

Facility: Callaway															Date of Exam: January 2011				
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	2	1	5	N/A			5	1	N/A			4	18	2	4	6		
	2	3	1	0				0	4				1	9	2	2	4		
	Tier Totals	5	2	5				5	5				5	27	4	6	10		
2. Plant Systems	1	5	3	3	3	2	3	3	0	4	2	0	28	1	4	5			
	2	0	1	0	0	1	0	0	2	1	3	2	10	1	2	3			
	Tier Totals	5	4	3	3	3	3	3	2	5	5	2	38	2	6	8			
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7	
					2		3		2		3		2	2	2	1			

Note:

- 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).
- 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.
- 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/evolutions 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.
- 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.
- 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.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- * 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.
- 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.
- 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		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1			X				007 EK3.01 Knowledge of the interrelations between a reactor trip: Actions contained in EOP for reactor trip. (CFR 41.5/ 41.10 / 45.6 / 45.13)	4.0	1
000008 Pressurizer Vapor Space Accident / 3						X	2.4.31 Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 /45.3)	4.2	2
000011 Large Break LOCA / 3			X				EK3.02 Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: Feedwater isolation (CFR 41.5 / 41.10 / 45.6 / 45.13)	3.5	3
000015/17 RCP Malfunctions / 4					X		AA2.08 Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): When to secure RCPs on high bearing temperature. (CFR 43.5 / 45.13)	3.4	4
000025 Loss of RHR System / 4			X				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Residual Heat Removal System: Shift to alternate flowpath. (CFR 41.5,41.10 / 45.6 / 45.13)	3.1	5
000026 Loss of Component Cooling Water / 8			X				AK3.02 Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: The automatic actions (alignments) within the CCWS resulting from the actuation of the ESFAS. (CFR 41.5,41.10 / 45.6 / 45.13)	3.6	6
000029 ATWS / 1	X						EK1.01 Knowledge of the operational implications of the following concepts as they apply to the ATWS: Reactor nucleonics and thermo-hydraulics behavior. (CFR 41.8 / 41.10 / 45.3)	2.8	7
000038 Steam Gen. Tube Rupture / 3				X			EA1.34 Ability to operate and monitor the following as they apply to a SGTR: Obtaining shutdown with natural circulation. (CFR 41.7 / 45.5 / 45.6)	4.2	8
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4	X						040 AK1.05 Knowledge of the operational implications of the following concepts as they apply to Steam Line Rupture: Reactivity effects of cooldown. (CFR 41.8 / 41.10 / 45.3)	4.1	9

000054 (CE/E06) Loss of Main Feedwater / 4						X	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. (CFR: 41.5 / 43.5 / 45.12 / 45.13)	4.4	10
000055 Station Blackout / 6				X			EA1.02 Ability to operate and monitor the following as they apply to a Station Blackout: Manual ED/G start. (CFR 41.7 / 45.5 / 45.6)	4.3	11
000056 Loss of Off-site Power / 6						X	2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs. (CFR: 41.10 / 43.5 / 45.13)	3.8	12
000062 Loss of Nuclear Svc Water / 4			X				AK3.03 Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: Guidance actions contained in EOP for Loss of nuclear service water. (CFR 41.4, 41.8 / 45.7)	4.0	13
000065 Loss of Instrument Air / 8				X			AA1.03 Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: Restoration of systems served by instrument air when pressure is regained. (CFR 41.7 / 45.5 / 45.6)	2.9	14
W/E04 LOCA Outside Containment / 3						X	2.1.28 Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	4.1	15
W/E11 Loss of Emergency Coolant Recirc. / 4				X			EA1.1 Ability to operate and / or monitor the following as they apply to the (Loss of Emergency Coolant Recirculation): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features. (CFR: 41.7 / 45.5 / 45.6)	3.9	16
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4				X			EA1.3 Ability to operate and / or monitor the following as they apply to the (Loss of Secondary Heat Sink): Desired operating results during abnormal and emergency situations. (CFR: 41.7 / 45.5 / 45.6)	3.8	17
000077 Generator Voltage and Electric Grid Disturbances / 6		X					AK2.07 Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Turbine / generator control. (CFR: 41.4, 41.5, 41.7, 41.10 / 45.8)	3.6	18
K/A Category Totals:	2	1	5	5	1	4	Group Point Total:	18/6	

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)							Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1					X		AA2.05 Ability to determine and interpret the following as they apply to the Continuous Rod Withdrawal : Uncontrolled rod withdrawal, from available indications (CFR: 43.5 / 45.13)	4.4	19	
000032 Loss of Source Range NI / 7					X		AA2.04 Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: Satisfactory source-range/intermediate-range overlap (CFR: 43.5 / 45.13)	3.1	20	
000033 Loss of Intermediate Range NI / 7	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of Intermediate Range Nuclear Instrumentation: Effects of voltage changes on performance. (CFR 41.8 / 41.10 / 45.3)	2.7	21	
000051 Loss of Condenser Vacuum / 4					X		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Conditions requiring reactor and/or turbine trip (CFR: 43.5 / 45.13)	3.9	22	
000059 Accidental Liquid RadWaste Rel. / 9		X					AK2.01 Knowledge of the interrelations between the Accidental Liquid Radwaste Release and the following: Radioactive-liquid monitors. (CFR 41.7 / 45.7)	2.7	23	
000061 ARM System Alarms / 7					X		AA2.06 Ability to determine and interpret the following as they apply to the Area Radiation Monitoring (ARM) System Alarms: Required actions if alarm channel is out of service. (CFR: 43.5 / 45.13)	3.2	24	

W/E13 Steam Generator Over-pressure / 4	X						EK1.1 Knowledge of the operational implications of the following concepts as they apply to the (Steam Generator Overpressure): Components, capacity, and function of emergency systems (CFR: 41.8 / 41.10, 45.3)	3.2	25
W/E16 High Containment Radiation / 9	X						EK1.1 Knowledge of the operational implications of the following concepts as they apply to the (High Containment Radiation): Components, capacity, and function of emergency systems. (CFR: 41.8 / 41.10, 45.3)	2.7	26
CE/A11; W/E08 RCS Overcooling - PTS / 4						X	2.1.30 Ability to locate and operate components, including local controls. (CFR: 41.7 / 45.7)	4.4	27
K/A Category Point Totals:	3	1	0	0	4	1	Group Point Total:	9/4	

