

Facility: Calvert Cliffs			Date of Exam: 7/12/02										Exam Level: SRO	
Tier	Group	K/A Category Points											Point Total	
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *		
1. Emergency & Abnormal Plant Evolutions	1	4	3	3				3	5			6	24	
	2	3	1	2				5	2			3	16	
	3	1	0	0				1	1			0	3	
	Tier Totals	8	4	5				9	8			9	43	
2. Plant Systems	1	3	1	1	1	2	2	3	2	1	1	2	19	
	2	1	0	3	2	2	3	1	2	1	1	1	17	
	3	0	1	1	1	0	0	0	0	0	0	1	4	
	Tier Totals	4	2	5	4	4	5	4	4	2	2	4	40	
3. Generic Knowledge and Abilities				Cat 1		Cat 2		Cat 3		Cat 4		17		
				5		6		4		2				

**Note:**

1. Ensure that at least two topics from every K/A category are sampled within each tier (ie., 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  $\pm 1$  from that specified in the table based on NRC revisions. The final exam must total 100 points.
3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities.
4. Systems/evolutions within each group are identified on the associated outline.
5. The shaded areas are not applicable to the category/tier.
- 6\* The generic 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.
7. On the following pages, enter the K/A numbers, a brief description of each topic, the topic's importance ratings for the SRO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000001 Continuous Rod Withdrawal / 1						2.4.1	Knowledge of EOP entry conditions and immediate action steps. SRO	4.6	1
000003 Dropped Control Rod / 1	1.04						Knowledge of the operational implications of the effects of power level and control rod position, on flux.	3.7	1
000005 Inoperable/Stuck Control Rod / 1		2.01					Knowledge of the interrelationships between an inoperable/stuck control rod and the controllers and positioners.	3.8	1
000011 Large Break LOCA / 3						2.1.32	Ability to explain and apply all system limits and precautions SRO	3.4	1
					2.07		Ability to determine or interpret the equipment necessary for functioning of critical pump water seals during a large break LOCA. SRO	3.4	1
W/E04 LOCA Outside Containment / 3							Not applicable to Calvert Cliffs.	N/A	N/A
W/E01 & E02 Rediagnosis & SI Termination / 3							Not applicable to Calvert Cliffs.	N/A	N/A
000015/17 RCP Malfunctions / 4		2.10					Knowledge of the interrelationships between RCP malfunctions and the RCP indicators and controls.	2.8	1
CE/A13 Natural Circulation / 4			3.4				Knowledge of the reasons for the RO and SRO to function as a team such that procedures are adhered to and license limitations are not violated, during natural circulation operations.	3.4	1
000024 Emergency Boration / 1					2.03		Ability to determine and interpret the correlation between boric acid controller setpoint and boric acid flow. SRO	3.0	1
000026 Loss of Component Cooling Water / 8				1.06			Ability to control and/or monitor flowrates to components cooled by CCW, during loss of Component Cooling Water	2.9	1
000029 Anticipated Transient W/O Scram / 1			3.10				Knowledge of the reasons for manual rod insertion during an ATWS.	4.1	1
000040 (CE/E05) Steam Line Rupture – Excessive Heat Transfer / 4						2.2.4	Ability to explain variations in control board layouts, systems, instrumentation and procedural actions between units.	3.0	1

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
CE/A11 RCS Overcooling – PTS / 4				1.30			Ability to operate/monitor desired operating results during abnormal and emergency situations.	3.5	1
	1.30						Knowledge of the operational implications of annunciators, condition indicating signals, and remedial actions, as they apply to RCS overcooling.	3.2	1
000051 Loss of Condenser Vacuum / 4					2.02		Ability to determine and interpret condenser vacuum conditions requiring a reactor and/or turbine trip. SRO	4.1	1
000055 Station Blackout / 6	1.01						Knowledge of the operational impacts of battery discharge rates on capacity.	3.7	1
000057 Loss of Vital AC Electrical Instrument Bus / 6					2.16		Ability to determine and interpret normal and abnormal Pressurizer levels for various modes of plant operation, as they apply to a loss of a Vital AC Instrument Bus.	3.1	1
000059 Accidental Liquid RadWaste Release / 9		2.02					Knowledge of the interrelationships between the accidental release and the radioactive gas monitors.	2.7	1
000062 Loss of Nuclear Service Water / 4						2.1.8	Ability to coordinate personnel activities outside the control room.	3.6	1
000067 Plant Fire On-site / 9	1.02						Knowledge of operational implications of firefighting.	3.9	1
000068 Control Room Evacuation / 8					2.08		Ability to determine and interpret SG pressure during Control Room evacuation.	4.1	1
000069 Loss of Containment Integrity / 5						2.1.33	Ability to recognize indications for system operating parameters, which are entry level conditions to technical specifications. (SRO ONLY)	4.0	1
				1.03			Ability to operate and/or monitor fluid systems penetrating containment, as they apply to a loss of Containment integrity.	3.0	1

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**PWR SRO Examination Outline**  
**Emergency and Abnormal Plant Evolutions – Tier 1/Group 1 (Cont.)**

Form ES-401-3

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000074 Inadequate Core Cooling / 4						2.4.6	Knowledge of symptom based EOP mitigation strategies. <b>SRO</b>	4.0	1
BW/E03 Inadequate Subcooling Margin / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000076 High Reactor Coolant Activity / 9			3.05				Knowledge of the reasons for corrective actions as a result of high fission product radioactivity levels in the RCS.	3.6	1
BW/A02 & A03 Loss of NNI-X/Y / 7							Not applicable to Calvert Cliffs.	N/A	N/A
K/A Category Point Totals:	4	3	3	3	5	6	Group Point Total:		24

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000007 (CE/E02) Reactor Trip – Stabilization – Recovery / 1		2.1					Knowledge of interrelationships between reactor trip recovery and the components and functions of control and safety systems.	3.7	1
BW/A01 Plant Runback / 1							Not applicable to Calvert Cliffs.	N/A	N/A
BW/A04 Turbine Trip / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000008 Pressurizer Vapor Space Accident / 3						2.4.11	Knowledge of abnormal condition procedures. SRO	3.6	1
000009 Small Break LOCA / 3	1.02						Knowledge of the operational implications of the steam tables during a small break LOCA.	4.2	1
BW/E08: W/E03 LOCA Cooldown – Depressurization / 4							Not applicable to Calvert Cliffs.	N/A	N/A
W/E11 Loss of Emergency Coolant Recirculation / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000022 Loss of Reactor Coolant Makeup / 2	1.02						Knowledge of the operational implications of the relationship of charging flow to pressure differential between charging and RCS.	3.1	1
000025 Loss of RHR System / 4	1.01						Knowledge of the operational implications of a loss of the RHR system during all modes of operation.	4.3	1
000027 Pressurizer Pressure Control System Malfunction / 3				1.02			Ability to operate and/or monitor SCR-controlled heaters in manual mode during Pressurizer pressure control malfunctions.	3.0	1
000032 Loss of Source Range NI / 7					2.05		Ability to determine the loss of Source Range NI from rapid survey of Control Room data. SRO	3.2	1
000033 Loss of Intermediate Range NI / 7				1.02			Ability to operate/monitor level trip bypass.	3.1	1

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PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions – Tier 1/Group 2 (Cont.)

Form ES-401-3

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000037 Steam Generator Tube Leak / 3				1.11			Ability to operate and/or monitor Pressurizer level indicator during a SG tube leak.	3.3	1
000038 Steam Generator Tube Rupture / 3					2.13		Ability to determine the magnitude of a Steam Generator Tube Rupture. SRO	3.7	1
000054 (CE/E06) Loss of Main Feedwater / 4				1.04			Ability to operate and/or monitor HPSI under total loss of feedwater conditions.	4.5	1
BW/E04: W/E05 Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000058 Loss of DC Power / 6			3.01				Knowledge of the reasons for the use of DC control power by the Diesel Generators.	3.7	1
000060 Accidental Gaseous Radwaste Release / 9						2.3.9	Knowledge of the process for performing a containment purge. SRO	3.4	1
000061 ARM System Alarms / 7				1.01			Ability to operate and/or monitor automatic actuation of Area Radiation Monitoring System alarms.	3.6	1
W/E16 High Containment Radiation / 9							Not applicable to Calvert Cliffs.	N/A	N/A
000065 Loss of Instrument Air / 8			3.03				Knowing effects on plant operation of isolating certain equipment	3.4	1
CE/E09 Functional Recovery						2.2.11	Knowledge of the process for controlling temporary changes SRO	3.4	1
K/A Category Point Totals:	3	1	2	5	2	3	Group Point Total:		16

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PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions – Tier 1/Group 3

