

Tier	Group	RO K/A Category Points											SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total	
1. Emergency and Abnormal Plant Evolutions	1	2	3	3				4	3			3	18	3	3	6	
	2	2	2	1				0	2			1	8	2	2	4	
	Tier Totals	4	5	4				4	5			4	26	5	5	10	
2. Plant Systems	1	3	2	3	4	2	2	2	3	2	2	3	28	3	2	5	
	2	0	0	2	1	1	0	1	2	0	1	1	9	0	1	2	
	Tier Totals	3	2	5	5	3	2	3	5	2	3	4	37	4	4	8	
3. Generic Knowledge and Abilities Categories					1	2	3	4				6	1	2	3	4	7
					2	2	1	1									

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 outline sections (i.e., except for one category in Tier 3 of the SRO-only section, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 radiation control K/A is allowed if it 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 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' 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

- * These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.
- ** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)

Item #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	Q#
1	000007 (EPE 7; BW E02 & E10; CE E02) Reactor Trip, Stabilization, Recovery / 1					X		(000007EA2.04) Ability to determine and interpret the following as they apply to (EPE 7) REACTOR TRIP, STABILIZATION, RECOVERY / 1 (CFR: 43.5 / 45.13): If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP	4.6	76 1316 New
2	000008 (APE 8) Pressurizer Vapor Space Accident / 3		X					(000008AK2.03) Knowledge of the interrelations between the (APE 8) PRESSURIZER VAPOR SPACE ACCIDENT / 3 and the following (CFR 41.7 / 45.7): Controllers and positioners	2.5	1 1317 New
3	000009 (EPE 9) Small Break LOCA / 3	X						(000009EK1.01) Knowledge of the operational implications of the following concepts as they apply to (EPE 9) SMALL BREAK LOCA / 3 (CFR: 41.8 / 41.10 / 45.3): Natural circulation and cooling, including reflux boiling	4.2	2 1333 New
4	000009 (EPE 9) Small Break LOCA / 3						X	(000009 (EPE 9) Small Break LOCA / 3) (G2.4.30) Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)	4.1	77 1331 New
5	000011 (EPE 11) Large Break LOCA / 3		X					(000011EK2.02) Knowledge of the interrelations between (EPE 11) LARGE BREAK LOCA / 3 and the following (CFR: 41.7 / 45.7): Pumps	2.6	3 491 Bank
6	000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					X		(000015AA2.11) Ability to determine and interpret the following as they apply to the (APE 15) REACTOR COOLANT PUMP MALFUNCTIONS / 4 (CFR: 43.5 / 45.13): When to jog RCPs during ICC (000015AA2.10) Ability to determine and interpret the following as they apply to the (APE 15) REACTOR COOLANT PUMP MALFUNCTIONS / 4 (CFR: 43.5 / 45.13): When to secure RCPs on loss of cooling or seal injection	3.4 3.7	REJECT 4 1373 New
7	000022 (APE 22) Loss of Reactor Coolant Makeup / 2	X						(000022AK1.04) Knowledge of the operational implications of the following concepts as they apply to (APE 22) LOSS OF REACTOR COOLANT MAKEUP / 2 (CFR 41.8 / 41.10 / 45.3): Reason for changing from manual to automatic control of charging flow valve controller	2.9	5 1338 Bank
8	000025 (APE 25) Loss of Residual Heat Removal System / 4						X	(000025 (APE 25) Loss of Residual Heat Removal System / 4) (G2.2.22) Knowledge of limiting conditions for operations and safety limits. (CFR: 43.2 / 45.2)	4.0	6 1340 Mod
9	000026 (APE 26) Loss of Component Cooling Water / 8					X		(000026AA2.01) Ability to determine and interpret the following as they apply to the (APE 26) LOSS OF COMPONENT COOLING WATER / 8 (CFR: 43.5 / 45.13): Location of a leak in the CCWS	2.9	7 8 Bank
10	000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3			X				(000027AK3.01) Knowledge of the reasons for the following responses as they apply to the (APE 27) PRESSURIZER PRESSURE CONTROL SYSTEM MALFUNCTION / 3 (CFR 41.5, 41.10 / 45.6 / 45.13): Isolation of PZR spray following loss of PZR heaters (000027AK3.03) Knowledge of the reasons for the following responses as they apply to the (APE 27) PRESSURIZER PRESSURE CONTROL SYSTEM MALFUNCTION / 3 (CFR 41.5, 41.10 / 45.6 / 45.13): Actions contained in EOP for PZR PCS malfunction	3.5 3.7	REJECT 8 1374 New

11	000029 (EPE 29) Anticipated Transient Without Scram / 1		X				(000029EK2.06) Knowledge of the interrelations between (EPE 29) ANTICIPATED TRANSIENT WITHOUT SCRAM / 1 and the following (CFR: 41.7 / 45.7): Breakers, relays, and disconnects	2.9	9 509 Repeat
12	000038 (EPE 38) Steam Generator Tube Rupture / 3			X			(000038EK3.01) Knowledge of the reasons for the following responses as they apply to (EPE 38) STEAM GENERATOR TUBE RUPTURE / 3 (CFR: 41.5 / 41.10 / 45.6 / 45.13): Equalizing pressure on primary and secondary sides of ruptured S/G	4.1	10 37 Bank
13	000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture – Excessive Heat Transfer / 4				X		(000040AA1.01) Ability to operate and / or monitor the following as they apply to (APE 040) the Steam Line Rupture (CFR 41.7 / 45.5 / 45.6): Manual and automatic ESFAS initiation	4.6	11 1341 Mod
14	000054 (APE 54; CE E06) Loss of Main Feedwater / 4					X	(000054AA2.03) Ability to determine and interpret the following as they apply to the (APE 54) LOSS OF MAIN FEEDWATER / 4 (CFR: 43.5 / 45.13): Conditions and reasons for AFW pump startup	4.1	12 1342 New
15	000055 (EPE 55) Station Blackout / 6				X		(000055EA1.01) Ability to operate and / or monitor the following as they apply to (EPE 55) STATION BLACKOUT / 6 (CFR: 41.7 / 45.5 / 45.6): In-core thermocouple temperatures	3.7	13 1343 New
16	000055 (EPE 55) Station Blackout / 6					X	(000055 (EPE 55) Station Blackout / 6) (G2.4.20) Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)	4.3	78 1319 Bank
17	000056 (APE 56) Loss of Offsite Power / 6					X	(000056 (APE 56) Loss of Offsite Power / 6) (G2.1.32) Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12)	3.8	14 1344 New
18	000056 (APE 56) Loss of Offsite Power / 6					X	(000056AA2.19) Ability to determine and interpret the following as they apply to the (APE 56) LOSS OF OFFSITE POWER / 6 (CFR: 43.5 / 45.13): T-cold and T-hot indicators (wide range)	4.0	79 1320 New
19	000057 (APE 57) Loss of Vital AC Instrument Bus / 6					X	(000057 (APE 57) Loss of Vital AC Instrument Bus / 6) (G2.4.18) Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)	4.0	REJECT
						X	(000057 (APE 57) Loss of Vital AC Instrument Bus / 6) (G2.4.6) Knowledge of symptom based EOP mitigation strategies. (CFR:41.10 / 43.5 / 45.13)	4.7	80 1386 New
20	000058 (APE 58) Loss of DC Power / 6					X	(000058 (APE 58) Loss of DC Power / 6) (G2.1.20) Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12)	4.6	15 41 Bank
21	000062 (APE 62) Loss of Nuclear Service Water / 4				X		(000062AA1.01) Ability to operate and / or monitor the following as they apply to the (APE 62) LOSS OF NUCLEAR SERVICE WATER / 4 (CFR 41.7 / 45.5 / 45.6): Nuclear service water temperature indications	3.1	16 625 Mod
22	000065 (APE 65) Loss of Instrument Air / 8					X	(000065AA2.05) Ability to determine and interpret the following as they apply to the (APE 65) LOSS OF INSTRUMENT AIR / 8 (CFR: 43.5 / 45.13): When to commence plant shutdown if instrument air pressure is decreasing	4.1	81 1114 Mod
23	000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6				X		(000077AA1.02) Ability to operate and / or monitor the following as they apply to the (APE 77) GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES / 6 (CFR 41.7 / 45.5 / 45.6): Turbine / generator controls.	3.8	17 891 Bank

