

Facility: Arkansas Nuclear One Unit 1 RO Written Outline														Date of Exam: 12/7/2005				
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	3	3	3	N/A			3	3	N/A			3	18			6	
	2	3	1	2	N/A			1	1	N/A			1	9			4	
	Tier Totals	6	4	5	N/A			4	4	N/A			4	27			10	
2. Plant Systems	1	3	3	3	2	3	2	3	2	3	2	2	28			5		
	2	1	1	1	1	1	0	1	1	1	1	1	10			3		
	Tier Totals	4	4	5	3	3	4	3	3	3	3	3	38			8		
3. Generic Knowledge and Abilities Categories					1	2	3	4					10	1	2	3	4	7
					3	2	3	2										

  

Note:

- Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and the SRO only outlines (i.e. except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
- The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO –only exam must total 25 points.
- Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.
- Select topics from many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
- Absent a plant specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- \* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system.
- 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.
- For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A number, descriptions, importance ratings, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions – Tier1 /Group1 (RO /SRO)							Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
00007 (BW/E02 & E10; CE/E02) Reactor Trip – Stabilization – Recovery / 1						X	2.4.3 – Ability to identify post-accident instrumentation.	3.5	1	
00008 Pressurizer Vapor Space Accident / 3		X					AK2.01 – Knowledge of the interrelations between the Pressurizer Vapor Space Accident and the following: Valves.	2.7*	2	
000009 Small Break LOCA / 3							Not selected.			
000011 Large Break LOCA / 3	X						EK1.01 – Knowledge of the operational implications of the following concepts as they apply to the Large Break LOCA: Natural circulation and cooling, including reflux boiling.	4.1	3	
000015/17 RCP Malfunctions / 4							Not selected.			
000022 Loss of Rx Coolant Makeup / 2			X				AK3.01 – Knowledge of the reasons for the following responses as they apply to Loss of Rx Coolant Makeup: Adjustment of RCP seal backpressure regulator valve to obtain normal flow.	2.7	4	
000025 Loss of RHR System / 4			X				AK3.02 - Knowledge of the reasons for the following responses as they apply to the Loss of Residual Heat Removal System: Isolation of RHR low pressure piping prior to pressure increase above specified level.	3.3	5	
000026 Loss of Component Cooling Water / 8					X		AA2.01 – Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: Location of a leak in the CCWS.	2.9	6	
000027 Pressurizer Pressure Control System Malfunction / 3		X					AK2.03 – Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners.	2.6	7	
000029 ATWS / 1		X					EK2.06- Knowledge of the interrelations between the ATWS and the following: Breakers, relays, and disconnects.	2.9*	8	
000038 Steam Gen. Tube Rupture / 3						X	2.4.48 - Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.	3.5	9	
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4						X	2.4.6 – Knowledge of symptom based EOP mitigation strategies.	3.1	10	
000054 (CE/E06) Loss of Main Feedwater / 4					X		AA2.01 – Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): Occurrence of reactor and/or turbine trip.	4.3	11	
000055 Station Blackout / 6				X			EA1.05 - Ability to operate and monitor the following as they apply to a Station Blackout: Battery, when approaching fully discharged.	3.3	12	
000056 Loss of Off-site Power / 6			X				AK3.01 – Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: Order and time to initiation of power for the load sequencer.	3.5	13	

