

Outline Development for 3/2004 Fort Calhoun NRC Exam

This exam outline was developed in accordance with NUREG-1021, draft Rev 9. In addition, the NRC Region IV A Good Practices document was used as a reference.

Written Exam Outline

Fort Calhoun has developed a methodology to ensure that the selection of K/A items for the written exam is random and unbiased. The written exam outline was developed using a Microsoft Access database. All K/A items from NUREG-1122, Rev 2 are contained in a table within the database. Items which clearly are not applicable to Fort Calhoun are assigned a flag to prevent them from being sampled. Flagged items are selected using guidance provided in ES-401, attachment 2. Flagged items include the Ice Condenser System K/A's, Non-Combustion Engineering vender specific EPE/APE K/A's, and K/A's only associated with multi-unit plants. The sample plan is developed as follows:

- \$ A module is run that assigns a random number to each item in the K/A catalog. This module uses a Randomize routine to ensure that the pattern of random numbers is unique.
- \$ A query is run that presents K/A items belonging to the tier and group being sampled ordered by their associated random number. Minimum and maximum numbers are assigned to topics and categories to prevent over and under sampling. Items are entered in the sample plan as ordered, subject to the pre-established minimums and maximums. If a sampled K/A item has an importance value less than 2.5 with no FCS specific priority, is not applicable to Fort Calhoun or not appropriate for the written exam, it will be tagged and included in the Record of Rejected K/A's along with the reason for rejection. This sampling process is repeated until the tier/group has the required number of items.
- \$ This procedure is repeated for each tier/group combination.
- \$ Additional items are selected for the SRO only questions to meet the SRO tier/group requirements. These items are also presented in order of their associated random number. An additional requirement, for this step, is that the selected K/A items must be associated with 10 CFR 55.43 items.

In addition to the ES-401-2 and ES-401-3 forms, a more detailed listing of the selected K/A item including the full text and a cross reference to the applicable 10 CFR 55.41/43/45 items is provided.

Operating Exam Outline

The Fort Calhoun APRA Summary Notebook® was used as a resource to ensure that risk-significant items identified in the Fort Calhoun IPE are reflected in the exam. The following risk significant initiating events are included in the operating exams:

- \$ Steam Generator Tube Rupture
- \$ Loss of offsite power
- \$ Total loss of feedwater
- \$ RCP seal failures

It also resulted in the following risk-significant operator actions being evaluated:

- \$ Manually opening a Circulating Water Pump breaker to allow D/G to power vital bus.
- \$ Minimizing DC loads following a loss of offsite power.
- \$ Initiation of Once-Through Cooling
- \$ Initiation of simultaneous hot and cold leg injection

All four simulator scenarios are new.

The development of the audit exam that will be given was completed prior to beginning work on this exam outline.

Facility: Fort Calhoun

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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	K	A	A2	G*	
1. Emergency & Abnormal Plant Evolution	1	3	3	3				3	3			3	18	0	0	0	0	0
	2	0	2	2				2	1			2	9	0	0	0	0	0
	Tier Totals	3	5	5				5	4			5	27	0	0	0	0	0
2. Plant Systems	1	3	2	2	3	3	1	3	3	2	3	3	28	0	0	0	0	0
	2	1	0	1	1	1	1	1	1	1	1	1	10	0	0	0	0	0
	Tier Totals	4	2	3	4	4	2	4	4	3	4	4	38	0	0	0	0	0
3. Generic Knowledge And Abilities Categories					1		2		3		4		10	1	2	3	4	0
					3		2		2		3			0	0	0	0	

Note:

1. Ensure that at least two topics from every K/A category are sampled within each tier of the RO outline (i.e., the "Tier Totals" in each K/A category shall not be less than two). Refer to Section D.1.c for additional guidance regarding the SRO sampling.
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. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system unless they relate to plant-specific priorities.
4. Systems/evolutions within each group are identified on the associated outline.
5. The shaded areas are not applicable to the category /tier.
- 6.* The generic (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. The SRO K/As must also be linked to 10 CFR 55.43 or an SRO-level learning objective.
7. 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 columns labeled "K" and "A".
Use duplicate pages for RO and SRO-only exams.
8. For Tier 3, enter the K/A numbers, descriptions, importance ratings, and point totals on Form ES-401-3.
9. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.

PWR RO Examination Outline

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Facility: Fort Calhoun

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE #	E/APE Name/Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
007	000007 Reactor Trip - Stabilization - Recovery / 1					X		EA2.03 - Reactor trip breaker position	4.2	1
008	000008 Pressurizer Vapor Space Accident / 3			X				AK3.04 - RCP tripping requirements	4.2	1
009	000009 Small Break LOCA / 3					X		EA2.06 - Whether PZR water inventory loss is imminent	3.8	1
009	000009 Small Break LOCA / 3			X				EK3.21 - Actions contained in EOP for small break LOCA/leak	4.2	1
015	000015 RCP Malfunctions / 4		X					AK2.07 - RCP seals	2.9	1
026	000026 Loss of Component Cooling Water / 8				X			AA1.07 - Flow rates to the components and systems that are serviced by the CCWS; interactions among the components	2.9	1
027	000027 Pressurizer Pressure Control System Malfunction / 3						X	2.4.49 - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	1
029	000029 ATWS / 1		X					EK2.06 - Breakers, relays, and disconnects	2.9*	1
038	000038 Steam Gen. Tube Rupture / 3			X				EK3.03 - Automatic actions associated with high radioactivity in S/G sample lines	3.6*	1
040	000040 Steam Line Rupture - Excessive Heat Transfer / 4		X					AK2.01 - Valves	2.6*	1
040	000040 Steam Line Rupture - Excessive Heat Transfer / 4				X			AA1.24 - Main steam header pressure gauges	3.8	1
054	000054 Loss of Main Feedwater / 4						X	2.4.50 - Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	1
055	000055 Station Blackout / 6	X						EK1.01 - Effect of battery discharge rates on capacity	3.3	1
056	000056 Loss of Off-site Power / 6					X		AA2.20 - AFW flow indicator	3.9	1
057	000057 Loss of Vital AC Inst. Bus / 6						X	2.4.50 - Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	1
057	000057 Loss of Vital AC Inst. Bus / 6				X			AA1.02 - Manual control of PZR level	3.8	1
E02	CE/E02 Reactor Trip - Stabilization - Recovery / 1	X						EK1.1 - Components, capacity, and function of emergency systems	2.9	1
E06	CE/E06 Loss of Main Feedwater / 4	X						EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Feedwater)	3.2	1

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE #	E/APE Name/Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
K/A Category Totals:		3	3	3	3	3	3	Group Point Total:	18	