	(W E04) LOCA Outside Containment / 3										
	(W E11) Loss of Emergency Coolant Recirculation / 4										
24	(BW E04; W E05) Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4			X					(BE04EK3.1) Knowledge of the reasons for the following responses as they apply to (BW E04) INADEQUATE HEAT TRANSFER / 4 (CFR: 41.5 / 41.10 / 45.6 / 45.13): Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics.	3.5	18 556 Bank
K/A Category Totals:		2	3	3	4	6	6	Group Point Total:		24	

Item #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	Q#
25	000003 (APE 3) Dropped Control Rod / 1			X				(000003AK3.09) Knowledge of the reasons for the following responses as they apply to the (APE 3) DROPPED CONTROL ROD / 1 (CFR 41.5,41.10 / 45.6 / 45.13): Recording of group bank position for dropped rod (reference point used to withdraw dropped rod to equal height with other rods in the bank) (000003AK3.04) Knowledge of the reasons for the following responses as they apply to the (APE 3) DROPPED CONTROL ROD / 1 (CFR 41.5,41.10 / 45.6 / 45.13): Actions contained in EOP for dropped control rod	3.0 3.8	REJECT 19 1127 Bank
	000024 (APE 24) Emergency Boration / 1									
26	000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2	X						(000028AK1.01) Knowledge of the operational implications of the following concepts as they apply to (APE 28) PRESSURIZER (PZR) LEVEL CONTROL MALFUNCTION / 2 (CFR 41.8 / 41.10 / 45.3): PZR reference leak abnormalities	2.8	20 1359 New
27	000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7	X						(000032AK1.01) Knowledge of the operational implications of the following concepts as they apply to (APE 32) LOSS OF SOURCE RANGE NUCLEAR INSTRUMENTATION / 7 (CFR 41.8 / 41.10 / 45.3): Effects of voltage changes on performance	2.5	21 1360 New
28	000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7					X		(000033AA2.10) Ability to determine and interpret the following as they apply to the (APE 33) LOSS OF INTERMEDIATE RANGE NUCLEAR INSTRUMENTATION / 7 (CFR: 43.5 / 45.13): Tech-Spec limits if both intermediate-range channels have failed (000033AA2.04) Ability to determine and interpret the following as they apply to the (APE 33) LOSS OF INTERMEDIATE RANGE NUCLEAR INSTRUMENTATION / 7 (CFR: 43.5 / 45.13): Satisfactory overlap between source-range, intermediate-range and power-range instrumentation	3.8 3.6	REJECT 82 TBD
29	000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8		X					(BA08AK2.1) Knowledge of the interrelations between the (BW A08) REFUELING CANAL LEVEL DECREASE / 8 and the following (CFR 41.7 / 45.7): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.0	22 1361 New
30	000037 (APE 37) Steam Generator Tube Leak / 3					X		(000037AA2.05) Ability to determine and interpret the following as they apply to the (APE 37) STEAM GENERATOR TUBE LEAK / 3 (CFR: 43.5 / 45.13): Past history of leakage with current problem	2.8	23 1362 New
	000051 (APE 51) Loss of Condenser Vacuum / 4									
31	000059 (APE 59) Accidental Liquid Radwaste Release / 9						X	(000051 (APE 59) Accidental Liquid Radwaste Release / 9 (G2.2.25) Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits. (CFR: 43.2) (000051 (APE 59) Accidental Liquid Radwaste Release / 9 (G2.2.38) Knowledge of conditions and limitations in the facility license. (CFR: 43.2)	4.2 4.5	REJECT 83 1086 Bank

	000060 (APE 60) Accidental Gaseous Radwaste Release / 9												
	000061 (APE 61) Area Radiation Monitoring System Alarms / 7												
32	000067 (APE 67) Plant Fire On Site / 8						X			(000067AA.16) Ability to determine and interpret the following as they apply to the (APE 67) PLANT FIRE ON SITE / 8 (CFR: 43.5 / 45.13): Vital equipment and control systems to be maintained and operated during a fire	4.0	84 1116 Bank	
	000068 (APE 68; BW A06) Control Room Evacuation / 8												
33	000069 (APE 69; W E14) Loss of Containment Integrity / 5						X			(000069AA.01) Ability to determine and interpret the following as they apply to the (APE 69) LOSS OF CONTAINMENT INTEGRITY / 5 (CFR: 43.5 / 45.13): Loss of containment integrity.	3.7	24 499 Bank	
	000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4												
34	000076 (APE 76) High Reactor Coolant Activity / 9							X		(000076 (APE 76) High Reactor Coolant Activity / 9) (G2.4.45) Ability to prioritize and interpret the significance of each annunciator or alarm. (CFR: 41.10 / 43.5 / 45.3 / 45.12)	4.1	25 1363 New	
	000078 (APE 78*) RCS Leak / 3												
	(W E01 & E02) Rediagnosis & SI Termination / 3												
	(W E13) Steam Generator Overpressure / 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												
35	(BW A04) Turbine Trip / 4		X							(BA04AK.1) Knowledge of the interrelations between the (BW A04) TURBINE TRIP / 4 and the following (CFR 41.7 / 45.7): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.5	26 1364 Mod	
	(BW A05) Emergency Diesel Actuation / 6												
36	(BW A07) Flooding / 8							X		((BW A07) Flooding / 8) (G2.1.19) Ability to use plant computers to evaluate system or component status. (CFR: 41.10 / 45.12)	3.8	85 TBD	
	(BW E03) Inadequate Subcooling Margin / 4												

	(BW E08; W E03) LOCA Cooldown – Depressurization / 4										
37	(BW E09; CE A13**; W E09 & E10) Natural Circulation/4 192005 Reactor Theory / Control Rods								(BE09EA1.2) Ability to operate and / or monitor the following as they apply to (BW E09) NATURAL CIRCULATION-COOLDOWN / 4 (CFR: 41.7 / 45.5 / 45.6); Operating behavior characteristics of the facility. (192005 K1.15) Discuss rod insertion limits. (CFR: 41.1)	3.2 3.4	GFES 70 893 Bank
	(BW E13 & E14) EOP Rules and Enclosures										
	(CE A11**; W E08) RCS Overcooling – Pressurized Thermal Shock / 4										
	(CE A16) Excess RCS Leakage / 2										
	(CE E09) Functional Recovery										
	(CE E13*) Loss of Forced Circulation / LOOP / Blackout / 4										
K/A Category Totals:		2	2	1	0	4	3	Group Point Total:			12

Item #	System / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	Q#
38	003 (SF4P RCP) REACTOR COOLANT PUMP SYSTEM		X										(003K2.02) (SF4P RCP) REACTOR COOLANT PUMP SYSTEM Knowledge of electrical power supplies to the following (CFR: 41.7): CCW pumps (NCC)	2.5	REJECT
													(003K2.01) (SF4P RCP) REACTOR COOLANT PUMP SYSTEM Knowledge of electrical power supplies to the following (CFR: 41.7): RCPS	3.1	27 1375 New
39	004 (SF1; SF2 CVCS) CHEMICAL AND VOLUME CONTROL SYSTEM				X								(004K4.04) Knowledge of (SF1; SF2 CVCS) CHEMICAL AND VOLUME CONTROL SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Manual/automatic transfers of control	3.2	28 1335 New
40	004 (SF1; SF2 CVCS) CHEMICAL AND VOLUME CONTROL SYSTEM											X	(004 (SF1; SF2 CVCS) CHEMICAL AND VOLUME CONTROL SYSTEM) (G2.1.25) Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12)	4.2	86 1324 New
41	005 (SF4P RHR) RESIDUAL HEAT REMOVAL SYSTEM	X											(005K1.06) Knowledge of the physical connections and/or cause-effect relationships between (SF4P RHR) RESIDUAL HEAT REMOVAL SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): ECCS	3.5	29 1336 New
42	006 (SF2; SF3 ECCS) EMERGENCY CORE COOLING SYSTEM										X		(006A4.07) (SF2; SF3 ECCS) EMERGENCY CORE COOLING SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): ECCS Pumps and valves	4.4	30 1337 New
43	006 (SF2; SF3 ECCS) EMERGENCY CORE COOLING SYSTEM										X		(006A4.11) (SF2; SF3 ECCS) EMERGENCY CORE COOLING SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): Overpressure protection system	4.2	31 1339 Mod
44	007 (SF5 PRTS) PRESSURIZER RELIEF/QUENCH TANK SYSTEM					X							(007K5.02) Knowledge of the operational implications of the following concepts as they apply to the (SF5 PRTS) PRESSURIZER RELIEF/QUENCH TANK SYSTEM (CFR: 41.5 / 45.7): Method of forming a steam bubble in the PZR	3.1	32 561 Mod
45	008 (SF8 CCW) COMPONENT COOLING WATER SYSTEM		X										(008K2.02) (SF8 CCW) COMPONENT COOLING WATER SYSTEM Knowledge of electrical power supplies to the following (CFR: 41.7): CCW pump, including emergency backup	3.0	33 1334 New

