INSTRUCTIONAL COVER SHEET

PROGRAM TITLE: OPERATIONS TRAINING

COURSE TITLE: COLUMBIA GENERATING STATION SIMULATOR EXAMINATION

LESSON TITLE: Raise Power with Flow; Place MT into Gov. Valve Optimization; SLC-V-31 indication; HPCS-P-3 Fails; ASD Channel Fails; ASD Loss - Manual Scram; RFW & RCIC Loss; Lower Pressure For CBP Injection; EQ; SP Rupture: ED on Low SP/L

LENGTH OF LESSON 1.5 Hours

INSTRUCTIONAL MATERIALS INCLUDED

Lesson Plan PQD Code		Rev. No.	
Simulator Guide PQD Code	LO001625	Rev. No.	0
JPM PQD Code		Rev. No.	
Exam PQD Code		Rev. No.	

DIVISION TITLE: Nuclear Training

DEPARTMENT: Operations Training

PREPARED BY: Ron Hayden DATE: 6/12/08

REVISED BY: DATE:

VALIDATED BY: DATE:

TECHNICAL REVIEW: DATE:

INSTRUCTIONAL REVIEW: DATE:

APPROVED: DATE:

Operations Training Manager

Verify materials current IAW SWP-TQS-01 prior to use.

NRC SCENARIO #1

Columbia Generating Station ILC NRC Exam January, 2009

Facility: Columbia NRC Scenario No: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial conditions: The plant is operating at approximately 94% power due to economic dispatch.

Turnover Information: Immediately after shift turnover, reactor power is to be raised with RRC Flow until Generator Output reaches 1150 MWe. At that point stop the power increase and place the Main Turbine into Governor Valve Optimization. When complete, resume power increase to 100%.

A reactivity brief for the power increase has been held. There are no pre-conditioning limits.

Event No.	Timeline	Event Type*	Event Description
1.	T=0	R (SRO/RO)	Increase power with flow.
2.	T=10	N (BOP)	Place Main Turbine into Governor Valve Optimization.
3.	T=12	I (SRO/RO)	SLC-V-31 Indication Failure (Tech Spec).
4.	T=20	C (SRO/BOP)	HPCS-P-3 Failure (HPCS Keepfill Pump) (Tech Spec).
5.	T=30	C (SRO/RO)	ASD Channel A2 alarm and fault.
6.	T=35	C (ALL)	ASD UPS trouble simulating both inverters on battery power requiring RRC flow reduction and manual scram.
7.	T=40	C (ALL)	RCIC shaft coupling breaks on initiation. Both RFW Pumps trip and can not be reset.
8.	T=50	M (ALL)	OBE and RHR-B Suction Break.
9.	T=65		Emergency Depressurization when SP Level cannot be maintained GT 19’2”.

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

The scenario starts with Columbia at 94% power.

After turnover, the crew is to raise power to 1150 Mwe.

When 1150 MWe has been reached and the MT is to be placed into GV optimization.

The next event is SLC-V-31 losing position indication. This is a non-annunciated failure. If the crew does not discover the malfunction, OPS2 will prompt them from a report from the field. SLC-V-31 failure prevents SLC from auto starting. Tech Specs will be referenced. LCO 3.1.7 is applicable and requires SLC restoration in 8 hours.

The next event is a failure of the HPCS keepfill pump, HPCS-P-3. The crew will take actions and pull the control power fuses for HPCS-P-1. A problem with re-installation of the fuses later in the scenario will render HPCS not available for the scenario.

The next event is a GTO Freeze alarm on ASD channel 1A/2. RRC-P-1A will run back to 51 Hz. The crew will take action to match loop flows.

When flows are matched the next event is a failure of E-TR-ASD 1. An ASD UPS trouble alarm will be received and the crew will investigate. The transformer failure puts both ASD inverters on battery power. The report from the field will indicate that normal power can not be restored to the inverters. Per ABN-ADS-INV, the crew should reduce RRC flow, scram the reactor and carry out the actions of PPM 3.3.1. PPM 5.1.1 will be entered on low RPV level.

All rods will insert and as RPV level rises above +13", both RFW pumps will trip. When RFW pump resets are attempted they will not reset. RCIC will be initiated and a shaft shear will occur when turbine speed reaches 300 rpm. This effectively is a loss of HP injection sources.

The crew should lower RPV pressure with BPVs to facilitate feeding with condensate booster pumps. RPV level will be returned to +13 to +54 inch band.

After level has been returned to normal band, an OBE will occur. Due to the earthquake the suppression pool will develop a crack in the B RHR pump room. The crew should pull the control power fuses for RHR-P-2B. ABN-FLOODING will be entered along with EOP PPM 5.2.1 and EOP PPM 5.3.1.

When it is determined that suppression pool level cannot be maintained GT 19'2" the crew should anticipate Emergency Depressurization is required and per PPM 5.1.1 override, fully open the BPVs. When suppression pool level reaches 19'2", the crew should exit to PPM 5.1.3 and open 7 ADS SRV's to perform an emergency depressurization.

The scenario will be terminated when the ED is performed and RPV level is being returned to normal band.

Event No. 1

Description: Increase reactor power with flow to 100% power.

This event is initiated by the turnover information.

Time	Position	Applicants Actions or Behavior
T=0	SRO	Directs the RO to increase reactor power to 100% power with RRC flow at the rate of 10 Mwe/minute.
	RO	Increases reactor power with RRC flow as directed at the rate directed.
	BOP	Monitors plant equipment and peer checks RO.

COMMENTS:

Event No. 2		
Description: Place the Main Turbine into Governor Valve Optimization This event is initiated by the turnover information and will take place when output reaches 1150 Mwe		
Time	**Position**	**Applicants Actions or Behavior**
T= 5	SRO	Directs BOP operator to place the Main Turbine into Governor Valve Optimization per SOP-MT-GV/OPTIMIZATION
	BOP	Per SOP-MT-GV/OPTIMIZATION performs the following: Step 5.1.1 Verifies SNE info, TDAS points not inop, DEH in Turbine follow Reactor Mode; MWe GE 1192 and Reactor Power and Pressure stable Step 5.1.2a Verifies LOAD TARGET at 1370 MW Step 5.1.2b Sets VPL demand to 100% Step 5.1.2c Verifies OK TO SELECT light illuminated Step 5.1.2d Selects OPTIMIZED VALVE MODE Step 5.1.2e Selects yes Step 5.1.2f Verifies valve movement Step 5.1.2g Sets VPL demand 10% GT GV Demand Step 5.1.2h Verifies VPL Demand ramps to target value Step 5.1.2i Verifies VPL demand is 10% above GV Demand
	BOP	Informs SRO that the MT is in Governor Valve Optimization Mode of operation
COMMENTS:		

Event No. 3		
Description: SLC test tank outlet valve, SLC-V-31 loss of position indication. This event is initiated by activating **TRIGGER 1** and should be initiated when the MT is being placed into GV Optimization.		
Time	Position	Applicants Actions or Behavior
ROLE-PLAY: If the loss of indication is not observed by the crew (no alarms occur), after 2 minutes call the control room on the phone and report as Ops 2 that, while doing your rounds, you discovered the leads to SLC-V-31 are disconnected from the valves closed limit switch. The cause was due to an NLO trainee stepping on the limit switch while tracing SLC system piping.		
	SRO	If crew detects SLC-V-31 loss of indication prior to the role-play, directs Ops 2 to investigate SLC-V-31 locally.
Cue: As OPS2 - if not already reported – wait two minutes and report that the leads to SLC-V-31 are disconnected from the valves closed limit switch. The cause was due to an NLO trainee stepping on the limit switch while tracing SLC system piping.		
	SRO/BOP	Determines that neither SLC pump will initiate from the Control Room. (see Comments below).
	SRO	Declares both SLC pumps inoperable. - T.S. LCO 3.1.7 B "Two SLC subsystems shall be OPERABLE" requires restoration of one SLC subsystem to operable status in 8 hours. - OR be in MODE 3 in 12 Hrs and MODE 4 in 36 Hrs. - Contacts Work Week Manager to initiate repairs of SLC-V-31. Conducts brief.
COMMENTS: SLC logic is such that with V-31 "not" indicating closed, SLC-V-1A and SLC-V-1B (SLC tank outlets) will not auto open following initiation from the control room. If SLC-V-1A and B do not open, the SLC pumps will not start.		