Form ES-401-3

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000028 Pressurizer level Malfunction / 2					2.03		Ability to determine and interpret the charging flow indicator and controller. SRO	3.3	1
000036 Fuel Handling Accident / 8							Not selected	N/A	N/A
000056 Loss of Off-site Power / 6				1.32			Ability to operate the Pressurizer PORV handswitch.	3.4	1
BW/E13 & E14 EOP Rules and Enclosures							Not applicable to Calvert Cliffs.	N/A	N/A
BW/A05 Emergency Diesel Actuation / 6							Not applicable to Calvert Cliffs.	N/A	N/A
BW/A07 Flooding / 8							Not applicable to Calvert Cliffs.	N/A	N/A
CE/A16 Excess RCS Leakage / 2	1.3						Knowledge of the operational implications of the annunciators and condition indicating signals and remedial actions for excess RCS leakage.	3.5	1
W/E13 Steam Generator Over-pressure / 4							Not applicable to Calvert Cliffs.	N/A	N/A
W/E15 Containment Flooding / 5							Not applicable to Calvert Cliffs.	N/A	N/A
K/A Category Point Totals:	1	0	0	1	1	0	Group Point Total:		3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
001 Control Rod Drive								2.15				Ability to predict the impact of Quadrant Power Tilt on the CEDS, and mitigate the consequences. SRO	4.2	1
003 Reactor Coolant Pump						6.02						Knowledge of the effect that a loss or malfunction of RCP seals and seal water will have on the RCPs.	3.1	1
004 Chemical and Volume Control	1.07											Knowledge of the physical connections or cause/effect relationships between the CVCS and NI systems.	2.9	1
013 Engineered Safety Features Actuation						6.01						Knowledge of the effect that a loss or malfunction of sensors and detector will have on the ESFAS.	3.1	1
014 Rod Position Indication					5.01							Knowledge of the operational implications of the reasons for differences between the RPIS and step counter.	3.0	1
015 Nuclear Instrumentation				4.02								Knowledge of rod motion inhibits.	3.9	2
							1.06					Ability to predict and/or monitor changes in parameters to prevent exceeding design limits due to fuel burnup.	2.9	
017 In-core Temperature Monitor							1.01					Ability to predict and/or monitor changes in parameters to prevent exceeding design limits due to core exit temperatures.	3.9	1
022 Containment Cooling		2.01										Knowledge of power supplies for Containment Cooling Fans.	3.1	2
										4.02		Ability to manually operate and monitor the CCS pumps in the Control Room.	3.1	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
025 Ice Condenser												Not applicable to Calvert Cliffs.	N/A	N/A
026 Containment Spray							1.01					Ability to predict and/or monitor changes in parameters to prevent exceeding design limits due to Containment pressure.	4.2	1
056 Condensate								2.04				Ability to predict the impacts of a loss of Condensate pumps on the Condensate system. Mitigate the consequences. SRO	2.8	1
059 Main Feedwater									3.03			Ability to monitor automatic operation of the feedwater pump suction flow pressure.	2.6	1
061 Auxiliary/Emergency Feedwater	1.05											Knowledge of the physical connections or cause/effect relationships between the AFW and Condensate systems.	2.8	2
			3.01									Knowledge of the effect that a loss or malfunction of the AFW system will have on the RCS.	4.6	
063 DC Electrical Distribution											2.1.11	Knowledge of less than one hour Technical Specification action statements for systems. SRO	3.8	1
068 Liquid Radwaste	1.07											Knowledge of the physical connections or cause/effect relationships between the Liquid Radwaste System and the sources of liquid wastes.	2.9	1

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PWR SRO Examination Outline  
Plant Systems – Tier 2/Group 1 (Cont.)

Form ES-401-3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
071 Waste Gas Disposal					5.04							Knowledge of the operational implications of the relationship between hydrogen/oxygen concentrations to flammability.	3.1	1
072 Area Radiation Monitoring											2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure. SRO	3.3	1
K/A Category Point Totals:	3	1	1	1	2	2	3	2	1	1	2	Group Point Total:		19

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
002 Reactor Coolant											2.2.2	Ability to manipulate the control console controls as required to operate the facility between shutdown and designated power levels.	3.5	1
006 Emergency Core Cooling					5.01							Knowledge of the operational implications of the effects of temperature on water level indications.	3.3	1
010 Pressurizer Pressure Control						6.04						Knowledge of the effect that a loss or malfunction of the Quench Tank will have on Pressurizer pressure control.	3.2	1
011 Pressurizer Level Control										4.03		Ability to manually operate and/or monitor the Pressurizer heaters in the Control Room.	3.1	1
012 Reactor Protection				4.02								Knowledge of RPS design features which provide automatic reactor trip when RPS setpoints are exceeded, and the basis for each.	4.3	1
016 Non-nuclear Instrumentation				4.03								Knowledge of NNIS design features which provide input to control systems.	2.9	1
027 Containment Iodine Removal					5.01							Knowledge of the operational implications of the purpose of charcoal filters.	3.4	1
028 Hydrogen Recombiner and Purge Control												Not selected.	N/A	N/A
029 Containment Purge			3.01									Knowledge of the effect that a loss or malfunction of the Containment Purge System will have on Containment parameters.	3.1	1
033 Spent Fuel Pool Cooling			3.03									Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on spent fuel temperature.	3.3	1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
034 Fuel Handling Equipment									3.02			Ability to monitor automatic operation of the Fuel Handling System, including load limits.	3.1	1
035 Steam Generator						6.01						Knowledge of the effect that a loss or malfunction of the MSIVs will have on the S/Gs.	3.6	1
039 Main and Reheat Steam	1.09											Knowledge of the physical connections and/or cause/effect relationships between the MRSS and the RMS.	2.7	1
055 Condenser Air Removal												Not selected.	N/A	N/A
062 AC Electrical Distribution			3.03									Knowledge of the effect that a loss or malfunction of the AC distribution system will have on the DC system.	3.9	1
064 Emergency Diesel Generator							1.02					Ability to predict and/or monitor changes in fuel consumption rate with changes in EDG load.	2.8	1
073 Process Radiation Monitoring												Not selected.	N/A	N/A
075 Circulating Water								2.01				Ability to predict the impacts of a loss of intake structure on the Circulating Water system. Correct, control, or mitigate the consequences. SRO	3.2	1
079 Station Air								2.01				Ability to predict the impact of cross connection with Instrument Air, and to mitigate the consequences. SRO	3.2	1

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PWR SRO Examination Outline  
Plant Systems – Tier 2/Group 2 (Cont.)

Form ES-401-3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
086 Fire Protection						6.04						Knowledge of the effect that a loss or malfunction of the fire, smoke, and heat detectors will have on the Fire Protection system.	2.9	1
103 Containment												Not selected.	N/A	N/A
K/A Category Point Totals:	1	0	3	2	2	3	1	2	1	1	1	Group Point Total:		17

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
005 Residual Heat Removal												Not selected.	N/A	N/A
007 Pressurizer Relief/Quench Tank			3.01									Knowledge of the effect that a loss or malfunction of the Quench Tank will have on Containment.	3.6	1
008 Component Cooling Water		2.02										Knowledge of bus power supplies to the CCW pumps, including emergency backups.	3.2	1
041 Steam Dump/Turbine Bypass Control				4.01								Knowledge of the Steam Dump System design features associated with the Reactor Regulating System.	3.3	1
045 Main Turbine Generator												Not selected.	N/A	N/A
076 Service Water											2.1.7	Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation. SRO	4.4	1
078 Instrument Air												Not selected.	N/A	N/A
K/A Category Point Totals:	0	1	1	1	0	0	0	0	0	0	1	Group Point Total:		4

ES-401	PWR SRO Examination Outline Plant Systems – Tier 2/Group 3 (Cont.)		Form ES-401-3
Plant-Specific Priorities			
System / Topic	Recommended Replacement for:....	Reason	Points
Plant-Specific Priority Total: (limit 10)			

Facility: Calvert Cliffs		Date of Exam: 7/12/02		Exam Level: SRO	
Category 1	K/A #	Topic	Imp.	Points	
Conduct of Operations	2.1.	30. Ability to locate and operate components, including local controls.	3.4	1	
	2.1.	22. Ability to determine Mode Of Operation	3.3	1	
	2.1.	24. Ability to obtain and interpret station electrical and mechanical drawings.	3.1	1	
	2.1.	20. Ability to execute procedure steps. SRO	4.2	1	
	2.1.	Not selected.	N/A	N/A	
	2.1.	18. Ability to make accurate, clear and concise logs, records, status boards, and reports.	3.0	1	
	Total				5

Category 2	K/A #	Topic	Imp.	Points	
Equipment Control	2.2.	25. Knowledge of the basis in Technical Specifications for Limiting Conditions of Operations and Safety Limits. SRO	3.7	1	
	2.2.	30. Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.3	1	
	2.2.	13. Knowledge of tagging and clearance procedures.	3.8	1	
	2.2.	31. Knowledge of procedures and limitations included in initial core loading. SRO	2.9	1	
	2.2.	1. Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	3.7	1	
	2.2.	27. Knowledge of the refueling process. SRO	3.5	1	
	Total				6

