol Valve, GP 8 Auto Isolation Logic

- Lift and individually tape both leads
- Install one jumper.

e. 0MC009, MC CNMT Outbd Isol Vlv and 0MC010, MC CNMT Inbd Isol Vlv, GR8 Auto Isolation Logic

- Lift and individually tape both leads.
- Install two jumpers

10. CPS No. 4410.00C010, DEFEATING CNMT VENT INTERLOCKS (EOP-6, DW/CT Pressure Leg) **.1.4.10**

Defeat necessary CNMT vent path isolation interlocks and trips in support of CPS No. 4411.06, EMERGENCY CONTAINMENT VENTING, PURGING, AND VACUUM RELIEF directed actions.

a. VENT USING HYDROGEN PURGE SUPPLY PATH

Div 1and Div 2 each

- Remove one relay.
- Install one jumper.

b. VENT TO CONDENSER or SPENT FUEL POOL USING FC RETURN HEADER

Div 2

- Remove relay.
- Install one jumper

NOTE - Following steps will cause 1FC008, FC CNMT Outlet Outbd Isol Vlv to open.

Div 1:

- Lift and tape lead.
- Install one jumper.

c. VENT TO CONDENSER or SPENT FUEL POOL USING RHR CNMT SPRAY SPARGERS

IF CPS No. 4411.06 Section 2.6, Vent To Spent Fuel Pool Using RHR CNMT A Spray Sparger is being used, THEN perform steps 3.3.a - d only.

1) Div 1: RHR A Vent Path

a) Lift and tape one lead.

b & c) Install two jumpers.

d) Lift and tape one lead.

If venting to condenser, this step is also required;

e) Install one backplane jumper

2) Div. 2: RHR B Vent Path

f & g) Lift and tape two leads.

h & i) Install two jumpers.

j) Install one backplane jumper.

d. VENT USING CCP SUPPLY PATH MODIFICATION

1) IA Isolations

- Remove steel jumpers.

2) CCP Isolations

- Lift and tape four leads.

e. VACUUM PUMP MSL HIGH RADIATION TRIP

Main Condenser Vacuum Pump A & B (0CA01PA & B)

- Lift and tape a single lead
- Install one jumper

11. CPS No. 4410.00C011, DEFEATING VF INTERLOCKS (EOP-8) — **.1.4.11**

Allow restart/continued use of Fuel Building Ventilation (VF) after isolation and when VF Exhaust < 10 mR/hr.

a. Remove two relays

b. The RPV Level 2 and High Drywell Pressure Isolation/Trips will be defeated:

- VF Exhaust Fans, 1VF04CA/B
- VF Supply Fans, 1VF03CA/B
- Secondary Containment Isolation Dampers, 1VF04Y, 1VF06Y, 1VF07Y, and 1VF09Y

c. Standby Gas Treatment (VG) Automatic Initiation on Level 2 and High Drywell Pressure will be defeated.

12. CPS No. 4410.00C012, DEFEATING ATWS INTERLOCKS (EOP-1A) — **.1.4.12**

    When directed by CPS No. 4411.08, ALTERNATE CONTROL ROD INSERTION, defeat isolations/trips.

    a. Defeating IA Isolations

       Allows instrument air (IA) supply to the containment to be re-established or maintained.

       1) Defeating IA Isolations

          - Remove two steel jumpers

    b. Defeating RPS Logic Trips

       Allow the scram to be reset, the scram discharge volume drained, and the CRD accumulators recharged for subsequent manual scram attempts. This action bypasses Div. 1 through 4 RPS automatic scram signals.

       1) Defeating RPS Logic Trips

          - Install four backplane jumpers

    c. Defeating Rod Pattern Controller

       Allows manual insertion of control rods irrespective of pattern and sequence constraints which would otherwise be imposed.

       1) Defeat the Rod Pattern Controller by 2 ATM Trip Circuits adjustments.

    d. Defeating ARI Logic Trips

       Allows ARI/RPT trip logic to be manually reset irrespective of automatic trip signals.

       1) Defeating ARI Logic Trips

          - Trip both reactor recirculation pumps.
          - Place ARI/RPT SYSTEM 1 & 2 TEST keylock switches in TEST.

After completion:

- 1C11-F401A(B), Scram Valve Pilot Air Header Block Solenoid Valves open.
- 1C11-F402-405A(B), Scram Valve Pilot Air Header Vent Solenoid Valves shut.
- RR pump automatic ATWS trips defeated.

13. Interim Summary

Ask questions to assess student achievement of objectives/knowledge.

Q When is use of the checklists of CPS No. 4410.00, DEFEATING SYSTEM INTERLOCKS permitted?

Q What types of actions are performed using CPS No. 4410.00 checklists?

Q Who can perform a CPS No. 4410.00 checklist?

Q What actions are to be taken when a duplicated step of a checklist is performed?

Q When installing backplane jumpers, what action could occur if the jumper accidentally touches a wrong pin?

Q Following a Reactor scram, all feedwater is lost. The SRO directs the IMDs to defeat all the RCIC Interlocks. What interlocks are bypassed?

Q What actions can be performed when checklist CPS No. 4410.00C003, DEFEATING IA INTERLOCKS is completed?

Q What is the strategy when performing CPS No. 4410.00C004, DEFEATING MSL/OG INTERLOCKS when directed by EOP-1A, ATWS CONTROL?

Q What are the concerns when defeating Off Gas Isolations per CPS No. 4410.00C004, DEFEATING MSL/OG INTERLOCKS?

Q What is the purpose of performing CPS No. 4410.00C005, DEFEATING RWCU INTERLOCKS checklist?

Q A LOCA occurs causing Drywell Temperature (285°F) and Pressure (4.7 psig) to rise rapidly. The CRS directs the IMDs to perform checklist CPS No. 4410.00C006, DEFEATING VP/WO INTERLOCKS. What should be of concern prior to performing this checklist?

Q When defeating RPS Logic trips per checklist CPS No. 4410.00C012, DEFEATING ATWS INTERLOCKS, what actions should be performed prior to subsequent manual scram attempts?

1. This completes the section that covers the checklists that defeat the various interlocks and isolation signals.

2. 4411.XX procedures are next.

   Equipment manipulations

   Plant operation

   As directed by EOP-SAG

C. CPS 4411.02, TERMINATING AND PREVENTING INJECTION

1. This procedure is entered when directed by:

   *EOP-1A Level Leg

   *EOP-2 Flooding with ATWS

   *EOP-3 Emergency Depressurization with Shutdown Criteria not met

   NOTE

   A manual ECCS initiation will block DG protective devices with the exception of generator differential current and overspeed.

2. Removal of 'QS Relay *[HARD CARD at P601]*

   [Prevents TB MCC 1M shunt trip which maintains MDRFP availability.]

   <u>1FW004, MDRFP Feed Reg Valve Concerns</u>

   a. Removing relay 1UAY-AP567B (QS) in steps 2.1 and 2.7.1 prior to depressing LPCI FM RHR B & C MANUAL INITIATION push-button, assures hydraulic control for 1FW004, MDRFP Feed Reg Valve, and RFP 1C Aux Oil pump are not lost due to a TB MCC 1M shunt trip signal.

   b. When the FW controllers are in MANUAL/minimum, the 1FW004, MDRFP Feed Reg Valve hydraulic pump needs one of these conditions satisfied in order to run and supply hydraulic pressure to shut the valve: **.1.5**

      1) 1FW024, RFP Bypass Vlv open, <u>or</u>

      2) 1FW01PC, Motor Driven RFP 1C running, <u>or</u>

      3) RFP 1C Aux Oil Pump running.

   c. Operator error and/or other events can result in a loss of hydraulics to the 1FW004 valve.

      The accumulator should under normal conditions provide for one valve stroke before the valve hydraulics are totally lost, and the valve will then remain in its last position.

IF Div 2 LPCI B/C initiation has not occurred, [Manual or Automatic (Level 1/Hi DW pressure)],

THEN At backpanel 1H13-P851 (Div 2), Bay B:

Remove relay

- Require pushing spring clip off of relay
- Grab and work relay side – to – side as it slowly extracts.
- If cover comes off, gently slide it back onto relay and try again.

3. HPCS – Initiation Signal NOT Present [HARD CARD] — **.1.6.1**

   a. While <u>holding</u> control switch in CLOSE for 1E22-F004, HPCS To CNMT Outbd Isln Valve:

      Arm and Depress HPCS MANUAL INITIATION push-button.

   b. After starting current has decayed, stop HPCS Pump, 1E22-C001.

   c. Manual HPCS initiation starts Div 3 DG & SX Pump C and will need to verify they correctly start.

4. HPCS – Initiation Signal Present [HARD CARD]

   a. Stop HPCS Pump, 1E22-C001.

   b. Shut 1E22-F004, HPCS To CNMT Outbd Isln Valve.

5. RCIC [HARD CARD at P601]

   a. Depress RCIC TURBINE REMOTE TRIP push-button.

   b. Shut 1E51-C002, RCIC Turbine Trip Valve Stem

   c. Shut 1E51-F013, RCIC Pump Disch To Rx Outbd Isol Valve.

   NOTE: RHR A may already be running due to non-ECCS considerations. Performing the following steps might cause system valves to be realigned.

6. LPCS/LPCI A – Initiation of Signal NOT Present [HARD CARD at P601]

   a. Arm and Depress:

   LPCS/LPCI FM RHR A MANUAL INITIATION push-button.

   RPV pressure is normally greater than the open permissive pressure for these two valves.

   b. Provide a CLOSE signal to:

   1E21-F005, LPCS To CNMT Outbd Isol Valve.

   c. Provide a CLOSE signal to:

   1E12-F042A, LPCI Fm RHR A Shutoff Valve.

   d. Shut 1E12-F053A, RHR A To Feedwater S/D Cooling Rtrn Vlv.

   e. Start both DW/CNMT Mixing Compressors.

   f. LPCS/LPCI FM RHR A MANUAL INITIATION starts Div 1 DG and **isolates** Drywell Cooling and needs verified.

7. LPCS/LPCI A – Initiation Signal Present [HARD CARD]

   a. Provide a CLOSE signal to:

      1E21-F005, LPCS To CNMT Outbd Isol Valve.

   b. Provide a CLOSE signal to:

      1E12-F042A, LPCI Fm RHR A Shutoff Valve.

   c. Shut 1E12-F053A, RHR A To Feedwater S/D Cooling Rtrn Vlv.

   d. Start DW/CNMT Mixing Compressors per P800 HARD CARD or 4411.11.

8. LPCI B/C – Initiation Signal NOT Present [HARD CARD]

   a. Verify/remove relay.

   b. Arm and Depress:

      LPCI FM RHR B & C MANUAL INITIATION push-button.

   c. Provide a CLOSE signal to:

      1E12-F042B, LPCI Fm RHR B Shutoff Valve.

   d. Provide a CLOSE signal to:

      1E12-F042C, LPCI Fm RHR C Shutoff Valve.

   e. Shut 1E12-F053B, RHR B to Feedwater S/D Cooling Rtrn Vlv.

   f. Shut 1E12-F023, RHR B Supp to Rx Head Spray Valve.

   g. Start DW/CNMT Mixing Compressors.

   h. LPCI FM RHR B & C MANUAL INITIATION starts Div 2 DG and **isolates** Drywell Cooling and needs verified.

9. LPCI B/C – Initiation Signal Present [HARD CARD]

   a. Provide a CLOSE signal to:

      1E12-F042B, LPCI Fm RHR B Shutoff Valve.

   b. Provide a CLOSE signal to:

      1E12-F042C, LPCI Fm RHR C Shutoff Valve.

   c. Shut 1E12-F053B, RHR B to Feedwater S/D Cooling Rtrn Vlv.

   d. Shut 1E12-F023, RHR B Supp To Rx Head Spray Valve.

   e. Start DW/CNMT Mixing Compressors per P800 HARD CARD or 4411.11.

10. CONDENSATE/FEEDWATER [HARD CARD] — **.1.6.5**

    ☞ Recommended step sequence only - may be performed in any order based on existing plant conditions.

   a. Place RFPT Flow Controller A/B, in MANUAL/min.

   b. Shut 1FW004, MDRFP Feed Reg Valve by placing:

      - Flow Control RFPT C in MANUAL/min.

        and

      - Start-Up Level Control in MANUAL/min.

      ☞ 1FW004 may not fully shut due to a loss of hydraulics.

      Verify status via annunciator 5002-1M and DCS.

   c. Shut 1FW002A/B, RFP 1A/1B Disch Vlvs.

d. Shut 1FW003A/B, RFP Discharge Bypass Valves, by placing Flow Controller, FC-FW231 in minimum.

e. IF Feedwater flow cannot be terminated as above,

THEN Using as necessary for plant conditions:

- Shut 1B21-F065A/B, RPV Inlet Vlvs.
- Stop running FW/CD/CB pumps.

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q Why is the Q/S Relay removed prior to terminating Division 2 LPCI B/C?

Q While terminating HPCS with an initiation signal NOT present, when is the HPCS pump stopped?

Q Why does it take a two handed operation to terminate HPCS with an initiation signal NOT present?

Q If the LPCS/LPCI RHR A MANUAL initiation push button is depressed what actions occur?

Q If Division 2 RHR was in Suppression Pool cooling and the LPCI FM RHR B/C MANUAL INITIATION PUSHBUTTON was armed and depressed, what effect (if any) would this have on Suppression Pool Cooling?

Q When would you close the 1B21-F065A/B , RPV Inlet Valves, when terminating and preventing injection?

Q Concerning the shunt trip of TB MCC 1M, how does this affect the Feedwater System?

Q What is required for the MDRFP Feed Reg Valve hydraulic pump to run and supply hydraulic pressure to operate the 1FW004 Valve?

D. CPS 4411.03, INJECTION/FLOODING SOURCES

1. Directed by the EOP/SAGs - align and operate available RPV injection and CT flooding sources. EOP-1, 1A, 2 and SAG will all direct injection/flooding per CPS 4411.03.

2. Based on plant conditions, resource availability, and EOP/SAG directions, select one or more methods below to perform injection/flooding operations.

   a. NORMAL MCR LINEUP/OPERATION — **.1.7.1**

      1) TDRFP(S) – Max RPV pressure for injection is ~1950 psig.

      2) MDRFP – Max PRV pressure for MDRFP injection: ~1780 psig.

3) CD/CB PUMP(S)

a) Using this path places a minimum of one CD pump (CD/CB pump set) in service with the FW002A(B) closed and the FW024 valve open, opening/throttling the 1B21F065A(B) valve(s) and controlling level using the Startup, 1FW004 Flow or 1FW003A(B) Controllers.

When EOP 1 directs to maximize injection for preferred and alternate systems opening 1FW002A&B would be allowed to restore core cooling. Other action to raise injection rate:

- Startup CB pump if one isn't running
- Startup an additional CD/CB pair

b) It is possible to feed through the 1FW002A(B) valves although this path does not provide any throttling capability for flow rate. This flowpath requires throttling the 1B21-F065A(B) to control flow.

4) CRD — .1.7.5

a) To use the CRD Pumps to inject requires opening both 1C11-F116 and F117, Suct Filt Byp. Valves, placing the CRD Hydraulics Flow Control in MANUAL, and starting one or two CRD pumps.

b) Injection to the vessel is performed by alternately throttling open 1C11-F002A(B) and 1C11-F003A(B) to maximize injection then starting the RCRC Aux Seal Injection Pump.

5) ECCS SYSTEMS (RCIC, HPCS, LPCS, LPCI)

NOTE

No unique lineups or operating modes exist when using these systems in the normal operating mode.

Operate the systems in accordance with the normal operating procedures and as directed by the EOPs.

a) RCIC, CPS 3310.01, Reactor Core Isolation Cooling (RI)

b) HPCS, CPS 3309.01, High Pressure Core Spray (HPCS)

c) LPCS, CPS 3313.01, Low Pressure Core Spray (LPCS)

d) LPCI, CPS 3312.01, Residual Heat Removal (RHR)

6) HEAD SPRAY — .1.7.3

NOTE

Head spray is only permitted when in SAG-1, PRIMARY CONTAINMENT FLOODING for recirculation use when suppression pool water level is to be held above 61 ft 11 in. Head spray operation does not add to the CT water inventory.

a) Start LPCI B per RHR procedure.

b) Open 1E12-F023 (Head Spray Valve).

7) ECCS WATER LEG PUMPS

a) HPCS — .1.7.5

HPCS Water Leg pump has a maximum injection pressure of ~ 29 psig, with pump runout pressure of ~ 6 psig RPV pressure and a flow rate of ~ 50 gpm.

- If needed to raise RPV level above Level 8 defeat HPCS Level 8 isolation interlocks.

Align injection by opening either 1E22-F001 or F015, start the WLP and open 1E22-F004

b) RCIC — .1.7.6

NOTE

F013 will not open if F045 is shut.

RCIC Water Leg pump has a maximum injection pressure of ~ 29 psig, with pump runout pressure of ~ 6 psig RPV pressure and a flow rate of ~ 50 gpm.

- OK to defeat RCIC isolations and reset RCIC turbine to open F045.

Align injection by opening the 1E51-F045, RCIC Turb Stm Supp Shutoff Valve then opening either 1E51-F010 or 1E51-F031, starting the RCIC WLP and opening 1E51-F013.

c) LPCS/RHR A — .1.7.7

RHR A/LPCS Water Leg pump has a maximum injection pressure of ~ 55 psig, will not run-out or trip and a flow rate of ~ 50 gpm.

Align injection by opening 1E21-F001, starting the LPCS & RHR A WLP and opening either1E21-F005 and/or 1E12-F042A.

d) RHR B/C — .1.7.8

RHR B/C Water Leg pump has a maximum injection pressure of ~ 55 psig, will not run-out or trip and a flow rate of ~ 50 gpm.Align injection by opening 1E21-F105, starting the RHR B/C WLP and opening either1E21-F042B and/or 1E12-F042C.

b. ABNORMAL LINEUP/OPERATION	
1) RHR Through Shutdown Cooling (App. A, 1.0)	.1.7.9
• If RPV level is < Level 3 <u>or</u> pressure is > 104 psig defeat 1E12-F053A(B) isolation logic.	
Align injection by starting RHR Pump A(B), throttling open 1E12-F053A(B) to maintain RPV level and shutting 1E12-F042A(B).	
2) SX Through RHR B (App. A, 2.0)	.1.7.10
3) SX Through RHR B Test Return (App. A, 3.0)	.1.7.11
4) SX Through Containment Spray B (App. A, 4.0)	.1.7.12
5) Fire Protection (App. B)	.1.7.13
a) ERO Prioritization/Resource Guidance	
b) Perform injection path lineups:	
• Lineup #1, MCR Valves	
• Lineup #2: Critical Path Field Valves	
• Lineup #3: Non-Critical Path Field Valves	
c) Locally remove internals of 1FP036.	
d) Locally start all available fire pumps.	

e) Locally commence injection by slowly opening 1FP035.

f) Monitor FP flow on the RHR Pump B Flow indicator.

g) Maintain RPV level as required using 1E12-F096.

h) If 1E12-F042B cannot be opened and CT spray is not required then inject FP via the shutdown cooling return line, 1E12-F053B.

i) Summary of FP Injection:

(1) Require extensive amount of field manipulations to:

- Lineup valves
- Remove check valve disk (1FP036)

(2) The Diesel Fire Pump(s) flow lake water to the T.B. ring header where the WS cross-connect has the internal disk removed. The WS system is aligned to SX B only at the screenhouse and flows water to the RHR 'B' cross-connect 1E12-F096 & F094. The RHR 'B' loop injects to the RPV through the RHR injection 1E12-F042B or 1E12-F053B.

