Facility Name: Date of Exam:

Tier	Group	RO K/A Category Points											SRO-Only Points		
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1	3	4	3	N/A			3	3	N/A		4	20	4	3	7
	2	1	1	1				1	2			1	7	2	1	3
	Tier Totals	4	5	4				4	5			5	27	6	4	10
2. Plant Systems	1	3	2	2	3	1	2	2	3	3	2	3	26	3	2	5
	2	1	0	0	2	2	1	2	1	1	1	1	12	0 2	1	3
	Tier Totals	4	2	2	5	3	3	4	4	4	3	4	38	5	3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1 2 3 4			7
		3			3			2			2			2 2 2 1			

Note:
1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
7.* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

ES-401 BWR Examination Outline Form ES-401-1

Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4			05				Reduced loop operating requirements: Plant-Specific	3.2	1
295003 Partial or Complete Loss of AC / 6		06					D.C. electrical loads	3.4	1
295004 Partial or Total Loss of DC Pwr / 6				03			A.C. electrical distribution	3.4	1
295005 Main Turbine Generator Trip / 3	02						Core thermal limit considerations	3.2	1
295006 SCRAM / 1				03			Reactor/turbine pressure regulating system	3.7	1
295016 Control Room Abandonment / 7						01.19	Ability to use plant computers to evaluate system or component status.	3.9	1
295018 Partial or Total Loss of CCW / 8					03		Cause for partial or complete loss	3.2	1
295019 Partial or Total Loss of Inst. Air / 8		03					Reactor feedwater	3.2	1
295021 Loss of Shutdown Cooling / 4						01.30	Ability to locate and operate components, including local controls.	4.4	1
295023 Refueling Acc / 8			01				Refueling floor evacuation	3.6	1
295024 High Drywell Pressure / 5						04.02	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5	1
295025 High Reactor Pressure / 3		04					ARI/RPT/ATWS: Plant-Specific	3.9	1
295026 Suppression Pool High Water Temp. / 5			01				Emergency/normal depressurization	3.8	1
295027 High Containment Temperature / 5									0
295028 High Drywell Temperature / 5	01						Reactor water level measurement	3.5	1
295030 Low Suppression Pool Wtr Lvl / 5					03		Reactor pressure	3.7	1
295031 Reactor Low Water Level / 2		14					Emergency generators	3.9	1
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1	02						Reactor water level effects on reactor power	4.1	1
295038 High Off-site Release Rate / 9				07			Control room ventilation: Plant-Specific	3.6	1
600000 Plant Fire On Site / 8						04.34	Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	4.2	1
700000 Generator Voltage and Electric Grid Disturbances / 6					04		VARs outside capability curve	3.6	1
K/A Category Totals:	3	4	3	3	3	4	Group Point Total:		20

ES-401	BWR Examination Outline								Form ES-401-1
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295002 Loss of Main Condenser Vac / 3					01		Condenser vacuum/absolute pressure	2.9	1
295007 High Reactor Pressure / 3									0
295008 High Reactor Water Level / 2			08				RCIC steam supply valve closure: Plant-Specific	3.4	1
295009 Low Reactor Water Level / 2									0
295010 High Drywell Pressure / 5									0
295011 High Containment Temp / 5									0
295012 High Drywell Temperature / 5						02.42	Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9	1
295013 High Suppression Pool Temp. / 5					02		Localized heating/stratification	3.2	1
295014 Inadvertent Reactivity Addition / 1									0
295015 Incomplete SCRAM / 1	02						Cooldown effects on reactor power	3.9	1
295017 High Off-site Release Rate / 9									0
295020 Inadvertent Cont. Isolation / 5 & 7									0
295022 Loss of CRD Pumps / 1									0
295029 High Suppression Pool Wtr Lvl / 5									0
295032 High Secondary Containment Area Temperature / 5				05			Affected systems so as to isolate damaged portions	3.7	1
295033 High Secondary Containment Area Radiation Levels / 9									0
295034 Secondary Containment Ventilation High Radiation / 9									0
295035 Secondary Containment High Differential Pressure / 5									0
295036 Secondary Containment High Sump/Area Water Level / 5		01					Secondary containment equipment and floor drain system	3.1	1
500000 High CTMT Hydrogen Conc. / 5									0
K/A Category Totals:	1	1	1	1	2	1	Group Point Total:		7

ES-401	BWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)											Form ES-401-1	
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
203000 RHR/LPCI: Injection Mode				15						11		Pump runout protection: Plant-Specific; Indicating lights and alarms	2.5; 3.7	2
205000 Shutdown Cooling		02										Motor operated valves	2.5	1
206000 HPCI														0
207000 Isolation (Emergency) Condenser														0
209001 LPCS	05							03				Automatic depressurization system ; A.C. failures	3.7; 3.4	2
209002 HPCS				07								Override of reactor water level interlock: Plant-Specific	3.5	1
211000 SLC							09					SBLC system lineup	4.0	1
212000 RPS	05										01.28	Process radiation monitoring system ; Knowledge of the purpose and function of major system components and controls.	3.3; 4.1	2
215003 IRM			02									Reactor manual control	3.6	1
215004 Source Range Monitor					03							Changing detector position	2.8	1
215005 APRM / LPRM									02			Full core display	3.5	1
217000 RCIC								15				Steam line break	3.8	1
218000 ADS						03						Nuclear boiler instrument system (level indication)	3.8	1
223002 PCIS/Nuclear Steam Supply Shutoff				08								Manual defeating of selected isolations during specified emergency conditions	3.3	1
239002 SRVs		01										SRV solenoids	2.8	1
259002 Reactor Water Level Control										01		All individual component controllers in the manual mode	3.8	1
261000 SGTS									03			Valve operation	3.0	1
262001 AC Electrical Distribution							03					Bus voltage	2.9	1
262002 UPS (AC/DC)								02				Over voltage	2.5	1
263000 DC Electrical Distribution			03								01.23	Systems with D.C. components (i.e. valves, motors, solenoids, etc.); Ability to perform specific system and integrated plant procedures during all modes of plant operation	3.4; 4.3	2
264000 EDGs											02.12	Knowledge of surveillance procedures.	3.7	1
300000 Instrument Air	02											Service air	2.7	1
400000 Component Cooling Water						07			01			Breakers, relays, and disconnects; Setpoints on instrument signal levels for normal operations, warnings, and trips that are applicable to the CCWS	2.7; 3	2
														0
K/A Category Totals:	3	2	2	3	1	2	2	3	3	2	3	Group Point Total:		26

ES-401	BWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											Form ES-401-1	
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
201001 CRD Hydraulic					02							Flow indication	2.6	1
201002 RMCS														0
201003 Control Rod and Drive Mechanism														0
201004 RSCS														0
201005 RCIS														0
201006 RWM										04		Rod withdrawal error indication: P-Spec(Not-BWR6)	3.3	1
202001 Recirculation											02.22	Knowledge of limiting conditions for operations and safety limits.	4.0	1
202002 Recirculation Flow Control								04				Recirculation pump speed mismatch between loops: Plant-Specific	3.0	1
204000 RWCU														0
214000 RPIS														0
215001 Traversing In-core Probe														0
215002 RBM						04						APRM reference channel: BWR-3, 4, 5	2.8	1
216000 Nuclear Boiler Inst.					09							Recirculation flow effects on level indications: Design-Specific	2.9	1
219000 RHR/LPCI: Torus/Pool Cooling Mode														0
223001 Primary CTMT and Aux.														0
226001 RHR/LPCI: CTMT Spray Mode														0
230000 RHR/LPCI: Torus/Pool Spray Mode				03								Unintentional reduction in vessel injection flow during accident conditions	3.5	1
233000 Fuel Pool Cooling/Cleanup														0
234000 Fuel Handling Equipment														0
239001 Main and Reheat Steam									02			Opening and closing of drain valves as turbine load changes: Plant-Specific	2.9	1
239003 MSIV Leakage Control														0
241000 Reactor/Turbine Pressure Regulator							13					Main turbine speed	2.7	1
245000 Main Turbine Gen. / Aux.														0
256000 Reactor Condensate	05											CRD hydraulics system	3.1	1
259001 Reactor Feedwater							04					RFP turbine speed: Turbine-Driven-Only	2.8	1
268000 Radwaste														0
271000 Offgas														0
272000 Radiation Monitoring														0
286000 Fire Protection														0
288000 Plant Ventilation														0
290001 Secondary CTMT				02								Protection against over pressurization: Plant-System	3.4	1
290003 Control Room HVAC														0
290002 Reactor Vessel Internals														0
														0
K/A Category Totals:	1	0	0	2	2	1	2	1	1	1	1	Group Point Total:		12

ES-401 BWR Examination Outline Form ES-401-1 Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4									0
295003 Partial or Complete Loss of AC / 6					05		Whether a partial or complete loss of A.C. power has occurred	4.2	1
295004 Partial or Total Loss of DC Pwr / 6									0
295005 Main Turbine Generator Trip / 3									0
295006 SCRAM / 1									0
295016 Control Room Abandonment / 7									0
295018 Partial or Total Loss of CCW / 8									0
295019 Partial or Total Loss of Inst. Air / 8									0
295021 Loss of Shutdown Cooling / 4									0
295023 Refueling Acc / 8					04		Occurrence of fuel handling accident	4.1	1
295024 High Drywell Pressure / 5						04.21	Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release	4.6	1
295025 High Reactor Pressure / 3					02		Reactor power	4.2	1
295026 Suppression Pool High Water Temp. / 5									0
295027 High Containment Temperature / 5									0
295028 High Drywell Temperature / 5						01.25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	4.2	1
295030 Low Suppression Pool Wtr Lvl / 5									0
295031 Reactor Low Water Level / 2						04.16	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident	4.4	1
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1					06		Reactor pressure	4.1	1
295038 High Off-site Release Rate / 9									0
600000 Plant Fire On Site / 8									0
700000 Generator Voltage and Electric Grid Disturbances / 6									0
K/A Category Totals:	0	0	0	0	4	3	Group Point Total:		7

ES-401	BWR Examination Outline								Form ES-401-1
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295002 Loss of Main Condenser Vac / 3									0
295007 High Reactor Pressure / 3									0
295008 High Reactor Water Level / 2									0
295009 Low Reactor Water Level / 2									0
295010 High Drywell Pressure / 5									0
295011 High Containment Temp / 5									0
295012 High Drywell Temperature / 5									0
295013 High Suppression Pool Temp. / 5									0
295014 Inadvertent Reactivity Addition / 1					03		Cause of reactivity addition	4.3	1
295015 Incomplete SCRAM / 1									0
295017 High Off-site Release Rate / 9									0
295020 Inadvertent Cont. Isolation / 5 & 7									0
295022 Loss of CRD Pumps / 1									0
295029 High Suppression Pool Wtr Lvl / 5						04.06	Knowledge of EOP mitigation strategies.	4.7	1
295032 High Secondary Containment Area Temperature / 5									0
295033 High Secondary Containment Area Radiation Levels / 9									0
295034 Secondary Containment Ventilation High Radiation / 9									0
295035 Secondary Containment High Differential Pressure / 5					01		Secondary containment pressure: Plant-Specific	3.9	1
295036 Secondary Containment High Sump/Area Water Level / 5									0
500000 High CTMT Hydrogen Conc. / 5									0
K/A Category Totals:	0	0	0	0	2	1	Group Point Total:		3

ES-401	BWR Examination Outline												Form ES-401-1
Plant Systems - Tier 2/Group 1 (SRO)													
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
203000 RHR/LPCI: Injection														0
205000 Shutdown Cooling Mode														0
206000 HPCI														0
207000 Isolation (Emergency) Condenser														0
209001 LPCS														0
209002 HPCS														0
211000 SLC								02				Failure of explosive valve to fire	3.9	1
212000 RPS								06				High reactor power	4.2	1
215003 IRM														0
215004 Source Range Monitor											02.44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.4	1
215005 APRM / LPRM														0
217000 RCIC														0
218000 ADS														0
223002 PCIS/Nuclear Steam Supply Shutoff														0
239002 SRVs														0
259002 Reactor Water Level Control														0
261000 SGTS														0
262001 AC Electrical Distribution								03				Loss of off-site power	4.3	1
262002 UPS (AC/DC)														0
263000 DC Electrical Distribution											02.25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	1
264000 EDGs														0
300000 Instrument Air														0
400000 Component Cooling Water														0
														0
K/A Category Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5

ES-401	BWR Examination Outline												Form ES-401-1
	Plant Systems - Tier 2/Group 2 (SRO)												
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
201001 CRD Hydraulic														0
201002 RMCS														0
201003 Control Rod and Drive Mechanism														0
201004 RSCS														0
201005 RCIS														0
201006 RWM														0
202001 Recirculation														0
202002 Recirculation Flow Control														0
204000 RWCU								10				Valve closures	2.8	1
214000 RPIS								01				Failed reed switches	3.3	1
215001 Traversing In-core Probe														0
215002 RBM														0
216000 Nuclear Boiler Inst.														0
219000 RHR/LPCI: Torus/Pool Cooling Mode														0
223001 Primary CTMT and Aux.														0
226001 RHR/LPCI: CTMT Spray Mode														0
230000 RHR/LPCI: Torus/Pool Spray Mode														0
233000 Fuel Pool Cooling/Cleanup														0
234000 Fuel Handling Equipment														0
239001 Main and Reheat Steam														0
239003 MSIV Leakage Control														0
241000 Reactor/Turbine Pressure Regulator														0
245000 Main Turbine Gen. / Aux.														0
256000 Reactor Condensate														0
259001 Reactor Feedwater														0
268000 Radwaste														0
271000 Offgas											02 36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations	4.2	1
272000 Radiation Monitoring														0
286000 Fire Protection														0
288000 Plant Ventilation														0
290001 Secondary CTMT														0
290003 Control Room HVAC														0
290002 Reactor Vessel Internals														0
														0
K/A Category Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:		3

ES-401	Generic Knowledge and Abilities Outline (Tier 3)	Form ES-401-3

Facility Name: Date of Exam:

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1. 07	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.			4.7	1
	2.1. 42	Knowledge of new and spent fuel movement procedures.			3.4	1
	2.1. 01	Knowledge of conduct of operations requirements.	3.8	1		
	2.1. 15	Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, operations memos, etc.	2.7	1		
	2.1. 38	Knowledge of the station's requirements for verbal communications when implementing procedures.	3.7	1		
	2.1.					
	Subtotal			3		2
2. Equipment Control	2.2. 17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.			3.8	1
	2.2. 11	Knowledge of the process for controlling temporary design changes.			3.3	1
	2.2. 06	Knowledge of the process for making changes to procedures.	3.0	1		
	2.2. 13	Knowledge of tagging and clearance procedures.	4.1	1		
	2.2. 35	Ability to determine Technical Specification Mode of Operation.	3.6	1		
	2.2.					
	Subtotal			3		2
3. Radiation Control	2.3. 04	Knowledge of radiation exposure limits under normal or emergency conditions.			3.7	1
	2.3. 05	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			2.9	1
	2.3. 07	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1		
	2.3. 11	Ability to control radiation releases.	3.8	1		
	2.3.					
	2.3.					
	Subtotal			2		2
4. Emergency Procedures / Plan	2.4. 38	Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required.			4.4	1
	2.4. 19	Knowledge of EOP layout, symbols, and icons.	3.4	1		
	2.4. 43	Knowledge of emergency communications systems and techniques.	3.2	1		
	2.4.					
	2.4.					
	2.4.					
	Subtotal			2		1
Tier 3 Point Total				10		7

Facility: Columbia 2013 Date of Examination: February

Examination Level: RO ☒ SRO ☐ Operating Test Number: 1

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	M, R	Determine if APRM indication is greater than reactor power as calculated from Main Turbine Bypass Valve position and Reactor Feedwater temperature (2.1.25 RO 3.9). Given the positions of the four Main Turbine Bypass Valves, Reactor Feedwater temperature and house loads, calculate current reactor power by plotting the values on the "Core Thermal Power Versus Bypass Valve Position" graph in PPM 3.1.2 and summing the values. Compare the results to the APRM reading to determine if APRM indications are greater than reactor power.
Conduct of Operations	N, R	Use procedures to assign operators to the positions required to meet minimum crew compliment (2.1.5 RO 2.9). Provided a list of the On-Coming crew operators and the PQD Viewer duty areas, assign operators to positions to meet the requirements for the minimum crew compliment.
Equipment Control	M, R	Use electrical prints to determine why RHR-P-2C did not start following a manual initiation (2.2.41 RO 3.5). Given a set of initial conditions, explain which contacts prevent starting RHR-P-2C using the ARM & DEPRESS pushbutton.
Radiation Control	D, R, P	Use radiological survey maps to determine the minimum and maximum stay times until radiation exposure limits are reached (2.3.4 RO 3.2). Given year-to-date exposure and work instructions, refer to radiological survey maps to determine work area radiation levels and calculate the time at which a

		radiation exposure limit will be reached.
Emergency Procedures/Plan		

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.