Category 3	K/A #	Topic	Imp.	Points
Radiation Control	2.3.	1. Knowledge of 10-CFR-20 and related facility radiation control requirements. SRO	3.0	1
	2.3.	9. Knowledge of the process for performing a containment purge. SRO	3.4	1
	2.3.	8. Knowledge of the process for performing a planned radioactive release. SRO	3.2	1
	2.3.	Not selected.	N/A	N/A
	2.3.	11. Ability to control radiation releases.	3.2	1
	2.3.	Not selected.	N/A	N/A
	Total			4

Category 4	K/A #	Topic	Imp.	Points
Emergency Procedures/ Plan	2.4.	Not selected.	N/A	N/A
	2.4.	Not selected.	N/A	N/A
	2.4.	Not selected.	N/A	N/A
	2.4.	Not selected.	N/A	N/A
	2.4.	27. Knowledge of fire in the plant procedure. SRO	3.5	1
	2.4.	16. Knowledge of EOP implementation hierarchy and coordination with other support procedures. SRO	4.0	1
	Total			2

Tier 3 Point Total				17
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		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *		
1. Emergency & Abnormal Plant Evolutions	1	2	2	2				3	4			3	16	
	2	4	2	2				3	3			3	17	
	3	1	0	0				1	1			0	3	
	Tier Totals	7	4	4				7	8			6	36	
2. Plant Systems	1	5	1	4	1	2	2	2	3	1	1	1	23	
	2	1	0	4	2	2	3	2	3	0	1	2	20	
	3	0	1	1	1	1	1	1	0	1	0	1	8	
	Tier Totals	6	2	9	4	5	6	5	6	2	2	4	51	
3. Generic Knowledge and Abilities				Cat 1		Cat 2		Cat 3		Cat 4		13		
				4		4		3		2				

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7. On the following pages, enter the K/A numbers, a brief description of each topic, the topic's importance ratings for the RO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.

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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions – Tier 1/Group 1

Form ES-401-4

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000005 Inoperable/Stuck Control Rod / 1		2.01					Knowledge of the interrelationships between an inoperable/stuck control rod and the controllers and positioners.	2.5	1
000015/17 RCP Malfunctions / 4		2.10					Knowledge of the interrelationships between RCP malfunctions and the RCP indicators and controls.	2.8	1
CE/A13 Natural Circulation / 4			3.4				Knowledge of the reasons for the RO and SRO to function as a team such that procedures are adhered to and license limitations are not violated, during natural circulation operations.	3.1	1
000024 Emergency Boration / 1					2.03		Ability to determine and interpret the correlation between boric acid controller setpoint and boric acid flow.	2.9	1
000026 Loss of Component Cooling Water / 8				1.06			Ability to control and/or monitor flowrates to components cooled by CCW, during loss of Component Cooling Water	2.9	1
000027 Pressurizer Pressure Control System Malfunction / 3				1.02			Ability to operate and/or monitor SCR-controlled heaters in manual mode during Pressurizer pressure control malfunctions.	3.1	1
000040 (CE/E05) Steam Line Rupture – Excessive Heat Transfer / 4						2.2.4	Ability to explain variations in control board layouts, systems, instrumentation and procedural actions between units.	2.8	1
CE/A11 RCS Overcooling – PTS / 4	1.30						Knowledge of the operational implications of annunciators, condition indicating signals, and remedial actions, as they apply to RCS overcooling.	3.0	1
000051 Loss of Condenser Vacuum / 4					2.02		Ability to determine and interpret condenser vacuum conditions requiring a reactor and/or turbine trip.	3.9	1
000055 Station Blackout / 6	1.01						Knowledge of the operational impacts of battery discharge rates on capacity.	3.3	1
000057 Loss of Vital AC Electrical Instrument Bus / 6					2.16		Ability to determine and interpret normal and abnormal Pressurizer levels for various modes of plant operation, as they apply to a loss of a Vital AC Instrument Bus.	3.0	1
000062 Loss of Nuclear Service Water / 4						2.1.8	Ability to coordinate personnel activities outside the control room.	3.8	1
000067 Plant Fire On-site / 9							Not selected.	N/A	N/A

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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions – Tier 1/Group 1 (Cont.)

Form ES-401-4

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000068 Control Room Evacuation / 8					2.08		Ability to determine and interpret SG pressure during Control Room evacuation.	3.9	1
000069 Loss of Containment Integrity / 5				1.03			Ability to operate and/or monitor fluid systems penetrating containment, as they apply to a loss of Containment integrity.	2.8	1
000074 Inadequate Core Cooling / 4						2.4.6	Knowledge of symptom based EOP mitigation strategies.	3.1	1
BW/E03 Inadequate Subcooling Margin / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000076 High Reactor Coolant Activity / 9			3.05				Knowledge of the reasons for corrective actions as a result of high fission product radioactivity levels in the RCS.	2.9	1
BW/A02 & A03 Loss of NNI-X/Y / 7							Not applicable to Calvert Cliffs.	N/A	N/A
K/A Category Point Totals:	2	2	2	3	4	3	Group Point Total:	16	

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000001 Continuous Rod Withdrawal / 1						2.4.1	Knowledge of EOP entry conditions and immediate action steps.	4.3	1
000003 Dropped Control Rod / 1	1.04						Knowledge of the operational implications of the effects of power level and control rod position, on flux.	3.1	1
000007 (CE/E02) Reactor Trip – Stabilization – Recovery / 1		2.1					Knowledge of interrelationships between reactor trip recovery and the components and functions of control and safety systems.	3.3	1
BW/A01 Plant Runback / 1							Not applicable to Calvert Cliffs.	N/A	N/A
BW/A04 Turbine Trip / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000008 Pressurizer Vapor Space Accident / 3						2.4.11	Knowledge of abnormal condition procedures.	3.4	1
000009 Small Break LOCA / 3	1.02						Knowledge of the operational implications of the steam tables during a small break LOCA.	3.5	1
000011 Large Break LOCA / 3					2.07		Ability to determine or interpret the equipment necessary for functioning of critical pump water seals during a large break LOCA.	3.2	1
W/E04 LOCA Outside Containment / 3							Not applicable to Calvert Cliffs.	N/A	N/A
BW/E08; W/E03 LOCA Cooledown – Depressurization / 4							Not applicable to Calvert Cliffs.	N/A	N/A
W/E11 Loss of Emergency Coolant Recirculation / 4							Not applicable to Calvert Cliffs.	N/A	N/A
W/E01 & E02 Rediagnosis & SI Termination / 3							Not applicable to Calvert Cliffs.	N/A	N/A
000022 Loss of Reactor Coolant Makeup / 2	1.02						Knowledge of the operational implications of the relationship of charging flow to pressure differential between charging and RCS.	2.7	1
000025 Loss of RHR System / 4	1.01						Knowledge of the operational implications of a loss of the RHR system during all modes of operation.	3.9	1

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000029 Anticipated Transient W/O Scram / 1			3.10				Knowledge of the reasons for manual rod insertion during an ATWS.	4.1	1
000032 Loss of Source Range NI / 7					2.05		Ability to determine the nature of a loss of Source Range NI from rapid survey of Control Room data.	2.9	1
000033 Loss of Intermediate Range NI / 7							Not selected.	N/A	N/A
000037 Steam Generator Tube Leak / 3				1.11			Ability to operate and/or monitor Pressurizer level indicator during a SG tube leak.	3.4	1
000038 Steam Generator Tube Rupture / 3					2.13		Ability to determine the magnitude of a Steam Generator Tube Rupture.	3.1	1
000054 (CE/E06) Loss of Main Feedwater / 4				1.04			Ability to operate and/or monitor HPSI under total loss of feedwater conditions.	4.4	1
BW/E04; W/E05 Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4							Not applicable to Calvert Cliffs.	N/A	N/A
000058 Loss of DC Power / 6			3.01				Knowledge of the reasons for the use of DC control power by the Diesel Generators.	3.4	1
000059 Accidental Liquid RadWaste Release / 9		2.02					Knowledge of the interrelationships between the accidental release and the radioactive gas monitors.	2.7	1
000060 Accidental Gaseous Radwaste Release / 9						2.3.9	Knowledge of the process for performing a containment purge.	2.5	1
000061 ARM System Alarms / 7				1.01			Ability to operate and/or monitor automatic actuation of Area Radiation Monitoring System alarms.	3.6	1
W/E16 High Containment Radiation / 9							Not applicable to Calvert Cliffs.	N/A	N/A
CE/E09 Functional Recovery							Not selected.	N/A	N/A
K/A Category Point Totals:	4	2	2	3	3	3	Group Point Total:	17	

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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions – Tier 1/Group 3