6) Fuel Pool Cooling (App. C) — .1.7.14

7) SLC (test or storage tank) (App. D) Method 1.0: SLC Test Tank	**.1.7.15**

8) Method 2.0 SLC STORAGE TANK (Hard Card)	
Start both SLC Pumps A and B (Record start time).	
c. Suppression Pool Makeup/Cleanup (App. E)	
1) DUMP UPPER POOLS	**.1.7.16**
2) CNMT FLOODING THROUGH SF USING CP	**.1.7.17**
d. Cycled Condensate (App. F)	
1) CY THROUGH ECCS FILL PATH	**.1.7.18**
a) Start all available CY pumps.	
b) Inject using any of the following CY fill paths:	
HPCS.	
LPCS.	
LPCI A.	
LPCI B.	
LPCI C.	
c) CNMT Flooding - CY Through SM/SF	
Option 1 – CY-SM	**.1.7.19**
Option 2 – CY to SF - This flow path gravity drains the CY tank to the suppression pool.	**.1.7.20**

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q When using Feedwater as an injection source to the RPV what guidance is there for maintaining hotwell level?

Q When using CD or CD/CB pumps for injection into the RPV, what is the shutoff head for these conditions?

Q When using CD/CB to inject to the RPV, what is used to throttle injection?

Q What could occur by running both CRD pumps with a suction from the CY tank and the scram not reset?

Q When would the HPCS Level 8 interlocked be defeated?

Q What are some of the decisions that must be addressed before Fire Protection is lined up to inject the RPV?

Q What important consideration must be made to line up SLC Test Tank to inject to the RPV?

E. CPS 4411.04, THROTTLING ECCS FLOW .1.8

1. ENTRY CONDITIONS

   EOP-1 Level Control Leg

   EOP-2 RPV Flooding

   This procedure provides instructions for defeating the Emergency Core Cooling System (ECCS) injection valves' seal-in open/close circuits, thereby allowing the valves to be throttled from MCR.

2. OPERATOR ACTIONS

   a. Special Equipment/Tools Required

   b. Instructions for defeating Seal-in Logic.

      1) Place breaker in OFF.

      2) Open breaker front and side doors as necessary to access terminal boards.

      3) CUT specified jumpers near each terminal lug, and remove the excess wire.

         Unique cutting directions are provided for 1E22-F004, HPCS PUMP DISCHARGE VALVE, step 2.2.1.

      4) Shut breaker doors.

      5) Place breaker in ON.

      6) Notify MCR that valve may now be throttled.

   c. HPCS Pump Discharge Valve, 1E22-F004. – Unique and different from rest of the valves.

   d. LPCS Injection Shutoff Valve, 1E21-F005.

e. RHR Pump 1A LPCI Injection Spray Valve, 1E12-F042A.

f. RHR Pump 1B LPCI Injection Spray, 1E12-F042B.

g. RHR Pump 1C LPCI Injection Spray, 1E12-F042C.

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q When throttling with ECCS equipment, what does the light on the valve going out mean?

Q What valves can be throttled by performing 4411.04, Throttling ECCS Flow?

F. CPS 4411.05, HIGH CONTAINMENT POOL LEVEL PROTECTIVE ACTIONS

.1.9

1. ENTRY CONDITIONS

   EOP-6 Primary Containment Control – Pool Level High

2. OPERATOR ACTIONS

   Discuss equipment to be secured prior to containment water level reaching;

   a. Table 1: CNMT Level 23'9"

      DW Clg Fan, 1VP01CA

      DW Clg Fan, 1VP01CB

      DW Equip Drain Sump Pump

      DW Floor Drain Sump Pump

   b. Table 2: CNMT Level 25'

      CNMT Equip Drain Sump Pumps

      CNMT Floor Drain Sump Pumps

      TIP Drive Mechanisms

   c. Table 3: CNMT Level 40'

      CGCS Hydrogen Recombiner 1 and shut its containment isolation valves 1HG001 & 4.

   d. Table 4: CNMT Level 43'

      Rod Gang Drive Cabinet

      RR HPUs

      Open 1B21-F016, MS Drn & MSIV Byp Inbd Isol Valve

      All RPS Scram Solenoid Breakers

      CNMT Bldg Mezz Flr Air Hdlg Unit Fans

e. Table 5: CNMT Level 50'

Secure CGCS Hydrogen Recombiner 2 and shut its containment isolation valves 1HG005 & 8.

f. Table 6: CNMT Level 66'

Fission Product Monitor

DW Cooling Fans (6)

SLC Pumps (2)

RWCU Filter/Demin Holding Pumps

CNMT Bldg Above Mezz Flr Air Hdlg Unit Fns

Comb Gas Control Sys Supply Fan

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q What components are secured at 23'9"?

Q As water level rises, when are the components required to be deenergized?

Q What equipment is de-energized at 40', action taken and why?

G. CPS 4411.06, EMERGENCY CONTAINMENT VENTING, PURGING, AND VACUUM RELIEF

1. ENTRY CONDITIONS

   EOP-6 DW/Containment Pressure Leg, Figure N exceeded.

2. OPERATOR ACTIONS

   a. Advantages/Disadvantages of Vent and Purge Path, Table A.

      Review the Entry Conditions and its associated decision making Chart, 1.0 to 2.1.3.

      1) Which flowpath is chosen will depend on the plant conditions at the time venting must be performed.

         Variables/questions include, but are not limited to:

         a) Is CNMT venting of a priority that it justifies abandoning core cooling?

            The EOP/SAGs give clear direction on this variable.

         b) Is the condenser available?

            CNMT venting may have to be performed at a rate that exceeds the vacuum pumps' capacity which would result in condenser over pressurization.

            In this case, throttling of the path to the condenser while lining up a second flowpath not to the condenser would be proper.

         c) Can radioactivity release rates be minimized?

            The limit envelopes are large enough such that immediate venting actions are not always necessary or prudent.

            The ERO should make recommendations on when to vent based on the event conditions, weather conditions, and risk to plant personnel and the public.

d) For lineups requiring local valve operations, can the areas be accessed in a timely manner, safely?

If not, another path must be chosen.

2) Once successfully venting, the amount vented should be minimized, if possible, to limit radioactivity releases and to prevent CNMT pressure from going negative due to temperature dropping or other reasons.

3) There are fewer CNMT vacuum relief flowpath options than venting flowpaths due to the existence of check valves and water seals in the venting paths.

The path chosen will depend upon plant conditions and resources available.

Review each section's Advantages/Disadvantages as each section is reviewed.

Use a copy of 4411.06 and move into the associated portion of the text.

b. Vent Using Hydrogen Purge Supply Path, section 2.2. **.1.10.1**

c. Vent to Condenser Using FC Return Header, section 2.3. **.1.10.2**

d. Vent To Condenser using RHR CNMT Spray Spargers, section 2.4 **.1.10.3**

e. Vent to Spent Fuel Pool Using FC Return Header, section 2.5. **.1.10.4**

Approximately 20 psig differential pressure is required to relieve through this path.

f. Vent to spent Fuel Pool Using RHR A CNMT Spray Sparger, section 2.6. **.1.10.5**

Approximately 20 psig differential pressure is required to relieve through this path.

g. Vent Using CCP Supply Path Modification, section 2.7. **.1.10.6**

h. CNMT Hydrogen Purge, section 2.8. **.1.10.7**

Content/Skills	Activities/Notes
i. Recovery – Isolating Vent Paths, section 2.9. Review the recovery chart for actions and cautions. Review the isolation vent paths of 2.9. Each lineup vent is secured but the lineup is not restored to normal. With the extensive portion of a vent path's lineup completed the vent can be re-used if 4411.06 is re-entered or if vacuum relief is needed.	**.1.10.8**
j. CNMT Vacuum Relief, section 2.10. Review 2.10 for containment vacuum relief actions CNMT ultimate strength pressure is –11 psig. MCR indications lower range is –5 psig.	**.1.10.9**
INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge. **Q** Before initiating a vent path, who must be notified? **Q** State the methods that can be used to vent the containment.	

Q Describe the operating strategy that will prevent exceeding the ultimate containment strength pressure during venting operations when MCR recorders read to –5 psig?

Q When venting to the main condenser why is it necessary to control the vent rate to the condenser?

Q Which vent paths conflict with core cooling?

Q Which vent paths are filtered prior to release?

H. CPS 4411.08, ALTERNATE CONTROL ROD INSERTION

1. This procedure is entered when directed by the Emergency Operating Procedures (EOPs) or CPS 4100.01, Reactor Scram, and is used for initiating alternate control rod insertion methods.

2. OPERATOR ACTIONS

   a. Guidelines

      Initiate methods based on potential success.

      RETRY, methods as plant conditions change.

      REPEAT, methods until all rods are full in or <u>cannot</u> be moved inward.

      When directed from CPS 4100.01, Reactor Scram, the ATWS Interlocks listed in CPS 4410.00C012 <u>shall not</u> be defeated.

   b. Manual Scram — .1.11.1

Content/Skills	Activities/Notes
c. Manual ARI Initiation	**.1.11.2**
d. RPS Scram Solenoids	**.1.11.3**
e. Manual Control Rod Insertion	**.1.11.4**

Content/Skills	Activities/Notes
f. Individual Rod Scram	**.1.11.5**
g. Venting CRD Withdrawal Lines	**.1.11.6**

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q Why is IA restored to the containment to assist with;

Resetting RPS?

Reset ARI?

Manual Control Rod Insertion?

Individual Rod Scram?

Q How long a wait is required for resetting ARI system?

Q When venting CRD withdrawal lines, where is the water being vented to?

Q If all the breakers in the both NSPS 120 VAC Solenoid Power distribution panels are turned off instead of just the ones for rod insertion, what would be the impact?

Q What is isolated when 1C11-F034, Charging Water Header Isolation is closed?

I. CPS 4411.09, RPV PRESSURE CONTROL SOURCES

1. This procedure is entered when directed by the EOP/SAGs, and provides appropriate instructions for utilization of available RPV pressure control sources.

   EOP-1

   EOP-1A

   EOP-2

2. SYSTEM SELECTION

3. Pressure Control Strategies/Concerns

4. Normal MCR System Lineup/Operation

   a. Main Steam – Condenser/Bypass Valves/MSL Drains — .1.12.1

      Re-open the MSIVs

      Bypass Valve operation

      MSL drain operation

1.
2.

Content/Skills	Activities/Notes
b. SRVs (Hard Card)	
c. RFPTs	.1.12.2

Content/Skills	Activities/Notes
d. Shutdown Cooling	**.1.12.3**
e. HEAD VENT	**.1.12.4**
5. ABNORMAL SYSTEM LINEUP/OPERATION	
a. RCIC	**.1.12.5**

b. RCIC Steam Line	**.1.12.6**
c. RWCU (recirculation mode)	**.1.12.7**
d. RWCU (reject mode) – To the Main Condenser	**.1.12.8**
e. RWCU (reject mode) – To the Waste Surge Tank	**.1.12.9**

6. DISCUSSION

   a. STABILIZATION

   b. DEPRESSURIZATION

Q What is the quickest way to open the bypass valves?

Q What are reasons for lowering RPV pressure early?

J. CPS 4411.10, SLC OPERATIONS	
1. This procedure is entered when directed by the Emergency Operating Procedures (EOPs), and is used for shutting down the reactor by injecting boron via the SLC system or via a mixed boron solution in the RCIC storage tank utilizing HPCS or RCIC injection.	
2. OPERATOR ACTIONS	
Inject boron using SLC system, or if SLC system is not available, using alternate boron injections.	
a. SLC INITIATION [HARD CARD]	**.1.13.1**
b. ALTERNATE BORON INJECTION	**.1.13.2**
c. Recirculating RCIC Storage Tank using HPCS (Preferred method)	
d. Recirculating RCIC Storage Tank using RCIC (Alternate method)	
e. Injecting Boron Solution using HPCS (Preferred method)	**.1.13.3**
f. Injecting Boron Solution using RCIC (Alternate method)	
3. DISCUSSION	
REQUIRED EQUIPMENT	•

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q When the SLC pumps start what action is required?

Q If a loss of IA to the containment occurs how is SLC tank level maintained above pump suction if it was started due to an ATWS condition?

Q How does the operator verify that SLC is injecting to the RPV?

Q When are the mixing heaters and the operating heaters deenergized for SLC operations?

Q What support is needed to add chemicals to the RCIC tank?

Q If using RCIC or HPCS to inject boron into the vessel what precautions must be adhered to?

Q When is SLC injection stopped?

Q Why are the RCIC storage tank heaters energized by setting the controller to 95°F?

Q What happens to the temperature when borax and boric acid are combined?

K. CPS 4411.11, HYDROGEN CONTROL SYSTEM OPERATIONS (Hard Card)

In 1979, an accident occurred at Three Mile Island which resulted in reactor water level dropping to below the top of active fuel. When this occurred, Hydrogen was generated due to high cladding temperature, thus causing a Zirconium-water chemical reaction. The Hydrogen generated with a subsequent release to the Containment resulted in a Containment Hydrogen concentration of greater than 8%. This concentration later under went Hydrogen deflagation resulting in a Containment pressure of 26 psig and equipment damage due to high temperature/fire.

The purpose of this training is to provide training on the CPS 4411.11, HYDROGEN CONTROL SYSTEM OPERATION.

To prevent a similar event at CPS, the hydrogen control systems are placed in service to monitor and control hydrogen concentration in both the drywell and containment. Improper application or failure to use the hydrogen control systems may result in the loss of the integrity of the containment.

1. When directed by the EOP/SAGs:

   Provides guidance for the operation of the H_2/O_2 monitors and the containment combustible gas control system (CGCS).

2. OPERATOR ACTIONS

   a. H_2/O_2 Monitors — **.1.14.1**

   b. Hydrogen Igniters — **.1.14.2**

   c. DW/CNMT Mixing Compressors — **.1.14.3**

   d. Hydrogen Recombiners – Startup from MCR — **.1.14.4**

   e. Hydrogen Recombiners – Startup from Local Control Panel — **.1.14.6**

   f. Hydrogen Recombiners – Shutdown Emergency (EOP directed) — **.1.14.5**

INTERIM SUMMARY

CPS No. 4411.11, is entered when directed by EOP-6, “Primary Containment”. This procedure is used to align the appropriate systems to monitor/control Hydrogen concentration in both the Drywell and Containment.

Ask questions to assess student achievement of objectives/knowledge.

Q During an accident condition, how is Hydrogen generated?

Q When will the H_2/O_2 monitors isolate?

Q How long does it take to warm up a Hydrogen/Oxygen monitor?

Q What is the minimum hydrogen concentration that can be detected by the hydrogen/oxygen monitors.

Q How long does it take to warm up hydrogen igniters?

Q What is the maximum Containment pressure that a Hydrogen recombiner can be operated at?

Q How long does it take for a Hydrogen recombiner to reach the normal operating temperature of 1325°F?

Content/Skills	Activities/Notes
L. CPS 4412.00, CHEMISTRY SAMPLING 1. Provide specific guidance for performing and documenting of liquid and gaseous sampling when directed by EOPs. 2. DISCUSSION/DEFINITIONS 3. CPS 4412.00C001, SAMPLING CONTAINMENT AND DRYWELL FOR HYDROGEN 4. CPS 4412.00C002, SAMPLING CONTAINMENT ATMOSPHERE PRIOR TO VENTING	**.1.15**

INTERIM SUMMARY - Ask questions to assess student achievement of objectives/knowledge.

Q During performance of CPS No. 4412.00, CHEMISTRY SAMPLING, what actions should be taken if normal sampling methods are not available?

Q Following a transient, if both MCR H_2 Monitors do not work, what conditions are needed to consider Drywell and Containment H_2 levels known?

Q What are two challenges when using an alternate sample method for Drywell and Containment H_2 Sampling?

Q Following sampling of Primary CT atmosphere, results show that Dose Equivalent I-131 is 4.1 E-03 µCi/cc. Can Containment venting be performed?

IV. OPEX

A. An invalid Rx vessel water level event led to the following: Engineered Safety Feature (ESF) Actuations: Reactor Protection System (RPS) Actuation and Primary Containment Isolation System (PCIS) Actuation, also, a Condition Prohibited by Tech Specs and a Loss of Safety Function occurred during the event.

The cause of the invalid reactor water level was the failure of the packing gland follower on the variable leg root valve that resulted in the depressurization of the variable leg to various instruments. As a result, the reactor scram signal could not be reset to allow the RPS logic and the secondary containment isolation signal to be reset and allow the standby gas treatment system to be secured and restore normal ventilation to the secondary containment.

With normal ventilation to the secondary containment shutdown, secondary containment temperatures began to increase. The EOP directed the crew to enter a supplemental procedure, which directed overriding the low reactor water level and high drywell pressure initiation signals to standby gas treatment and secondary containment isolation valves. Once the initiation signals were overridden, the procedure directed the crew to secure the standby gas treatment fans and restore reactor building ventilation to its normal configuration.

With the plant in hot shutdown (mode 3), technical specifications require two standby gas treatment subsystems to be operable. With the initiation signal for high drywell pressure and low reactor water level overridden, the plant did not have two standby gas treatment trains operable as required by technical specification for mode 3. This placed the unit in LCO 3.0.3. Entry into LCO 3.0.3 constitutes placing the unit in a condition prohibited by technical specifications.

This event is NOTEWORTHY because an equipment failure resulted in a reactor SCRAM and due to this event, secondary containment temperatures increased requiring entry into an EOP that required actions that placed the unit in a condition prohibited by technical specifications.

Each checklist that overrides interlock will in some way result in inoperability. Technical Specification requirements will eventually need to be addressed.

V. Conclusion/Lesson Summary

A. The goals:

Covered all the 4410.00 checklist procedures

Recognize procedure usage requirements

Importance of carefully documenting what actions have been performed

LCO required actions upon plant stabilization

Recognize procedure hierarchy

Review of isolations and interlocks defeated in an emergency

Overview of procedure guidance

Recognize that the following are also EOP support procedures

a. ECCS

b. RCIC

c. SRVs

Discussed SRO/RO and qualified IM technicians are the only ones authorized to perform MCR actions in 4410.00CXXX procedures.