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Facility: Fort Calhoun

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE #	E/APE Name/Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
024	000024 Emergency Boration / 1		X					AK2.04 - Pumps	2.6	1
032	000032 Loss of Source Range NI / 7				X			AA1.01 - Manual restoration of power	3.1*	1
036	000036 Fuel Handling Accident / 8						X	2.4.49 - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	1
060	000060 Accidental Gaseous Radwaste Rel. / 9		X					AK2.01 - ARM system, including the normal radiation-level indications and the operability status	2.6	1
061	000061 ARM System Alarms / 7					X		AA2.01 - ARM panel displays	3.5	1
068	000068 Control Room Evac. / 8			X				AK3.17 - Injection of boric acid into the RCS	3.7	1
A11	CE/A11 RCS Overcooling - PTS / 4						X	2.1.27 - Knowledge of system purpose and or function.	2.8	1
A13	CE/A13 Natural Circ. / 4			X				AK3.3 - Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations	3.4	1
A16	CE/A16 Excess RCS Leakage / 2				X			AA1.2 - Operating behavior characteristics of the facility	3.0	1
K/A Category Totals:		0	2	2	2	1	2	Group Point Total: 9		

PWR RO Examination Outline

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Facility: Fort Calhoun

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
003	003 Reactor Coolant Pump									X			A3.04 - RCS flow	3.6	1
003	003 Reactor Coolant Pump	X											K1.08 - Containment isolation	2.7*	1
004	004 Chemical and Volume Control								X				A2.09 - High primary and/or secondary activity	3.0	1
004	004 Chemical and Volume Control						X						K6.15 - Reason for venting VCT and pump casings while filling: vents must connect to LRS	2.8	1
005	005 Residual Heat Removal										X		A4.03 - RHR temperature, PZR heaters and flow, and nitrogen	2.8*	1
005	005 Residual Heat Removal				X								K4.12 - Lineup for piggyback mode with CSS	3.1*	1
006	006 Emergency Core Cooling											X	2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	3.4	1
006	006 Emergency Core Cooling								X				A2.12 - Conditions requiring actuation of ECCS	4.5	1
007	007 Pressurizer Relief/Quench Tank								X				A2.02 - Abnormal pressure in the PRT	2.6	1
007	007 Pressurizer Relief/Quench Tank										X		A4.10 - Recognition of leaking PORV/code safety	3.6	1
008	008 Component Cooling Water									X			A3.01 - Setpoints on instrument signal levels for normal operations, warnings, and trips that are applicable to the CCWS	3.2*	1
010	010 Pressurizer Pressure Control	X											K1.05 - PRTS	3.4	1
010	010 Pressurizer Pressure Control					X							K5.01 - Determination of condition of fluid in PZR, using steam tables	3.5	1
012	012 Reactor Protection	X											K1.08 - MFW	2.9*	1
012	012 Reactor Protection					X							K5.02 - Power density	3.1*	1
013	013 Engineered Safety Features Actuation											X	2.1.32 - Ability to explain and apply all system limits and precautions.	3.4	1
013	013 Engineered Safety Features Actuation							X					A1.02 - Containment pressure, temperature, and humidity	3.9	1
026	026 Containment Spray							X					A1.04 - Containment humidity	3.1	1

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Facility: Fort Calhoun

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
039	039 Main and Reheat Steam				X								K4.08 - Interlocks on MSIV and bypass valves	3.3	1
039	039 Main and Reheat Steam					X							K5.08 - Effect of steam removal on reactivity	3.6	1
059	059 Main Feedwater										X		A4.11 - Recovery from automatic feedwater isolation	3.1	1
061	061 Auxiliary/Emergency Feedwater							X					A1.02 - S/G pressure	3.3*	1
064	064 Emergency Diesel Generator		X										K2.03 - Control power	3.2*	1
064	064 Emergency Diesel Generator				X								K4.03 - Governor valve operation	2.5	1
073	073 Process Radiation Monitoring											X	2.4.50 - Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	1
076	076 Service Water		X										K2.01 - Service water	2.7*	1
076	076 Service Water			X									K3.07 - ESF loads	3.7	1
078	078 Instrument Air			X									K3.02 - Systems having pneumatic valves and controls	3.4	1
K/A Category Totals:		3	2	2	3	3	1	3	3	2	3	3	Group Point Total: 28		

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Facility: Fort Calhoun

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
001	001 Control Rod Drive				X								K4.11 - Resetting of CRDM circuit breakers	2.7	1
002	002 Reactor Coolant										X		A4.06 - Overflow level of the RWST	2.9	1
011	011 Pressurizer Level Control											X	2.1.2 - Knowledge of operator responsibilities during all modes of plant operation.	3.0	1
015	015 Nuclear Instrumentation			X									K3.01 - RPS	3.9	1
028	028 Hydrogen Recombiner and Purge Control								X				A2.03 - The hydrogen air concentration in excess of limit flame propagation or detonation with resulting equipment damage in containment	3.4	1
029	029 Containment Purge									X			A3.01 - CPS isolation	3.8	1
033	033 Spent Fuel Pool Cooling	X											K1.02 - RHRS	2.5	1
035	035 Steam Generator							X					A1.02 - S/G pressure	3.5	1
041	041 Steam Dump/Turbine Bypass Control					X							K5.02 - Use of steam tables for saturation temperature and pressure	2.5	1
086	086 Fire Protection						X						K6.04 - Fire, smoke, and heat detectors	2.6	1
K/A Category Totals:		1	0	1	1	1	1	1	1	1	1	1	Group Point Total: 10		

Generic Knowledge and Abilities Outline (Tier 3)

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Facility: Fort Calhoun

Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3.0	1
	2.1.20	Ability to execute procedure steps.	4.3	1
	2.1.28	Knowledge of the purpose and function of major system components and controls.	3.2	1
	Category Total:			3
Equipment Control	2.2.12	Knowledge of surveillance procedures.	3.0	1
	2.2.13	Knowledge of tagging and clearance procedures.	3.6	1
	Category Total:			2
Radiation Control	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.	2.6	1
	2.3.11	Ability to control radiation releases.	2.7	1
	Category Total:			2
Emergency Procedures/Plan	2.4.17	Knowledge of EOP terms and definitions.	3.1	1
	2.4.24	Knowledge of loss of cooling water procedures.	3.3	1
	2.4.31	Knowledge of annunciators alarms and indications, and use of the response instructions.	3.3	1
	Category Total:			3
Generic Total:				10

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System/Mode	System Title	K1	K2	K3	A1	A2	G	Points
EPE/APE Tier 1 / Group 1								
000007	Reactor Trip					1		1
000008	Pressurizer Vapor Space Accident			1				1
000009	Small Break LOCA			1		1		2
000017	Reactor Coolant Pump Malfunctions (Loss of RC Flow)		1					1
000026	Loss of Component Cooling Water				1			1
000027	Pressurizer Pressure Control System Malfunction						1	1
000029	Anticipated Transient Without Scram (ATWS)		1					1
000038	Steam Generator Tube Rupture			1				1
000040	Steam Line Rupture		1		1			2
000054	Loss of Main Feedwater						1	1
000055	Station Blackout	1						1
000056	Loss of Off-Site Power					1		1
000057	Loss of Vital AC Electrical Instrument Bus				1		1	2
CE-E02	Reactor Trip Recovery	1						1
CE-E06	Loss of Feedwater	1						1
		3	3	3	3	3	3	18

