

Facility:		Callaway		Date of Exam:		8/22/2005											
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	1	1	3				7	4			2	18	3	3	6	
	2	1	2	2				2	2			0	9	2	2	4	
	Tier Totals	2	3	5				9	6			2	27	5	5	10	
2. Plant Systems	1	4	2	2	4	2	2	3	3	2	3	1	28	3	2	5	
	2	1	2	1	0	0	1	0	0	2	1	2	10	1	2	3	
	Tier Totals	5	4	3	4	2	3	3	3	4	4	3	38	4	4	8	
3. Generic Knowledge and Abilities Categories					1	2	3	4				10	1	2	3	4	7
					2	2	2	4					1	2	2	2	
Note:	1.	Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).															
	2.	The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.															
	3.	Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to ES-401, Attachment 2, for guidance regarding 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 KAs 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.															
	8.	On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IR) 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. 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 10CFR55.43															

PWR BOTH Written Examination Outline
Emergency and Abnormal Plant Evolutions – Tier 1 Group 1

E/APE # / Name Safety Function	G	K1	K2	K3	A1	A2	Number	K/A Topic(s)	Imp.	Q#
008 / Pressurizer Vapor Space Accident / 3						X	AA2.30	Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: Inadequate Core Cooling	4.7	76
011 / Large Break LOCA / 3	X						2.2.25	Equipment Control Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	77
022 / Loss of Rx Coolant Makeup / 2						X	AA2.03	Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: Failures of flow control valve or controller	3.6	78
038 / Steam Gen. Tube Rupture / 3	X						2.1.32	Conduct of Operations: Ability to explain and apply all system limits and precautions.	3.8	79
054 / Loss of Main Feedwater / 4	X						2.4.49	Emergency Procedures / Plan Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	80
E04 / LOCA Outside Containment / 3						X	EA2.1	Ability to determine and interpret the following as they apply to the (LOCA Outside Containment) Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	4.3	81
007 / Reactor Trip - Stabilization - Recovery / 1					X		EA1.02	Ability to operate and monitor the following as they apply to a reactor trip: MFW System	3.8	39
008 / Pressurizer Vapor Space Accident / 3			X				AK2.03	Knowledge of the interrelations between the Pressurizer Vapor Space Accident and the following: Controllers and positioners	2.5	40
009 / Small Break LOCA / 3				X			EK3.12	Knowledge of the reasons for the following responses as they apply to the small break LOCA: Letdown isolation	3.4	41
011 / Large Break LOCA / 3	X						2.1.23	Conduct of Operations: Ability to perform specific system and integrated plant procedures during all modes of plant operation.	3.9	42
025 / Loss of RHR System / 4	X						2.1.30	Conduct of Operations: Ability to locate and operate components, including local controls.	3.9	43
026 / Loss of Component Cooling Water / 8						X	AA2.06	Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: The length of time after the loss of CCW flow to a component before that component may be damaged	2.8	44
027 / Pressurizer Pressure Control System Malfunction / 3						X	AA2.04	Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions: Tech-Spec limits for RCS pressure	3.7	45
029 / ATWS / 1					X		EA1.10	Ability to operate and monitor the following as they apply to a ATWS: Rod control function switch	3.6	46

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Emergency and Abnormal Plant Evolutions – Tier 1 Group 1