Form ES-401-4

E/APE# / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000028 Pressurizer level Malfunction / 2					2.03		Ability to determine and interpret the charging flow indicator and controller.	2.8	1
000036 Fuel Handling Accident / 8							Not selected	N/A	N/A
000056 Loss of Off-site Power / 6				1.32			Ability to operate the Pressurizer PORV handswitch.	3.4	1
000065 Loss of Instrument Air / 8							Not selected	N/A	N/A
BW/E13 & E14 EOP Rules and Enclosures							Not applicable to Calvert Cliffs.	N/A	N/A
BW/A05 Emergency Diesel Actuation / 6							Not applicable to Calvert Cliffs.	N/A	N/A
BW/A07 Flooding / 8							Not applicable to Calvert Cliffs.	N/A	N/A
CE/A16 Excess RCS Leakage / 2	1.3						Knowledge of the operational implications of the annunciators and condition indicating signals and remedial actions for excess RCS leakage.	3.2	1
W/E13 Steam Generator Over-pressure / 4							Not applicable to Calvert Cliffs.	N/A	N/A
W/E15 Containment Flooding / 5							Not applicable to Calvert Cliffs.	N/A	N/A
K/A Category Point Totals:	1	0	0	1	1	0	Group Point Total:		3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
001 Control Rod Drive	1.04											Knowledge of the physical connections or cause/effect relationships between the CEDS and RCS.	3.2	2
								2.15				Ability to predict the impact of Quadrant Power Tilt on the CEDS, and mitigate the consequences.	3.6	
003 Reactor Coolant Pump					5.04							Knowledge of the operational implications of RCP shutdown on secondary parameters.	3.2	2
						6.02						Knowledge of the effect that a loss or malfunction of RCP seals and bleedoff will have on the RCPs.	2.7	
004 Chemical and Volume Control	1.07											Knowledge of the physical connections or cause/effect relationships between the CVCS and NI systems.	2.6	1
013 Engineered Safety Features Actuation			3.03									Knowledge of the effect that a loss or malfunction of the ESFAS will have on Containment.	4.3	2
						6.01						Knowledge of the effect that a loss or malfunction of sensors and detector will have on the ESFAS.	2.7	
015 Nuclear Instrumentation				4.02								Knowledge of rod motion inhibits.	3.7	2
							1.06					Ability to predict and/or monitor changes in parameters to prevent exceeding design limits due to fuel burnup.	2.5	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
017 In-core Temperature Monitor			3.01									Knowledge of the effect that a loss or malfunction of the ITM will have on natural circulation indications.	3.5	2
							1.01					Ability to predict and/or monitor changes in parameters to prevent exceeding design limits associated with core exit temperatures.	3.7	
022 Containment Cooling		2.01										Knowledge of power supplies for Containment Cooling Fans.	3.0	2
										4.02		Ability to manually operate and monitor the CCS pumps in the Control Room.	3.2	
025 Ice Condenser												Not applicable to Calvert Cliffs.	N/A	N/A
056 Condensate	1.03											Knowledge of the physical connections or cause/effect relationships between the Condensate and the Main Feedwater systems.	2.6	2
								2.04				Ability to predict the impacts of a loss of Condensate pumps on the Condensate system. Mitigate the consequences.	2.6	
059 Main Feedwater									3.03			Ability to monitor automatic operation of the feedwater pump suction flow pressure.	2.5	1
061 Auxiliary/Emergency Feedwater	1.05											Knowledge of the physical connections or cause/effect relationships between the AFW and Condensate systems.	2.6	2
			3.01									Knowledge of the effect that a loss or malfunction of the AFW system will have on the RCS.	4.4	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
068 Liquid Radwaste	1.07											Knowledge of the physical connections or cause/effect relationships between the Liquid Radwaste System and the sources of liquid wastes.	2.7	1
071 Waste Gas Disposal					5.04							Knowledge of the operational implications of the relationship between hydrogen/oxygen concentrations to flammability.	2.5	2
								2.02				Ability to predict the impact of a loss of release monitors, radiation, gas flow rate and totalize on the Waste Gas Disposal System, and to mitigate the consequences.	2.5	
072 Area Radiation Monitoring			3.01									Knowledge of the effect that a loss or malfunction of the ARM system will have on Containment Ventilation Isolation.	3.2	2
											2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	
K/A Category Point Totals:	5	1	4	1	2	2	2	3	1	1	1	Group Point Total:		23

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
002 Reactor Coolant											2.2.2	Ability to manipulate the control console controls as required to operate the facility between shutdown and designated power levels.	4.0	1
006 Emergency Core Cooling					5.01							Knowledge of the operational implications of the effects of temperature on water level indications.	2.8	1
010 Pressurizer Pressure Control						6.04						Knowledge of the effect that a loss or malfunction of the Quench Tank will have on Pressurizer pressure control.	2.9	1
011 Pressurizer Level Control										4.03		Ability to manually operate and/or monitor the Pressurizer heaters in the Control Room.	3.3	1
012 Reactor Protection				4.02								Knowledge of RPS design features which provide automatic reactor trip when RPS setpoints are exceeded, and the basis for each.	3.9	1
014 Rod Position Indication					5.01							Knowledge of the operational implications of the reasons for differences between the RPIS and step counter.	2.7	1
016 Non-nuclear Instrumentation				4.03								Knowledge of NNIS design features which provide input to control systems.	2.8	1
026 Containment Spray							1.01					Ability to predict and/or monitor changes in parameters to prevent exceeding design limits due to Containment pressure.	3.9	1
029 Containment Purge			3.01									Knowledge of the effect that a loss or malfunction of the Containment Purge System will have on Containment parameters.	2.9	1
033 Spent Fuel Pool Cooling			3.03									Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on spent fuel temperature.	3.0	1

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PWR RO Examination Outline  
Plant Systems – Tier 2/Group 2 (Cont.)

Form ES-401-4

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
035 Steam Generator						6.01						Knowledge of the effect that a loss or malfunction of the MSIVs will have on the S/Gs.	3.2	1
039 Main and Reheat Steam	1.09											Knowledge of the physical connections and/or cause/effect relationships between the MRSS and the RMS.	2.7	1
055 Condenser Air Removal			3.01									Knowledge of the effect that a loss or malfunction of the CAR system will have on the Main Condenser.	2.5	1
062 AC Electrical Distribution			3.03									Knowledge of the effect that a loss or malfunction of the AC distribution system will have on the DC system.	3.7	1
063 DC Electrical Distribution											2.1.11	Knowledge of less than one hour Technical Specification action statements for systems.	3.0	1
064 Emergency Diesel Generator							1.02					Ability to predict and/or monitor changes in fuel consumption rate with changes in EDG load.	2.5	1
073 Process Radiation Monitoring								2.01				Ability to predict the impacts of an erratic or failed power supply on the PRMS. Correct, control, or mitigate the consequences.	2.5	1
075 Circulating Water								2.01				Ability to predict the impacts of a loss of intake structure on the Circulating Water system. Correct, control, or mitigate the consequences.	3.0	1

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PWR RO Examination Outline  
Plant Systems – Tier 2/Group 2 (Cont.)

Form ES-401-4

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
079 Station Air								2.01				Ability to predict the impact of cross connection with Instrument Air, and to mitigate the consequences.	2.9	1
086 Fire Protection						6.04						Knowledge of the effect that a loss or malfunction of the fire, smoke, and heat detectors will have on the Fire Protection system.	2.6	1
K/A Category Point Totals:	1	0	4	2	2	3	2	3	0	1	2	Group Point Total:		20

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PWR RO Examination Outline  
Plant Systems – Tier 2/Group 3

Form ES-401-4

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
005 Residual Heat Removal						6.03						Knowledge of the effect that a loss or malfunction of an RHR Heat Exchanger will have on RHR System.	2.5	1
007 Pressurizer Relief/Quench Tank			3.01									Knowledge of the effect that a loss or malfunction of the Quench Tank will have on Containment.	3.3	1
008 Component Cooling Water		2.02										Knowledge of bus power supplies to the CCW pumps, including emergency backups.	3.0	1
027 Containment Iodine Removal					5.01							Knowledge of the operational implications of the purpose of charcoal filters.	3.1	1
028 Hydrogen Recombiner and Purge Control												Not selected.	N/A	N/A
034 Fuel Handling Equipment									3.02			Ability to monitor automatic operation of the Fuel Handling System, including load limits.	2.5	1
041 Steam Dump/Turbine Bypass Control				4.01								Knowledge of the Steam Dump System design features associated with the Reactor Regulating System.	2.9	1
045 Main Turbine Generator							1.06					Ability to predict and/or monitor the expected response of secondary plant parameters following a T/G trip.	3.3	1
076 Service Water											2.1.7	Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation.	3.7	1
078 Instrument Air												Not selected.	N/A	N/A
103 Containment												Not selected.	N/A	N/A
K/A Category Point Totals:	0	1	1	1	1	1	1	0	1	0	1	Group Point Total:		8

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PWR RO Examination Outline  
Plant Systems – Tier 2/Group 3 (Cont.)

