

Facility: Palo Verde

Printed: 07/09/2009

Date Of Exam: 11/06/2009

Tier	Group	RO K/A Category Points											SRO-Only Points					
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total		
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A			3	18	0	0	0	
	2	1	2	1				2	2				1	9	0	0	0	
	Tier Totals	4	5	4				5	5				4	27	0	0	0	
2. Plant Systems	1	3	2	3	3	3	2	3	2	1	3	3	28	0	0	0		
	2	1	1	1	1	1	1	1	1	1	0	1	10	0	0	0		
	Tier Totals	4	3	4	4	4	3	4	3	2	3	4	38	0	0	0		
3. Generic Knowledge And Abilities Categories				1		2		3		4		10		1	2	3	4	0
				3		3		2		2				0	0	0	0	

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/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.

PWR RO Examination Outline

Printed: 07/09/2009

Facility: Palo Verde

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000008 Pressurizer Vapor Space Accident / 3						X	2.4.11 - Knowledge of abnormal condition procedures.	4.0	1
000009 Small Break LOCA / 3				X			EA1.07 - CCS	3.7	1
000011 Large Break LOCA / 3						X	2.1.27 - Knowledge of system purpose and/or function.	3.9	1
000015/000017 RCP Malfunctions / 4					X		AA2.02 - Abnormalities in RCP air vent flow paths and/or oil cooling system	2.8	1
000022 Loss of Rx Coolant Makeup / 2	X						AK1.02 - Relationship of charging flow to pressure differential between charging and RCS	2.7	1
000025 Loss of RHR System / 4		X					AK2.02 - LPI or Decay Heat Removal/RHR pumps	3.2*	1
000026 Loss of Component Cooling Water / 8				X			AA1.01 - CCW temperature indications	3.1	1
000027 Pressurizer Pressure Control System Malfunction / 3				X			AA1.03 - Pressure control when on a steam bubble	3.6	1
000029 ATWS / 1	X						EK1.03 - Effects of boron on reactivity	3.6	1
000040 Steam Line Rupture - Excessive Heat Transfer / 4	X						AK1.01 - Consequences of PTS	4.1	1
000054 Loss of Main Feedwater / 4			X				AK3.01 - Reactor and/or turbine trip, manual and automatic	4.1	1
000055 Station Blackout / 6			X				EK3.01 - Length of time for which battery capacity is designed	2.7	1
000056 Loss of Off-site Power / 6					X		AA2.57 - RCS hot-leg and cold-leg temperatures	3.9	1
000057 Loss of Vital AC Inst. Bus / 6						X	2.4.14 - Knowledge of general guidelines for EOP usage.	3.8	1
000058 Loss of DC Power / 6			X				AK3.01 - Use of dc control power by ED/Gs	3.4*	1
000065 Loss of Instrument Air / 8					X		AA2.03 - Location and isolation of leaks	2.6	1
000077 Generator Voltage and Electric Grid Disturbances / 6		X					AK2.07 - Turbine / Generator control	3.6	1
CE/E02 Reactor Trip - Stabilization - Recovery / 1		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.3	1
K/A Category Totals:	3	3	3	3	3	3		Group Point Total:	18

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000001 Continuous Rod Withdrawal / 1			X				AK3.02 - Tech-Spec limits on rod operability	3.2	1
000024 Emergency Boration / 1					X		AA2.05 - Amount of boron to add to achieve required SDM	3.3	1
000028 Pressurizer Level Malfunction / 2						X	2.1.28 - Knowledge of the purpose and function of major system components and controls.	4.1	1
000037 Steam Generator Tube Leak / 3					X		AA2.16 - Pressure at which to maintain RCS during S/G cooldown	4.1	1
000068 Control Room Evac. / 8		X					AK2.01 - Auxiliary shutdown panel layout	3.9	1
000069 Loss of CTMT Integrity / 5				X			AA1.03 - Fluid systems penetrating containment	2.8	1
000076 High Reactor Coolant Activity / 9		X					AK2.01 - Process radiation monitors	2.6	1
CE/A16 Excess RCS Leakage / 2				X			EA1.3 - Desired operating results during abnormal and emergency situations	3.0	1
CE/E09 Functional Recovery	X						EK1.1 - Components, capacity, and function of emergency systems	3.4	1
K/A Category Totals:	1	2	1	2	2	1	Group Point Total:	9	