E/APE # / Name Safety Function	G	K1	K2	K3	A1	A2	Number	K/A Topic(s)	Imp.	Q#
038 / Steam Gen. Tube Rupture / 3					X		EA1.35	Ability to operate and monitor the following as they apply to a SGTR: Steam dump condenser	3.5	47
040 / Steam Line Rupture - Excessive Heat Transfer / 4					X		AA1.05	Ability to operate and / or monitor the following as they apply to the Steam Line Rupture: Manual and automatic RPS trip initiation	4.5	48
054 / Loss of Main Feedwater / 4						X	AA2.02	Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): Differentiation between loss of all MFW and trip of one MFW pump	4.1	49
056 / Loss of Off-site Power / 6		X					AK1.01	Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: Principle of cooling by natural convection	3.7	50
057 / Loss of Vital AC Inst. Bus / 6					X		AA1.04	Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: RWST and VCT valves	3.5	51
058 / Loss of DC Power / 6						X	AA2.01	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	3.7	52
062 / Loss of Nuclear Svc. Water / 4					X		AA1.07	Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water: Flow rates to the components and systems that are serviced by the CCWS; interactions among the components	2.9	53
E04 / LOCA Outside Containment / 3				X			EK3.2	Knowledge of the reasons for the following responses as they apply to the (LOCA Outside Containment) Normal, abnormal and emergency operating procedures associated with (LOCA Outside Containment).	3.4	54
E11 / Loss of Emergency Coolant Recirc. / 4				X			EK3.4	Knowledge of the reasons for the following responses as they apply to the (Loss of Emergency Coolant Recirculation) RO or SRO function as a within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.	3.6	55
E12 / Steam Line Rupture - Excessive Heat Transfer / 4					X		EA1.3	Ability to operate and / or monitor the following as they apply to the (Uncontrolled Depressurization of all Steam Generators) Desired operating results during abnormal and emergency situations.	3.4	56
K/A Category Point Totals:	2/3	1	1	3	7	4/3	Group Point Total:			18/6

PWR BOTH Written Examination Outline
Emergency and Abnormal Plant Evolutions – Tier 1 Group 2

E/APE # / Name Safety Function	G	K1	K2	K3	A1	A2	Number	K/A Topic(s)	Imp.	Q#
001 / Continuous Rod Withdrawal / 1						X	AA2.02	Ability to determine and interpret the following as they apply to the Continuous Rod Withdrawal: Proper actions to be taken if automatic safety functions have not taken place	4.5	82
037 / Steam Generator Tube Leak / 3	X						2.2.22	Equipment Control Knowledge of limiting conditions for operations and safety limits.	4.1	83
060 / Accidental Gaseous RadWaste Rel. / 9						X	AA2.04	Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: Valve lineup for release of radioactive gases	3.6	84
E14 / Loss of CTMT Integrity / 5	X						2.4.6	Emergency Procedures / Plan Knowledge symptom based EOP mitigation strategies.	4.0	85
036 / Fuel Handling Accident / 8					X		AA1.02	Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: ARM system	3.1	57
037 / Steam Generator Tube Leak / 3					X		AA1.06	Ability to operate and / or monitor the following as they apply to the Steam Generator Tube Leak: Main steam line rad monitor meters	3.8	58
059 / Accidental Liquid RadWaste Rel. / 9		X					AK1.02	Knowledge of the operational implications of the following concepts as they apply to Accidental Liquid Radwaste Release: Biological effects on humans of various types of radiation, exposure levels that are acceptable for nuclear power plant personnel, and the units used for radiation-intensity measurements and for radiation exposure levels	2.6	59
E01 & E02 Rediagnosis and SI Termination / 3				X			EK3.1	Knowledge of the reasons for the following responses as they apply to the (Reactor Trip or Safety Injection/Rediagnosis) Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.	3.0	60
E03 / LOCA Cooldown - Depress. / 4				X			EK3.2	Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown and Depressurization) Normal, abnormal and emergency operating procedures associated with (LOCA Cooldown and Depressurization).	3.4	61
E07 / Inad. Core Cooling / 4						X	EA2.2	Ability to determine and interpret the following as they apply to the (Saturated Core Cooling) Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	3.3	62

PWR BOTH Written Examination Outline
 Emergency and Abnormal Plant Evolutions – Tier 1 Group 2

E/APE # / Name Safety Function	G	K1	K2	K3	A1	A2	Number	K/A Topic(s)	Imp.	Q#
E08 / RCS Overcooling - PTS / 4			X				EK2.1	Knowledge of the interrelations between the (Pressurized Thermal Shock) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.4	63
E09 / Natural Circ. / 4						X	EA2.2	Ability to determine and interpret the following as they apply to the (Natural Circulation Operations) Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	3.4	64
E14 / Loss of CTMT Integrity / 5			X				EK2.1	Knowledge of the interrelations between the (High Containment Pressure) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.4	65
K/A Category Point Total:	0/2	1	2	2	2	2/2	Group Point Total:			9/4