QS relay is authorized to be removed supporting EOP 1A activities.

EOPs provide instructions to:

a. Defeat trip logic.

b. Defeat isolation logic.

c. Defeat auto-start logic.

d. Alignment and operation of alternate systems/methods for injecting water into RPV.

e. Alignment and operation of alternate systems/methods for depressurizing the RPV.

f. Alignment and operation of an alternate boron injection method.

g. Venting containment directly to atmosphere.

Electrical Safety requirements

Hardcard and when allowed to be used

Procedure placekeeping

All actions self checked, peer check not required

Procedure guidance, notes & cautions for:

a. Termination and prevention of injection

b. Injection/Flooding sources

c. Making ECCS systems throttleable

d. Protective actions on High Containment pool levels

e. Emergency Containment Venting, purging and vacuum relief

f. Alternate control rod insertion

g. RPV pressure control sources

h. SLC injection

i. Hydrogen control system operation

j. Chemistry sampling

B. Review the objectives.

Attachments

None

Figures

None

Exelon Nuclear

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-01

EOP-1 RPV CONTROL
PRESSURE CONTROL USING BYPASS VALVES

REVISION 003

REVISED / DEVELOPED BY: Carl Leach

REVIEWED / APPROVED BY: Daniel Snook /S/
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision DLS /S/ / 02/21/13
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SCENARIO OUTLINE

1. The purpose of this scenario is to introduce ILT Students to EOP-1, RPV Control.

2. This is a **TRAINING SCENARIO.**

3. Risk Conditions do not change.

4. If the scenario is a training scenario it should contain the following:

   If this is a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.

5. Scenario initial conditions (to include initial plant Risk level). Full power, middle of core life, no equipment out of service with Risk Conditions Green.

6. Turnover Information:

   a. The unit is operating at rated power, middle of core life. There is no equipment out of service and no LCOs in effect. The online risk level is GREEN.

7. Event narratives

   a. The unit is operating at rated power, middle of core life. There is no equipment out of service and no LCOs in effect. The online risk level is GREEN.

   b. This scenario allows the crew to perform EOP-1, RPV CONTROL, following a turbine trip with no additional equipment failure, using normal pressure and level control sources and normal system operation.

   c. A main turbine trip occurs from full power and initiates a reactor scram. The turbine bypass valves operate normally and control reactor pressure. Reactor pressure initially increases when the turbine trips, then approaches the EHC pressure set value following the scram and as decay heat is removed.

   d. The crew enters and performs the actions of CPS 4401.01, EOP-1 RPV CONTROL, and CPS 4100.01, REACTOR SCRAM. The CRS marks EOP Flow Charts and directs crew actions.

   e. The crew verifies normal RPV pressure control with turbine bypass valves and RPV level control with Feedwater. The crew then begins normal RPV depressurization and establishes a cool-down rate of <100°F/hr.

8. Technical Specification/Reportability calls. None

9. EAL/PAR or any on-site protective action (such as site evacuation). None

10. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. None

SCENARIO OUTLINE (Continued)

11. Scenario termination criteria: The scenario may be terminated when RPV pressure and level are being controlled within the designated bands and the crew has established normal RPV cooldown conditions, or, at the discretion of the Floor Instructor

12. Approximate Scenario Runtime.30 minutes, then students and have each SRO candidate be CRS for this scenario.

13. Related OPEX : See Attachment 1.

CPS SIMULATOR EXERCISE GUIDE

LESSON PLAN HISTORY PAGE	
REV.	**DESCRIPTION**
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 1.
01	Revised to update task links per TRACER 2004-05-0142A.
02	Revised to update tasks for updated task list. Rebuilt booth actions for Simulator Guide. Added standard turnover sheet.
003	Updated to latest template. Minor revision.

REFERENCES

- CPS 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS 4100.01, REACTOR SCRAM
- CPS 4401.01, EOP-1, RPV CONTROL
- CPS 4411.09, EOP RPV PRESSURE CONTROL SOURCES
- CPS 4411.03, INJECTION/FLOODING SOURCES
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. CPS 4100.01, REACTOR SCRAM
2. CPS 4401.01, EOP-1 RPV CONTROL

CPS SIMULATOR EXERCISE GUIDE

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Training Scenarios.

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE). An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: **Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation (OBE).**

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
From the Main Control Room respond to a turbine trip at power in accordance with CPS 4101.01, REACTOR SCRAM	410001.01	CRS ARO BRO	
From the Main Control Room and given entry condition into EOP-1, control RPV power, pressure and level in accordance with EOP-1	440101.01 440101.02 100509.03 100509.04 100509.05 100509.06 100509.07	CRS	
From the Main Control Room and given entry conditions in EOP-1 enter EOP-1 and control RPV level in accordance with CPS 4411.03	441103.01 441103.09 440101.03	CRS ARO	
From the Main Control Room, given CPS 4411.09, EOP RPV PRESSURE CONTROL SOURCES, perform RPV Pressure Control using Normal System Lineup/Operation in accordance with CPS 441109.01.	441109.01	CRS BRO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

Operator Rounds – OP-AA-102-102
Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
Clearance & Tagging – OP-AA-109-101
Human Error Prevention – HU-AA-101
Self-Assessment/Continuous Improvement – LS-AA-126
Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – LS-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-01 or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson Plan SE-EOP-01.
5. Execute simulator Lesson Plan SE-EOP-1.
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. **(CM-1)** If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: None
9. Equipment out of service: NONE
10. Non-standard paperwork required: NONE
11. Surveillances to provide: NONE
12. Flagging to be placed: NONE
13. Other: NONE

PRESSURE CONTROL USING BYPASS VALVES

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Initialize to an IC at rated power, middle of core life. Place the simulator in RUN. Open and execute simulator lesson SE-EOP-1. Provide the turnover sheet to the crew. When the crew has taken the shift **TRIGGER Remote 1:** YP_XMFTB_4983, Turbine Trip – TRUE	**CREW:** ❑ Walks down panels and conducts a shift turnover. **ARO:** ❑ Completes Scram Choreography ▪ Announces reactor scram ▪ Announces EOP-1 entry condition (RPV/L low) ❑ Enters CPS 4100.01, REACTOR SCRAM, and performs immediate actions (410101.01) ▪ Turns mode switch to SHUTDOWN ❖ Verifies reactor power is lowering ❖ Verifies shutdown criteria are met ▪ Controls RPV/L Level 3 (8.9 in.) to Level 8 (52 in.) ▪ Verifies turbine and generator trip **BRO:** ❑ Completes Scram Choreography ❑ Enters CPS 4100.01, REACTOR SCRAM, and performs immediate actions (41001.01) ▪ Announces reactor scram ▪ Announces containment and RCIC room evacuation ▪ Verifies all control rods full in

PRESSURE CONTROL USING BYPASS VALVES (Continued)

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
	CRS: ❑ Completes Scram Choreography. ▪ Enters CPS 4100.01, REACTOR SCRAM. ❑ Enters EOP-1 RPV CONTROL and directs: (440101.01, 440101.02 100509.03, 100509.04, 100509.04, 100509.05, 100509.06, 100509.07) ▪ RPV/P control 800 – 1065 psig. (441109.01) ▪ RPV/L Level 3 to Level 8 with FW (441103.01, 441103.09) ❑ Properly marks EOP-1 flowcharts.
The instructor should watch for band control. If a crew member goes out of band on a parameter, an out of band report should be made including what actions are being made to return to the assigned band. When the crew member returns the parameter to the assigned band, a report should be made that the parameter is now in band.	**ARO:** ❑ Controls RPV/P 800 – 1065 using turbine bypass valves. (441109.01) ❑ Controls RPV/L L-3 to L-8 using CD/CB/FW. (441103.01 & 441103.09)
	CRS: ❑ Directs establishing a cooldown rate of <100°F/hr. using turbine bypass valves in accordance with CPS 3006.01, UNIT SHUTDOWN.
When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, place the simulator or upon direction of Floor Instructor in **FREEZE** and inform the crew **"Training has control".**	**ARO:** ❑ Begins normal cooldown at <100°F/hr. using turbine bypass valves. **CRS:** ❑ Declares the EAL Classification None
Facilitate a short crew self critique. Note any deficiencies for future training. Also monitor for signs of improvement in the remaining scenarios.	

OPEX

Power Reactor	Event Number: **48673**
Facility: **GRAND GULF** Region: 4 State: MS Unit: [1] [ ] [ ] RX Type: [1] GE-6 NRC Notified By: HARDY FARRIS HQ OPS Officer: VINCE KLCO	Notification Date: 01/14/2013 Notification Time: 22:04 [ET] Event Date: 01/14/2013 Event Time: 18:05 [CST] Last Update Date: 01/14/2013
Emergency Class: NON EMERGENCY 10 CFR Section: 50.72(b)(2)(iv)(B) - RPS ACTUATION - CRITICAL	Person (Organization): MICHAEL VASQUEZ (R4DO)

Unit	SCRAM Code	RX CRIT	Initial PWR	Initial RX Mode	Current PWR	Current RX Mode
1	A/R	Y	100	Power Operation	0	Hot Shutdown

*****NOT FOR PUBLIC DISTRIBUTION*****

AUTOMATIC REACTOR SCRAM FROM 100% POWER DUE TO A TURBINE/GENERATOR TRIP

"Actuation of RPS [Reactor Protection System] with reactor critical. The Reactor Scram occurred at 1805 [CST] 01/14/13 from 100% CTP [Core Thermal Power]. The cause of scram appears to be a Turbine Generator Trip.

"05-S-01-EP-2 RPV Control, Reactor Scram ONEP [Off Normal Event Procedure] 05-1-02-I-1, and Turbine and Generator Trips ONEP 05-1-02-1-2 were entered to mitigate the transient with all systems responding as designed. No loss of offsite or ESF power occurred. No ECCS initiation signals were reached and no ECCS or Diesel Generator initiation occurred.

"All control rods are fully inserted. MSIVs remained open and SRVs lifted and reseated as designed. Currently, reactor water level is being maintained by the Condensate and Feedwater system in the normal band and reactor pressure is being controlled via Main Turbine Bypass valves to the main condenser. There are no challenges to Primary or Secondary Containment at this time."

The licensee notified the NRC Resident Inspector.

TURNOVER

1. Full Power, stable xenon and middle of core life.
2. Status of Tagged Out Equipment: None
3. Shift conditions: *Day Shift*
4. Weather Conditions: *Clear & Sunny*
5. Thermal Limit Problems or Concerns: None

   LCOs in effect:None
6. Surveillances / Jobs in progress: None
7. Upcoming Jobs Maintain Power*(List here to include when planned to commence.)*
8. Risk Level: *Green*
9. Dose equivalent Iodine 131 is reading 1.5 E-6 μcuries per gram.
10. Other: None

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.

Exelon Nuclear

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-02

EOP-1 RPV CONTROL
PRESSURE CONTROL WITHOUT BYPASS VALVES

REVISION 003

REVISED / DEVELOPED BY: Carl Leach

REVIEWED / APPROVED BY: Daniel Snook /S/
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision DLS /S/ / 02/21/13
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SCENARIO OUTLINE

1. The purpose of this scenario is to train ILT Students on EOP-1, in particular alternate methods of RPV pressure control in accordance with CPS 4411.09.

2. This is a **TRAINING SCENARIO.**

3. If a conditions changes such that it would be expected the crew would evaluate for a Risk Condition change, the scenario should have the necessary new risk level and protected equipment. N/A

4. If the scenario is a training scenario it should contain the following:

   If this is a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.

5. Scenario initial conditions: The unit is operating at rated power, middle of core life, with Bypass Valve EHC pump A OOS to replace the pump impeller. RCIC suction is aligned to the Suppression Pool to support work on the RCIC Storage Tank suction piping. No LCOs are in effect. The online risk level is GREEN

6. Turnover Information: The unit is operating at rated power, middle of core life, with Bypass Valve EHC pump A OOS to replace the pump impeller. RCIC suction is aligned to the Suppression Pool to support work on the RCIC Storage Tank suction piping. No LCOs are in effect. The online risk level is GREEN.

7. Event narratives :

   a. The unit is operating at rated power, middle of core life, with Bypass Valve EHC pump A OOS to replace the pump impeller. RCIC suction is aligned to the Suppression Pool to support work on the RCIC Storage Tank suction piping. No LCOs are in effect. The online risk level is GREEN.

   b. This scenario allows the crew to perform EOP-1, RPV CONTROL, following a turbine trip with bypass valve failure, using alternate pressure control methods. Feedwater remains available to provide makeup to the reactor vessel.

   c. A main turbine trip occurs from full power and initiates a reactor scram. The turbine bypass valves fail to open to control reactor pressure. Reactor pressure increases when the turbine trips and SRV(s) open to limit the reactor pressure rise. RCIC is operated to assist in RPV/P control and RPV makeup is from the MDRFP.

   d. The crew enters and performs the actions of CPS No. 4401.01, EOP-1 RPV CONTROL, and CPS No. 4100.01, REACTOR SCRAM. The CRS marks EOP Flow Charts and directs crew actions.

   e. The CRS enters CPS No. 4411.09, RPV PRESSURE CONTROL SOURCES, and directs crew actions to control RPV pressure using alternate pressure control methods (SRVs, RCIC, RFPTs, MSL Drains, and RWCU). The crew identifies failure of the turbine bypass valves to control RPV/P and performs actions as directed by the CRS to stabilize RPV/P using alternate pressure control methods.

   f. When the Main Turbine Bypass Valve EHC is returned to service, the crew establishes RPV/P control using Turbine BPVs. RCIC operation is no longer required for RPV/P control and is shut down. The crew then begins normal RPV depressurization and establishes a cool-down rate of <100°F/hr.

SCENARIO OUTLINE (Continued)

8. Technical Specification/Reportability calls. None.
9. EAL/PAR or any on-site protective action (such as site evacuation): None
10. If this is a training scenario and additional material is needed, detail what additional material will be required. None
11. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. None
12. Scenario termination criteria; The scenario may be terminated when RPV pressure and level is being controlled within the designated bands and the crew has established normal RPV cool down, or, at the discretion of the Floor Instructor.
13. Approximate Scenario Runtime.45 Minutes
14. Related OPEX: See Attachment 1

LESSON PLAN HISTORY PAGE

REV.	DESCRIPTION
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 2.
01	Revised to update task links per TRACER 2004-05-0142A.
02	Revised to include tasks from the updated tasks list. Added turnover sheet. Rebuilt simulator lesson.
003	Updated to latest template. Minor Revision.

REFERENCES

- CPS No. 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS No. 4100.01, REACTOR SCRAM
- CPS No. 4401.01, EOP-1, RPV CONTROL
- CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. CPS No. 4100.01, REACTOR SCRAM
2. CPS No. 4401.01, EOP-1 RPV CONTROL
3. CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES

CPS SIMULATOR EXERCISE GUIDE

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Training Scenarios.

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE). An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation (OBE).

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
From the Main Control Room perform RPV Pressure Control using Abnormal System Lineup/Operation in accordance with CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES	441109.02	CRS ARO	
From the Main Control Room, respond to a Reactor Pressure Control Emergency, in accordance with CPS 4401.1, RPV Control.	440101.01 440101.02 440101.03 100509.03 100509.04 100509.05 100509.06 100509.07	CRS ARO	
From the Main Control Room, place RCIC in pressure control, in accordance with CPS 4411.09.	441109.03	ARO BRO	
From the Main Control Room, place MSL Drains in pressure control, in accordance with CPS 4411.09.	441109.05	ARO	
From the Main Control Room, place SRVs in pressure control, in accordance with CPS 4411.09,	441109.07	ARO	
From the Main Control Room, place a RFPT in pressure control, in accordance with CPS 4411.09.	441109.06	ARO	
From the Main Control Room, control RPV water level with Feed water, in accordance with CPS 4411.03.	441103.09 441103.01	ARO	
From the Main Control Room, perform a Manual RCIC Initiation with Logic Operable, in accordance with CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI),	331001.03	ARO	
From the Main Control Room, manually operate a Safety Relief Valve in accordance with CPS No. 3101.01, MAIN STEAM (MS, IS & ADS).	310101.06	ARO	
From the Main Control Room, perform a Manual RCIC Startup with Flow from Tank to Tank , in accordance with CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI).	331001.05	ARO	
From the Main Control Room, perform RCIC System Shutdown with Initiation Signal Clear in accordance with CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI).	331001.06	ARO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

Operator Rounds – OP-AA-102-102
Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
Clearance & Tagging – OP-AA-109-101
Human Error Prevention – HU-AA-101
Self-Assessment/Continuous Improvement – LS-AA-126
Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – LS-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-01 or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson Plan SE-EOP-02.
5. Execute simulator Lesson Plan SE-EOP-02.
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. (**CM-1**) If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: NONE
9. Equipment out of service: NONE
10. Non-standard paperwork required: NONE
11. Surveillances to provide: NONE
12. Other: List here : NONE

PRESSURE CONTROL WITHOUT BYPASS VALVES

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Initialize to an IC at rated power, middle of core life. Place the simulator in RUN. Open and execute simulator lesson SE-EOP-2. Provide the turnover sheet to the crew. When the crew has taken the shift: **TRIGGER Remote 1:** YP_XMFTB_4983, Turbine Trip – TRUE, 40-sec. TD YP_XMFTB_4986, Loss of EHC Hydraulics (BPVs) – TRUE	**Crew:** ❑ Walks down panels and conducts a shift turnover. **RO:** ❑ Performs Scram Choreography (410001.01) ▪ Reports reactor scram ▪ Reports EOP-1 entry condition (RPV/P high and/or RPV/L low as applicable) ▪ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ▪ Turns mode switch to SHUTDOWN ❖ Verifies reactor power is lowering ❖ Verifies shutdown criteria are met ▪ Controls RPV/L Level 3 (8.9 in.) to Level 8 (52 in.) ▪ Verifies turbine and generator trip ▪ Reports turbine bypass valves are not functioning **BRO:** ❑ Performs Scram Choreography (410001.01) ▪ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ❖ Announces reactor scram ❖ Announces containment and RCIC room evacuation ❖ Verifies all control rods full in

PRESSURE CONTROL WITHOUT BYPASS VALVES (Continued)