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)											Form ES-401-2	
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	#
003 Reactor Coolant Pump	X											K1.03 Knowledge of the physical connections and/or cause-effect relationships between the RCPS and the following systems: RCP seal system. (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.3	28
003 Reactor Coolant Pump			X									K3.02 Knowledge of the effect that a loss or malfunction of the RCPS will have on the following: S/G (CFR: 41.7 / 45.6)	3.5	29
004 Chemical and Volume Control						X						K6.01 Knowledge of the effect of a loss or malfunction on the following CVCS components: Spray/heater combination in PZR to assure uniform boron concentration (CFR: 41.7 / 45.7)	3.1	30
005 Residual Heat Removal	X											K1.11 Knowledge of the physical connections and/or causeeffect relationships between the RHRS and the following systems: RWST (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.5	31
005 Residual Heat Removal						X						K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger (CFR: 41.7 / 45.7)	2.5	32
006 Emergency Core Cooling					X							K5.08 Knowledge of the operational implications of the following concepts as they apply to ECCS: Operation of pumps in parallel (CFR: 41.5 / 45.7)	2.9	33
006 Emergency Core Cooling									X			A3.02 Ability to monitor automatic operation of the ECCS, including: Pumps (CFR: 41.7 / 45.5)	4.1	34
007 Pressurizer Relief/Quench Tank									X			A3.01 Ability to monitor automatic operation of the PRTS: Components which discharge to the PRT. (CFR: 41.7 / 45.5)	2.7	35

007 Pressurizer Relief/Quench Tank						X					A1.02 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including: Maintaining quench tank pressure (CFR: 41.5 / 45.5)	2.7	36
008 Component Cooling Water			X								K3.01 Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: Loads cooled by CCWS	3.4	37
010 Pressurizer Pressure Control				X							K4.03 Knowledge of PZR PCS design feature(s) and/or interlock(s) which provide for the following: Over pressure control (CFR: 41.7)	3.8	38
012 Reactor Protection			X								K2.01 Knowledge of bus power supplies to the following: RPS channels, components, and interconnections. (CFR: 41.7)	3.3	39
012 Reactor Protection					X						K6.10 Knowledge of the effect of a loss or malfunction of the following will have on the RPS: Permissive circuits (CFR: 41.7 / 45.7)	3.3	40
013 Engineered Safety Features Actuation						X					K6.01 Knowledge of the effect of a loss or malfunction on the following will have on the ESFAS: Sensors and detectors (CFR: 41.7 / 45.5 to 45.8)	2.7	41
013 Engineered Safety Features Actuation									X		A4.02 Ability to manually operate and/or monitor in the control room: Reset of ESFAS channels (CFR: 41.7 / 45.5 to 45.8)	4.3	42
022 Containment Cooling							X				A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: Containment humidity (CFR: 41.5 / 45.5)	3.1	43
026 Containment Spray			X								K2.01 Knowledge of bus power supplies to the following: Containment spray pumps (CFR: 41.7)	3.4	44

039 Main and Reheat Steam	X																K1.02 Knowledge of the physical connections and/or cause-effect relationships between the MRSS and the following systems: Atmospheric relief dump valves (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.3	45
059 Main Feedwater				X													K4.19 Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following: Automatic Feedwater Isolation (CFR: 41.7)	3.2	46
061 Auxiliary/Emergency Feedwater									X								A3.01 Ability to monitor automatic operation of the AFW, including: AFW startup and flows (CFR: 41.7 / 45.5)	4.2	47
062 AC Electrical Distribution		X															K2.01 Knowledge of bus power supplies to the following: Major system loads (CFR: 41.7)	3.3	48
063 DC Electrical Distribution										X							A4.01 Ability to manually operate and/or monitor in the control room: Major breakers and control power fuses (CFR: 41.7 / 45.5 to 45.8)	2.8	49
064 Emergency Diesel Generator	X																K1.03 Knowledge of the physical connections and/or cause effect relationships between the ED/G system and the following systems: Diesel fuel oil supply system (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.6	50
073 Process Radiation Monitoring			X														K3.01 Knowledge of the effect that a loss or malfunction of the PRM system will have on the following: Radioactive effluent releases. (CFR: 41.7 / 45.6)	3.6	51
076 Service Water				X													K4.06 Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following: Service water train separation (CFR: 41/7)	2.8	52
078 Instrument Air	X																K1.03 Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: Containment air (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.3	53

103 Containment								X					A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: Containment pressure, temperature, and humidity (CFR: 41.5 / 45.5)	3.7	54
103 Containment										X			A3.01 Ability to monitor automatic operation of the containment system, including: Containment isolation (CFR: 41.7 / 45.5)	3.9	55
K/A Category Point Totals:	5	3	3	3	2	3	3	0	4	2	0	Group Point Total:			28/5

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											Form ES-401-2	
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	#
001 Control Rod Drive										X		A4.13 Ability to manually operate and/or monitor in the control room: Stopping other changes in plant, e.g., turbine, S/G, SDBCS, boration, before adjusting rods. (CFR: 41.7/45.5 to 45.8)	2.7	56
002 Reactor Coolant									X			A3.01 Ability to monitor automatic operation of the RCS, including: Reactor Coolant leak detection system. (CFR: 41.7 / 45.5)	3.7	57
014 Rod Position Indication					X							K5.02 Knowledge of the operational implications of the following concepts as they apply to the RPIS: RPIS independent of demand position. (CFR: 41.5 / 45.7)	2.8	58
027 Containment Iodine Removal										X		A4.04 Ability to manually operate and/or monitor in the control room: Filter temperature (CFR: 41.7 / 45.5 to 45.8)	2.8	59
029 Containment Purge								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the Containment Purge System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Startup operations and the associated required valve lineups (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7	60
045 Main Turbine Generator										X		A4.02 Ability to manually operate and/or monitor in the control room: T/G controls, including breakers (CFR: 41.7 / 45.5 to 45.8)	2.7	61
055 Condenser Air Removal											X	2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)	3.9	62