System #/Name	G	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	Number	K/A Topics	Imp.	Q#
006 Emergency Core Cooling									X			A2.12	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: Conditions requiring actuation of ECCS	4.8	86
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	4.2	87
064 Emergency Diesel Generator	X											2.4.30	Emergency Procedures / Plan Knowledge of which events related to system operations/status should be reported to outside agencies.	3.6	88
076 Service Water									X			A2.02	Ability to (a) predict the impacts of the following malfunctions or operations on the SWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Service water header pressure	3.1	89
103 Containment	X											2.1.14	Conduct of Operations: Knowledge of system status criteria which require the notification of plant personnel.	3.3	90
003 Reactor Coolant Pump		X										K1.01	Knowledge of the physical connections and/or cause-effect relationships between the RCPS and the following systems: RCP lube oil	2.6	1
003 Reactor Coolant Pump								X				A1.01	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCPS controls including: RCP vibration	2.9	2
004 Chemical and Volume Control				X								K3.06	Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: RCS temperature and pressure	3.4	3
004 Chemical and Volume Control					X							K4.15	Knowledge of CVCS design feature(s) and/or interlock(s) which provide for the following: Interlocks associated with operation of orifice isolation valves	3.0	16
005 Residual Heat Removal						X						K5.03	Knowledge of the operational implications of the following concepts as they apply the RHRS: Reactivity effects of RHR fill water	2.9	4
006 Emergency Core Cooling					X							K4.10	Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: Redundant pressure meters	2.9	5

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PWR BOTH Written Examination Outline
Plant Systems – Tier 2 Group 1

System #/Name	G	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	Number	K/A Topics	Imp.	Q#
007 Pressurizer Relief/Quench Tank									X			A2.02	Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Abnormal pressure in the PRT	2.6	6
008 Component Cooling Water										X		A3.08	Ability to monitor automatic operation of the CCWS, including: Automatic actions associated with the CCWS that occur as a result of a safety injection signal	3.6	7
008 Component Cooling Water			X									K2.02	Knowledge of bus power supplies to the following: CCW pump, including emergency backup	3.0	8
010 Pressurizer Pressure Control								X				A1.08	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PZR PCS controls including: Spray nozzle DT	3.2	9
010 Pressurizer Pressure Control		X										K1.01	Knowledge of the physical connections and/or cause-effect relationships between the PZR PCS and the following systems: RPS	3.9	10
012 Reactor Protection			X									K2.01	Knowledge of bus power supplies to the following: RPS channels, components, and interconnections	3.3	11
012 Reactor Protection										X		A3.06	Ability to monitor automatic operation of the RPS, including: Trip logic	3.7	12
013 Engineered Safety Features Actuation		X										K1.14	Knowledge of the physical connections and/or cause effect relationships between the ESFAS and the following systems: IAS	3.1	13
013 Engineered Safety Features Actuation						X						K5.01	Knowledge of the operational implications of the following concepts as they apply to the ESFAS: Definitions of safety train and ESF channel	2.8	14
022 Containment Cooling									X			A2.04	Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of service water	2.9	15
026 Containment Spray	X											2.1.2	Conduct of Operations: Knowledge of operator responsibilities during all modes of plant operation.	3.0	17
039 Main and Reheat Steam				X								K3.05	Knowledge of the effect that a loss or malfunction of the MRSS will have on the following: RCS	3.6	18

System #/Name	G	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	Number	K/A Topics	Imp.	Q#
059 Main Feedwater									X			A2.07	Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Tripping of MFW pump turbine	3.0	19
061 Auxillary/Emergency Feedwater							X					K6.02	Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Pumps	2.6	20
062 AC Electrical Distribution								X				A1.01	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ac distribution system controls including: Significance of D/G load limits	3.4	21
063 DC Electrical Distribution					X							K4.02	Knowledge of dc electrical system design feature(s) and/or interlock(s) which provide for the following: Breaker interlocks, permissives, bypasses and cross-ties.	2.9	22
063 DC Electrical Distribution											X	A4.01	Ability to manually operate and/or monitor in the control room: Major breakers and control power fuses	2.8	23
064 Emergency Diesel Generator							X					K6.08	Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Fuel oil storage tanks	3.2	24
073 Process Radiation Monitoring											X	A4.01	Ability to manually operate and/or monitor in the control room: Effluent release	3.9	25
076 Service Water		X										K1.19	Knowledge of the physical connections and/or cause- effect relationships between the SWS and the following systems: SWS emergency heat loads	3.6	26
078 Instrument Air					X							K4.01	Knowledge of IAS design feature(s) and/or interlock(s) which provide for the following: Manual/automatic transfers of control	2.7	27
103 Containment											X	A4.04	Ability to manually operate and/or monitor in the control room: Phase A and phase B resets	3.5	28
K/A Category Point Totals:	1/2	4	2	2	4	2	2	3	3/3	2	3	Group Point Total:			28/5