EPE/APE Tier 1 / Group 2								
000024	Emergency Boration		1					1
000032	Loss of Source Range Nuclear Instrumentation				1			1
000036	Fuel Handling Incidents						1	1
000060	Accidental Gaseous Radwaste Release		1					1
000061	Area Radiation Monitoring (ARM) System Alarms					1		1
000068	Control Room Evacuation			1				1
CE-A11	RCS Overcooling						1	1
CE-A13	Natural Circulation Operations			1				1
CE-A16	Excess RCS Leakage				1			1
			2	2	2	1	2	9

Grand Total of EPE/APE K&A Selection	3	5	5	5	4	5	27
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System/Mode	System Title	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Points
Plant System Tier 2 / Group 1													
003000	Reactor Coolant Pump System	1								1			2
004000	Chemical and Volume Control System						1		1				2
005000	Residual Heat Removal System				1						1		2
006000	Emergency Core Cooling System								1			1	2
007000	Pressurizer Relief Tank / Quench Tank System								1		1		2
008000	Component Cooling Water System									1			1
010000	Pressurizer Pressure Control System	1				1							2
012000	Reactor Protection System	1				1							2
013000	Engineered Safety Features Actuation System							1				1	2
026000	Containment Spray System							1					1
039000	Main and Reheat Steam System				1	1							2
059000	Main Feedwater System										1		1
061000	Auxiliary / Emergency Feedwater System							1					1
064000	Emergency Diesel Generators				1					1			2
073000	Process Radiation Monitoring System											1	1
076000	Service Water System		1	1									2
078000	Instrument Air System			1									1
		3	1	2	3	3	1	3	3	3	3	3	28

Plant System Tier 2 / Group 2													
001000	Control Rod Drive System				1								1
002000	Reactor Coolant System										1		1
011000	Pressurizer Level Control System											1	1
015000	Nuclear Instrumentation System			1									1
028000	Hydrogen Recombiner and Purge Control System								1				1
029000	Containment Purge System									1			1
033000	Spent Fuel Pool Cooling System	1											1
035000	Steam Generator System							1					1
041000	Steam Dump System and Turbine Bypass Control					1							1
086000	Fire Protection System						1						1
		1		1	1	1	1	1	1	1	1	1	10

Grand Total of Plant System K&A Selectio

4	1	3	4	4	2	4	4	4	4	4	4	38
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System/Mode	System Title	Cat 1	Cat 2	Cat 3	Cat 4	Points
Generic Knowledge and Abilities Tier 3						
000000	Generic Knowledges and Abilities	3	2	2	3	10
		3	2	2	3	10

Grand Total of Generic K&A Selectio	3	2	2	3	10
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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
Tier	1	Group	1		
000007	Reactor Trip	EA2.03	Ability to determine or interpret the following as they apply to a reactor trip:: Reactor trip breaker position	4.2	41.7 / 45.5 / 45.6
000008	Pressurizer Vapor Space Accident	AK3.04	Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident:: RCP tripping requirements	4.2	41.5 / 41.10 / 45.6 / 45.13
000009	Small Break LOCA	EA2.06	Ability to determine or interpret the following as they apply to a small break LOCA:: Whether PZR water inventory loss is imminent	3.8	43.5 / 45.13
000009	Small Break LOCA	EK3.21	Knowledge of the reasons for the following responses as the apply to the small break LOCA:: Actions contained in EOP for small break LOCA/leak	4.2	41.5 / 41.10 / 45.6 / 45.13
000017	Reactor Coolant Pump Malfunctions (Loss of RC Flow)	AK2.07	Knowledge of the interrelations between the Reactor Coolant Pump Malfunctions (Loss of RC Flow) and the following:: RCP seals	2.9	41.7 / 45.7
000026	Loss of Component Cooling Water	AA1.07	Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water:: Flow rates to the components and systems that are serviced by the CCWS; interactions among the components	2.9	41.7 / 45.5 / 45.6
000027	Pressurizer Pressure Control System Malfunction	2.4.49	: Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	41.10 / 43.2 / 45.6
000029	Anticipated Transient Without Scram (ATWS)	EK2.06	Knowledge of the interrelations between the and the following an ATWS:: Breakers, relays, and disconnects	2.9*	41.7 / 45.7
000038	Steam Generator Tube Rupture	EK3.03	Knowledge of the reasons for the following responses as the apply to the SGTR:: Automatic actions associated with high radioactivity in S/G sample lines	3.6*	41.5 / 41.10 / 45.6 / 45.13
000040	Steam Line Rupture	AA1.24	Ability to operate and / or monitor the following as they apply to the Steam Line Rupture:: Main steam header pressure gauges	3.8	41.7 / 45.5 / 45.6
000040	Steam Line Rupture	AK2.01	Knowledge of the interrelations between the Steam Line Rupture and the following:: Valves	2.6*	41.7 / 45.7

PWR RO Written Examination Outline (Continued)

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
000054	Loss of Main Feedwater	2.4.50	: Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	45.3
000055	Station Blackout	EK1.01	Knowledge of the operational implications of the following concepts as they apply to the Station Blackout :: Effect of battery discharge rates on capacity	3.3	41.8 / 41.10 / 45.3
000056	Loss of Off-Site Power	AA2.20	Ability to determine and interpret the following as they apply to the Loss of Offsite Power:: AFW flow indicator	3.9	43.5 / 45.13
000057	Loss of Vital AC Electrical Instrument Bus	2.4.50	: Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	45.3
000057	Loss of Vital AC Electrical Instrument Bus	AA1.02	Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus:: Manual control of PZR level	3.8	41.7 / 45.5 / 45.6
CE-E02	Reactor Trip Recovery	EK1.01	Knowledge of the operational implications of the following concepts as they apply to the (Reactor Trip Recovery): Components, capacity, and function of emergency systems.	2.9	41.8 / 41.10 / 45.3
CE-E06	Loss of Feedwater	EK1.03	Knowledge of the operational implications of the following concepts as they apply to the (Loss of Feedwater): Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Feedwater).	3.2	41.8 / 41.10 / 45.3