* Type Codes & Criteria:	(C)ontrol room, (S)imulator, or Class(R)oom
	(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
	(N)ew or (M)odified from bank (≥ 1)
	(P)revious 2 exams (≤ 1; randomly selected)

Facility: Columbia 2013 Date of Examination: February

Examination Level: RO ☐ SRO ☒ Operating Test Number: 1

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	D, R	Determine if a MODE change is allowed during a plant startup (2.1.23 SRO 4.4). With a plant startup in progress, the SRO candidate is provided a list of plant conditions and required to determine if a MODE change is allowed. The candidate must recognize that HPCS is inoperable and LCO 3.0.4 is not applicable.
Conduct of Operations	N, R	Use procedures to project On-Coming Crew's watch manning, and verify qualifications meet the minimum requirements (2.1.5 SRO 3.9). Provided the list of operators scheduled for the new crew starting a series of nightshifts and PQD Viewer areas, the SRO candidate must determine that the minimum qualifications are not satisfied.
Equipment Control	M, R	Maintain control of equipment status by issuing a Fire Protection System Impairment (2.2.14 SRO 4.3). During the performance of a surveillance, two Main Control Room Halon Tanks have been reported to have UNSAT pressures. The SRO candidate must determine that a Fire Protection System Impairment is required to track the equipment status, and complete the Impairment.
Radiation Control	D, P, R	The SRO Candidate is tasked with reviewing a request to initiate blowdown from the Circulating Water and Plant Service Water systems (2.3.6 SRO 3.8). Given parameters associated with CW and TSW blowdown, the SRO candidate must determine that the minimum instrumentation required to initiate blowdown is not available, and should not be

		allowed.
Emergency Procedures/Plan	D, R	The SRO Candidate is given that a UE was previously declared due to a credible threat security event. The situation then escalates and the SRO has to determine that an Emergency Plan upgrade is required, the applicable EAL and then fill out the required Classification Notification Form.
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		
* Type Codes & Criteria:	(C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1; randomly selected)	

Facility: Columbia Date of Examination: February 2013

Exam Level: RO ☒ SRO-I ☐ SRO-U ☐ Operating Test Number: 1

Control Room Systems[@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
a. Reactor Manual Control System / Conduct a Refueling Interlocks Functional Test of the Refuel Position One-Rod-Out Interlock (201002 A3.01). With the MODE Switch in SHUTDOWN, place the plant in MODE 5 and perform OSP-NSSE-W402 (Refuel Position One-Rod-Out Interlock CFT). The designated control rod is in a quadrant that does not have an operable SRM.	A, L, N, S	1
b. Component Cooling Water System / Restore adequate Component Cooling Water (RCC) flow to containment loads (400000 A1.01). While transferring SM-7 to the Backup Transformer, a lockout on SL-71 occurs. This results in the loss of one RCC pumps and requires manual action to start the standby RCC pump to restore normal system flow.	A, M, S	8
c. Reactor Core Isolation Cooling System / Manually initiate RCIC and establish normal RPV water level (217000 A4.04). Initiate RCIC for level control following a scram. The controller is failed and manual control is required to establish flow and restore RPV water level.	A, D, L, S	2
d. Main and Reheat Steam / Open the inboard MSIVs to establish the Main Condenser as a heat sink (239001 A4.01). Following a loss and restoration of Containment Instrument Air, open the inboard MSIVs to restore the Main Condenser heat sink.	D, L, S	4
e. Reactor/Turbine Pressure Regulating System / Lower RPV pressure with Main Turbine Bypass Valves (241000 A2.03). Three Main Turbine Bypass Valves fail open while manually reducing RPV pressure. Entry into ABN-PRESSURE and actions to close the MSIVs are required prior to RPV Pressure reaching 500 psig.	A, D, L, S	3
f. Traversing In-Core Probe System / Manually Initiate Containment Isolations (223002 A2.03; A3.01; A3.02). TIP-V-5 is found to be opened when -50" Isolations are verified. Action is then taken to manually isolate the containment penetration by firing the associated squib	A, D, P, S	7

valve.		
g. Fuel Pool Cooling and Clean-up / Align Standby Service Water to the Fuel Pool Cooling HX following a complete loss of RCC (233000 A2.08). Following a reactor scram due to a complete loss of RCC and with Fuel Pool Temperatures rising, align Service Water A and B to the Fuel Pool Cooling HXs.	L, N, S	9
h. Secondary Containment / Restore Secondary Containment differential pressure (290001 A4.01). Operate the Reactor Building HVAC System to restore Reactor Building differential pressure. Start ROA-FN-1A and REA-FN-1A.	M, S	5

In-Plant Systems[@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. Emergency Generators / Shutdown DG-2 from the local control panel (264000 K4.07). DG-2 fails to stop when the stop pushbutton is depressed requiring a manual trip using the mechanical overspeed device.	A, D, EN, R	6
j. Reactor Core Isolation Cooling System / Prevent a RCIC High Exhaust Pressure Trip (217000 A2.02). During a Station Blackout, performs the actions of PPM 5.6.1 required to prevent a high exhaust pressure trip of the RCIC turbine.	D, E, EN, L, P, R	2
k. Primary Containment System and Auxiliaries / Perform Emergency Drywell Venting during a LOCA using SGT-B (223001 A2.07). With a LOCA signal present, emergency vent the Drywell using SGT.	C, D, E, EN, L, R	5

[@] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path (C)ontrol room	4-6 / 4-6 / 2-3
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	- / - / ≥ 1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Facility: Columbia Date of Examination: February 2013

Exam Level: RO ☐ SRO-I ☒ SRO-U ☐ Operating Test Number: 1

Control Room Systems[@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
a. Reactor Manual Control System / Conduct a Refueling Interlocks Functional Test of the Refuel Position One-Rod-Out Interlock (201002 A3.01). With the MODE Switch in SHUTDOWN, place the plant in MODE 5 and perform OSP-NSSE-W402 (Refuel Position One-Rod-Out Interlock CFT). The designated control rod is in a quadrant that does not have an operable SRM.	A, L, N, S	1
b. Component Cooling Water System / Restore adequate Component Cooling Water (RCC) flow to containment loads (400000 A1.01). While transferring SM-7 to the Backup Transformer, a lockout on SL-71 occurs. This results in the loss of one RCC pumps and requires manual action to start the standby RCC pump to restore normal system flow.	A, M, S	8
c.		
d. Main and Reheat Steam / Open the inboard MSIVs to establish the Main Condenser as a heat sink (239001 A4.01). Following a loss and restoration of Containment Instrument Air, open the inboard MSIVs to restore the Main Condenser heat sink.	D, L, S	4
e. Reactor/Turbine Pressure Regulating System / Lower RPV pressure with Main Turbine Bypass Valves (241000 A2.03). Three Main Turbine Bypass Valves fail open while manually reducing RPV pressure. Entry into ABN-PRESSURE and actions to close the MSIVs are required prior to RPV Pressure reaching 500 psig.	A, D, L, S	3
f. Traversing In-Core Probe System / Manually Initiate Containment Isolations (223002 A2.03; A3.01; A3.02). TIP-V-5 is found to be opened when -50" Isolations are verified. Action is then taken to manually isolate the containment penetration by firing the associated squib valve.	A, D, P, S	7

g. Fuel Pool Cooling and Clean-up / Align Standby Service Water to the Fuel Pool Cooling HX following a complete loss of RCC (233000 A2.08). Following a reactor scram due to a complete loss of RCC and with Fuel Pool Temperatures rising, align Service Water A and B to the Fuel Pool Cooling HXs.	L, N, S	9
h. Secondary Containment / Restore Secondary Containment differential pressure (290001 A4.01). Operate the Reactor Building HVAC System to restore Reactor Building differential pressure. Start ROA-FN-1A and REA-FN-1A.	M, S	5

In-Plant Systems[@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. Emergency Generators / Shutdown DG-2 from the local control panel (264000 K4.07). DG-2 fails to stop when the stop pushbutton is depressed requiring a manual trip using the mechanical overspeed device.	A, D, EN, R	6
j. Reactor Core Isolation Cooling System / Prevent a RCIC High Exhaust Pressure Trip (217000 A2.02). During a Station Blackout, performs the actions of PPM 5.6.1 required to prevent a high exhaust pressure trip of the RCIC turbine.	D, E, EN, L, P, R	2
k. Primary Containment System and Auxiliaries / Perform Emergency Drywell Venting during a LOCA using SGT-B (223001 A2.07). With a LOCA signal present, emergency vent the Drywell using SGT.	C, D, E, EN, L, R	5

[@] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator	4-6 / 4-6 / 2-3 ≤ 9 / ≤ 8 / ≤ 4 ≥ 1 / ≥ 1 / ≥ 1 - / - / ≥ 1 (control room system) ≥ 1 / ≥ 1 / ≥ 1 ≥ 2 / ≥ 2 / ≥ 1 ≤ 3 / ≤ 3 / ≤ 2 (randomly selected) ≥ 1 / ≥ 1 / ≥ 1

Facility: Columbia Date of Examination: February 2013

Exam Level: RO ☐ SRO-I ☐ SRO-U ☒ Operating Test Number: 1

Control Room Systems[@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
a. Reactor Manual Control System / Conduct a Refueling Interlocks Functional Test of the Refuel Position One-Rod-Out Interlock (201002 A3.01). With the MODE Switch in SHUTDOWN, place the plant in MODE 5 and perform OSP-NSSE-W402 (Refuel Position One-Rod-Out Interlock CFT). The designated control rod is in a quadrant that does not have an operable SRM.	A, L, N, S	1
b. Component Cooling Water System / Restore adequate Component Cooling Water (RCC) flow to containment loads (400000 A1.01). While transferring SM-7 to the Backup Transformer, a lockout on SL-71 occurs. This results in the loss of one RCC pumps and requires manual action to start the standby RCC pump to restore normal system flow.	A, M, S	8
c.		
d.		
e.		
f.		
g.		
h.		

In-Plant Systems[@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. Emergency Generators / Shutdown DG-2 from the local control panel (264000 K4.07). DG-2 fails to stop when the stop pushbutton is depressed requiring a manual trip using the mechanical overspeed device.	A, D, EN, R	6
j. Reactor Core Isolation Cooling System / Prevent a RCIC High Exhaust Pressure Trip (217000 A2.02). During a Station Blackout, performs the actions of PPM 5.6.1 required to prevent a high exhaust pressure trip of the RCIC turbine.	D, E, EN, L, P, R	2
k. Primary Containment System and Auxiliaries / Perform Emergency Drywell Venting during a LOCA using SGT-B (223001 A2.07). With a LOCA signal present, emergency vent the Drywell using SGT.	C, D, E, EN, L, R	5

[@] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	≤ 9 / ≤ 8 / ≤ 4
(D)irect from bank	≥ 1 / ≥ 1 / ≥ 1
(E)mergency or abnormal in-plant	- / - / ≥ 1 (control room system)
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1
(L)ow-Power / Shutdown	≥ 2 / ≥ 2 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(P)revious 2 exams	≥ 1 / ≥ 1 / ≥ 1
(R)CA	
(S)imulator	

INSTRUCTIONAL COVER SHEET

PROGRAM TITLE: OPERATIONS TRAINING

COURSE TITLE: COLUMBIA GENERATING STATION SIMULATOR EXAMINATION

LESSON TITLE: Reduce Power with Flow; BPV Surveillance – One BPV is Failed Closed; NR Instrument Fails Downscale; Fire in TB – CAS Leak – A/C's Fail to Auto Start – CAS A/B Trip; Scram on Loss of CAS Pressure; Steam Leak in Containment; RHR-P-2A Overcurrent Causes an SM-7 Lockout; RHR-P-2B Fail Auto Start Then a Shaft Shear; RRC-P-1A Stop P/B Failed off; Spray with SW-B per PPM 5.5.2; Secure Drywell Sprays

LENGTH OF LESSON 1.5 Hours

INSTRUCTIONAL MATERIALS INCLUDED

Lesson Plan PQD Code		Rev. No.	
Simulator Guide PQD Code	LO001750	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: 12/09/12

REVISED BY: DATE:

VALIDATED BY: DATE:

TECHNICAL REVIEW: DATE:

INSTRUCTIONAL REVIEW: DATE:

SAT Coordinator

APPROVED: DATE:

Operations Training Manager

NRC EXAM SCENARIO #1

Initial conditions: The plant is operating at 100% power. TSW-P-1A is tagged out for motor replacement. The reactivity brief and task preview for the shift's scheduled activities have been completed.

Shift Directions: Per the Reactivity Control Plan, reduce reactor power with flow to 90%. Concurrent with the power reduction, perform OSP-MS-M701, Bypass Valves Test.

Event No.	Timeline	Event Type*	Event Description
1	T = 0	R (ATC) R (CRS)	Power reduction to 90% by lowering RRC flow.
2	T = 0	C (BOP)	Perform OSP-MS-M701, Main Turbine Bypass Valves Test. BV3 fails to open, requiring BPV's to be declared inoperable (Tech Spec).
3	T = 20	I (ATC) I (CRS)	RFW-LI-606A (the selected NR instrument) fails downscale (Tech Spec).
4	T = 35	I (BOP)	Fire in the Turbine Building resulting in degrading Control Air header pressure. Both standby CAS compressors fail to auto start on low header pressure, and must be manually started to restore header pressure.
5	T = 45	M (All)	Loss of CAS-C-1A and CAS-C-1B. A manual rector scram is required prior to MSIV closure.
6	T = 55	M (All)	A Steam LOCA develops inside containment when the MSIVs close.
7	T = 60	C (BOP) C (CRS)	When Drywell pressure reaches 1.68 psig, RHR-P-2A will automatically start with an overcurrent condition. The output breaker will fail to trip and cause a lockout on SM-7. DG-1 must be emergency tripped.
8	T = 65	C (BOP) C (CRS)	RHR-P-2B fails to auto start. RHR-P-2B has a sheared shaft when manually started. Initiate Drywell sprays with SW-B through RHR-B using PPM 5.5.2 after Drywell temperature reaches 285°F, but before Drywell temperature reaches 330°F (Critical Task). Secure Drywell sprays when Drywell pressure drops to LT 12 psig and before it drops to -0.5 psig (Critical Task).

9	T = 65	C (ATC)	The stop pushbutton fails to stop RRC-P-1A.

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

The scenario starts with Columbia at 100% power. TSW-P-1A is tagged out for motor replacement.

