

Facility: ANO Unit 2		Date of Exam: 04/21/2000					Exam Level: RO						
Tier	Group	K/A Category Points											Point Total
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	
1. Emergency & Abnormal Plant Evolutions	1	3	2	3				4	3			1	16
	2	2	2	5				1	6			1	17
	3	0	1	1				0	1			0	3
	Tier Totals	5	5	9				5	10			2	36
2. Plant Systems	1	3	1	3	5	3	1	1	2	2	2	0	23
	2	3	1	1	3	3	1	2	1	2	1	2	20
	3	0	1	0	1	0	0	1	2	1	1	1	8
	Tier Totals	6	3	4	9	6	2	4	5	5	4	3	51
3. Generic Knowledge and Abilities					Cat 1		Cat 2		Cat 3		Cat 4		13
					3		3		4		3		
<p>Note: 1. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., the "Tier Totals" in each K/A category shall not be less than two).</p> <p>2. Actual point totals must match those specified in the table.</p> <p>3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities.</p> <p>4. Systems/evolutions within each group are identified on the associated outline.</p> <p>5. The shaded areas are not applicable to the category/tier.</p> <p>6.* The generic 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.</p> <p>7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the RO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.</p>													

ES-401 PWR RO Examination Outline Form ES-401-4
 Emergency and Abnormal Plant Evolutions - Tier 1/Group 1

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	Imp.	Points
000005 Inoperable/Stuck Control Rod / 1									
000015/17 RCP Malfunctions / 4					1		015 AA2.08 – Ability to determine/interpret when to secure RCPs on high bearing temperature as per Reactor Coolant Pump Malfunctions.	3.4	1.0
				1			017 AA1.21 - Ability to operate and/or monitor development of natural circulation.	4.4	1.0
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4				1			A13 AA1.2 – Ability to operate and/or monitor operating behavior characteristics of the facility as they apply to Natural Circulation Operations.	3.1	1.0
000024 Emergency Boration / 1					1		024 AA2.01 – Ability to determine and interpret whether boron flow and/or MOVs are malfunctioning from plant conditions as it applies to Emergency Boration.	3.8	1.0
000026 Loss of Component Cooling Water / 8			1				026 AK3.03 – Knowledge of the reasons for guidance actions contained in EOPs for Loss of CCW.	4.0	1.0
000027 Pressurizer Pressure Control System Malfunction / 3						1	027 2.4.2 – Knowledge of system setpoints, interlocks, and automatic actions associated with EOP entry conditions.	3.9	1.0
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4	1						040 AK1.06 – Knowledge of the operational implications of high-energy break considerations.	3.7	1.0
CE/A11; W/E08 RCS Overcooling - PTS / 4		1					A11 AK2.2 – Knowledge of the interrelations between RCS Overcooling and facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of facility.	3.2	1.0
000051 Loss of Condenser Vacuum / 4					1		051 AA2.02 – Ability to determine and interpret conditions requiring reactor and/or turbine trip as they apply to Loss of Condenser Vacuum.	3.9	1.0
000055 Station Blackout / 6			1				055 EK3.02 – Knowledge of the reason for actions contained in EOP for Loss of Offsite and Onsite Power as they apply to Station Blackout EOP.	4.3	1.0
000057 Loss of Vital AC Elec. Inst. Bus / 6				1			057 AA1.06 – Ability to operate and/or monitor manual control of components for which automatic control is lost as they apply to Loss of Vital AC Instrument Bus.	3.5	1.0
000062 Loss of Nuclear Service Water / 4				1			062 AA1.02 – Ability to operate and/or monitor loads on the SWS in the control room as they apply to Loss of Nuclear Service Water.	3.2	1.0
000067 Plant Fire On-site / 9	1						067 K1.02 – Knowledge of the operational implications of fire fighting as they apply to Plant Fire on Site.	3.1	1.0
000068 (BW/A06) Control Room Evac. / 8		1					068 K2.02 – Knowledge of the interrelations between the Control Room Evacuation and Reactor Trip System.	3.7	1.0
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4	1						074 EK1.02 – Knowledge of the operational implications and potential consequences of uncovering the core as they apply to Inadequate Core Cooling.	4.6	1.0
000076 High Reactor Coolant Activity / 9			1				076 AK3.06 – Knowledge of the actions contained in EOP for high reactor coolant activity.	3.2	1.0
K/A Category Totals:	3	2	3	4	3	1	Group Point Total:		16

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 Emergency and Abnormal Plant Evolutions - Tier 1/Group 2

