

Facility: Arkansas Nuclear One Unit 1														Date of Exam: August 2016			
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	4	2	3	N/A			3	4	N/A			2	18			6
	2	2	1	2	N/A			2	1	N/A			1	9			4
	Tier Totals	6	3	5	N/A			5	5	N/A			3	27			10
2. Plant Systems	1	3	2	2	3	4	2	3	1	4	2	2	28			5	
	2	0	1	1	2	1	0	2	2	0	1	0	10			3	
	Tier Totals	3	3	3	5	5	2	5	3	4	3	2	38			8	
3. Generic Knowledge and Abilities Categories				<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	10		1	2	3	4	7			
				3	2	2	3										

- Note:
1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 Radiation Control K/A is allowed if the K/A is replaced by a K/A from another Tier 3 Category).
  2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
  3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted with justification; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
  4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
  5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
  6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
  7. The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
  8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in a category other than Category A2 or G\* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
  9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.
- G\* Generic K/As

ES-401 2		PWR Examination Outline						Form ES-401-	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G *	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1									
000008 Pressurizer Vapor Space Accident / 3			X				<b>AK3.03 Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident:</b> Actions contained in EOP for PZR vapor space accident/ LOCA.  <b>(CFR 41.5, 41.10 / 45.6 / 45.13)</b>	3.7	1 324
000009 Small Break LOCA / 3			X				<b>EK3.23 Knowledge of the reasons for the following responses as they apply to the small break LOCA:</b> RCP tripping requirements.  <b>(CFR 41.5 / 41.10 / 45.6 / 45.13)</b>	4.2	2 1089
000011 Large Break LOCA / 3					X		<b>EA2.11 Ability to determine or interpret the following as they apply to a Large Break LOCA:</b> Conditions for throttling or stopping HPI.  <b>(CFR 43.5 / 45.13)</b>	3.9	3 684
000015/17 RCP Malfunctions / 4									
000022 Loss of Rx Coolant Makeup / 2	X						<b>AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of Reactor Coolant Makeup:</b> Consequences of thermal shock to RCP seals.  <b>(CFR 41.8 / 41.10 / 45.3)</b>	2.8	4 183
000025 Loss of RHR System / 4				X			<b>AA1.03 Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System:</b> LPI pumps.  <b>(CFR 41.7 / 45.5 / 45.6)</b>	3.4	5 New 1091
000026 Loss of Component Cooling Water / 8					X		<b>AA2.01 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water:</b> Location of a leak in the CCWS.  <b>(CFR: 43.5 / 45.13)</b>	2.9	6 8 2004
000027 Pressurizer Pressure Control System Malfunction / 3									
000029 ATWS / 1						X	<b>2.1.20 Ability to interpret and execute procedure steps.</b> <b>REPLACE KA and system due to conflict with operating exam</b>  <b>(CFR: 41.10 / 43.5 / 45.12)</b>	4.6	7

000038 Steam Gen. Tube Rupture / 3	X					<b>EK1.02 Knowledge of the operational implications of the following concepts as they apply to the SGTR: Leak rate vs. pressure drop</b>  (CFR 41.8 / 41.10 / 45.3)	3.2	8 332 2007
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4		X				<b>EK2.1. Knowledge of the interrelations between the (Excessive Heat Transfer) and the following:</b> Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.  (CFR: 41.7 / 45.7)	3.8	9 686 2008
000054 (CE/E06) Loss of Main Feedwater / 4					X	<b>2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.</b>  (CFR: 41.10 / 43.2 / 45.6)	4.5	10 146 2004
000055 Station Blackout / 6				X		<b>EA2.03 Ability to determine or interpret the following as they apply to a Station Blackout:</b> Actions necessary to restore power.  (CFR 43.5 / 45.13)	3.9	11 Need ?
000056 Loss of Off-site Power / 6			X			<b>AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power:</b> Order and time to initiation of power for the load sequencer.  (CFR 41.5,41.10 / 45.6 / 45.13)	3.5	12 New 1057
000057 Loss of Vital AC Inst. Bus / 6			X			<b>AA1.06 Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus:</b> Manual control of components for which automatic control is lost.  (CFR 41.7 / 45.5 / 45.6)	3.5	13 945 2013
000058 Loss of DC Power / 6				X		<b>AA2.03 Ability to determine and interpret the following as they apply to the Loss of DC Power:</b> DC loads lost; impact on ability to operate and monitor plant systems.  (CFR: 43.5 / 45.13)	3.5	14 513 2008
000062 Loss of Nuclear Svc Water / 4			X			<b>AA1.06 Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS):</b> Control of flow rates to components cooled by the SWS.  (CFR 41.7 / 45.5 / 45.6)	2.9	15 New 1058
000065 Loss of Instrument Air / 8	X					<b>AA1.02 Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air:</b> Components served by instrument air to minimize drain on system  (CFR 41.7 / 45.5 / 45.6)	2.6	16 691 2008
W/E04 LOCA Outside Containment / 3								

W/E11 Loss of Emergency Coolant Recirc. / 4											
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	X								<p><b>EK1.3. Knowledge of the operational implications of the following concepts as they apply to the (Inadequate Heat Transfer):</b> Annunciators and conditions indicating signals, and remedial actions associated with the (Inadequate Heat Transfer).</p> <p><b>(CFR: 41.8 / 41.10 / 45.3)</b></p>	4.0	17 949 <b>2013</b>
000077 Generator Voltage and Electric Grid Disturbances / 6		X							<p><b>AK2.07 Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following:</b> Turbine / generator control</p> <p><b>(CFR: 41.4, 41.5, 41.7, 41.10 / 45.8)</b></p>	3.6	18 891 <b>2014</b>
<b>K/A Category Totals:</b>	4	2	3	3	4	2			<b>Group Point Total:</b>		18

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)						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	#
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1	X						<b>AK1.13 Knowledge of the operational implications of the following concepts as they apply to Dropped Control Rod: Operating behavior characteristics of the facility.</b>  <b>(CFR 41.8 / 41.10 / 45.3)</b>	3.2	19 320
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1									
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7							AK2.01 <b>REPLACED with system 000033</b>		
000033 Loss of Intermediate Range NI / 7		X					<b>AK2.01 Knowledge of the interrelations between the Loss of Intermediate Range Nuclear Instrumentation and the following: Power supplies, including proper switch positions.</b>  <b>(CFR 41.7 / 45.7)</b>	2.4	20 MOD 1060
000036 (BW/A08) Fuel Handling Accident / 8									
000037 Steam Generator Tube Leak / 3						X	<b>AA2.14 Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: Actions to be taken if S/G goes solid and water enters steam lines</b>  <b>(CFR: 43.5 / 45.13)</b>	4.0	21 New 1061
000051 Loss of Condenser Vacuum / 4						X	<b>2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.</b>  <b>(CFR: 41.7 / 45.7 / 45.8)</b>	4.5	22 MOD 1062
000059 Accidental Liquid Radwaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9									
000061 ARM System Alarms / 7									
000067 Plant Fire On-site / 8									
000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4									