After the crew takes the shift, power is to be lowered to 90% for economic dispatch request from BPA. The crew will lower power with RRC flow.

At the same time, the BOP operator will perform BPV surveillance test, OSP-MS-M701. When the third bypass valve is tested, it will not open. The CRS will refer to Tech Specs and enter TS 3.7.6.

After Tech Specs are referenced, RFW-LI-606A will fail downscale. The crew will swap FWLC channels from Channel A to Channel B. Tech Spec again will be referenced.

The next event is a fire in the Aux Boiler Room, Turbine Building 441' elevation East side. The fire will cause a rupture in the Control Air System. CAS pressure will slowly drop. ABN-FIRE and ABN-CAS will be entered. The Standby CAS compressors will not auto start but may be started manually. When started, CAS pressure will start to recover.

Due to a failed fire hose that occurs during firefighting efforts, CAS-C-1A and CAS-C-1B become wetted and will trip. With only one CAS compressor running, CAS pressure will again begin to drop. Firefighting efforts will put the fire out.

When it is determined that a complete loss of air is apparent, the crew will insert a manual scram (should be prior to MSIVs going closed which would cause an automatic scram).

When the MSIVs close, a Steam LOCA inside containment will occur causing a High Drywell Pressure signal at 1.68 psig.

When RHR-P-2A starts on high Drywell pressure, it will have an overcurrent fault. The breaker on SM-7 will not open, and a lockout on SM-7 will occur. The crew will emergency trip DG-1 which will be running with no Service Water.

Additionally, RHR-P-2B will not auto start on high Drywell pressure but may be manually started. When it is started the shaft will shear and the pump will develop no discharge pressure.

The crew will realize that both RRC pumps are running without RCC flow (RRC pumps tripped off on the high drywell pressure signal). When the stop pushbutton for RRC-P-1A is depressed it will not stop the pump. The crew will open one of the supply breakers to stop RRC-P-1A.

Wetwell pressure will rise to 2 psig and the crew will want to spray the Wetwell but will realize both RHR spray systems are not operational.

Drywell/Wetwell pressure and Drywell temperature will continue to rise. The crew will perform PPM 5.5.2, RHR/SW Crosstie Lineup.

Wetwell sprays will be initiated (GT 2 psig Wetwell pressure). Drywell Sprays will be initiated when Drywell temperature reaches 285°F or Wetwell pressure reaches 12 psig. (Note: After MSIVs close it takes 5 minutes and 15 seconds to get to 285°F DW/T, 6 minutes and 15 seconds to get to 12 psig WW/P, and 12 minutes to get to 330°F DW/T) (Critical Task).

Drywell Sprays will be secured when Drywell Pressure drops to LT 12 psig and before Drywell Pressure drops to LT -0.5 psig (Critical Task).

The scenario will be terminated when drywell sprays have been secured.

Event No. 1

Description: Reduce Reactor Power with flow.

This event is initiated by the turnover information.

Time	Position	Applicants Actions or Behavior
T = 0	CRS	Directs the ATC to reduce reactor power at the rate of 1 Hz per minute or 10 MWe/minute and stop the power decrease when Reactor Power is approximately 90%.
	ATC	Reduces reactor power with RRC flow as directed at the rate directed. Verifies both RRC pump individual pump controllers are in AUTO and depresses the Master Controller LOWER pushbutton to lower RRC Pump flow.

COMMENTS:

Event No. 2

Description: Perform Bypass Valve Test Surveillance OSP-MS-M701 (Tech Spec).

This event is initiated by turnover information. Failure of BPV #3 to open is active from the beginning of the scenario.

Time	Position	Applicants Actions or Behavior
T = 0	CRS	Directs BOP operator to perform OSP-MS-M701.
	BOP	Flags expected annunciators per P&L 3.4.
		Step 7.1 Reduce Reactor Power to LE 3411 Mwt (75 Mwt below 100% power) per PPM 3.2.1 or 3.2.6.
		Step 7.2 Verify proper margin to Pre-Conditioned Status (PCS) exists per PPM 9.3.18.
		NOTE: Due to low extraction steam pressures, therefore slower heater level control, low pressure heaters 1 and 2 are removed from service when Reactor Power is LT 76% and testing Turbine Bypass Valves.
		Step 7.3 If reactor power is LT 76%, then verify COND-HX-1A, B, and C and COND-HX-2A, B, and C are removed from service per SOP-FWH-SHUTDOWN..
		NOTE: The following condensate flow requirement is to allow sufficient margin for Desuperheat Sprays and Hotwell dump flow, while providing sufficient flow to the Reactor. NOTE: Each Condensate Booster Pump is rated for 11,000 gpm.
		Step 7.4 If condensate flow is not 3000 gpm LT the rated flow for the present condensate pump configuration (as indicated on COND-FR-11), then reduce reactor power until condensate flow is 3000 gpm LT the rated flow for the present pump configuration.
		Step 7.5 Establish desuperheat spray at approximately 150 psig (COND-PI-40), by one or more of the following methods. N/A method(s) not used. • Place COND-PCV-40 to OPEN (Desuper Spray Press Control) • Throttle OPEN COND-V-178 (Desuper Spray Bypass) • Place COND-PIC-40 in MANUAL (TB 441, IR-9) to establish desuperheat spray at ~100

		psig
		Step 7.6 Select BV on the SELECT VALVE panel (Menu, Valve Testing). Selects Menu. Selects Valve Testing. Selects BV.
		Step 7.7 Verify OK TO TEST BV VALVES is green. (The light will turn green at ~91% power)
		NOTE: Use indication on DEH Monitor panel for MWe.
		Step 7.8 Perform the following to test BV1:
		Step 7.8.1 Record MWe.
		Step 7.8.2 Select TEST BV1.
		NOTE: When in the Valve Testing Mode, BPVs will move only while the OPEN BV or CLOSE BV button is being touched. Valve motion will stop if finger is lifted from the touch screen, and will resume when the button is touched and held again.
		Step 7.8.3 Select TEST.
		Step 7.8.4 Touch and hold OPEN BV1 button.
		Step 7.8.5 When BPV1 is fully open, then release OPEN BV1 button.
		Step 7.8.6 Verify BPV1 is OPEN.
		Step 7.8.7 Record MWe.
		Step 7.8.8 Touch and hold CLOSE BV1 button.
		Step 7.8.9 When BPV1 is fully closed, then release CLOSE BV1 button.

		Step 7.8.10 Verify BPV1 is CLOSED.
		Step 7.8.11 Record MWe.
		Step 7.8.12 Select TEST BV1.
		Step 7.8.13 Select EXIT TEST.
	CRS	Step 7.8.14 Verify Plant conditions have stabilized before continuing to the next step.
	BOP	Step 7.9 Perform the following to test BV2:
		Step 7.9.1 Record MWe.
		Step 7.9.2 Select TEST BV2.
		NOTE: When in the Valve Testing Mode, BPVs will move only while the OPEN BV or CLOSE BV button is being touched. Valve motion will stop if finger is lifted from the touch screen, and will resume when the button is touched and held again.
		Step 7.9.3 Select TEST.
		Step 7.9.4 Touch and hold OPEN BV2 button.
		Step 7.9.5 When BPV2 is fully open, then release OPEN BV2 button.
		Step 7.9.6 Verify BPV2 is OPEN.
		Step 7.9.7 Record MWe.
		Step 7.9.8 Touch and hold CLOSE BV2 button.
		Step 7.9.9 When BPV2 is fully closed, then release CLOSE BV2 button.

		Step 7.9.10 Verify BPV2 is CLOSED.
		Step 7.9.11 Record MWe.
		Step 7.9.12 Select TEST BV2.
		Step 7.9.13 Select EXIT TEST.
	CRS	Step 7.9.14 Verify Plant conditions have stabilized before continuing to the next step.
	BOP	Step 7.10 Perform the following to test BV3:
		Step 7.10.1 Record MWe.
		Step 7.10.2 Select TEST BV3.
		NOTE: When in the Valve Testing Mode, BPVs will move only while the OPEN BV or CLOSE BV button is being touched. Valve motion will stop if finger is lifted from the touch screen, and will resume when the button is touched and held again.
		Step 7.10.3 Select TEST.
		Step 7.10.4 Touch and Hold Open BV3 button.
		Step 7.10.5 When BPV3 is fully open, then release OPEN BV3 button.
	BOP	Recognizes that Bypass valve #3 does not open and informs CRS. (Note: if the OPEN button is held long enough the DEH Trouble alarm will annunciate due to SPC A Control vs. feedback deviation).
	CRS	Refers to Technical Specifications and refers to LCO 3.7.6 Main Turbine Bypass System.

		Contacts Work Control and requests assistance with inoperable bypass valve. May contact System Engineer.
		Conducts Brief – informs crew that LCO 3.7.6 Condition A is applicable and required action is to satisfy the requirements of the LCO within 2 hours or reduce thermal power to LT 25% RTP within 4 hours.
		May direct desuperheat spray be secured.
	BOP	If directed secures desuperheat spray by taking the control switch for COND-PCV-40 to Close.
COMMENT:		

Event No. 3

Description: RFW-LI-606A Fails Downscale.

This event is initiated by activating **TRIGGER 1** after Tech Specs for the Bypass Valve has been referenced.

Time	Position	Applicants Actions or Behavior
T = 20	ATC	Acknowledges RFW CONTR SYSTEM TROUBLE alarm. Monitors RPV level and reports level is 36" and steady. Recognizes RFW-LI-606A indicates downscale and informs CRS. Refers to ARP.
	CRS	Enters ABN-INSTRUMENTATION and updates crew on entry. Determines RFW-LI-606A detector is RFW-DPT-4A.
	BOP	Per ARP, checks FWLC Video Display on back panel H13-P612 and notes that it indicated 'A' Narrow Range has an invalid signal (reading 0.0 in) and Channel B is controlling.
		May direct OPS2 to investigate RFW-DPT-4A on RB 522' on H22-P004.
ROLEPLAY: In two minutes and call X2171 and report there is nothing obviously wrong with RFW-DPT-4A.		
	BOP	May check EFCV-X107 open.
	CRS	Directs transfer of Reactor Vessel Level Control Channel selector switch from CH A to CH B.
	ATC	Places the Reactor Vessel Level Control Channels from Channel A to Channel B.
	CRS	Refers to Tech Specs and identifies TS 3.3.2.2, Feedwater and Main Turbine High Water Trip Instrumentation, Condition A (Place channel in trip within 7 days).
		Contacts Work Control about Channel A failure and requirement to put in a tripped condition within 7 days.
		Conducts brief.

COMMENTS:

Event No. 4

Description: Fire in the Turbine Building with degrading CAS pressure on a 2 minute time delay. CAS-C-1A and CAS-C-1C fail to Auto Start.

This event is initiated by activating **TRIGGER 2** and is initiated after Tech Specs for RFW-LI-606A failure have been referenced. The failure of compressors to auto start is active from the beginning of the scenario.

Time	Position	Applicants Actions or Behavior
T = 35	BOP	Responds to fire alarms and reports alarms indicate a fire in the Turbine Building 441' Boiler Room and the East End Equipment Area.
		Reports start of FP-P-2A.
ROLEPLAY: After FP-P-2A starts, call as OPS 3 (on radio) and report heavy smoke coming from the Aux Boiler Room.		
	CRS	Enters ABN-FIRE and updates crew on entry.
	BOP	Performs ABN-FIRE immediate actions: • Sounds Alerting Tone • Announces fire Turbine Building 441' Aux Boiler Room • Dispatches the Fire Brigade • Repeats the three steps • Depresses the Hanford Fire Department pushbutton on FCP-1
ROLEPLAY: After the announcement: As the Fire Brigade Leader request the fire brigade muster at the 441' turnout locker.		
	BOP	Makes announcement for the fire brigade to muster at the 441' turnout locker.
	CRS	Directs evacuation of non-emergency personnel per PPM 13.5.1 (Blue form).
	BOP	Announces evacuation of the Turbine Building.
ROLEPLAY: Three minutes later, as the Fire Brigade Leader, report the fire is limited to the Aux Boiler Room.		

	BOP	Responds to Air Dryer Trouble, the Air AFT-FLTR A dP High, Standby Air Compressor On, and Low CAS Header Pressure alarms as they annunciate. Informs CRS and refers to ARP.
		Informs CRS of lowering CAS pressure and trend (down slow).
	CRS	Enters ABN-CAS and updates crew on entry.
ROLEPLAY: If asked for local investigation of CAS pressure loss – you will try and investigate but priority is on fighting the fire for now.		
	BOP	When the Standby Compressor On annunciator alarms, verifies starting of standby air compressors. Recognizes that CAS-C-1A and CAS-C-1C should have auto started but did not. May inform CRS prior to attempting start.
		Places the control switches for CAS-C-1A and CAS-C-1C in the START position and reports start of both compressors to the CRS.
		Checks CAS pressure and reports CAS pressure trend is up slow (Note: it takes about a minute until CAS pressures downward trend stops and the header starts to re-pressurize).
	CRS	Directs announcement to suspend all unnecessary use of Control and Service Air be made.
	BOP	Makes announcement as directed.
COMMENT:		

Event No. 5

Description: Loss of CAS-C-1A and CAS-C-1B.

This event is triggered by activating **TRIGGER 3** after it has been reported that CAS pressure trend is up and the Control Air Header Pressure Low annunciator has cleared.

Time	Position	Applicants Actions or Behavior
T=45	BOP	Acknowledges and reports Bus 73 ground alarm. Acknowledges and reports CAS-C-1A motor trip alarm. Acknowledges and reports Bus 83 ground alarm. Acknowledges and reports CAS-C-1B motor trip alarm. Reports CAS-C-1A and CAS-C-1B are not running.
	CRS	May direct Fire Brigade be contacted and asked about the compressor trips.
ROLEPLAY: If asked, report that the compressors tripped when a fire hose failed and wetted the air compressor motors. Fire water has been isolated to that hose and efforts are underway to replace the hose. The fire is being attacked with another hose and the fire is under control. **Also – if asked about CAS pressure loss report there is no way to investigate that at this time.**		
	BOP	Reports CAS pressure again trending down.
	CRS	Sets CAS pressure as a key parameter.
		When it is determined that a complete loss of air is apparent directs RFW-V-118 be verified closed. Directs RFW-LIC-620 to manual and full open Startup flow control valves.
	ATC	Verifies RFW-V-118 is closed and fully opens both Startup Flow Control valves (RFW-FCV-10A/10B) using the controllers turn knob until 100 is indicated on the controller. May also observe panel indication for both valves indicates that both are full open (10A fully opens before the 10B starts to open).
	CRS	May set key parameter of CAS air pressure.
	BOP	Monitors lowering CAS pressure and reports when key parameter met.
	CRS	When it is determined that a complete loss of air is apparent directs a manual scram be inserted.