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
Tier	1	Group	2		
000024	Emergency Boration	AK2.04	Knowledge of the interrelations between the Emergency Boration and the following:: Pumps	2.6	41.7 / 45.7
000032	Loss of Source Range Nuclear Instrumentation	AA1.01	Ability to operate and / or monitor the following as they apply to the Loss of Source Range Nuclear Instrumentation:: Manual restoration of power	3.1*	41.7 / 45.5 / 45.6
000036	Fuel Handling Incidents	2.4.49	: Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	41.10 / 43.2 / 45.6
000060	Accidental Gaseous Radwaste Release	AK2.01	Knowledge of the interrelations between the Accidental Gaseous Radwaste Release and the following:: ARM system, including the normal radiation-level indications and the operability status	2.6	41.7 / 45.7
000061	Area Radiation Monitoring (ARM) System Alarms	AA2.01	Ability to determine and interpret the following as they apply to the Area Radiation Monitoring (ARM) System Alarms:: ARM panel displays	3.5	43.5 / 45.13
000068	Control Room Evacuation	AK3.17	Knowledge of the reasons for the following responses as they apply to the Control Room Evacuation:: Injection of boric acid into the RCS	3.7	41.5 / 41.10 / 45.6 / 45.13
CE-A11	RCS Overcooling	2.1.27	: Knowledge of system purpose and or function.	2.8	41.7
CE-A13	Natural Circulation Operations	AK3.03	Knowledge of the reasons for the following responses as they apply to the (Natural Circulation Operations): Manipulation of controls required to obtain desired operating results during abnormal and emergency situations.	3.4	41.5 / 41.10 / 45.6 / 45.13
CE-A16	Excess RCS Leakage	AA1.02	Ability to operate and / or monitor the following as they apply to the (Excess RCS Leakage): Operating behavior characteristics of the facility.	3.0	41.7 / 45.5 / 45.6

PWR RO Written Examination Outline (Continued)

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
Tier	2	Group	1		
003000	Reactor Coolant Pump System	A3.04	Ability to monitor automatic operation of the RCPS, including:: RCS flow	3.6	41.7 / 45.5
003000	Reactor Coolant Pump System	K1.08	Knowledge of the physical connections and/or cause-effect relationships between the RCPS and the following systems:: Containment isolation	2.7*	41.2 to 41.9 / 45.7 to 45.8
004000	Chemical and Volume Control System	A2.09	Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:: High primary and/or secondary activity	3.0	41.5 / 43.5 / 45.3 / 45.5
004000	Chemical and Volume Control System	K6.15	Knowledge of the effect of a loss or malfunction on the following CVCS components:: Reason for venting VCT and pump casings while filling: vents must connect to LRS	2.8	41.7 / 45.7
005000	Residual Heat Removal System	A4.03	Ability to manually operate and/or monitor in the control room:: RHR temperature, PZR heaters and flow, and nitrogen	2.8*	41.7 / 45.5 to 45.8
005000	Residual Heat Removal System	K4.12	Knowledge of RHRS design feature(s) and/or interlock(s) which provide or the following:: Lineup for piggyback mode with CSS	3.1*	41.7
006000	Emergency Core Cooling System	2.1.33	: Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	3.4	43.2 / 43.3 / 45.3
006000	Emergency Core Cooling System	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	4.5	41.5 / 45.5
007000	Pressurizer Relief Tank / Quench Tank System	A2.02	Ability to (a) predict the impacts of the following malfunctions or operations on the P S; 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	41.5 / 43.5 / 45.3 / 45.13
007000	Pressurizer Relief Tank / Quench Tank System	A4.10	Ability to manually operate and/or monitor in the control room:: Recognition of leaking PORV/code safety	3.6	41.7 / 45.5 to 45.8
008000	Component Cooling Water System	A3.01	Ability to monitor automatic operation of the CCWS, including:: Setpoints on instrument signal levels for normal operations, warnings, and trips that are applicable to the CCWS	3.2*	41.7 / 45.5

PWR RO Written Examination Outline (Continued)

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
010000	Pressurizer Pressure Control System	K1.05	Knowledge of the physical connections and/or cause-effect relationships between the PZR PCS and the following systems:: PRTS	3.4	41.2 to 41.9 / 45.7 to 45.8
010000	Pressurizer Pressure Control System	K5.01	Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: Determination of condition of fluid in PZR, using steam tables	3.5	41.5 / 45.7
012000	Reactor Protection System	K1.08	Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems:: MFW	2.9*	41.2 to 41.9 / 45.7 to 45.8
012000	Reactor Protection System	K5.02	Knowledge of the operational implications of the following concepts as the apply to the RPS:: Power density	3.1*	41.5 / 45.7
013000	Engineered Safety Features Actuation System	2.1.32	: Ability to explain and apply all system limits and precautions.	3.4	41.10 / 43.2 / 45.12
013000	Engineered Safety Features Actuation System	A1.02	Ability to predict and/or monitor changes in parameters (to Prevent exceeding design limits) associated with operating the ESFAS controls including:: Containment pressure, temperature, and humidity	3.9	41.5 / 45.5
026000	Containment Spray System	A1.04	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including:: Containment humidity	3.1	41.5 / 45.5
039000	Main and Reheat Steam System	K4.08	Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following:: Interlocks on MSIV and bypass valves	3.3	41.7
039000	Main and Reheat Steam System	K5.08	Knowledge of the operational implications of the following concepts as the apply to the MRSS:: Effect of steam removal on reactivity	3.6	41.5 / 45.7
059000	Main Feedwater System	A4.11	Ability to manually operate and monitor in the control room:: Recovery from automatic feedwater isolation	3.1	41.7 / 45.5 to 45.8
061000	Auxiliary / Emergency Feedwater System	A1.02	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AFW controls including:: S/G pressure	3.3*	41.5 / 45.5

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
064000	Emergency Diesel Generators	A3.12	Ability to monitor automatic operation of the ED/G system, including:: Purpose of automatic load sequencer	3.3*	41.7 / 45.5
064000	Emergency Diesel Generators	K4.03	Knowledge of ED/G system design feature(s) and/or interlock(s) which provide for the following: Governor valve operation	2.5	41.7
073000	Process Radiation Monitoring System	2.4.50	: Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	45.3
076000	Service Water System	K2.01	Knowledge of bus power supplies to the following:: Service water	2.7*	41.7
076000	Service Water System	K3.07	Knowledge of the effect that a loss or malfunction of the SWS will have on the following:: ESF loads	3.7	41.7 / 45.6
078000	Instrument Air System	K3.02	Knowledge of the effect that a loss or malfunction of the IAS will have on the following:: Systems having pneumatic valves and controls	3.4	41.7 / 45.6

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
Tier	2	Group	2		
001000	Control Rod Drive System	K4.11	Knowledge of CRDS design feature(s) and/or interlock(s) which provide for the following:: Resetting of CRDM circuit breakers	2.7	41.7
002000	Reactor Coolant System	A4.06	Ability to manually operate and/or monitor in the control room:: Overflow level of the RWST	2.9	41.7 / 45.5 to 45.8
011000	Pressurizer Level Control System	2.1.02	: Knowledge of operator responsibilities during all modes of plant operation.	3.0	41.10 / 45.13
015000	Nuclear Instrumentation System	K3.01	Knowledge of the effect that a loss or malfunction of the NIS will have on the following:: RPS	3.9	41.7 / 45.6
028000	Hydrogen Recombiner and Purge Control System	A2.03	Ability to (a) predict the impacts of the following malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations:: The hydrogen air concentration in excess of limit flame propagation or detonation with resulting equipment damage in containment	3.4	41.5 / 43.5 / 45.3 / 45.13
029000	Containment Purge System	A3.01	Ability to monitor automatic operation of the Containment Purge System including:: CPS isolation	3.8	41.7 / 45.5
033000	Spent Fuel Pool Cooling System	K1.02	Knowledge of the physical connections and/or cause-effect relationships between the Spent Fuel Pool Cooling System and the following systems:: RHRS	2.5	41.2 to 41.9 / 45.7 to 45.8
035000	Steam Generator System	A1.02	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the S/GS controls including:: S/G pressure	3.5	41.5 / 45.5
041000	Steam Dump System and Turbine Bypass Control	K5.02	Knowledge of the operational implications of the following concepts as they apply to the SDS:: Use of steam tables for saturation temperature and pressure	2.5	41.5 / 45.7
086000	Fire Protection System	K6.04	Knowledge of the effect of a loss or malfunction on the Fire Protection System following will have on the :: Fire, smoke, and heat detectors	2.6	41.7 / 45.7