056 Condensate System								X					A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of condensate pumps (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.6	63
075 Circulating Water		X											K2.03 Knowledge of bus power supplies to the following: Emergency/essential SWS pumps (CFR: 41.7)	2.6	64
079 Station Air												X	Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)	4.0	65
K/A Category Point Totals:	0	1	0	0	1	0	0	2	1	3	2	Group Point Total:			10/3

Facility: Callaway		Date of Exam: January 2011				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.4	Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. (CFR: 41.10 / 43.2)	3.3	66		
	2.1.34	Knowledge of primary and secondary plant chemistry limits. (CFR: 41.10 / 43.5 / 45.12)	2.7	67		
	Subtotal			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. (CFR: 41.10 / 43.5 / 45.13)	2.6	68		
	2.2.6	Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13)	3.0	69		
	2.2.37	Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)	3.6	70		
	Subtotal			3		
3. Radiation Control	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10)	3.4	71		
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9)	2.9	72		
	Subtotal			2		
4. Emergency Procedures / Plan	2.4.2	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	4.5	73		
	2.4.25	Knowledge of fire protection procedures. (CFR: 41.10 / 43.5 / 45.13)	3.3	74		

	2.4.47	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)	4.2	75		
	Subtotal			3		
Tier 3 Point Total				10		

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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												18	3	3	6		
	2												9	2	2	4		
	Tier Totals												27	5	5	10		
2. Plant Systems	1												28	3	2	5		
	2												10	1	2	3		
	Tier Totals												38	4	4	8		
3. Generic Knowledge and Abilities Categories													10	1	2	3	4	7
														2	2	1	2	
<p>Note:</p> <ol style="list-style-type: none"> 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/evolutions 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		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000008 Pressurizer Vapor Space Accident / 3 (PORV Stuck Open)					X		AA2.06 – Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: PORV logic control under low-pressure conditions. (CFR: 43.5 / 45.13)	3.6	76
000009 Small Break LOCA / 3						X	2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)	4.0	77
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4					X		AA2.03 – Ability to determine and interpret the following as they apply to the Steam Line Rupture: Difference between steam line rupture and LOCA (CFR: 43.5 / 45.13)	4.7	78
000054 (CE/E06) Loss of Main Feedwater / 4						X	2.2.44 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. (CFR: 41.5 / 43.5 / 45.12)	4.4	79
000058 Loss of DC Power / 6					X		Ability to determine and interpret the following as they apply to the Loss of DC Power: That a loss of dc power has occurred; verification that substitute power sources have come on line (CFR: 43.5 / 45.13)	4.1	80
000062 Loss of Nuclear Svc Water / 4						X	2.1.27 Knowledge of system purpose and/or function. (CFR: 41.7)	4.0	81
K/A Category Totals:					3	3	Group Point Total:		6

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E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000037 Steam Generator Tube Leak / 3					X		AA.2.06 Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: S/G tube failure. (CFR: 43.5 / 45.13)	4.5	82
000067 Plant Fire On-site / 8						X	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)	4.4	83
000074 (W/E06&E07) Inad. Core Cooling / 4					X		EA2.04 Ability to determine or interpret the following as they apply to a Inadequate Core Cooling: Relationship between RCS temperature and main steam pressure (CFR 43.5 / 45.13)	4.2	84
W/E16 High Containment Radiation / 9						X	2.4.6 Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	4.7	85
K/A Category Point Totals:					2	2	Group Point Total:	4	

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (SRO)										Form ES-401-2		
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	#
006 Emergency Core Cooling								X				A2.07 Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of heat tracing (CFR: 41.5 / 45.5)	3.1	86
008 Component Cooling Water											X	2.4.9 Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	4.2	87
010 Pressurizer Pressure Control								X				A2.03- Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: PORV failures (CFR: 41.5 / 43.5 / 45.3 / 45.13).	4.2	88
062 AC Electrical Distribution											X	2.2.12 Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)	4.1	89

064 Emergency Diesel Generator								X				A2.12 Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of air-cooling fans (CFR: 41.5 / 43.5 / 45.3 / 45.13) N/A for CW. Selected new K/A A2.16 Loss of offsite power during full-load testing of ED/G	3.1	90
K/A Category Point Totals:								3			2	Group Point Total:	5	

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 2 (SRO)												Form ES-401-2	
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	#	
002 Reactor Coolant											X	2.4.46 Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12)	4.2	91	
027 Containment Iodine Removal N/A for Callaway								X				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the CIRS; and (b) based on those predictions, use Procedures to correct, control, or mitigate the consequences of those malfunctions or operations: High temperature in the filter system (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.3	92	
034 Fuel Handling Equipment								X				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the Fuel Handling System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Dropped fuel element (CFR: 41.5 / 43.5 / 45.3 / 45.13)	4.4	92	
041 Steam Dump/Turbine Bypass Control												2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)	4.3	93	
068 Liquid Radwaste N/A for Callaway											X	2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)	4.3	93	
K/A Category Point Totals:								1			2	Group Point Total:		3	

Facility: Callaway		Date of Exam: January 2011				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.	2.1.39 Knowledge of conservative decision making practices. (CFR: 41.10 / 43.5 / 45.12)			4.3	94
	2.1.	2.1.21 Ability to verify the controlled procedure copy. (CFR: 41.10 / 45.10 / 45.13)			3.6	95
	Subtotal					
2. Equipment Control	2.2.	2.2.40 Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3)			4.7	96
	2.2.	2.2.20 Knowledge of the process for managing troubleshooting activities. (CFR: 41.10 / 43.5 / 45.13)			3.8	97
	Subtotal					
3. Radiation Control	2.3.	2.3.12 Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)			3.7	98
	Subtotal					
4. Emergency Procedures / Plan	2.4.	2.4.41 Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)			4.6	99
	2.4.	2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)			4.0	100
						7