	ATC	Announces “Listen up for the scram report”. Inserts a manual scram by rotating the Mode switch to Shutdown; Monitors and reports APRM downscale lights illuminated, reports RPV Pressure and trend, and reports RPV Level and trend. Announces EOP entry due to low RPV level. Reports All Rods In. Inserts IRM/SRMs by depressing the Power On and the Drive In pushbuttons.
	CRS	Enters EOP 5.1.1 (RPV Control) and updates crew on entry.
Right after the CRS announces entry into EOP 5.1.1 (RPV Control): ROLEPLAY: Control Room – this is the Fire Brigade Leader – the fire is out and a re-flash watch has been stationed. **Also – if asked about CAS pressure loss report that you will attempt to look into it (no further feedback during the remainder of the scenario will be given).**		
	CRS	Directs RPV level be maintained +13” to +54” with the feed and condensate system. RPV/L band may be widened to -50” to +54” as the scenario progresses due to MSIV closure and changing feed sources.
		Directs PPM 3.3.1 subsequent actions.
		Directs pressure control with DEH in automatic (while MSIVs are still open).
		Direct +13” actuations be verified.
	BOP	Verifies the following: Reactor scram; RRC Pumps running at 15 Hz; Group 5 and 6 valves isolated on GDS screen (no yellow bordered NSSS groups on GDS). Reports +13” actuations verified.
	ATC	Maintains RPV level in given band with the Feed and Condensate System using RFW-V-118.
		Uses Quick Card initially to use RFW pumps to maintain level (while MSIVs are still open should use RFW pumps): Step 2.1.1 If Reactor Feed Pump(s) (RFP) are operating, then perform the following:
		a. Verify RFP(s) have ramped down in speed. b. If preferred to operate RFW-FCV-2A(B) in auto, then verify RFW-FCV-2A(B) is operating properly in Automatic (Minimum Flow Valve) (H13-P840).

		c. If desired to operate RFW-FCV-2A(B) in manual to prevent complications in controlling Reactor Level or valve cycling, then place RFW-FCV-2A(B) in Manual, and slowly Open to approximately 80%. (**Should leave in Auto)** d. Place RFW-P-1B in MDEM mode using either RFT-COMP-1 or RFT-COMP-2 (Pump Control Screen) as follows (H13-P840): 1) Select MDEM. 2) Select YES. e. Place RFW-P-1A in MDEM mode using either RFT-COMP-1 or RFT-COMP-2 (Pump Control Screen) as follows (H13-P840): 1) Select MDEM. 2) Select YES. f. Control Turbine speed as required.
		Step 2.1.2 If Feedwater Temperature Reduction was in progress, then verify RFW-V-109 is closed (H13-P840).
		Step 2.1.3 Start closing RFW-V-112A and RFW-V-112B (H13-P840).
		Step 2.1.4 Start opening RFW-V-118 (Throttle valve) (H13-P840) **(Uses RFW-V-118 to control feed rate to vessel to maintain RPV Level as directed)**
		Step 2.1.5 Verify the following open (H13-P840): • RFW-V-117A • RFW-V-117B
		Step 2.1.6 Verify RFW-LIC-620 is in manual (V selected for Valve position demand) with 0 output

		(Startup RPV Level Control) (H13-P603). (Valves are fully open due to loss of CAS)
		Step 2.1.7 Verify RFW-V-112A and RFW-V-112B are fully closed.
		Step 2.1.8 Verify RFW-V-118 is FULLY OPEN. (Uses RFW-V-118 to control RPV level as directed)
		Step 2.1.9 If Reactor Feed Pump(s) (RFP) are operating, then adjust the running RFP speed to establish ~ 200 psid across RFW-FCV-10A & 10B using either Feedwater touch screen (H13-P840). (Will adjust RFW pump speed to be GT RPV pressure)
Note: When MSIVs close, RPV pressure band should be lowered to facilitate feeding with the Condensate Booster pumps.		
		Maintains RPV level in band directed.
COMMENTS:		

Event No. 7

Description: Steam LOCA inside Primary Containment.

This event is **automatically activated** when the MSIVs close on low CAS pressure by the event file and uses Trigger 4.

Time	Position	Applicants Actions or Behavior
T=55	BOP	Recognizes and reports MSIV closure (due to low CAS pressure).
		Places MSIV control switches for all MSIVs in the close position.
		Takes manual control of RPV pressure with SRVs at a pressure band of 800 to 1000 psig. Updates crew.
	CRS	Directs pressure control with SRVs at 800 – 1000 psig. May direct a lower pressure band of 500 to 600 psig to facilitate feeding with the Condensate Booster Pumps.
	BOP	Acknowledges Suppression Pool Level high/low and Drywell/Suppression Pool Temp high annunciators as they annunciate. Recognizes increasing Drywell pressure and informs CRS.
		Reports EOP entry on High Drywell pressure at 1.68 psig (and Wetwell level (+2”) and Drywell temperature (135°F) when they occur).
	CRS	Enters PPM 5.2.1 (Primary Containment Control) and re-enters PPM 5.1.1 (RPV Control) and updates crew.
		Directs actuations be verified for 1.68 psig Drywell pressure.
		Verifies the following: HPCS DG, HPCS-P-1 and HPCS-P-2 start DG-1 and DG-2 start RHR-P-2A (Refer to Event 8), RHR-P-2B (refer to Event 9), RHR-P-2C and LPCS-P-1 start CW-P-1B and CW-P-1C trip (continued on next page)

		SW-P-2A and SW-P-2B start RCC-P-1A, RCC-P-1B and RCC-P-1C trip Observes GDS and verifies no yellow bordered NSSS groups (which would indicate a containment isolation valve out of position)
Comments:		

Event No. 8

Description: SM-7 Lockout caused by overcurrent condition on RHR-P-2A and failure of the pumps breaker to open.

This event is active from the start of the scenario and is realized when RHR-P-2A starts. When the pump starts the event file will initiate trigger 5 which causes pump breaker to fail as is and SM-7 lockout on a 30 second time delay.

Time	Position	Applicants Actions or Behavior
T=60	BOP	May recognize overcurrent condition on RHR-P-2A when it auto starts by observing pump amp meter on P601.
		May recognize that a loss of power to LPCS-P-1 and RHR-P-2A has occurred. Responds to electrical panel to investigate loss of power.
		Notes that SM-7 is not powered. Investigates annunciators and panel indications and recognizes that a lockout on SM-7 exists (the Lockout Circuit Avail white light for CB-7/1 is not lit) and informs CRS.
		Reports that due to the lockout, DG-1 is running without service water. May refer CRS to ABN-SW and ABN-ELEC-SM1/SM7.
	CRS	Enters ABN-SW and ABN-ELEC-SM1/SM7 and updates crew.
		Directs DG-1 be tripped per subsequent actions of either ABN-SW or ABN-ELEC-SM1/SM7.
	BOP	Depresses the DG-1 emergency trip pushbutton and reports DG-1 tripped.

Comments:

Event No. 9

Description: RHR-P-2B Fails to Auto Start and when it is started it has a sheared shaft.

This event is active from the start of the scenario and is realized when 1.69 psig actuations are being verified.

Time	Position	Applicants Actions or Behavior
T=65	BOP	While verification of 1.68 psig actuations is being performed, recognizes that RHR-P-2B should have auto started but did not.
		Takes the control switch for RHR-P-2B to start and observes breaker closure/pump start. Verifies proper pump operation and recognizes the pump has not developed any discharge pressure and low running amps are indicated. Informs CRS.
	CRS	May direct local investigation of RHR-P-2B.
ROLEPLAY: Wait one minute: RHR-P-2B shaft is sheared and the motor is free spinning from the pump.		
	CRS	Directs RHR-P-2B be secured and may direct control fuses be pulled
	BOP	Secures RHR-P-2B by placing C/S to Stop and directs OPS 2 to pull the control power fuses.
BOOTH OPERATOR: Wait two minutes and <u>ACTIVATE TRIGGER 10</u> to pull the control power fuses/rackout the breaker and report completion to the control room.		
Comments:		

Event No. 10

Description: RRC-P-1A Stop pushbutton Failed.

This event is active from the start of the scenario and is realized when the pushbutton is depressed.

Time	Position	Applicants Actions or Behavior
T=65	ATC	Recognizes that RRC pumps are running without RCC cooling (RCC pumps trip off at 1.68 psig Drywell pressure).
		Informs CRS and requests permission to stop the RRC pumps.
	CRS	Directs both RRC pumps be stopped.
	ATC	Depresses the stop pushbuttons for RRC-P-1A and RRC-P-1B. Verifies pumps stopped (red ASD lights out and green lights illuminate). Recognizes RRC-P-1A did not stop.
		Informs the CRS of the failure of RRC-P-1A to stop when the Stop pushbutton was depressed.
	CRS	Directs opening CB-RRA, CB-RPT-3A or CB-RPT-4A to stop RRC-P-1A.
	ATC	Opens breaker as directed. Reports RRC-P-1A stopped.

Comments:

Event No. 11

Description: Perform PPM 5.5.2 to spray containment with Service Water B.

The Critical Task is to initiate Drywell sprays with SW-B through RHR-B using PPM 5.5.2 after Drywell temperature reaches 285°F, but before Drywell temperature reaches 330°F .

The Critical Task is to terminate Drywell sprays after Drywell pressure reaches 1.68 psig but before drywell pressure drops to LT -0/5 psig.

Time	Position	Applicants Actions or Behavior
T=70	BOP	Reports Wetwell pressure at 2 psig and trending up.
	CRS	Referring to PPM 5.2.1 (Primary Containment Control, determines that Wetwell sprays are required to be initiated (before 12 psig Wetwell pressure). Recognizes that both loops of RHR are unavailable to spray containment. Using flow chart icon, directs PPM 5.5.2 (RHR/SW CROSSTIE LINEUP) be performed.
	BOP	Obtains PPM 5.5.2 and required equipment in plastic bag from EOP drawer.
		Step 4.1.1 Verify RHR-P-2B Stopped. **Takes C/S for RHR-P-2B to stop if not previously accomplished.**
FLOOR OPERATOR: Be behind H13-P601 and when candidates comes back to perform step 4.1.2 ask what actions he is performing. When step 4.1.2 is stated inform him that he is in the process of performing the step. Keep him there for one total minute and then inform him that the step has been completed.		
		NOTE: The following step overrides RHR-V-68B (Heat Exchanger SW Discharge) automatic open logic. E-CP-H13/P680 Bay F is located behind H13-P601. See Attachment 6.1.
		Step 4.1.2 Lift and tape the black wire at TM-7, Terminal 15 (Cable 2M8BB-24) to override RHR-V-68B automatic open logic (E-CP-H13-P680 Bay F) (This panel is not modeled in the simulator but is located behind H13-P601 in the control room.
		Step 4.1.3 Verify the following valves are closed: • RHR-V-24B (Suppression Pool Cooling/Test Return)(H13-P601)

		• RHR-V-27B (Suppression Pool Spray) (H13-P601) • RHR-V-16B (Drywell Spray Outboard Isolation) (H13-P601) • RHR-V-17B (Drywell Spray Inboard Isolation) (H13-P601)
		NOTE: If SW-P-1B is operating, then performing the following step may result in injecting service water into the RPV.
		Step 4.1.4 Open the following valves: • RHR-V-115 (SW B to RHR B Cross Connect) (H13-P601) • RHR-V-116 (SW B to RHR B Cross Connect) (H13-P601)
		Step 4.1.5 Start SW-P-1B (if not operating).
		Step 4.1.6 Perform one of the following sections. N/A the section not performed. • Section 4.2 for RPV injection • Section 4.3 for Containment Sprays
		Informs the CRS that PPM 5.5.2 is completed up to initiating containment sprays.
	CRS	Directs spraying the Wetwell.
	BOP	Step 4.3.1 Verify RHR-V-42B Closed.
		Step 4.3.2 If desire to spray the Wetwell, then open RHR-V-27B.
		Verifies flow through RHR-B (may not be visible due to only about 500 gpm flowrate from Wetwell sprays). Informs the CRS that Wetwell sprays have been initiated with SW-B.
	CRS	Sets key parameter of 285°F DW/T or 12 psig Wetwell pressure.
	BOP	Informs the CRS when Drywell Temperature reaches 285°F or when Wetwell pressure reaches 12 psig.
	CRS	Verifies RRC pumps are secured. (It may be at this point in the scenario that the crew attempts to stop RRC-P-1A and not on the loss of RCC cooling flow at 1.68 psig) Directs Drywell Cooling fans be secured.

	BOP/ATC	Goes to back panel and secures the five Drywell Cooling Fans (CRA-FC-2A, 1A, 2B, 1B, 1C – Fan controls that are not in brown area on panel – Note: CRA-FC-2A and 1A are already off due to loss of power to SM-7). Informs CRS that Drywell Cooling fans are secured.
	CRS	Directs Drywell Sprays be initiated with PPM 5.5.2.
	BOP	Step 4.3.3 If desire to spray the Drywell, then open the following valves: • RHR-V-17B • RHR-V-16B
		Step 4.3.4 Close RHR-V-68B.
		Informs CRS Drywell sprays with SW-B have commenced. Reports Drywell pressure and downward trend.
	CRS	Directs that Drywell sprays be terminated when Drywell pressure drops to LT 1.68 psig and that Wetwell Sprays be stopped if Wetwell pressure drops to LT 1.68 psig.
BOOTH OPERTOR: When Drywell Sprays have been initiated, reduce MAL-RRS009A to 1500 (and adjust as necessary) to allow Drywell pressure to drop and allow securing of Drywell Sprays.		
	BOP	After Drywell pressure reaches 1.68 psig and before it drops to LT -0.5 pisg, stops Drywell sprays be closing RHR-V-16B and/or RHR-V-17B. Informs the CRS that Drywell sprays have been stopped.
Comments:		
TERMINATION CRITERIA: The scenario will be terminated when Drywell sprays have been stopped.		

TURNOVER INFORMATION

Initial Conditions

Columbia is operating at 100% power. TSW-P-1A is tagged out for motor replacement. TSW-P-1B is protected and selected as the emergency standby TSW pump.

Shift Directions

Reactor Power is to be lowered for economic dispatch due to a request from the BPA. Stop the power decrease when the "OK TO TEST BV VALVES green light illuminates at approximately 90% reactor power.

A Reactivity brief for the power reduction has been held and power is to be lowered immediately following shift turnover.

Additionally, commence performance of OSP-MS-M701. The pre job brief has been conducted. Proper margin to Pre-Conditioned Status (PCS) exists per PPM 9.3.18. The Dittmer Dispatcher has been notified of the upcoming Bypass Valve Testing.

The power reduction and BPV surveillance are to be performed concurrently.

SIMULATOR SETUP INSTRUCTIONS

Reset to IC #171.

Blue Tag TSW-P-1A C/S.

Blue tag the Emergency Standby Selector Switch in the B Pump position.

Flag annunciator.

Have a signed in copy of OSP-MT-M701 available for each crew.

SCHEDULE FILE

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      <ITEM row = 1>
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Start and Trigger 6 on RHR-V-68B Green light on</DESCRIPTION>
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EVENT FILE

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LOCKOUT">X01O299R &gt 0</TRIGGER>
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CLOSED">X01O321G &gt 0</TRIGGER>

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INSTRUCTIONAL COVER SHEET

PROGRAM TITLE: OPERATIONS TRAINING

COURSE TITLE: COLUMBIA GENERATING STATION SIMULATOR EXAMINATION

LESSON TITLE: Pull Control Rods for a Control Rod Set; Rod Drifts Out; Isolate Rod; SGT Strip Heater Fails On; Another Failure; OBE – Trip of RFW-P-1A; RRC Pumps Fail to Run Back; RFW-P-1B Trips; Startup Fail to Close in on SM-1, SM-2 and SM-3 – Manually Re-Energized; RHR-A Suction Line Rupture ED on Low Suppression Pool Water Level

LENGTH OF LESSON 1.5 Hours

INSTRUCTIONAL MATERIALS INCLUDED

Lesson Plan PQD Code		Rev. No.	
Simulator Guide PQD Code	LO001751	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: 06/11/12

REVISED BY: DATE:

VALIDATED BY: DATE:

TECHNICAL REVIEW: DATE:

INSTRUCTIONAL REVIEW: DATE:

SAT Coordinator

APPROVED: DATE:

Operations Training Manager

NRC EXAM SCENARIO #2

Facility: Columbia Scenario No.: 2 Op-Test No.: 2013

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Reactor power has been lowered to support a Control Rod Set. HPCS-P-1 is tagged out for shaft replacement. The #1 and #2 RFW Heaters have been removed from service per the Reactivity Control Plan. The reactivity brief and the task preview for the shift's scheduled activities have been completed. An SNE is stationed in the Control Room to monitor core conditions.