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
	CRS:
EOP direction is to stabilize RPV/P below 1065 psig.	❑ Performs Scram Choreography (410001.01) ➢ Enters CPS No. 4100.01, REACTOR SCRAM and directs crew actions: ❑ Enters EOP-1 RPV CONTROL and directs: (440101.01, 440101.02, 100509.03, 100509.04, 100509.05, 100509.06, 100509.07) ▪ RPV/P control 800 – 1065 psig (441109.02) ▪ RPV/L Level 3 to Level 8 with FW (441101.02, 440401.03 & 441103.09) ▪ May direct RPV/L control –30" to +40" (target 0" to 10") in accordance with CPS No. 4100.01, Reactor Scram ❑ Properly marks EOP-1 flowcharts
The instructor should watch for band control. If a crew member goes out of band on a parameter, an out of band report should be made including what actions are being made to return to the assigned band. When the crew member returns the parameter to the assigned band, a report should be made that the parameter is now in band.	❑ Enters CPS No. 4411.09, RPV PRESSURE CONTROL SOURCES, and directs actions to control RPV/P 800 - 1065 psig using alternate pressure control methods from any of the following:(441109.02) ▪ RCIC in Tank to Tank (441109.03) ▪ SRV's (441109.07) ▪ MSL Drains (441109.05) ▪ RFPT's (441109.06)
	BRO: ❑ Controls RPV/P 800 – 1065 using SRVs (in the preferred sequence) (441109.07 & 310101.06) ❑ Places RCIC in service for RPV/P control as directed ➢ Starts RI with flow tank to tank (441109.03, 331001.03, 331001.05)
Observe the RO's communications allow them to maintain positive control of RPV/L and RPV/P. Verify the crew actuates the SRVs in the preferred sequence. Observe the crew monitors and controls RPV/P to avoid uncontrolled overfeed to the RPV from the CD/CB system at RPV/P <650 psig	**ARO** ❑ Controls RPV/L L-3 to L-8 using CD/CB/FW (441101.01, 441103.09)

CPS SIMULATOR EXERCISE GUIDE

PRESSURE CONTROL WITHOUT BYPASS VALVES (Continued)

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Restore Turbine Bypass EHC to operable **DELETE MALFUNCTION by triggering Remote 3**: YP_XMFTB_4986, Loss of EHC Hydraulics *a.* Report as the FS, ***"The BPV EHC trouble has been repaired and the pump restarted."***	**CRS:** ❑ Directs controlling RPV/P using Turbine BPVs ➢ Prescribes RPV/P control band ❑ Directs RCIC shutdown ❑ Directs re-establishing RPV/L to normal band (if lowered previously)
The instructor should watch for band control. If a crew member goes out of band on a parameter, an out of band report should be made including what actions are being made to return to the assigned band. When the crew member returns the parameter to the assigned band, a report should be made that the parameter is now in band.	**ARO:** ❑ Controls RPV/P within the prescribed band using Turbine BPVs **BRO:** ❑ Shuts down RCIC as directed in accordance with CPS No. 3310.01 (331001.06) **CRS:** ❑ Directs establishing a cool down rate of <100°F/hr. using alternate pressure control methods
When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, place the simulator in **FREEZE** and inform the crew **"Training has control".** Direct CRS to make EAL declaration. Facilitate a short crew self critique. Note any deficiencies for future training. Also monitor for signs of improvement in the remaining scenarios. Rotate students and re-run scenario to allow all to place various systems in pressure control.	**ARO:** ❑ Begins normal cool down at <100°F/hr. using alternate pressure control methods as directed **CRS:** ❑ Declares the EAL Classification: None

OPEX

Date: 19 Apr 1989 16:38:11 EST

Subject: MAIN TURBINE BYPASS VALVES DRIFT OPEN DUE TO ERRATIC OPERATION OF BYPASS VALVE OPENING POTENTIOMETER

UNIT: QUAD CITIES UNIT ONE
DOC NO/LER NO: 50-254/89-003
EVENT DATE: 04/12/89
NSSS/A-E: GE/SARGENT & LUNDY
RATING: 833 MWe
DATE OF COMMERCIAL OPERATION: FEBRUARY 18, 1973

On 04/11/89 at 2321 hours with the unit at 750 MWe in the run mode, U1 bypass valves drifted open. Upon further investigation, the Instrument Maintenance Technicians found the 1000 ohm bypass valve opening bias pot (MD 711) to be very erratic and difficult to adjust for a .5 VDC bias to the bypass valve amplifier card.

The potentiometer was readjusted to give the correct voltage signal to the amplifier card, reclosing the bypass valves. The potentiometer was readjusted several times over the next 11 hours as the bypass valves repeatedly drifted open.

At 1042 hours as the bypass valves continued to open, recirc flow was reduced and rods were inserted in an attempt to cause the bypass valve to close. At 1126 hours, all 9 bypass valves were open, the reactor was at 75% power, while the generator load was 250 MWe. At 1136 hours, the unit was manually scrammed because all 9 bypass valves were open, control valves were slowly closing and reactor pressure
was increasing.

It was later determined that the cause of the event was a failing operational amplifier (A-64) in the maximum combined flow limit circuit which is gated with the control valve signal causing the control valves to slowly drift closed.

Quad Cities uses a GE EHC system and turbine.

TURNOVER

1. Full Power, stable xenon and middle of core life.

2. Status of Tagged Out Equipment: "A" Steam Bypass EHC Pump out of service for 2 days should be returned in 4 days.

3. Shift conditions: Day Shift

4. Weather Conditions: Clear & Sunny

5. Thermal Limit Problems or Concerns: None

   LCOs in effect: None

6. Surveillances / Jobs in progress: None

7. Upcoming Jobs: None

8. Risk Level: Green

9. Dose equivalent Iodine 131 is reading 1.5 E-6 μcuries per gram.

10. Other: None

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.

Exelon Nuclear

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-03

EOP-1 RPV CONTROL
PRESSURE CONTROL WITHOUT BYPASS VALVES AND SRVS

REVISION 003

REVISED / DEVELOPED BY: Carl Leach

REVIEWED / APPROVED BY: Daniel Snook /S/
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision DLS /S/ / 02/21/13
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SCENARIO OUTLINE

1. The purpose of this scenario is to train the ILT Student on EOP-1 in particular controlling RPV pressure using alternate pressure control systems.

2. This is a **TRAINING SCENARIO.**

3. If a conditions changes such that it would be expected the crew would evaluate for a Risk Condition change, the scenario should have the necessary new risk level and protected equipment. N/A

4. If the scenario is a training scenario it should contain the following:

   If this is a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.

5. Scenario initial conditions:

   a. The unit is operating at rated power, middle of core life, with BPV EHC pump A OOS to replace the pump impeller. RCIC suction is aligned to the Suppression Pool to support work on the RCIC Storage Tank suction piping. The online risk level is GREEN.

6. Turnover Information:

   a. The unit is operating at rated power, middle of core life, with BPV EHC pump A OOS to replace the pump impeller. RCIC suction is aligned to the Suppression Pool to support work on the RCIC Storage Tank suction piping. The online risk level is GREEN.

7. Event narratives :

   a. This scenario allows the crew to perform EOP-1, RPV CONTROL, following a turbine trip with bypass valve and SRV failure, using alternate pressure control methods. Feedwater remains available to provide makeup to the reactor vessel.

   b. A main turbine trip occurs from full power and initiates a reactor scram. The turbine bypass valves fail to open to control reactor pressure. Reactor pressure increases when the turbine trips and initially the crew controls RPV/P using SRVs. RCIC may also be started and used for pressure control. However, if RCIC injection occurs, the TDRFPs trip and makeup to the RPV is from the Motor Driven Feedwater pump.

   c. When Div. 1 and Div. 2 125 VDC buses trip, the SRVs and RCIC become unavailable for RPV/P control.

   d. The crew enters and performs the actions of CPS No. 4401.01, EOP-1 RPV CONTROL, and CPS No. 4100.01, REACTOR SCRAM. The CRS marks EOP Flow Charts and directs crew actions.

   e. The crew identifies failure of the turbine bypass valves and SRVs to control RPV/P and performs actions as directed by the CRS to stabilize RPV/P using additional alternate pressure control methods.

SCENARIO OUTLINE (Continued)

f. The CRS enters CPS No. 4411.09, RPV PRESSURE CONTROL SOURCES, and directs crew actions to control RPV pressure using alternate pressure control methods (RFPTs, MSL Drains, and RWCU). RWCU system interlocks may be defeated in accordance with CPS No. 4110.00C005, DEFEATING RWCU INTERLOCKS, to allow use of the RWCU system for pressure control.

g. The crew begins normal RPV depressurization and establishes a cool-down rate of <100°F/hr.

The scenario may be terminated when RPV pressure and level is being controlled within the designated bands and the crew has established normal RPV cooldown, or, at the discretion of the Floor Instructor

8. Technical Specification/Reportability calls: None
9. EAL/PAR or any on-site protective action (such as site evacuation). None
10. If this is a training scenario and additional material is needed, detail what additional material will be required. None
11. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. N/A
12. Scenario termination criteria:

    The scenario may be terminated when RPV pressure and level is being controlled within the designated bands and the crew has established normal RPV cooldown, or, at the discretion of the Floor Instructor
13. Approximate Scenario Runtime: 45 minutes
14. Related OPEX: See Attachment 1

LESSON PLAN HISTORY PAGE

REV.	DESCRIPTION
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 3.
01	Revised to update task links per TRACER 2004-05-0142A.
02	Revised to include updated Tasks. Rebuilt simulator scenario file.
003	Updated to latest template. Minor Revision.

REFERENCES

- CPS No. 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS No. 4100.01, REACTOR SCRAM
- CPS No. 4401.01, EOP-1, RPV CONTROL
- CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. CPS No. 4100.01, REACTOR SCRAM
2. CPS No. 4401.01, EOP-1 RPV CONTROL
3. CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES

CPS SIMULATOR EXERCISE GUIDE

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Scenarios.

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE). An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation (OBE).

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
Given CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES, perform RPV Pressure Control Sources using Abnormal System Lineup/Operation (441109.02)	441109.01	CRS ARO BRO	
Given CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES place RCIC in pressure control.	441109.03	ARO BRO	
Given CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES use SRV for pressure control	310101.06 441109.07	ARO BRO	
Given CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES place RFPT in pressure control	441109.06	ARO BRO	
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), perform a Manual RCIC Initiation with Logic Operable	331001.03	ARO BRO	
Given CPS No. 4411.09, EOP RPV PRESSURE CONTROL SOURCES place MSL Drains in pressure control.	441109.05	ARO BRO	
Given EOP-1 respond to a Reactor Pressure Vessel emergency event.	440101.01 4401109.04 441000.04 441000.06 100509.03 100509.04 100509.05 100509.06 100509.07	CRS ARO BRO	
Control RPV water level in accordance with CPS 441103 while in EOP-1.	441103.01 441103.09 440101.03	ARO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

CPS identified scenario dependent crew critical tasks are in **BOLD FACE**.

1. Perform immediate operator actions on a reactor scram.
2. Verify shutdown criteria are met.
3. Use normal injection methods to control RPV/L in the designated band.
4. Use alternate RPV pressure control methods to control RPV/P in the designated band.

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

Operator Rounds – OP-AA-102-102
Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
Clearance & Tagging – OP-AA-109-101
Human Error Prevention – HU-AA-101
Self-Assessment/Continuous Improvement – LS-AA-126
Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – LS-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-133 or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson Plan SE-EOP-03
5. Execute simulator Lesson Plan SE-EOP-03.
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. (**CM-1**) If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: None
9. Equipment out of service: A Bypass EHC Pump
10. Non-standard paperwork required: NONE
11. Surveillances to provide: NONE
12. Flagging to be placed: NONE
13. Other: NONE

PRESSURE CONTROL WITHOUT BYPASS VALVES AND SRVS

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Initialize to an IC at rated power, middle of core life. Place the simulator in RUN. Open and execute simulator lesson SE-EOP-03. Provide the turnover sheet to the crew.	**CREW:** ❑ Walks down panels and conducts a shift turnover. **ARO:** ❑ Performs Scram Choreography (410001.01) ❑ Reports reactor scram ❑ Reports EOP-1 entry condition (RPV/P high and/or RPV/L low as applicable)
When the crew has taken the shift: **TRIGGER Remote 1:** YP_XMFTB_4983, Turbine Trip – TRUE, 40-sec. TD YP_XMFTB_4986, Loss of EHC Hydraulics (BPVs) – TRUE	❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ❑ Turns mode switch to SHUTDOWN ❑ Verifies reactor power is lowering ❑ Verifies shutdown criteria are met ❑ Controls RPV/L Level 3 (8.9 in.) to Level 8 (52 in.) (441103.09, 441101.01) ❑ Verifies turbine and generator trip ❑ Reports turbine bypass valves are not functioning **BRO:** ❑ Performs Scram Choreography (410001.01) ❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ❖ Announces reactor scram ❖ Announces containment and RCIC room evacuation ❖ Verifies all control rods full in

PRESSURE CONTROL WITHOUT BYPASS VALVES AND SRVS (Continued)

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
EOP direction is to stabilize RPV/P below 1065 psig. Observe the RO's communications allow them to maintain positive control of RPV/L and RPV/P. Verify the crew actuates the SRVs in the preferred sequence. When the crew is controlling RPV/P using SRVs after the first SRV is cycled, or at the discretion of the Floor Instructor: **TRIGGER MALFUNCTION (Remote 2):** YP_XMFTB_4041, 125 VDC Bus 1A Over current - TRUE YP_XMFTB_4042, 125 VDC Bus 1B Over current – TRUE Loss of 2 divisions of DC suggests some common mode failure	**CRS:** ❑ Enters CPS No. 4100.01, REACTOR SCRAM and directs crew actions (440101.01, 440101.02, 100509.03, 100509.04, 100509.06, 100509.07) ❑ Enters EOP-1 RPV CONTROL and directs: ▪ RPV/P control 800 – 1065 psig (441109.01) ▪ RPV/L Level 3 to Level 8 with FW (441103.09) ❑ Properly marks EOP-1 flowcharts ❑ Enters CPS No. 4411.09, RPV PRESSURE CONTROL SOURCES, and directs actions to control RPV/P 800 - 1065 psig using alternate pressure control methods. ▪ SRVs (441109.07) ▪ May direct RCIC manually started (initiated) (441109.03) ▪ MSL Drains (441109.05) ▪ RFPT (441109.06) **BRO:** ❑ Controls RPV/P 800 – 1065 using SRVs (in the preferred sequence) (310101.06, 441109.07) ❑ Places RCIC in service for RPV/P control as directed (331001.03, 441109.03) ❑ Places MSL Drains in service for pressure control (441109.05) ❑ Reports 125 VDC Bus 1A and 125 VDC Bus 1B trip ❑ Dispatches NLO to investigate 125 VDC Bus 1A and 1B trip **CREW:** Recognizes SRVs and RCIC is no longer available for RPV/P control

PRESSURE CONTROL WITHOUT BYPASS VALVES AND SRVS (Continued)

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
If directed to defeat RWCU interlocks: **TRIGGER FROM THE PENDING PAGE** YP_XREMT_737,EP105, RWCU Isolations – TRUE, 5-min. TD a. After the time delay times out, report as IMD: ***"The RWCU Interlocks in accordance with CPS No. 4410.00C005."*** The instructor should watch for band control. If a crew member goes out of band on a parameter, an out of band report should be made including what actions are being made to return to the assigned band. When the crew member returns the parameter to the assigned band, a report should be made that the parameter is now in band.	**CRS:** ❑ May direct IMD to defeat RWCU Interlocks in accordance with CPS No. 4410.00C005, DEFEATING RWCU INTERLOCKS (441000.06) ❑ Directs establishing a cool down rate of <100°F/hr. using alternate pressure control methods from the following systems if not previously used: ➢ RFPT ➢ RWCU ➢ Main Steam Line Drains
Observe the crew monitors and controls RPV/P to avoid uncontrolled overfeed to the RPV from the CD/CB system at RPV/P <650 psig Remind Crew SRV's will still open on Safety Function. Direct the CRS to declare the EAL classification. When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, or at the discretion of the Floor Instructor, place the simulator in **FREEZE** and inform the crew **"Training has control".** Facilitate a short crew self critique. Note any deficiencies for future training. Also monitor for signs of improvement in the remaining scenarios.	**ARO:** ❑ Controls RPV/L L-3 to L-8 using CD/CB/FW (441103.09) ❑ Begins normal cool down at <100°F/hr. using alternate pressure control methods as directed from: ➢ RFPT (441109.06) ➢ RT (441109.04) ➢ Main Steam Line Drains **CRS:** ❑ Declares the EAL Classification: None

OPEX

Quad Cities Unit 1 **1996-08-25 4:47 AM** **#161146**

Bypass Valves Open Unexpectedly During HPCI and RCIC Testing and Result in Manual Reactor Scram

Status: OE - No Equipment Involved - Event Final Complete
Last Updated: 1997-03-4 1:58 PM

Significance: Noteworthy Event

Abstract:
Bypass Valves Open Unexpectedly During HPCI and RCIC Testing and Result in Manual Reactor Scram

Recommended for Review By:

Lessons Learned Summary:

Work Practices - Work Group Unspecified / Unknown
Training / Qualification - Control Room Operator
Procedures and Documents - Control Room Operator

Event Summary:
Bypass Valves Open Unexpectedly During HPCI and RCIC Testing and Result in Manual Reactor Scram On August 25, 1996, with Unit 1 operating in startup at 4 percent power, the turbine bypass valves automatically opened unexpectedly decreasing reactor pressure and increasing reactor level. With reactor level increasing toward a previously discussed level for manually scramming the reactor, the operators inserted a manual reactor scram. All plant equipment responded normally to the transient. The operators had stopped increasing power with reactor pressure indicating approximately 115 psig in order to conduct high pressure coolant injection and reactor core isolation cooling turbine overspeed testing. At the same time, the mechanical vacuum pump was operating to establish a vacuum in the main condenser. The procedure for the overspeed testing directed the EHC pressure regulator be set to control reactor pressure less than 150 psig. It was assumed that control below 150 psig (the low-end of the pressure regulator scale) was possible because the regulator had a motor stop below the scale (150 psig) but above 130 or 135 psig. Actually, control below 150 psig indicated was only possible because of calibration limitations (inaccuracies) at low pressure. Consequently, the operators set the EHC pressure regulator "below" 150 psig (ran it down to the low peg and held the lower control for several more seconds). At the same time, the actual reactor pressure was greater than 115 psig, as indicated (more so on one channel than the other). As a result, the pressure regulator was set to control less than reactor pressure and bypass valves opened when sufficient vacuum was established in the main condenser to satisfy a bypass valve permissive. When bypass valves opened, reactor pressure decreased and reactor vessel level increased. In their pre-evolution briefing, the crew had discussed manually scramming the reactor if vessel level increased to 44 inches, and they took this action when plant conditions warranted.

OPEX (Continued)

The procedure assumed the EHC pressure regulator would control below 150 psig, and simulator training with the procedure reinforced that assumption. When some of the operators questioned why the procedure "worked," they were not told about the calibration inaccuracies. This event is NOT SIGNIFICANT. The operators were following an approved procedure and performing the test with the appropriate administrative controls. The event is NOTEWORTHY because the basis for observed plant behavior was not understood by the operators nor by the majority of station personnel involved with the test procedure or training on the test procedure.