PWR RO Written Examination Outline (Last Page)

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System/Mode	System Title	KA Number	Title	RO Value	10 CFR 55
Tier	3	Group	4		
000000	Generic Knowledges and Abilities	2.1.19	: Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3.0	45.12
000000	Generic Knowledges and Abilities	2.1.20	: Ability to execute procedure steps.	4.3	41.10 / 43.5 / 45.12
000000	Generic Knowledges and Abilities	2.1.28	: Knowledge of the purpose and function of major system components and controls.	3.2	41.7
000000	Generic Knowledges and Abilities	2.2.12	: Knowledge of surveillance procedures.	3.0	41.10 / 45.13
000000	Generic Knowledges and Abilities	2.2.13	: Knowledge of tagging and clearance procedures.	3.6	41.10 / 45.13
000000	Generic Knowledges and Abilities	2.3.01	: Knowledge of 10CFR20 and related facility radiation control requirements.	2.6	41.12 / 43.4 / 45.9 / 45.10
000000	Generic Knowledges and Abilities	2.3.11	: Ability to control radiation releases.	2.7	45.9 / 45.10
000000	Generic Knowledges and Abilities	2.4.17	: Knowledge of EOP terms and definitions.	3.1	41.10 / 45.13
000000	Generic Knowledges and Abilities	2.4.24	: Knowledge of loss of cooling water procedures.	3.3	41.10 / 45.13
000000	Generic Knowledges and Abilities	2.4.31	: Knowledge of annunciators alarms and indications, and use of the response instructions.	3.3	41.10 / 45.3

Facility: Fort Calhoun

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Date Of Exam: 03/12/2004

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	K	A	A2	G*	
1. Emergency & Abnormal Plant Evolution	1	3	3	3				3	3			3	18	0	0	4	3	7
	2	0	2	2				2	1			2	9	0	0	2	3	5
	Tier Totals	3	5	5				5	4			5	27	0	0	6	6	12
2. Plant Systems	1	3	2	2	3	3	1	3	3	2	3	3	28	0	0	2	2	4
	2	1	0	1	1	1	1	1	1	1	1	1	10	0	0	1	1	2
	Tier Totals	4	2	3	4	4	2	4	4	3	4	4	38	0	0	3	3	6
3. Generic Knowledge And Abilities Categories					1			2		3		4		1	2	3	4	7
					3			2		2		3		1	2	2	2	

Note:

1. Ensure that at least two topics from every K/A category are sampled within each tier of the RO outline (i.e., the "Tier Totals" in each K/A category shall not be less than two). Refer to Section D.1.c for additional guidance regarding the SRO sampling.
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. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system unless they relate to plant-specific priorities.
4. Systems/evolutions within each group are identified on the associated outline.
5. The shaded areas are not applicable to the category /tier.
- 6.* The generic (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. The SRO K/As must also be linked to 10 CFR 55.43 or an SRO-level learning objective.
7. 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 columns labeled "K" and "A".
Use duplicate pages for RO and SRO-only exams.
8. For Tier 3, enter the K/A numbers, descriptions, importance ratings, and point totals on Form ES-401-3.
9. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE #	E/APE Name/Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
008	000008 Pressurizer Vapor Space Accident / 3					X		AA2.22 - Consequences of loss of pressure in RCS; methods for evaluating pressure loss	4.2	1
015	000015 RCP Malfunctions / 4					X		AA2.07 - Calculation of expected values of flow in the loop with RCP secured	2.9	1
022	000022 Loss of Rx Coolant Makeup / 2						X	2.1.14 - Knowledge of system status criteria which require the notification of plant personnel.	3.3	1
025	000025 Loss of RHR System / 4						X	2.4.49 - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	1
038	000038 Steam Gen. Tube Rupture / 3					X		EA2.08 - Viable alternatives for placing plant in safe condition when condenser is not available	4.4	1
055	000055 Station Blackout / 6					X		EA2.02 - RCS core cooling through natural circulation cooling to S/G cooling	4.6	1
056	000056 Loss of Off-site Power / 6						X	2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	1
K/A Category Totals:		0	0	0	0	4	3	Group Point Total: 7		

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 #	E/APE Name/Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
051	000051 Loss of Condenser Vacuum / 4					X		AA2.01 - Cause for low vacuum condition	2.7*	1
069	000069 Loss of CTMT Integrity / 5					X		AA2.01 - Loss of containment integrity	4.3	1
074	000074 Inad. Core Cooling / 4						X	2.4.6 - Knowledge symptom based EOP mitigation strategies.	4.0	1
076	000076 High Reactor Coolant Activity / 9						X	2.1.32 - Ability to explain and apply all system limits and precautions.	3.8	1
E09	CE/E09 Functional Recovery						X	2.2.25 - Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	1
K/A Category Totals:		0	0	0	0	2	3	Group Point Total:	5	

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ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
022	022 Containment Cooling											X	2.1.14 - Knowledge of system status criteria which require the notification of plant personnel.	3.3	1
059	059 Main Feedwater								X				A2.04 - Feeding a dry S/G	3.4*	1
062	062 AC Electrical Distribution								X				A2.08 - Consequences of exceeding voltage limitations	3.0*	1
063	063 DC Electrical Distribution											X	2.4.6 - Knowledge symptom based EOP mitigation strategies.	4.0	1
K/A Category Totals:		0	0	0	0	0	0	0	2	0	0	2	Group Point Total: 4		

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ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
016	016 Non-nuclear Instrumentation											X	2.2.25 - Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	1
071	071 Waste Gas Disposal								X				A2.05 - Power failure to the ARM and PRM Systems	2.6	1
K/A Category Totals:		0	0	0	0	0	0	0	1	0	0	1	Group Point Total:		2

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	2.1.11	Knowledge of less than one hour technical specification action statements for systems.	3.8	1
	Category Total:			1
Equipment Control	2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations.	3.6	1
	2.2.28	Knowledge of new and spent fuel movement procedures.	3.5	1
	Category Total:			2
Radiation Control	2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	3.1	1
	2.3.8	Knowledge of the process for performing a planned gaseous radioactive release.	3.2	1
	Category Total:			2
Emergency Procedures/Plan	2.4.8	Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.	3.7	1
	2.4.33	Knowledge of the process used track inoperable alarms.	2.8	1
	Category Total:			2