Form ES-401-4

Plant-Specific Priorities			
System / Topic	Recommended Replacement for:....	Reason	Points
Plant-Specific Priority Total: (limit 10)			

Facility: Calvert Cliffs		Date of Exam: 7/12/02		Exam Level: RO	
Category 1	K/A #	Topic	Imp.	Points	
Conduct of Operations	2.1.	30. Ability to locate and operate components, including local controls.	3.9	1	
	2.1.	Not selected.	N/A	N/A	
	2.1.	24. Ability to obtain and interpret station electrical and mechanical drawings.	2.8	1	
	2.1.	20. Ability to execute procedure steps.	4.3	1	
	2.1.	Not selected.	N/A	N/A	
	2.1.	18. Ability to make accurate, clear and concise logs, records, status boards, and reports.	2.9	1	
	Total				4

Category 2	K/A #	Topic	Imp.	Points	
Equipment Control	2.2.	11. Knowledge of process for controlling temporary changes.	2.5	1	
	2.2.	30. Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.6	1	
	2.2.	13. Knowledge of tagging and clearance procedures.	4.0	1	
	2.2.	Not selected.	N/A	N/A	
	2.2.	1. Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	3.7	1	
	2.2.	Not selected.	N/A	N/A	
	Total				4

Facility: Calvert Cliffs		Date of Exam: 7/12/02		Exam Level: RO	
Category 3	K/A #	Topic	Imp.	Points	
Radiation Control	2.3.	1. Knowledge of 10-CFR-20 and related facility radiation control requirements.	2.6	1	
	2.3.	9. Knowledge of the process for performing a containment purge.	2.5	1	
	2.3.	Not selected.	N/A	N/A	
	2.3.	Not selected.	N/A	N/A	
	2.3.	11. Ability to control radiation releases.	2.7	1	
	2.3.	Not selected.	N/A	N/A	
	Total			3	

Category 4	K/A #	Topic	Imp.	Points	
Emergency Procedures/ Plan	2.4.	Not selected.	N/A	N/A	
	2.4.	Not selected.	N/A	N/A	
	2.4.	Not selected.	N/A	N/A	
	2.4.	Not selected.	N/A	N/A	
	2.4.	27. Knowledge of fire in the plant procedure.	3.0	1	
	2.4.	16. Knowledge of EOP implementation hierarchy and coordination with other support procedures.	3.0	1	
	Total			2	

Tier 3 Point Total (RO)	13
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ES-301

## Administrative Topics Outline

Form ES-301-1

Facility: **Calvert Cliffs 1 and 2**Date of Examination: 7/15/02Examination Level **SRO**Operating Test Number: 1

Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	Shift Staffing requirements	JPM K/A 2.1.5 // 3.4 Ability to locate and use procedures and directives related to shift staffing.
	Security	Question K/A 2.1.13 // 2.9 Knowledge of facility requirements for controlling vital/controlled area access  Question K/A 2.1.14 // 3.3 Knowledge of system status criteria which require notification of plant personnel
A.2	Maintenance	Question K/A 2.2.24 // 3.8 Ability to analyze the effect of maintenance activities on LCO status.
		Question K/A 2.2.17 // 3.5 Knowledge of the process for managing maintenance activities during power operations.
A.3	Knowledge of facility ALARA program	JPM K/A 2.3.2 // 2.9 Requirements for performing a task in the Aux. Building
A.4	Emergency action levels and classifications	JPM K/A 2.4.41 // 4.1 Knowledge of emergency action levels and classifications

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## Administrative Topics Outline

Form ES-301-1

Facility: **Calvert Cliffs 1 and 2**Date of Examination: **7/15/02**Examination Level: **RO**Operating Test Number: **1**

Administrative Topic/Subject Description		Describe method of evaluation: 3. ONE Administrative JPM, OR 4. TWO Administrative Questions
A.1	Plant parameter verification	JPM K/A 2.1.25 // 2.8 ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data -perform shutdown margin verification.
	Shift turnover	JPM K/A 2.1.31 // 4.2 ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup. Complete Checklists from NO-1-207.
A.2	Tagging and clearances	Question K/A 2.2.13. // 3.6 Qualifications to pull Control Room panel fuses/slide links
		Question K/A 2.2.13. // 3.6 Effects of tagging activities on Control Room Annunciators
A.3	Knowledge of facility ALARA program	JPM K/A 2.3.2 // 2.5 Requirements for performing a task in the Aux. Building
A.4	Emergency communications	JPM K/A 2.4.43 // 2.8 Knowledge of emergency communications system and techniques.

ES-301 Control Room and Facility Walk-Through Test Outline Form ES-301-2

Facility: Calvert Cliffs Units 1 and 2 Date of Examination: July 15, 2002

Exam Level: **RO/SRO(I)**

Operating Test No: 1

**B.1 Control Room Systems**

System / JPM Title	Type Code*	Safety Function
a. 062 Parallel OC Diesel to 24 4KV Bus	D / S	6 A4.06 // 3.9
b. 059 Recover From automatic feedwater isolation	S / D / A	4 (secondary) A4.11 // 3.4
c. 013 Respond to an inadvertent CIS	S / M / A	2 A2.06 // 3.7
d. 071. Waste Gas Discharge RMS checks	S / N / A	9 A3.03 // 3.6
e. 002 Use procedures to correct Loss of Forced Circulation	S / N / L	4 (primary) A2.03 // 4.1
f. 015 Monitor DNB	S / N	7 A1.05 // 3.7
g. 007 Bleed and feed operation to cool the Quench Tank per OI-1B	S / N	5 A1.01 thru 1.03 // 2.9, 2.7, 2.6

**B.2 Facility Walk-Through**

a. 029 Align system for alternate containment purge per OI-36	N / R / L	8 A2.03 // 2.7
b. 014 Monitor CEA positions per AOP 7H, alternate method.	N / A	1 A2.02 // 3.1
c. 061 Take local control of AFW pumps to feed S/Gs	N	4 (secondary) A2.04 // 3.4

\*Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrolroom, (S)imulator, (L)ow-Power, (R)CA

ES-301 Control Room and Facility Walk-Through Test Outline Form ES-301-2

Facility: Calvert Cliffs Units 1 and 2 Date of Examination: July 15, 2002

Exam Level: **SRO(U)**

Operating Test No: 1

**B.1 Control Room Systems**

System / JPM Title	Type Code*	Safety Function
a. 062 Parallel OC Diesel to 24 4KV Bus	D / S	6 A4.06 // 3.9
b. 071. Waste Gas Discharge RMS checks	S / N / A	9 A3.03 // 3.8
c. 013 Respond to an inadvertent CIS	D / S	2 A2.06 // 4.0
d.		
e.		
f.		
g.		

**B.2 Facility Walk-Through**

a. 029 Align system for alternate containment purge per OI-36	N / R / L	8 A2.03 // 3.1
b. 014 Monitor CEA positions per AOP 7H, alternate method.	N / A	1 A2.02 // 3.1
c.		

\*Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrolroom, (S)imulator, (L)ow-Power, (R)CA

Simulation Facility Calvert Cliffs Scenario No.: 1 (Spare) Op Test No.: 1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_ SRO  
\_\_\_\_\_  
\_\_\_\_\_ RO  
\_\_\_\_\_ BOP

Objectives: To evaluate the applicants' ability to conduct a unit power increase, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including failure of 11 CCW Pp, the PZR pressure control channel and selector switch, an RCP seal and the ADV controller. After the ADV controller fails the remaining seals fail on the affected RCP resulting in an RCS leak. After EOP-0 is entered, the RCS leak causes a SIAS actuation. SIAS 'A' fails to actuate requiring 11 or 12 HPSI Pump to be started manually to establish HPSI flow. As EOP-0 progresses, a steam leak begins in CNMNT from 12 SG requiring EOP-8 be implemented. 11 AFW pump will trip upon start and AFW will have to be established by starting 12 or 13 AFW Pump.

Initial Conditions: The plant is at 100% Power, EOC

12 Main CPU is failed for 12 SG DFWCS

11 CCW Head Tank Makeup CV is isolated due to leakby.

13 HPSI Pp is OOS.

13 CCW Pp is OOS

INSTR AIR COMPR(S) alarm (K-25) hanging.

Turnover: Present plant conditions: 100% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 100% power for previous 68 days.

Equipment out of service:

- 1) 12 Main CPU is failed for 12 SG DFWCS. System engineer is investigating.
- 2) 13 HPSI Pp motor bearing failure during STP. It is disassembled, expected to be returned to service in 2 days. T.S. 3.5.2 Action Statement entered 6 hours ago.
- 3) 11 CCW Head Tank Makeup CV is isolated due to leakby.
- 4) 13 CCW Pp has a broken shaft, expected repair tomorrow-noon.
- 5) Alarm K-25 INSTR AIR COMPR(S) is hanging. No problems with the compressors, I & C is investigating, alarm card has been swapped out.

Surveillances due: STP-0-29 (CEA Movement Test) due by end of shift. SM will discuss with CRS shortly after turnover.

Instructions for shift:

- 1) Maintain 100% power.