000076 High Reactor Coolant Activity / 9			X					AK3.05 <b>Knowledge of the reasons for the following responses as they apply to the High Reactor Coolant Activity</b> : Corrective actions as a result of high fission-product radioactivity level in the RCS <b>(CFR 41.5,41.10 / 45.6 / 45.13)</b>	2.9	23 693 2013
W/E01 & E02 Rediagnosis & SI Termination / 3										
W/E13 Steam Generator Over-pressure / 4										
W/E15 Containment Flooding / 5										
W/E16 High Containment Radiation / 9										
BW/A01 Plant Runback / 1				X				AA1.2 <b>Ability to operate and / or monitor the following as they apply to the (Plant Runback)</b> : Operating behavior characteristics of the facility. <b>(CFR: 41.7 / 45.5 / 45.6)</b>	3.2	24 162 2005
BW/A02&A03 Loss of NNI-X/Y / 7										
BW/A04 Turbine Trip / 4										
BW/A05 Emergency Diesel Actuation / 6				X				AA1.1 <b>Ability to operate and / or monitor the following as they apply to the (Emergency Diesel Actuation)</b> Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features. <b>(CFR: 41.7 / 45.5,45.6)</b>	4.3	25 276 2005
BW/A07 Flooding / 8				X				AK3.2 <b>Knowledge of the reasons for the following responses as they apply to the (Flooding)</b> : Normal, abnormal and emergency operating procedures associated with (Flooding). <b>(CFR: 41.5 / 41.10, 45.6, 45.13)</b>	3.2	26 New 1064
BW/E03 Inadequate Subcooling Margin / 4										
BW/E08; W/E03 LOCA Cooldown - Depress. / 4	X							EK1.1. <b>Knowledge of the operational implications of the following concepts as they apply to the (LOCA Cooldown)</b> : Components, capacity, and function of emergency systems. <b>(CFR: 41.8 / 41.10 / 45.3)</b>	3.5	27 MOD 1063
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4										
BW/E13&E14 EOP Rules and Enclosures										
CE/A11; W/E08 RCS Overcooling - PTS / 4										
CE/A16 Excess RCS Leakage / 2										
CE/E09 Functional Recovery										
K/A Category Point Totals:	2	1	2	2	1	1		Group Point Total:		9

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)											Form ES-401-2	
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)	IR	#
003 Reactor Coolant Pump						X						K6.02 <b>Knowledge of the effect of a loss or malfunction on the following will have on the RCPS:</b> RCP seals and seal water supply.  (CFR: 41.7 / 45/5)	2.7	28 326 <b>2014</b>
004 Chemical and Volume Control					X							K5.26 <b>Knowledge of the operational implications of the following concepts as they apply to the CVCS:</b> Relationship between VCT pressure and NPSH for charging pumps.  (CFR: 41.5/45.7)	3.1	29 MOD 1069
004 Chemical and Volume Control									X			A3.02 <b>Ability to monitor automatic operation of the CVCS, including:</b> Letdown isolation.  (CFR: 41.7 / 45.5)	3.6	30 654 2007
005 Residual Heat Removal	X											K1.09 <b>Knowledge of the physical connections and/or cause-effect relationships between the RHRS and the following systems:</b> RCS.  (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.62	31 MOD 1068
005 Residual Heat Removal							X					A1.05 <b>Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including:</b> Detection of and response to presence of water in RHR emergency sump.  (CFR: 41.5 / 45.5)	3.3	32 611 <b>2013</b>
006 Emergency Core Cooling		X										K2.04 <b>Knowledge of bus power supplies to the following:</b> ESFAS-operated valves.  (CFR: 41.7)	3.6	33 903 <b>2014</b>
007 Pressurizer Relief/Quench Tank					X							K5.02 <b>Knowledge of the operational implications of the following concepts as they apply to the PRTS:</b> Method of forming a steam bubble in the PZR.  (CFR: 41.7)	2.6	34 561 2010
008 Component Cooling Water									X			A3.04 <b>Ability to monitor automatic operation of the CCWS, including:</b> Requirements on and for the CCWS for different conditions of the power plant.  (CFR: 41.7 / 45.5)	2.9	35 627 2005

008 Component Cooling Water										X	<b>2.4.31 Knowledge of annunciator alarms, indications, or response procedures.</b>  (CFR: 41.10 / 45.13)	3.7	36 MOD 1070
010 Pressurizer Pressure Control					X						<b>K6.03 Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR sprays and heaters.</b>  (CFR: 41.7 / 45.7)	3.2	37 New 1071
012 Reactor Protection		X									<b>K2.01 Knowledge of bus power supplies to the following: RPS channels, components, and interconnections.</b>  (CFR: 41.7)	3.3	38 85 2002
012 Reactor Protection										X	<b>A4.04 Ability to manually operate and/or monitor in the control room: Bistable, trips, reset and test switches.</b>  (CFR: 41.7 / 45.5 to 45.8)	3.3	39 966 <b>2013</b>
013 Engineered Safety Features Actuation			X								<b>K3.02 Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: RCS.</b>  (CFR: 41.7 / 45.6)	4.3	40 337
013 Engineered Safety Features Actuation										X	<b>2.1.28 Knowledge of the purpose and function of major system components and controls.</b>  (CFR: 41.7)	4.1	41 New 1073
022 Containment Cooling				X							<b>K4.03 Knowledge of CCS design feature(s) and/or interlock(s) which provide for the following: Automatic containment isolation.</b>  (CFR: 41.7)	3.6	42 909 <b>2014</b>
<b>025 Ice Condenser</b>													
026 Containment Spray						X					<b>A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including: Containment sump level.</b>  (CFR: 41.5 / 45.5)	3.5	43 New 1075
039 Main and Reheat Steam					X						<b>K5.05 Knowledge of the operational implications of the following concepts as they apply to the MRSS: Bases for RCS cooldown limits.</b>  (CFR: 41.5 / 45.7)	2.7	44 MOD 1074
059 Main Feedwater										X	<b>A4.10 Ability to manually operate and monitor in the control room: ICS.</b>  (CFR: 41.7 / 45.5 to 45.8)	3.9	45 565 2005







ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 Control Rod Drive								X				A2.17 Ability to (a) predict the impacts of the following malfunction or operations on the CRDS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Rod-misalignment alarm.  (CFR: 41.5/43.5/45.3/45.13)	3.3	56 674 2007
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.  (CFR: 41.5 / 45.7)	2.5	57 193 2005
011 Pressurizer Level Control														
014 Rod Position Indication														
015 Nuclear Instrumentation		X										K2.01 Knowledge of bus power supplies to the following: NIS channels, components, and interconnections.  (CFR: 41.7)	3.3	58 New 1066
016 Non-Nuclear Instrumentation			X									K3.01 Knowledge of the effect that a loss or malfunction of the NNIS will have on the following: MFW system.  (CFR: 41.7 / 45.6)	2.6	65 309
017 In-Core Temperature Monitor								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the ITM system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Core damage. REPLACE? No core damage effect for CETs (except melting, could fail either way).  (CFR: 41.5 / 43.5 / 45.3 / 45.5)	3.6	59 MOD 1067
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control														
029 Containment Purge														



Facility: Arkansas Nuclear One Unit 1		Date of Exam: August 2016				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.	<b>2.1.2 Knowledge of operator responsibilities during all modes of plant operation.</b>  (CFR: 41.10 / 45.13)	4.1	66 New 1083		
	2.1.	<b>2.1.4 Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc.</b>  (CFR: 41.10 / 43.2)	3.3	67 838 2011		
	2.1.	<b>2.1.15 Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.</b>  (CFR: 41.10 / 45.12)	2.7	68 New 1084		
	Subtotal			3		
2. Equipment Control	2.2.	<b>2.2.13 Knowledge of tagging and clearance procedures.</b>  (CFR: 41.10 / 45.13)	4.1	69 231 2007		
	2.2.	<b>2.2.6 Knowledge of the process for making changes to procedures.</b>  (CFR: 41.10 / 43.3 / 45.13)	3.0	70 New 1082		
	Subtotal			2		
3. Radiation Control	2.3.	<b>2.3.12 Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.</b>  (CFR: 41.12 / 45.9 / 45.10)	3.2	71 New 1081		
	2.3.	<b>2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.</b>  (CFR: 41.12 / 43.4 / 45.10)	3.2	72 751 2008		
	Subtotal			2		