Event No. 4

Description: HPCS System Keepfill pump, HPCS-P-3, failure.

This event is initiated by activating **TRIGGER 2** after Technical Specifications have been referenced and a brief has been ..

Time	Position	Applicants Actions or Behavior
T=15	BOP	Acknowledges HPCS WATER LEG PUMP DISCH PRESS LOW and HPCS SYSTEM OUT OF SERVICE alarms. Observes HPCS system pressure and HPCS-P-3 not running. Refers to ARP and informs SRO of condition. Directs OPS 2 investigate pump and breaker for HPCS-P-3.
	SRO	Per ARP, directs HPCS-P-1 start be inhibited by pulling the control power fuses. Contacts Work Week Manager. Refers to Tech Spec 3.5.1, condition B which requires RCIC operability verified immediately and restore HPCS within 14 days. May direct LPCS, RCIC, and ADS be protected per OI-49.

Booth Operator: Three minutes after being sent, report back as OPS 2 that the shaft coupling on HPCS-P-3 is broken.

Booth Operator: Two minutes after request to pull control power fuses on HPCS-P-1 activate TRIGGER 10 and report completion to Control Room.

COMMENTS:

Event No. 5		
Description: ASD Channel A2 alarm and fault. This event is initiated by activating **TRIGGER 3** after brief is completed or as directed.		
Time	**Position**	**Applicants Actions or Behavior**
T=25	RO	Acknowledges LOOP A ASD CHANNEL FAILURE LIMIT alarm. Reports trip of ASD 1A/2 alarm and Fault alarms and RECIRC A OR B HIGH FLOW DELTA alarm. Verifies trip of channel ASD1 A/2. Ensures RRC-P-1A has runback to 51 Hz. Reports power drop due to runback. Reports RPV power/level/pressure. Checks ASD video Display Unit for source of alarm. Dispatches OPS1/4 to investigate at the ASD Building.
	SRO	Directs actions per ARPs.
Cue: Call 2393 and report as OPS4 that there is a GTO freeze alarm on Channel 1A2. Also inform the RO that there is an 'electrical smell' in the building but you see nothing else wrong.		
	SRO	Per ARP for high delta flow (4.602.A6 6-2): Refers to ABN-POWER for the unplanned power change.

	SRO	Refers to Tech Spec 3.4.1, flow mismatch, which is applicable until flows are matched. Contacts Work Week Manager for ASD Channel fault. Directs RO to match RRC loop flows by lowering RRC Loop B flow.
	RO	Reduces RRC-P-1B speed as directed to match flows and clear High Flow Delta alarm.
COMMENTS:		

Event No. 6		
Description: ASD UPS trouble alarm which simulates the loss of E-PP-ASD1/4. This event is initiated by activating **TRIGGER 4** and should be initiated after RRC loop flows are matched or as directed.		
Time	**Position**	**Applicants Actions or Behavior**
Critical Task is to initiate a Manual Reactor Scram when it is determined both ASD inverters are on battery power		
T=30	RO	Reports ASD UPS Trouble Alarm (P602.A13 3-5) and refers to ARP.
	SRO	Refers to ARP and to ABN-ASD-INV.
	BOP	Sends OPS4 to investigate.
BOOTH OPERATOR: One minute after being sent to investigate, call on the radio and report that there are no lights on in the ASD building, you hear water running (not sure why or where) and are investigating cautiously. One minutes later call 2393 and report that it appears that there is a crack in the roof of the ASD building above transformer E-TR-ASD-1 and water is falling on the transformer. It looks like the main breaker supplying the AC input to E-PP-ASD 1/3 is opened and E-PP-ASD 1/3 is deenergized. You are exiting the building and taking the necessary electrical precautions.		
	SRO	Acknowledges report and refers to Attachment 7.1. Determines that E-PP-ASD 1/3 is de-energized and that IN-ASD/1A and 1B panels are on battery power. Determines that normal AC power is not going to be restored to the inverters and that flow reduction and scram are required

	SRO	Conducts brief. Directs that RRC flow be reduced to 60 Mlbm/hr. Directs a manual scram of reactor.
	RO	Lowers Core Flow to 60 Mlbm/hr as directed. Announces "Listen up for the scram report". Performs immediate scram actions: • Places Reactor Mode Switch in SHUTDOWN • Monitors Power, Pressure, and Level • Verifies all rods inserted • Inserts IRMs and SRMs by depressing INSERT P/B Reports EOP entry on low RPV water level.
COMMENTS:		

Event No. 7		
Description: RCIC Shaft Coupling breaks when 300 rpm is reached. RFW Pumps trip and can not be reset. The RCIC event is active from the start of the scenario. RFW pumps auto trip when mode switch is taken to shutdown.		
Time	**Position**	**Applicants Actions or Behavior**
T=35	SRO	Enters (and re-enters) PPM 5.1.1 and directs restoration of RPV level to +13 inches to +54 inches with RCIC and/or Reactor Feed Pump.
	RO	Reports both Reactor Feed Pumps tripped.
	SRO	Directs that the second CRD pump be started.
	RO	Starts second CRD pump when directed. May direct ABN-CRD-MAXFLOW be performed.
ROLE-PLAY – three minutes after request for ABN-CRD-MAXFLOW, activate <u>TRIGGER 26</u> and when valves are finished re-positioning, report completion to control room. **ROLE-PLAY – If sent to RCIC room to investigate, report shaft coupling in pieces on the floor.**		
	RO/BOP	When RCIC is initiated, reports that no discharge pressure/flow is observed on RCIC. May report that RPMs did rise but are zero now. When reset of RFW is attempted, reports they cannot be reset. Performs actions of PPM 3.3.1.

	BOP	Reports +13" initiations and isolations sat and monitors pressure.
	SRO	Directs the BOP to reduce RPV pressure to 500 psig to 600 psig with Bypass Valves to allow injection with the condensate booster pumps.
	BOP	Reduces pressure as directed with BPVs, using quick card.
	RO	Sets up feedwater level control for RFW-V-10A/B valve operation. Injects with condensate booster pumps when pressure has been reduce to 500 psig to 600 psig. Restores reactor level to +13 inches to + 54 inches.
Comments:		

Event No. 8

Description: OBE and RHR-B Suction Break

This event is initiated after RPV pressure has been lowered to 500 to 600 psig band and RPV level is being controlled +13" to +54".

BOOTH OPERATOR: During the remainder of the scenario, if asked to re-install the HPCS-P-1 control power fuses, report the fuse block broke and you have contacted the electricians to come help. HPCS-P-1 will NOT be returned to service during the scenario.

BOOTH OPERATOR: Start earthquake machine at low volume working quickly up to full volume and leave on for a 20 seconds total EQ. When full volume is reached, activate TRIGGER 5.