Cause Summary:

Corrective Action Summary:

Event Type:

Operational Consequence - Scram or Plant Transient
International Severity - 0. No Safety Significance
Regulatory Reporting Consequence - Licensee Event Report (LER)

TURNOVER

1. Power, xenon and time in life: Full power middle, stable xenon, and middle of core life

2. Status of Tagged Out Equipment:

   a. BPV EHC Pump A OOS to replace the pump impeller.

   b. RCIC suction is aligned to the Suppression Pool to support work on the RCIC Storage Tank suction piping. The online risk level is GREEN.

3. Shift conditions: Day Shift

4. Weather Conditions: Clear & Sunny

5. Thermal Limit Problems or Concerns: None

   LCOs in effect: None

6. Surveillances / Jobs in progress: None

7. Upcoming Jobs: None

8. Risk Level: Green

9. Dose equivalent Iodine 131 is reading 1.5 E-6 μcuries per gram.

10. Other: None

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.

Exelon Generation.

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-04

EOP-1 RPV CONTROL
LOSS OF FEEDWATER WITH HIGH PRESSURE MAKEUP AVAILABLE

REVISION 004

REVISED / DEVELOPED BY: Russ Bedford

REVIEWED / APPROVED BY: Daniel Snook /S/ / 06/05/14
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SRRS 3D.126/3D.111: Retain approved lessons for life of plant OR Life of Insurance Policy + 1 Yr for RP lesson plans. May be retained in department for two years, then forwarded to Records Management.

SCENARIO OUTLINE

1. The purpose of this scenario is to train ILT students on the use of EOP-1, in particular the level leg when Feedwater in not available for injections.

2. This is a **TRAINING OR EVALUATION SCENARIO.**

3. If a conditions changes such that it would be expected the crew would evaluate for a Risk Condition change, the scenario should have the necessary new risk level and protected equipment. N/A

4. If the scenario is used as a training scenario it should contain the following:

   If this is used as a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.

5. Scenario initial conditions: Full power, middle of core life with no equipment out of service and Risk level is Green.

6. Turnover Information: Full power, middle of core life with no equipment out of service.

7. Event narratives:

   a. This scenario allows the crew to perform EOP-1, RPV CONTROL, following a loss of Feedwater, using normal pressure control methods and preferred injection systems (other than Feedwater).

   b. The turbine bypass valves operate normally and control reactor pressure. Reactor pressure initially increases when the turbine trips, then approaches the EHC pressure set value following the scram and as decay heat is removed.

   c. A simultaneous trip of all running Condensate pumps, resulting in a total loss of Feedwater and a reactor scram due to low RPV/L.

   d. The crew enters and performs the actions of CPS No. 4401.01, EOP-1 RPV CONTROL, and CPS No. 4100.01, REACTOR SCRAM. The CRS marks EOP Flow Charts and directs crew actions.

   e. The CRS directs crew actions in accordance with the LEVEL leg of EOP-1 to restore and control RPV/L using any of the available preferred injection systems. When RCIC is started, it trips. The crew has the RCIC Turbine Trip reset and then aligns RCIC for injection.

   f. When RPV/L and RPV/P have been stabilized within the designated control bands the crew begins normal RPV depressurization and establishes a cool-down rate of <100°F/hr.

8. Technical Specification/Reportability calls. None.

9. EAL/PAR or any on-site protective action (such as site evacuation). None

10. If this is used as a training scenario and additional material is needed, detail what additional material will be required. None

SCENARIO OUTLINE (Continued)

11. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. None
12. Scenario termination criteria: The scenario may be terminated when RPV pressure and level are being controlled within the designated bands.
13. Approximate Scenario Runtime: 45 minutes
14. Related OPEX: See Attachment 1

CPS SIMULATOR EXERCISE GUIDE

LESSON PLAN HISTORY PAGE

REV.	DESCRIPTION
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 4.
01	Revised to up date task links per TRACER 2004-05-0142A.
02	Revised to add tasks. Rebuilt Simulator File. Removed the leak on the RCIC turbine to eliminate conflict with EOP-8, which the crew may not have been trained on yet. The focus for this scenario is EOP-1. Rebuilt the simulator file.
003	Updated to latest template. Minor Revision.
004	Revised to allow use as an Evaluation scenario. Minor Revision.

REFERENCES

- HU-AA-104-101, PROCEDURE USE AND ADHERANCE
- CPS No. 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS No. 4100.01, REACTOR SCRAM
- CPS No. 4401.01, EOP-1, RPV CONTROL
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. CPS No. 4100.01, REACTOR SCRAM
2. CPS No. 4401.01, EOP-1 RPV CONTROL

CPS SIMULATOR EXERCISE GUIDE

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Scenarios.

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE) or other evaluations. An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: **Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation (OBE) or other evaluations.**

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
Given CPS No. 3309.01, HIGH PRESSURE CORE SPRAY (HPCS), perform Manual HPCS Initiation with Logic Operable	330901.02	ARO BRO	
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), perform a Manual RCIC Initiation with Logic Operable	331001.03	ARO BRO	
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), Redirect RCIC Flow to the RCIC Storage Tank	331001.09	ARO BRO	
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), perform RCIC System Shutdown with Initiation Signal Present (331001.07)	331001.07	ARO BRO	
Given a loss of Feed water event control the RPV in accordance with EOP-1	440101.01 440101.02 440101.03 100509.03 100509.04 100509.05 100509.06 100509.07	CRS ARO BRO	
Given a loss of Feed water and Condensate control RPV water level in accordance with CPS 4411.03.	441103.01 441103.11	CRS ARO BRO	
Given and EOP-1 condition throttle ECCS flow in accordance with CPS 4411.04	441104.01	CRS	
Given lowering RPV water level and entry into EOP-1 verify automatic isolations.	100509.09	CRS	
Given lowering RPV water level and entry into EOP-1 verify automatic ECCS Pump starts	100509.10	ARO BRO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

CPS identified scenario dependent crew critical tasks are in **BOLD FACE**.

1. Perform immediate operator actions on a reactor scram.
2. Verify shutdown criteria are met.
3. Use preferred injection systems to control RPV/L in the designated band.
4. Use normal RPV pressure control methods to control RPV/P in the designated band.

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

Operator Rounds – OP-AA-102-102
Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
Clearance & Tagging – OP-AA-109-101
Human Error Prevention – HU-AA-101
Self-Assessment/Continuous Improvement – PI-AA-126
Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – PI-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-01 or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson Plan SE-EOP-04.
5. Execute simulator Lesson Plan SE-EOP-04.
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. **(CM-1)** If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: None
9. Equipment out of service: None
10. Non-standard paperwork required: None
11. Surveillances to provide: None
12. Flagging to be placed: None
13. Other: None

LOSS OF FEEDWATER

When the crew has taken the shift **TRIGGER MALFUNCTION: (Remote 1) to trip all Condensate Pumps:** **YP_XMFTB_4068 1** –trips "A" CD Pump **YP_XMFTB_4069 1**- trips "B" CD Pump **YP_XMFTB_4070 1**- trips "C" CD Pump **YP_XMFTB_4071 1**- trips "D" CD Pump	**ARO:** ❑ Reports all CD pumps tripped, loss of all Feed water ❑ Reports RPV/L rapidly lowering ❑ Inserts a manual scram, OR, reports reactor scram ❑ Performs Scram Choreography ❑ Reports EOP-1 entry condition (RPV/L low) ❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ▪ Turns mode switch to SHUTDOWN ❖ Verifies reactor power is lowering ❖ Verifies shutdown criteria are met ❖ Verifies turbine and generator trip **BRO:** ❑ Performs Scram Choreography ▪ Announces reactor scram ▪ Verifies all control rods full in **CRS:** ❑ Enters CPS No. 4100.01, REACTOR SCRAM and directs crew actions ❑ Enters EOP-1 RPV CONTROL:(440101.01, 440101.02, 100509.03, 100509.04, 100509.05, 100509.06, 100509.07) ▪ Directs ARO to control RPV/P 800 – 1065 psig using bypass valves ▪ Enters CPS No. 4411.03, INJECTION/FLOODING SOURCES, and directs B RO to control RPV/L L3 to L8 using available preferred injection systems (RCIC/HPCS) (441103.01, 440101.03) ❑ Properly marks EOP-1 flowcharts

<table>
<tr>
<td>
Watch for Crew's ability to maintain band control with RPV Water Level
When asked reset RCIC turbine trip TRIGGER REMOTE 2:
YP-XMFTB_4960 0
and report, "The RCIC turbine has been reset."
If asked to throttle HPCS Injection valve TRIGGER FROM THE PENDING PAGE:
YP_XREMT 755 HPCS injection valve throttlable
If asked to bypass RD suction filters and cycle RD Pump discharge valve close and open TRIGGER FROM PENDING PAGE.
</td>
<td>
CRS:
❑ Directs automatic isolations and ECCS pumps starts verified. (100509.09 & 100509.10)
ARO:
❑ Verifies turbine bypass valves are automatically controlling RPV/P 800 – 1065 psig
CRS:
❑ Directs HPCS made throttable in accordance with CPS 4411.04 (441104.01)
BRO:
❑ Attempts to manually start RCIC (331001.03) and/or HPCS (330901.02) and controls RPV/L L3 to L8 as directed

Cycles HPCS Injection Valve to assist RCIC in level control and controls level using RCIC
Recognizes RCIC trip and dispatches NLO to reset the trip
Redirects RI flow to the RI storage tank as necessary (331001.09)

❑ Verifies automatic isolations and ECCS Pump starts (100509.09 & 100509.10)
CRS:
❑ Directs RD lined up for injection in accordance with CPS 4411.03, INJECTION/FLOODING SOURCES (441103.11)
❑ Directs establishing a cool down rate of <100°F/hr. using
❑ turbine bypass valves in accordance with EOP-1
❑ Directs establishing a cool down rate of <100°F/hr. using turbine bypass valves in accordance with EO
</td>
</tr>
</table>

When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, or at the discretion of the Floor Instructor, place the simulator in **FREEZE** and inform the crew **"Training has control".**	**ARO:** ❑ Begins normal cool down at <100°F/hr. using turbine bypass valves **CRS:** ❑ Declares the EAL Classification: None

OPEX

Diablo Canyon Unit 1 **1990-02-20 5:30 AM** **#91063**

MANUAL REACTOR TRIP DUE TO MAIN FEEDWATER PUMPS TRIPPING DUE TO UNKNOWN CAUSE

Status: OE - No Equipment Involved - Event Final Complete
Last Updated: 1995-10-02 9:35 AM

Significance: Noteworthy Event

Abstract:
MANUAL REACTOR TRIP DUE TO MAIN FEEDWATER PUMPS TRIPPING DUE TO UNKNOWN CAUSE

Recommended for Review By:

Lessons Learned Summary:
Work Practices - I&C Maintenance

Event Summary:
MANUAL REACTOR TRIP DUE TO MAIN FEEDWATER PUMPS TRIPPING DUE TO UNKNOWN CAUSE BACKFIT EVENT
ON FEBRUARY 20 , 1990 , AT 0530 PST , WITH UNIT 1 OPERATING AT 100 PERCENT POWER , PLANT OPERATORS INITIATED A MANUAL REACTOR TRIP AFTER BOTH MAIN FEEDWATER PUMPS (MFPS) HAD TRIPPED . PLANT OPERATORS INITIATED ACTIONS PER PLANT PROCEDURES AND STABILIZED THE UNIT IN MODE 3 (HOT STANDBY) AT 0600 PST . A DETAILED INVESTIGATION WAS PERFORMED USING INFORMATION FROM ALL EVENT RECORDERS AND INTERVIEWS WITH PERSONNEL INVOLVED . THIS INVESTIGATION CONCLUDED THAT THE IMMEDIATE CAUSE OF THE EVENT WAS ALL MAIN FEEDWATER CONTROL VALVES TRIPPING SHUT WHICH CAUSED BOTH MFPS TO TRIP ON HIGH DISCHARGE PRESSURE. THE INVESTIGATION CONCLUDED THAT THE MOST PROBABLE CAUSE OF THE VALVES TRIPPING CLOSED WAS EITHER A NON-REPEATABLE SOLID STATE PROTECTION SYSTEM (SSPS) CARD FAILURE OR AN INADEVERTENT ACTUATION CAUSED BY INSTRUMENTATION AND CONTROLS (I&C) TECHNICIANS WORKING IN THE SSPS RACKS . IMMEDIATE CORRECTIVE ACTIONS INCLUDED EXTENSIVE TESTING AND INSPECTION OF THE SSPS TO DETERMINE THE ROOT CAUSE , REPLACEMENT OF THE TWO SUSPECT SSPS CARDS AND A CAUTIONARY TAILBOARD OF I&C TECHNICIANS REGARDING THE POTENTIAL HAZARDS ASSOCIATED WITH SSPS TESTING .
A SSPS CARD FAILURE OR AN INADVERTENT ACTUATION CAUSED BY 18C TECHNICIANS CAUSE ALL MAIN FEEDWATER CONTROL VALVES TRIPPING SHUT WHICH CAUSED BOTH MFPS TO TRIP ON HIGH DISCHAGRE PRESSURE AND A MANUAL REACTOR TRIP INITIATED . THE FAILED CARD HAVE BEEN REPLACED AND THE 18C TECHNICIANS TRAINED .

TURNOVER

1. Full Power, stable xenon and middle of core life.
2. Status of Tagged Out Equipment: None
3. Shift conditions: *Day Shift*
4. Weather Conditions: *Clear & Sunny*
5. Thermal Limit Problems or Concerns: None

   LCOs in effect: *None*
6. Surveillances / Jobs in progress: None
7. Upcoming Jobs: None
8. Risk Level : *Green*
9. Dose equivalent Iodine 131 is reading 1.5 E-6 μcuries per gram.
10. Other: None

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.

Exelon Nuclear

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-05

EOP-1 RPV CONTROL
LOSS OF FEEDWATER WITH HIGH PRESSURE MAKEUP NOT AVAILABLE

REVISION 003

REVISED / DEVELOPED BY: Carl Leach

REVIEWED / APPROVED BY: Daniel Snook /S/
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision DLS /S/ / 02/21/13
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SCENARIO OUTLINE

1. The purpose of this scenario is to train ILT Students on EOP-1 in particular controlling RPV water level with alternate injection systems.
2. This is a **TRAINING SCENARIO.**
3. If a conditions changes such that it would be expected the crew would evaluate for a Risk Condition change, the scenario should have the necessary new risk level and protected equipment. N/A
4. If the scenario is a training scenario it should contain the following:

   If this is a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.
5. Scenario initial conditions: Full power, middle of core life, with D CD pump out of service and Risk Conditions are Green.
6. Turnover Information: Full power, D CD Pump out of service, Risk Conditions are Green.
7. Event narratives:
   a. This scenario allows the crew to perform EOP-1, RPV CONTROL, following a loss of Feedwater, using normal pressure control methods and preferred injection systems to control RPV/L.

   b. A simultaneous trip of all running Condensate pumps, resulting in a total loss of Feedwater and a reactor scram due to low RPV/L. The operator may insert a manual scram before RPV/L reaches the scram setpoint.

   c. The turbine bypass valves operate normally and control reactor pressure. Reactor pressure initially increases when the turbine trips, then approaches the EHC pressure set value following the scram and as decay heat is removed.

   d. The crew enters and performs the actions of CPS No. 4401.01, EOP-1 RPV CONTROL, and CPS No. 4100.01, REACTOR SCRAM. In performing the immediate scram actions the operator identifies and reports one control rod did not fully insert.

   e. The CRS marks EOP Flow Charts and directs crew actions in accordance with the LEVEL leg of EOP-1 to restore and control RPV/L using any of the available preferred injection systems. Starting the standby CRD pump and opening the suction filter bypass valve maximize CRD injection.

   f. When preferred injection systems are used, RCIC fails to automatically start and when manually started the RCIC turbine trips. The HPCS pump fails to automatically start. When it is manually started the pump uncouples. Attempts to manually initiate RCIC and HPCS should be performed before lowering RPV/L reaches to Level 2.

SCENARIO OUTLINE (Continued)

g. After the crew maximizes CRD injection and injects with SLC the RCIC turbine trip is reset. The operator manually starts the RCIC system. The HPCS injection valve breaker is reset and the operator cycles the injection valve as necessary to assist the RCIC and CRD systems in maintaining RPV/L within the designated band.

h. When RPV/L and RPV/P have been stabilized within the designated control bands the crew begins normal RPV depressurization and establishes a cool-down rate of <100°F/hr.

8. Technical Specification/Reportability calls: None

9. EAL/PAR or any on-site protective action (such as site evacuation): None .

10. If this is a training scenario and additional material is needed, detail what additional material will be required: None

11. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. None

12. Scenario termination criteria: The scenario may be terminated when RPV pressure and level are being controlled within the designated bands and the crew has established normal RPV cooldown conditions, or, at the discretion of the Floor Instructor.

13. Approximate Scenario Runtime: 45 minutes

14. Related OPEX: See Attachment 1

CPS SIMULATOR EXERCISE GUIDE

LESSON PLAN HISTORY PAGE	
REV.	**DESCRIPTION**
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 5.
01	Revised to update task links per TRACER 2004-05-0142A.
02	Revised to add new tasks. Rebuilt Simulator File.
003	Updated to latest template. Minor Revision.

REFERENCES

- HU-AA-104-101, PROCEDURE USE AND ADHERANCE
- CPS No. 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS No. 4100.01, REACTOR SCRAM
- CPS No. 4401.01, EOP-1, RPV CONTROL
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. CPS No. 4100.01, REACTOR SCRAM
2. CPS No. 4401.01, EOP-1 RPV CONTROL

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Scenarios

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE). An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation (OBE).

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), respond to RCIC System Automatic Initiation	331001.02	ARO BRO	
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), perform a Manual RCIC Initiation with Logic NOT Operable	331001.03	ARO BRO	
Given CPS No. 3309.01, HIGH PRESSURE CORE SPRAY (HPCS), perform Manual HPCS Initiation with Logic Operable	330901.02	ARO BRO	
Given CPS No. 3310.01, REACTOR CORE ISOLATION COOLING (RI), perform RCIC Restart with Initiation Signal Present (331001.08)	331001.08	ARO BRO	
Given CPS No. 3309.01, HIGH PRESSURE CORE SPRAY (HPCS), manually initiate HPCS with Logic NOT Operable (330901.03)	330901.03	ARO BRO	
Given a loss of Feed water event control the RPV in accordance with EOP-1	440101.01 440101.02 440101.03 441103.01 100509.03 100509.04 100509.05 100509.06 100509.07 100509.11	CRS ARO BRO	
Given a loss of Feed water and Condensate control RPV water level in accordance with CPS 4411.03 using CRD.	441103.11	ARO BRO	
Given and EOP-1 condition throttle ECCS flow in accordance with CPS 4411.04	441104.01	CRS	
Given lowering RPV water level and entry into EOP-1 verify automatic isolations	100509.09	CRS ARO BRO	

CPS SIMULATOR EXERCISE GUIDE

Evolution	Objective #	Position	Requirement Met
Given lowering RPV water level and entry into EOP-1 verify automatic ECCS Pump starts	100509.10	CRS ARO BRO	
Given lowering RPV water level and entry into EOP-1 verifies automatic start of DGs.	100509.11	CRS BRO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

CPS identified scenario dependent crew critical tasks are in **BOLD FACE**.