Tier / Group	Randomly Selected K/A	Reason for Rejection
3	2.3.6	IR < 2.5
1/1	015/17 AA2.05	IR < 2.5
1/1	015/17 AA2.03	IR < 2.5
1/1	026 AK2	NONE → Selected another category
1/1	054 AK2	All IR < 2.5 → Selected another category
1/2	032 AA2.08	IR < 2.5
1/2	051 AK1.01	IR < 2.5
1/2	059 2.4.20	Undersampling of K2, Oversampling of G
2/1	004 K6.38	IR < 2.5
2/1	004 K6.08	IR < 2.5
2/1	007 K2	NONE → Selected another category
2/1	073 K6	All IR < 2.5 → Selected another category
2/1	103 K6	All IR < 2.5 → Selected another category
2/1	103 K5	NONE → Selected another category
2/2	014 K6	All IR < 2.5 → Selected another category
2/2	014 K2	All IR < 2.5 → Selected another category
2/2	055 K6	All IR < 2.5 → Selected another category
2/1	008 K3.02	No link between CCW and CRDS. CRDS cooled by air coolers in containment, which are cooled by ESW from Ult Heat Sink. Chose 008 K3.01
1/1	025 AK3.03	No immediate actions for Loss of RHR. Randomly selected alternate, 025 AK3.01.
2/1	059 K4.13	N/A for Callaway. Randomly selected alternate, 059 K4.19
2/2	02 A3.02	N/A for Callaway. Randomly selected alternate, 002 A3.01
1/1	W/E04 Generic 2.2.12	Not RO Knowledge. Randomly selected alternate, Generic 2.1.28
2/1	007 K5.02	Little link between PRT and forming a steam bubble in PZR. No other K/A > 2.5 in K5. Randomly selected alternate, 007 A3.01
1/1	008 2.2.25	Not RO Knowledge. Randomly selected alternate, Generic 2.4.31
1/2	059 AK2.02	No radioactive-gas monitors on liquid radwaste system. Selected alternate, AK2.01.

2/2	079 2.4.20	N/A, Randomly selected alternate KA, 2.4.11
3	2 2.2.21	Rejected, too similar to 2.2.37, Randomly selected alternate, 2.2.6
2/2	068 A2.02	Rejected, N/A for Callaway, Randomly selected alternate 056 A2.04
1/1	077 AK2.05	Unable to develop acceptably discriminatory question for K/A statement. Randomly selected alternate, 077 AK2.07.
2/1	003 K1.04	Thrown out due to potential electronic security compromise on 11/23/2010. Selected 003 K1.03 as a replacement.

[illegible]

Facility: Callaway Examination Level: RO		Date of Examination: 2/7/2011 Operating Test Number: (NRC)
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
(A1) Conduct of Operations	R, N	<p>Determine Hydrogen Recombiner Power Settings</p> <p>2.1.25 (3.9): Ability to interpret reference materials, such as graphs, curves, tables, etc.</p> <p>*Written by NRC*</p>
(A2) Conduct of Operations	R, N	<p>Calculate RCS Boration Required to Reach Cold Shutdown Conditions</p> <p>2.1.37 (4.3): Knowledge of procedures, guidelines, or limitations associated with reactivity management.</p>
(A3) Equipment Control	R, N	<p>Review Pump Run Data and Determine if Acceptance Criteria are Met.</p> <p>2.2.12 (3.7): Knowledge of surveillance procedures.</p>
(A4) Radiation Control	R, D	<p>Determine Radiological Requirements for HRA Entry</p> <p>2.3.12 (3.2): Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.</p>
Emergency Procedures/Plan	N/A	N/A
<p>NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.</p>		
<p>* Type Codes & Criteria:</p> <p>(C)ontrol room, (S)imulator, or Class(R)oom</p> <p>(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)</p> <p>(N)ew or (M)odified from bank (≥ 1)</p> <p>(P)revious 2 exams (≤ 1; randomly selected)</p>		

RO ADMIN JPM SUMMARY

- A1 This is a New JPM. The candidate will determine Hydrogen Recombiner Settings based on data and tables given. (RO)
- A2 This is a New JPM. The candidate will be given a copy of the Curve Book and will have to determine the amount of Boron required to place the plant in Mode 5. (RO)
- A3 This is a New JPM. The candidate will be given a copy of the data recorded on Attachment 4 of OSP-EN-P001B, Train B Containment Spray Pump Comprehensive Test data Sheet. The candidate will be required to complete the calculations and determine whether the acceptance criteria is satisfied.(RO)
- A4 This is a Bank JPM from the Kewaunee Nuclear Power Plant. Given dose rates and dose limits as established by Radiation Protection, the candidate will be required to determine stay time allowed to perform hanging of WPA in a High Radiation Area. (RO)

Facility: Callaway Examination Level: SRO		Date of Examination: 2/7/2011 Operating Test Number: (NRC)
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
(A5) Conduct of Operations	R, N	<p>Determine Time to Boil for a Loss of Shutdown Cooling – Computer not Available</p> <p>2.1.25 (3.9): Ability to interpret reference materials, such as graphs, curves, tables, etc.</p> <p>*Written by NRC*</p>
(A6) Conduct of Operations	R, N	<p>Determine Shift Staffing (Fatigue Rule)</p> <p>2.1.5 (3.9): Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.</p>
(A7) Equipment Control	R, N	<p>Review Completed Surveillance (ESF Power Availability / Offsite Power Availability)</p> <p>2.2.42 (4.6): Ability to recognize system parameters that are entry-level conditions for Technical Specifications</p>
(A8) Radiation Control	R, D	<p>Determine Reportability Requirements for Overexposure</p> <p>2.3.4 (3.7): Knowledge of radiation exposure limits under normal and emergency conditions</p>
(A9) Emergency Procedures/Plans	R, N	<p>Make a Protective Action Recommendation</p> <p>2.4.44 (4.4): Knowledge of emergency plan protective action recommendations</p>
<p>NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.</p>		
<p>* Type Codes & Criteria:</p> <p>(C)ontrol room, (S)imulator, or Class(R)oom</p> <p>(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)</p> <p>(N)ew or (M)odified from bank (≥ 1)</p> <p>(P)revious 2 exams (≤ 1; randomly selected)</p>		