4. Emergency Procedures / Plan	2.4.	<b>2.4.3 Ability to identify post-accident instrumentation.</b> (CFR: 41.6 / 45.4)	3.7	73 242 2010		
	2.4.	<b>2.4.12 Knowledge of general operating crew responsibilities during emergency operations.</b> (CFR: 41.10 / 45.12)	4.0	74 51 1998		
	2.4.	<b>2.4.25 Knowledge of fire protection procedures.</b> (CFR: 41.10 / 43.5 / 45.13)	3.3	75 848		
	Subtotal				3	
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO 1/1	008 AK3.01	This KA is for a Pressurizer Vapor Space Accident and states, "Why PZR level may come back on scale if RCS is saturated". Could not develop a question for this K/A with one correct answer and three incorrect but plausible distractors. Replaced with K/A AK3.03.
RO 1/1	025 AA1.23	This K/A is for monitoring/operating RHR heat exchangers as they apply to a loss of RHR. Another question relating the DH heat exchangers is being asked on another system so to remove this duplication the K/A was replaced with AA1.03.
RO 1/1	038 EK1.03	The EPE is Steam Generator Tube Rupture and the K/A concerns natural circulation. ANO-1 does not have any unique actions in 1202.006, Tube Rupture, for natural circulation conditions. Replaced with K/A EK1.02.
RO 1/1	056 AK3.01	ANO-1 does not have individual load sequencers. Sequencing of loads is accomplished by time delay relays on the individual breakers.
RO 1/1	062 AA1.03	ANO-1 does not use the Service Water System as a backup to CCWS. The Unit 1 equivalent of CCWS is Intermediate Cooling Water (ICW) and Service Water provides cooling to the ICW heat exchangers but it is not considered a backup system to ICW. Replaced with K/A AA1.06.
RO 1/2	003 AK1.21	ANO-1 equivalent of Delta Flux (DI) is Axial Power Imbalance. The Technical Specification (3.2.3) is used in conjunction with the Core Operating Limits Report (COLR). COLR Figures 6A-C, 7A-C, 8A-C give such broad limits for Axial Power Imbalance such that a single dropped control rod would have little operational implications other than performing the surveillance for TS 3.2.3. Replaced with K/A AK1.13.
RO 1/2	032 AK2.01	ANO-1 AOP 1203.021, Loss of Neutron Flux Indication, Section 3 contains no actions for resetting the power supplies for Source Range indication. There are actions for resetting power supplies for Intermediate Range detectors, replaced with system 000033 K/A AK2.01, RO Importance Rating 2.4. <u>JUSTIFICATION FOR USE OF K/A WITH RATING LESS THAN 2.5:</u> Monitoring of neutron flux during power changes, particularly startups, is important to reactor safety and thus the health, safety, and welfare of the general public.
RO 2/1	004 K5.32	This KA concerns purpose and control of heat tracing. This is NLO knowledge. Replaced with K/A K5.26.
RO 2/1	005 K1.01	ANO-1 equivalent of CCWS is Intermediate Cooling Water (ICW) and the ICW system has no interconnection with the RHRS equivalent, the Decay Heat System. Replaced with K/A K1.09.
RO 2/1	007 K4.01	This K/A concerns the design features which allow for Quench Tank cooling. This is the only K/A in this category with an importance rating greater than 2.5 and has thus been over-used in exams. Changed to category K5 and replaced with K/A K5.02.
RO 2/1	008 2.2.12	Knowledge of surveillance procedures would best be tested via a JPM instead of the written exam, and ANO-1 does not have any surveillances for the ICW system since it is not in Tech Specs. Replaced with K/A 2.4.31.

RO 2/1	013 K3.03	This K/A concerns the impact a malfunction of the ESFAS would have upon containment. A question was developed for this K/A, however this question was a better fit for the other K/A selected for the 013 system. Replaced with K/A K3.02.
RO 2/1	022 K4.04	This K/A concerns Containment Cooling System design features and/or interlocks which provide for cooling of the control rod drive motors. ANO-1 does not have direct cooling of the CRDMs via the CCS, therefore no question could be developed for this K/A. Replaced with K/A K4.03.
RO 2/1	026 A1.02	This K/A concerns the ability to monitor containment temperature as relates to operating Containment Spray controls. ANO-1 Reactor Building Spray System is not operated based upon containment temperature but upon containment pressure. Replaced with K/A A1.03.
RO 2/1	039 K5.01	This K/A concerns the definition and causes of steam/water hammer. A licensed level question could not be developed for this K/A. Replaced with K/A K5.05.
RO 2/1	061 A1.03	This K/A concerns Emergency Feedwater System interactions with multi-units. ANO-1 does not have cross-connects with Unit 2 for the EFW system. Replaced with K/A A1.01.
RO 2/1	062 K4.06	This K/A concerns 6.9KV one line diagrams. A licensed level question could not be developed for this K/A. Replaced with K/A K4.03.
RO 2/2	002 K5.02	This K/A concerns the need for a vent path during draining. A licensed level question could not be developed for this K/A. Replaced with K/A K5.10.
RO 2/2	075 K3.07	This K/A concerns the connection between Circulating Water and ESFAS. ANO-1 has no connection between the two systems. A CW K/A with a rating greater than 2.5 and a lack of conflict with other questions could not be found. Replaced with system 016 and K/A K3.01.
RO 3	2.1.14	This K/A concerns the knowledge of things which require plant wide announcements. A licensed level question could not be developed for this K/A. Replaced with K/A 2.1.2.
RO 3	2.1.26	This K/A concerns the knowledge of industrial safety requirements. A licensed level question could not be developed for this K/A. Replaced with K/A 2.1.15.
RO 3	2.2.41	This K/A concerns the ability to obtain and interpret station electrical and mechanical drawings. This K/A can only be used to develop a system based question. Replaced with K/A 2.2.6.
RO 3	2.3.5	This K/A concerns the ability to use fixed radiation monitors and alarms which would result in a radiation monitoring system question, or use of portable survey instruments which would best be evaluated via a JPM. Replaced with K/A 2.3.4.
RO 3	2.4.46	This K/A concerns ability to verify alarms are consistent with plant conditions. This K/A can only be used to develop a system based question. Replaced with K/A 2.4.25.



Facility: Arkansas Nuclear One Unit 1														Date of Exam: August 2016		
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												18	4	2	6
	2											9	1	3	4	
	Tier Totals											27	5	5	10	
2. Plant Systems	1											28	3	2	5	
	2											10	3	0	3	
	Tier Totals											38	6	2	8	
3. Generic Knowledge and Abilities Categories				1	2	3	4	10	1	2	3	4	7			

- Note:
- Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 Radiation Control K/A is allowed if the K/A is replaced by a K/A from another Tier 3 Category).
  - 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 with justification; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
  - Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
  - 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. Refer to Section D.1.b of ES-401 for the applicable K/As.
  - On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in a category other than Category A2 or G\* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
  - For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.
- G\* Generic K/As

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (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	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1									
000008 Pressurizer Vapor Space Accident / 3									
000009 Small Break LOCA / 3					X		<b>EA2.02 Ability to determine or interpret the following as they apply to a small break LOCA:</b> Possible leak paths. (CFR 43.5 / 45.13)	3.8	76 MOD 1051
000011 Large Break LOCA / 3									
000015/17 RCP Malfunctions / 4									
000022 Loss of Rx Coolant Makeup / 2									
000025 Loss of RHR System / 4					X		<b>AA2.02 Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System:</b> Leakage of reactor coolant from RHR into closed cooling water system or into reactor building atmosphere. <b>(CFR: 43.5 / 45.13)</b>	3.8	77 MOD 639
000026 Loss of Component Cooling Water / 8									
000027 Pressurizer Pressure Control System Malfunction / 3									
000029 ATWS / 1					X		<b>EA2.01 Ability to determine or interpret the following as they apply to a ATWS:</b> Reactor nuclear instrumentation (CFR 43.5 / 45.13)	4.7	78 New 1085
000038 Steam Gen. Tube Rupture / 3									
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4						X	<b>2.4.6 Knowledge of EOP mitigation strategies.</b> (CFR: 41.10 / 43.5 / 45.13)	4.7	79 584
000054 (CE/E06) Loss of Main Feedwater / 4									
000055 Station Blackout / 6									
000056 Loss of Off-site Power / 6						X	<b>2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.</b> (CFR: 41.10 / 43.2 / 45.13)	4.2	80 MOD 586
000057 Loss of Vital AC Inst. Bus / 6									