000057 Loss of Vital AC Inst. Bus / 6					X		AA2.05 – Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: S/G pressure and level meters.	3.5	14
000058 Loss of DC Power / 6	X						AK1.01 - Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: Battery charger equipment and instrumentation.	2.8	15
000062 Loss of Nuclear Svc Water / 4				X			AA1.01 - Ability to operate and/or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): Nuclear service water temperature indications.	3.1	16
000065 Loss of Instrument Air / 8				X			AA1.02 - Ability to operate and/or monitor the following as they apply to the Loss of Instrument Air: Components served by instrument air to minimize drain on system.	2.6	17
W/E04 LOCA Outside Containment / 3							Not applicable to this unit.		
W/E11 Loss of Emergency Coolant Recirc. / 4							Not applicable to this unit.		
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	X						EK1.1 – Knowledge of the operational implications of the following concepts as they apply to the (Inadequate Heat Transfer): Components, capacity, and function of emergency systems.	3.4	18
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401		PWR Examination Outline						Form ES-401-2	
		Emergency and Abnormal Plant Evolutions – Tier1 /Group2 (RO / BRO)							
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1							Not selected.		
000003 Dropped Control Rod / 1						X	2.4.31 - Knowledge of annunciators alarms and indications, and use of the response instructions.	3.3	19
000005 Inoperable/Stuck Control Rod / 1							Not selected.		
000024 Emergency Boration / 1							Not selected.		
000028 Pressurizer Level Malfunction / 2							Not selected.		
000032 Loss of Source Range NI / 7							Not selected.		
000033 Loss of Intermediate Range NI / 7							<b>AK3.02 - Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Guidance contained in EOP for loss of intermediate range instrumentation.</b>	3.6	20
000036 (BW/A08) Fuel Handling Accident / 8			X				AK3.01 – Knowledge of the reasons for the following responses as they apply to the Fuel Handling Incidents: Different inputs that will cause a reactor building evacuation.  <b>Replaced during development with 033 AK3.02.</b>		
000037 Steam Generator Tube Leak / 3					X		AA2.11 - Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: When to isolate one or more S/Gs.	3.8	21
000051 Loss of Condenser Vacuum / 4							Not selected.		
000059 Accidental Liquid RadWaste Rel. / 9							Not selected.		
000060 Accidental Gaseous Radwaste Rel. / 9		X					AK2.01 - Knowledge of the interrelationships between the Accidental Gaseous Radwaste Release and the following: ARM system, including the normal radiation-level indications and the operability status.	2.6	22
000061 ARM System Alarms / 7			X				AK3.02 - Knowledge of the reasons for the following responses as they apply to the Area Radiation Monitoring (ARM) System Alarms: Guidance contained in alarm response for ARM system.	3.4	23
000067 Plant Fire On-site / 8							Not selected.		
000068 (BW/A06) Control Room Evac. / 8							Not selected.		
000069 (W/E14) Loss of CTMT Integrity / 5	X						AK1.01 – Knowledge of the operational implications of the following concepts as they apply to Loss of Containment Integrity: Effect of pressure on leak rate.	2.6	24
000074 (W/E06&E07) Inad. Core Cooling / 4		X					EK1.03 – Knowledge of the operational implications of the following concepts as they apply to the Inadequate Core Cooling: Processes for removing decay heat from the core.	4.5	25
000076 High Reactor Coolant Activity / 9							Not selected.		
W/E01 & E02 Rediagnosis & SI Termination / 3							Not applicable to this Unit.		
W/E13 Steam Generator Over-pressure / 4							Not applicable to this Unit.		
W/E15 Containment Flooding / 5							Not applicable to this Unit.		
W/E16 High Containment Radiation / 9							Not applicable to this Unit.		
BW/A01 Plant Runback / 1				X			AA1.3 - Ability to operate and/or monitor the following as they apply to the (Plant Runback): Desired operating results during abnormal and emergency situations.	3.7	26

BW/A02&A03 Loss of NNI-X/Y / 7								Not selected.		
BW/A04 Turbine Trip / 4								Not selected.		
BW/A05 Emergency Diesel Actuation / 6								Not selected.		
BW/A07 Flooding / 8								Not selected.		
BW/E03 Inadequate Subcooling Margin / 4								Not selected.		
BW/E08; W/E03 LOCA Cooldown - Depress. / 4								Not selected.		
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4	X							EK1.2 - Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Cooldown): Normal, abnormal and emergency operating procedures associated with (Natural Circulation Cooldown).	3.7	27
BW/E13&E14 EOP Rules and Enclosures								Not selected.		
CE/A11; W/E08 RCS Overcooling - PTS / 4								Not applicable to this Unit.		
CE/A16 Excess RCS Leakage / 2								Not applicable to this Unit.		
CE/E09 Functional Recovery								Not applicable to this Unit.		
K/A Category Point Totals:	3	1	2	1	1	1				9