Time	Position	Applicants Actions or Behavior
Booth Operator: When EQ is completed, as OPS1, call the control room on the radio and report that you felt severe shaking and movement in the turbine building.		
T=45	BOP	Reports OBE annunciator, pulls ARP and refers SRO to ABN-EARTHQUAKE. Investigates and reports indications on Bd. L.
	SRO	Directs actions for earthquake per ABN-EARTHQUAKE: • Directs plant announcement • Directs SAS repeat announcement
	RO	Reports: • Reactor Sump R2 level Hi Hi alarm • Suppression Pool level Hi/Low Suppression Pool level low alarm • Reports lowering trend on Suppression Pool Water Level • Reports EOP 5.2.1 entry at –2" when it occurs. • Reports RHR B Room level Hi EOP entry into PPM 5.3.1.

ROLE-PLAY – If asked to investigate RHR room leak, wait two minutes and report water coming from a crack down the side of the suppression pool wall <u>that EXTENDS INTO THE FLOOR</u>. You have exited the room and closed the hatch behind you.		
	SRO	Enters PPM 5.2.1 on low SP level and directs actions per ABN-FLOODING. Enters PPM 5.3.1 on RHR B room level Hi. Directs OPS2 to investigate water level in RHR B room. Determines that RHR B is not operational due to flooding. May direct the RO to close RHR-V-4B in an attempt to isolate the leak. May direct pulling of RHR-P-2B control power fuses.
Cue: If directed, wait three minutes, then ACTIVATE <u>TRIGGER 6</u> to pull RHR-P-2B fuses and report completion.		
	RO/BOP	If directed, closes RHR-V-4B. Reports continued lowering trend on Suppression Pool level.
Comments:		

Event No. 9		
Description: Emergency Depressurization due to low Suppression Pool level This event is initiated when SP level cannot be maintained GT 19'2". SP Level drops about 1 foot every 2 minutes.		
Time	**Position**	**Applicants Actions or Behavior**
Critical Task is to initiate an Emergency Depressurization when Suppression Pool level cannot be maintained GT 19'2".		
Note: SRO may anticipate the ED on low suppression pool level and direct the bypass valves be opened to rapidly reduce pressure.		
	BOP	Continues to give Suppression Pool level reports as level drops.
T=60	SRO	Determines that Suppression Pool level will not be able to be maintained above 19'2". May take override in PPM 5.1.1 pressure leg and anticipate Emergency Depressurization. May direct BPVs be rapidly opened.
	RO/BOP	If directed, takes manual control of the Bypass Valves and fully opens them.
	SRO	When Emergency Depressurization is required due to low suppression pool level, (SP Level LE 19'2") exits pressure leg of PPM 5.1.1. Enters PPM 5.1.3 and directs 7 ADS SRVs open.
	RO/BOP	Opens 7 ADS SRVs to depressurize the reactor.

	SRO	Directs injection with systems to return RPV level to +13" to +54".
	RO/BOP	Returns RPV level to band as directed.
This scenario will be terminated when the reactor has been emergency depressurized and RPV level is under control and stable/increasing.		
Comments:		

SRO TURNOVER INFORMATION

Initial Conditions: The plant is operating at approximately 94% power due to economic dispatch.

Turnover Information: After shift turnover, reactor power is to be raised with RRC Flow until Generator Output reaches 1150 MWe. At that point stop the power increase and place the Main Turbine into Governor Valve Optimization. When complete, resume power increase to 100%.

A reactivity brief for the power increase has been held and power is to be increased immediately following shift turnover. There are no pre-conditioning limits.

SIMULATOR SETUP INSTRUCTIONS

Reset to IC-179

Set Up Earthquake Machine on Low Volume

BAT FILE

```
>*************************
>*  Trigger list *
>*************************
>
>Trigger 1 SLC-V-31 position indication loss
>Trigger 2 HPCS-P-3 Shaft break
>Trigger 3 ASD CH A2 alarm/fault
>Trigger 4 ASD UPS Trouble – Simulates loss of E-PP-ASD 1/4
>Trigger 5 EQ, Suppression Pool Leak, RHR B Suction break
>Trigger 6 Pull control power fuses for RHR-P-2B
>Trigger 7 Conditional to Lock in ASD Annunciators
>Trigger 8 Conditional for RCIC Shaft Break (when 300 rpm is reached)
>Trigger 9 Conditional for RFW A/B trip and can't be reset (on MODE SW in SD)
>Trigger 10 Pull Control Power Fuses for HPCS-P-1
>
>*************************************************************************
>The following items are triggered in the scenario
>*************************************************************************
>
> TRIGGER 1 - SLC-V-31 Loss of position indication
> SLC-V-31 TEST TANK OUTLET VALVE
IRF LOA-SLC002 (1) 1
> SLC-V-31 RED LAMP
IOR IND-SLC003B (1)  OFF
> SLC-V-31 GREEN LAMP
IOR IND-SLC003A (1)  OFF
>
> TRIGGER 2 – HPCS-P-3 Shaft Break & Low Press Alarm
IRF  LOA-EPS137  (2)  DISCONNECT
IRF  PLP-CSS006   (2)   0.01  0
IRF PLP-CSS002    (2)   2.0  0
IOR  STL-HPCS31  (2)  ON
>
> TRIGGER 3 - ASD CH A2 alarm and Fault
IMF MAL-RFC002E (3)
IMF MAL-RFC006A (3)
>
> TRIGGER 4 - ASD UPS Trouble Alarm
IMF ANN-602A13C05 (4) 0
>
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> TRIGGER 5 - SUPP CHAMBER LEVEL INDICATION
>SLOWLY DROPS TO BOTTOM OF SCALE (8"/MIN)
IMF XMT-PCN003A (5 5) -25 198
IMF XMT-PCN004A (5 5) -24.94 200
IMF XMT-PCN006A (5 5) 3 3000
IMF XMT-PCN007A (5 5) 2 2999
>
> LINE BREAK AT RHR-P-2B SUCTION
IMF MAL-RHR005 (5 10) 8000
>
> EARTHQUAKE
IMF MAL-RWB001 (5) 0.3
>
> TRIGGER 6 - PULLS CONTROL POWER FUSES FOR RHR-P-2B
IRF LOA-EPS397 (6) 1
>
> TRIGGER 10 - PULLS CONTROL POWER FUSES FOR HPCS-P-1
IMF BKR-CSS001 (10)  5
>
>*************************************************************************
>The following are conditionals to initiate triggers
>*************************************************************************
>
> Locks in annunciator window 602.A6 5-1 when both ASD annunciator
> and itself are actuated
IMF ANN-602A6E01 (7) 0
TRGSET 7 "JN06E01.AND.JN13D03.GT.0"
>
>Causes the RCIC pump shaft to seize when speed exceeds 300 rpm.
IMF PMP-RCI001S (8) TRUE
TRGSET 8 "X01D066M.GT.300"
>
>Mode switch to shutdown causes RFW pumps to trip and cannot be reset
TRGSET 9 "X03I102S.GT.0"
IOR OVR-FPT002B (9)  ON
IOR OVR-FPT002C (9)  OFF
IOR OVR-FPT007B (9)  ON
IOR OVR-FPT007C (9)  OFF
>
>Local Bat file loads generic triggers for local plant actions
bat LOCAL.txt
```

INSTRUCTIONAL COVER SHEET

PROGRAM: OPERATIONS TRAINING

COURSE TITLE: COLUMBIA GENERATING STATION SIMULATOR EXAMINATION

LESSON TITLE: DG-3 Monthly Surveillance, Failure of HPCS-P-2, RFW-DPT-4B Failure, FWH-6B High Level Trip, DEH Leak Requiring Manual Scram, Loss of TR-S, DG-1/2 Fails to Auto Start, LOCA, ED on RPV Level

LENGTH OF LESSON 1.5 Hours

INSTRUCTIONAL MATERIALS INCLUDED

Lesson Plan PQD Code		Rev. No.	
Simulator Guide PQD Code	LO001626	Rev. No.	0
JPM PQD Code		Rev. No.	
Exam PQD Code		Rev. No.	