1. Perform immediate operator actions on a reactor scram
2. Verify shutdown criteria are met
3. Use preferred injection systems to control RPV/L in the designated band
4. Use normal RPV pressure control methods to control RPV/P in the designated band

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

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Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
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Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – LS-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-01 or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson Plan SE-EOP-05
5. Execute simulator Lesson Plan SE-EOP-05
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. (**CM-1**) If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: D Condensate Pump
9. Equipment out of service: D Condensate Pump
10. Non-standard paperwork required: None
11. Surveillances to provide: None
12. Flagging to be placed: None
13. Other: None

LOSS OF HIGH PRESSURE INJECTION SOURCES (FW, RI, HP)

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
❖ When the crew has taken the shift **TRIGGER MALFUNCTION: (Remote 1):** **FW01A (B, C, D)**, Condensate Pump 1A, (B, C, D) Trip – **TRUE** **Rod 20-25 Stuck at Current Position**	**ARO**: ❑ Reports all CD pumps tripped, loss of all Feed water. ❑ Reports RPV/L rapidly lowering. ❑ Inserts a manual scram, OR, reports reactor scram. ❑ Performs Scram Choreography ❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ▪ Turns mode switch to SHUTDOWN ❖ Verifies reactor power is lowering ❖ Verifies shutdown criteria are met ❖ Report one control rod not fully inserted (rod ID and position) ❖ Verifies turbine and generator trip ❖ Reports EOP-1 entry condition (RPV/L low) **BRO:** ❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ▪ Announces reactor scram ▪ Announces containment and RCIC room evacuation and MDRFP may start ❑ Confirms one control rod is not fully inserted (rod ID and position) **CRS**: ❑ Enters CPS No. 4100.01, REACTOR SCRAM and directs crew actions ▪ Directs ARO to attempt to insert/scram the stuck control rod in accordance with CPS No. 4100.01, REACTOR SCRAM

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
	CRS: ❑ Enters EOP-1 RPV CONTROL: (440101.01, 440101.02, 100509.03, 100509.04, 100509.05, 100509.06, 100509.07) ▪ Directs ARO to control RPV/P using bypass valves ▪ Enters CPS No. 4411.03, INJECTION/FLOODING SOURCES, and directs B CRO to control RPV/L L3 to L8 using available preferred injection systems (RCIC and HPCS) (441103.01) 440101.03) ▪ Directs crew to verify needed automatic actions ❑ Properly marks EOP-1 flowcharts
Ensure Crew maintains RPV Level in and given by CRS and reports anytime outside the band.	**CREW:** ❑ Verifies needed automatic actions ▪ Isolations (100509.09) ▪ ECCS Start (100509.10) ▪ Diesel Generators Start (100509.11) ❑ Dispatches NLO to verify proper operation of the DGs
	ARO: ❑ Verifies turbine bypass valves are automatically controlling RPV/P <1065 psig (or as directed by the CRS) ❑ Attempts to insert/scram the stuck control rod in accordance with CPS No. 4100.01, REACTOR SCRAM, as directed

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
❖ RI and HP should be initiated before RPV/L reaches L2 ❖ HP Injection Valve fails when 1E22-F004 red status light comes on OR when its control switch is placed in OPEN. This is a key RO action for level restoration! ❖ Observe BRO holds the RCIC initiation pushbutton depressed for 6 sec. ❖ As the NLO report: ***"The HPCS Pump appears to be uncoupled."*** ❖ RI Turbine trips when 1E51-F013 green status light extinguishes. ❖ As the NLO report: ***"The RCIC turbine mechanical over speed trip device is tripped."*** ❖ If directed to reset the RCIC turbine trip **TRIGGER MALFUNCTION/REMOTE**: (Remote 2): **RI02**, RCIC Turbine Trip – FALSE (DELETE) RCIC Turbine Mechanical Reset – TRUE, 10-sec. TD ➢ Report as the NLO: ***"The RCIC Turbine trip is reset."*** ❖ When directed to open the CRD Suction Filter Bypass valves **TRIGGER FROM THE PENDING PAGE** **LC107**, CRDH Suction Filters - TRUE ➢ As NLO report: ***"The CRD Suction Filter Bypass valves are open."***	**BRO:** ❑ Initiates HPCS and cycles Injection Valve to assist RCIC in level control and controls level using RCIC (330901.02) ▪ Reports HPCS injection valve will not open ▪ Dispatches NLO to investigate ❑ Manually initiates RCIC (331001.03) ▪ Holds RCIC Initiation Button depressed for 6 sec. until steam supply valve starts open ▪ Reports RCIC turbine trip **BRO**: ❑ Dispatches NLO to investigate RCIC turbine trip ❑ If directed by CRS, directs NLO to reset the RCIC turbine trip ❑ If RCIC and HPCS are not manually initiated before RPV/L low L2, reports: ▪ RCIC failed to automatically start (331001.02) ▪ HPCS pump failed to start ❖ Manually starts HPCS.(330901.03) ❑ Reports the injection valve (1H22-F004) will not open **CRS**: Directs maximizing CRD injection in accordance with CPS No. 4411.03, INJECTION/FLOODING SOURCES (441103.11) **BRO:** ❑ Starts second CRD pump (441103.11) ▪ As time permits, dispatches NLO to verify proper operation of the CRD pump just started ❑ Directs NLO to open the CRD Suction Filter Bypass Valves

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
❖ Observe the operator does not change the 600-gpm set point until after RCIC flow stabilizes at 600 gpm. ❖ If IMD is directed to defeat RCIC Interlocks, **TRIGGER FROM THE PENDING PAGE**: **EP107B**, RCIC Isolations – TRUE, 5-min. TD ➢ After time delay times out, report as IMD: ***"RCIC isolation interlocks are defeated."*** ❖ If IMD is directed to defeat HPCS Interlocks, **TRIGGER FROM THE PENDING PAGE:** **EP109**, High RPV Level HPCS Isolation – TRUE, 5-min. TD ➢ After time delay times out, report as IMD: ***"HPCS High RPV level interlock is defeated*** ❖ If directed to couple the HPCS Pump **DELETE MALFUNCTION** for HPCS Pump uncoupled. ➢ Report as the Maintenance: ***"HPCS Pump is coupled."*** "	**CRS**: ❑ Directs BRO to start RCIC after RCIC turbine is reset ❑ May direct SLC injected to RPV **BRO:** ❑ Starts RCIC as directed (331001.08) **CRS**: ❑ May direct IMD to defeat RCIC Interlocks (if necessary) in accordance with CPS No. 4410.00C001, DEFEAT RCIC INTERLOCKS ❑ May direct IMD to defeat HPCS RPV high level isolation interlock in accordance with CPS No. 4410.00C002, DEFEATING HPCS INTERLOCKS ❑ May direct resetting the HPCS F004 valve breaker . **BRO:** ❑ Directs the NLO to reset the HPCS F004 valve breaker
	CRS: ❑ Directs using HPCS to aid in controlling Reactor level

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
	BRO: ❑ Cycles HPCS Injection (F004) valve to assist in RPV level control and controls RPV level using RCIC and CRD ❑ May direct making HPCS F004 valve throttlable. (441104.01) **CRS:** ❑ Directs establishing a cool down rate of <100°F/hr. using turbine bypass valves in accordance pressure leg of EOP-1. **ARO:** Begins normal cool down at <100°F/hr. using turbine bypass valves
When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, or at the discretion of the Floor Instructor, place the simulator in **FREEZE** and inform the crew **"Training has control".**	**CRS:** ❑ Declares the EAL Classification: None

OPEX

Power Reactor	*Event Number:* ***48696***
Facility: **NINE MILE POINT** Region: 1 State: NY Unit: [ ] [2] [ ] RX Type: [1] GE-2,[2] GE-5 NRC Notified By: MARK GREER HQ OPS Officer: VINCE KLCO	Notification Date: 01/23/2013 Notification Time: 22:03 [ET] Event Date: 01/23/2013 Event Time: 15:16 [EST] Last Update Date: 01/23/2013
Emergency Class: NON EMERGENCY 10 CFR Section: 50.72(b)(3)(v)(A) - POT UNABLE TO SAFE SD 50.72(b)(3)(v)(D) - ACCIDENT MITIGATION	Person (Organization): MARC FERDAS (R1DO)

Unit	SCRAM Code	RX CRIT	Initial PWR	Initial RX Mode	Current PWR	Current RX Mode
2	N	Y	100	Power Operation	100	Power Operation

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CONCURRENT LOSS OF HIGH PRESSURE REACTOR MAKEUP SYSTEMS CAPABILITY

On 1/23/2013 at 1516 [EST], Nine Mile Point 2 (NMP2) had a failure of a Reactor Building General Area temperature trip unit occur resulting in the closure of an isolation valve on the Reactor Core Isolation Cooling (RCIC) system steam supply line. Concurrent with this failure, the High Pressure Core Spray (HPCS) system was inoperable for planned surveillance testing. With both the RCIC and HPCS systems inoperable, NMP2 entered a Technical Specification Required Action to be in Mode 3 within 12 hours. At 1550, the HPCS system was restored to OPERABLE. Based on the concurrent loss of the high pressure reactor makeup capability of these two systems, it was determined that the condition is reportable under section 50.72(b)(3)(v) as the following safety functions were impacted: (A) Shutdown the reactor and maintain it in a safe shutdown condition; and (D) Mitigate the consequences of an accident.

NMP2 remains in a stable condition at rated power. The offsite grid is stable with no restrictions or warnings in effect.

The licensee notified the NRC Resident Inspector.

TURNOVER

1. Full Power, stable xenon and middle of core life:
2. Status of Tagged Out Equipment: D CD Pump motor replacement expected back in service in 2 days
3. Shift conditions: Day Shift
4. Weather Conditions: Clear & Sunny
5. Thermal Limit Problems or Concerns: None

   LCOs in effect: None
6. Surveillances / Jobs in progress: None
7. Upcoming Jobs: None
8. Risk Level: Green
9. Dose equivalent Iodine 131 is reading 1.5 E-6 μcuries per gram.
10. Other: None

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.

Exelon Nuclear

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-06

EOP-1 RPV CONTROL
LOSS OF ALL HIGH PRESSURE MAKEUP

REVISION 003

REVISED / DEVELOPED BY: Carl Leach

REVIEWED / APPROVED BY: Daniel Snook /S/
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision DLS /S/ / 02/21/13
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SCENARIO OUTLINE

1. The purpose of this scenario is to train ILT students on the use of EOP-1 and EOP-3 for RPV level that goes below TAF and allows them to blow down and restore RPV level with low pressure ECCS Systems.

2. This is a **TRAINING SCENARIO.**

3. If a conditions changes such that it would be expected the crew would evaluate for a Risk Condition change, the scenario should have the necessary new risk level and protected equipment. N/A

4. If the scenario is a training scenario it should contain the following:

   If this is a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.

5. Scenario initial conditions (to include initial plant Risk level). Full power, no equipment out of service. Risk Conditions are Green

6. Turnover Information: Full power, middle of core life, no equipment out of service with Risk Conditions Green.

7. Event narratives:

   a. This scenario allows the crew to perform EOP-1, RPV CONTROL, and EOP-3, EMERGENCY RPV DEPRESSURIZATION (BLOWDOWN), following a loss of all high pressure injection sources. Normal pressure control methods are used to control RPV/P. Preferred and alternate injection systems are used to control RPV/L.

   b. The running CRD pump trips and, when attempted, the standby CRD pump cannot be started.

   c. A simultaneous trip of all running Condensate pumps, resulting in a total loss of Feed water and a reactor scram due to low RPV/L. The operator may insert a manual scram before RPV/L reaches the scram set point.

   d. The turbine bypass valves operate normally and control reactor pressure. Reactor pressure initially increases when the turbine trips, then approaches the EHC pressure set value following the scram and as decay heat is removed.

   e. The crew enters and performs the actions of CPS 4401.01, EOP-1 RPV CONTROL, and CPS 4100.01, REACTOR SCRAM.

   f. The CRS marks EOP Flow Charts and directs crew actions in accordance with EOP-1 to restore and control RPV/L using any of the available preferred injection systems. When preferred injection systems fail the CRS makes preparation to use alternate injection systems.

   g. RCIC fails to automatically start. When manually started the turbine trips and damage to the trip mechanism prevents resetting the turbine trip. HPCS automatically starts then trips due to breaker failure.

SCENARIO OUTLINE (Continued)

h. The CRS directs aligning alternate injection systems to supply makeup to the RPV. The crew is unable to restore RPV/L and RPV/L drops below –162" (TAF). When RPV/L drops below TAF, the crew enters EOP-3, EMERGENCY RPV DEPRESSUIRZATION (BLOWDOWN).

i. When the RPV is depressurized injection from preferred and alternate injection systems restores RPV/L to the normal operating band. Two ADS Valves fail to open and the crew is forced to open two additional SRV's

The scenario may be terminated when RPV blow down has been performed and RPV/L is restored to normal band, or, at the discretion of the Floor Instructor.

8. Technical Specification/Reportability calls: None
9. EAL/PAR or any on-site protective action (such as site evacuation): None
10. If this is a training scenario and additional material is needed, detail what additional material will be required. None
11. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. None
12. Scenario termination criteria

    The scenario may be terminated when RPV blow down has been performed and RPV/L is restored to normal band, or, at the discretion of the Floor Instructor.

13. Approximate Scenario Runtime: 55 minutes
14. Related OPEX: See Attachment 1

CPS SIMULATOR EXERCISE GUIDE

LESSON PLAN HISTORY PAGE

REV.	DESCRIPTION
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 6.
01	Revised to include update of tasks per TRACER 2004-05-0142A.
02	Revised to add tasks. Rebuilt Scenario File, which removed the steam leak. Removed the alternate path Emergency Depressurization this was used for a new scenario.
003	Updated to latest template. Minor Revision.

REFERENCES

- HU-AA-104-101, PROCEDURE USE AND ADHERANCE
- CPS 1005.09, EMERGENCY OPERATING PROCEDURE (EOP) AND SEVERE ACCIDENT GUIDELINE (SAG) PROGRAM
- CPS 4100.01, REACTOR SCRAM
- CPS 4401.01, EOP-1, RPV CONTROL
- CPS 4407.01, EOP-3, EMERGENCY RPV DEPRESSURIZATION (BLOWDOWN)
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. CPS 4100.01, REACTOR SCRAM
2. CPS 4401.01, EOP-1 RPV CONTROL
3. CPS 4407.01, EOP-3, EMERGENCY RPV DEPRESSURIZATION (BLOWDOWN)

CPS SIMULATOR EXERCISE GUIDE

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Scenarios.

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE). An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation.(OBE).

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
Given CPS 3312.01, RESIDUAL HEAT REMOVAL (RHR), respond to a LPCI Automatic Initiation	331201.02	ARO BRO	
Given CPS 3313.01, LOW PRESSURE CORE SPRAY (LPCS), respond to an Automatic Initiation of the LPCS System (331301.01)	331301.01	ARO BRO	
Given CPS 3101.01, MAIN STEAM (MS, IS & ADS), perform a manual ADS Initiation (310101.07)	310101.07	BRO	
Given CPS 4407.01, perform an Emergency RPV Depressurization (440701.01)	440701.01	CRS ARO BRO	
Given CPS 3312.01, RESIDUAL HEAT REMOVAL (RHR), perform a LPCI Shutdown (331201.05)	331201.05	ARO BRO	
Given CPS 3313.01, LOW PRESSURE CORE SPRAY (LPCS), perform a LPCS Shutdown with Initiation Signal Clear (331301.04)	331301.04	ARO BRO	
Respond to a Reactor Pressure Vessel Control Emergency in accordance with EOP-1	440101.01 440101.02 100509.03 100509.04 100509.05 100509.06 100509.07 100509.08	CRS ARO BRO	
Given a condition with a failure of high pressure makeup systems determine when to initiate RPV injections with Alternate Injection Systems in accordance with EOP-1.	440101.03	CRS	
Given a condition with a failure of high pressure makeup systems and RPV water level going below Top of Active Fuel, perform non-ATWS Emergency Depressurization in accordance with EOP-1 and EOP-3.	440701.03 440701.06	CRS ARO BRO	
Given a condition with a failure of high pressure makeup systems, maximize injection to the RPV in accordance with EOP-1.	441103.07 441103.01	CRS ARO BRO	
Inject to the RPV with RHR in accordance with CPS 4411.03.	441103.12	AROP BRO	
Inject to the RPV with SLC in accordance with CPS 4411.03.	441103.13	ARO	

CPS SIMULATOR EXERCISE GUIDE

Evolution	Objective #	Position	Requirement Met
Start Hydrogen Igniters in accordance with CPS 4411.11.	441111.02	BRO	
Start DW/CMT Mixing Compressors in accordance with CPS 4411.11.	441111.03	BRO	
Given RPV water level lowering to TAF verifies automatic actions and isolations in accordance with EOP-1.	100509.09 100509.10 100509.11	CRS ARO BRO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

CPS identified scenario dependent crew critical tasks are in **BOLD FACE**.