Turnover: Continue with the Reactivity Control Plan (RCP) and adjust control rods to the target pattern and then return the plant to 100% power.

Event No.	Timeline	Event Type*	Event Description
1	T = 0	R (ATC) R (CRS)	Pull Control Rods per the Reactivity Control Plan to achieve the target rod pattern.
2	T = 10	C (ATC) C (CRS)	While moving control rods, a previously adjusted rod (38-23) begins to drift out. Once inserted, releasing the continuous insert pushbutton causes the control rod to drift out again, requiring the control rod to be isolated (Tech Spec).
3	T = 20	I (BOP) I (CRS)	SGT-A high temperature due to strip heaters failing to de-energize (Tech Spec).
4	T = 35	C (BOP)	Bus Duct Cooling Fan 1A Fails, Standby does not auto start but can be manually started.
5	T = 40	I (ATC) I (CRS)	Operating Basis Earthquake. RFW-P-1A Trip. RRC pumps fail to automatically run back to 30Hz.
6	T = 50	M (All)	A trip of RFW-P-1B results in a loss of Feedwater and a reactor scram.

7	T = 51	C (All)	When the Main Turbine trips, Startup Power will not close in on SM-1, SM-2 or SM-3.
8	T = 60	M (All)	Aftershock results in a rupture in the RHR-A suction line. Emergency Depressurize the RPV before Suppression Pool level reaches 19 feet 2 inches (Critical Task).
9	T = 70	C (BOP) C (CRS)	The cross-connect valve between the RHR-A and RCIC pump rooms (FDR-V-607) fails to automatically close due to a failed level switch, and must be manually closed to maintain RCIC operation. Close FDR-V-607 prior to reaching the Maximum Safe Operating Value water level in the RCIC pump room (Critical Task).

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

The scenario starts with Columbia at approximately 75% power. HPCS-P-1 is OOS due to shaft replacement.

After shift turnover reactor power will be lowered with core flow to 70% to support a control rod set.

During the control rod set, one of the previously moved control rods will begin to drift out of the core. The ATC operator will recognize this and take actions to insert the control rod, which will insert. When the insert pushbutton is released, the control rod will again begin to drift out of the core. The ATC operator will again insert the control rod and the crew will take action to isolate that rod. Tech Spec will be referenced.

After Tech Specs have been referenced a SGT-B high temperature alarm will occur due to a strip heater failing to de-energize. The BOP operator will respond and start SGT-B per and then start SGT-A which will cause temperature to drop. Tech Specs will be referenced.

The next event is a failure of IBD-FN-1A. The BOP operator will respond to annunciators and report the failure of IBD-FN-1A and refer to ARPs. He will note that IBD-FN-1B should have auto started but did not and start IBD-FN-1B.

The next event is an Operating Basis Earthquake which results in a trip of one of the two operating Reactor Feedwater Pumps, RFW-P-1A. During verification of automatic actions the ATC operator will find that the automatic runback of the Reactor Recirculation Pumps did not occur. Manual actions to lower RRC pumps to 30 Hz will be successful.

After the plant stabilizes, the Turbine Building watch will contact the Control Room and inform them that the reason RFW-P-1A tripped was a rupture of the control oil system and that there is a leak in the control oil system on RFW-P-1B. Ten seconds later RFW-P-1B will trip. The crew should attempt to insert a manual scram prior to the automatic scram at +13 inches.

When the Main Turbine trips and the electrical plant transfers to the Startup Transformer, the startup breakers associated with SM-1, SM-2 and SM-3 will not auto close. This results in a loss of all operating Condensate Pumps, closure of the MSIVs, a loss of CRD and a trip of the Control Air System's Air Compressors. The crew will take action to establish RPV level control with the RCIC system, and restart CRD pumps (HPCS-P-1 is OOS at the beginning of the scenario). Pressure control will be on SRVs at 800 – 1000 psig.

An aftershock will result in a rupture of the RHR-A suction line from the suppression pool causing flooding in the A-RHR room. The crew will take action per EOP PPM 5.3.1 (Secondary Containment Control). During verification of automatic actions the crew will recognize that the cross connect valve between RHR-A room and the RCIC pump room, FDR-V-607, failed to automatically close (due to a failed R1 sump level switch). Prior to reaching Maximum Safe Operating Value in the RCIC pump room, the crew will manually close FDR-V-607 with the control switch which is located on back panel H13-P632.

Makeup to the Suppression Pool cannot be performed due to HPCS being OOS.

The crew should initiate an Emergency Depressurization per PPM 5.1.3, RPV Depressurization, before Suppression Pool water level drops to 19 feet 2 inches.

The scenario will be terminated when an Emergency Depressurization has been performed and RPV level is being returned to +13" to +54" level band.

Event No. 1

Description: Reduce Reactor Power to approximately 70% with flow. Withdraws control rods 38-23, 38-39 and 22-23 per reactivity plan from position 06 to position 10.

This event is initiated by the turnover information.

Time	Position	Applicants Actions or Behavior
T = 0	CRS	Directs control rod withdrawal per reactivity plan.
	ATC	Selects control rod 38-23 (then 38-39, then 22-23). Performs the following to withdraw each control rod one notch each time: • Verifies control rod position and no rod blocks exist • Depresses the Withdraw pushbutton • Observes CRD Drive Header and Cooling Header Flow • Observes Insert then the Withdraw and then the Settle lights illuminate • Verifies control rod position when settle function complete

COMMENTS:

Event No. 2

Description: Control Rod 38-23 Drifts Out of the Core

This event is initiated by activating **TRIGGER 1** when Control Rod 22-39 (the last control rod to be withdrawn per the Reactivity Plan) is **selected** to be withdrawn (Note: Drift is on 38-23 NOT 22-39).

Time	Position	Applicants Actions or Behavior
T = 10	ATC	Acknowledges the Rod Drift annunciator. Scans the full core display and observes the red drift light is lit for control rod 38-23 or observes the Rod Worth Minimizer Operator Console display and observes the 'd' associated with rod 38-12.
		Per ABN-ROD immediate actions - selects Control Rod 38-23. Observes the rod position. Notes that the rod is drifting out of the core.
		Per ABN-ROD immediate actions: Depresses the CONTINUOUS INSERT pushbutton. Drives Control Rod 38-23 full in. Releases the Continuous Insert pushbutton.
		Observes that Control Rod 38-23 continues to drift out of the core and informs the CRS. Per ABN-ROD Immediate Actions: Depresses and Holds the CONTINUOUS INSERT pushbutton.
	CRS	Per ABN-ROD immediate actions: Directs Control Rod 38-23 be isolated.
	BOP	Directs OPS2 to isolate control rod 38-23 by closing CRD-V-103 and CRD-V-105 associated with control rod 38-23.
BOOTH OPERATOR: Wait two minutes and then REMOVE MAL-RMC-004 for rod 38-23. **ROLEPLAY: After malfunction is removed inform the control room that the rod has been isolated.**		
	CRS	Directs the ATC operator release the CONTINUOUS INSERT pushbutton for 38-23.
	ATC	Releases the CONTINUOUS INSERT pushbutton and observes control rod remains fully inserted and informs the CRS.

	CRS	Refers to Tech Spec 3.1.3 Control Rod operability and notes condition C applies (Fully insert inoperable control rod within 3 hours AND Disarm the associated CRD within 4 hours). Conducts Brief.
COMMENT:		

Event No. 3

Description: SGT-B Strip Heater Fails Resulting in a High Temperature Condition.

This event is initiated by activating **TRIGGER 2** after Tech Specs for the Control Rod has been referenced.

Time	Position	Applicants Actions or Behavior
T = 20	BOP	Acknowledge the SGT Div B Board K2 Trouble alarm on Board S. Investigates back panel.
		Acknowledges the Charcoal Filter B-1 Outlet Temperature High alarm and refers to ARP.
		Observes SGT-TI-6B and notes reading (~265°F). Refers CRS to ABN-SGT-TEMP/RAD.
	CRS/BOP	May send OPS2 to SGT-B to investigate locally.
ROLEPLAY: If sent, wait two minutes and report that SGT-B train smells hot and the unit is hot to the touch. The local temperature indications are higher than normal at 200°F and 230°F. There is no smoke and no indications of a fire.		
	CRS	Per ABN-SGT-TEMP/RAD directs SGT-A be started per SOP-SGT-START.
	CRS/BOP	Directs SGT-DISC-8B2BL (SGT-ESH-1B) disconnect be opened per ARP.
BOOTH OPERATOR: When SGT-FN-1B12 is started per ABN Trigger 3 will automatically initiate and lower SGT Temperature to 100°F on a 15 minute ramp. **ROLEPLAY: When Trigger 3 initiates, report SGT-DISC-8B2BL has been opened.**		
	BOP	Starts SGT-A per SOP-SGT-START section 5.2.2: If manually initiating SGT Train A with the lead fan at the subsystem level, then perform the following (H13-P827, Bd K1): a. Verify SGT-V-2A is OPEN (Inlet from Reactor Building). b. Momentarily turn SGT-FN-1A1 fan control switch from AUTO to PTL SYS. START. c. Verify the following: • Main Heaters ENERGIZE as indicated by Main Heater ON light and A1 amp meter. • SGT-V-5A1 OPENS (Exhaust to Stack).

		• SGT-FN-1A1 STARTS (within 10 seconds). d. If required to operate in manual flow control, then perform the following: **(MANUAL CONTROL SHOULD NOT BE REQUIRED).**
	CRS	Directs subsequent actions of ABN-SGT-TEMP/RAD be performed to start SGT-B.
	BOP	Start and recirculate the SGT train that has the charcoal high temperature or high radiation as follows: Step 4.2.1 Verify SGT-V-1A(1B) is CLOSED (Inlet From Containment). Step 4.2.2 Verify SGT-V-5A1(5B2) and SGT-V-5A2(5B1) are CLOSED (Exhaust to Stack). Step 4.2.3 Verify SGT-V-2A(2B) is OPEN (Inlet from Reactor Building). Step 4.2.4 Verify SGT-V-3A2 (3B1) is OPEN (Fan Inlet). Step 4.2.5 If possible, then station an HP technician near SGT to monitor for airborne contamination/smoke. Step 4.2.6 Open SGT-V-4A1(4B2) (Exhaust to Reactor Building). Step 4.2.7 Place SGT-EHC-1A1(1B2) control switch to ON (Main Heater). Step 4.2.8 Verify SGT-FN-1A1(1B2) starts within 10 seconds after the Main Heaters energize. Step 4.2.9 If the SGT system is required to be operable, then declare the SGT train inoperable in the Plant Logging System. Step 4.2.10 Place SGT-DPIC-1A1(1B2) in MANUAL, and adjust the flow rate to approximately 4000 CFM as indicated by SGT-FR-2A1(2B2). Step 4.2.11 When the charcoal temperature/radiation has returned to normal, then place SGT in

		standby per SOP-SGT-STBY.
		Reports SGT-B started per ABN-SGT-TEMP/RAD and temperature decreasing.
	CRS	Refers to Tech Specs 3.6.4.3 (SGT is inoperable when manual control of SGT-B is taken. TS 3.6.4.3 Condition A is applicable – Restore SGT subsystem to operable status within 7 days.
COMMENTS:		

Event No. 4

Description: IBD-FN-1A Motor Fails due to ground. IBD-FN-1B does not Auto start.

This event is initiated by activating **TRIGGER 9** after Tech Specs for Standby Gas have been referenced.

Time	Position	Applicants Actions or Behavior
T = 20	BOP	Responds to electrical panel alarms as they annunciate: • Bus 31 ground • Gen Bus Duct Clr Flow low • Gen Bus Duct Air Flow Loss Observes Bus Duct Cooling Fans 1A control switch in run but Green light is on and Red light is off. Observes Bus Duct Cooling Fan 1B is also not running. Informs the CRS and refers to ARPs.
		Informs the CRS that the ARP for Air Flow Loss directs to start the standby fan per SOP-IBD-OPS. Refers the CRS to ABN-GENERATOR.
	CRS	May direct the standby fan be started per PPM 1.3.1, Conduct of Operations as an auto action that should have occurred and didn't or may direct starting the standby fan per SOP-IBD-OPS.
	BOP	Starts IBD-FN-1B as directed. Places IBD-FN-1A C/S to Off and notes that IBD-FN-1B does not auto start. Places IBD-FN-1B C/S to Run and after dampers reposition, notes it does start. Observes annunciators clear as bus duct temperatures/parameters return to normal. Reports system status to CRS.

COMMENTS:

Event No. 5

Description: Operating Basis Earthquake. Trip of RFW-P-1A (on a 20 second Time Delay). Failure of RRC Pumps to Automatically runback to 30 Hz.

This event is initiated by activating **TRIGGER 4** and is initiated after Tech Specs for SGT has been referenced.

Time	Position	Applicants Actions or Behavior
BOOTH OPERATOR: Start EQ at lowest volume and work to highest volume in 15 seconds then turn off the earthquake machine. Activate TRIGGER 4 five seconds into earthquake simulation.		
T = 40	BOP	Responds to Board S and announces Operating Basis Earthquake Exceeded alarm. Refers to ARP and directs the CRS to ABN-EARTHQUAKE.
	ATC	Recognizes and announces the trip of RFW-P-1A. Observes RPV level dropping. Observes RFW-P-1B speed ramping up and reports B Feed Pump responding. Reports RPV level as it drops to about +20 inches and then begins to return to +36".
	CRS	Directs runback of the RRC pumps be verified.
	ATC	Observes P602 indications and recognizes: • both RRC pumps remain at GT 30 Hz • both RRC Pump controllers remain in Automatic • the FW Pump trip amber lights are not lit on either controller • the Feedwater pump Trip Limit annunciator is not in alarm Reports observations to the CRS.
	CRS	Directs both RRC pump speeds be lowered to 30 Hz.
	ATC	May leave master controller in Auto and depress the lower pushbutton to reduce RRC-P-1A and RRC-P-1B's speed to 30 Hz. May take manual control of the both RRC pump controllers and depresses the lower pushbutton to reduce RRC-P-1A and RRC-P-1B's speed to 30 Hz or may depress the master controller to lower speeds to 30 Hz. Reports both RRC pumps at 30 Hz. Reports Power/Pressure/Level at end of power reduction.
	BOP	After referring CRS to ABN-EARTHQUAKE, checks back panel and reports all Amber and all Red lights illuminated.

	CRS	Updates crew on ABN-EARTHQUAKE entry. Per subsequent actions – initiates a controlled Reactor Shutdown per PPM 3.2.1.
		Directs ABN-EARTHQUAKE announcement be made.
	BOP	Makes ABN-EARTHQUAKE announcement.
ROLEPLAY: Booth Operator to Role Play SAS officer.		
	BOP	Goes to Simulator Booth and directs SAS to repeat above announcement on the Alternate Security/Area Wide and Security radio channels. Directs OPS2 inspection of the Spent Fuel Pool for damage.
COMMENT:		

Event No. 6

Description: Trip of the B Reactor Feedwater Pump.

This event is initiated by activating **TRIGGER 5** and is initiated after the below role play which should be made after actions to reduce RRC flow due to the failure of the pumps to runback and actions for the OBE have taken place.