SRO ADMIN JPM SUMMARY

- A5 This is a New JPM. Following a Loss of Shutdown Cooling, the candidate will determine the Time to Boil based on data and tables given. (SRO)
- A6 This is a new JPM. Given the schedules of six (6) different Operators, the candidate will be required to choose which ones will be able to man the shift on a certain day and not violate the Fatigue Rule. Guidance will be provided in APA-ZZ-00905, Limitations of Callaway Plant Staff Working Hours. (SRO)
- A7 This is a new JPM. The candidate will be given completed Attachments 1 and 2 of OSP-NB-00001, Class 1E Electrical Source Verification. The candidate will have to determine that NK01 is inoperable determine when it must be returned to operable status per Tech Specs. (SRO)
- A8 This is a Bank JPM. Given an Overexposure event in the plant, the candidate will be required to determine whether the event is reportable, who to call, and the time limit which the call must be made.(SRO)
- A9 This is a new JPM. Given a set of conditions and the appropriate Emergency Response procedure forms, the candidate will prepare the EIP-ZZ-00102, Att. 4, Control Room Offsite Notification Form, and Form CA2843, PAR Flowchart, in accordance with EIP-ZZ-00102, Emergency Implementing Actions to make a Protective Action Recommendation (PAR). EIP-ZZ-00212, Protective Action Recommendations will also be provided. (SRO)

Facility: <u>CALLAWAY</u>		Date of Examination: <u>02/07/11</u>
Exam Level: <i>RO (only)</i> /SRO(I)/ SRO(U)		Operating Test No.: _____
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. 001 Control Rod Drive System Perform Partial Rod Movement test (When rods are moved inwards, continuous rod insertion will require tripping the reactor)	N, S, A	1
b. 006 Emergency Core Cooling System Lower Accumulator Level	D, S, EN	2
c. 003 Reactor Coolant Pump System (RCPS) Start 'A' RCP (Trip on high vibration)	N, S, L, A	4-P
d. 059 Main Feedwater System FWIS Bypass Operation (EOP Addendum 29 – simulate in CR)	N, C, E	4-S
e. 026 Containment Spray System (CSS) Swap Containment Spray Pump suction to Containment Sump; (CS Pump "B" Sump Suction Valve cannot be opened, must secure pump.)	N, S, EN, A	5
f. 064 Emergency Diesel Generator Manually start Diesel Generator (Both EDGs fail to auto start following loss of offsite power. Perform Step 5 of ECA-0.0 to restore power)	N, L, S, A	6
g. 073 Process Radiation Monitoring System Radiation Monitor source check (Repeat from 11/07 exam)	D, S, P, A	7
h. 029 Containment Purge System Re-establish Containment Purge After Isolation (Repeat from 6/09 exam)	D, S, P	8

In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i.	061 Auxiliary Feedwater System Reset TDAFW Pump Mechanical Overspeed Trip	D, E, EN 4-S
j.	APE 068 Control Room Evacuation Control Room Inaccessibility – BOP actions. (URO-AEO15057J)	D, R, E, L 8
k.	062 A.C. Electrical Distribution Switch NK01 power supply from Swing Charger NK25 to Normal Charger NK21 (NK21 DC Breaker CB2 trips open on transfer; operator re-aligns NK01 to NK25)	N, E, A 6
<p>@ 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.</p>		
* 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 (6) / 4-6 (6) / 2-3 (3) (1) / (1) / (0) ≤ 9 (5) / ≤ 8 (4) / ≤ 4 (2) ≥ 1 (3) / ≥ 1 (3) / ≥ 1 (3) (3) / (3) / ≥1 (2) (control room system) ≥ 1 (3) / ≥ 1 (3) / ≥ 1 (1) ≥ 2 (6) / ≥ 2 (6) / ≥ 1 (3) ≤ 3 (2) / ≤ 3 (1) / ≤ 2 (0) (randomly selected) ≥ 1 (1) / ≥ 1 (1) / ≥ 1 (1) (7) / (6) / (3)

ITEMS IN RED WRITTEN BY NRC

JPM Summary

- Sim A This is a new JPM. The candidate will start the task by performing steps of OSP-SF-00002, Control Rod Partial Movement, for Control Bank 'D'. When the Control Rods are inserted for the test, they continue to insert, forcing the candidate to take the ALTERNATE PATH and trip the Reactor based on continuous rod motion. (RO/SROI/SROU)
- Sim B This is a Bank JPM. The candidate will be given a high level in one of the SI Accumulators. The candidate will lower level to within the appropriate band. (RO/SROI/SROU)
- Sim C This is a New JPM. The simulator will be set up in a Low Mode. The candidate will start an RCP. The RCP will at first run normally, then develop high vibration, forcing the candidate to take actions per the ALTERNATE PATH and Trip the RCP. (RO/SROI)
- Sim D This is a New JPM. This JPM will be done at the Control Room back panels. The candidate will be given direction to perform EOP Addendum 29. The Candidate will successfully identify all components required in the Control Room and Simulate Bypassing the Feedwater Isolation System. (RO/SROI)
- Sim E This is a New JPM. The simulator will be set up with conditions that will require the candidate to Swap Containment Spray Pump suction to the Containment Sump. When the candidate gets to the 'B' Containment Spray system, the 'B' Containment Spray Suction valve cannot be opened, forcing the candidate to take the ALTERNATE PATH by stopping the 'B' Containment Spray Pump. (RO/SROI/SROU)
- Sim F This is a New JPM. The simulator will be set up with a Loss of Offsite power. Both EDGs fail to Auto Start, but then must be started manually - ALTERNATE PATH. Once the Diesel Generators are started, the operator verifies adequate cooling to the EDGs and sees that the "A" ESW Pump is not running and must start it. ALTERNATE PATH (RO/SROI)
- Sim G This is a Bank JPM repeated from the 2007 License Exam. The candidate will be required to perform a Source Check at the RM-11 panel using OSP-SP-00001, Radiation monitors Source Check. The Source Check will fail (CUE by Examiner) forcing the candidate to take an ALTERNATE PATH to address Actions required by the FSAR.
- Sim H This is a Bank JPM. The candidate will re-establish Containment Purge following a Containment Purge Isolation Signal. Repeat from the 2009 exam. (RO ONLY)
- Sim I This is a Bank JPM. In the Plant, the candidate will simulate how to Reset the TDAFW Pump Mechanical Overspeed Trip. (RO/SROI)