46	008 (SF8 CCW) COMPONENT COOLING WATER SYSTEM											X	(008 (SF8 CCW) COMPONENT COOLING WATER SYSTEM) (G2.4.41) Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)	4.6	87 1325 New
47	010 (SF3 PZR PCS) PRESSURIZER PRESSURE CONTROL SYSTEM											X	(010A3.02) Ability to monitor automatic operations of the (SF3 PZR PCS) PRESSURIZER PRESSURE CONTROL SYSTEM including (CFR: 41.7 / 45.5): PZR pressure	3.6	34 1149 Bank
48	012 (SF7 RPS) REACTOR PROTECTION SYSTEM											X	(012 (SF7 RPS) REACTOR PROTECTION SYSTEM) (G2.4.47) Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material. (CFR: 41.10 / 43.5 / 45.12)	4.2	35 1371 New
49	012 (SF7 RPS) REACTOR PROTECTION SYSTEM						X						(012K6.06) Knowledge of the of the effect of a loss or malfunction on the following will have on the (SF7 RPS) REACTOR PROTECTION SYSTEM (CFR: 41.7 / 45.7): Sensors and detectors	2.7	36 155 Bank
50	013 (SF2 ESFAS) ENGINEERED SAFETY FEATURES ACTUATION SYSTEM				X								(013K4.03) Knowledge of (SF2-ESFAS) ENGINEERED SAFETY FEATURES ACTUATION SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Main Steam Isolation System (013K4.04) Knowledge of (SF2 ESFAS) ENGINEERED SAFETY FEATURES ACTUATION SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Auxiliary feed actuation signal	3.9 4.3	REJECT 37 908 Bank
51	022 (SF5 CCS) CONTAINMENT COOLING SYSTEM	X											(022K1.01) Knowledge of the physical connections and/or cause-effect relationships between (SF5 CCS) CONTAINMENT COOLING SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): SWS/ cooling system	3.5	38 256 Bank
52	022 (SF5 CCS) CONTAINMENT COOLING SYSTEM				X								(022K4.04) Knowledge of (SF5 CCS) CONTAINMENT COOLING SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Cooling of control rod drive motors	2.8	39 1345 New
	025 (SF5 ICE) ICE CONDENSER SYSTEM														

53	026 (SF5 CSS) CONTAINMENT SPRAY SYSTEM							X				(026A1.03) Ability to predict and/or monitor changes in parameters associated with operating the (SF5 CSS) CONTAINMENT SPRAY SYSTEM controls including (CFR: 41.5 / 45.5): Containment sump level	3.5	40 1075 Bank
54	026 (SF5 CSS) CONTAINMENT SPRAY SYSTEM							X				(026A2.09) Ability to (a) predict the impacts of the following on the (SF5 CSS) CONTAINMENT SPRAY SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Radiation hazard potential of BWST (026A2.04) Ability to (a) predict the impacts of the following on the (SF5 CSS) CONTAINMENT SPRAY SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Failure of a spray pump	2.5 3.9	REJECT 41 1376 New
55	039 (SF4S MSS) MAIN AND REHEAT STEAM SYSTEM								X			(039A3.02) Ability to monitor automatic operations of the (SF4S MSS) MAIN AND REHEAT STEAM SYSTEM including (CFR: 41.7 / 45.5): Isolation of the MRSS	3.1	42 1346 New
56	039 (SF4S MSS) MAIN AND REHEAT STEAM SYSTEM							X				(039A2.04) Ability to (a) predict the impacts of the following on the (SF4S MSS) MAIN AND REHEAT STEAM SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Malfunctioning steam dump	3.7	88 1327 New
	053 (SF1; SF4P ICS*) INTEGRATED CONTROL													
57	059 (SF4S MFW) MAIN FEEDWATER SYSTEM							X				(059A1.07) Ability to predict and/or monitor changes in parameters associated with operating the (SF4S MFW) MAIN FEEDWATER SYSTEM controls including (CFR: 41.5 / 45.5): Feed Pump speed, including normal control speed for ICS	2.5	43 1347 New
58	059 (SF4S MFW) MAIN FEEDWATER SYSTEM			X								(059K3.02) Knowledge of the effect that a loss or malfunction of the (SF4S MFW) MAIN FEEDWATER SYSTEM will have on the following (CFR: 41.7 / 45.6): AFW system (059K3.04) Knowledge of the effect that a loss or malfunction of the (SF4S MFW) MAIN FEEDWATER SYSTEM will have on the following (CFR: 41.7 / 45.6): RCS	3.6 3.6	REJECT 44 1379 New

59	061 (SF4S AFW) AUXILIARY / EMERGENCY FEEDWATER SYSTEM				X							(061K4.01) Knowledge of (SF4S AFW) AUXILIARY / EMERGENCY FEEDWATER SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Water sources and priority of use	4.1	45 1348 New
60	062 (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM							X				(062A2.15) Ability to (a) predict the impacts of the following on the (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Consequence of paralleling out of phase/mismatch in volts (062A2.04) Ability to (a) predict the impacts of the following on the (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Effect on plant of de-energizing a bus	2.8 3.1	REJECT 46 1380 Mod
61	062 (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM							X				(062A2.16) Ability to (a) predict the impacts of the following on the (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Degraded system voltages	2.9	89 1328 Bank
62	063 (SF6 ED DC) DC ELECTRICAL DISTRIBUTION SYSTEM									X		(063 (SF6 ED DC) DC ELECTRICAL DISTRIBUTION SYSTEM) (G2.4.3) Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4) (063 (SF6 ED DC) DC ELECTRICAL DISTRIBUTION SYSTEM) (G2.4.11) Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.4)	3.7 4.0	REJECT 47 187 Bank
63	063 (SF6 ED DC) DC ELECTRICAL DISTRIBUTION SYSTEM			X								(063K3.01) Knowledge of the effect that a loss or malfunction of the (SF6 ED DC) DC ELECTRICAL DISTRIBUTION SYSTEM will have on the following (CFR: 41.7 / 45.6): ED/G	3.7	48 975 Bank
64	064 (SF6 EDG) EMERGENCY DIESEL GENERATOR SYSTEM					X						(064K6.08) Knowledge of the of the effect of a loss or malfunction on the following will have on the (SF6 EDG) EMERGENCY DIESEL GENERATOR SYSTEM (CFR: 41.7 / 45.7): Fuel oil storage tanks	3.2	49 1349 New