Time	Position	Applicants Actions or Behavior
T = 50	**ROLEPLAY: Call X2171 and as OPS3 report oil on floor in front of the Reactor Feed Pump cabinets which appears to be coming from the control oil system and you are investigating further. Call back one minute later and report that you just opened the cabinet door of the B Reactor Feed Pump and it appears there is a leak in the control oil piping on the B Reactor Feed Pump which is getting larger even as you speak. After the Roleplay THEN activate TRIGGER 5.**	
	ATC	Acknowledges annunciator and reports trip of the B Reactor Feedwater pump and may also announce that he is initiating a manual reactor scram.
	CRS	Directs a manual scram if not already being performed.
	ATC	Turns Mode switch to SHUTDOWN and announces: Listen up for the scram report: Mode switch is in Shutdown, APRMs are downscale, RPV Pressure is xxx, RPV Level is xxx and down fast. Reports EOP entry due to low RPV level.
	CRS	Repeats back the scram report. Updates crew on EOP 5.1.1 (RPV Control) EOP entry.
	ATC	Reports RPV level as it drops below -50". Verifies RCIC initiation and injection to the RPV at 600 gpm (may increase injection flow to 700 gpm).
	CRS	Directs +13" and -50" actuations be verified.
	ATC/BOP	Verifies Containment isolation valves closed by GDS indication (no yellow bordered groups). Verifies RCIC initiated. Verifies HPCS DG start.
	ATC	Updates crew on MSIV closure (Due to loss of RPS power when buses fail to auto transfer to startup power) and that pressure control is on SRVs at 800 to 1000 psig.
	CRS	Directs pressure control with SRVs at 800 – 1000 psig pressure band.
COMMENTS:		

Event No. 7

Description: Failure of the Startup Transformer to Auto Close in on SM-1, SM-2 and SM-3 causing a loss of the Condensate system.

This event is active from the beginning of the scenario and is realized when the Main Turbine trips.

Time	Position	Applicants Actions or Behavior
The Critical Task for this event is to re-power SL-21 which supplies power to Control Room back panel H13-P632 which will allow the closure of FDR-V-607 (refer to EVENT 7).		
T=50	BOP	Responds to the electrical panels and observes that the Startup breakers have not closed in on SM-1, SM-2 and SM-3 but did close in on SH-5 and SH-6. Observes and reports that Backup Transformer has closed in and is powering SM-7 and SM-8. Observes DG-1 and DG-2 have auto started.
	BOP	May report electrical board status to CRS prior to taking the following actions to re-power SM-1, SM-2 and SM-3: Places the CB-S1 SYNC Selector switch to MAN position. Places the CB-S1 Control Switch to CLOSE and observes red light on and green light off. Places the CB-S1 SYNC Selector switch to OFF position. Places the CB-S2 SYNC Selector switch to MAN position. Places the CB-S2 Control Switch to CLOSE and observes red light on and green light off. Places the CB-S2 SYNC Selector switch to OFF position. Places the CB-S3 SYNC Selector switch to MAN position Places the CB-S3 Control Switch to CLOSE and observes red light on and green light off. Places the CB-S3 SYNC Selector switch to OFF position.
	BOP	Re-powers SL-11, SL-21 and SL-31 using quick card: 2.1 Energizing SL-11 from SM-1 (Dead Bus) 2.1.1 Verify SM-1 is energized. 2.1.2 Verify CB-11/1 green light illuminated and green flag displayed.

		2.1.3 If CB-1/11 is OPEN, then perform the following: a. Verify CB-1/11 white LOCKOUT CIRCUIT AVAIL light illuminated. b. Verify CB-1/11 green light illuminated and green flag displayed. c. Close CB-1/11. 2.1.4 Close CB-11/1. 2.1.5 Verify SL-11 voltage is approximately 480 (432-528) volts. 2.2 Energizing SL-21 from SM-2 (Dead Bus) 2.2.1 Verify SM-2 is energized. 2.2.2 Verify CB-21/2 green light illuminated and green flag displayed. 2.2.3 If CB-2/21 is OPEN, then perform the following: a. Verify CB-2/21 white LOCKOUT CIRCUIT AVAIL light illuminated. b. Verify CB-2/21 green light illuminated and green flag displayed. c. Close CB-2/21. 2.2.4 Close CB-21/2. 2.2.5 Verify SL-21 voltage is approximately 480 (432-528) volts. 2.3 Energizing SL-31 from SM-3 (Dead Bus) 2.3.1 Verify SM-3 is energized. 2.3.2 Verify CB-31/3 green light illuminated and green flag displayed. 2.3.3 If CB-3/21 is OPEN, then perform the following: a. Verify CB-3/31 white LOCKOUT CIRCUIT AVAIL light illuminated. b. Verify CB-3/31 green light illuminated and green flag displayed. c. Close CB-3/31. 2.3.4 Close CB-31/3. 2.3.5 Verify SL-31 voltage is approximately 480 (432-528) volts.
	CRS	Directs both CRD pumps be started for RPV injection.

	ATC/BOP	Places CRD controller to manual and takes control switches for CRD-P-1A and CRD-P-1B to START. May direct OPS2 perform ABN-CRD-MAXFLOW.
BOOTH OPERATOR: If directed to perform ABN-CRD-MAXFLOW, wait three minutes and then <u>ACTIVATE TRIGGER 26</u> and report completion when valves have completed repositioning.		
	BOP	Reports High Drywell Pressure EOP entry into PPM 5.2.1 (Primary Containment Control) at 1.68 psig with no indication of a leak in the drywell (due to heat up).
	CRS	Directs 1.68 psig actuations be verified.

	BOP	Verifies 1.68 psig actuations: RHR-P-2A, RHR-P-2B, RHR-P-2C, LPCS-P-1 running on min flow. DG-1 and DG-2 are running. SW-P-1A and SW-P-1B are running. GDS indicates all containment isolation valves closed except for RCIC-V-8 and RCIC-V-63 (no yellow bordered NSSSS groups).
	ATC	Reports RPV level slowly recovering.
	BOP	Reports Main Steam Tunnel high temp alarm and eventual EOP entry into PPM 5.3.1 (Secondary Containment Control), due to Main Steam Tunnel Temp Hi Hi. Reports EOP 5.2.1 (Primary Containment Control), entry on Drywell Temperature and Wetwell level as they occur.
	ATC/BOP	Recognizes CAS air compressors do not restart on loss of power. Directs OPS3 to reset CAS air compressors.
ROLEPLAY: A minute after the request to reset CAS, <u>ACTIVATE TRIGGER 23</u> and when compressors have restarted, report completion to the Control Room.		
	CRS	May decide to expand RPV level band to -50" to +54". May direct SLC initiation and injection into RPV as an Alternate Injection System (Table 3 of EOP 5.1.1 RPV Control).
	ATC	If directed, injects with both SLC Systems using SOP-SLC-INJECTION-QC: 2.1 Remove the SLC keylock switch blanks, and insert both keys into the SLC System control switches. 2.2 Initiate SLC injection by performing the following (H13-P603): • PLACE SLC System A control switch to the OPER position. • PLACE SLC System B control switch to the OPER position. 2.3 Report the following to the CRS: • SLC flow rate (-82 gpm) • Initial tank level (4800 gal) • RWCU-V-4 status (should be closed)
COMMENTS:		

Event No. 8

Description: Earthquake tremor causes a rupture in the RHR-A suction piping resulting in flooding of the RHR-A pump room and Suppression Pool Water Level to drop. Emergency Depressurize the RPV when it is determined that Suppression Pool water level cannot be maintained GT 19' 2".

The event is initiated by activating **TRIGGER 6** and is initiated after plant has been stabilized, the electrical buses have been re-energized and RPV level is GT -50".

Time	Position	Applicants Actions or Behavior
The Critical Task for this event is to initiate an Emergency Depressurization prior to Suppression Pool Water Level reaching 19'2".		
BOOTH OPERATOR: Start EQ and work back to highest volume in 10 seconds then turn off the earthquake machine. Activate TRIGGER 6 five seconds into earthquake simulation.		
T=60	BOP	Acknowledges the Suppression Pool Level Hi/Low alarm (P601-A11 2-3 and P601-A12 2-3). Reports Suppression Pool level dropping giving actual level and trend. Reports EOP entry into PPM 5.2.1 (Primary Containment Control) on Low Suppression Pool level when level drops to LT -2".
	CRS	Directs field investigation by OPS2. Updates crew on PPM 5.2.1 (Primary Containment Control) EOP entry.
ROLE-PLAY – Two minutes after being directed to investigate, report that there is a crack in the piping between the Suppression Pool and the RHR Pumps suction valve, RHR-V-4A. Room water level is rising and you are leaving the room. If asked, the break cannot be isolated.		
NOTE: It takes about five minutes after trigger actuation to get the RHR-A Pump Room High Level EOP entry alarm and BISI. The R1 sump high level alarm does not annunciate due to failed level switch which also causes FDR-V-607 not to auto close.		
	BOP	Acknowledges RHR A PUMP ROOM WATER LEVEL HIGH annunciator and BISI and reports EOP entry into PPM 5.3.1 (Secondary Containment Control). Refers to ARP: May contact the RWCR Operator to verify sump pumps FDR-P-1A and FDR-P-1B operating. Refers CRS to ABN-FLOODING.

		Verifies FDR-V-607 closed on P632 and observes valve is actually opened. Takes FDR-V-607 control switch to close and observes green light on and red light off. Informs CRS.
	CRS	Updates crew on PPM 5.3.1 (Secondary Containment Control) EOP entry. Refers ABN-FLOODING and directs actions: • Directs evacuation of affected Area (RHR-A Pump Room). • Directs RHR-P-2A be stopped (Note: Pump will eventually trip on overload if not secured). • Directs the control power fuses be removed for RHR-P-2A. • Locate and isolate the source of the flooding per Section 7.2. • Monitor adjacent ECCS Pump rooms for flooding.
ROLE-PLAY – Two minutes after request to pull RHR-P-2A fuses, <u>ACTIVATE TRIGGER 7</u> and report control power fuses for RHR-P-2A have been pulled.		
	BOP	Makes evacuation announcement as directed per ABN-FLOODING: • Sounds Alerting tone for 5-10 seconds • Alert station personnel to flooding in the RHR-A Pump Room • Evacuates all non-emergency personnel from the affected area • Refers to PPM 13.5.1 for localized evacuation.
COMMENTS:		

Event No. 9

Description: FDR-V-607 (the RHR-A / RCIC Room cross-connect valve) Fails to Auto Close.

This event is initiated by the CRS when it has been determined that Suppression Pool Water Level cannot be maintained GT +19'2".

The Critical Task is to close FDR-V-607 prior to exceeding Max Safe Operating Level in the RCIC Pump Room.

Time	Position	Applicants Actions or Behavior
T = 75	CRS	Recognizes HPCS-P-1 is not available and Suppression Pool Water Level cannot be maintained GT +19'2".
	CRS	Updates crew on requirement to initiate an Emergency Depressurization. Updates crew on PPM 5.1.3 (RPV Depressurization) EOP entry. Exits the Pressure leg of PPM 5.1.1 (RPV Control), and enters PPM 5.1.3 (Emergency RPV Depressurization).
		Determines if RPV injection with LPCS and RHR is required based on RPV Level and trend (It is anticipated that one ECCS pump will be used to return RPV water level back to +13" to +54" level band with RCIC eventually isolating on low RPV pressure).
		Determines Wetwell level is above 17'. Directs 7 SRVs (ADS preferred) be opened.
	BOP	Opens SRVs as directed starting with the first ADS SRV and working to the last.
		As each SRV is opened, observes Primary Containment pressure response.

Comments:

TURNOVER INFORMATION

Initial Conditions

HPCS-P-1 is undergoing schedule maintenance as the pump shaft has been removed.

The following have been protected per PPM 1.3.83 – RCIC-P-1, LPCS-P-1, DG-1, DG-2, ADS-A, ADS-B' SW-A, SW-B, TR-S, TR-B.

Reactor power has been lowered to support a Control Rod Set.

The #1 and #2 RFW Heaters have been removed from service per the Reactivity Control Plan.

The reactivity brief and the task preview for the shift's scheduled activities have been completed.

An SNE is stationed in the Control Room to monitor core conditions.

Shift Directions

Continue with the Reactivity Control Plan (RCP) to adjust control rods to the target pattern and then return the plant to 100% power.

SIMULATOR SETUP INSTRUCTIONS

Reset to Saved IC#172 (75% Power, FW Heaters #1 and #2's Removed From Service)

Hang Blue Tags on HPCS-P-1 and HPCS-V-4.

Depress the Manual Out Of Service BISI for the HPCS System.

Make it a Div 3 Work Week.

Flag locked in annunciators.

Protect the following per PPM 1.3.83 – RCIC-P-1, LPCS-P-1, DG-1, DG-2, ADS-A, ADS-B, SW-A, SW-B, TR-S and TR-B.

Set up the Earthquake Machine on lowest volume.

SCHEDULE FILE

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<!-- This file contains a Thunder Simulations Schedule -->
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                  <ACTION>Insert remote LOA-EPS140 to RACKED-OUT</ACTION>
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            <DESCRIPTION>HPCS-P-1 Breaker Racked out</DESCRIPTION>
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            <ACTION>Insert malfunction MAL-RFC019</ACTION>
            <DESCRIPTION>FAILURE OF ALL FWC INPUTS To RRC ASD</DESCRIPTION>
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</ITEM>

<ITEM row = 4>
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      <ACTION>Insert malfunction MAL-PCN002R to 850000</ACTION>
      <DESCRIPTION>RUPT MS-RV-4D TAILPIP ABOVE SUPP POOL LVL</DESCRIPTION>
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<ITEM row = 5>
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      <DESCRIPTION>LEVEL SWITCH for FDR-V-607</DESCRIPTION>
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      <DESCRIPTION>SM-3 STARTUP</DESCRIPTION>
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<ITEM row = 9>
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<ITEM row = 10>
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<ITEM row = 11>
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      <ACTION>Insert malfunction XMT-RMS034A to 2 on event 2</ACTION>
      <DESCRIPTION>ARM-RE-8 SGT FILTER AREA</DESCRIPTION>
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<ITEM row = 12>
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EVENT FILE

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<!-- This file contains a Thunder Simulations Event -->
<EVENT>

      <TRIGGER id="3" description="SGT-FN-1B2 START KICKS TRG 3 TO LOWER TEMPERATURE">XKRO033R &gt 0</TRIGGER>
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NRC EXAM SCENARIO #3

INSTRUCTIONAL COVER SHEET

PROGRAM TITLE	OPERATIONS TRAINING
COURSE TITLE	COLUMBIA GENERATING STATION SIMULATOR EXAMINATION
LESSON TITLE	Raise Power with Flow to 100%; Perform OSP-HPCS/IST-Q701; HPCS Min Flow Fuses Clear; CRD-P-1B Trips; Grid Disturbance, ASD Channel 1B1 Trips; Grid Disturbance, Lockout on SH-5 and SH-6, Manual Scram; Hydraulic ATWS; Inject SLC, RWCU-V-4 Fails to Auto Close; Lower Level, S/R/S Inserts Control Rods

LENGTH OF LESSON 1.5 Hours

INSTRUCTIONAL MATERIALS INCLUDED

Lesson Plan PQD Code		Rev. No.	
Simulator Guide PQD Code	LO001752	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	12/09/12
REVISED BY		DATE	
VALIDATED BY		DATE	

TECHNICAL REVIEW		DATE	
INSTRUCTIONAL REVIEW		DATE	
	SAT Coordinator		
APPROVED		DATE	
	Operations Training Manager		

NRC EXAM SCENARIO #3

Facility: Columbia Scenario No.: 3 Op-Test No.: 2013

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: The plant is operating at 95% power. RCC-P-1B is tagged out due to excessive vibrations and imminent failure. OSP-HPCS/IST-Q701, HPCS System Operability Test, is in-progress.

Turnover: Return Columbia to 100% power. Continue with the performance of OSP-HPCS/IST-Q701, starting at Step 7.3. The two year VPI and channel calibration are NOT due. The pre-job brief has been completed, and Equipment Operators are on station to support completion of the surveillance. The power increase and surveillance are to be performed concurrently.