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ES - 401 Plant Systems - Tier 2 / Group 1 Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
003 Reactor Coolant Pump					X							K5.02 - Effects of RCP coastdown on RCS parameters	2.8	1
004 Chemical and Volume Control			X									K3.08 - RCP seal injection	3.6	1
004 Chemical and Volume Control						X						K6.22 - Design minimum and maximum flow rates for letdown system	2.6	1
005 Residual Heat Removal		X										K2.03 - RCS pressure boundary motor-operated valves	2.7*	1
006 Emergency Core Cooling	X											K1.02 - ESFAS	4.3	1
007 Pressurizer Relief/Quench Tank										X		A4.09 - Relationships between PZR level and changing levels of the PRT and bleed holdup tank	2.5	1
007 Pressurizer Relief/Quench Tank								X				A2.03 - Overpressurization of the PZR	3.6	1
008 Component Cooling Water											X	2.1.1 - Knowledge of conduct of operations requirements.	3.8	1
010 Pressurizer Pressure Control						X						K6.03 - PZR sprays and heaters	3.2	1
012 Reactor Protection					X							K5.01 - DNB	3.3*	1
012 Reactor Protection											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.	4.2	1
013 Engineered Safety Features Actuation				X								K4.03 - Main Steam Isolation System	3.9	1
013 Engineered Safety Features Actuation		X										K2.01 - ESFAS/safeguards equipment control	3.6*	1
022 Containment Cooling				X								K4.01 - Cooling of containment penetrations	2.5*	1
026 Containment Spray							X					A1.06 - Containment spray pump cooling	2.7	1
026 Containment Spray											X	2.2.41 - Ability to obtain and interpret station electrical and mechanical drawings.	3.5	1
039 Main and Reheat Steam							X					A1.06 - Main steam pressure	3.0	1
059 Main Feedwater										X		A4.03 - Feedwater control during power increase and decrease	2.9*	1
061 Auxiliary/Emergency Feedwater					X							K5.01 - Relationship between AFW flow and	3.6	1

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ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
			X									RCS heat transfer		
061 Auxiliary/Emergency Feedwater			X									K3.02 - S/G	4.2	1
062 AC Electrical Distribution	X											K1.04 - Off-site power sources	3.7	1
062 AC Electrical Distribution								X				A2.04 - Effect on plant of de-energizing a bus	3.4*	1
063 DC Electrical Distribution										X		A4.02 - Battery voltage indicator	2.8*	1
064 Emergency Diesel Generator				X								K4.02 - Trips for ED/G while operating (normal or emergency)	3.9	1
073 Process Radiation Monitoring	X											K1.01 - Those systems served by PRMs	3.6	1
076 Service Water							X					A1.02 - Reactor and turbine building closed cooling water temperatures	2.6*	1
078 Instrument Air			X									K3.02 - Systems having pneumatic valves and controls	3.4	1
103 Containment									X			A3.01 - Containment isolation	3.9	1
K/A Category Totals:	3	2	3	3	3	2	3	2	1	3	3		Group Point Total:	28

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Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
001 Control Rod Drive							X					A1.09 - Location and interpretation of RCS temperature and pressure indications	4.2	1
002 Reactor Coolant				X								K4.02 - Monitoring reactor vessel level	3.5*	1
011 Pressurizer Level Control		X										K2.02 - PZR heaters	3.1	1
014 Rod Position Indication					X							K5.01 - Reasons for differences between RPIS and step counter	2.7	1
015 Nuclear Instrumentation	X											K1.03 - CRDS	3.1*	1
017 In-core Temperature Monitor			X									K3.01 - Natural circulation indications	3.5*	1
028 Hydrogen Recombiner and Purge Control						X						K6.01 - Hydrogen recombiners	2.6	1
035 Steam Generator											X	2.4.31 - Knowledge of annunciator alarms, indications, or response procedures.	4.2	1
041 Steam Dump/Turbine Bypass Control								X				A2.02 - Steam valve stuck open	3.6	1
045 Main Turbine Generator									X			A3.07 - Turbine stop/governor valve closure on turbine trip	3.5	1
K/A Category Totals:	1	0	1	Group Point Total:	10									