65	073 (SF7 PRM) PROCESS RADIATION MONITORING SYSTEM								X						(073A2.02) Ability to (a) predict the impacts of the following on the (SF7 PRM) PROCESS RADIATION MONITORING SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Detector failure	2.7	50 1366 New
66	073 (SF7 PRM) PROCESS RADIATION MONITORING SYSTEM						X								(073K5.01) Knowledge of the operational implications of the following concepts as they apply to the (SF7 PRM) PROCESS RADIATION MONITORING SYSTEM (CFR: 41.5 / 45.7): Radiation theory, including sources, types, units, and effects	2.5	51 672 Bank
67	076 (SF4S SW) SERVICE WATER SYSTEM			X											(076K3.07) Knowledge of the effect that a loss or malfunction of the (SF4S SW) SERVICE WATER SYSTEM will have on the following (CFR: 41.7 / 45.6): ESF loads	3.7	52 1350 New
68	076 (SF4S SW) SERVICE WATER SYSTEM								X						(076A2.02) Ability to (a) predict the impacts of the following on the (SF4S SW) SERVICE WATER SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Service water header pressure	3.4	REJECT
															(076A2.01) Ability to (a) predict the impacts of the following on the (SF4S SW) SERVICE WATER SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Loss of SWS	3.7	90 1329 New
69	078 (SF8 IAS) INSTRUMENT AIR SYSTEM	X													(078K1.04) Knowledge of the physical connections and/or cause-effect relationships between (SF8 IAS) INSTRUMENT AIR SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): Cooling water to compressor	2.6	REJECT
															(078K1.05) Knowledge of the physical connections and/or cause-effect relationships between (SF8 IAS) INSTRUMENT AIR SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): MSIV air	3.4	53 988 Bank
70	103 (SF5 CNT) CONTAINMENT SYSTEM											X			(103 (SF5 CNT) CONTAINMENT SYSTEM) (G2.4.50) Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)	4.2	54 1351 New
K/A Category Totals:		3	2	3	4	2	2	2	6	2	2	5	Group Point Total:			33	

Item #	System / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	Q#
	001 (SF1 CRDS) CONTROL ROD DRIVE SYSTEM														
	002 (SF2; SF4P RCS) REACTOR COOLANT														
	011 (SF2 PZR LCS) PRESSURIZER LEVEL CONTROL SYSTEM														
71	014 (SF1 RPI) ROD POSITION INDICATION SYSTEM										X		(014A4.02) (SF1 RPI) ROD POSITION INDICATION SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): Control rod mode-select switch	3.4	55 1352 Mod
72	015 (SF7 NI) NUCLEAR INSTRUMENTATION SYSTEM								X				(015A2.01) Ability to (a) predict the impacts of the following on the (SF7 NI) NUCLEAR INSTRUMENTATION SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Power supply loss or erratic operation	3.9	91 1332 New
	016 (SF7 NNI) NONNUCLEAR INSTRUMENTATION SYSTEM														
	017 (SF7 ITM) IN CORE TEMPERATURE MONITOR SYSTEM														
	027 (SF5 CIRS) CONTAINMENT IODINE REMOVAL SYSTEM														
73	028 (SF5 HRPS) HYDROGEN RECOMBINER AND PURGE CONTROL SYSTEM			X									(028K3.01) Knowledge of the effect that a loss or malfunction of the (SF5 HRPS) HYDROGEN RECOMBINER AND PURGE CONTROL SYSTEM will have on the following (CFR: 41.7 / 45.6): Hydrogen concentration in containment	3.3	56 1353 New
74	029 (SF8 CPS) CONTAINMENT PURGE SYSTEM											X	(029 (SF8 CPS) CONTAINMENT PURGE SYSTEM) (G2.2.44) Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. (CFR: 41.5 / 43.5 / 45.12)	4.4	92 1330 Bank

81	075 (SF8 CW) CIRCULATING WATER SYSTEM											X	(075 (SF8 CW) CIRCULATING WATER SYSTEM) (G2.4.4) Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures. (CFR: 41.10 / 43.2 / 45.6)	4.7	93 TBD
82	079 (SF8 SAS**) STATION AIR SYSTEM								X				(079A2.01) Ability to (a) predict the impacts of the following on the (SF8 SAS**) STATION AIR SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Cross-connection with IAS	2.9	63 1358 New
83	086 (SF8 FPS) FIRE PROTECTION SYSTEM												(086A2.01) Ability to (a) predict the impacts of the following on the (SF8 FPS) FIRE PROTECTION SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Manual shutdown of the FPS	2.9	GFES
	192008 Reactor Theory / Reactor Operational Physics												(192008 K1.12) List parameters which should be monitored and controlled during the intermediate phase of startup (from criticality to POAH).	3.5	71 1378 New
K/A Category Totals:		0	0	2	1	1	0	1	3	0	1	3	Group Point Total:		12

ES-401		PWR Examination Outline (ANO 1)				Form ES-401-3	
Generic Knowledge and Abilities Outline (Tier 3) (RO/SRO)							
Facility: ANO 1				Date of Exam: 04/05/2022			
Category	K/A #	Topic	Item #	RO		SRO-Only	
				IR	Q#	IR	Q#
1. Conduct of Operations	G2.1.26	(G2.1.26) Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen). (CFR: 41.10 / 45.12)	84	3.4	64 1367 Bank		
	G2.1.45	(G2.1.45) Ability to identify and interpret diverse indications to validate the response of another indication. (CFR: 41.7 / 43.5 / 45.4)	85	4.3	65 883 Bank		
	G2.1.21	(G2.1.21) Ability to verify the controlled procedure copy. (CFR: 41.10 / 45.10 / 45.13)				3.6	REJECT
	G2.1.14	(G2.1.14) Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.	86			3.1	94 1372 Bank
	G2.1.36	(G2.1.36) Knowledge of procedures and limitations involved in core alterations. (CFR: 41.10 / 43.6 / 45.7)	87			4.1	95 1250 Repeat
Subtotal					2		2
2. Equipment Control	G2.2.12	(G2.2.12) Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)	88	3.7	66 1368 Mod		
	G2.2.13	(G2.2.13) Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)	89	4.1	67 1369 Bank		
	G2.2.36	(G2.2.36) Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting-conditions for operations. (CFR: 41.10 / 43.2 / 45.13)	90		GFES		
	192006 Reactor Theory / Fission Product Poisons	(192006 K1.06) Describe the following process and state their effect on reactor operations: (CFR: 41.1) Transient Xenon			72 1381 Mod		
	G2.2.20	(G2.2.20) Knowledge of the process for managing troubleshooting activities. (CFR: 41.10 / 43.5 / 45.13)	91			3.8	96 1326 New
	G2.2.43	(G2.2.43) Knowledge of the process used to track inoperable alarms. (CFR: 41.10 / 43.5 / 45.13)	92			3.3	97 1323 New
Subtotal					2		2
3. Radiation Control	G2.3.13	(G2.3.13) Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10)	93	3.4	68 1081 Bank		
	G2.3.5	(G2.3.5) Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.11 / 41.12 / 43.4 / 45.9)	94		GFES		
	193007 Thermodynamics / Heat Transfer	193007			73 1385 Bank		
	G2.3.6	(G2.3.6) Ability to approve release permits. (CFR: 41.13 / 43.4 / 45.10)	95			3.8	98 1322 New
Subtotal					1		1

4. Emergency Procedures/Plan	G2.4.11	(G2.4.11) Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)	96	4.0	69 1370 New		
	G2.4.25	(G2.4.25) Knowledge of fire protection procedures. (CFR: 41.10 / 43.5 / 45.13)	97		GFES		
	193010 Thermodynamics / Brittle Fracture and Thermal Stress	(193010 K1.01) State the brittle fracture mode of failure. (CFR: 41.14)		2.8	74 1383 Bank		
	G2.4.29	(G2.4.29) Knowledge of the emergency plan. (CFR: 41.10 / 43.5 / 45.11)	98		GFES		
	193008 Thermodynamics / Thermal Hydraulics	(193008 K1.22) Describe means to determine if natural circulation flow exists.		4.2	75 1384 Mod		
	G2.4.42	(G2.4.42) Knowledge of emergency response facilities. (CFR: 41.10 / 45.11)	99			3.8	99 1321 Bank
G2.4.44	(G2.4.44) Knowledge of emergency plan protective action recommendations. (CFR: 41.10 / 41.12 / 43.5 / 45.11)	100			4.4	100 1162 Bank	
Subtotal					1		2