Sim J This a Bank JPM. In the Plant, the candidate will locate and demonstrate how to manually/locally close SG Atmospheric Steam Dumps 'A' and 'C', EGHV0061 and BGHV8105. (RO/SROI/SROU)

Sim K This is a New JPM. In the Plant, the candidate will simulate aligning NK01 from the swing charger NK25 to the Normal Charger NK21 per OTN-NK-00001. When the Normal Charger NK21 is attempted to be put in service, it's output trips and the operator must place NK25 back in service. (RO/SROI/SROU)

Facility: Callaway		Date of Exam: 2/7/2011		Operating Test No.: 2011301		Rev. 4											
A P P L I C A N T	E V E N T T Y P E	Scenarios												T O T A L	M I N I M U M(*)		
		1			2			3			4				R	I	U
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P				
SROU-1	RX													0			0
	NOR													0			1
	I/C							1 2 3 5						4			2
	MAJ							4 7						2			1
	TS							1 3						2			2
SROU-2	RX													0			0
	NOR												1	1			1
	I/C							1 2 3 5					2 4 6 7	8			2
	MAJ							4 7					5	3			1
	TS							1 3						2			2
SROU-3	RX													0			0
	NOR											1		1			1
	I/C											2 3 4 6 7 8		6		2	
	MAJ											5		1			1
	TS											2 4 5		3		2	
SROI-1	RX													0		1	
	NOR											1		1		1	
	I/C								1 2 5			2 3 4 6 7 8		9		4	
	MAJ								4 7			5		3		2	
	TS											2 4 5		3		2	

Instructions:

- 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.
- 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.
- 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.

Facility: Callaway		Date of Exam: 2/7/2011		Operating Test No.: 2011301		Rev. 4												
A P P L I C A N T	E V E N T T Y P E	Scenarios																
		1			2			3			4			T O T A L	M I N I M U M (*)			
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION							
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P					
SROI-2	RX														0		1	
	NOR		1										1		2		1	
	I/C		2 4 5					1 2 3 5					2 4 6 7		11		4	
	MAJ		6					4 7					5		4		2	
	TS							1 3							2		2	
SROI-3	RX														0		1	
	NOR											1			1		1	
	I/C			3 4 5 7					1 2 5			2 3 4 6 7 8			13		4	
	MAJ			6					4 7			5			4		2	
	TS											2 4 5			3		2	
SROI-4	RX											1			1		1	
	NOR	1													1		1	
	I/C	2 3 4 5								3 6		3 6 7 8			10		4	
	MAJ	6								4 7		5			4		2	
	TS	3 4													2		2	
RO-1	RX														0	1		
	NOR												1		1	1		
	I/C								1 2 5				2 4 6 7		7	4		
	MAJ								4 7				5		3	2		
	TS														0	0		

Instructions:

- 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.
- 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.
- 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.

Facility: Callaway		Date of Exam: 2/7/2009									Operating Test No.: 2011301			Rev. 4			
A P P L I C A N T	E V E N T T Y P E	Scenarios															
		1			2			3			4			T O T A L	M I N I M U M (*)		
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P		R	I	U
RO-2	RX											1		1	1		
	NOR													0	1		
	I/C									3 6		3 6 7 8		6	4		
	MAJ									4 7		5		3	2		
	TS													0	0		
RO-3	RX											1		1	1		
	NOR													0	1		
	I/C									3 6		3 6 7 8		6	4		
	MAJ									4 7		5		3	2		
	TS													0	0		
Instructions:																	
<ol style="list-style-type: none"> 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 <i>additionally</i> 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 <i>controlled</i> 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. 																	

<u>SRO</u>	<u>ATC</u>	<u>BOP</u>	<u>Scenario #</u>
I4	I2	I3	1
I2	I3	I4	3
U1	R1	R2	3
U2	I1	R3	3
I3	I4	I2	4
U3	R2	R1	4
I1	R3	U3	4

Standby scenario used as needed

Facility: Callaway	Scenario No.: 1 rev. 2	Op Test No.: 2011301
Examiners: _____	Operators: _____	
_____	_____	
_____	_____	
Initial Conditions:	100% Power, steady state, Middle of Core Life	
Turnover:	Turnover: The Turbine Driven Auxiliary Feed pump has been out of service for 1 hour. Work is scheduled to complete next shift. Lower letdown flow to 75 gpm for ALARA concerns due to maintenance planning walkdown near letdown line.	