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.17	Ability to make accurate, clear, and concise verbal reports.	3.9	1
	2.1.23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.3	1
	2.1.29	Knowledge of how to conduct system lineups such as valves, breakers, switches, etc.	4.1	1
	Category Total:			3
Equipment Control	2.2.22	Knowledge of limiting conditions for operations and safety limits.	4.0	1
	2.2.36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations	3.1	1
	2.2.39	Knowledge of less than or equal to one hour Technical Specification action statements for systems.	3.9	1
	Category Total:			3
Radiation Control	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.	3.2	1
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	1
	Category Total:			2
Emergency Procedures/Plan	2.4.21	Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	4.0	1
	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm.	4.1	1
	Category Total:			2

Generic Total: 10

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Tier	Group	RO K/A Category Points											SRO-Only Points					
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total		
1. Emergency & Abnormal Plant Evolutions	1	0	0	0	N/A			0	0	N/A			0	0	3		3	6
	2	0	0	0				0	0				0	0	2		2	4
	Tier Totals	0	0	0				0	0				0	0	0	5		5
2. Plant Systems	1	0	0	0	0	0	0	0	0	0	0	0	0	3		2	5	
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	
	Tier Totals	0	0	0	0	0	0	0	0	0	0	0	0	5		3	8	
3. Generic Knowledge And Abilities Categories				1		2		3		4		0		1	2	3	4	7
				0		0		0		0				1	2	2	2	

Note:

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000009 Small Break LOCA / 3						X	2.1.23 - Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	1
000022 Loss of Rx Coolant Makeup / 2						X	2.4.47 - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	1
000026 Loss of Component Cooling Water / 8					X		AA2.02 - The cause of possible CCW loss	3.6	1
000054 Loss of Main Feedwater / 4						X	2.4.38 - Ability to take actions called for in the facility emergency plan, including supporting or acting as emergency coordinator if required.	4.4	1
CE/E02 Reactor Trip - Stabilization - Recovery / 1					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.7	1
CE/E05 Steam Line Rupture - Excessive Heat Transfer / 4					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	4.2	1
K/A Category Totals:	0	0	0	0	3	3		Group Point Total:	6

PWR SRO Examination Outline

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
000003 Dropped Control Rod / 1					X		AA2.03 - Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements	3.8	1
000024 Emergency Boration / 1					X		AA2.04 - Availability of BWST	4.2	1
000051 Loss of Condenser Vacuum / 4						X	2.3.14 - Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.8	1
000076 High Reactor Coolant Activity / 9						X	2.3.11 - Ability to control radiation releases.	4.3	1
K/A Category Totals:	0	0	0	0	2	2		Group Point Total:	4

PWR SRO Examination Outline

Printed: 07/09/2009

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ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
005 Residual Heat Removal											X	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.	3.8	1
039 Main and Reheat Steam								X				A2.05 - Increasing steam demand, its relationship to increases in reactor power	3.6	1
059 Main Feedwater								X				A2.02 - Loss of feedwater heater	2.5*	1
064 Emergency Diesel Generator											X	2.1.23 - Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	1
076 Service Water								X				A2.01 - Loss of SWS	3.7*	1
K/A Category Totals:	0	3	0	0	2	Group Point Total:	5							

PWR SRO Examination Outline

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ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
002 Reactor Coolant								X				A2.03 - Loss of forced circulation	4.3	1
017 In-core Temperature Monitor											X	2.4.40 - Knowledge of SRO responsibilities in emergency plan implementation.	4.5	1
033 Spent Fuel Pool Cooling								X				A2.03 - Abnormal spent fuel pool water level or loss of water level	3.5	1
K/A Category Totals:	0	2	0	0	1	Group Point Total:		3						

Generic Knowledge and Abilities Outline (Tier 3)

PWR SRO Examination Outline

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Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	1
	Category Total:			1
Equipment Control	2.2.20	Knowledge of the process for managing troubleshooting activities.	3.8	1
	2.2.38	Knowledge of conditions and limitations in the facility license.	4.5	1
	Category Total:			2
Radiation Control	2.3.11	Ability to control radiation releases.	4.3	1
	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.	3.8	1
	Category Total:			2
Emergency Procedures/Plan	2.4.11	Knowledge of abnormal condition procedures.	4.2	1
	2.4.30	Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.	4.1	1
	Category Total:			2
Generic Total:			7	