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO T1 015 AA2.11 (3.4)	(Q#4) 015 AA2.10 (3.7)	It is not possible (without expending an unreasonable amount of resources) to prepare a psychometrically sound question related to the subject K/A. The original K/A concerns when to jog RCPs during ICC. While there is EOP guidance on how to perform jogging the RCPs, there is no EOP/AOP guidance on when to perform jogging. In an emergency, this task would be directed based on input and guidance from the TSC. Randomly selected 015 AA2.10 which concerns when to secure RCPs on loss of cooling or seal injection.
RO T1 027 AK3.01 (3.5)	(Q#8) 027 AK3.03 (3.7)	The subject K/A is not relevant at the subject facility. The original K/A concerns isolating PZR spray during a loss of PZR heaters. The only time ANO1 isolates PZR spray is when the PZR spray valve fails open. There is no procedural guidance to isolate PZR spray during a loss of heaters. Randomly selected 027 AK3.03 which concerns actions contained in the EOP for PZR PCS malfunction.
RO T1 003 AK3.09 (3.0)	(Q#19) 003 AK3.04 (3.8)	The subject K/A is not relevant at the subject facility. The original K/A was the knowledge for the reasons that group bank position for a dropped rod is recorded when withdrawing the dropped rod to equal height with the other rods in the bank. For a dropped rod event at ANO1, an automatic plant runback occurs to 40% power by the Integrated Control System (ICS). ICS will then control bank position in automatic to maintain power at the runback setpoint. When the rod is ready to be recovered, it is simply leveled with the other rods in the group. No position data is recorded. The AOP even recognizes that group position might need to be changed to keep power less than 40% when withdrawing the single rod which would be accomplished by moving control rod group position. Randomly selected AK3.04 which is actions contained in the EOP for dropped control rod.
RO T2 003 K2.02 (2.5)	(Q#28) 003 K2.01 (3.1)	The original K/A was knowledge of electrical supplies to CCW pumps. This is sampling the same knowledge required to answer Q34 (008 K2.02). Randomly selected K2.01 which is knowledge of the power supplies to RCPS.
RO T2 026 A2.09 (2.5)	(Q#41) 026 A2.04 (3.9)	It is not possible (without expending an unreasonable amount of resources) to prepare a psychometrically sound question related to the subject K/A. The original K/A concerned predicting the impacts of the BWST being a radiation hazard as it relates to the RB Spray system and using procedures to correct, control, or mitigate the consequences. It was difficult to write a question to fit this K/A without overlapping items contained in Q#40 (K/A 026 A2.09). Randomly selected 026 A2.04 which is predicting the impacts of a failure of a RB spray pump and using procedures to correct, control, or mitigate the event.
RO T2 013 K4.03 (3.9)	(Q#38) 013 K4.04 (4.3)	The subject K/A is not relevant at the subject facility. The original K/A was knowledge of ESFAS interlocks which provide Main Steam Isolation. The ESAS system does not initiate MSLI. This is performed by the Emergency Feedwater and Actuation Control System (EFIC). Randomly selected 013 K4.04 which is the knowledge of ESFAS interlocks which provide AFW actuation signal.
RO T2 059 K3.02 (3.6)	(Q#45) 059 K3.04 (3.6)	The original K/A concerned the knowledge of the effect that a loss of malfunction of MFW will have on the AFW system. This is sampling the same knowledge required to answer Q12 (054 AA2.03). Randomly selected 059 K3.04 which is the effect a malfunction of MFW has on the RCS.
RO T2 062 A2.15 (2.8)	(Q#47) 062 A2.04 (3.1)	The subject K/A is not relevant at the subject facility. The original K/A concerned the impact of paralleling out-of-phase or mismatch in volts on the Electrical Distribution System and using procedures to correct, control, or mitigate the consequences. There is no guidance at ANO1 for this situation. If the system was EDGs, it would be more applicable as EDG voltage and frequency can be controlled by procedure, however for the Electrical Distribution System, no guidance exists. Randomly selected A2.04 which concerns the effect on the plant of de-energizing a bus.
RO T2 063 2.4.3 (3.7)	(Q#48) 063 2.4.11 (4.0)	The subject K/A is not relevant at the subject facility. The original K/A was the generic K/A concerning the ability to identify post-accident instrumentation in the Tier 2 section for the DC electrical system. There are no DC parameters that are considered post-accident instrumentation at ANO1. Randomly selected K/A 2.4.11 which is the knowledge of abnormal condition procedures.
RO T2 078 K1.04 (2.6)	(Q#54) 078 K1.05 (3.4)	The subject K/A is not relevant at the subject facility. The original K/A concerned the physical or cause effect relationships between IAS and Cooling Water to the Compressor. ANO1 no longer utilizes cooling water to the IA compressors. Both air compressors are air cooled. Randomly selected K1.05 which concerns the relationship between IAS and MSIV air.

Tier / Group	Randomly Selected K/A	Reason for Rejection
SRO T1 057 2.4.18 (4.0)	(Q#80) 057 2.4.6 (4.7)	It is not possible to prepare a question at the correct license level related to the subject K/A. The original K/A concerned knowledge of the specific bases for EOPs as a generic K/A within the T1 SRO section of the exam. There is no bases document for the Loss of Vital AC Instrument Bus procedure at ANO1. During research within the procedure, notes and cautions were reviewed but any potential question would have been better suited as a RO question, not SRO. Randomly selected K/A 2.4.6 which concerns the knowledge of symptom based EOP mitigation strategies.
SRO T1 033 AA2.10 (3.8)	(Q#82) 033 AA2.04 (3.6)	It is not possible to prepare a question at the correct license level related to the subject K/A. The original K/A concerned tech spec limits if both intermediate range channels have failed. At ANO1, these TS action times are all 1 hour or less so this question would be RO knowledge not SRO knowledge. Randomly selected K/A 003 AA2.04 which concerns the satisfactory overlap between source-range, intermediate-range, and power range instrumentation.
SRO T1 059 2.2.25 (4.2)	(Q#83) 059 2.2.38 (4.5)	It is not possible (without expending an unreasonable amount of resources) to prepare a psychometrically sound question related to the subject K/A. The original K/A concerns knowledge of TS bases for LCOs and safety limits as it pertains to an Accidental Liquid Radwaste Release. There is nothing in TS that concerns an accidental liquid radwaste release. All the license basis requirements are controlled in the ODCM. The ODCM bases contains a level of detail that is not operationally relevant and would be considered minutia for a senior licensed operator. Randomly selected K/A 2.2.38 which is the knowledge of conditions and limitations in the facility license.
SRO T2 076 A2.02 (3.1)	(Q#90) 076 A2.01 (3.7)	The subject K/A is not relevant at the subject facility. The original K/A concerns the ability to predict the impact of service water header pressure on the service water system and use procedures to correct, control or mitigate the consequences. There are no TS or procedural actions based on the service water pressure parameter. Randomly selected K/A 076 A2.01 which is the same A2 category but concerns a loss of SWS, not service water pressure.
SRO T3 2.1.21 (3.6)	(Q#94) 2.1.14 (3.1)	It is not possible to prepare a question at the correct license level related to the subject K/A. The subject K/A is ability to verify controlled procedure copy. This is performed by all procedure users on site, not a specific SRO task. Randomly selected K/A 2.1.14 which is the knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc.

Form 3.2-1 Administrative Topics Outline

Facility: <u>ANO UNIT 1</u>		Date of Examination: <u>4/4/2022</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>2022-04</u>
Administrative Topic (Step 1)	Activity and Associated K/A (Step 2)	Type Code (Step 3)
Conduct of Operations	A1 Estimate RCS Leak Rate. 2.1.20 Ability to interpret and execute procedure steps.	N, R
Conduct of Operations	A2 Manually Calculate Heat Balance Power. 2.1.25 Ability to interpret reference material, such as graphs, curves, tables, etc.	N, R
Equipment Control	A3 Determine the mechanical and electrical boundary isolations for P-36A Makeup Pump seal leak. (Do not need to drain the pump) 2.2.13 Knowledge of tagging and clearance procedures.	D, R
Radiation Control	A4 Review RWP and survey map to calculate maximum stay time. 2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions.	D, R, P
Emergency Plan		

Instructions for completing Form 3.2-1, "Administrative Topics Outline"

1. For each license level, determine the number of administrative job performance measures (JPMs) and topic areas as follows:

Topic	Number of JPMs	
	RO*	SRO and RO Retakes
Conduct of Operations	1 (or 2)	2
Equipment Control	1 (or 0)	1
Radiation Control	1 (or 0)	1
Emergency Plan	1 (or 0)	1
Total	4	5

* Reactor operator (RO) applicants do not need to be evaluated on every topic (i.e., "Equipment Control," "Radiation Control," or "Emergency Plan" can be omitted by doubling up on "Conduct of Operations"), unless the applicant is taking only the administrative topics portion of the operating test (with a waiver or excusal of the other portions).