000058 Loss of DC Power / 6											
000062 Loss of Nuclear Svc Water / 4											
000065 Loss of Instrument Air / 8											
W/E04 LOCA Outside Containment / 3											
W/E11 Loss of Emergency Coolant Recirc. / 4											
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4					X				EA2.2 Ability to determine and interpret the following as they apply to the (Excessive Heat Transfer): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.  (CFR: 43.5 / 45.13)	4.0	81 New 1050
000077 Generator Voltage and Electric Grid Disturbances / 6											
K/A Category Totals:					4	2	Group Point Total:				6

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (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	#
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1									
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1									
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7									
000033 Loss of Intermediate Range NI / 7									
000036 (BW/A08) Fuel Handling Accident / 8						X	<b>A08 AA2.2 Refueling Canal Level Decrease: Ability to determine and interpret the following as they apply to the (Refueling Canal Level Decrease)</b> Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. <b>(CFR: 43.5 / 45.13)</b>	4.0	82 347
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4									
000059 Accidental Liquid Radwaste Rel. / 9						X	<b>2.3.11 Ability to control radiation releases.</b> <b>(CFR: 41.11 / 43.4 / 45.10)</b>	4.3	83 New 1086
000060 Accidental Gaseous Radwaste Rel. / 9									
000061 ARM System Alarms / 7									
000067 Plant Fire On site / 8						X	<b>2.4.25 Knowledge of fire protection procedures.</b> <b>(CFR: 41.10 / 43.5 / 45.13)</b>	3.7	84 1045 NEW
000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									
W/E01 & E02 Rediagnosis & SI Termination / 3									
W/E13 Steam Generator Over-pressure / 4									
W/E15 Containment Flooding / 5									
W/E16 High Containment Radiation / 9									
BW/A01 Plant Runback / 1									
BW/A02&A03 Loss of NNI-X/Y / 7									
BW/A04 Turbine Trip / 4									
BW/A05 Emergency Diesel Actuation / 6									

BW/A07 Flooding / 8											
BW/E03 Inadequate Subcooling Margin / 4											
BW/E08; W/E03 LOCA Cooldown - Depress. / 4											
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4							X			2.2.44 <b>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.</b>  (CFR: 41.5 / 43.5 / 45.12)	4.4 85 737
BW/E13&E14 EOP Rules and Enclosures											
CE/A11; W/E08 RCS Overcooling - PTS / 4											
CE/A16 Excess RCS Leakage / 2											
CE/E09 Functional Recovery											
K/A Category Point Totals:						1	3			Group Point Total:	4

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (SRO)											Form ES-401-2		
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)	IR	#
003 Reactor Coolant Pump								X				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Problems with RCP seals, especially rates of seal leak-off. (CFR: 41.5 / 43.5 / 45.3 / 45/13)	3.9	86 638
004 Chemical and Volume Control														
005 Residual Heat Removal														
006 Emergency Core Cooling														
007 Pressurizer Relief/Quench Tank														
008 Component Cooling Water														
010 Pressurizer Pressure Control														
012 Reactor Protection														
013 Engineered Safety Features Actuation								X				A2.05 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; Loss of dc control power. (CFR: 41.5 / 43.5 / 45.3 / 45.13)	4.2	87 New 1052
022 Containment Cooling														
025 Ice Condenser														
026 Containment Spray														
039 Main and Reheat Steam														
059 Main Feedwater														
061 Auxiliary/Emergency Feedwater											X	2.2.37 Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12)	4.6	88 740

062 AC Electrical Distribution									X											A2.06 <b>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:</b> Keeping the safeguards buses electrically separate. (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.9	89 New 1046
063 DC Electrical Distribution																						
064 Emergency Diesel Generator																		X		2.4.11 <b>Knowledge of abnormal condition procedures.</b> (CFR: 41.10 / 43.5 / 45.13)	4.2	90 New 1047
073 Process Radiation Monitoring																						
076 Service Water																						
078 Instrument Air																						
103 Containment																						
K/A Category Point Totals:									3									2		Group Point Total:		5

ES-401		PWR Examination Outline Plant Systems - Tier 2/Group 2 (SRO)											Form ES-401-2	
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)	IR	#
001 Control Rod Drive														
002 Reactor Coolant														
011 Pressurizer Level Control											X	2.2.40 Ability to apply technical specifications for a system.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	4.7	91 MOD 1056
014 Rod Position Indication												(Replaced, see system 011)		
015 Nuclear Instrumentation														
016 Non-Nuclear Instrumentation														
017 In-Core Temperature Monitor														
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control														
029 Containment Purge														
033 Spent Fuel Pool Cooling														
034 Fuel Handling Equipment								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the Fuel Handling System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Mispositioned fuel element.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	4.0	92 New 1048
035 Steam Generator														
041 Steam Dump/Turbine Bypass Control														
045 Main Turbine Generator														
055 Condenser Air Removal														
056 Condensate														
068 Liquid Radwaste														
071 Waste Gas Disposal														
072 Area Radiation Monitoring														
075 Circulating Water														





Facility: Arkansas Nuclear One Unit 1		Date of Exam: August 2016				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.5	<b>Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.</b> <b><u>Replace – too many fuel handling KAs</u></b>  (CFR: 41.10 / 43.5 / 45.12)			3.9	94 MOD 1055
	2.1.35	<b>Knowledge of the fuel-handling responsibilities of SROs.</b>  (CFR: 41.10 / 43.7)			3.9	95 846
	Subtotal					2
2. Equipment Control	2.2.7	<b>Knowledge of the process for conducting special or infrequent tests.</b>  (CFR: 41.10 / 43.3 / 45.13)			3.6	96 MOD 486
	2.2.17	<b>Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.</b>  (CFR: 41.10 / 43.5 / 45.13)			3.8	97 879 <b>2014</b>
	Subtotal					2
3. Radiation Control	2.3.4	<b>Knowledge of radiation exposure limits under normal or emergency conditions.</b>  (CFR: 41.12 / 43.4 / 45.10)			3.7	98 MOD 1049
	Subtotal					1
4. Emergency Procedures / Plan	2.4.29	<b>Knowledge the emergency plan.</b>  (CFR: 41.10 / 43.5 / 45.11)			4.4	99 New 1088
	2.4.30	<b>Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.</b>  (CFR: 41.10 / 43.5 / 45.11)			4.1	100 411
	Subtotal					2
Tier 3 Point Total						7

Tier / Group	Randomly Selected K/A	Reason for Rejection
SRO T1G1	BW/E04 EA2.2	This is not a rejection, just a record of a correction. Sample plan submitted to ANO used EA2.2 from BW/E05 Excessive Heat Transfer instead of the EA2.2 for the T1G1 topic BW/E04Inadequate Heat Transfer. Excessive Heat Transfer was already being tested in topic 000040 in T1G1. The word “Excessive” was changed to “Inadequate” and IR changed from 4.0 to 4.4.
SRO T1G2	000059 AA2.02	This APE is titled Accidental Liquid Radioactive-Waste Release. The KA is “The permit for liquid radioactive-waste release.” If it is an accidental release, then a permit is not in effect. The APE for Accidental Gaseous Radwaste Release does not have any K/As referring to release permits. After reviewing the remaining AA2 K/As for this topic, concluded that none of the K/As would produce an SRO level question. Replaced with generic K/A 2.3.11.
SRO T1G2	000067 2.4.18	The APE is Plant Fire on Site and 2.4.18 refers to the “knowledge of specific bases for EOPs”. Our Fire and Explosion AOP does not have a bases document so this would be a difficult K/A to develop a question for. Replaced with K/A 2.4.25.
SRO T2G2	000014 2.1.32	This generic K/A concerns the explanation of system limits and precautions. An SRO level question could not be developed for this KA. Additionally, Rod Position Indication is being evaluated by a JPM so a different system had to be selected. Selected system 000011 PZR Level Control System and K/A A2.11 as a replacement.
SRO T3	2.1.40	This generic K/A concerns fuel handling. Randomly selected K/A 2.1.35 also concerns fuel handling. Fuel handling was randomly over sampled. Selected K/A 2.1.5 as a replacement.
SRO T3	2.3.6	This generic K/A concerns the ability to approve release permits. It is difficult to evaluate this K/A with a written exam question. This is best evaluated with an administrative JPM. Replaced with K/A 2.3.4.
SRO T3	2.4.9	This generic K/A concerns the knowledge of low power implications during accident situations. This K/A would only result in a system type question which is not desired in Tier 3. Replaced with K/A 2.4.29.