DIVISION TITLE: Nuclear Training

DEPARTMENT: Operations Training

PREPARED BY: **Ron Hayden** DATE: 06/16/08

REVISED BY: DATE:

VALIDATED BY: DATE:

TECHNICAL REVIEW: DATE:

INSTRUCTIONAL REVIEW: DATE:

APPROVED: DATE:

Operations Training Manager

Verify materials current IAW SWP-TQS-01 prior to use.

Facility: Columbia NRC Scenario No: 2

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: The reactor has been operating at 100% power for the last 131 days. This is a Division 3 work week. OSP-ELEC-M703, DG-3 Monthly Surveillance, is in progress. OPS 2 is standing by in the HPCS DG room. DG-3 is running and SM-2 is being powered from TR-S per OPS-ELEC-M703. PDIS signal X108 (DG3 voltage) is not available.

Turnover Information: Continue with DG-3 monthly surveillance which has been completed through step 7.5.49.

Time	Position	Applicants Actions or Behavior
1.	N (BOP)	Synchronize DG-3 per monthly surveillance OSP-ELEC-M703
2.	C (BOP) C (SRO)	Failure of HPCS-P-2 requiring manual trip of DG-3 SRO - Tech Spec
3.	C (SRO/RO)	Failure of RFW-DPT-4B – Narrow Range on H13-P603 SRO – Tech Spec
4.	R (RO)	High Level Trip of FWH-6B requiring reducing core flow to LE 92 Mlbm/hr Rod Line GT 100% requiring using Fast Shutdown Sequence to insert rods to lower the rod line Also required core flow be lowered to 75 Mlbm/hr
5.	C (SRO/BOP)	DEH Leak eventually requires a manual scram and trip of MT and MG
6.		TR-S Lockout; MSIVs close, Initiate RCIC/CRD for level control
7.	C (RO)	DG-1 and DG-2 Fails to Auto Start
8.	M (All)	LOCA - Spray Wetwell and Drywell
9.		LOCA - RPV level drops to TAF
10.		Initiate Emergency Depressurization on low RPV Level and return level to normal with low pressure ECCS pumps

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

SCENARIO DESCRIPTION

The scenario begins with power at 100%. DG-3 is running and SM-2 is powered from Startup to support surveillance testing of DG-3.

Turnover information is that OSP-ELEC-M703, DG-3 Monthly Surveillance, is in progress and DG-3 is running and is ready to be synchronized. The BOP operator will continue with this surveillance and sync DG-3.

A short time after the DG-3 is synchronized, HPCS-P-2 will trip and Service Water to DG-3 will be lost. Per the immediate actions of ABN-SW, DG-3 will be tripped locally. The SRO will review Tech Specs for HPCS DG being INOP.

The next event is RFW-DPT-4B (RFW-LI-606B RPV narrow range indication differential pressure transmitter) will fail and RFW-LI-606B will fail upscale causing a level 8 trip on 1 out of 3 instruments.

The crew will refer to technical specification 3.3.2.2 Action A which will give the crew 7 days to place the affected channel in Trip. The CRS will refer to ABN-INSTRUMENTATION.

The next event is a high level trip of High Pressure Feedwater Heater 6B. Feedwater temperature will drop by GT 6°F requiring entry into ABN-POWER. Reactor Power to rise requiring the RO to lower power with flow and to drive control rods to maintain LT the 100% rod line. When the fast shutdown sequence is used to insert control rods it requires core flow to be lowered to 75 Mlbm/hr.

The next event is a leak in the DEH system. ABN-DEH will be entered and the leak rate will require a reactor scram and trip of the Main Turbine and Main Generator.

When TR-S closes in it will lockout. TR-B will power SM-7 and SM-8.

When TR-S is lost the MSIVs will close causing a LOCA to develop. Manual pressure control on SRV will be required. RCIC will be initiated and CRD restarted to feed the RPV but RPV level will continue to drop.

On the High Drywell Pressure initiation signal, DG-1 and DG-2 will fail to auto start. When initiations are checked the RO will take actions and manually start both Diesel Generators.

RPV level will eventually drop to LT -161” and an Emergency Depressurization will be initiated to facilitate feeding with low pressure ECCS pumps.

Containment pressures will rise requiring the crew to spray the wetwell and the drywell. Sprays will be removed from service to allow RPV injection after the Emergency Depressurization occurs.

The scenario will be terminated when RPV level is being returned to normal band and sprays have been re-initiated as appropriate.

Event No. 1		
Description: Synchronize DG-3 for monthly surveillance OSP-ELEC-M703. This event is initiated by the turnover sheet.		
Time	**Position**	**Applicants Actions or Behavior**
T=0	SRO	Directs the BOP to complete OSP-ELEC-M703 starting at step 7.5.50.
	BOP (N)	At H13-P601, places the CB-4DG3 Sync Selector Switch to D. GEN/BUS. Raises voltage using Diesel Generator Voltage Reg Control switch until incoming voltage is slightly higher than running voltage. Raises frequency with the Electric Governor control switch until sync scope is running slow in the fast (Clockwise) direction. When the sync scope is about 5 minutes before the 12 o'clock position, places CB-4DG3 control switch in the CLOSE position. Verifies breaker closes. Immediately verifies KVARs are zero or slightly positive. Immediately loads DG-3 to GE 100 KW using the Electric Governor control switch. Gradually loads DG-3 to 1300KW using the Electric Governor control switch. Adjust reactive load to approximately 325 KVAR out (to the right) using Diesel Generator Voltage Regulator Control switch.

		Places CB-4/DG3 Sync Selector Switch to OFF. Wait 5 minutes.
COMMENTS:		

Event No. 2		
Description: Failure of HPCS-P-2 (DG-3 Service Water pump).. This event is initiated when the 5 minute wait step has been reached (Step 7.5.59) during operability test of DG-3 and is initiated by activating **TRIGGER 1**.		
Time	**Position**	**Applicants Actions or Behavior**
T=10	BOP (C)	Acknowledges alarms associated with the loss of HPCS-P-2. Scans panel and notes HPCS-P-2 is not running and SW-V-29 is going closed. Informs SRO of loss of HPCS-P-2. May give ABN reference to SRO and that a trip of DG-3 is required. May direct OPS 4 investigate loss of pump.
BOOTH OPERATOR – If requested, three minutes after request inform the Control Room that HPCS-P-2 is hot to the touch and the motor looks scorched. **If required, the breaker is tripped for HPCS-P-2 on MC-4A.**		
	SRO (C)	Announces entry into ABN-SW. Directs BOP to have DG-3 tripped at the local panel (if BOP has not already performed).
BOOTH OPERATOR – 30 seconds after request to trip DG-3, activate TRIGGER 20 and inform the control room when trip has occurred.		
	SRO	Contacts Work Week Manager. Reviews Technical Specifications: TS 3.8.1B – One required DG inoperable requires: B1 - performance of SR 3.8.1.1 for OPERABLE offsite circuit within 1 hour; B2 – Declare required features associated with inop DG, inoperable (TS 3.5.1 B1 HPCS System inoperable – Verify RCIC operable immediately and restore HPCS within 14 days); AND B.3.1 Determine common cause within 24 hours ; AND B.4.1 -

		Restore DG to operable status within 72 hours. May protect DG-1 and DG-2 per OI-49.
COMMENTS:		

Event No. 3

Description: RFW-DPT-4B Failure.