Generic Total: **7**

PWR SRO Written Examination Outline Summary

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System/Mode	System Title	K1	K2	K3	A1	A2	G	Points
EPE/APE Tier 1 / Group 1								
000007	Reactor Trip					1		1
000008	Pressurizer Vapor Space Accident			1		1		2
000009	Small Break LOCA			1		1		2
000015	Reactor Coolant Pump Malfunctions					1		1
000017	Reactor Coolant Pump Malfunctions (Loss of RC Flow)		1					1
000022	Loss of Reactor Coolant Makeup						1	1
000025	Loss of Residual Heat Removal System						1	1
000026	Loss of Component Cooling Water				1			1
000027	Pressurizer Pressure Control System Malfunction						1	1
000029	Anticipated Transient Without Scram (ATWS)		1					1
000038	Steam Generator Tube Rupture			1		1		2
000040	Steam Line Rupture		1		1			2
000054	Loss of Main Feedwater						1	1
000055	Station Blackout	1				1		2
000056	Loss of Off-Site Power					1	1	2
000057	Loss of Vital AC Electrical Instrument Bus				1		1	2
CE-E02	Reactor Trip Recovery	1						1
CE-E06	Loss of Feedwater	1						1
		3	3	3	3	7	6	25

EPE/APE Tier 1 / Group 2								
000024	Emergency Boration		1					1
000032	Loss of Source Range Nuclear Instrumentation				1			1
000036	Fuel Handling Incidents						1	1
000051	Loss of Condenser Vacuum					1		1
000060	Accidental Gaseous Radwaste Release		1					1
000061	Area Radiation Monitoring (ARM) System Alarms					1		1
000068	Control Room Evacuation			1				1
000069	Loss of Containment Integrity					1		1
000074	Inadequate Core Cooling						1	1
000076	High Reactor Coolant Activity						1	1
CE-A11	RCS Overcooling						1	1
CE-A13	Natural Circulation Operations			1				1
CE-A16	Excess RCS Leakage				1			1
CE-E09	Functional Recovery						1	1
			2	2	2	3	5	14

Grand Total of EPE/APE K&A Selection:

3	5	5	5	10	11
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System/Mode	System Title	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Points
Plant System Tier 2 / Group 1													
003000	Reactor Coolant Pump System	1								1			2
004000	Chemical and Volume Control System						1		1				2
005000	Residual Heat Removal System				1						1		2
006000	Emergency Core Cooling System								1			1	2
007000	Pressurizer Relief Tank / Quench Tank System								1		1		2
008000	Component Cooling Water System									1			1
010000	Pressurizer Pressure Control System	1				1							2
012000	Reactor Protection System	1				1							2
013000	Engineered Safety Features Actuation System							1				1	2
022000	Containment Cooling System											1	1
026000	Containment Spray System							1					1
039000	Main and Reheat Steam System				1	1							2
059000	Main Feedwater System								1		1		2
061000	Auxiliary / Emergency Feedwater System							1					1
062000	A.C. Electrical Distribution								1				1
063000	D.C. Electrical Distribution											1	1
064000	Emergency Diesel Generators				1					1			2
073000	Process Radiation Monitoring System											1	1
076000	Service Water System		1	1									2
078000	Instrument Air System			1									1
		3	1	2	3	3	1	3	5	3	3	5	32

Plant System Tier 2 / Group 2													
001000	Control Rod Drive System				1								1
002000	Reactor Coolant System										1		1
011000	Pressurizer Level Control System											1	1
015000	Nuclear Instrumentation System			1									1
016000	Non-Nuclear Instrumentation System											1	1
028000	Hydrogen Recombiner and Purge Control System								1				1
029000	Containment Purge System									1			1
033000	Spent Fuel Pool Cooling System	1											1
035000	Steam Generator System							1					1
041000	Steam Dump System and Turbine Bypass Control					1							1
071000	Waste Gas Disposal System								1				1
086000	Fire Protection System						1						1
		1		1	1	1	1	1	2	1	1	2	12

Grand Total of Plant System K&A Selection:

4	1	3	4	4	2	4	7	4	4	7	44
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PWR SRO Written Examination Outline Summary

System/Mode	System Title	Cat 1	Cat 2	Cat 3	Cat 4	Points
Generic Knowledge and Abilities Tier 3						
000000	Generic Knowledges and Abilities	4	4	4	5	17
		4	4	4	5	17

Grand Total of Generic K&A Selection:

4	4	4	5	17
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PWR SRO Only Written Examination Outline

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System/Mode	System Title	KA Number	Title	SRO Value	10 CFR 55
Tier	1	Group	1		
000008	Pressurizer Vapor Space Accident	AA2.22	Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident:: Consequences of loss of pressure in RCS; methods for evaluating pressure loss	4.2	43.5 / 45.13
000015	Reactor Coolant Pump Malfunctions	AA2.07	Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow):: Calculation of expected values of flow in the loop with RCP secured	2.9	43.5 / 45.13
000022	Loss of Reactor Coolant Makeup	2.1.14	: Knowledge of system status criteria which require the notification of plant personnel.	3.3	43.5 / 45.12
000025	Loss of Residual Heat Removal System	2.4.49	: Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	41.10 / 43.2 / 45.6
000038	Steam Generator Tube Rupture	EA2.08	Ability to determine or interpret the following as they apply to a SGTR:: Viable alternatives for placing plant in safe condition when condenser is not available	4.4	43.5 / 45.13
000055	Station Blackout	EA2.02	Ability to determine or interpret the following as they apply to a Station Blackout:: RCS core cooling through natural circulation cooling to S/G cooling	4.6	43.5 / 45.13
000056	Loss of Off-Site Power	2.1.33	: Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	43.2 / 43.3 / 45.3

PWR SRO Only Written Examination Outline (Continued)

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System/Mode	System Title	KA Number	Title	SRO Value	10 CFR 55
Tier	1	Group	2		
000051	Loss of Condenser Vacuum	AA2.01	Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum:: Cause for low vacuum condition	2.7*	43.5 / 45.13
000069	Loss of Containment Integrity	AA2.01	Ability to determine and interpret the following as they apply to the Loss of Containment Integrity:: Loss of containment integrity	4.3	43.5 / 45.13
000074	Inadequate Core Cooling	2.4.06	: Knowledge symptom based EOP mitigation strategies.	4.0	41.10 / 43.5 / 45.13
000076	High Reactor Coolant Activity	2.1.32	: Ability to explain and apply all system limits and precautions.	3.8	41.10 / 43.2 / 45.12
CE-E09	Functional Recovery	2.2.25	: Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	43.2