ES-401	PWR Examination Outline											Form ES-401-2		
	Plant systems – Tier 2/Group (RO / SRO)													
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump				X								K4.04 - Knowledge of the RCPS design feature(s) and/or interlock(s) which provide for the following: Adequate cooling of RCP motor and seals.	2.8	28
004 Chemical and Volume Control					X							<b>K5.26 - Knowledge of the operational implications of the following concepts as they apply to the CVCS: Relationship between CT pressure and NPSH for charging pumps.</b>  <b>Replaced K6.13 during development.</b>	3.1	29
004 Chemical and Volume Control						X						K6.07 - Knowledge of the effect of a loss or malfunction on the following CVCS components: Heat exchangers and condensers.	2.7	30
005 Residual Heat Removal		X										K2.01 - Knowledge of bus power supplies to the following: RHR pumps.	3.0	31
006 Emergency Core Cooling			X									K3.02 - Knowledge of the effect that a loss or malfunction of the ECCS will have on the following: Fuel.	4.3	32
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	33
008 Component Cooling Water				X								K4.09 - Knowledge of CCWS design feature(s) and/or interlock(s) which provide for the following: The "standby" feature for the CCW pumps.	2.7	34
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	35
012 Reactor Protection			X									K3.01- Knowledge of the effect that a loss or malfunction of the RPS will have on the following: CRDS.	3.9	36
012 Reactor Protection										X		A4.04 - Ability to manually operate and/or monitor in the control room: Bistable trips, reset and test switches.	3.3*	37
013 Engineered Safety Features Actuation					X							K5.02 - Knowledge of the operational implications of the following concepts as they apply to the ESFAS: Safety system logic and reliability.	2.9	38
022 Containment Cooling							X					A1.04 - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: Cooling water flow.  <b>This K/A replaced K3.01 during development.</b>	3.2	39
025 Ice Condenser												Not applicable to this Unit.		
026 Containment Spray	X											K1.01 - Knowledge of the physical connections and/or cause-effect relationships between the CSS and the following systems: ECCS.	4.2	40
039 Main and Reheat Steam									X			A3.02 Ability to monitor automatic operation of the MRSS, including: Isolation of the MRSS.	3.1	41
039 Main and Reheat Steam										X		2.1.20 - Ability to execute procedure steps.	4.3	42



ES-401		PWR Examination Outline										Form ES-401-2		
		Plant systems – Tier 2/Group 2 (RO/SRO)												
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive				X								K4.15 – Knowledge of CRDS design feature(s) and/or interlocks which provide for the following: Operation of latching controls for groups and individual rods.	2.7	56
002 Reactor Coolant					X							K5.10 - Knowledge of the operational implications of the following concepts as they apply to the RCS: Relationship between reactor power and RCS differential temperature.	3.6	57
011 Pressurizer Level Control			x									K3.01 - Knowledge of the effect that a loss or malfunction of the PZR LCS will have on the following: CVCS.	3.2*	58
014 Rod Position Indication												Not selected.		
015 Nuclear Instrumentation								X				A2.01 - Ability to (a) predict the impacts of the following malfunctions or operations on the NIS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Power supply loss or erratic operation.	3.5	59
016 Non-nuclear Instrumentation										X		A4.01 - Ability to manually operate and/or monitor in the control room: NNI channel select controls.	2.9*	60
017 In-core Temperature Monitor	X											K1.02 - Knowledge of the physical connections and/or cause-effect relationships between the ITM system and the following systems: RCS.	3.3	61
027 Containment Iodine Removal												Not selected.		
028 Hydrogen Recombiner and Purge Control												K6.01 - Knowledge of the effect of a loss or malfunction of the following will have on the HRPS: Hydrogen recombiners. (Replaced during exam development with 072 A3.01.)		
029 Containment Purge												Not selected.		
033 Spent Fuel Pool Cooling							X					A1.01 - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the Spent Fuel Pool Cooling System controls including: Spent fuel pool water level.	2.7	62
034 Fuel Handling Equipment												Not selected.		
035 Steam Generator												Not selected.		
041 Steam Dump/Turbine Bypass Control		X										K2.01 - Knowledge of bus power supplies to the following: ICS, normal and alternate power supply.	2.8*	63
045 Main Turbine Generator												Not selected.		
055 Condenser Air Removal												Not selected.		
056 Condensate											X	2.1.30 - Ability to locate and operate components, including local controls.	3.9	64
068 Liquid Radwaste												Not selected.		
071 Waste Gas Disposal												Not selected.		
072 Area Radiation Monitoring									X			A3.01 - Ability to monitor automatic operation of the ARM system, including: Changes in ventilation alignment.	2.9	65
075 Circulating Water												Not selected.		
079 Station Air												Not selected.		
086 Fire Protection												Not selected.		
K/A Category Totals:	1	1	1	1	1	0	1	1	1	1	1	Group Point Total:		10