This event is initiated when the actions for HPCS-P-2 failure are complete and is initiated by activating **TRIGGER 2.**

Time	Position	Applicants Actions or Behavior
T=20	RO	Acknowledges alarms: H13-P603 A8 drop 1-7 and 4-7 (RFW control system trouble and RFW/Turbine RPV level high trip). Identifies RFW-LI-606B indicated upscale but RFW-LI-606A and C are reading normal RPV level. Identifies that the 'B' Reactor Vessel High Level is sealed in. Refers to ARPs.
	SRO	Refers to ABN-INSTRUMENTATION. Refers to Tech Spec 3.3.2.2 and determines action statement 3.3.2.2 Action A applies - place the affected channel in trip within 7 days. Contacts Work Week Manager. Conducts brief.

COMMENTS:

Event No. 4

Description: High Level Trip of High Pressure Feedwater Heater 6B.

This event is initiated when the actions for RFW-DPT-4B failure are complete and is initiated by activating **TRIGGER 3.**

Time	Position	Applicants Actions or Behavior
T=20	RO	Acknowledges HTR 6B High level alarm and refers to ARP.
	BOP	Investigates backpanel and notes controllers for dump and drain valves in AUTO and requiring the valves to be open but level continues to rise. Note: Nothing the operator does will cause level to stop rising. Reports actions (if any) to SRO and that level in FWH 6B cannot be controlled.
	RO (R)	Acknowledges Heater 6B High Level Trip and steam dump valves not fully closed alarms (MSR B heater drain tank alarms may also annunciate). Reports trip of 6B Heater to SRO and entry into ABN-POWER. Due to the FWH trip, observes feedwater inlet temperature and notes that it has dropped more than 6°F (begin temp is about 411°F and final temp is about 391°F). Notes Thermal Power has gone up and when GT 3486 MWT, reduces power with RRC flow to maintain LT 3486 per Immediate actions of ABN-POWER. (Note: SRO may direct power reduction to LE 92Mlbm/hr prior to RO reducing to LT 3486 MWT.)
	SRO (C)	Announced entry into ABN-POWER and per step 4.4.1, directs RRC flow be

		lowered to LE 92 Mlbm/hr core flow.
COMMENTS:		

Event No. 5		
Description: DEH System Leak requiring a Manual Scram be inserted. This event is initiated when the actions for the trip of FWH 6B are complete and is initiated by activating **TRIGGER 4.**		
Time	**Position**	**Applicants Actions or Behavior**
Critical Task is to initiate a Manual Reactor Scram when the DEH Low Low Reservoir Level alarm annunciates within 15 minutes of the Low Reservoir level annunciator.		
T=35	BOP (C)	Acknowledges DEH Reservoir Level Low annunciator and refers to ARP. Directs OPS3 to investigate locally and report level on DEH-LG-17. References ABN-DEH-LEAK to SRO.
	SRO (C)	Announces entry into ABN-DEH-LEAK. Directs that OPS1 commence filling the DEH reservoir per SOP-DEH-OPS. Notes time and starts 15 minute clock for step 4.1.1 of ABN-DEH-LEAK.
BOOTH OPERATOR – Initial tank level will be one minute after request and remainder of reports will be consistent with time since trigger initiation as follows: **Initial report tank level is 16.75"; Level report will be ½" less each minute after initial level report. It takes 11 minutes to get Low Low Level alarm which required a manual scram**		
	BOP	Acknowledges DEH Reservoir Level Low Low annunciator and refers to ARP (It takes 11 minutes from low level alarm to get low-low alarm).

	SRO	Directs manual scram; trip of Main Turbine, and trip of Main Generator per step 4.1.1 of ABN-DEH-LEAK.
	RO	Announces 'Listen up for the scram report' and places MODE switch to shutdown. Announces APRM downscales in, RPV pressure reading and trend, RPV level reading and trend, and EOP entry on low RPV level. Announces all-rods-in to SRO.
	BOP	Initiates trip of the Main Turbine (if not automatically completed) by depressing the two Turbine trip pushbuttons. Initiates trip of the Main Generator (if not automatically complete) by depressing the two red Unit Emergency and Unit Overall Emergency pushbuttons.
	SRO	Announces entry into EOP 5.1.1, RPV Control, on low RPV level.
COMMENTS:		

Event No. 6		
Description: Lockout of the Startup Transformer. MSIVs close, Initiate RCIC and CRD This event is automatically initiated when CB-S1 breaker closes.		
Time	**Position**	**Applicants Actions or Behavior**
	BOP	Investigates electrical board status when lights go out after TR-S lockout. Notes no power to SM-1, SM-2, SM-3, SH-5 or SH-6. Notes TR-B is powering SM-7 and SM-8. Updates crew on plants electrical board status.
	BOP/RO	Notes that MSIVs have closed and announces pressure control with SRVs at a pressure band of 800 to 1000 psig.
	SRO	Working down the level leg of EOP 5.1.1, notes that no high pressure injection sources are running. Directs RCIC and CRD be initiated and injection to RPV at a level band of +13" to +54".
	BOP/RO	Using the quick card, Arms and Depresses RCIC Manual Initiation pushbutton and verifies injection at 600 gpm. Starts CRD pump as directed. May direct ABN-CRD-MAXFLOW be performed to facilitate running both CRD pumps.
BOOTH OPERATOR – If requested, wait 5 minutes and then activate <u>TRIGGER 26</u> to place both CRD suction and discharge filters on line and report completion to control room.		
	BOP/RO	Notes that no CAS air compressors are running, contacts OPS3 and directs the reset of CAS compressors.

BOOTH OPERATOR – If requested, wait 2 minutes and then initiate trigger (23) to reset CAS Air Compressors.
COMMENTS:

Event No. 7		
Description: Failure of DG-1 and DG-2 to AUTO start on Undervoltage or when DW/P reaches 1.68 psig. This event is automatically initiated when SM-7 and SM-8 become de-energized or when DW/P rises above 1.68 psig.		
Time	**Position**	**Applicants Actions or Behavior**
	BOP/RO (C)	When TR-S locks out of when initiations are checked due to DW/P being GT 1.68 psig, notes that neither DG-1 nor DG-2 are running. Takes control switches for both DG-1 and DG-2 to start and notes that they did start. Informs SRO of failure of DGs to auto start. Directs OPS 3 verify DG operation after auto start.
BOOTH OPERATOR: After requested, wait 5 minutes and report DG 1 and DG2 operating normally.		
COMMENTS:		

Event No. 8		
Description: ***LOCA (Containment Sprays).*** This event is initiated automatically one minute after the MSIVs close.		
Time	**Position**	*Applicants Actions or Behavior*
	RO/BOP	Recognizes rising DW Pressure and reports EOP entry at 1.68 psig. Also reports additional primary containment EOP entries as they occur.
	SRO	Enters EOP 5.2.1, Primary Containment Control and re-enters 5.1.1 due to high DW pressure. Directs isolations, initiations and DG starts for +13", -50" and 1.68 psig be verified as parameters occur.
	RO/BOP	Reports Wetwell pressure when it reaches 2 psig.
	SRO	Directs Wetwell sprays with RHR. Directs securing sprays if pressure drops below 1.68 psig.
	RO/BOP	Using quick card, initiates wetwell sprays and supplements with wetwell cooling and reports completion to SRO.
	SRO	May directs other loop of RHR be placed in suppression pool cooling.
	RO/BOP	Utilizing quick card, places RHR loop in SP Cooling.