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System/Mode	System Title	KA Number	Title	SRO Value	10 CFR 55
Tier	2	Group	1		
022000	Containment Cooling System	2.1.14	: Knowledge of system status criteria which require the notification of plant personnel.	3.3	43.5 / 45.12
059000	Main Feedwater System	A2.04	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:: Feeding a dry S/G	3.4*	41.5 / 43.5 / 45.3 / 45.13
062000	A.C. Electrical Distribution	A2.08	Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:: Consequences of exceeding voltage limitations	3.0*	41.5 / 43.5 / 45.3 / 45.13
063000	D.C. Electrical Distribution	2.4.06	: Knowledge symptom based EOP mitigation strategies.	4.0	41.10 / 43.5 / 45.13

PWR SRO Only Written Examination Outline (Continued)

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System/Mode	System Title	KA Number	Title	SRO Value	10 CFR 55
Tier	2	Group	2		
016000	Non-Nuclear Instrumentation System	2.2.25	: Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	43.2
071000	Waste Gas Disposal System	A2.05	Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:: Power failure to the ARM and PRM Systems	2.6	41.5 / 43.5 / 45.3 / 45.13

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System/Mode	System Title	KA Number	Title	SRO Value	10 CFR 55
Tier	3	Group	4		
000000	Generic Knowledges and Abilities	2.1.11	: Knowledge of less than one hour technical specification action statements for systems.	3.8	43.2 / 45.13
000000	Generic Knowledges and Abilities	2.2.18	: Knowledge of the process for managing maintenance activities during shutdown operations.	3.6	43.5 / 45.13
000000	Generic Knowledges and Abilities	2.2.28	: Knowledge of new and spent fuel movement procedures.	3.5	43.7 / 45.13
000000	Generic Knowledges and Abilities	2.3.04	: Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	3.1	43.4 / 45.10
000000	Generic Knowledges and Abilities	2.3.08	: Knowledge of the process for performing a planned gaseous radioactive release.	3.2	43.4 / 45.10
000000	Generic Knowledges and Abilities	2.4.08	: Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.	3.7	41.10 / 43.5 / 45.13
000000	Generic Knowledges and Abilities	2.4.33	: Knowledge of the process used track inoperable alarms.	2.8	41.10 / 43.5 / 45.13

<i>Tier</i>	<i>ROGroup</i>	<i>System/Mode</i>	<i>KA Number</i>	<i>Reason for Rejection</i>
1	1	000015	AA2.07	RO imp:2.1 No FCS specific priority Used for SRO exam
1	1	000038	EK2.02	RO Imp:2.4 No FCS specific priority
1	1	000057	AA2.10	RO imp:2.3 No FCS specific priority
2	2	001000	K4.06	No First Out panel at FCS - reject from RO
2	1	003000	K4.10	RO Imp:2.3 No FCS specific priority
2	1	005000	K2.02	RO Imp:2.4 No FCS specific priority
2	1	010000	K6.07	RO Imp:2.3 No FCS specific priority
2	2	014000	K6.01	RO Imp:2.3 No FCS specific priority
2	2	033000	K1.07	RO Imp:2.4 No FCS specific priority
2	1	039000	K3.04	RO: No turbine driven MFW pumps at FCS
2	1	056000	K5.03	RO Imp:2.2 No FCS specific priority
2	1	062000	K5.03	RO Imp:2.4 No FCS specific priority
2	1	063000	K5.02	RO Imp:2.2 No FCS specific priority
2	2	068000	K1.05	RO Imp:2.3 No FCS specific priority
2	2	071000	K6.10	RO Imp:2.3 No FCS specific priority
2	2	075000	K2.03	RO: Redundant to 076000 K2
2	1	078000	K6.01	RO Imp:2.4 No FCS specific priority
1	1	CE-E05	2.4.30	RO imp:2.2 No FCS specific priority

Facility: Fort Calhoun		Date of Examination: 3/12/04
Examination Level: RO / SRO		Operating Test Number: _____
Administrative Topic (See Note)	Describe activity to be performed	
Conduct of Operations	Manually determine dilution volume needed to raise power level. (K/A 2.1.25 – Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data. RO Imp: 2.8; CFR: 41.10/43.5/45.12)	
Conduct of Operations	Determine maximum allowable Diesel/Generator load based on weather conditions. (K/A 2.1.32 – Ability to explain and apply all system limits and precautions. RO Imp: 3.4; CFR: 41.10/43.2/45.12)	
Equipment Control	Use P&ID's to determine equipment affected by closure of instrument air valve. (K/A 2.2.13 – Knowledge of tagging and clearance procedures. RO Imp: 3.6; CFR 41.10/45.13)	
Radiation Control	High Radiation Area entry and exit with EAD alarm. (K/A 2.3.1 – Knowledge of 10 CFR:20 and related facility radiation control requirements. RO Imp: 2.6; CFR: 41.12/43.4/45.9/45.10)	
Emergency Plan		
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		

Facility: Fort Calhoun		Date of Examination: 3/12/04
Examination Level: RO / <u>SRO</u>		Operating Test Number: _____
Administrative Topic (See Note)	Describe activity to be performed	
Conduct of Operations	SRO Review of shutdown margin calculation with inoperable CEA. (K/A: 2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation; SRO Imp: 3.7; CFR: 43.5/45.12/45.13)	
Conduct of Operations	Determine Raw Water system operability based on technical specifications and TDB III.41. (K/A: 2.1.12 – Ability to apply technical specifications for a system; SRO Imp: 4.0; CFR: 43.2/43.5/45.3)	
Equipment Control	SRO Review of Surveillance Test results. (K/A: 2.2.12 – Knowledge of surveillance procedures; SRO Imp: 3.4; CFR: 41.10/45.13)	
Radiation Control	Determine primary to secondary leakage from plant parameters and actions required to control offsite releases (K/A: 2.3.11 – Ability to control radiation releases; SRO Imp: 3.2; CFR 45.9/45.10)	
Emergency Plan	Emergency event classification and Protective Action Recommendations (K/A 2.4.41 – Knowledge of the emergency action level thresholds and classifications. SRO Imp: 4.1; CFR 43.5/45.11) (K/A 2.4.44 – Knowledge of emergency plan protective action recommendations SRO Imp: 4.0; CFR 43.5/45.11)	
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		

Facility: Fort Calhoun

Date of Examination: 3/12/04

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

Operating Test No. _____

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System / JPM Title	Type Code*	Safety Function
a. Establish Simultaneous Hot and Cold leg injection – new (K/A 006000 A4.05 3.9/3.8)	N, E, A	2
b. Shutdown a Reactor Coolant Pump – 0613 (modified) (K/A 003000 A4.06 2.9/2.9)	M, A, L	4P
c. Operate Containment Hydrogen Analyzer – 0156 (K/A 028000 A1.01 3.4/3.8)	D, E	5
d. Restoration of offsite electrical power following loss of offsite power – 0026 (K/A 064000 A4.07 3.4/3.4)	D, E	6
e. Perform manual trip check - 0654 (K/A 012000 A4.01 4.5/4.5)	D, L	7
f. Raise RCS Pressure with PORV Open Failure – 0621 (K/A 010000 A2.03 4.1/4.2)	D, A	3
g. Recover misaligned Control Rod – new (K/A 001000 A2.03 3.5/4.2)	N, A	1
h. Startup Containment Purge – 0704 (modified) (K/A 029000 A2.03 2.7/3.1)	M, A, L	8