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	Imp.	Points
000001 Continuous Rod Withdrawal / 1					1		001 AA2.05 – Ability to determine and interpret uncontrolled rod withdrawal, from available indications	4.4	1.0
000003 Dropped Control Rod / 1	1						003 AK1.04 - Knowledge of the operational implications of the effects of power level and control position on flux as they apply to Dropped Control Rods.	3.1	1.0
			1				003 AK3.04 – Knowledge of the reasons for the action contained in AOP for Dropped Control Rod.	3.8	1.0
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1	1						007 EK1.06 – Knowledge of the operational implications of the relationship of emergency feedwater flow to SG and decay heat removal following a Reactor Trip.	3.7	1.0
000008 Pressurizer Vapor Space Accident / 3				1			008 AA1.02 – Ability to operate and/or monitor the HPSI Pump to control Pzr Level/Pressure with a pressurizer Vapor Space Accident.	4.1	1.0
000009 Small Break LOCA / 3					1		009 EA2.33 – Ability to determine or interpret RCS water inventory balance and Tech Spec Limits as they apply to Small Break LOCA.	3.3	1.0
000011 Large Break LOCA / 3					1		011 EA2.08 – Ability to determine or interpret conditions necessary for recovery when accident reaches stable phase as they apply to Large Break LOCA.	3.4	1.0
000022 Loss of Reactor Coolant Makeup / 2			1				022 AK3.02 – Knowledge of the reasons for actions contained in SOPs and EOPs for RCPs, Loss of Makeup, Loss of Charging, and abnormal charging as they apply to the Loss of Reactor Coolant Makeup.	3.5	1.0
000025 Loss of RHR System / 4			1				025 AK3.01 – Knowledge of the reasons for shifting to alternate flowpath as they apply to Loss of Residual Heat Removal System.	3.1	1.0
000029 Anticipated Transient w/o Scram / 1		1					029 AK2.06 – Knowledge of the interrelations between breakers, relays, and disconnects and ATWS.	2.9	1.0
000032 Loss of Source Range NI / 7		1					032 AK2.01 – Knowledge of the interrelations between the Loss of Source Range Nuclear Instrumentation and Power supplies, including proper switch positions.	2.7	1.0
000033 Loss of Intermediate Range NI / 7									
000037 Steam Generator Tube Leak / 3					1		037 AA2.16 – Ability to determine and interpret pressure at which to maintain RCS during SG cooldown during a Steam Generator Tube Leak.	4.1	1.0
000038 Steam Generator Tube Rupture / 3						1	038 2.4.48 – Ability to interpret control room indications to verify the status and operation of systems, and understand how operator actions and directives affect plant and system conditions.	3.5	1.0
000054 (CE/E06) Loss of Main Feedwater / 4			1				E06 EK3.2 – Knowledge for the reasons for normal, abnormal and emergency operating procedures associated with Loss of Feedwater.	3.2	1.0
000058 Loss of DC Power / 6					1		058 AA2.03 – Ability to determine and interpret DC loads lost and impact on ability to operate and monitor plant systems as they apply to the Loss of DC Power.	3.5	1.0
000059 Accidental Liquid RadWaste Rel. / 9			1				059 AK3.01 – Knowledge of the reasons for termination of a release of radioactive liquid as they apply to the Accidental Liquid Radwaste Release.	3.5	1.0

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 Emergency and Abnormal Plant Evolutions - Tier 1/Group 2

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	Imp.	Points
000060 Accidental Gaseous Radwaste Rel. / 9									
000061 ARM System Alarms / 7					1		061 AA2.01 – Ability to determine and interpret the ARM displays as they apply to the Area Radiation Monitoring System.	3.5	1.0
CE/E09 Functional Recovery									
K/A Category Point Totals:	2	2	5	1	6	1	Group Point Total:		17

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 Emergency and Abnormal Plant Evolutions - Tier 1/Group 3

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	Imp.	Points
000028 Pressurizer Level Malfunction / 2			1				028 AK3.05 – Knowledge of reasons for actions contained in AOP for PZR level malfunctions.	3.7	1.0
000036 (BW/A08) Fuel Handling Accident / 8					1		036 AA2.02 – Ability to determine and interpret occurrence of a fuel handling incident.	3.4	1.0
000056 Loss of Off-site Power / 6									
000065 Loss of Instrument Air / 8									
CE/A16 Excess RCS Leakage / 2		1					A16 AK2.2 – Knowledge of the interrelations between Excess RCS Leakage and the facilities heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	3.0	1.0
K/A Category Point Totals:	0	1	1	0	1	0	Group Point Total:		3

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 Plant Systems - Tier 2/Group 1