Facility: Arkansas Nuclear One Unit 2 RO Written Outline		Date of Exam: 12/9/2005		
Category	K/A #	Topic	RO	
			IR	#
1. Conduct of Operations	2.1	2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	3.7	66
	2.1	2.1.8 - Ability to coordinate personnel activities outside the control room.	3.8	67
	2.1	2.1.29 - Knowledge of how to conduct and verify valve lineups.	3.4	68
	2.1			
	2.1			
	Subtotal			
2. Equipment Control	2.2	2.2.12 - Knowledge of surveillance procedures.	3.0	69
	2.2	2.2.30 - Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.5	70
	2.2			
	2.2			
	Subtotal			
3. Radiation Control	2.3	2.3.1 - Knowledge of 10CFR20 and related facility radiation control requirements.	2.6	71
	2.3	2.3.4 - Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	2.5	72
	2.3	2.3.10 - Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	73
	2.3			
	2.3			
	Subtotal			
4. Emergency Procedures/ Plan	2.4	2.4.10 Knowledge of annunciator response procedures.	3.0	74
	2.4	2.4.25 Knowledge of fire protection procedures.	2.9	75
	2.4			
	2.4			
	Subtotal			
Tier 3 Point Total				<b>10</b>

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	000007 2.4.10	This generic K/A concerns annunciator response procedures while the system is Reactor Trip, there is a generic disconnect between the K/A and the system. Randomly selected another K/A: 2.4.3.
1/1	000040 2.4.5	This generic K/A merely addresses organization of procedures. Randomly selected another K/A, 2.4.7, that addresses operator actions required to mitigate a transient within this system.
1/1	000057 AA2.01	<b>This was a typo discovered during exam development. The text was correct, AA2.05 is the K/A.</b>
1/2	000036 AK3.01	<b>This system was determined during development to be more applicable to the SRO exam vs. the RO exam. Another system and K/A was selected: 033 AK3.02.</b>
1/2	CE/A16 EK1.3	This system is for CE units and is not applicable to ANO-1. Randomly selected another system and K/A: B/WA01 AA1.3.
2/1	000004 K6.10	This K/A focuses on a Boric acid storage tank or injection tank recirculation valve. ANO-1 does not have a corresponding component. Randomly selected another K6 K/A: K6.13.
2/1	000004 K6.13	<b>An adequate question could not be developed for this K/A (there is only one purpose of the batch controller). Selected K/A K5.26 as a replacement.</b>
2/1	000012 K3.03	This K/A addresses the connection between RPS and SDS. There is no connection between the two at ANO-1. Another K3 K/A was randomly selected, K3.01.
2/1	000012 K4.07	This K/A is for M/G set breakers which ANO-1 does not have. Another K4 K/A was randomly selected, K4.04.
2/1	000022 K3.01	<b>An adequate question could not be developed for this K/A or the other K3 K/A with an importance &gt;2.5. Selected K/A A1.04 as a replacement.</b>
2/1	000063 A1.01	This K/A concerns battery discharge rates which was also selected in T1/G1 for system 055. Another K/A was randomly selected, K2.01.
2/2	000028 K6.01	<b>During exam development, it was discerned that this K/A could not produce a valid question since the Hydrogen Recombiners are no longer in ANO-1's Technical Specifications nor in the TRM. This is the only K6 K/A for system 028, therefore another system not previously selected in this group was randomly selected (with K/A's &gt;2.5 in the K6 or A3 categories, the only categories not filled in this group). System 072 and K/A A3.01 was chosen.</b>

2/2	000034 K6.02	This system is not to be used for RO outlines per the Rev. 9 of NUREG-1021. The software used at ANO for random sample plan generation has not been modified for this change. Another system was randomly selected from the systems not chosen and a K6 K/A randomly selected from that system. The K/A is 028 K6.01 (see above entry).
2/2	075 K2.03	This particular K/A concerns emergency/essential SWS pumps. The service water system is best sampled under system 076 in Tier 2/Group 1. The 075 system, Circulating Water, generally has K/A's with very low values (most under 2.5), therefore system 041 was selected as a substitute and a K2 K/A randomly selected (041 K2.01).
3	2.1.17	The ability to make concise verbal reports is not easily evaluated with a written exam item. Randomly selected another K/A, 2.1.8.
3	2.2.3	ANO is not a multi-unit site with near identical units, therefore this K/A is not applicable. Randomly selected another K/A, 2.2.12.
3	2.4.31	This K/A duplicated another randomly selected K/A, 2.4.10. Randomly selected another K/A, 2.4.25.

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