2. Enter the associated knowledge and abilities (K/A) statement and summarize the administrative activities for each JPM.

3. For each JPM, specify the type codes for location and source as follows:

Location:

(C)ontrol room, (S)imulator, or Class(R)oom

Source and Source Criteria:

(P)revious two NRC exams (no more than one JPM that is **randomly selected** from last two NRC exams)

(D)irect from bank (no more than three for ROs, no more than four for SROs and RO retakes)

(N)ew or Significantly (M)odified from bank (no fewer than one)

Form 3.2-1 Administrative Topics Outline

Facility: <u>ANO UNIT 1</u>		Date of Examination: <u>4/4/2022</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <u>2022-04</u>
Administrative Topic (Step 1)	Activity and Associated K/A (Step 2)	Type Code (Step 3)
Conduct of Operations	A5 Determine acceptable control room loading. 2.1.9 Ability to direct personnel activities inside the control room.	M, R
Conduct of Operations	A6 Review Manually Calculated Heat Balance Power 2.1.25 Ability to interpret reference material, such as graphs, curves, tables, etc.	N, R
Equipment Control	A7 Review and approve the tagout provided for P-36A Makeup Pump seal leak for approval. 2.2.13 Knowledge of tagging and clearance procedures.	D, R
Radiation Control	A8 Determine eligibility of containment entry during accident conditions. 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.	N, R
Emergency Plan	A9 Classify an Emergency Event. 2.4.41 Knowledge of emergency action level thresholds and classifications.	D, R

Instructions for completing Form 3.2-1, "Administrative Topics Outline"

1. For each license level, determine the number of administrative job performance measures (JPMs) and topic areas as follows:

Topic	Number of JPMs	
	RO*	SRO and RO Retakes
Conduct of Operations	1 (or 2)	2
Equipment Control	1 (or 0)	1
Radiation Control	1 (or 0)	1
Emergency Plan	1 (or 0)	1
Total	4	5

* Reactor operator (RO) applicants do not need to be evaluated on every topic (i.e., "Equipment Control," "Radiation Control," or "Emergency Plan" can be omitted by doubling up on "Conduct of Operations"), unless the applicant is taking only the administrative topics portion of the operating test (with a waiver or excusal of the other portions).

2. Enter the associated knowledge and abilities (K/A) statement and summarize the administrative activities for each JPM.

3. For each JPM, specify the type codes for location and source as follows:

Location:

(C)ontrol room, (S)imulator, or Class(R)oom

Source and Source Criteria:

(P)revious two NRC exams (no more than one JPM that is **randomly selected** from last two NRC exams)

(D)irect from bank (no more than three for ROs, no more than four for SROs and RO retakes)

(N)ew or Significantly (M)odified from bank (no fewer than one)

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: <u>ANO UNIT 1</u>		Date of Examination: <u>4/4/2022</u>
Operating Test Number: <u>2022-04</u>		
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/>		
System/JPM Title	Type Code	Safety Function
Control Room Systems		
a. Respond to continuous rod withdrawal. 001 A2.11 (RO 3.3/SRO 3.3) RO/SRO-U	S, D, A	1
b. Perform actions for ESAS Actuation (RT-10) 006 A2.02 (RO 3.9/SRO 4.3) RO/SRO-U	S, N, EN, A, L	2
c. Transfer of Service Water suction from the Lake to the ECP. 076 A2.01 (RO 3.5/SRO 3.7) RO	S, D	4S
d. Respond to simultaneous loss of seal injection and seal cooling. 003 A4.08 (RO 3.2/SRO 2.9) RO	S, A, M	4P
e. Secure RB Spray after ES Actuation. 026 A2.08 (RO 3.2/SRO 3.7) RO	S, D, L	5
f. Transferring A1 from SU2 to SU1. 062 A4.07 (RO 3.1/SRO 3.1) RO/SRO-U	S, A, N, L	6
g. RX Tripped Check NNI and ICS Power Available. A02 AA1.1 (B&W EPEs/APEs) (RO 4.0/SRO 3.8) RO	S, A, D, L	7

<p>h. Respond to Pressurizer ERV failure. 010 A3.02 (RO 3.6/SRO/3.5)</p> <p>RO</p>	<p>S, A, P, L, D</p>	<p>3</p>
<p>In-Plant Systems</p>		
<p>i. Perform Restoring SW to ICW following ES Actuation 008 A3.08 (RO 3.6/SRO 3.7)</p> <p>RO/SRO-U</p>	<p>D, E, L</p>	<p>8</p>
<p>j. Take manual control of P-7A EFW Pump at turbine 061 A2.05 (RO 3.1/SRO 3.4)</p> <p>RO/SRO-U</p>	<p>R, D, P, E</p>	<p>4S</p>
<p>k. Align T-16A (Treated Waste Monitoring Tank) for Recirc/Sample 068 A2.02 (RO2.7/SRO 2.8)</p> <p>RO</p>	<p>D, A, P, R</p>	<p>9</p>

1. Determine the number of control room system and in-plant system job performance measures (JPMs) to develop using the following table:

License Level	Control Room	In-Plant	Total
Reactor Operator (RO)	8	3	11
Senior Reactor Operator-Instant (SRO-I)	7	3	10
Senior Reactor Operator-Upgrade (SRO-U)	2 or 3	3 or 2	5

2. Select safety functions and systems for each JPM as follows:

Refer to Section 1.9 of the applicable knowledge and abilities (K/A) catalog for the plant systems organized by safety function. For pressurized-water reactor operating tests, the primary and secondary systems listed under Safety Function 4, "Heat Removal from Reactor Core," in Section 1.9 of the applicable K/A catalog, may be treated as separate safety functions (i.e., two systems, one primary and one secondary, may be selected from Safety Function 4). From the safety function groupings identified in the K/A catalog, select the appropriate number of plant systems by safety functions to be evaluated based on the applicant's license level (see the table in step 1).

For RO/SRO-I applicants: Each of the control room system JPMs and, separately, each of the in-plant system JPMs must evaluate a different safety function, and the same system or evolution cannot be used to evaluate more than one safety function in each location. One of the control room system JPMs must be an engineered safety feature.

For SRO-U applicants: Evaluate SRO-U applicants on five different safety functions. One of the control room system JPMs must be an engineered safety feature, and the same system or evolution cannot be used to evaluate more than one safety function.

3. Select a task for each JPM that supports, either directly or indirectly and in a meaningful way, the successful fulfillment of the associated safety function. Select the task from the applicable K/A catalog (K/As for plant systems or emergency and abnormal plant evolutions) or the facility licensee's site-specific task list. If this task has an associated K/A, the K/A should have an importance rating of at least 2.5 in the RO column. K/As that have importance ratings of less than 2.5 may be used if justified based on plant priorities; inform the NRC chief examiner if selecting K/As with an importance rating less than 2.5. The selected tasks must be different from the events and evolutions conducted during the simulator operating test and tasks tested on the written examination. A task that is similar to a simulator scenario event may be acceptable if the actions required to complete the task are significantly different from those required in response to the scenario event.

Apply the following specific task selection criteria:

- At least one of the tasks shall be related to a shutdown or low-power condition.
- Four to six of the tasks for RO and SRO-I applicants shall require execution of alternative paths within the facility licensee's operating procedures. Two to three of the tasks for SRO-U applicants shall require execution of alternative paths within the facility licensee's operating procedures.
- At least one alternate path JPM must be new or modified from the bank.
- At least one of the tasks conducted in the plant shall evaluate the applicant's ability to implement actions required during an emergency or abnormal condition.
- At least one of the tasks conducted in the plant shall require the applicant to enter the radiologically controlled area. This provides an excellent opportunity for the applicant to discuss or demonstrate radiation control administrative subjects.