	RO/BOP	Reports Wetwell pressure when it reaches 12 psig.
	SRO	Directs drywell cooling fans be secured.
	RO/BOP	Secures drywell cooling fans as directed and reports completion.
	SRO	Directs DSIL verification and then drywell sprays be initiated. Directs securing sprays if drywell pressure drops below 1.68 psig.
	RO/BOP	Verifies within DSIL and using quick card, initiates drywell sprays as directed. Reports Drywell pressure drop as expected.
COMMENTS:		

Event No. 9		
Description: ***LOCA (RPV Level Drop).*** This event is initiated automatically one minute after TR-S lockout and the MSIVs close.		
Time	**Position**	**Applicants Actions or Behavior**
	BOP/RO	Reports RPV level dropping even with RCIC and CRD running. Gives RPV level reports as level continues to lower.
NOTE – From the time -50 " RPV/ Level is reached, it takes about 5 minutes to get to -129" RPV/L and another minute to get to TAF and an additional minute to get to -183" RPV/L.		
	SRO	Directs ADS be inhibited when ADS timers initiate.
	BOP/RO	When RPV/L drops to -129" and the ADS timers intimate, takes both ADS inhibit switches to inhibit and acknowledges BISIs. Reports ADS inhibited to SRO.
	BOP/RO	Reports RPV level as it transitions from Wide Range to Fuel Zone indicators. Reports RPV level at TAF and trend continues down slow.
COMMENTS:		

Event No. 10

Description: ***Initiate Emergency Depressurization.***

This is initiated when it is determined that RPV level cannot be restored and maintained GT –183".

Critical Task is to initiate an Emergency Depressurization when TAF is reached at -161" and before RPV Level drops to -183".

Time	Position	Applicants Actions or Behavior
	SRO	Determines that Emergency Depressurization is required. Enters PPM 5.1.3, Emergency Depressurization, and determines wetwell level GT 17'. Directs 7 ADS SRVs be opened.
	RO/BOP	Opens 7 ADS SRVs as directed.
	SRO	Directs wetwell and drywell sprays and suppression pool cooling be secured to facilitate RPV injection.
	RO/BOP	Secures DW and WW sprays and SP cooling as directed. Allows ECCS injection valves to open at 470 psig. Reports RPV injection as it occurs. Reports RPV level rising and when GT –161 inches.

COMMENTS:

Event No. 11		
Description: ***Re-initiation of Wetwell and Drywell Sprays.*** This event is initiated by the SRO when RPV level has been raised GT TAF.		
Time	**Position**	**Applicants Actions or Behavior**
	SRO	Based on rate of RPV level change, injection systems available, and wetwell pressure, directs re-initiation of wetwell and drywell sprays and suppression pool cooling with RHR as appropriate (Wetwell spray initiation if WW/P GT 2 psig and DW Spray initiation if WW/P GT 12 psig.
	RO/BOP	Secures injection systems as directed to return RPV level to +13 to +54 inch band. Reinitiates wetwell and drywell sprays as appropriate. Reinitiates suppression pool cooling as directed.
Termination Criteria: The scenario will be terminated when RPV level is being returned to normal and wetwell and drywell sprays have been initiated as appropriate.		
COMMENTS:		

TURNOVER INFORMATION

Initial Conditions: The reactor has been operating at 100% power for the last 131 days. This is a Division 3 work week. OSP-ELEC-M703, DG-3 Monthly Surveillance, is in progress. OPS 2 is standing by in the HPCS DG room. DG-3 is running and SM-2 is being powered from TR-S per OPS-ELEC-M703. PDIS signal X108 (DG3 voltage) is not available.

Turnover Information: Continue with OSP-ELEC-M703, DG-3 Monthly Surveillance, which has been completed up through step 7.5.49.

SIMULATOR SETUP

Reset to IC-180.

Have HPCS DG Surveillance signed off thru step 7.5.49.

Ensure sign at SRO desk indicates a Division 3 work week.

BAT FILE

```
> 2009 NRC Scenario #2
>************************
>*  Trigger list *
>************************
>Trigger 1 HPCS-P-2 Shaft Seizure
>Trigger 2 RFW-DPT-4B Fails
>Trigger 3 Feedwater Heater 6B Trips
>Trigger 4 DEH Leak
>Trigger 10 Conditional for TR-S Lockout and LOCA on CB S1 closure
>*************************************************************************
>The following items setup conditions for the beginning of the scenario
>*************************************************************************
> DG1 ECCS - FAIL AUTO START
IMF MAL-DGN006A TRUE
IMF MAL-DGN007A TRUE
> DG2 ECCS - FAIL AUTO START
IMF MAL-DGN006B TRUE
IMF MAL-DGN007B TRUE
>*************************************************************************
>The following items are triggered in the scenario
>*************************************************************************
>TRIGGER 1 - HPCS-P-2 SHAFT SEIZURE
IMF PMP-SSW001S (1) TRUE
>
>TRIGGER 2 - RFW-DPT-4B   FAILS UPSCALE
IMF XMT-RRS107A (2) 60.000000 0 36.389500
>
> TRIGGER 3 FWH 6B TRIPS ON HIGH LEVEL
> DUMP VALVE LCV-6B2 FAILS CLOSED
IMF AOV-FWH050F (3) 1
> DRAIN VALVE LCV-6B1 FAILS CLOSED
IMF AOV-FWH049F (3) 1
>
> TRIGGER 4 - DEH COMMON DISCH LEAK
> DEH RESERVOIR LEVEL LOW ALARM (P820-B1.6-7)
IMF ANN-820B1F07 (4) 0
> DEH RESERVOIR LEVEL LOW-LOW ALARM (P820-B1.7-7)
IMF ANN-820B1G07 (4 660)  0
>
>*************************************************************************
>The following are conditionals to initiate triggers
>*************************************************************************
>TRIGGER 10 TR-S TRIP/LOCKS OUT ON CLOSURE ON CB-S1
IMF MAL-OED001 (10) TRUE
IMF MAL-RRS004B  (10 60) 2 600
TRGSET 10 "X8CO230R.GT.0"
>
>Local Bat file loads generic triggers for local plant actions
bat local.txt
```

INSTRUCTIONAL COVER SHEET

PROGRAM	OPERATIONS TRAINING
COURSE TITLE	COLUMBIA GENERATING STATION SIMULATOR EXAMINATION
LESSON TITLE	Raise Power With Flow, MS-RV-2A Spurious Open, Place RHR in SP Cooling, ARM-RIS-3 Failure, MT Drain Tank Controller Failure Causes MT Trip, Hydraulic ATWS, Reduced SLC, Lower Level, S/R/S Inserts Control Rods, Return Level to Normal

LENGTH OF LESSON 1.5 Hours

LS INCLUDED

Lesson Plan PQD Code		Rev. No.	
Simulator Guide PQD Code	LO001627	Rev. No.	0
JPM PQD Code		Rev. No.	
Exam PQD Code		Rev. No.	

DIVISION TITLE	Nuclear Training		
DEPARTMENT	Operations Training		
PREPARED BY	**Ron Hayden**	DATE	6/12/08
REVISED BY		DATE	
VALIDATED BY		DATE	

TECHNICAL REVIEW		DATE	
INSTRUCTIONAL REVIEW		DATE	
APPROVED		DATE	

Operations Training Manager

Verify materials current IAW SWP-TQS-01 prior to use.

Facility: Columbia NRC Scenario No: 3
Examiners: _____ Operators: _____
_____ _____
_____ _____

Initial conditions: During a plant startup following a refueling outage, Columbia is at approximately 60% with the Main Turbine Generator synchronized. CAS-C-1C is tagged out for repairs.

Turnover: Continue with the startup and raise power with flow to 65% power per PPM 3.1.2 step Q-60. The reactivity brief has been given.