In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)

a. Establish RW Backup to SI Pumps – 0010-RW (K/A 076000 A4.04 3.5/3.5)	D, R, E	4S
b. Emergency Start of Diesel Fire Pump – 0450 (K/A 086000 A4.01 3.3/3.3)	D, E	8
c. Minimize DC Loads – 0304 (time critical) (K/A 063000 A1.01 2.5/3.3)	D, E	6

* Type Codes: (D)irect from bank, (M)odified from Bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, (E)mergency or abnormal condition

Facility: Fort Calhoun

Date of Examination: 3/12/04

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

Operating Test No. _____

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System / JPM Title	Type Code*	Safety Function
a. Establish Simultaneous Hot and Cold leg injection – new (K/A 006000 A4.05 3.9/3.8)	N, E, A	2
b. Shutdown a Reactor Coolant Pump – 0613 (modified) (K/A 003000 A4.06 2.9/2.9)	M, A, L	4P
c. Operate Containment Hydrogen Analyzer – 0156 (K/A 028000 A1.01 3.4/3.8)	D, E	5
d. Restoration of offsite electrical power following loss of offsite power – 0026 (K/A 064000 A4.07 3.4/3.4)	D, E	6
e.		
f. Raise RCS Pressure with PORV Open Failure – 0621 (K/A 010000 A2.03 4.1/4.2)	D, A	3
g. Recover misaligned Control Rod – new (K/A 001000 A2.03 3.5/4.2)	N, A	1
h. Startup Containment Purge – 0704 (modified) (K/A 029000 A2.03 2.7/3.1)	M, A, L	8

In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)

a. Establish RW Backup to SI Pumps – 0010-RW (K/A 076000 A4.04 3.5/3.5)	D, R, E	4S
b. Emergency Start of Diesel Fire Pump – 0450 (K/A 086000 A4.01 3.3/3.3)	D, E	8
c. Minimize DC Loads – 0304 (time critical) (K/A 063000 A1.01 2.5/3.3)	D, E	6

* Type Codes: (D)irect from bank, (M)odified from Bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, (E)mergency or abnormal condition

Facility: Fort Calhoun

Date of Examination: 3/12/04

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

Operating Test No. _____

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System / JPM Title	Type Code*	Safety Function
a. Establish Simultaneous Hot and Cold leg injection – new (K/A 006000 A4.05 3.9/3.8)	N, E, A	2
b. Shutdown a Reactor Coolant Pump – 0613 (modified) (K/A 003000 A4.06 2.9/2.9)	M, A, L	4P
c.		
d.		
e.		
f.		
g.		
h.		

In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)

a. Establish RW Backup to SI Pumps – 0010-RW (K/A 076000 A4.04 3.5/3.5)	D, R, E	4S
b. Emergency Start of Diesel Fire Pump – 0450 (K/A 086000 A4.01 3.3/3.3)	D, E	8
c. Minimize DC Loads – 0304 (time critical) (K/A 063000 A1.01 2.5/3.3)	D, E	6

* Type Codes: (D)irect from bank, (M)odified from Bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, (E)mergency or abnormal condition

Facility: Fort Calhoun		Scenario No: 1		Op-Test No. _____	
Examiners: _____ _____ _____			Operators: _____ _____ _____		
Initial Conditions: 100% Power MOC					
Turnover: Diesel Generator DG-1 and Charging Pump CH-1B are out of service. Maintain full power operation.					
Event No.	Malf No.	Event Type*	Event Description		
1		I - sec	S/G steam flow transmitter output fails high		
2		I - pri	Hot leg RTD fails high (tech spec entry)		
3		C - sec	Heater Drain Pump trips		
4		C - pri	CEA drop (tech spec entry)		
5		R – pri N - sec	T. S. required power reduction		
6		I - pri	VCT level transmitter fails low		
7		C - pri	CCW pump trips (tech spec entry)		
8		C - pri	Second CEA drops – Manual Reactor Trip Required		
9		M - all	Steam Generator Tube Rupture		
10		C - sec	MSIV on ruptured S/G will not close		

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

Facility: Fort Calhoun		Scenario No: 2		Op-Test No. _____	
Examiners: _____ _____ _____			Operators: _____ _____ _____		
Initial Conditions: 100% Power MOC					
Turnover: Diesel driven FW pump, FW-54 and charging pump CH-1B are Out of Service. Maintain power.					
Event No.	Malf No.	Event Type*	Event Description		
1		I - sec	PT-910 fails high causing turbine bypass valve to open		
2		C - pri	Charging Pump Trips (tech spec entry)		
3		C - sec	High turbine vibration caused by inadequate oil cooling		
4		I - pri	Wide Range NI channel D fails (tech spec entry)		
5		I - pri	Pressurizer Pressure channel fails low		
6		M - all	Loss of Offsite Power		
7		M - all	ATWS – manual trip required		
8		C - sec	Emergency Feedwater Storage Tank line is blocked causing a total loss of Feedwater (once-through cooling required)		

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

Facility: Fort Calhoun		Scenario No: 3		Op-Test No. _____
Examiners: _____ _____ _____			Operators: _____ _____ _____	
Initial Conditions: 50% Power, FW-54 Out of Service				
Turnover: Diesel drive FW pump, FW-54 is out of service. Maintain power				
Scenario objective: Evaluate ISRO candidates in the primary and secondary positions with a surrogate acting as SRO				
Event No.	Malf No.	Event Type*	Event Description	
1		I - pri	Controlling pressurizer level channel fails low	
2		I - sec	Steam generator level channel fails high	
3		C - pri	Reactor Coolant Pump lower seal failure	
4		I - pri	Letdown pressure transmitter PCV-210 fails low	
5		C - pri	Reactor Coolant Pump middle seal failure	
6		R - pri N - sec	Emergency shutdown	
7		C - sec	Running Bearing water pump trips	
8		M - all	Loss of Coolant Accident	
9		C - sec	Turbine trip failure	
10		C - pri	HPSI loop injection valves fail to open	

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

Facility: Fort Calhoun		Scenario No: 4 (spare)		Op-Test No. _____
Examiners: _____ _____			Operators: _____ _____	
Initial Conditions: 100% Power MOC				
Turnover: LPSI pump SI-1B is Out of Service for bearing replacement				
Event No.	Malf No.	Event Type*	Event Description	
1		I - pri	Power range nuclear instrumentation channel fails (tech spec entry)	
2		I - sec	FW flow channel fails low	
3		C - sec	Diesel Generator, D/G-1, radiator leak (tech spec entry)	
4		I - pri	Letdown HX CCW outlet temperature transmitter fails low	
5		C -sec	Loss of 161 KV	
6		M - all	Steam line break inside containment	
7		C -sec	CW-1C breaker fails to trip preventing D/G-2 breaker from closing	
8		C - pri	CPHS fails to actuate	

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