If it is not possible to develop or locate a suitable task for a selected system, return to step 2 and select a different system.

4. For each JPM, specify the codes for type, source, and location:

Code	License Level Criteria		
	RO	SRO-I	SRO-U
(A)lternate path	4-6	4-6	2-3
(C)ontrol room			
(D)irect from bank	≤ 9	≤ 8	≤ 4
(E)mergency or abnormal in-plant	≥ 1	≥ 1	≥ 1
(EN)gineered safety feature (for control room system)	≥ 1	≥ 1	≥ 1
(L)ow power/shutdown	≥ 1	≥ 1	≥ 1
(N)ew or (M)odified from bank (must apply to at least one alternate path JPM)	≥ 2	≥ 2	≥ 1
(P)revious two exams (randomly selected)	≤ 3	≤ 3	≤ 2
(R)adiologically controlled area	≥ 1	≥ 1	≥ 1
(S)imulator			

Form 3.4-1 Events and Evolutions Checklist

Facility: ANO Unit 1			Date of Exam: 04/04/2022									Operating Test No.: 2022-04						
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							
		P O S I T I O N			P O S I T I O N			P O S I T I O N			P O S I T I O N							
		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	RX													0	1	1	0	
	NOR	1												1	1	1	1	
	I/C	2, 3, 4,5					2, 4, 5, 7							8	4	4	2	
	MAJ	6,7					6							3	2	2	1	
	Man. Ctrl						4							1	1	1	0	
	TS	2,3												2	0	2	2	
U2	RX		4,5		3									3	1	1	0	
	NOR													0	1	1	1	
	I/C		2,8		2, 4, 5,7									6	4	4	2	
	MAJ		6,7		6									3	2	2	1	
	Man. Ctrl		6											1	1	1	0	
	TS				1,2									2	0	2	2	
R1	RX					3								1	1	1	0	
	NOR			1										1	1	1	1	
	I/C			2, 3, 4, 5		4,5,8								7	4	4	2	
	MAJ			6,7		6								3	2	2	1	
	Man. Ctrl			5		4								2	1	1	0	
	TS													0	0	2	2	
U3	RX				3									1	1	1	0	
	NOR	1												1	1	1	1	
	I/C	2, 3, 4,5			2, 4, 5,7									8	4	4	2	
	MAJ	6,7			6									3	2	2	1	
	Man. Ctrl													0	1	1	0	
	TS	2,3			1,2									4	0	2	2	
R2	RX		4,5											2	1	1	0	
	NOR													0	1	1	1	
	I/C		2,8			2, 4, 5, 7								6	4	4	2	
	MAJ		6,7			6								3	2	2	1	
	Man. Ctrl		6			4								2	1	1	0	
	TS													0	0	2	2	

Form 3.4-1 Events and Evolutions Checklist

Facility: ANO Unit 1		Date of Exam: 04/04/2022									Operating Test No.: 1						
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
R3	RX						3							1	1	1	0
	NOR			1										1	1	1	1
	I/C			2, 3, 4, 5			4,5,8							7	4	4	2
	MAJ			6,7			6							3	2	2	1
	Man. Ctrl			5			4							2	1	1	0
	TS													0	0	2	2
U4	RX													0	1	1	0
	NOR	1												1	1	1	1
	I/C	2, 3, 4,5												4	4	4	2
	MAJ	6,7												2	2	2	1
	Man. Ctrl													0	1	1	0
	TS	2,3												2	0	2	2
U5	RX						3							1	1	1	0
	NOR													0	1	1	1
	I/C						2, 4, 5,7							4	4	4	2
	MAJ						6							1	2	2	1
	Man. Ctrl													0	1	1	0
	TS						1,2							2	0	2	2
R4	RX		4,5											2	1	1	0
	NOR													0	1	1	1
	I/C		2,8				2, 4, 5, 7							6	4	4	2
	MAJ		6,7				6							3	2	2	1
	Man. Ctrl		6				4							2	1	1	0
	TS													0	0	2	2
R5	RX						3							1	1	1	0
	NOR			1										1	1	1	1
	I/C			2, 3, 4, 5			4,5,8							7	4	4	2
	MAJ			6,7			6							3	2	2	1
	Man. Ctrl			5			4							2	1	1	0
	TS													0	0	2	2

Form 3.4-1 Events and Evolutions Checklist

Facility: ANO Unit 1		Date of Exam: 04/04/2020											Operating Test No.: 1				
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			
U6	RX				3												1
	NOR	1												1	1	1	1
	I/C	2, 3, 4,5			2, 4, 5,7									8	4	4	2
	MAJ	6,7			6									3	2	2	1
	Man. Ctrl													0	1	1	0
	TS	2,3			1,2									4	0	2	2
R6	RX		4,5											2	1	1	0
	NOR													0	1	1	1
	I/C		2,8				2, 4, 5, 7							6	4	4	2
	MAJ		6,7				6							3	2	2	1
	Man. Ctrl		6				4							2	1	1	0
	TS													0	0	2	2
R7	RX					3								1	1	1	0
	NOR			1										1	1	1	1
	I/C			2, 3, 4, 5		4,5,8								7	4	4	2
	MAJ			6,7		6								3	2	2	1
	Man. Ctrl			5		4								2	1	1	0
	TS													0	0	2	2

Form 3.4-1 Instructions for the Events and Evolutions Checklist

1. Mark the applicant license level for each simulator operating test number.
2. For the set of scenario columns, fill in the associated event number from Form 3.3-1, "Scenario Outline," to show the specific event types being used for the applicant while in the assigned crew position for that scenario.

* Minimums are subject to the instructions in Section C.2, "License Level Criteria."

KEY: RX = Reactivity Manipulation; NOR = Normal Evolution; I/C = Instrument/Component Failure; MAJ = Major Transient; Man. Ctrl = Manual Control of Automatic Function; TS = Technical Specification Evaluation; RO = Reactor Operator; SRO-I or I = Instant Senior Reactor Operator; SRO-U or U = Upgrade Senior Reactor Operator; SRO = Senior Reactor Operator; ATC = At the Controls; and BOP = Balance of Plan

Form 3.3-1 Scenario Outline

Facility:	<u>ANO-1</u>	Scenario #:	<u>1 Rev 4</u>
Scenario Source:	<u>NEW</u>	Op. Test #:	<u>2022-04</u>
Examiners:	_____	Applicants/ Operators:	_____
	_____		_____
	_____		_____

Initial Condition:

- 100% Power
- EFIC Channels A,B, and D initiate modules failed only allowing ½ trip of MSLI.
- RPS Channels B, C, and D Failed, Will not automatically trip the reactor.
- Ensure RPS Bypass key is available.

Turnover:

- Plant is at 100% Power
- 450 EFPD
- Need to rotate operating EH Oil Pumps P-14A in service Secure P-14B.
- P-75 Aux Feedwater Pump Out of Service for Oil Change Out.

Critical Tasks:

CT-1 IAW 1015.050, Time Critical Operator Actions, operators are required to trip the RX within 1 minute if RPS fails and the main reactor trip pushbutton fails.

CT-2 Following Overcooling event take action(s) to stabilize RCS temperature / pressure (ADV Operation and/or throttle HPI flow) prior to lifting any Pressurizer Relief Valves.