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)	Imp.	Points
001 Control Rod Drive				1								001 K4.03 – Knowledge of CRDS design feature(s) and/or interlock(s) which provide rod control logic.	3.5	1.0
				1								001 K4.03 – Knowledge of CRDS design feature(s) and/or interlock(s), which provide for rod control logic.	3.5	1.0
003 Reactor Coolant Pump			1									003 K3.02 – Knowledge of the effect that a loss or malfunction of RCPs will have on SGs.	3.5	1.0
	1											003 K1.03 – Knowledge of the physical connections and/or cause effect relationship between the RCPs and the RCP Seal System.	3.3	1.0
004 Chemical and Volume Control										1		004 A4.05 – Ability to manually operate and/or monitor in the control room the letdown pressure and temperature control valves.	3.6	1.0
								1				004 A2.22 – Ability to (a) predict the impacts of mismatch of letdown and charging flows on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions.	3.2	1.0
					1							004 K5.15 – Knowledge of the operational implications of boron and control rod reactivity effects as they apply to the CVCS.	3.3	1.0
013 Engineered Safety Features Actuation			1									013 K3.01 – Knowledge of the effect that a loss or malfunction of the ESFAS will have on the fuel.	4.4	1.0
				1								013 K4.10 – Knowledge of ESFAS design feature(s) and/or Interlock(s) which provide for safeguards equipment control reset.	3.3	1.0
					1							013 K5.02 – Knowledge of the operational implications of safety system logic and reliability as they apply to the ESFAS.	2.9	1.0
								1				013 A2.06 – Ability to (a) predict the impacts of inadvertent ESFAS actuation on the ESFAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of Inadvertent ESFAS actuation.	3.7	1.0

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 Plant Systems - Tier 2/Group 1 (continued)

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)	Imp.	Points
015 Nuclear Instrumentation				1								015 K4.06 – Knowledge of Nuclear Instrumentation System design feature(s) and/or interlocks(s) which provide for Reactor Trip Bypasses.	3.9	1.0
					1							015 K5.10 – Knowledge of the operational implications of the following concepts as they apply to the Nuclear Instrumentation System (NIS) and Detector Operation.	2.9	1.0
				1								015 K4.10 – Knowledge of NIS design feature(s) and/or interlock(s) providing for redundant sources of information on power level.	3.2	1.0
017 In-core Temperature Monitor							1					017 A1.01 – Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ITM system controls including core exit temperatures.	3.7	1.0
022 Containment Cooling		1										022 K2.01 – Knowledge of power supplies to Containment Cooling Fans.	3.0	1.0
										1		022 A4.03 – Ability to manually operate and/or monitor dampers in the Containment Cooling System.	3.2	1.0
025 Ice Condenser														
056 Condensate	1											056 K1.03 – Knowledge of the physical connections and/or cause-effect relationships between the Condensate System and the Main Feedwater System.	2.6	1.0
059 Main Feedwater			1									059 K3.03 – Knowledge of the effect that a loss/malfunction of MFW will have on SGs.	3.5	1.0
									1			059 A3.02 – Ability to monitor automatic operation of the MFW, including programmed levels in the SGs.	2.9	1.0
061 Auxiliary/Emergency Feedwater									1			061 A3.03 - Ability to monitor automatic operation of EFW including EFW SG level control on automatic start.	3.9	1.0
068 Liquid Radwaste						1						068 K6.10 – Knowledge of the effect of a loss or malfunction of radiation monitor will have on the Liquid Radwaste System.	2.5	1.0
071 Waste Gas Disposal														
072 Area Radiation Monitoring	1											072 K1.04 – Knowledge of the physical connections and/or cause-effect relationships between the ARM system and Control Room Ventilation System.	3.3	1.0
K/A Category Point Totals:	3	1	3	5	3	1	1	2	2	2	0	Group Point Total:		23

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Plant Systems - Tier 2/Group 2

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
002 Reactor Coolant					1							002 K5.09 – Knowledge of the operational implications of the relationship of pressure and temperature for water saturation and subcooling conditions as they apply to RCS.	3.7	1.0
											1	002 2.1.7 – Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation.	3.7	1.0
						1						002 K6.02 – Knowledge of the effect of an RCP start on RCS components.	3.6	1.0
006 Emergency Core Cooling		1										006 K2.04 – Knowledge of bus power supplies to ESFAS operated valves.	3.6	1.0
									1			006 A3.08 – Ability to monitor automatic operation of the ECCS, including automatic transfer of ECCS flowpaths.	4.2	1.0
010 Pressurizer Pressure Control	1											010 K1.08 – Knowledge of the physical connections and/or cause-effect relationships between Pressurizer Pressure Control System and Pressurizer Level Control Sys.	3.2	1.0
										1		010 A4.02 – Ability to manually operate and/or monitor pressurizer heaters in the Control Room.	3.6	1.0
011 Pressurizer Level Control	1											011K1.05 – Knowledge of the physical connections and/or cause effect relationships between the Pressurizer Level Control System and the Reactor Regulating System.	3.4	1.0
012 Reactor Protection									1			012 A2.05 – Ability to (a) predict the impacts of faulty or erratic operation of detectors and function generators on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations.	3.1	1.0
014 Rod Position Indication				1								014 K4.06 – Knowledge of RPIS design feature(s) and/or interlock(s), which provide for individual and group misalignment.	3.4	1.0
016 Non-nuclear Instrumentation											1	016 2.4.48 – Ability to interpret control room indications to verify the status of operation of system, and understand how operator actions and directives affect plant and system conditions.	3.5	1.0