Facility: <u>ANO-1</u>		Date of Examination: <u>8/22/2016</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>2016-1</u>
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations KA – 2.1.5, Importance rating 2.9 (RO/SRO)	R, N	Given their work history, select the eligible operators to fill vacancy due to illness of the on watch ATC.
Conduct of Operations KA- 2.1.23, Importance 4.3 RO/SRO	R, M	Perform Time to Boil and Time to Core Uncovery Calculations
Equipment Control KA – 2.2.13, Importance 4.1 RO	R, N	Determine the mechanical and electrical boundary isolations for P-36B Makeup Pump seal replacement.
Radiation Control KA – 2.3.7, Importance 3.5 RO	R, N	Given a survey map and associated RWP, determine the entry requirements to perform a task in the Letdown Cooler Room.
Emergency Plan		Not used
NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank ( $\leq 3$ for ROs; $\leq 4$ for SROs & RO retakes) (N)ew or (M)odified from bank ( $\geq 1$ ) (P)revious 2 exams ( $\leq 1$ ; randomly selected)		

Facility: <u>ANO-1</u>		Date of Examination: <u>8/22/2016</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <u>2016-1</u>
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations KA – 2.1.5, Importance rating 3.9 (RO/SRO)	R, N	Given their work history, select the eligible operators to fill vacancy due to illness of the on watch ATC.
Conduct of Operations KA- 2.1.23, Importance 4.4 RO/SRO	R, M	Perform Time to Boil and Time to Core Uncovery Calculations
Equipment Control KA – 2.2.13, Importance 4.3 SRO	R, N	Review and approve the tagout provided for P-36B Makeup Pump seal replacement. If not approved, provide the reasons why.
Radiation Control KA – 2.3.4, Importance 3.7 SRO	R, N	Provided with the dose history for each individual. Determine which of the 5 are eligible for performing the task during an emergency situation.
Emergency Plan KA – 2.4.44, Importance 4.4 SRO	R, D	Determine the correct PAR and evacuation/sheltering required for a given GE.
NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank ( $\leq 3$ for ROs; $\leq 4$ for SROs & RO retakes) (N)ew or (M)odified from bank ( $\geq 1$ ) (P)revious 2 exams ( $\leq 1$ ; randomly selected)		

Facility: <u>Arkansas Nuclear One – Unit 1</u>		Date of Examination: <u>8/22/2016</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: <u>2016-1</u>
Control Room Systems: * 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U		
System / JPM Title	Type Code*	Safety Function
a. API-RPI Comparison 014 A1.02 (RO 3.2 / SRO 3.6) <b>RO</b>	N/S	1
b. Throttle HPI 013 A4.01 (RO 4.5 / SRO 4.8) <b>RO / SRO-U / SRO-I</b>	A/D/EN/L/S	2
c. Manually Control RCS Pressure with the Pressurizer Spray Valve 010 A3.02 (RO 3.6 / SRO 3.5) <b>RO / SRO-I</b>	D/S	3
d. Shutdown RCP P-32A at Power 003 A2.02 (RO 3.7 / SRO 3.9) <b>RO / SRO-I</b>	A/D/E/S	4P
e. Pump the Quench Tank 007 A1.01 (RO 2.9 / SRO 3.1) <b>RO / SRO-I</b>	D/S	5
f. Transferring Buses From Unit Aux Transformer to a Startup Transformer 062 A4.07 (RO 3.1 / SRO 3.1) <b>RO / SRO-I</b>	A/N/S	6
g. RPS and Manual PB Fails to trip the Reactor 007 EA2.02 (RO 4.3 / SRO 4.6) <b>RO / SRO-U / SRO-I</b>	A/D/S	7
h. Shift ICW Pumps 008 A2.01 (RO 3.3 / SRO 3.6) <b>RO / SRO-I</b>	D/S	8

In-Plant Systems* (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i.	Alternate Shutdown for RO#1 A06 AA1.01 (RO 4.3 / SRO 4.2) <b>RO / SRO-U / SRO-I</b>	A/D/E/R	4S
j.	Defeat S/U #2 Load Shed 062 A2.01 (RO 3.4 / SRO 3.9) <b>RO / SRO-U / SRO-I</b>	D/L	6
k.	Align T-16A (TWMT) for Recirc / Sample 068 A2.02 (RO 2.7 / SRO 2.8) <b>RO / SRO-U / SRO-I</b>	N/R	9
* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all five SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.			
* Type Codes		Criteria for RO / SRO-I / SRO-U	
A)lternate path (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator		4-6 (5) / 4-6 (5) / 2-3 (3) ≥ 8 (8) / ≥ 7 (7) / 2-3 (2) ≤ 9 (8) / ≤ 8 (8) / ≤ 4 (4) ≥ 1 (2) / ≥ 1 (2) / ≥ 1 (1) ≥ 1 (1) / ≥ 1 (1) / ≥ 1 (1) (control room system) ≥ 1 (2) / ≥ 1 (2) / ≥ 1 (2) ≥ 2 (3) / ≥ 2 (2) / ≥ 1 (1) ≤ 3 (0) / ≤ 3 (0) / ≤ 2 (0) (randomly selected) ≥ 1 (1) / ≥ 1 (1) / ≥ 1 (1)	

Facility: <b>ANO-1</b>		Date of Examination: <b>8/22/2016</b>		Operating Test Number: <b>2016-1</b>	
1. General Criteria			Initials		
			a	b*	c#
a.	The operating test conforms with the previously approved outline; changes are consistent with sampling requirements (e.g., 10 CFR 55.45, operational importance, safety function distribution).				
b.	There is no day-to-day repetition between this and other operating tests to be administered during this examination.				
c.	The operating test shall not duplicate items from the applicants' audit test(s). (see Section D.1.a.)				
d.	Overlap with the written examination and between different parts of the operating test is within acceptable limits.				
e.	It appears that the operating test will differentiate between competent and less-than-competent applicants at the designated license level.				
2. Walk-Through Criteria			--	--	--
a.	Each JPM includes the following, as applicable: <ul style="list-style-type: none"> <li>• initial conditions</li> <li>• initiating cues</li> <li>• references and tools, including associated procedures</li> <li>• reasonable and validated time limits (average time allowed for completion) and specific designation if deemed to be time-critical by the facility licensee</li> <li>• operationally important specific performance criteria that include:                             <ul style="list-style-type: none"> <li>– detailed expected actions with exact criteria and nomenclature</li> <li>– system response and other examiner cues</li> <li>– statements describing important observations to be made by the applicant</li> <li>– criteria for successful completion of the task</li> <li>– identification of critical steps and their associated performance standards</li> <li>– restrictions on the sequence of steps, if applicable</li> </ul> </li> </ul>				
b.	Ensure that any changes from the previously approved systems and administrative walk-through outlines (Forms ES-301-1 and 2) have not caused the test to deviate from any of the acceptance criteria (e.g., item distribution, bank use, repetition from the last 2 NRC examinations) specified on those forms and Form ES-201-2.				
3. Simulator Criteria			--	--	--
The associated simulator operating tests (scenario sets) have been reviewed in accordance with Form ES-301-4 and a copy is attached.					
Printed Name / Signature				Date	
a.	Author	_____	_____	_____	_____
b.	Facility Reviewer(*)	_____	_____	_____	_____
c.	NRC Chief Examiner (#)	_____	_____	_____	_____
d.	NRC Supervisor	_____	_____	_____	_____
NOTE: * The facility signature is not applicable for NRC-developed tests. # Independent NRC reviewer initial items in Column "c"; chief examiner concurrence required.					