Event No.	Timeline	Event Type*	Event Description
1.	T=0	R (RO)	Raise power with flow
2.	T=10	C (SRO/BOP)	MS-RV-2A Spurious open – Pull fuses to close
3.	T=15	N (BOP)	Place RHR-B in Suppression Pool Cooling
4.	T=35	I (SRO/BOP)	ARM-RIS-3 Failure
5.	T=40	C (SRO/BOP)	MT Drain Tank Controller Failure – Leads to Manual Scram and Automatic Main Turbine Trip
6.	T=45	M (ALL)	Hydraulic ATWS. Lower RPV Level to establish "LL"
7.	T=50	C (RO)	Reduced SLC flow
8.	T=55		Perform PPM 5.5.1 (ECCS Inj. Valves) and PPM 5.5.6 (MSIV bypass) Perform PPM 5.5.10 and PPM 5.5.11 to insert control rods
9.	T=65		Scram/Reset/Scram Inserts All Control Rods Return RPV Level to normal band
	T=75		Termination Cue: All rods are in and RPV level is being returned/is returned to normal band

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

SCENARIO DESCRIPTION

The scenario starts with the reactor at approximately 60% power. The turnover information has the crew ready to raise power per PPM 3.1.2 to 65%.

CRO1 will begin raising power with flow to 65% at 10 Mwe per minute.

The next event is a spurious opening of MS-RV-2A. ABN-SRV will be entered. When the SRV control switch is taken to close the valve will remain open.

RHR will be placed in Suppression Pool Cooling per SOP-RHR-SPC

Fuses BB-F19 and F20, in H13-P628, will be pulled to close the SRV. Tech specs will be referenced but none will apply.

The next event is a downscale failure of ARM-RIS-3. The crew will investigate, take actions per ARP and refer to LCS 1.3.7.4.

The next event is a failure of the level control valves associated with the A MSR drain tank. As level rises, a drain tank high level alarm annunciates. Level will continue to rise and a MSR high level alarm will activate. The crew should scram the plant prior to the 30 second time delay expiring. The MT will trip when the 30 second time delay times out.

When the manual scram occurs the crew will recognize that the reactor control rods did not insert due to a hydraulic ATWS. PPM 5.1.1 will be entered, which will direct entry into PPM 5.1.2. Pressure should be controlled by MT Bypass valve operation.

PPM 5.5.1 and PPM 5.5.6 will be implemented.

Reactor water level will be intentionally lowered to –65” to –183” (-80” to -140”) to control reactor power.

When SLC is started the relief valves will lift resulting in reduced SLC flow (18 gpm) to the vessel.

The Control Rods will be inserted with the Reactor Manual Control System (driving rods), and the Scram/Reset/Scram method listed in PPM 5.5.11.

The ATWS will clear when RPV level has been lowered and is under control.

When all rods are in, SLC will be secured and PPM 5.1.2 will be exited. RPV level will be returned to normal band per PPM 5.1.1 with feedwater.

The scenario will be terminated when RPV level has been returned to normal band.

Event No. 1		
Description: Raise Reactor Power with Flow. The event is initiated by turnover information and is started when the crew takes the shift.		
Time	**Position**	**Applicants Actions or Behavior**
T = 0	SRO	Directs RO to raise Reactor Power with flow not to exceed 10 Mwe per minute to a power level of 65%.
	RO	With ASD in AUTO, raises reactor power with flow at LE 10 Mwe per minute.
COMMENTS:		

Event No. 2		
Description: MS-RV-2A spurious open – Fuses pulled to close This event occurs when the RO Evaluator has observed the power increase and indicates the is initiated by activating **TRIGGER 1** when power has been raised to 75% or when it is determined that the last event has been completed.		
Time	**Position**	**Applicants Actions or Behavior**
T=10	BOP	Acknowledges SRV Open alarm, observes MS-RV-2A is open and refers to ARP Informs SRO and refers him to ABN-SRV
	SRO	Directs actions: Verify SRV open by tail pipe temp rise or SP Temp/level rise or MG output reduction With power LT 90% - directs BOP to place the control switch for MS-RV-2A to OFF
	BOP	Places the control switch to OFF and observes that the SRV is still open and informs the SRO
	SRO	Directs placing RHR in Suppression Pool Cooling per SOP-RHR-SPC (Refer to Event 3)
	SRO	Directs fuses be pulled per Attachment 7.1
	BOP	Takes all watches/rings off, wears safety glasses and using small yellow fuse pullers, removes Fuses BB-F19 and BB-F20 in H13-P628
	BOP	Verifies indication on P601 and informs SRO that MS-RV-2A is closed

	SRO	Refers to Tech Specs and notes that no action statement applies with just this SRV inop Contacts Work Week Manager
COMMENTS:		

Event No. 3		
Description: Place RHR B in Suppression Pool Cooling per SOP-RHR-SPC The event is initiated by ABN-SRV performance		
Time	**Position**	**Applicants Actions or Behavior**
T=15	SRO	Directs placing RHR-B in Suppression Pool Cooling per SOP-RHR-SPC
	BOP	Verify RHR-A operable Verify SW-P-1B running – otherwise N / A Start RHR-P-2B by taking C/S to start Verifies RHR-FCV-64B opens Verifies SW-P-1B running Throttle open RHR-V-24B to between 2500 – 7000 gpm, as determined by the CRS Verify RHR-V-64B closes If maximum cooling is desired, closes RHR-V-48B
COMMENTS:		

Event No. 4		
Description: Downscale failure of ARM-RIS-3 The event is initiated by activating **TRIGGER 2** after actions for SRV have been completed		
Time	**Position**	**Applicants Actions or Behavior**
T=35	BOP	Acknowledges AREA RAD MONITOR DNSCL alarm and pulls ARP. Notes that ARM-RIS-3 is reading downscale.
	SRO	Directs actions per ARP: Notify Health Physics Refers to LCS 1.3.7.4 with new fuel in vault. Directs HP to survey area once every 24 hours. Directs reset of ARM (not successful). Stops/confirms stoppage of fuel movement.
COMMENTS:		

Event No. 5

Description: Failure of MSR Drain tank 1A level control valves HD-LIC-9A and 9A2 closed

The event is initiated by activating **TRIGGER 3** after actions for ARM failure have been completed

(It takes 6 minutes to get MSR A High Level Alarm after trigger activation)

Time	Position	Applicants Actions or Behavior
T=40	BOP	Acknowledges alarm and reports MSR Drain Tank 1A Level High alarm. Refers to ARP. Investigates controllers to ensure they are in Auto and recognizes the controllers are not controlling in Auto. Attempts Manual operation. Reports controllers not functioning in Auto or Manual and level indication is off scale high.
	SRO	Conduct a brief on actions if level continues to rise and MSR Level High alarm is received.
	RO/BOP	Acknowledges and reports MSR A Level High alarm and refers to ARP (Turbine Trip has a 30 second time delay)
	SRO	Directs a manual reactor scram prior to automatic scram actuation (SRO may direct a scram prior to MSR A high Level alarm)
	RO	Scrams the reactor and performs immediate operator actions of PPM 3.3.1: • mode switch to shutdown • monitors/reports Power/Pressure/Level Recognizes failure to scram (ATWS) – **(REFER TO EVENT 6)**

COMMENTS:

Event No. 6		
Description: Hydraulic ATWS This event is setup at the beginning of the scenario and occurs automatically when a manual scram is inserted.		
Critical Task is to lower RPV level and establish an LL (Lowered Level).		
Time	**Position**	**Applicants Actions or Behavior**
T=45	RO	Continues with immediate scram actions after recognizing all control rods did not insert: Depress the manual scram pushbuttons Initiate ARI and verifies valves opened Insert SRMs and IRMs Announce EOP entry into PPM 5.1.1 on low Reactor Water level and/or Power GT 5% and a scram required Reports reactor power
	SRO	Enters PPM 5.1.1 and directs/verifies that the Mode Switch has been placed in SHUTDOWN and exits PPM 5.1.1 via the Power leg to PPM 5.1.2 RPV Control ATWS Directs BOP to: Inhibit ADS and take manual control of HPCS Verify all appropriate isolations and initiations have occurred Verify pressure is being maintained by the main turbine/bypass valves
	BOP	Takes both ADS control switches to the INHIBIT position and

		acknowledges associated BISIs Arms and Depresses the HPCS system initiation P/B while holding the control switch for HPCS-P-1 to STOP Closes HPCS-V-4 when it get fully opened Reports completion to SRO
	SRO	When Main Turbine trips directs Bypass Valve operation be verified for pressure control
	RO/BOP	Verifies Bypass valve operation and reports to SRO
	SRO	Directs bypassing the MSIV isolation interlocks per PPM 5.5.6 Directs performance of PPM 5.5.1
	BOP	Performs PPM 5.5.6 and reports completion to Crew Performs PPM 5.5.1 and reports completion to Crew
	SRO	Direct the RO to: Stop and prevent all injection into the RPV except by Boron injection systems, RCIC, and CRD (May direct RCIC start be prevented). Lower level to a band less than –65 inches but greater than –183 inches (preferred band is -80" to –140"). Record the upper limit as LL. Maintain level as directed from LL to –183 inches with systems listed in Table 5 (Band should be –80" to –140").
	SRO	Directs SLC initiation when RRC pumps are off **(REFER TO EVENT 7).**

	RO	Stops and prevents condensate and feedwater as directed and lines up on the startup flow control valves Reports EOP entry on low RPV level Reports Reactor Power as it drops due to lowering level When Reactor Power is LT 5%, marks RPV level to establish an LL Maintains RPV level between LL and –183 inches as directed (-80" to –140")
	SRO	Directs PPM 5.5.10 and 5.5.11 (Tabs B, F) performance for a hydraulic ATWS. **(REFER TO EVENT 8)**
COMMENTS:		

Event No. 7		
Description: Failure of SLC pumps to deliver normal SLC flow to RPV This event is activated at the beginning of the scenario and realized by the crew when SLC control switches are taken to OPER to initiate SLC.		
Time	**Position**	**Applicants Actions or Behavior**
T=50	SRO	Recognizes RRC Pumps have tripped off and directs SLC initiation before SP temp reaches 110°F
	RO	Initiates SLC per the quick card: Swaps keys and places two switches to OPER Verifies squib valves fire Verifies RWCU-V-4 closure Verifies flow and SLC tank level Reports reduced SLC flow (about 18 gpm) and initial tank level
	SRO	May contact Work Week Manager
COMMENTS:		

Event No. 8		
Description: Insert control rods using PPM 5.5.10 and 5.5.11 Tab B. This event is initiated by the SRO direction.		
Time	**Position**	**Applicants Actions or Behavior**
Critical Task is to insert Control Rods by performing PPM 5.5.11 Scram/Reset/Scram and then to return RPV level back to normal level band.		
T=55	SRO	Directs PPM 5.5.10 and PPM 5.5.11 be performed to insert control rods
	BOP	Performs, as directed: PPM 5.5.10 - Override ARI Logic – pulls 2 fuses
	BOP	Performs PPM 5.5.11 Tab B to scram/reset/scram Places SDV HIGH LEVEL TRIP control switch to BYPASS on P603 Determines that scram cannot be reset and overrides RPS per Attachment 6.1: In H13-P611: Installs jumpers between RPS-RLY-K9B stud 2 and RPS-RLY-K12F stud 4 Installs jumper between RPS-RLY-K9D stud 2 and RPS-RLY-K12H stud 4 In H13-P609: Installs jumpers between RPS-RLY-K9A stud 2 and RPS-RLY-K12E stud 4 Installs jumper between RPS-RLY-K9C stud 2 and RPS-RLY-K12GH stud 4

	BOP	Resets scram and notes time When SDV drain valves have been opened for more than 2 minutes: Checks rod density Initiates a manual scram If rods do not insert continues scram/reset/scram Tab B
COMMENTS:		

Event No. 9		
Description: Control Rods Insert and RPV Level returned to +13" to +54" band. This event is activated when RPV level has been lowered.		
Time	**Position**	**Applicants Actions or Behavior**
BOOTH OPERATOR: When RPV Level has been lowered and is being controlled in the desired band, and PPM 5.5.11 is being performed (scram/reset/scram) to insert control rods: **ACTIVATE TRIGGER 4**		
T=65	BOP	Checks control rod density Initiates a manual scram Notes Control Rod motion Recognizes and reports All Rods In to the SRO
	SRO	Directs SLC be stopped
	RO	Takes control switches out of OPER and observes both SLC pumps stop
	SRO	Exits PPM 5.1.2 and re-enters PPM 5.1.1 Directs RPV level be raised to +13" to +54" band with available systems
	RO	Raises RPV level into band as directed
TERMINATION POINT – The scenario will be terminated when RPV level has been returned to normal operating band.		
COMMENTS:		

TURNOVER INFORMATION

Initial conditions: During a plant startup following a refueling outage, Columbia is at approximately 60% with the Main Turbine Generator synchronized. CAS-C-1C is tagged out for repairs.

Turnover: Continue with the startup and raise power with flow to 65% power per PPM 3.1.2 step Q-60. The reactivity brief has been given.

SIMULATOR SETUP INSTRUCTIONS

Mark up the startup flowcharts as follows: Up through and including L-33 signed off; Up through and including Q-59 signed off; Up through and including P-13 signed off; Up through and including S-39 signed off; Ensure B43 and B44 are completed; Up through and including A-52 signed off.

BAT FILE

```
> 2009 NRC Scenario #3
>>************************
>*  Trigger list *
>************************
>
>Trigger 1 MS-RV-2A spurious opening
>Trigger 2 ARM-RIS-3 Fails Downscale
>Trigger 3 High Pressure Feedwater Heater 6B High Level Trip
>Trigger 4 Run BAT file to Clear ATWS
>
>*********************************************************************
>The following items set conditions before scenario begins
>*********************************************************************
> Hydraulic ATWS
IMF MAL-CRD007A1  100
IMF MAL-CRD007A2  83
IMF MAL-CRD007B1  100
IMF MAL-CRD007B2  83
>
> SLC-P-1A REDUCED FLOW
IMF PMP-SLC001F 100
>
> SLC-P-1B REDUCED FLOW
IMF PMP-SLC002F 50
>
>*********************************************************************
>The following items are triggered in the scenario
>*********************************************************************
> TRIGGER 1 - MS-RV-2A SWITCH OFF - SPURIOUS OPENING
IOR OVR-RRS010C (1)  OFF
> MS-RV-2A SWITCH OPEN
IOR OVR-RRS010D (1)  ON
>
> TRIGGER 2 - ARM-RIS-3 FAILS DOWNSCALE
IOR OVR-RMS027E (2) OFF
>
> TRIGGER 3 - HD-LIC-9A2 and HD-LIC-9A Fail
IMF AOV-FWH059F (3)  1
IMF AOV-FWH060F (3)  1
>
>*********************************************************************
>The following set up triggers to initiate batch files
>*********************************************************************
> Local Bat file loads generic triggers for local plant actions
bat local.txt
>
> TRIGGER 4 - Clear ATWS
trg 4 "bat 2009NRCScenario3A.txt"
>
>LO001627A.txt
>Ron Hayden
>
>This file supplements LO001627 and clears the Hydraulic ATWS
>
DMF MAL-CRD007A1
DMF MAL-CRD007A2
DMF MAL-CRD007B1
DMF MAL-CRD007B2
```