Event No.	Malf. No.	Event Type*	Event Description
Preload	FW001_03 ESFA002_01 ESFA001_01 SI 002_03 CCW002_03 PNL OVD PNL OVR K-25		12 Main CPU on 12 SG DFWCS OOS. SIAS 'A' fails to actuate automatically and manually.  13 HPSI Pp OOS. 13 CCW Pp OOS. Pressurizer Press Controller Selector Switch in channel X. INSTR AIR COMPR(S) alarm hanging.
1	CCW002_01	C CRO	About 3 minutes after the crew takes the watch, 11 CCW Pp trips. The CRO will acknowledge the alarms, inform the CRS and refer to the ARM. The crew will check for common mode failure and the CRS will direct the CRO to start 12 CCW Pp. The CRS should refer to AOP-7C and T.S. 3.7.5. The CRS contacts the OWC for assistance.
2	RCS023_01 (high)	I RO	PRZR Press Channel 100X fails high. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The RO should note the lowering RCS pressure and the open spray valves. Pressure control should be shifted to channel Y and the spray valves verified shut. The RO should note the spray valves did not shut. The CRS should direct the spray controller be taken to manual and the spray valves closed. The CRS should contact the OWC for assistance.
3	RCS011_01 (0-100% over 3 min)	C RO	Next, the lower seal (first stage) fails on 11A RCP. The RO should note the alarm, inform the CRS and refer to the ARM. The crew should determine the lower seal on 11A RCP has failed. The OMC and system engineer should be contacted.
4	MS015 (high)	I CRO	Two minutes after the notifications have been made the ADV controller fails high causing the ADVs to open. The CRO will inform the CRS. The CRS should direct the CRO to take manual control of the ADVs and shut them. The RO should maintain reactor power less than 100%. The CRS should refer to AOP-7K. The CRS should contact the OWC for assistance.
5	RCS012_01 (0-100% over 2 min)	R N CRO	After the CRS has referenced AOP-7K, the 11A RCP middle seal fails. The crew should implement ARM guidance and begin an expeditious shutdown. The CRS should refer to OP-3 for guidance on for the shutdown.
6	RCS013_01 (100% over 2 min)  RCS014_01 (100% over 4 min)	M All	After power has been reduced at least 5%, the 11A upper seal begins to fail followed shortly thereafter by the failure of the vapor seal. With all the seals failed RCS leakage begins via the seals. The CRS will trip the unit based on high RCP seal temperature and EOP-0 implemented. When SIAS actuates, train A fails to automatically and manually initiate. To establish HPSI flow 11 or 12 HPSI must be started manually.
7	MS010_02 (0-25% over 3 min)  AFW001_01	M All	After the first pass through the safety functions is complete, a steam break in CNMNT begins. When AFW is initiated 11 AFW pump trips. AFW can be established using either 12 or 13 AFW pump. The CRS should recognize two events are taking place and implement EOP-8. After the Success Paths have been selected and 12 SG isolated, the scenario can be terminated.

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

## **SCENARIO 1 OVERVIEW**

The candidates will take the shift at 100% power with instructions maintain.

After the crew has taken the shift, 11 CCW Pp trips. The CRO will acknowledge the alarms, inform the CRS and refer to the ARM. The crew will check for common mode failure and the CRS will direct the CRO to start 12 CCW Pp. The CRS should refer to AOP-7C and T.S. 3.7.5. The CRS contacts the OWC for assistance.

Several minutes later, PRZR Press Channel 100X fails high. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The RO should note the lowering RCS pressure and the open spray valves. Pressure control should be shifted to channel Y and the spray valves verified shut. The RO should note the spray valves did not shut. The CRS should direct the spray controller be taken to manual and the spray valves closed. Once the spray valves are closed, the RO should stabilize RCS pressure. The CRS should contact the OWC for assistance.

About 3 minutes after the crew has regained RCS pressure control, the lower seal (first stage) fails on 11A RCP. The RO should note the alarm, inform the CRS and refer to the ARM. The crew should determine the lower seal on 11A RCP has failed and monitor RCP parameters. The OWC and system engineer should be contacted.

Two minutes after the notifications have been made the ADV controller fails high causing the ADVs to open. The CRO diagnoses the open ADVs and inform the CRS. The CRS should direct the CRO to take manual control of the ADVs and shut them. The RO should maintain reactor power less than 100%. The CRS should refer to AOP-7K. The CRS contacts the OWC for assistance.

After the CRS has referenced AOP-7K, the 11A RCP middle seal fails. The crew should implement ARM guidance and begin an expeditious shutdown in accordance with OP-3. The CRS should refer to OP-3 and direct the unit shutdown at a rate less than 30%/hour. The appropriate notifications should be made.

After power has been reduced at least 5%, the 11A RCP upper seal begins to fail followed shortly thereafter by the failure of the vapor seal. With all the seals failed RCS leakage begins via the seals. The CRS will trip the unit based on high RCP Controlled Bleed Off temperature and EOP-0 implemented. When SIAS actuates, train 'A' fails to initiate automatically and manually. To establish HPSI flow 11 or 12 HPSI must be started manually.

After the first pass through the safety functions is complete, a steam break in CNMNT begins. When AFW is initiated 11 AFW pump trips. AFW can be established using either 12 or 13 AFW pump. The CRS should recognize two events are taking place and implement EOP-8. The crew will determine the appropriate Success Path for each Safety Function. After the Success Paths have been selected and 12 SG isolated, the scenario can be terminated.

Simulation Facility Calvert Cliffs Scenario No.: 2 Op Test No.: 1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_ SRO  
\_\_\_\_\_  
\_\_\_\_\_ RO  
\_\_\_\_\_ BOP

Objectives: To evaluate the applicants' ability to conduct a unit power reduction and to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including a failure of the Hotwell Level Controller, 11 Circulating Water Pp, and a VCT Level Transmitter with a failure of CVC-501-MOV to reopen, preventing realignment to the VCT. This scenario also evaluates the applicant's ability to respond to a leaking PORV and a condenser waterbox tube rupture requiring a rapid downpower to a target value of 300 MWe. Multiple CEA drops will require a reactor trip but an ATWS condition exists. In EOP-0 a SGTR begins in 12 SG. As the crew attempts to isolate 12 SG, 12 MSIV will fail to close from the Control Room and have to be closed locally by dumping the hydraulic fluid.

Initial Conditions: The plant is at 100% Power, MOC

13 HPSI Pp is OOS.

13 CCW Pp is OOS

11 CCW Head Tank Makeup CV is isolated due to leakby.

INSTR AIR COMPR(S) alarm (K-25) hanging.

Turnover: Present plant conditions: 100% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 100% power for previous 68 days.

Equipment out of service:

- 1) 13 HPSI Pp motor bearing failure during STP. It is disassembled, expected to be returned to service in 2 days. T.S. 3.5.2 Action Statement entered 6 hours ago.
- 2) 13 CCW Pp has a broken shaft, expected repair tomorrow-noon.
- 3) 11 CCW Head Tank Makeup CV is isolated due to leakby.
- 4) Alarm K-25 INSTR AIR COMPR(S) is hanging. No problems with the compressors, I & C is investigating, alarm card has been swapped out.

Surveillances due:

None

Instructions for shift:

Maintain 100% Power.

Event No.	Malf. No.	Event Type*	Event Description
Preload	SI002_03 CCW002_03 PNL OVR PNL OVR RPS005 RPS006 PNL OVR (K-25)		13 HPSI OOS. 13 CCW Pump OOS. 12 MSIV fails to close. HS for VCT remains in SHUT. ATWS.  INSTR AIR COMPR(S) alarm hanging.
1	CD002 (high)	I CRO	Several minutes after the crew takes the watch, the Hotwell Level Cont. (4405) fails high, dumping fully to the CST. The CRO will receive the Hotwell Level Low alarm, will inform the CRS and refer to the ARM. The CRO should determine 4405 has failed high, take manual control and restore hotwell level. The OWC should be contacted for assistance.
2	CW001_01	C CRO	After hotwell level control has been reestablished, 11 CW Pp trips. The crew will notice this via computer alarm. The CRS should direct the CRO to investigate. They will implement AOP-7L. The crew should monitor condenser delta T. The OWC should be contacted for assistance.
3	CVCS009 (LO)	I RO	Next, VCT Level transmitter LT-227 fails low. This causes Chg. Pp suction to shift to the RWT. The RO should inform the CRS. The CRS should direct the RO to shift Chg. Pp suction back to the VCT. RO should note the failure of VCT outlet (501-MOV) to reopen. The CRS should direct the plant boration be stopped by placing all Charging Pumps in PTL. The ABO may be dispatched to open CVC-501 locally. The crew should isolate letdown and set up charging to cycle on the backup pump. The OWC should be contacted for assistance.
4	RCS021 (5% over 2 min)	C RO	Next, PORV-402 starts to leak. The RO should acknowledge the Quench Tank alarm and note on the acoustic monitor the indicated leakage. The ARM will be referenced and the CRS will direct the PORV Block Valve, RC-403-MOV be closed. The CRS will refer to T. S. 3.4.11. The OWC will be conducted for assistance.
5	CD009_04	R N RO CRO	After T.S. have been addressed, a condenser tube ruptures in 12B waterbox. This will first be noticed with a Turbine Plant Sample Alarm. Chemistry and the TBO should be dispatched. Once a tube rupture has been determined in 12B waterbox a rapid power reduction to 300MW should be started and water dropped in the box. Chemistry and other appropriate plant management notifications should be made.
6	CEDS012_35 CEDS012_37	M ALL	After power has been reduced at least 5%, CEA 35 drops into the core. The crew should reduce turbine load to maintain Tc on program then about a minute later a 2 <sup>nd</sup> CEA drops. The CRS should direct the unit be tripped and EOP-0 implemented. When the RO attempts to trip the reactor an ATWS condition exists and the RO must take ATWS actions.
7	MS002_02	M ALL	During the performance of EOP-0 a SGTR begins in 12 SG. The crew is expected to diagnose the SGTR and implement EOP-6. While in EOP-6 the crew will cooldown to less than 515°F Th and isolate 12 SG. When the CRO attempts to close 12 MSIV it will not close and the ABO will be dispatched to close it locally. The scenario can be terminated after 12 SG is isolated.