System #/Name	G	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	Number	K/A Topics	Imp.	Q#
001 Control Rod Drive	X											2.4.4	Emergency Procedures / Plan Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.	4.3	91
002 Reactor Coolant	X											2.1.28	Conduct of Operations: Knowledge of the purpose and function of major system components and controls.	3.3	92
011 Pressurizer Level Control									X			A2.03	Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of PZR level	3.9	93
001 Control Rod Drive			X									K2.02	Knowledge of bus power supplies to the following: One-line diagram of power supply to trip breakers	3.6	29
011 Pressurizer Level Control							X					K6.04	Knowledge of the effect of a loss or malfunction on the following will have on the PZR LCS: Operation of PZR level controllers	3.1	30
014 Rod Position Indication	X											2.1.27	Conduct of Operations: Knowledge of system purpose and or function.	2.8	31
015 Nuclear Instrumentation			X									K2.01	Knowledge of bus power supplies to the following: NIS channels, components, and interconnections	3.3	32
017 In-core Temperature Monitor	X											2.1.28	Conduct of Operations: Knowledge of the purpose and function of major system components and controls.	3.1	33
029 Containment Purge										X		A3.01	Ability to monitor automatic operation of the Containment Purge System including: CPS isolation	3.8	34
041 Steam Dump/Turbine Bypass Control										X		A3.05	Ability to monitor automatic operation of the SDS, including: Main steam pressure	2.9	35
045 Main Turbine Generator		X										K1.19	Knowledge of the physical connections and/or cause-effect relationships between the MT/G system and the following systems: ESFAS	3.4	36
071 Waste Gas Disposal				X								K3.05	Knowledge of the effect that a loss or malfunction of the Waste Gas Disposal System will have on the following: ARM and PRM systems	3.2	37
079 Station Air											X	A4.01	Ability to manually operate and/or monitor in the control room: Cross-tie valves with IAS	2.7	38
K/A Category Point Totals:	2/2	1	2	1	0	0	1	0	0/1	2	1	Group Point Total:			10/3

Facility:	Callaway	Date of Exam:	8/22/2005			
Category	K/A #	Topic	RO		SRO-Only	
			IR	Q#	IR	Q#
1. Conduct of Operations	2.1.33	Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.			4.0	94
	2.1.18	Ability to make accurate, clear and concise logs, records, status boards, and reports.	2.9	66		
	2.1.16	Ability to operate plant phone, paging system, and two-way radio.	2.9	67		
	Subtotal			2		1
2. Equipment Control	2.2.33	Knowledge of control rod programming.			2.9	95
	2.2.10	Knowledge of the process for determining if the margin of safety, as defined in the basis of any technical specification is reduced by a proposed change, test or experiment.			3.3	96
	2.2.25	Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	2.5	68		
	2.2.2	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.	4.0	69		
	Subtotal			2		2
3. Radiation Control	2.3.8	Knowledge of the process for performing a planned gaseous radioactive release.			3.2	97
	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.			3.3	98
	2.3.9	Knowledge of the process for performing a containment purge.	2.5	70		
	2.3.11	Ability to control radiation releases.	2.7	71		
	Subtotal			2		2
4. Emergency Procedures / Plan	2.4.4	Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.			4.3	99
	2.4.38	Ability to take actions called for in the facility emergency plan, including (if required) supporting or acting as emergency coordinator.			4.0	100
	2.4.31	Knowledge of annunciators, alarms and indications, and use of the response instructions.	3.3	72		
	2.4.3	Ability to identify post-accident instrumentation.	3.5	73		
	2.4.12	Knowledge of general operating crew responsibilities during emergency operations.	3.4	74		
	2.4.29	Knowledge of the emergency plan.	2.6	75		
	Subtotal			4		2
Tier 3 Point Total				10		7