Facility: <b>ANO</b>			Date of Exam:			Operating Test No.:											
A P P L I C A N T	E V E N T  T Y P E	Scenarios												T O T A L	M I N I M U M(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P		R	I	U
U1 / U2	RX				1									1	1	1	0
	NOR	1			3									2	1	1	1
	I/C	2,3,4, 5,6			2,4,5, 6									9	4	4	2
	MAJ	7			7									2	2	2	1
	TS	2,3			4,5									4	0	2	2
R1 / R2	RX													0	1	1	0
	NOR						3							1	1	1	1
	I/C		2,3,4				2,4,5							6	4	4	2
	MAJ		7				7							2	2	2	1
	TS													0	0	2	2
R5 / R6	RX					1								1	1	1	0
	NOR			1										1	1	1	1
	I/C			3,5, 6		2,4, 6								6	4	4	2
	MAJ			7		7								2	2	2	1
	TS													0	0	2	2
I1 / I2	RX				1									1	1	1	0
	NOR				3									1	1	1	1
	I/C				2,4,5, 6				3,5,6				2,5,6	10	4	4	2
	MAJ				7				7				7	3	2	2	1
	TS				4,5									2	0	2	2
Instructions:																	
<ol style="list-style-type: none"> <li>Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls" (ATC) and "balance-of-plant" (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I <i>additionally</i> serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.</li> <li>Reactivity manipulations may be conducted under normal or <i>controlled</i> abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a one-for-one basis.</li> <li>Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.</li> <li>For licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.</li> </ol>																	

Facility:		Date of Exam:									Operating Test No.:						
A P P L I C A N T	E V E N T  T Y P E	Scenarios															
		1			2			3			4			T O T A L	M I N I M U M (*)		
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P	S R O	A T C	B O P				
												R	I	U			
U3 / U4	RX												0	1	1	0	
	NOR	1						1					2	1	1	1	
	I/C	2,3,4, 5,6						2,3,4, 5,6					10	4	4	2	
	MAJ	7						7					2	2	2	1	
	TS	2,3						2,3					4	0	2	2	
R3 / R4	RX												0	1	1	0	
	NOR								1				1	1	1	1	
	I/C		2,3,4							2,4,6			6	4	4	2	
	MAJ		7							7			2	2	2	1	
	TS												0	0	2	2	
R7 / R8	RX												0	1	1	0	
	NOR			1									1	1	1	1	
	I/C			3,5, 6					3,5,6				6	4	4	2	
	MAJ			7					7				2	2	2	1	
	TS												0	0	2	2	
I3	RX					1					1		2	1	1	0	
	NOR									1			1	1	1	1	
	I/C					2,4, 6				2,4,6	2,3,4, 5,6		11	4	4	2	
	MAJ					7				7	7		3	2	2	1	
	TS										2,6		2	0	2	2	
Instructions:																	
<ol style="list-style-type: none"> <li>1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls" (ATC) and "balance-of-plant" (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I <i>additionally</i> serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.</li> <li>2. Reactivity manipulations may be conducted under normal or <i>controlled</i> abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a one-for-one basis.</li> <li>3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.</li> <li>4. For licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.</li> </ol>																	



Facility:	Date of Examination:	Operating Test No.:								
Competencies	APPLICANTS									
	U1 / U2		R1 / R2 ATC / BOP		R5 / R6 BOP / ATC		RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>			
	SCENARIO		SCENARIO		SCENARIO		SCENARIO			
	1	2	1	2	1	2	1	2	3	4
Interpret/Diagnose Events and Conditions	2,3,4,5, 6,7,8,9	1,2,3,4, 5,6,7,8,	2,3,4, 7,8,9	2,3,4,5, 7,8	3,5,6, 7	1,2,4, 6,7,8				
Comply With and Use Procedures (1)	1,2,3,4, 5,6,7,8, 9	1,2,3,4, 5,6,7,8,	2,3,4, 7	2,3,4,5, 7,8	1,3,5, 6,7	1,2,4, 6,7,8				
Operate Control Boards (2)			2,3,4, 7,8,9	2,3,4,5, 7,8	1,3,5, 6,7	1,2,4, 6,7,8				
Communicate and Interact	1,2,3,4, 5,6,7,8, 9	1,2,3,4, 5,6,7,8,	2,3,4, 7,8,9	2,3,4,5, 7,8	3,5,6, 7	1,2,4, 6,7,8				
Demonstrate Supervisory Ability (3)	1,2,3,4, 5,6,7,8, 9	1,2,3,4, 5,6,7,8,								
Comply With and Use Tech. Specs. (3)	2,3	4,5								
Notes: (1) Includes Technical Specification compliance for an RO. (2) Optional for an SRO-U. (3) Only applicable to SROs.										

*Instructions:*

*Check the applicants' license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant. (This includes all rating factors for each competency.) (Competency Rating factors as described on forms ES-303-1 and ES-303-3.)*

Facility:	Date of Examination:	Operating Test No.:								
Competencies	APPLICANTS									
	U3 / U4		R3 / R4 ATC / BOP		R7 / R8 BOP / ATC		RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>			
	SCENARIO		SCENARIO		SCENARIO		SCENARIO			
	1	3	1	3	1	3	1	2	3	4
Interpret/Diagnose Events and Conditions	2,3,4,5, 6,7,8,9	2,3,4,5, 6,7,8,9	2,3,4, 7,8,9	2,4,6,7, 8	3,5,6, 7	3,5,6, 7,9				
Comply With and Use Procedures (1)	1,2,3,4, 5,6,7,8, 9	1,2,3,4, 5,6,7,8, 9	2,3,4, 7	1,2,4,6, 7,8	1,3,5, 6,7	3,5,6, 7,9				
Operate Control Boards (2)			2,3,4, 7,8,9	1,2,4,6, 7,8	1,3,5, 6,7	3,5,6, 7,9				
Communicate and Interact	1,2,3,4, 5,6,7,8, 9	1,2,3,4, 5,6,7,8, 9	2,3,4, 7,8,9	1,2,4,6, 7,8	3,5,6, 7	3,5,6, 7,9				
Demonstrate Supervisory Ability (3)	1,2,3,4, 5,6,7,8, 9	1,2,3,4, 5,6,7,8, 9								
Comply With and Use Tech. Specs. (3)	2,3	2,3								
Notes: (1) Includes Technical Specification compliance for an RO. (2) Optional for an SRO-U. (3) Only applicable to SROs.										

*Instructions:*

*Check the applicants' license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant. (This includes all rating factors for each competency.) (Competency Rating factors as described on forms ES-303-1 and ES-303-3.)*

Facility:	Date of Examination:						Operating Test No.:					
Competencies	APPLICANTS											
	I1 / I2 SRO/ATC/BOP			I3 ATC/BOP/SRO			I4 ATC/SRO/SRO			I5 BOP/SRO/ATC		
	SCENARIO			SCENARIO			SCENARIO			SCENARIO		
	2	3	4	2	3	4	2	3	4	2	3	4
Interpret/Diagnose Events and Conditions	1,2, 3,4, 5,6, 7,8,	3,5, 6,7, 9	2,4, 5,7, 9	1,2, 4,6, 7,8	2,4, 6,7, 8	1,2, 3,4, 5,6, 7,8, 9	1,2, 4,6, 7,8	2,3, 4,5, 6,7, 8,9	1,2, 3,4, 5,6, 7,8, 9	2,3, 4,5, 7,8	2,3, 4,5, 6,7, 8,9	3,5, 6,7, 8,9
Comply With and Use Procedures (1)	1,2, 3,4, 5,6, 7,8,	3,5, 6,7, 9	1,2, 4,5, 6,9	1,2, 4,6, 7,8	1,2, 4,6, 7,8	1,2, 3,4, 5,6, 7,8, 9	1,2, 4,6, 7,8	1,2, 3,4, 5,6, 7,8, 9	1,2, 3,4, 5,6, 7,8, 9	2,3, 4,5, 7,8	1,2, 3,4, 5,6, 7,8, 9	1,3, 5,6, 7
Operate Control Boards (2)		3,5, 6,7, 9	2,5, 7,9	1,2, 4,6, 7,8	1,2, 4,6, 7,8		1,2, 4,6, 7,8			2,3, 4,5, 7,8		1,3, 4,6, 7,8
Communicate and Interact	1,2, 3,4, 5,6, 7,8,	3,5, 6,7, 9	1,2, 4,5, 7,9	1,2, 4,6, 7,8	1,2, 4,6, 7,8	1,2, 3,4, 5,6, 7,8, 9	1,2, 4,6, 7,8	1,2, 3,4, 5,6, 7,8, 9	1,2, 3,4, 5,6, 7,8, 9	2,3, 4,5, 7,8	1,2, 3,4, 5,6, 7,8, 9	1,3, 4,5, 6,7, 8,9
Demonstrate Supervisory Ability (3)	1,2, 3,4, 5,6, 7,8,					1,2, 3,4, 5,6, 7,8, 9		1,2, 3,4, 5,6, 7,8, 9	1,2, 3,4, 5,6, 7,8, 9		1,2, 3,4, 5,6, 7,8, 9	
Comply With and Use Tech. Specs. (3)	4,5					2,6		2,3	2,6		2,3	
Notes:												
(1) Includes Technical Specification compliance for an RO.												
(2) Optional for an SRO-U.												
(3) Only applicable to SROs.												