Event No.	Timeline	Event Type*	Event Description
1	T = 0	R (ATC) R (CRS)	Increase Reactor Power from 95% to 100% with RRC Flow.
2	T = 0	N (BOP) N (CRS)	Perform the HPCS System Operability Test, OSP-HPCS/IST-Q701.
3	T = 15	I (BOP) I (CRS)	The HPCS min flow, HPCS-V-12, fuses clear while closing. (Tech Spec).
4	T = 25	C (ATC) C (CRS)	CRD-P-1B trips on low suction pressure.
5	T = 45	C (CRS) R (ATC)	A grid disturbance causes a trip of ASD Channel 1B1. (Tech Spec) Power reduction by lowering RRC-P-1A speed to match loop flows.

NRC EXAM SCENARIO #3

6	T = 60	C (ATC) C (CRS)	Another grid disturbance results in a lockout of SH-5 and SH-6, and a complete loss of RRC flow requiring a manual reactor scram.
7	T = 60	M (All)	Hydraulic ATWS. Inhibit ADS prior to automatic initiation to prevent an uncontrolled depressurization and significant power excursion (Critical Task). Terminate and prevent injection into the RPV with the exception of SLC, RCIC, and CRD, to establish an LL (Critical Task). Perform PPM 5.5.11 to insert control rods. Rods insert. Return RPV level to normal band (Critical Task).
8	T = 65	C (ATC)	Inject Standby Liquid Control (boron) prior to exceeding 110°F Suppression Pool temperature (Critical Task). RWCU-V-4 fails to automatically close when SLC is initiated.

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

Columbia is at 95% power due to economic dispatch. BPA has just requested Columbia return to 100%. Additionally, OSP-HPCS/IST-Q701 is in progress and will be continued after shift turnover.

The ATC will raise reactor power with RRC flow to achieve 100% power.

The BOP operator will perform the HPCS surveillance. As full flow test conditions are established, the Min Flow valve for HPCS-P-1 fuses will clear. The crew should back out of the surveillance and secure HPCS-P-1. Tech Specs will be referenced and HPCS will be declared inoperable.

The next event is a trip of CRD-P-1B on low suction pressure. ABN-CRD will be entered and both suction filters will be placed into service. CRD-P-1A will be started.

The next event is a grid disturbance that results in multiple annunciators and ASD Channel 1B1 tripping causing RRC-P-1B to run back to 51 Hz. The crew will lower RRC-P-1A speed to match loop flows.

Another grid disturbance will result in a lockout on SH-5 and then SH-6 which results in a loss of both RRC pumps. Per immediate actions of ABN-RRC-LOSS a manual reactor scram will be inserted.

The crew will recognize a hydraulic ATWS condition exists. The crew will take manual control of HPCS and will inhibit ADS. RCIC-V-1 will be closed to prevent RCIC initiation at -50” (which would cause the Main Turbine to trip).

Standby Liquid Control will be initiated and when initiated, SLC flow will be only 18 gpm due to relief valves lifting.

PPM 5.5.6 will be performed to prevent the MSIVs from closing when RPV level is lowered.

PPM 5.5.1 will be performed to make all ECCS injection valves throttleable.

The crew will stop and prevent injection into the RPV and establish an Lowered Level of -65” with RPV level being maintained between -80” and -140”.

PPM 5.5.11 will be performed to insert control rods.

Control rods will go in after RPV level has been lowered and is being controlled -80” to -140”.

When all control rods are inserted the crew will stop SLC injection and return RPV level back to +13” to +54” level band.

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

Event No. 1

Description: Raise power with Flow from 95% to 100%.

This event is initiated by the turnover information.

Time	Position	Applicants Actions or Behavior
T = 0	CRS	Directs ATC to raise power with flow to achieve 100% reactor power at a rate not to exceed 10MWE/min or 1Hz per minute.
	ATC	Notes Reactor Power and RRC pump flow and Hz indications. **Verifies both RRC pumps individual controllers are in AUTO and depresses Master Controller Raise P/B to increase flow/power as directed.**
		Informs the CRS when power is 100%.

COMMENTS:

Event No. 2

Description: Perform the HPCS System Operability Test, OSP-HPCS/IST-Q701.

This event is initiated by turnover information.

Time	Position	Applicants Actions or Behavior
T = 0		7.3.3 If not already operating, then start HPCS-P-2 (Service Water Pump) (H13-P601). ***Takes HPCS-P-2 control switch to start and observes red light on, green light off.***
		7.3.4 If not already open, then verify SW-V-29 auto opens. (Service Water Pump Discharge) (H13-P601). ***Observes SW-V-29 red light on green light off and rising discharge pressure on SW-PI-40.***
		7.3.5 Verify HPCS-P-1 Motor upper and lower lubricant levels are normal. Record SAT in the Driver Lubrication Measured Value space on Attachment 9.2. ***Contacts OPS2 and directs step performance.***
ROLEPLAY: VERIFY HPCS-P-1 Motor upper and lower lubricant levels are normal.		
		7.3.6 Verify H13-P601.A1-6.7, HPCS WATER LEG PUMP DISCH PRESS LOW is clear.
		Verify HPCS System pressure GE 50 psig per HPCS-PIS-13 (H22-P024) (RB 471). ***Contacts OPS2 and requests gage reading.***
ROLEPLAY: HPCS-PIS-13 is reading 90 psig.		
		7.3.8 If HPCS is required to be operable, then enter HPCS as inoperable, but available, in the Plant Logging System. ***Informs the CRS to perform this step.***
		7.3.9 Open HPCS-V-10 (Inboard Test Valve). ***Takes control switch for HPCS-V-10 to open and observes valve position indication on HPCS-P01-606 on P601 vertical board.***

		7.3.10 If non-intrusive testing is scheduled for HPCS-V-2 and/or HPCS-V-24, then notify Electricians that HPCS-V-2 and HPCS-V-24 are about to open.
		7.3.11 Start HPCS-P-1 (H13-P601). ***Makes plant announcement of the intent to start HPCS-P-1.*** ***Takes control switch for HPCS-P-1 to start and observes red light on, green light off and amps rising and discharge pressure rise.***
		7.3.12 Verify HPCS-V-12 (Minimum Flow Valve) auto opens. ***Observes HPCS-V-12 red light on and Green light off.***
ROLEPLAY: A minute after HPCS-P-1 starts, As OPS2, inform the Control Room that the pump start looks good. ALso call as OPS4 that HPCS-P-2 start looks good.		
		7.3.13 Throttle open HPCS-V-11 (Outboard Test Valve) to adjust system flow at HPCS-FI-603 to 6560 gpm (GE 6500 gpm but LE 6690 gpm). ***Takes control switch for HPCS-V-11 to open and observes valve position indication on HPCS-P01-604 on P601 vertical board.*** ***Observes HPCS flow rising on HPCS-FI-603 as HPCS-V-11 is opened.***
		7.3.14 Verify HPCS-V-12 (Minimum Flow Valve) auto closes above approximately 1300 gpm. ***Observes HPCS-V-12 start to close (green light comes on) as flow is raised GT 1300 gpm.*** ***SEE NEXT EVENT***
COMMENT:		

Event No. 3

Description: HPCS-V-12, HPCS Minimum Flow Valve fuses clear.

This event is initiated by **EVENT TRIGGER 1** which automatically activates when HPCS flow rises to 3000 gpm.

Time	Position	Applicants Actions or Behavior
T = 10	BOP	Observes both the green alight and the red light for HPCS-V-12 go out. Acknowledges the HPCS OUT OF SERVICE alarm and the MOV Network Pwr loss/OL BISI. Informs the CRS of indication and alarm/BISI.
	CRS	May direct HPCS-V-11 be closed and HPCS-P-1 be secured or may direct BOP operator to back out of the surveillance procedure.
	BOP	Performs actions to secure HPCS as directed by the CRS.
	CRS	Contacts Work Control / Production about HPCS-V-12.
		Refers to Tech Specs and notes LCO 3.5.1 Condition B applies (Verify RCIC operable by administrative means immediately; AND restore HPCS to operable status within14 days). PAM 3.3.3.1 (30 days). Also is reportable to NRC due to single train failure within 8 hours.
	CRS BOP	Directs Control Power fuses for HPCS-P-1 be pulled.
ROLEPLAY: Wait three minutes and then ACTIVATE TRIGGER 2 and report completion.		
	CRS	Conducts Brief.

COMMENTS:

Event No. 4

Description: CRD-P-1B Trips on Low Suction Pressure.

This event is initiated by activating **TRIGGER 3** and is initiated after Tech Specs for HPCS have been referenced and brief has been completed.

Time	Position	Applicants Actions or Behavior
T = 25	ATC	Acknowledges CRD PUMP B SUCTION PRESS LOW alarm and refers to ARP. Acknowledges CRD PUMP ABNORMAL OPERATION alarm and refers to ARP.
		Observes CRD-P-1B not running and informs the CRS. Refers CRS to ABN-CRD.
		When Accumulator alarms come in, refers the CRS to Tech Spec 3.1.5.
	CRS	Updates crew on ABN-CRD entry. Refers to ABN-CRD and directs placing both CRD suction filters in service per ABN-CRD-MAXFLOW (due to the CRD PUMP B SUCTION PRESS LOW alarm that was in and cleared).
ROLEPLAY: Wait two minutes and then ACTIVATE TRIGGER 26 and report completion.		
	CRS	Notes time the second accumulator alarm comes in and starts the 20 minute clock (see ABN-CRD step 4.1.1).
	CRS	May hand off ABN completion to ATC or direct individual steps. Directs placing CRD-FC-600, CRD Flow Controller, in MANUAL at zero output.
	ATC	**Places the CRD Flow Controller in MANUAL by moving black knob to the left over the 'M'.** **Depresses the Close pushbutton until the red arrow lowers and is over the '0'.**
	CRS	Directs the standby CRD pump, CRD-P-1A be started (May direct the tripped CRD pump be re-started if he determines the cause for the trip is known and has been corrected -Low suction trip corrected by placing both suction filters in service) (CRD-P-1B will trip immediately if restarted)..
	ATC	Starts CRD pump as directed by taking control switch to start. Observes amps, pressure indications for CRD pump start.
	CRS	Directs CRD-FC-600 be nulled and transferred to Auto.
	ATC	Depresses the Open pushbutton until the red arrow is in the green band. Moves black lever to the right until over the 'A'. Observes CRD accumulator alarms clearing.

		Informs the CRS when all accumulator alarms have cleared.
COMMENTS:		

Event No. 5

Description: Grid Disturbance, ASD Channel 1B1 Fault Trip

This event is initiated by activating **TRIGGER 4** and is initiated after a CRD pump has been re-started and all CRD accumulators have cleared.

Time	Position	Applicants Actions or Behavior
T=45	ATC	Acknowledges various annunciators associated with the grid disturbance. Acknowledges ASD 1B/1 Alarm and ASD 1B/1 Fault annunciators.
		Observes the following indication: Loop B ASD Channel Failure Limit light illuminated. RRC-P-1B speed is 51Hz. Green light on (Red light off) for ASD Channel 1B1. B RRC Pump controller has transferred to Manual.
		Informs CRS that ASD Channel 1B1 has tripped off. Reports current Reactor Power, Pressure and Level.
		Acknowledges A or B Hi Flow Delta annunciator. Observes Loop B flow at 36,000 gpm and Loop A flow at 44,000 gpm.
	CRS	Updates crew on ABN-POWER entry. Refers to Tech Spec 3.4.1, flow mismatch, which is applicable until flows are matched. Contacts Production/Work Control concerning ASD Channel fault. Directs RO to match RRC loop flows by lowering RRC Loop A flow.
	ATC	Reduces RRC-P-1A speed as directed to match flows and clear High Flow Delta alarm (may reduce RRC-A speed with controllers in Auto or may take manual control of RRC-M/A-R676A).
	ATC	Reports Reactor Power, Pressure and Level after the flow reduction.

COMMENTS:

Event No. 6

Description: Another Grid Disturbance and Lockout on SH-5 and SH-6 causing a loss of both RRC Pumps and a manual scram insertion.

The event is initiated by activating **TRIGGER 5** and is initiated after plant has been stabilized and RPV level is **STEADY** at +36".

Time	Position	Applicants Actions or Behavior
T=60	ATC	Acknowledges various annunciators associated with the grid disturbance.
	BOP	Responds to electrical plant and recognizes and reports lockout on SH-5 and SH-6. May not initially report lockouts due to loss of RRC Pumps and insertion of manual scram.
	ATC	Acknowledges alarms associated with loss of both RRC Pumps.
		Recognizes the loss of both RRC pumps and announces intent to initiate a manual reactor scram per immediate actions of ABN-RRC-LOSS. Inserts a manual reactor scram by turning Mode switch to SHUTDOWN and announces: Listen up for the scram report: Mode switch is in Shutdown, APRMs are NOT downscale, current RPV Pressure and trend, and current RPV Level and trend. Reports EOP entry due to failure to scram.

COMMENTS:

Event No. 7

Description: Hydraulic ATWS.

This event is active at the beginning of the scenario and is realized when a manual reactor scram is inserted.

Time	Position	Applicants Actions or Behavior
Critical Task is to inhibit ADS prior to an automatic initiation to prevent an uncontrolled depressurization and significant power excursion.		
Critical Task is to terminate and prevent injection into the RPV with the exception of SLC, RCIC, and CRD, to establish an Lowered Level.		
Critical Task is to Insert Control Rods.		
T = 60	ATC	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 Reports reactor power at approximately 45%.
	CRS	Updates crew on EOP entry into PPM 5.1.1 (RPV Control), and directs/verifies that the Mode Switch has been placed in SHUTDOWN. Updates crew and exits PPM 5.1.1 (RPV Control) and transitions to PPM 5.1.2 (RPV Control - ATWS). Directs BOP to: • Inhibit ADS and take manual control of HPCS. • Verify actuations for +13" and -50" as they occur. • Verify pressure is being maintained by the bypass valves in Auto.
	BOP	Takes both ADS control switches to the INHIBIT position and acknowledges associated alarms and 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 ADS inhibited and manual control of HPCS taken to CRS.
	CRS	Directs bypassing the MSIV isolation interlocks on high tunnel temperature and low RPV level per PPM 5.5.6.
	CRS	Goes to EOP drawer and gets PPM 5.5.6 procedure and equipment bag containing two keys.

		Performs PPM 5.5.6: • At H13-P609 places MS-RMS-S84 to BYPASS • At H13-P611 places MS-RMS-S85 to BYPASS Updates Crew on the completion of PPM 5.5.6.
T = 65	CRS	Directs RCIC-V-1 be closed to keep Main Turbine on line when RPV level is lowered.
	BOP	Closes RCIC-V-1, verifies RCIC trip annunciator and reports completion to CRS.
	CRS	Directs performance of PPM 5.5.1, Overriding ECCS valve logic to allow throttling RPV injection.
	BOP	Goes to EOP drawer and pulls PPM 5.5.1 procedure and equipment bag containing 5 keys. Performs PPM 5.5.1: • HPCS – Override HPCS-V-4 (HPCS RPV injection valve) automatic logic by placing HPCS-RMS-S25 in the OVERRIDE position (H13-P625). • LPCS - Override LPCS-V-5 (LPCS RPV injection valve) automatic logic by placing LPCS-RMS-S21 in the OVERRIDE position (H13-P629). • RHR Loop A - Override RHR-V-42A (RHR RPV injection valve) automatic logic by placing RHR-RMS-S105 in the OVERRIDE position (H13-P629). • RHR Loop B - Override RHR-V-42B (RHR RPV injection valve) automatic logic by placing RHR-RMS-S106 in the OVERRIDE position (H13-P618). • RHR Loop C - Override RHR-V-42C (RHR RPV injection valve) automatic logic by placing RHR-RMS-S107 in the OVERRIDE position (H13-P618). Updates crew to completion of PPM 5.5.1, and that the ECCS injection valves are closed and throttleable.