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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)	Imp.	Points
026 Containment Spray									1			026 A3.01 – Ability to monitor automatic operation of CSS, including pump starts and correct MOV positioning.	4.3	1.0
029 Containment Purge	1											029 K1.03 – Knowledge of the physical and/or cause-effect relationship between the Containment Purge System and Engineered Safeguards.	3.6	1.0
033 Spent Fuel Pool Cooling				1								033 K4.05 – Knowledge of design feature(s) and/or interlocks which provide for adequate SDM (boron concentration).	3.1	1.0
035 Steam Generator														
039 Main and Reheat Steam					1							039 K5.08 – Knowledge of the operational implications and effects of steam removal on reactivity as it applies to the Main and Reheat Steam Systems.	3.6	1.0
055 Condenser Air Removal														
062 AC Electrical Distribution							1					062 A1.01 – Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AC Distribution System control including significance of DG load limits.	3.4	1.0
063 DC Electrical Distribution			1									063 K3.02 – Knowledge of the effect that a loss or malfunction of the DC electrical system will have on components using DC control power.	3.5	1.0
064 Emergency Diesel Generator				1								064 K4.02 – Knowledge of EDG system design feature(s) and/or interlock(s) which provide trips of EDG while operating (normal or emergency).	3.9	1.0
073 Process Radiation Monitoring							1					073 A1.01 – Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM System controls including radiation levels.	3.2	1.0
075 Circulating Water														
079 Station Air														
086 Fire Protection					1							086 K5.03 – Knowledge of the operational implication of the effect of water spray on electrical components as they apply to the Fire Protection System.	3.1	1.0
K/A Category Point Totals:	3	1	1	3	3	1	2	1	2	1	2	Group Point Total:		20

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 Plant Systems - Tier 2/Group 3

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)	Imp.	Points
005 Residual Heat Removal		1										005 K2.01 – Knowledge of bus power supplies to the SDC pumps.	3.0	1.0
007 Pressurizer Relief/Quench Tank								1				007 A2.01 – Ability to (a) predict the impacts of a stuck-open PORV or code safety on the Quench Tank System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations.	3.9	1.0
008 Component Cooling Water											1	008 2.1.7 – Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretations.	3.7	1.0
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control								1				028 A2.02 – Ability to (a) predict the impacts of LOCA conditions and related concerns over hydrogen on the HRPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations.	3.5	1.0
034 Fuel Handling Equipment									1			034 A3.02 – Ability to monitor automatic operation of the Fuel Handling System including travel limits.	2.5	1.0
041 Steam Dump/Turbine Bypass Control				1								041 K4.17 - Knowledge of SDS design feature(s) and/or interlock(s) related to a reactor trip.	3.7	1.0
045 Main Turbine Generator							1					045 A1.05 – Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MT/G system controls including expected response of primary plant parameters (temp/press) following a T/G trip.	3.8	1.0
076 Service Water														
078 Instrument Air										1		078 A4.01 – Ability to manually operate and/or monitor pressure gages in control room.	3.1	1.0
103 Containment														
K/A Category Point Totals:	0	1	0	1	0	0	1	2	1	1	1	Group Point Total:		8

Facility: ANO Unit 2 Date of Exam: 04/21/2000 Exam Level: RO				
Category	K/A #	Topic	Imp.	Points
Conduct of Operations	2.1.1	Knowledge of conduct of operations requirements.	3.7	1.0
	2.1.21	Ability to obtain and verify controlled procedure copy.	3.1	1.0
	2.1.29	Knowledge of how to conduct and verify valve lineups.	3.4	1.0
Total				3.0
Equipment Control	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	3.7	1.0
	2.2.12	Knowledge of surveillance procedures.	3.0	1.0
	2.2.30	Knowledge of RO duties in the control room during fuel handling such as alarms for fuel handling area, communications with fuel storage facility, systems operated from the control room in support of fuel handling operations and supporting instrumentation.	3.5	1.0
Total				3.0
Radiation Control	2.3.2	Knowledge of facility ALARA program.	2.5	1.0
	2.3.9	Knowledge of the process for performing a containment purge.	2.5	1.0
	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	1.0
	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	1.0
Total				4.0
Emergency Procedures/ Plan	2.4.4	Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency or abnormal operating procedures.	4.0	1.0
	2.4.26	Knowledge of Facility protection requirements including fire brigade and portable fire fighting equipment usage.	3.5	1.0
	2.4.48	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.	3.5	1.0
Total				3.0
Tier 3 Point Total (RO)				13