**Instructions:**

Check the applicants' license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant. (This includes all rating factors for each competency.) (Competency Rating factors as described on forms ES-303-1 and ES-303-3.)

Facility:		Date of Examination:						Operating Test No.:					
Competencies	APPLICANTS												
	R9 BOP/BOP/ATC												
	SCENARIO			SCENARIO			SCENARIO			SCENARIO			
	2	3	4	2	3	4	2	3	4	2	3	4	
Interpret/Diagnose Events and Conditions	2,3, 4,5, 7,8	2,4, 6,7, 8	1,3, 5,6, 7,9										
Comply With and Use Procedures (1)	2,3, 4,5, 7,8	1,2, 4,6, 7,8	1,3, 4,6, 7,8										
Operate Control Boards (2)	2,3, 4,5, 7,8	1,2, 4,6, 7,8	1,3, 4,5, 6,7, 8										
Communicate and Interact	2,3, 4,5, 7,8	1,2, 4,6, 7,8											
Demonstrate Supervisory Ability (3)													
Comply With and Use Tech. Specs. (3)													
Notes:													
(1) Includes Technical Specification compliance for an RO.													
(2) Optional for an SRO-U.													
(3) Only applicable to SROs.													

*Instructions:*

*Check the applicants' license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant. (This includes all rating factors for each competency.) (Competency Rating factors as described on forms ES-303-1 and ES-303-3.)*

Facility: ANO-1 Scenario No.: 1 Op-Test No.: 2016-1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 100% power.

Turnover: 100% power, Drain RB Sump to AUX Building Sump (This is NOT the first draining of the month)

P-3D Circulating Water Pump OOS for maintenance

Event No.	Malf. No.	Event Type*	Event Description
1	BOP	N	Drain Reactor Building Sump
2	ATC SRO	I TS	Pressurizer level fails high. (LT-1001)
3	All	I TS	OTSG Press fails high. (PT-2618A)
4	ATC	C	E-3A Feedwater Heater tube leak
5	BOP	C	P-2A Condensate pump trip with a failure of the standby to auto start
6	BOP	C	Loss of 480 V Load Center B3 with a failure of C-5B to auto start
7		M	Pressurizer steam space leak
8	ATC	I CT	Failure of ES Channel 2 to automatically actuate
9	ATC	C CT	RPS fails to trip and RX trip pushbutton fails.

\*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification, (CT) Critical Task



Scenario starts with plant power at 100%. During turnover the BOP will be directed to drain the Reactor Building Sump to the Auxiliary Building Sump. This will be completed with no malfunctions. After the sump draining is complete, LT-1001 – Pressurizer Level Transmitter will fail high causing two alarms (Hi Level and Hi HI Level) and results in the RCS Makeup Valve being demanded closed due to the false high level. The ATC / BOP will determine which transmitter has failed and the ATC will select a good signal for pressurizer level control. The CRS will also enter T.S. 3.3.15 (PAM) for the failed transmitter. Next, PT-2618A, the A Steam Generator Pressure Transmitter, fails high causing the associated Atmospheric Dump Valve (ADV) to open fully. An initial condition built into the scenario is leakby of the ADV Isolation Valve, so the open ADV will result in a steam release and power rise. A call from the field will prompt the crew to look at the components in the Pent House which should lead them to identifying the open ADV, if they haven't already noticed prior to the call from the field. PT-2618A also impacts EFIC and will result in Channel A being INOPERABLE and the CRS will enter T.S. 3.3.11 for the inoperable channel. The BOP should be directed to place Channel A in Maintenance Bypass to comply with T.S. 3.3.11. Next, a tube leak in Feedwater Heater E-3A will result in a lowering of Main Feedwater Pump Suction (MFWP) and a rise in reactor power. Power will stabilize at ~103% with no operator action. The crew should take action to maintain power  $\leq 100\%$ . Next a Condensate Pump (P-2A) will trip with a failure of the standby Condensate Pump to automatically start. The standby Condensate Pump (P-2C) can be manually started from the control room. The trip of P-2A will result in an automatic runback to 40% power. Following the runback a loss of the Non-Vital 480V Load Center (B3) will occur with a failure of C-5B, Condenser Vacuum Pump to automatically start. C-5B can be started manually from the control room. The major event occurs next and is a Pressurizer Steam Space Leak that results in a LOSM and an ESAS actuation. The size of the leak will result in pressure stabilizing around 1200 psig. During the ESAS actuation Channel 2 (HPI) will fail to actuate. Both trains of HPI are required to regain adequate SCM for the given leak size. Therefore manual actuation of ES Channel 2 is a critical task. Additionally, RPS is failed and will not result in an automatic reactor trip, so the ATC will manually trip the reactor and this is also a critical step.

Facility: ANO-1 Scenario No.: 2 Op-Test No.: 2016-1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 90% power

Turnover: 90% power clearance has been given by Ops Manager and Shift Manager to raise power to 95% power.

P-75 Aux Feedwater Pump OOS for oil sample.

Event No.	Malf. No.	Event Type*	Event Description
1	ATC	R	Raise power to 95% using control rods
2	All	C	Trip of running Makeup Pump
3	BOP	N	Restore L/D
4	All	I / TS	NI-5 fails low
5	BOP CRS	C TS	K01-C4 #2 EDG oil leak. #2 EDG declared INOPERABLE
6	ATC	I	Seal Injection Flow Transmitter fails high
7	All BOP	M CT	LOOP with failure of #1 EDG to automatically start
8	All	C CT	MSSV fails open on A SG

\*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification, (CT) Critical Task

This scenario starts with plant power at 90%. During turn over the crew was directed to raise power to 95%. Following the up power, the running Makeup Pump will trip. This results in a loss of makeup and seal injection. The BOP will start the standby Makeup Pump and the ATC will restore makeup and seal injection. The CRS will then direct the BOP to restore letdown flow. Next NI-5 power range indicator will fail low, this will have no immediate effect on the plant but does require the CRS to declare RPS Channel A INOPERABLE and entry into T.S. 3.3.1. The BOP will place the RPS Channel A in Manual Bypass to comply with T.S. 3.3.1 Condition A. Next a Critical Trouble Alarm on low oil pressure for the #2 EDG will alert the crew to a significant oil leak rendering the #2 EDG INOPERABLE. The CRS will enter T.S. 3.8.1 and should direct the BOP to place the EDG in Lock Out to prevent an automatic start. Next, the RSP Seal Injection Total Flow Recorder (FR-1239) will fail high which will cause the Seal Injection Flow Control Valve (CV-1239) to go closed. This will isolate seal injection and result in an alarm and rising seal bleedoff temperatures. The ATC will take manual control of CV-1239 and open it enough to restore 8-10 gpm flow to each RCP. Next, a Loss of Offsite Power (LOOP) will occur with a failure of the #1 EDG to automatically start requiring the BOP to manually start the #1 EDG (critical task) to provide power to the Red Train ES components. Following the reactor trip a Main Steam Safety Valve (MSSV) on the A Steam Generator will fail open resulting in an overcooling and a transition to the Overcooling section in the Degraded Power EOP. Isolating the A Steam Generator is a critical task to stop the overcooling. Once the overcooling is stopped and temperature is being controlled the scenario is complete.