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

## SCENARIO 2 OVERVIEW

The candidates will take the shift at 100% power, MOL.

After the crew takes the watch, the Hotwell Level Controller (4405) fails high, dumping fully to the CST. The CRO will receive the Hotwell Level Low alarm, will inform the CRS and refer to the ARM. The CRO should determine 4405 has failed high, take manual control and restore hotwell level. The OWC should be contacted for assistance.

After hotwell level control has been reestablished, 11 CW Pp trips. The crew will notice this via computer alarm. The CRS should direct the CRO to investigate. They will implement AOP-7L. The crew should monitor condenser delta T. The CRO will isolate the waterbox using guidance from OI-14. The OWC should be contacted for assistance.

Next, VCT Level transmitter LT-227 fails low. This causes Chg. Pp suction to shift to the RWT. The RO informs the CRS. The CRS directs the RO to shift Chg. Pp suction back to the VCT. RO should note the failure of VCT outlet (501-MOV) to reopen. The CRS should direct the plant boration be stopped by placing all Charging Pumps in PTL. The ABO may be dispatched to open CVC-501-MOV locally. The crew should isolate letdown and set up charging to cycle on the backup pump. The OWC should be contacted for assistance.

Next, PORV-402 starts to leak. The RO should acknowledge the Quench Tank alarm and note on the acoustic monitor the indicated leakage. The ARM will be referenced and the CRS will direct the PORV Block Valve, RC-403-MOV be closed. The CRS will refer to T. S. 3.4.11. The RO should monitor RCS pressure and Quench tank parameters to be returning to normal values. The OWC will be conducted for assistance.

After T.S. have been addressed, a condenser tube ruptures in 12B waterbox. This will first be noticed with a Turbine Plant Sample Alarm. Chemistry and the TBO should be dispatched. Once a tube rupture has been determined in 12B waterbox a rapid power reduction to a target value of 300MW should be started and water dropped in the box. Additionally the waterbox should be isolated using OI-14. Chemistry and other appropriate plant management notifications should be made.

After power has been reduced at least 5%, CEA 35 drops into the core. The crew should reduce turbine load to maintain Tc on program then about a minute later a 2<sup>nd</sup> CEA drops. The CRS should direct the unit be tripped and EOP-0 implemented. When the RO attempts to trip the reactor an ATWS condition exists and the RO must take ATWS actions to trip the reactor and meet the reactivity control safety function.

During the performance of EOP-0 a SGTR begins in 12 SG. The crew is expected to diagnose the SGTR and implement EOP-6. While in EOP-6 the crew will cooldown to less than 515°F Th and attempt to isolate 12 SG. When the CRO tries to close 12 MSIV it will not close from the Control Room and the ABO will be dispatched to close it locally. The scenario can be terminated after 12 SG is isolated.

Simulation Facility Calvert Cliffs

Scenario No.: 3

Op Test No.: 1

Examiners: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Operators: \_\_\_\_\_ SRO  
\_\_\_\_\_ RO  
\_\_\_\_\_ BOP

**Objectives:** To evaluate the applicants' ability to conduct a unit power reduction, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including a failure of PRZR level control channel (110X) which causes a broken shaft on 12 Charging Pp, a failed FRV Controller (1121) and a SGFP oil leak causing a rapid power reduction. A loss of 11 BA Pp occurs at the start of the downpower. The crew will be forced to trip the unit when the running SGFP trips. Two stuck CEAs require boration to meet reactivity but a loss of 11 4KV Bus will force the crew to EOP-8 for reactivity not being met. In EOP-8, boration will be restored but 11 AFW Pp will trip resulting in a loss of feed. The crew can address the loss of feed in EOP-8 or transition to EOP-3.

**Initial Conditions:** The plant is at 67% Power, MOC (IC-17)

11 Chg Pp is OOS

12 AFW Pp is OOS

12 SGFP Pp is OOS.

11 CCW Head Tank Makeup CV is isolated due to leakby.

INSTR AIR COMPR(S) alarm (K-25) hanging.

**Turnover:** Present plant conditions: 67% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 67% power for previous 4 days.

Equipment out of service:

- 1) 11 Chg Pp packing replacement. Expected to be returned to service in 6 hours. All Chg. Pumps have been repacked, currently running in the packing on 13.
- 2) 12 AFW Pp exhibited excessive vibration during STP. It is disassembled, expected to be returned to service in 2 days.
- 3) 12 SGFP Pp to repair steam leak on LP poppets. It is disassembled, expected to be returned to service tomorrow
- 4) 11 CCW Head Tank Makeup CV is isolated due to leakby.
- 5) Alarm K-25 INSTR AIR COMPR(S) is hanging. No problems with the compressors, I & C is investigating, alarm card has been swapped out.

Surveillances due: 1B DG STP-O-8 due today. SM will bring STP to CR when ready.

Instructions for shift:

- 1) Maintain current power level. Perform 1B DG STP-O-8 when directed by SM.

Event No.	Malf. No.	Event Type*		Event Description
Preload	FW004_02 CEDs010_28 CEDs010_42 Remote Func AFW001_02 PNL OVR (K-25)			12 SGFP OOS. 2 stuck CEAs.  11 CHG Pp OOS. (bkr rackout) 12 AFW Pp OOS INSTR AIR COMPR(S) alarm hanging.
1	RCS026_01 (low)	I	RO	About 3 minutes after the crew has taken the watch, PRZR level contr. (110X) fails low. The RO should acknowledge the alarm, inform the CRS and refer to the ARM. Level control should be shifted to channel Y and the OWC notified. T.S. 3.3.10 should be entered.
2	CVCS003_02	C	RO	12 Chg. Pp shaft breaks on start following 110X failure, however, the pump stops again when channel Y is selected. It is unlikely the crew will notice the failure here, but probably later during the downpower or boration to meet reactivity control in EOP-0. When discovered the crew is expected to attempt to ensure boration via another means and to contact the OWC for assistance.
3	FW018_02 (LO)	I	CRO	Next, 12 SG FRV Controller (1121) fails. The CRO should acknowledge the alarm and inform the CRS. The CRS should direct the CRO to maintain SG level and implement AOP-3G. The CRS should direct the CRO to place the controller switch in the Main Fail position. The CRS should direct the OWC to contact the System Engineer for assistance.
4	PNL OVR (Conditioner level low alarm) FW004_01 CVCS014_01	C R C N	CRO RO RO CRO	The CRO acknowledges the SGFP Conditioner Level Low Alarm, informs the CRS and dispatches the TBO. Following the TBO report, a rapid downpower will be initiated to take 11 SGFP off. (The crew may notice the charging pump malfunction at this time.) The OWC should be contacted for assistance and notifications. As the power reduction to take 11 SGFP off is begun, 11 BA Pp trips off when started. The RO will either use 12 BA Pp or gravity feed from the BASTs. At ~50% power, 11 SGFP trips. The CRS should order the unit tripped due to loss of feed. EOP-0 is implemented, the RO notes 2 stuck CEAs and commences boration.
5	4KV001_01	M	ALL	After the RO reports on Pressure and Inventory, a loss of 11 4KV Bus occurs. The CRS orders a reassessment of safety functions. The RO should determine reactivity is no longer being met due to no charging and direct the TBO to align 13 Chg. Pp to 14 bus. With the TBO being unsuccessful the CRS will enter EOP-8 for failure to meet reactivity.
6	AFW001_01	M	ALL	After EOP-8 is entered and the selected Success Paths begun, 13 Chg. Pp is successfully aligned to 14 bus. With boration now in progress, 11 AFW Pp trips. The CRS directs all RCPs and blowdown be secured. The CRS can remain in EOP-8 or transition to EOP-3. The crew begins a rapid cooldown to 465°F for loss of feed. The scenario will terminate when Booster Pump Injection or OTCC is established.

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

## **SCENARIO 3 OVERVIEW**

The candidates will take the shift at  $\approx 67\%$  power.

About 3 minutes after the crew has taken the watch, PRZR level contr. (110X) fails low. The RO should acknowledge the alarm, inform the CRS and refer to the ARM. Level control should be shifted to channel Y and the OWC notified. T.S. 3.3.10 should be entered.