Event No.	Malfunction No.	Event Type*	Event Description
1	N/A	SRO (N) RO (N)	Lower letdown flow to 75 gpm
2 15 min	BGLT0149 TVSP	RO (I) SRO (I)	VCT Level Channel BG LT-149 fails high
3 25 min	AELT0539	SRO (I) (TS) BOP(I)	SG "C" Controlling Level Channel fails low (Tech Spec)
4 35 min	ACPT0505 TVSP	SRO (I) (TS) RO (I) BOP(I)	Turbine Impulse Pressure Channel PT-505 Fails Low (Tech Spec)
5 45 min	EAD05	SRO (C) RO (C) BOP (C)	Loss of Main Condenser Vacuum at a rate requiring rapid controlled shutdown (provide cues as necessary for downpower)
6 60 min	AB003 LOASAS 9XX_2 & 6	SRO (M) RO (M) BOP(M)	Large Steam Line Rupture in Turbine Building with "B" MSIV failing open. (MSIV FAILURE PRELOADED)
7 N/A	JLOASBI8_2	SRO (C) BOP (C)	Failure of AL HIS-22A, MD AFP B, to automatically start (Integral to scenario) (PRELOADED)

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	3

Callaway 2011 NRC Scenario #1

The plant is operating at 100%, steady state power. The Turbine Driven Auxiliary Feedpump is tagged out for maintenance and will not be returned until next shift. During Turnover the crew is informed they will need to lower letdown flow for ALARA concerns. Once the crew takes the watch efforts should be made to reduce the amount of letdown flow to 75 gpm in accordance with OTN-BG-00001, Add 4, Operation of CVCS Letdown.

Once Letdown has been lowered, VCT Level Transmitter BG LT-149 fails High, causing the VCT Inlet, BG HV 0112A to Divert to the RHUT. The crew will enter OTO-BG-00004, VCT Level Channel Failures, and place Letdown Divert to VCT position. VCT Level will have to be controlled manually. No Tech Specs apply.

Once VCT Level addressed, Steam Generator "C" Controlling Channel, AE LI-553 fails low. The crew recognizes the failure and selects to an operable channel in accordance with OTO-AE-00002, Steam Generator Water Level Control Malfunctions. Tech Specs 3.3.1 and 3.3.2 apply.

After Tech Specs have been addressed by the SRO, AB PT-505 fails low. The crew should respond per OTO-AC-00003, Turbine Impulse Pressure Channel Failure, place rod control in Manual and Select HP Turbine First Stage Pressure Selector to Operable. Tech Spec 3.3.1 applies.

Once Tech Specs have been addressed and maintenance contacted to repair the failed channels, a Main Condenser Vacuum Leak occurs. The crew observes the degrading vacuum on the Main Control Board and enters OTO-AD-00001, Loss of Condenser Vacuum. The crew sees that vacuum is degrading at a slow continuous rate and starts to reduce turbine load.

Once Turbine Load has been reduced to approximately 1000 MWe, a steam line break develops in the Turbine Building which will be seen by the crew as RCS pressure and temperature rapidly lower. The crew will Manually trip the reactor based on these plant conditions. The crew should enter E-0, Reactor Trip or Safety Injection.

The "B" Main Steamline Isolation Valve fails to close in response to the Low Steam Line Pressure. The crew should make efforts to manually isolate the Main Steamlines and complete the isolation of SG 'B' in accordance with E-2, Faulted S/G Isolation, but the "B" SG cannot be isolated.

The "A" MDAFP starts normally, but the "B" MDAFP must be started manually due to malfunction inserted during the setup. The crew will then restore adequate feed to the intact Steam Generators

The scenario will end when the crew gets to the final step of E-2 and starts to transition to ES-1.1, SI Termination

Critical Tasks:

Event #3 CT – SG level channel failed low – Select away prior to reactor trip

Event #6 CT – Isolate Auxiliary Feedwater Flow supply to SG “B” before a transition out of E-2

Event #7 CT – Start the MDAFP “B” to establish AFW flow rate greater than 355,000 lbm/hr to the intact SGs before transition out of E-0.

References
OTN-BG-00001, Add 4
OTO-AE-00002
OTO-AC-00003
OTO-AD-00001
OTO-BG-00004
E-0
E-2
ES-1.1

Facility: Callaway

Scenario No.: 3 rev.2

Op-Test No.: 2011301

Examiners: _____ Operators: _____

Initial Conditions: 100% Power, steady state, Middle of Core Life

Turnover: 'B' RHR Pump is out of Service for a breaker inspection. The 'B' RHR Pump should be returned to service in 8 hours. This is the 'A' Train Protected week. The crew is directed to maintain the current power level.

Event No.	Malf. No.	Event Type*	Event Description
1	BBLT0459	SRO (I) RO (I)	Pressurizer Level Channel fails Low (Tech Spec)
2	BGLCV 0459	RO (C) SRO (C)	Letdown cannot be restored, establish Excess Letdown
3 (25 min)	SEN0042	SRO (I) BOP (I)	Power Range Excore instrument N42 Fails Low (Tech Spec)
4 (50 min)	Quakey09 NE02	SRO (M) RO (M) BOP (M)	Earthquake / Loss of Off Site Power and Trip of Emergency Diesel Generator 'B' (IPE/PRA). (Trip of DG "B" PRELOADED)
5 (N/A)	SF006	SRO (C) RO (C)	Reactor Auto Trip Failure (PRELOADED)
6 (N/A)	JINHBFC	SRO (C) BOP (C)	TDAFW Pump Auto Start Failure (PRELOADED)
7 (N/A)	NE01	SRO (M) RO (M) BOP (M)	DG"A" Failure / Loss of all AC
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	3
4. Major transients (1-2)	2
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical tasks (2-3)	3

Callaway 2011 NRC Scenario #3

The plant is stable at 100%. RHR Pump "B" was taken Out of Service for a breaker inspection and should be returned to service in 8 hours. The crew is requested to maintain power at 100%.

Pressurizer Level Channel BB LT-459 fails low, causing a loss of CVCS Letdown. The crew should respond per OTO-BG-00001, "Pressurizer Level Control Malfunction", and refer to Technical Specification 3.3.1. When letdown restoration is attempted, BG LCV-0459 will not open. The crew will place excess letdown in service per OTN-BG-00001, Add 4, Operation of CVCS Letdown as a Normal Evolution.

Once Excess Letdown is in Service, Power Range Excore Nuclear Instrument N42 fails Low. The crew enters OTO-SE-00001, Nuclear Instrument Malfunction and takes action to Bypass the failed channel at the NI Back Panel. The BOP Operator will take these actions due to the RO monitoring Excess Letdown. Tech Spec 3.3.1 will be referenced due to the failed channel.