Facility: ANO-1 Scenario No.: 3 Op-Test No.: 2016-1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 35% power

Turnover: 35% power, P-34A Surveillance in progress and ready for pump start  
Pleasant Hill Line OOS, Breakers B5122 and B5148 Open to isolate the line.

Event No.	Malf. No.	Event Type*	Event Description
1	BOP	N	Perform P-34A Surveillance
2	CRS	TS	P-34A Pump Trip
3	ATC CRS	C TRM	ERV leaking
4	BOP	C	Chill Water Pump Trip
5	ATC	C	RCS leak requiring a down power.
6	BOP ATC	I	Main Turbine Controlling header pressure fails high
7	All	M	RCS leak resulting in Rx trip and pressure dropping below 150 psig.
8	BOP	C / CT	CV-1400 fails to open automatically.
9	ATC	CT	ES Channels 5 and 6 fail to actuate

\*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification, (CT) Critical Task

This scenario starts with plant power at 35%. During turnover the BOP is directed to complete a Decay Heat Pump (P-34A) surveillance already in progress. After starting the Decay Heat Pump and establishing the required flowrate P-34A shaft will shear requiring the BOP to diagnose the failure and stop the decay heat pump. The crew will declare P-34A INOPERABLE and the CRS will enter T.S. 3.5.2 Condition A (ECCS). Next, Pressurizer ERV will start leaking which will require the ATC to recognize that the RCS pressure is below the ERV setpoint and he will close the isolation valve, the CRS will enter TRO 3.4.2 Condition A for the RCS Vent Path. Next the Main Chiller's Chilled Water Pump will trip which will result in a Reactor Building temperature rise. The BOP will place Service Water Cooling to the Reactor Building Cooling Units in service while the Auxiliary AO works on recovering the chilled water pump. Next, an RCS leak will begin to develop and continue to degrade. Initial response will require a downpower to take the unit off line. During the downpower, the main turbine controlling header pressure instrument will fail resulting in the Main Turbine failing to respond correctly. The BOP will take manual control of the Main Turbine and the ATC will be required to close TBVs that responded to the failed high pressure. The downpower will be continued after the crew selects the good header pressure transmitter and return the Main Turbine to ICS Auto. They will proceed with the downpower using the SG/RX to manually control the shutdown rate. The RCS leak will degrade to the point resulting in an automatic reactor trip and RCS pressure stabilizing below 150 psig which will result in a LOSM and a transition to the ESAS EOP. CV-1400, (B LPI Isolation valve) will fail to open on ES Channel 4 actuation, a critical task will be for the BOP to identify the failure and manually open CV-1400 to provide the only available LPI flow. The RCS leak will also cause Reactor Building pressure to exceed the setpoint for ES Channels 5 and 6, these channels will fail to actuate and the ATC will have a critical task of manually actuating these channels in order to provide Reactor Building Isolation.

Facility: ANO-1 Scenario No.: 4 Op-Test No.: 2016-1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 100% power, P-7B EFW Pump OOS

Turnover: 100% power, P-7B EFW Pump OOS, Group 7 rods at 95%

Event No.	Malf. No.	Event Type*	Event Description
1	ATC	R	Dilute rods in 2%
2	BOP CRS	C TS	CFT Pressure high
3	ATC BOP	I	"B" Steam Generator S/U Level Fails Low.
4	ATC	C	P-8A Trips requiring down power to 70%
5	BOP	I	Turbine stops responding to down power
6	All	C TS	RCP Seal Cooler leak
7	All	M	Condensate system leak results in a loss of all MFW and Reactor trip
8	ATC	I CT	Failure of EFIC to actuate
9	BOP	C CT	P-7A Trip resulting in transition to Overheating EOP

\*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification, (CT) Critical Task

This scenario begins with plant power at 100% and Group 7 rods at 96%. During turnover the crew is directed to dilute and insert rods 2% (Approximately 4 ppm dilution). After the dilution is started, the CFT (Core Flood Tank) pressure will rise above the T.S. limit which will require entry into T.S. 3.5.1 Condition B. The BOP will be directed to vent tank pressure off. After venting the CFT, the "B" Steam Generator S/U Level will fail low. The ATC will have to identify the failure, he will then place the "B" MFW Pump H/A Station to HAND, the BOP will verify the other channel reading properly and the BOP will select the NNI-Y channel. After the MFW Pump control is back in automatic, a Heater Drain Pump (P-8A) will trip which requires a rapid downpower to 70% (10%/min) during this time the Main Turbine will stop responding to the downpower requiring manual action by the BOP to balance the plant and continue with the downpower. After the downpower is complete, an RCP Seal Cooler leak will develop requiring entry into T.S. 3.4.13 for RCS Leakage and taking the unit off line. The major event will begin with a large Condensate System leak which will result in the loss of both Main Feedwater Pumps and prevent the use of the Auxiliary Feedwater Pump (P-75). EFIC will fail to actuate EFW requiring the ATC to complete the actuation (critical task). This will result in P-7A being the only source of feed since P-7B was out of service as indicated in the initial conditions. Next, the steam driven EFW pump P-7A will trip which will require a critical action of the BOP to initiate HPI Cooling.

Facility: ANO-1 Scenario No.: 5 Op-Test No.: 2016-1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 60% power, ICS runback defeated, EH Oil Pump auto start defeated

Turnover: 60% Power, Swap Condensate Pumps  
P-28A – "A" MFWP Emergency Lube Oil Pump OOS.

Event No.	Malf. No.	Event Type*	Event Description
1	BOP	N	Swap Condensate Pumps
2	BOP	I	Gland Steam Pressure Controller fails closed
3	ATC CRS	C TS	Dropped rod in Group 6
4	ATC	I	ICS signal to "A" MFW Pump fails low
5	BOP	C	EH Oil Pump trips with failure of the standby pump to auto start
6	All	C / TS	SG Tube Leak requiring shutdown
7	All	M / CT	SG Tube Rupture
8	ATC	C / CT	2 Stuck Rods post trip
9	ATC	CT	Commence C/D
10	ATC	C	TBVs fail closed

\*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification, (CT) Critical Task



This scenario starts with plant power at 60%. During turnover the BOP will be directed to swap the in service Condensate Pumps. Following the pump swap the Gland Sealing Steam Pressure Controller will fail closed resulting in lowering condenser vacuum. The BOP will throttle open the pressure regulator bypass valve to regain sealing steam to the main turbine. Next, a rod will drop in (Group 6 Rod 3) which should result in a plant runback to 40% but the automatic runback fails which will require the ATC to manually lower power to 40% using the SG/RX station. After power is reduced to 40%, the ICS signal to the A MFW Pump will fail low which will lower Feedwater flow to the A SG. The ATC will trip the A MFW Pump and verify flow to both steam generators. Next, the running EH Oil Pump will trip with a failure of the standby pump to automatically start. The BOP will be able to manually start the standby EH Oil Pump from the control room to prevent a turbine trip. Then a small steam generator tube leak will develop in excess of the T.S. limit requiring a plant shutdown. The major event will be an escalation of the tube leak to a Tube Rupture. Post trip there will be two stuck rods which will require emergency boration which is a critical task. The second critical task is to commence a cooldown and depressurization. Initially the TBVs will be utilized for the cooldown in order to reduce the tube leak by lowering the dp between the RCS and the secondary side of the steam generator. Once the cooldown is in progress Condenser Vacuum will degrade to the point where the TBVs are interlocked closed, this will require a transition to the ADVs in order to continue the cooldown. The scenario will complete once the cooldown is re-established on the ADVs.