	CRS	Direct the ATC to: • Stop and prevent condensate and feedwater. • Lower level to a band less than –65" but greater than –183" (preferred band is –80" to –140"). • Commence RPV injection at -65".
	ATC	Uses Quick Cards to stop and prevent Condensate and Feedwater and lines up on the startup flow control valves as directed: Step 2.1.1 If Reactor Feed Pump(s) (RFP) are operating, then perform the following: a. Verify RFP(s) have ramped down in speed. b. Verify RFW-FCV-2A(B) is operating properly in Automatic (Minimum Flow Valve) (H13-P840). c. If RFW-FCV-2A(B) is not operating properly and is cycling, complicating Reactor Level Control, then place RFW-FCV-2A(B) in Manual, and slowly open to approximately 80%. d. Place RFW-P-1B in MDEM mode using either RFT-COMP-1 or RFT-COMP-2 (Pump Control Screen) as follows (H13-P840): 1) Select MDEM. 2) Select YES. e. Place RFW-P-1A in MDEM mode using either RFT-COMP-1 or RFT-COMP-2 (Pump Control Screen) as follows (H13-P840): 1) Select MDEM. 2) Select YES.

		f. Control Turbine speed as required. Step 2.1.2 If Feedwater Temperature Reduction was in progress, then verify RFW-V-109 is Closed (H13-P840). Step 2.1.3 Start closing RFW-V-112A and RFW-V-112B (H13-P840). (2H) Step 2.1.4 Start opening RFW-V-118 (Throttle valve) (H13-P840).	
		Step 2.1.5 Verify the following Open (H13-P840): (2H) • RFW-V-117A • RFW-V-117B Step 2.1.6 Verify RFW-LIC-620 is in MANUAL (V selected for Valve position demand) with 0 output (Startup RPV Level Control) (H13-P603). Step 2.1.7 Verify RFW-V-112A and RFW-V-112B are Fully Closed. Step 2.1.8 Verify RFW-V-118 is Fully Open.	

		Reports EOP entry on low RPV water level at +13". Reports Reactor Power as it drops due to lowering level. When Reactor Power is LT 5%, marks RPV level to establish an LL. Step 2.1.9 If Reactor Feed Pump(s) (RFP) are operating, then adjust the running RFP speed to establish ~ 200 psid across RFW-FCV-10A & 10B using either Feedwater touch screen (H13-P840). Step 2.1.10 Adjust RFW-LIC-620 manual output to control RPV level. Maintains RPV level between LL and –183" as directed (–80" to –140").
T = 70	CRS	Directs PPM 5.5.11 be performed to insert control rods.
BOOTH OPERATOR: Be standing next to Board S to get direction from BOP operator to perform Attachment 6.1.		
	BOP	Goes to EOP drawer and pulls procedure for PPM 5.5.11 and equipment bag. Performs PPM 5.5.11: Determines that no RPS scram lights are lit Removes one TB1 ARI fuse (P650 F01, F02, F03 or F04) Removes one TB2 ARI fuse (P650 F01, F02, F03 or F04). Determines that some or all blue scram valve lights are lit. Determines Tab B should be performed: TAB B: Places the SDV HIGH LEVEL TRIP control switch to BYPASS. Determines the scram cannot be reset. Overrides RPS trip signals per Attachment 6.1.
	BOP	ATTACHEMNT 6.1 Goes to Board S and directs booth operator to perform back panel operations associated with Attachment 6.1 (may also direct Attachment 6.2 at this point).

BACK PANEL OPERATOR: Take direction from the BOP operator. If Attachment 6.1 is directed, wait three minutes and then Activate <u>TRIGGER 28</u> to install RPS jumpers. **When completed, circle slash the procedure steps and inform the BOP operator that they have been completed by standing next to Board S and giving the crew an update:** **"UPDATE READY - Attachment 6.1 of PPM 5.5.11 has been completed, END OF UPDATE."**		
	BOP	Continues with Tab B actions: Reset the scram (by depressing reset pushbuttons). Ensures both CRD pumps are running (the tripped CRD pump may or may not be re-started per this step but if restarted it will immediately trip).
BACK PANEL OPERATOR: Be standing next to Board S to get direction from BOP operator to perform Attachment 6.2.		
	BOP	Directs Back Panel Operator to perform Attachment 6.2 to bypass all RSCS rod blocks.
BACK PANEL OPERATOR: Take direction from the BOP operator to perform back panel steps of Attachment 6.2. Wait two minutes and then Activate <u>TRIGGER 30</u> to install jumpers. **When completed, circle slash the two steps at the bottom of the page and inform the BOP operator that they have been completed by standing next to Board S and giving the crew an update:** **"UPDATE READY - Attachment 6.2 of PPM 5.5.11 has been completed, END OF UPDATE."**		
BOOTH OPERATOR: When RPV Level has been lowered and is being maintained: TO CLEAR ATWS: When both scram discharge volume vents and drains are fully open, set the four ATWS malfunctions to a severity of sixty (order does not matter).		
	BOP	Manually starts to drive control rods by starting at 10-43 and inserting every other rod in every other row. Reports success in driving control rods to CRS.
		When the Scram Discharge Volume has been drained for more than 2 minutes initiates a manual scram by depressing the four red manual scram pushbuttons. If rods do not insert continues scram/reset/scram Tab B and raises SDV drain time by 2 minutes. Determines All Rods are in and informs the CRS.
		Installs the following fuses removed in TAB A: TB1 ARI fuse

		TB2 ARI fuse
	CRS	Directs SLC be stopped.
	ATC BOP	Takes control switches out of OPER and observes both SLC pumps stop.
	CRS	Exits PPM 5.1.2 (RPV Control ATWS) and enters PPM 5.1.1 (RPV Control). Directs RPV level be raised to -50" to +54" band with available systems.
	ATC	Raises RPV level into band as directed.
TERMINATION POINT – The scenario will be terminated when RPV level is being returned to the directed band.		
Comments:		

Event No. 8		
Description: Initiate SLC - RWCU-V-4 fails to auto close. This event is active from the start of the scenario and is realized when SLC is initiated.		
Time	**Position**	**Applicants Actions or Behavior**
Critical Task is to inject Standby Liquid Control (boron) prior to exceeding 110°F Suppression Pool temperature.		
T = 65	CRS	Directs SLC initiation prior to Suppression Pool temperature reaching 110°F.
	ATC	Initiates SLC per the quick card: Remove the SLC keylock switch blanks and insert both keys into the SLC System control switches. Initiate SLC injection by performing the following (H13-P603): • Place SLC System A control switch to the OPER position • Place SLC System B control switch to the OPER position Report the following to the CRS: • SLC flow rate (~82gpm) • Initial tank level • RWCU-V-4 status (should be closed) Reports SLC flow rate indicating low at about 18 gpm. Reports initial tank level.
		Verifies RWCU-V-4 closed and notes valve is actually open. Takes the control switch for RWCU-V-4 to the close position and observes green light on and red light goes out.
		Reports RWCU-V-4 failed to auto close but was manually closed with the control switch.
		Directs investigation by OPS2 of reduced SLC flow.
ROLEPLAY - Three minutes after request inform the Control Room that the SLC relief valves are lifting and that maintenance has been contacted and is on their way. You will inform them in any change in SLC status.		
Comments:		

TURNOVER INFORMATION

Initial Conditions

Columbia is at 95% power due to an economic dispatch request from BPA.

RCC-P-1B is tagged Out of Service for pump seal replacement.

BPA has just requested Columbia return to 100%.

LCS 1.3.7.2 has been entered per OSP-HPCS/IST-Q701 step 7.3.2.

Shift Directions

Raise power with flow to 100% reactor power.

Continue with OSP-HPCS/IST-Q701.

The two evolutions are to be performed concurrently.

SIMULATOR SETUP INSTRUCTIONS

Have a copy of OSP-HPCS/IST-Q701 with it signed in and prerequisites signed off.

Reset to saved IC #173.

Hang blue tag on RCC-P-1B.

Ensure CRD-P-1B Running and the red dot is over CRD-P-1B.

Booth Operator needs to go on the floor to perform PPM 5.5.11 Attachment 6.1 and 6.2 during the scenario. Have a marker to mark up the EOP procedure available.

You may want to give the HPCS surveillance to the crew ahead of time for them to review.

SCHEDULE FILE

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		<TIME>0</TIME>
		<ACTION>Insert malfunction MAL-CRD007A2 to 100</ACTION>
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	</ITEM>
	<ITEM row = 2>
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		<ACTION>Insert malfunction MAL-CRD007B2 to 100</ACTION>
		<DESCRIPTION>HYDRAULIC ATWS WEST SDV</DESCRIPTION>
	</ITEM>
	<ITEM row = 3>
		<TIME>0</TIME>
		<ACTION>Insert malfunction MAL-CRD007A1 to 100</ACTION>
		<DESCRIPTION>HYDRAULIC ATWS EAST SDV BLOCKAGE</DESCRIPTION>
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		<DESCRIPTION>HYDRAULIC ATWS WEST SDV BLOCKAGE</DESCRIPTION>
	</ITEM>
	<ITEM row = 5>
		<TIME>0</TIME>
		<ACTION>Insert malfunction MOV-RWU010F to FAIL_AUTO_CLOSE</ACTION>
		<DESCRIPTION>RWCU-V-4</DESCRIPTION>
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	<ITEM row = 6>
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		<ACTION>Insert malfunction BKR-RCC002 to FA_CTRL_FUS</ACTION>
		<DESCRIPTION>Rackout RCC-P-1B</DESCRIPTION>
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	<ITEM row = 7>
		<TIME>0</TIME>
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		<DESCRIPTION>SLC PUMP 1B REDUCED FLOW</DESCRIPTION>
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<DESCRIPTION>HPCS-P-1 Pull Control Power Fuses</DESCRIPTION>
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</ITEM>
<ITEM row = 12>
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<EVENT>3</EVENT>
<ACTION>Insert malfunction BKR-CRD002 to TRIP after 5 on event 3</ACTION>
<DESCRIPTION>CRD-P-1B MOTOR SUPPLY BREAKER</DESCRIPTION>
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<ITEM row = 13>
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<ACTION>Insert malfunction MAL-OED004 to 20 in 20 on event 4 delete in 25</ACTION>
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<ACTION>Insert malfunction MAL-RFC007R after 25 on event 4</ACTION>

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EVENT FILE

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<EVENT>

        <TRIGGER id="1" description="HPCS FLOW GT KICKS TRG 1 TO CLEAR MIN FLOW FUSES">X01D033M &gt
3000</TRIGGER>
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ES-301 Transient and Event Checklist Form ES-301-5

Facility: Columbia | Date of Exam: February 2013 | Operating Test Number: 2013

	APPLICANT	EVENT TYPE	Scenarios 1 CREW POSITION SRO	1 ATC	1 BOP	2 SRO	2 ATC	2 BOP	3 SRO	3 ATC	3 BOP	4 SRO	4 ATC	4 BOP	TOTAL	MINIMUM(*) R	I	U
R1	RO ☒ SRO-I ☐ SRO-U ☐	RX								1,6					2	1	1	0
		NOR			2										1	1	1	1
		I/C			5,6,8,9			3,5,6,7		4,7,9					11	4	4	2
		MAJ			6,7			5,6		7,8					6	2	2	1
		TS													0	0	2	2
R2	RO ☒ SRO-I ☐ SRO-U ☐	RX					1								1	1	1	0
		NOR					2				1				2	1	1	1
		I/C					4,5,6				3				4	4	4	2
		MAJ					5,6				7,8				4	2	2	1
		TS													0	0	2	2
R3	RO ☒ SRO-I ☐ SRO-U ☐	RX		1											1	1	1	0
		NOR													0	1	1	1
		I/C		3,6,10				3,5,6,7							7	4	4	2
		MAJ		6,7				5,6							4	2	2	1
		TS														0	2	2
R4	RO ☒ SRO-I ☐ SRO-U ☐	RX			2		1								2	1	1	0
		NOR					2								1	1	1	1
		I/C			5,6,8,9		4,5,6								7	4	4	2
		MAJ			6,7		5,6								4	2	2	1
		TS													0	0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions. Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an Instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.
2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.
3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Columbia | Date of Exam: February 2013 | Operating Test Number: 2013

APPLICANT	EVENT TYPE	Scenarios 1 CREW POSITION SRO	1 ATC	1 BOP	2 CREW POSITION SRO	2 ATC	2 BOP	3 CREW POSITION SRO	3 ATC	3 BOP	4 CREW POSITION SRO	4 ATC	4 BOP	TOTAL	MINIMUM(*) R	I	U
RO ☐ SRO-I ☐ SRO-U ☒ (U1, U2)	RX	1			1									2	1	1	0
	NOR													0	1	1	1
	I/C	3,6, 8			2,3,4, 6,7									8	4	4	2
	MAJ	6,7			5,6									4	2	2	1
	TS	2,3			2,3									4	0	2	2
RO ☐ SRO-I ☒ SRO-U ☐ (I2, I4, I6)	RX	1			1				1,6					4	1	1	0
	NOR													0	1	1	1
	I/C	3,6, 8,9			2,3,4, 5,6,7				4,7, 9					13	4	4	2
	MAJ	6,7			5,6				7,8					6	2	2	1
	TS	2,3			2,3									4	0	2	2
RO ☐ SRO-I ☒ SRO-U ☐ (I3, I5, I7)	RX		1					1						2	1	1	0
	NOR							1						1	1	1	1
	I/C		3,6, 10				3,5, 6,7	3,4, 5,7						11	4	4	2
	MAJ		6,7				5,6	7,8						6	2	2	1
	TS							3,5						2	0	2	2
RO ☒ SRO-I ☐ SRO-U ☐ (R5, R6, R7)	RX					1								1	1	1	0
	NOR			2		2				1				3	1	1	1
	I/C			5,6, 8,9		4,5, 6				3				8	4	4	2
	MAJ			6,7		5,6				7,8				6	2	2	1
	TS													0	0	2	2

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Facility: Columbia Date of Exam: February 2013 Operating Test Number: 2013

	APPLICANT	EVENT TYPE	Scenario 1			Scenario 2			Scenario 3			Scenario 4			TOTAL	MINIMUM(*)		
			CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
			SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
I1	RO ☐ SRO-I ☒ SRO-U ☐	RX		1					1						2	1	1	0
		NOR							1						1	1	1	1
		I/C		3,6, 10					3,4, 5,7						7	4	4	2
		MAJ							7,8						2	2	2	1
		TS							3,5						2	0	2	2
	RO ☐ SRO-I ☐ SRO-U ☐	RX														1	1	0
		NOR														1	1	1
		I/C														4	4	2
		MAJ														2	2	1
		TS														0	2	2
	RO ☐ SRO-I ☐ SRO-U ☐	RX														1	1	0
		NOR														1	1	1
		I/C														4	4	2
		MAJ														2	2	1
		TS														0	2	2
	RO ☐ SRO-I ☐ SRO-U ☐	RX														1	1	0
		NOR														1	1	1
		I/C														4	4	2
		MAJ														2	2	1
		TS														0	2	2

Instructions:

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Tier / Group	Randomly Selected K/A	Reason for Rejection
3	2.1.37	Overlap with Audit Exam test item SRO-20.
3	2.1.17	Unable to write SRO-only question to this K/A
2/2	271000 2.2.39	No one hour or less Tech Spec action statements associated with Offgas.