1. Perform immediate operator actions on a reactor scram.
2. Verify shutdown criteria are met.
3. **Use preferred injection systems to restore RPV/L to the normal operating band**
4. Use alternate injection systems to control RPV/L in the designated band.
5. Use normal RPV pressure control methods to control RPV/P in the designated band.
6. **When RPV/L reaches TAF, enter EOP-3 and depressurize the RPV**

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

Operator Rounds – OP-AA-102-102
Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
Clearance & Tagging – OP-AA-109-101
Human Error Prevention – HU-AA-101
Self-Assessment/Continuous Improvement – LS-AA-126
Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – LS-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-01 or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson Plan SE-EOP-06.
5. Execute simulator Lesson Plan SE-EOP-06.
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. (**CM-1**) If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: NONE
9. Equipment out of service: NONE
10. Non-standard paperwork required: NONE
11. Surveillances to provide: NONE
12. Flagging to be placed: NONE
13. Other: NONE

14. LOSS OF ALL HIGH PRESSURE MAKEUP WITH A SMALL BREAK

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
When the crew has taken the shift **TRIGGER MALFUNCTION** (Remote 1): **LC08B**, CRD Pump B Trip – **TRUE**	**BRO:** ❑ Reports CRD pump B trip
Report as the NLO: ***"When CRD pump A tried to start there was a puff of smoke from the motor there is no fire. The motor is not running. There is no indication of sustained fire at this time."*** ***"CRD pump A breaker tripped on a ground fault."*** ***"When asked to investigate B RD Pump report the breaker tripped on over current."*** **If asked to bypass CRD Suction Filters activate from the Pending Page:** **LC107 –True** **IF asked to close and open A CRD Pump Discharge Valve ACTIVATE these actions from the Pending Page**	**CRS:** ❑ Directs BRO to start CRD pump A **BRO:** ❑ Dispatches NLO to prepare to start CRD pump A ❑ Dispatches NLO to investigate cause of CRD pump B trip ❑ Reports CRD pump A tripped when started and directs the NLO to investigate
After the crew attempts to start A CRD Pump, **TRIGGER MALFUNCTION**: (Remote 1): **FW01A (B, C, D)**, Condensate Pump 1A, (B, C, D) Trip – **TRUE**	**ARO:** ❑ Reports all CD pumps tripped, loss of all Feedwater ❑ Reports RPV/L rapidly lowering ❑ Inserts a manual scram, OR, reports reactor scram ❑ Performs Scram Choreography ❑ Enters CPS 4100.01, REACTOR SCRAM, and performs immediate actions ▪ Turns mode switch to SHUTDOWN ❖ Verifies reactor power is lowering ❖ Verifies shutdown criteria are met ❖ Verifies turbine and generator trip ❖ Reports EOP-1 entry condition (RPV/L low

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Observe BRO performs immediate scram actions.	**BRO:** ❑ Performs Scram Choreography ❑ Enters CPS 4100.01, REACTOR SCRAM, and performs immediate actions ❖ Announces reactor scram ❖ Announces containment and RCIC room evacuation ❖ Confirms all control rods are fully inserted
Observe CRS directs performance of scram actions and enters EOP-1	**CRS:** ❑ Enters CPS 4100.01, REACTOR SCRAM and directs crew actions ❖ May direct a manual scram before RPV/L reaches scram setpoint ❑ Enters EOP-1 RPV CONTROL: (440101.01, 440101.02, 100509.03, 100509.04, 100509.05, 100509.06, 100509.07, 100509.08) ❖ Directs RPV/P control using bypass valves (prescribes pressure band) ❖ Enters CPS 4411.03, INJECTION/FLOODING SOURCES, and directs BRO to control RPV/L L3 to L8 using available preferred injection systems (RCIC and HPCS) ❖ Directs crew to verify needed automatic actions (100509.09, 100509.10, 100509.11) ❖ Properly marks EOP-1 flowchart

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
RI and HP should be initiated before RPV/L reaches L2 This is a key RO action for level restoration! Observe BRO holds the RCIC initiation pushbutton depressed for 6 sec. As the NLO report: ***"The breaker for the HPCS pump is badly damaged. It looks like we had a small explosion in the breaker cubicle. We need the electricians to examine the breaker."*** As the NLO report: ***"The RCIC turbine mechanical overspeed trip device is tripped."*** If directed to reset the RCIC turbine trip **DO NOT** DELETE MALFUNCTION RI02, RCIC Turbine Trip a. Report as the NLO ***"The RCIC Turbine mechanical overspeed trip will not reset. There has been some damage to the mechanism and it will not engage."***	**ARO:** ❑ Verifies turbine bypass valves are automatically controlling RPV/P <1065 psig (or as directed by the CRS) **CREW:** ❑ Verifies needed automatic actions ▪ Isolations (100509.09) ▪ ECCS Start (100509.10) ▪ Diesel Generators Start (100509.11) ❖ Dispatches NLO to verify proper operation of the DGs **BRO:** ❑ Manually initiates HPCS ❖ Reports HPCS pump tripped when started ❖ Dispatches NLO to investigate ❖ May contact EMD to investigate HPCS pump breaker ❑ Manually initiates RCIC ❖ Holds RCIC Initiation Button depressed for 6 sec. until steam supply valve starts open ❑ Reports RCIC turbine trip Dispatches NLO to investigate RCIC turbine trip ❑ If directed by CRS, directs NLO to reset the RCIC turbine trip ❑ Reports RCIC turbine cannot be reset

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Attempts should have been made to manually initiate HP and RI before RPV/L reached L2. If not, place the simulator in FREEZE and discuss the event mitigation strategy. **OR** Discuss in scenario critique.	**BRO:** ❑ If RCIC and HPCS are not manually initiated before RPV/L low L2, reports: ❖ RCIC turbine tripped ❖ HPCS pump tripped when it started **CRS:** ❑ Reviews Alternate Injection Systems, Detail E and directs starting SLC A and SLC B and injecting from the storage tank (440101.03) ❑ Directs Igniters and Mixing Compressors Started ❑ Reviews Alternate Injection Systems, Detail E and directs starting SLC A and SLC B and injecting from the storage tank (440101.03) ❑ Directs Igniters and Mixing Compressors Started **BRO:** ❑ Starts SLC pumps A and B and injects from the storage tank (41103.13) ❑ Starts Igniters (441111.02) ❑ Starts Mixing Compressors (441111.03) ❑ Reports RPV/L at L1 and lowering **CRS:** ❑ Directs crew actions in response to RPV/L L1 ❖ Annunciator Response Procedures ❖ Verify automatic actions occur ❖ ADS inhibited

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Observe crew references procedures (Hard Cards) to verify isolations and operation of LPCS and LPCI.	**CREW:** ❑ Prioritizes response to annunciators ❑ Verifies automatic actions ❖ Isolations ❖ Low pressure ECCS start (331201.02 & 331301.01)
Observe CRS verifies all prerequisites for initiating blowdown	**CRS:** ❑ Frequently requests status of RPV/L ❑ When RPV/L reaches TAF (-162 in.), enters EOP-3, EMERGENCY RPV DEPRESSURIZATION (BLOWDOWN) (440701.06 & 440701.06) ❖ Verifies RPV/L at or below TAF ❖ Directs containment evacuation\\ ❖ Verifies shutdown criteria are met ❖ Verifies Drywell pressure is below 1.68 psig ❖ Verifies SP/L above 8 feet ❖
Observe crew reports all parameters when requested by CRS	**CREW:** ❑ Enters EOP-3 and responds to CRS queries: ❖ Reports RPV/L and trend ❖ Confirms shutdown criteria are met ❖ Reports Drywell pressure <1.68 psig (and trend) ❖ Reports SP/L **CRS:** ❑ Directs ADS initiated in accordance with CPS 3101.01 (331301.04)

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
	BRO: ❑ Sounds alarm and announces containment evacuation ❑ Initiates ADS in accordance with CPS 3101.01 or Hard Card (310101.07) ❑ Confirms and reports 5 ADS valves are open
	CRS: ❑ Directs opening other SRVs until 7 SRVs are open
	BRO: ❑ Opens two other SRVs ❑ Reports 7 SRVs are open ➢ Opens two other SRVs ❑ Reports 7 SRVs are open
If directed to defeat Shutdown Cooling interlocks: **TRIGGER From the PENDING PAGE** **EP207**, E12F008, F023, F053A Isolate – TRUE, 3-min. TD **<u>OR</u>** **EP208**, E12F009, F053B Isolate – TRUE, 3-min. TD After the time delay times out, report the task completed	**CRS:** ❑ Verifies 7 SRVs are open ❑ Waits for Shutdown Cooling interlock to clear (EOP-3) ❑ Returns to EOP-1 ❖ Directs maximizing injection with Preferred and Alternate Injection Systems, in accordance with CPS 4411.03, INJECTION/FLOODING SOURCES (441103.07) ❑ May direct defeating Shutdown Cooling interlocks

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Observe operator references procedure (Hard Card).	**BRO:** ❑ Maximizes injection using available preferred injection systems in accordance with CPS 4411.03 (441103.01) ❖ LPCS ❖ LPCI (441101.12) ❖ RHR through Shutdown Cooling
Make ECCS injection valves capable of being throttled as directed: **TRIGGER FROM THE PENDING PAGE** **EP201A**, RHR A Injection Valve Seal In – TRUE, 10-min. TD **EP201B**, RHR B Injection Valve Seal In - TRUE, 10-min. TD **EP201C**, RHR C Injection Valve Seal In - TRUE, 10-min. TD **EP201D**, LPCS Injection Valve Seal In - TRUE, 10-min. TD After the time delay times out, report the task completed.	**CRS:** ❑ When RPV/L is above –162 in., directs crew to restore and maintain RPV/L between L3 and L8 by throttling ECCS system per CPS 4411.04 ❑ Directs low pressure ECCS injection valves made capable of being throttled ❑ Directs low pressure ECCS not needed to maintain RPV/L between L3 and L8 secured as RPV/L returns to normal **BRO:** ❑ Secures low pressure ECCS not needed to maintain RPV/L as directed (331201.05 & 331301.04)
Observe the crew restores and maintains RPV Water Level in band given by CRS. IF necessary take a snap shot before crew blows down and have each member of the crew restore and maintain RPV level following Emergency Depressurization.	**CRS:** ❑ Declares the EAL Classification: Site Area Emergency (FS1)
When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, or at the discretion of the Floor Instructor, place the simulator in **FREEZE** and inform the crew **"Training has control".**	

OPEX

Power Reactor	*Event Number:* ***48696***
Facility: **NINE MILE POINT** Region: 1 State: NY Unit: [ ] [2] [ ] RX Type: [1] GE-2,[2] GE-5 NRC Notified By: MARK GREER HQ OPS Officer: VINCE KLCO	Notification Date: 01/23/2013 Notification Time: 22:03 [ET] Event Date: 01/23/2013 Event Time: 15:16 [EST] Last Update Date: 01/23/2013
Emergency Class: NON EMERGENCY 10 CFR Section: 50.72(b)(3)(v)(A) - POT UNABLE TO SAFE SD 50.72(b)(3)(v)(D) - ACCIDENT MITIGATION	Person (Organization): MARC FERDAS (R1DO)

Unit	SCRAM Code	RX CRIT	Initial PWR	Initial RX Mode	Current PWR	Current RX Mode
2	N	Y	100	Power Operation	100	Power Operation

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CONCURRENT LOSS OF HIGH PRESSURE REACTOR MAKEUP SYSTEMS CAPABILITY

On 1/23/2013 at 1516 [EST], Nine Mile Point 2 (NMP2) had a failure of a Reactor Building General Area temperature trip unit occur resulting in the closure of an isolation valve on the Reactor Core Isolation Cooling (RCIC) system steam supply line. Concurrent with this failure, the High Pressure Core Spray (HPCS) system was inoperable for planned surveillance testing. With both the RCIC and HPCS systems inoperable, NMP2 entered a Technical Specification Required Action to be in Mode 3 within 12 hours. At 1550, the HPCS system was restored to OPERABLE. Based on the concurrent loss of the high pressure reactor makeup capability of these two systems, it was determined that the condition is reportable under section 50.72(b)(3)(v) as the following safety functions were impacted: (A) Shutdown the reactor and maintain it in a safe shutdown condition; and (D) Mitigate the consequences of an accident.

NMP2 remains in a stable condition at rated power. The offsite grid is stable with no restrictions or warnings in effect.

The licensee notified the NRC Resident Inspector.

TURNOVER

1. Full Power, stable xenon and middle of core life
2. Status of Tagged Out Equipment: None
3. Shift conditions: Day Shift
4. Weather Conditions: Clear & Sunny
5. Thermal Limit Problems or Concerns: None

   LCOs in effect: None
6. Surveillances / Jobs in progress: None
7. Upcoming Jobs: None
8. Risk Level: Green
9. Dose equivalent Iodine 131 is reading 1.5 E-6 μcuries per gram.
10. Other: None

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.

Exelon
Nuclear

Clinton Power Station
Licensed Operator Training
Simulator Exercise Guide

SE-EOP-07

EOP-1 RPV CONTROL
LARGE BREAK LOCA OUTSIDE CONTAINMENT

REVISION 003

REVISED / DEVELOPED BY: Carl Leach

REVIEWED / APPROVED BY: Daniel Snook /S/ 03/06/13
Operations Training Manager

REVIEWED / APPROVED BY: N/A
Emergency Planning (if required) *

APPROVED BY: N/A Minor Revision DS / 03/06/13
Shift Operations Superintendent Date

* Emergency Planning approval required if the scenario could be used for input to the Emergency Planning Performance Indicator. Otherwise mark "N/A".

SRRS 3D.126/3D.111: Retain approved lessons for life of plant OR Life of Insurance Policy + 1 Yr for RP lesson plans. May be retained in department for two years, then forwarded to Records Management.

CPS SIMULATOR EXERCISE GUIDE

SCENARIO OUTLINE

1. The purpose of this scenario is to train ILT students on EOP-1 with high pressure injection sources failing.
2. This a TRAINING SCENARIO.
3. If a conditions changes such that it would be expected the crew would evaluate for a Risk Condition change, the scenario should have the necessary new risk level and protected equipment. N/A for ILT Scenarios
4. If the scenario is a training scenario it should contain the following:

   If this is a training scenario, look for opportunities to emphasize the HU/THU Fundamentals. For example, during periods of heavy communications, freeze and question crew members on the content of communications, updates, or briefs. Emphasize the responsibility for the correct execution of the communication lies with the initiator.
5. Scenario starts at full power with the following equipment out of service or tagged: Condensate Pump 1D, MSL D motor operated shutoff valve, and HPCS. Risk levels are Orange
6. Turnover Information: Full Power, middle of core life with the following tagged: 1D Condensate Pump, HPCS and D MSL Shutoff Valve (tagged open). Risk levels are orange.
7. Event narratives :
   a. The unit is operating at full power with Condensate Pump 1D, MSL D motor operated shutoff valve, and the HPCS pump out of service. All LCO paperwork is completed. The online risk level is ORANGE.
   b. This scenario allows the crew to perform EOP-1, RPV CONTROL, to control RPV/L following loss of CD/CB/FW and high pressure ECCS systems.
   c. All Feedwater pumps trip and Main Steam Line D ruptures in the Turbine Building. The MSL D MSIVs fail to close and steam continues to be released into the Turbine Building.
   d. The crew enters and performs the actions of CPS No. 4401.01, EOP-1 RPV CONTROL, and CPS No. 4100.01, REACTOR SCRAM.
   e. The CRS marks EOP Flow Charts and directs crew actions in accordance with the LEVEL leg of EOP-1 to restore and control RPV/L using any of the available preferred injection systems. Starting the standby CRD pump and opening the suction filter bypass valve maximize CRD injection. When RCIC is started the RCIC turbine trips.
   f. A simultaneous trip of all running Condensate pumps and Condensate Booster pumps occurs.
   g. The turbine bypass valves operate to control reactor pressure. Reactor pressure continues to decrease as energy is released from the ruptured steam line. Reactor level continues to lower due to the inventory loss through the MSL rupture at a greater rate than makeup from the CRD system.
   h. The low pressure ECCS pumps fail to automatically start. The operator manually starts LPCI and LPCS pumps and restores RPV/L to the normal band.
   i. The scenario may be terminated when RPV/L is being controlled within the designated band and the crew has established normal RPV cool down conditions, or, at the discretion of the Floor Instructor.

SCENARIO OUTLINE (Continued)

The crew enters and performs the actions of CPS No. 4401.01, EOP-1 RPV CONTROL, and CPS No. 4100.01, REACTOR SCRAM.

8. Technical Specification/Reportability calls: None for this scenario other than the initial 3.5.1.

   EAL/PAR or any on-site protective action (such as site evacuation). N/A for ILT training scenarios.

9. If this is a training scenario and additional material is needed, detail what additional material will be required.None

10. Changes in equipment status or overall plant status which has changed plant Risk level from that existing in the initial conditions should be included as they have occurred. None

11. Scenario termination criteria:

    The scenario may be terminated when RPV/L is being controlled within the designated band and the crew has established normal RPV cool down conditions, or, at the discretion of the Floor Instructor.

12. Approximate Scenario Runtime. 45 minutes

13. Related OPEX : See Attachement 1

LESSON PLAN HISTORY PAGE

REV.	DESCRIPTION
00	Updated to new format. Incorporated Pen & Ink comments. Updated objectives and resolved missing Task to SE links. This SE replaces SE87551, Scenario 7.
01	Updated to include Tasks to satisfy TRACER 2004-05-0142A.
02	Added tasks. Rebuilt Simulator File.
003	Updated to latest template. Minor Revision.

REFERENCES

- CPS No. 4100.02, CORE STABILITY CONTROL
- CPS No. 4100.01, REACTOR SCRAM
- CPS No. 4008.01, ABNROMAL COOLANT FLOW
- CPS No. 4401.01, EOP-1, RPV Control
- Technical Specifications
- **CM-1** CA 539389-11 Graph key parameters during validation
- SOER 10-2, Engaged, Thinking, Organizations
- SER 3-05, Weaknesses in Operator Fundamentals
- IER L1-11-3, Weaknesses in Operator Fundamentals

REQUIRED MATERIALS:

1. NONE

CPS SIMULATOR EXERCISE GUIDE

This section must be included if the scenario will be used as an EXAMINATION scenario. This section should be used for integrated plant type training scenarios. N/A for ILT Scenarios

Quantitative Attributes	
	Total malfunction inserted •
	Malfunctions that occur after EOP entry •
	Abnormal events •
	Major transients •
	EOPs used beyond primary response EOP **(Note 1)** •
	EOP contingency procedures used **(Note 2)** •
	Approximate scenario run time **(Note 3)(Note 4)**
	EOP run time
	Crew critical tasks **(Note 5)**
	Technical Specifications exercised (Yes or No)
	Based on Low Power Operation (< 5%) (Yes or No)
	Based on Dominant Accident Sequences (DAS) as determined by PRA/IPE
	Number of normal evolutions

Note 1: Refers to BWROG top-level guideline EOPs, i.e., RPV Control (EOP-1), Primary Containment Control (EOP-6), Secondary Containment Control (EOP-8), and Radioactivity Release Control (EOP-9).

Note 2: Refers to BWROG EOP Contingencies i.e., ATWS RPV Control (EOP-1A), Emergency RPV Depressurization (EOP-3), RPV Flooding (EOP-2), One scenario of the set must use a contingency procedure.

Note 3: An exam set consists of two scenarios. For Out-of-the-Box Evaluations (OBEs), an exam set typically consists of only one scenario.

Note 4: Number of crew critical tasks required per scenario or exam set applies only to LORT Annual Exams. There is no specific number of crew critical tasks required for an Out-of-the-Box Evaluation (OBE). An OBE may have as few as zero (0) crew critical tasks (typical for LORT Normal Operations scenarios) but otherwise will typically consist of 1 to 3 crew critical tasks.

Note 5: Number of malfunctions required after EOP entry per scenario or exam set applies only to LORT Annual Exams. There is no specific number of malfunctions which are required to occur after EOP entry for an Out-of-the-Box Evaluation (OBE).