12 Chg. Pp shaft breaks on start following 110X failure, however, the pump stops again when channel Y is selected. It is unlikely the crew will notice the failure here, but probably later in the scenario during the downpower or boration to meet reactivity control in EOP-0. When discovered the crew is expected to attempt to ensure boration via another means and to contact the OWC for assistance.

Next, 12 SG FRV Controller (1121) fails. The CRO should acknowledge the alarm and inform the CRS. The CRS should direct the CRO to maintain SG level and implement AOP-3G. The CRS should direct the CRO to place the controller switch in the Main Fail position. The CRO will control level via the PDI. The CRS should direct the OWC to contact the System Engineer for assistance.

The CRO acknowledges the SGFP Status Panel alarm and determines the alarm to be a SGFP Conditioner Level Low Alarm, informs the CRS and dispatches the TBO. Following the TBO report of a bad oil leak on 11 SGFP pump, a rapid downpower will be initiated to take 11 SGFP off. (The crew may notice the charging pump malfunction at this time.) The OWC should be contacted for assistance and notifications. As the power reduction to take 11 SGFP off is begun, 11 BA Pp trips off when started for the initial boration. The RO will either use 12 BA Pp or gravity feed from the BASTs to borate. At  $\approx 50\%$  power, 11 SGFP trips. The CRS should order the unit tripped due to loss of feed. EOP-0 is implemented, the RO notes 2 stuck CEAs and commences boration.

After the RO reports the status of RCS Pressure and Inventory, a loss of 11 4KV Bus occurs. The CRS should order a reassessment of safety functions. The RO should determine reactivity is no longer being met due to no charging flow and direct the TBO to align 13 Chg. Pp to 14 bus. The TBO's attempts to realign the 13 Charging Pump will initially be unsuccessful. The CRS will enter EOP-8 for failure to meet Reactivity Control.

After Eop-8 is entered and the selected Success Paths begun, 13 Chg. Pp is successfully aligned to 14 bus. After boration is in progress, 11 AFW Pp trips. The CRS directs all RCPs and blowdown be secured. The CRS can remain in EOP-8 or transition to EOP-3. The crew begins a rapid cooldown to  $465^{\circ}\text{F}$  for loss of feed. The scenario will terminate when heat removal has been reestablished by either Booster Pump Injection or OTCC.

Simulation Facility Calvert Cliffs Scenario No.: 4 (Spare) Op Test No.: 1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_ SRO  
\_\_\_\_\_  
\_\_\_\_\_ RO  
\_\_\_\_\_ BOP

**Objectives:** To evaluate the applicants' ability to conduct a unit power increase, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including raising power, a failure of the SRW Controller for the Main Generator H2 Cooler, a failure of the letdown backpressure regulator and a dropped CEA. When the CEA drops the crew will implement AOP-1B. As the dropped CEA is being recovered a loss of 14 4KV Bus occurs. The crew will shift charging suction back to the VCT, stabilize the unit and implement AOP-7I. Next, a loss of offsite power occurs and the Main Turbine does not Trip. The crew should determine a manual reactor trip is required, trip the unit and implement EOP-0. The 1A DG does not start and the 0C DG Tie Bus is faulted resulting in a Station Blackout. The crew will implement EOP-7. As actions for EOP-7 are being performed 11 AFW Pp will trip. The crew will be able to restore AFW using 12 AFW Pump allowing them to remain in the optimal procedure.

**Initial Conditions:** The plant is at 75% Power, MOC (IC-18)

13 CCW Pp is OOS

12 Charging Pp is OOS

INSTR AIR COMPR(S) alarm (K-25) hanging.

**Turnover:** Present plant conditions: 75% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 100% power for previous 190 days. Then reduced to ≈68% 3 days ago for 12 SGFP repairs.

Equipment out of service:

- 1) 13 CCW Pp has a broken shaft, expected repair tomorrow-noon.
- 2) Alarm K-25 INSTR AIR COMPR(S) is hanging. No problems with the compressors, I & C is investigating, alarm card has been swapped out.
- 3) 12 Charging Pp is OOS due to severe packing leakage. The packing is being replaced. Expected to be ready for PMT in about 4 hours.

Surveillances due: None.

Instructions for shift:

- 1) Unit 1 had been at ≈68% power the previous 3 days to repair a steam leak on 12 SGFP. Both SGFPs are operating in parallel. Continue raising power to 100% per OP-3.
- 2) Perform PMT on 12 Charging Pump when returned to service.

Event No.	Malf. No.	Event Type*		Event Description
Preload	DG0C004 DG002_02 CCW002_03 TG002 Remote Func PNL OVR (K-25)			0C DG tie bus faulted. 1A DG start failure. 13 CCW Pp OOS Turbine fails to trip. 12 Chg Pp OOS INSTR AIR COMPR(S) alarm hanging.
1	N/A	R N	RO CRO	After the crew takes the watch, the CRS should brief the crew on the power increase to 100% per OP-3. After the brief the RO and CRO should coordinate to raise power while maintaining plant parameters within acceptable limits and Tc on program.
2	TG030_01 (closed)	I	CRO	After power has been raised at least 5%, the SRW controller for the Main Generator H <sub>2</sub> cooler fails the valve shut. When the high temperature alarm is received, the CRO should acknowledge the alarm, inform the CRS and refer to the ARM. The CRO should determine TIC-1608 has failed low causing the CV to go shut, take manual control and restore H <sub>2</sub> temperature. The OWC should be contacted for assistance.
3	CVCS005	I	RO	Next, Letdown backpressure transmitter PT-201 fails low. The RO acknowledges the alarm, informs the CRS and refers to the ARM. The CRS should direct the RO to take manual control, restore letdown flow and maintain letdown pressure. The OWC should be contacted for support.
4	CEDS012_34	C	RO	After the PT-201 failure CEA 34 drops. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The CRS should implement AOP-1B and address T.S. 3.1.4. The primary will be stabilized and realignment time determined. After notifying maintenance and correcting the cause, realignment will be commenced.
5	4KV001_04	C	CRO	As the CEA is being withdrawn 14 4KV Bus is lost. The crew should stop CEA withdrawal, diagnose the bus loss, shift Charging Pump suction back to the VCT and stabilize the unit. The CRS should implement AOP-7I. The CRO will perform APO-7I actions as directed by the CRS. The OWC should be contacted for support.
6	SWYD002	M	ALL	About 5 minutes after the bus loss, a loss of offsite power occurs. 1A DG does not start and 14 4KV bus is locked out. The 0C Diesel will not energize the 0C Tie Bus due to a fault. The Main Turbine will not trip automatically. The crew should recognize a reactor trip is required and trip the unit manually. The crew will implement EOP-0 and diagnose a station blackout exists.
7	AFW001_01	M	ALL	In EOP-7, 11 AFW Pp will trip but they can restore AFW using 12 AFW Pump. 1A DG will become available and the 11 4KV Bus energized. After the bus is energized the scenario can be terminated.

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

## SCENARIO 4 OVERVIEW

The candidates will take the shift at  $\approx 75\%$  power with instructions to raise power to 100% per OP-3.

After the crew takes the watch, the CRS should brief the crew on the power increase to 100% per OP-3. After the brief the RO and CRO should coordinate to raise power while maintaining plant parameters within acceptable limits and Tc on program.

After power has been raised at least 5%, the SRW controller for the Main Generator H<sub>2</sub> cooler fails the SRW valve closed. When the generator H<sub>2</sub> high temperature alarm is received, the CRO should acknowledge the alarm, inform the CRS and refer to the ARM. The CRO should determine TIC-1608 has failed low causing the CV to go shut, take manual control and restore H<sub>2</sub> temperature. The OWC should be contacted for assistance.

Next, Letdown backpressure transmitter PT-201 fails low. The RO acknowledges the alarm, informs the CRS and refers to the ARM. The CRS should direct the RO to take manual control, restore letdown flow and maintain letdown pressure. The OWC should be contacted for support.

After the PT-201 failure CEA 34 drops. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The CRS directs the CRO to reduce turbine load as necessary to maintain Tc on program, implement AOP-1B and address T.S. 3.1.4. The primary will be stabilized and realignment time determined. After notifying maintenance and correcting the cause, realignment will be commenced.

As the CEA is being withdrawn 14 4KV Bus is lost. The crew should stop CEA withdrawal, diagnose the bus loss, shift Charging Pump suction back to the VCT and stabilize the unit. The CRS should implement AOP-7I. The CRO will perform AOP-7I actions as directed by the CRS. The OWC should be contacted for support.

About 5 minutes after the bus loss, a loss of offsite power occurs. 1A DG does not start and 14 4KV Bus is locked out. The 0C Diesel will not energize the 0C Tie Bus due to a fault. The Main Turbine will not trip automatically. The crew should recognize a reactor trip is required and trip the unit manually. The crew will implement EOP-0 and diagnose a station blackout exists.

In EOP-7 11 AFW Pp will trip but they can restore AFW using 12 AFW Pump. 1A DG will become available and the 11 4KV Bus energized. After the bus is energized the scenario can be terminated.