A major earthquake causes a loss of off-site power. The reactor fails to automatically trip. The crew must manually trip the reactor. Once the reactor trips the 'B' Emergency Diesel Generator will trip, leaving the crew with only one emergency bus. The crew should respond to the reactor trip per E-0, Reactor Trip or Safety Injection. A Safety Injection also actuates.

The Turbine Driven Auxiliary Feed Pump (TDAFP) fails to automatically start. The crew must manually start the TDAFP.

At the completion of Step 10 in E-0, Reactor Trip or Safety Injection the 'A' Diesel Generator will be tripped causing a Loss of All AC Power. The crew will transition to ECA-0.0, Loss of All AC Power.

The scenario is complete when the crew initiates ECA-0.0 step 16, Depressurize Intact SGs to 260 PSIG OR at the discretion of the Chief Examiner.

Critical Tasks:

Event #5 CT – Manually Trip the reactor from the control room following failure to Auto trip.

Event #6 CT – Establish a > 355,000 lbm/hr Auxiliary Feedwater flow rate to the Steam Generators before SG level of < 10% Wide Range (dryout) occurs.

Event #7 CT – Establish a cooldown of the RCS at less than 100 °F/hr prior to RCP seal damage occurring.

References
OTG-ZZ-00004
OTO-BG-00001
OTN-BG-00001, Addendum 4
OTN-BB-00005
OTO-SE-00001
E-0
ES-0.1
ECA-0.0

Facility: Callaway

Scenario No.: 4 rev 3

Op-Test No.: 2011301

Examiners: _____ Operators: _____

Initial Conditions: 100% Power, steady state, Middle of Core Life

Turnover: The plant has been at the current power level for two (2) months. The crew has been requested to reduce Reactor Power to 90% to remove the "A" Condensate Pump from service due to problems with the suction strainer.

Event No.	Malf. No.	Event Type*	Event Description
1 10 min	N/A	SRO (N) RO (R) BOP (N)	Reduce Power to 90% to remove Condensate Pump "A" from service
2 (20 min)	ABPT05 45	SRO (I) BOP (I)	SG "D" Controlling Pressure Channel Fails Low (Tech Spec)
3 (20 min)	BBPCV 0455B_1	SRO (C) RO (C)	Pressurizer Spray Valve Drifts Open
4 (30 min)	ABPV 0001_1	SRO (C) BOP (C)	Atmospheric Steam Dump "A" Fails Open (Tech Spec)
5 (40 min)	BB 002_A	SRO (M) RO/BOP (M)	Small Break LOCA Requiring Reactor Trip (Tech Spec)
6 (50 min)	BB 002_A	SRO (C) RO (C) BOP (C)	Large Break LOCA of 10000 gpm following Reactor Trip, requiring Safety Injection
7 (N/A)	JINHBSI NF039B	SRO (I) RO (I) BOP (I)	Safety Injection fails to actuate Automatically, so Manual initiation required and then "B" Train LOCA Sequencer Fails to actuate components (PRELOADED)
8 (N/A)	NG02B EF2 PEJ01A	SRO (C) RO (C)	Upon receipt of SI Signal, EJ HV8811B loses power and "A" RHR Pump Trips (Integral to Loss of Emergency Recirc Capability) (PRELOADED)

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	4
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical tasks (2-3)	3

Callaway 2011 NRC Scenario #4

The plant has been at the current power level for two (2) months. The crew is directed to lower Reactor Power to 90% to remove Condensate Pump "A" from service.

After a power reduction has been observed, SG "D" controlling pressure channel fails low. The crew enters OTO-AE-00002, Steam Generator Water Level Control Malfunctions, and selects an operable steam flow channel. Tech Spec 3.3.2 is applicable.

After the plant has been stabilized, a single Pressurizer Spray Valve fails/drifts open. This causes pressurizer pressure to lower. The crew should enter OTO-BB-00006, Pressurizer Pressure Control Malfunction, to manually operate the pressurizer spray loop controller affected. Tech Spec 3.4.1 may be entered to address RCS DNB conditions.

AB PV-0001, Atmospheric Steam Dump "A" fails open. The crew will enter OTO-AB-00001, Steam Dump Malfunction. The crew will be able to close the failed steam dump from the Control Room. Tech Spec 3.7.4 should be reviewed for the failed valve.

After Maintenance has been contacted to repair AB PV-0001, a small break LOCA of approximately 80 gpm initiates. The crew enters OTO-BB-00003, Excessive RCS Leakage, and maximizes charging to offset the leakage. The crew should determine that the leak rate is greater than 50 gpm and initiate a reactor trip. The CRS should determine that leakage is in excess of allowed per Tech Spec 3.4.13, RCS operational Leakage.

The crew enters E-0, Reactor Trip or Safety Injection. When the reactor is tripped the leak continues to increase to 10,000 gpm causing a Safety Injection Signal. The Automatic Safety Injection Signal (SIS) is overridden forcing the crew to manually actuate Safety Injection. Train "B" components will fail to actuate due to failure of the "B" LOCA Sequencer. The crew will continue in E-0 and transition to E-1, Loss of Primary or Secondary Coolant.

Upon receipt of the SIS, EJ HV-8811B loses power and RHR Pump "A" trips causing a loss of Emergency Recirculation capability. This will cause the crew to transition to ECA-1.1, Loss of Emergency Coolant Recirculation.

The scenario can be terminated when the crew completes Step 7 of ECA-1.1, Loss of Emergency Coolant Recirculation, or at the discretion of the Chief Examiner.

Critical Tasks:

Event #3 CT – Manually Trip the Reactor from the control room when it is determined that RCS leakage is > 50 gpm

Event #4 CT – Trip all RCPs such that the core does not uncover (RVLIS<55%) AND prior to commencing an operator controlled cooldown.

Event #5 CT – Manually actuate a Safety Injection before transitioning from E-0.

References
OTG-ZZ-00004
OTG-ZZ-00004, Addendum 03
OTO-AB-00001
OTO-AE-00002
OTO-BB-00003
OTO-BB-00006
E-0
E-1
ECA-1.1