Simulator Performance Objectives

Under simulated plant normal, abnormal and emergency conditions and in accordance with referenced plant procedures, the trainee shall:

Evolution	Objective #	Position	Requirement Met
From the Main Control Room, perform Emergency Feed Using CD/CB in accordance with CPS No. 3103.01 FEEDWATER (FW).	310301.28	ARO	
From the Main Control Room, perform a LPCI Manual Initiation with Logic NOT Operable in accordance with CPS No. 3312.01, RESIDUAL HEAT REMOVAL (RHR).	331201.04	ARO BRO	
From the Main Control Room, perform a Manual LPCS Initiation with Logic NOT Operable (331301.03) in accordance with CPS No. 3313.01, LOW PRESSURE CORE SPRAY (LPCS).	331301.03	ARO BRO	
From the Main Control Room perform a manually ADS Initiation in accordance with CPS No. 3101.01, MAIN STEAM (MS, IS & ADS).	310101.07	BRO ARO	
From the Main Control Room, manually operate a Safety Relief Valve in accordance with CPS No. 3101.01, MAIN STEAM (MS, IS & ADS).	310101.06	ARO	
From the Main Control Room, respond to a Reactor Pressure Vessel Emergency RPV Depressurization (Blowdown) in accordance with CPS No. 4401.01, EOP-1 RPV CONTROL.	440101.01 440101.02 100509.03 100509.04 100509.05 100509.06 100509.07 100509.08	CRS ARO BRO	
From the Main Control Room Given CPS No. 3313.01, LOW PRESSURE CORE SPRAY (LPCS), perform a LPCS Shutdown with Initiation Signal Present (331301.05)	331301.05	ARO	

CPS SIMULATOR EXERCISE GUIDE

Evolution	Objective #	Position	Requirement Met
From the Main Control Room given RPV lowering water level, and EOP-1 inject with water to maintain level above TAF, in accordance with CPS 4411.03.	441103.12 441103.13 441111.02 441111.03 441103.07 441103.01	ARO	
From the Main Control Room, given a condition requiring emergency depressurization, emergency depressurizes the RPV in accordance with EOP-3	440701.06 440701.03	CRS ARO BRO	

SCENARIO CRITICAL TASKS and COMPETENCIES

The ILT Lead Instructor has determined that the Scenario Critical Tasks and Competencies section is NOT applicable to the SE-EOP- series of Simulator Training Guides.

CPS identified scenario dependent crew critical tasks are in **BOLD FACE**.

1. Perform immediate operator actions on a reactor scram
2. Verify shutdown criteria are met
3. **Use preferred injection systems to restore RPV/L to the normal operating band**
4. Use alternate injection systems to control RPV/L in the designated band.
5. Use normal RPV pressure control methods to control RPV/P in the designated band
6. **When RPV/L reaches TAF, enter EOP-3 and depressurize the RPV**

Human Performance Improvement

During the course of this scenario, instructors should watch for the following human performance fundamentals and competencies and discuss at the appropriate freeze point or during the critique.

- Briefs
- Use of STAR when manipulating controls
- First Check
- Peer checks when appropriate
- Proper use of procedures
- Place keeping
- Robust barriers when appropriate
- Proper directed three part communications

OPERATIONS STANDARDS AND FUNDAMENTALS

Operator Rounds – OP-AA-102-102
Log Keeping – OP-AA-111-101
Shift Turnover – OP-AA-112-101
Clearance & Tagging – OP-AA-109-101
Human Error Prevention – HU-AA-101
Self-Assessment/Continuous Improvement – LS-AA-126
Teamwork – OP-AA-101-111-1001
Briefs HU-AA-1211
Procedural Adherence – HU-AA-104-101
Control Board Awareness – OP-AA-103-102
Industrial Safety – SA-AA-0301
Reactor Safety – OP-AA-101-111-1001
Reactivity Management – OP-AA-300
Work Management – WC-AA-101-, OU-AA-101
Security – SY-AA-101-130
Regulatory Compliance – OP-AA-101-111
Condition Reporting and Resolution – LS-AA-125
Radiological Safety – OP-AA-101-111-1001
Personal Responsibility and Accountability OP-AA-101-111/112
Training and Qualification OP-AA-101-111
Intolerance for Unexpected Equipment Failure ER-AA-10
Technical Human Performance HU-AA-102

COMPETENCIES

Reactivity Management
Understand/Interpret Annunciator and Alarm Signals
Diagnose Events/Conditions Based on Signals/Readings
Understand Plant and System Response
Compliance With and Use of Procedures and Technical Specifications
Operate the Control Boards
Communicate and Interact With the Crew and Other Personnel
Direct Shift Operations (SRO ONLY)
Emergency Plan (If applicable)
Lessons learned captured for retention

For LORT scenarios, the instructor should review the Fundamentals focus areas selected each training cycle.

LESSON PLAN SPECIFIC SIMULATOR SETUP

1. Generic Simulator Setup complete.
2. Initialize to IC-01or to an IC greater than 95% power.
3. Place the simulator in RUN.
4. Open simulator Lesson PlanSE-EOP-07..
5. Execute simulator Lesson Plan SE-EOP-07.
6. Compare simulator initial conditions to 1005.09M002, Cycle Operating Limits.
7. (**CM-1**) If this is an examination scenario or being run for validation, start a CHART to plot the critical parameters.
8. Place OOS Tags on: HPCS Pump control switch, D Condensate Pump, 1B21-F098D keylock switch
9. Equipment out of service: List here : HPCS, D CD Pumps, 1B21-F098D
10. Non-standard paperwork required: NONE
11. Surveillances to provide: NONE
12. Flagging to be placed: NONE
13. Other: NONE

LARGE BREAK LOCA OUTSIDE CONTAINMENT

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
When the crew has taken the shift **TRIGGER MALFUNCTION (Remote 1):** **FW08A(B)**, Feedwater Pumps 1A, (B) Trip – TRUE **FW08C** Feedwater 1C Trip, TRUE, 10-sec. TD	**ARO:** ❑ Reports trip of all Feedwater pumps ❑ Reports RPV/L rapidly lowering ❑ Inserts a manual scram, OR, reports reactor scram ❑ Performs Scram Choreography ❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ▪ Turns mode switch to SHUTDOWN ❖ Verifies reactor power is lowering ❖ Verifies shutdown criteria are met ❖ Verifies turbine and generator trip ❖ Reports EOP-1 entry condition (RPV/L low) **BRO:** ❑ Performs Scram Choreography ❑ Enters CPS No. 4100.01, REACTOR SCRAM, and performs immediate actions ❖ Announces reactor scram ❖ Announces containment and RCIC room evacuation ❑ Confirms shutdown criteria are met

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
	CRS: ❑ Enters CPS No. 4100.01, REACTOR SCRAM and directs crew actions ❑ Enters EOP-1 RPV CONTROL: (440101.01, 440101.02, 100509.03, 100509.04, 100509.05, 100509.06, 100509.07, 100509.08) ❖ Directs ARO to control RPV/P using bypass valves ❖ Enters CPS No. 4411.03, INJECTION/FLOODING SOURCES, and directs B CRO to control RPV/L L3 to L8 using available preferred injection systems (RCIC) ❖ Directs crew to verify needed automatic actions ❖ Properly marks EOP-1 flowcharts
When scram actions have been complete and/or when directed by Floor Instructor **TRIGGER Remote 2** to cause Steam Leak in the Turbine Building from "D" Main Steam Line.	**CREW:** ❑ Verifies needed automatic actions ❖ Isolations (100509.09) ❖ ECCS Start (100509.10) ❖ Diesel Generators Start (100509.11) ❑ Dispatches NLO to verify proper operation of the DGs
Steam line break depressurizes RPV.	**ARO:** ❑ Verifies turbine bypass valves initially control RPV/P <1065 psig (or as directed by the CRS) ❑ Reports RPV/P lowering

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Observe crew references applicable annunciator response procedures.	**BRO:** ❑ Reports sump high level alarms ❑ Reports steam tunnel high temperature alarms ❑ Reports initiation of Group 1 isolation ❑ Reports incomplete Group 1 isolation, MSL D MSIVs not closed
If EMD is contacted for status of 1B21-F098D, report: ***"The breaker is still in the shop. Expected return to service in about 1 hour.***	**CRS:** ❑ Directs NLO and MMD to close MSL D outboard MSIV ❑ May direct cycling MSL D MSIV control switches in attempt to close the MSIVs ❑ May investigate status of 1B21-F098D and direct expediting return to service
RCIC should be initiated before RPV/L reaches L2 <u>This is a key RO action for level restoration</u>! Observe BRO holds the RCIC initiation pushbutton depressed for 6 sec. RCICTurbine trip initiates when the seal-in light comes on.	**BRO:** ❑ Attempts to close MSL D isolation valves as directed ❑ Manually initiates RCIC ❖ Holds RCIC Initiation Button depressed for 6 sec. until steam supply valve starts open ❖ Reports RCIC turbine trip ❑ If RCIC auto initiates, reports RCIC turbine trip

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
As the NLO report: ***"The RCIC turbine mechanical overspeed trip device is tripped."*** If directed to reset the RCIC turbine trip Report as the NLO ***"The RCIC Turbine trip will not reset. The trip mechanism is bent and will not latch."*** When RPV/P drops below 750 psig, trip of all CD pumps will auto-TRIGGER: **FW01A (B, C, D)**, Condensate Pump 1A (1B, 1C, 1D) Trip - TRUE If directed to open the CRD Suction Filter Bypass valves **TRIGGERFROM PENDING PAGE**: **LC107**, CRDH Suction Filters – TRUE, 5-min. TD After the time delay times out, report as NLO: ***"The CRD Suction Filter Bypass valves are open.*** If asked to close A RD Pump Discharge to start the pump **ACTIVATE** from the pending page and then cycle it open form same page. **<u>NOTE</u>**: RPV/P may drop to below LP ECCS shutoff head before RPV/L drops to L1.	**BRO:** ❑ Dispatches NLO to investigate RCIC turbine trip ❑ If directed by CRS, directs NLO to reset the RCIC turbine trip **ARO:** ❑ Reports trip of all CD and CB pumps ❑ May dispatch NLO to investigate cause of trip **CRS:** ❑ May direct maximizing CRD injection in accordance with CPS No. 4411.03, INJECTION/FLOODING SOURCES (441103.07) ❑ Directs injection with SLC (441103.13) **BRO:** ❑ Starts second CRD pump (441103.11) ❖ As time permits, dispatches NLO to verify proper operation of the CRD pump just started ❖ Directs NLO to open the CRD Suction Filter Bypass Valves ❑ Starts SLC for injection

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Observe crew performs required actions when RPV/L drops below L1 Optional for CRS to isolate air to containment to close Inboard MSIV which will stop the level lowering due to stopping the inventory loss due to break in Main Steam Line.	**BRO:** ❑ Reports RPV/L at L1 and lowering **CRS:** ❑ Directs crew actions in response to RPV/L L1 ❖ Annunciator Response Procedures ❖ Verify automatic actions occur ❖ Inhibit ADS **CREW:** ❑ Prioritizes response to annunciators ❑ Inhibits ADS ❑ Verifies automatic actions ❖ Isolations ❖ Reports low pressure ECCS did not automatically start (1110509.10) **CRS:** ❑ Directs manually starting LPCI and LPCS **BRO:** ❑ References procedures (Hard Cards) and starts LPCI and LPCS

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Observe CRS verifies all prerequisites for initiating blow down.	**CRS:** ❑ Frequently requests status of RPV/L ❑ When RPV/L reaches TAF (-162 in.), enters EOP-3, EMERGENCY RPV DEPRESSURIZATION (BLOWDOWN) (440701.03) ❖ Verifies RPV/L at or below TAF ❖ Directs containment evacuation ❖ Verifies shutdown criteria are met ❖ Verifies Drywell pressure is below 1.68 psig ❖ Verifies SP/L above 8 feet
Observe crew reports all parameters when requested by CRS.	**CREW:** ❑ Enters EOP-3 and responds to CRS queries: ❖ Reports RPV/L and trend ❖ Confirms shutdown criteria are met ❖ Reports Drywell pressure <1.68 psig (and trend) ❖ Reports SP/L **CRS:** ❑ Directs ADS initiated in accordance with CPS No. 3101.01
Observe operator references procedure or Hard Card for initiation of ADS.	**BRO:** ❑ Sounds alarm and announces containment evacuation ❑ Initiates ADS in accordance with CPS No. 3101.01 or Hard Card (440701.06) ❑ Reports 5 ADS valves are open

CPS SIMULATOR EXERCISE GUIDE

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Ensure crew restore and then maintains RPV water level in the band given by CRS.	**CRS:** ❑ Directs opening other SRVs until 7 SRVs are open
	BRO: ❑ Opens 2 other SRVs ❑ Reports 7 SRVs are open
If directed to defeat Shutdown Cooling interlocks: **TRIGGER FROM THE PENDING PAGE:** **EP207**, E12F008, F023, F053A Isolate – TRUE, 3-min. TD **<u>OR</u>** **EP208**, E12F009, F053B Isolate – TRUE, 3-min. TD After the time delay times out, report the task completed	**CRS:** ❑ Directs maximizing injection with Preferred and Alternate Injection Systems, in accordance with CPS No. 4411.03, INJECTION/FLOODING SOURCES ❑ Waits for Shutdown Cooling interlock to clear (EOP-3) ❑ May direct defeating Shutdown Cooling interlocks
	BRO: ❑ Maximizes injection using available preferred injection systems in accordance with CPS No. 4411.03 ❖ LPCS ❖ LPCI ❖ RHR through Shutdown Cooling

INSTRUCTOR INFORMATION/ACTIVITY	EXPECTED OPERATOR RESPONSE
Make ECCS injection valves capable of being throttled as directed: **TRIGGER FORM THE PENDING PAGE** **EP201A**, RHR A Injection Valve Seal In – TRUE, 10-min. TD **EP201B**, RHR B Injection Valve Seal In - TRUE, 10-min. TD **EP201C**, RHR C Injection Valve Seal In - TRUE, 10-min. TD **EP201D**, LPCS Injection Valve Seal In - TRUE, 10-min. TD After the time delay times out, report the task completed.	CRS: ❑ When RPV/L is above –162 in., directs crew to restore and maintain RPV/L between L3 and L8 by throttling ECCS system per CPS No. 4411.04 ❑ Directs low pressure ECCS injection valves made capable of being throttled ❑ Directs low pressure ECCS not needed to maintain RPV/L between L3 and L8 secured as RPV/L returns to normal
Observe operator references procedures to secure ECCS systems. When plant parameters are stable and RPV/P and RPV/L are being controlled within the designated bands, or at the discretion of the Floor Instructor, place the simulator in **FREEZE** and inform the crew **"Training has control".**	**BRO:** ❑ Secures low pressure ECCS not needed to maintain RPV/L as directed **CRS** ❑ Declares the EAL Classification ❖ Site Area Emergency (FS1) due to Unisolable MSL break and potential loss of fuel clad (RPV/L ≤–162.5 in.)

OPEX

Facility: CLINTON	*Notification Date: 02/18/2013*
Region: 3 State: IL	*Notification Time: 11:35 [ET]*
Unit: [1] [ ] [ ]	*Event Date: 02/18/2013*
RX Type: [1] GE-6	*Event Time: 03:18 [CST]*
NRC Notified By: MARK DODDS	*Last Update Date: 02/18/2013*
HQ OPS Officer: CHARLES TEAL	

48765 - HIGH PRESSURE CORE SPRAY DECLARED INOPERABLE

On February 18, 2013, at 0318 hours (CST), the Main Control Room received an alarm associated with a transfer of the Division 4 Nuclear System Protection System (NSPS) inverter to the alternate source. Plant Technicians were performing a Technical Specification (TS) Surveillance, 'Average Power Range Monitor Flow Biased/Neutron Flux Response Time Test,' when a test cable connector contacted a fuse block staple jumper, causing the transfer of the Division 4 NSPS bus from normal inverter source to its alternate source.

TS 3.8.7, 'Inverters - Operating' Surveillance Requirement 3.8.7.1 is not met with the inverter on the alternate source, and Condition C, requires High Pressure Core Spray (HPCS) system to be declared inoperable immediately since the Division 4 NSPS bus was not energized from the inverter. Since HPCS is an emergency core cooling system and is a single train safety system, this is a condition that could have prevented fulfillment of a safety function and is reportable under 10 CFR 50.72(b)(3)(v)(D), system needed to mitigate the consequences of an accident.

At 0925 CST, the Division 4 NSPS bus has been restored to service on the normal source. At 0925 CST, HPCS has been declared Operable.

The NRC Resident has been notified.

TURNOVER

1. Full Power, stable xenon and middle of core life:
2. Status of Tagged Out Equipment: HPCS out of service for 2 days expected back in service in 8 hours, 1D Condensate Pump been out of service for 4 hours, not known when it will be returned, MSL 1D Shutoff Valve open and tagged for breaker work, been out of service for 1 day expected back in 3 days.
3. Shift conditions: *Day Shift*
4. Weather Conditions: *Clear & Sunny*
5. Thermal Limit Problems or Concerns: None

   LCOs in effect: *3.5.1*
6. Surveillances / Jobs in progress: None
7. Upcoming Jobs: Support HPCS return
8. Risk Level: Orange
9. Dose equivalent Iodine 131 is reading 1.5 E-6 µcuries per gram.
10. Other *None*

Note:

If this scenario is being used for an examination, **COLLECT** student beepers and PCS phones.

Checklist for DEP EAL Declaration and Notifications

This checklist is to be used in the evaluation of DEP EAL declaration, notification and related activities during all simulator LOR unannounced and evaluated scenarios.

Task	Time	Comments
Time Condition Evident in Control Room		
Time EAL Matrix Used by SM		
Time Independent Peer Check of EAL Call Obtained		
Time of Declaration (as announced)		
Time Notification Form completed by SM		
** Expected Time to Declare (time of condition + 15 min)		
** Release in Progress ID (NA if no release in progress)		
Escalation Criteria Announced to CR		
Plant Announcement Time		
ERO Part 1 Activation Time		
ERO Part 2 Activation Time		
Time of Management Notification (NA if ERO is activated)		
Time from Declaration to ERO activation		
EAL Declared (per NARS Form)		
** **Expected** EAL		
PAR Made		
** **Expected** PAR		
State & Local Notification time		
** **Expected** Time for State & Local Notification (Declaration + 15 min)		
NRC Notification Time		
Expected Time for NRC Notification (Declaration + 60 min)		
ERDs Activation Time		
** VERIFY Wind Speed, Direction, Evacuation Sectors, and DRILL (Evaluator)		

** Reference TQ-AA-150 for DEP accuracy criteria

Checklist for DEP EAL Declaration and Notifications Plant Turnover 3D.100 Destroy at option.