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N-(BOP) N-(SRO)	Rotate operating EH Oil Pumps P-14A in service Secure P-14B.
2	TR458	I-(BOP) I-(ATC) I-(SRO) TS	Controlling RCS pressure transmitter fails causing pressure indication to drift low. (T.S. 3.3.1 RPS Condition A Function 3,4,5)
3	ED180	C-(BOP) C-(SRO) TS	Startup 1 Transformer is deenergized due to Lockout caused by sudden pressure. (T.S. 3.8.1 Condition A).
4	K05C1 DO_P3CLUB CW084	C-(BOP) R-(ATC) C-(SRO)	Circ Water Pump Motor Cooling Flow Low
5	MC088 SW087	R-(ATC) C-(BOP) C-(SRO) MC-(BOP) AOP	Condenser Vacuum Leak (5000 SCFM) C-5B Condenser Vacuum Pump will fail to autostart.
6	DI_PB9201 RP247 RP248 RP249	M-(ALL) MC-(ATC)	Main Generator Trips at either 65% power or 25.5" Vac. RPS Failed.
	DI_ICC0020	M-(ATC) M-(SRO) (CT)	CO3 Manual Trip Pushbutton Failed
7	MS141	M-(ALL) (CT)	MSSV Stuck Open transition to overcooling, and stabilize temperatures.
8	FW621	C-(ATC)	Half Trip of MSLI.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Tech Spec, (MC)Manual Control

OBJECTIVES FOR SCENARIO

- 1) Evaluate individual ability to perform rotation of plant equipment.
- 2) Evaluate individual ability to recognize and respond to a failed RCS Pressure Instrument.
- 3) Evaluate individual ability to recognize and respond to failure of the Startup 1 Transformer.
- 4) Evaluate individual ability to recognize when conditions require the entry into Technical Specifications conditions.
- 5) Evaluate individual ability to recognize and respond to failure of Circulating Water Pump.
- 6) Evaluate individual ability to recognize and respond to Lowering Main Condenser Vacuum.
- 7) Evaluate individual ability to reduce plant power.
- 8) Evaluate individual ability to recognize and respond to failure of RPS Trip.
- 9) Evaluate individual ability to recognize respond to a Reactor Trip.
- 10) Evaluate individual ability to recognize and respond to Overcooling.
- 11) Evaluate individual ability to recognize and respond to EFIC System Failures.
- 12) Evaluate individual ability to perform EOP Repetitive Tasks.

Target Quantitative Attributes (Section D.5.d)	Actual Attributes
Malfunctions after EOP entry (1-2)	1
Abnormal Events (2-4)	4
Major Transients (1-2)	2
EOPs entered requiring substantive actions (1-2)	2
EOP contingencies requiring substantive actions (≥ 1 per scenario set)	1
Critical Tasks (≥ 2)	2

SCENARIO 1 NARRATIVE

The crew will assume the watch with the plant at 100% power.

The turnover sheet will direct the crew to swap operating turbine electro-hydraulic pumps per 1106.012 Electro-Hydraulic Oil System Operation Section 15 for a 30 minute run PMT.

(SRO-N) (BOP-N).

After the P-14B EH Oil Pump is placed into service and P-14A EH Oil Pump is secured, the controlling RCS pressure transmitter (PT-1021) will fail causing the pressure indication to drift low. This will cause a SASS MISMATCH (K07-B4) alarm to come in indicating a deviation of the controlling pressure signals. 1203.012F *Annunciator K07 Corrective Action (ACA)* should be referenced. This will direct the operators to verify that the alternate instrument (PT-1038) is reading as expected and then the ATC operator will select PT-1038 for control on panel C04. The SRO may direct the ATC to control heaters manually, isolating the ERV by closing (CV-1000), and controlling spray in manual as needed to stabilize RCS Pressure. Crew should verify that RCS recovers to approximately 2155 psig and stabilizes. When the failed pressure instrument reaches 1800 psig, the "A" RPS channel will trip on low RCS Pressure. This would require entry into **TS 3.3.1 Condition A (functions 3,4,5)** for RPS Instrumentation. The SRO may direct that the "A" RPS channel be placed in maintenance bypass per 1105 .001, NI & RPS Operating Procedure.

(SRO-TS) (ATC-I) (BOP-I) (TS)

SU 1 L.O. RELAY TRIP alarm (K02-A1) will come in, indicating the Startup 1 transformer is deenergized. 1203.012B, *Annunciator K02 Corrective Action* should be entered. An Auxiliary Operator should be dispatched to investigate the transformer locally. The AO will report that the cause of the lockout is due to a Sudden Gas Pressure alarm. Per the ACA, the Startup 2 handswitches should be removed from Pull-to-Lock (coordinated with Unit 2). The SRO should declare one required offsite power source inoperable and enter **TS 3.8.1. Condition A.**

(BOP-C) (SRO-C) (TS)

Circ Water Pump Motor Cooling Water Flow Low annunciator K05-C1 will alarm for the C CW Pump. The Outside AO should be dispatched to investigate. The AO will report that Seal Flow Sight Glass FI-3620 is broken and will need to be isolated. The crew should secure the C CW Pump per 1104.008 Circulating Water and Water Box Vacuum System Operation, section 10.0 Stopping a Circ Water Pump.

(SRO-C) (BOP-C) (ATC-R)

A condenser vacuum leak will occur. The SRO should direct actions per 1203.016 Loss of Condenser Vacuum. The ATC should place SG/RX to hand and ensure power is less than 100%. BOP should enter the transient low vacuum alarm setpoints in the plant computer and start the standby Condenser Vacuum Pump (C-5B). SRO should then enter 1203.045 Rapid Plant shutdown and decrease turbine load to stabilize vacuum.

(ATC-R) (BOP-C) (SRO-C) (BOP-MC)

At 25.5 inches or 65% power the main turbine will trip, due to a failure of RPS the team should recognize the failure of the RX trip and trip the RX and perform immediate actions.

(ATC-MC) (ATC-M) (SRO-M)

CONTINUED

The backup pushbuttons on CO3 will be required due to failure of the Rx Trip pushbutton to work. **(CT-1 IAW 1015.050, Time Critical Operator Actions, operators are required to trip**

the RX within 1 minute if RPS fails and the main reactor trip pushbutton fails.) When the reactor trips, a main steam safety valve on the "A" Steam Generator (SG) will fail open and will not reseal. This will result in an overcooling of the RCS. When "A" SG pressure is <900 psig, the Overcooling EOP, 1203.003 will be entered to address the event. HPI will be aligned if required.

(ATC-M) (SRO-M)

The crew should identify the MSSV Open annunciator remains in alarm and recognize the lowering steam pressure (<900 psig) in the "A" SG. The SRO should transition to 1202.003, the Overcooling EOP.

(ALL-M)

Actuation of HPI will be required to maintain RCS pressure and Pressurizer level during Overcooling event. Repetitive task 2 (RT-2) will be utilized to initiate and control HPI flow. The Overcooling EOP directs that HPI be initiated if Pressurizer Level drops below 30" or RCS pressure is < 1700 psig. During the depressurization of the "A" SG, the crew will identify the failure of the MSLI to fully actuate. The ATC should diagnose this and the SRO should direct actuating EFW and MSLI for the "A" SG. **(CT-2 Following Overcooling event stabilize RCS temperature and throttle HPI flow as necessary to prevent lifting any Pressurizer Relief Valves.)**

(ATC-C)

The scenario can be terminated when MSLI has been actuated to the "A" SG and the SG is dry. Crew has taken actions to stabilize RCS temperature, pressure and inventory. "B" Turbine Bypass Valves utilized to stabilize RCS temperature. HPI is secured if initiated to limit RCS pressure and pressurizer level.

Critical Task Table:

	Safety significance	Initiating Cue	Measurable Performance Standard	Performance Feedback
CT1: Manually trip the reactor within 1 minute of exceeding an RPS trip setpoint.	Failure of Reactor Protection System (RPS)	Main Turbine trips above 43% Power.	Manually trip the reactor within 1 minute of exceeding the RPS trip setpoint. This criterion is based on EN-OP-123, Time Critical Action / Time Sensitive Action Program Standard.	Reactor tripped, all rods inserted, and reactor power dropping.
CT2: Following Overcooling event, take action(s) to stabilize RCS temperature / pressure (ADV Operation and/or throttle HPI flow) prior to lifting any Pressurizer Relief Valves.	Failure to take action to control RCS pressure below lift setpoint of a pressurizer relief valve will result in compounding the overcooling by unnecessarily creating a LOCA.	Rising RCS pressure and temperature following termination of overcooling.	Take action to stabilize RCS pressure / temperature prior to ERV automatically opening.	ERV valve status and alarm along with RCS pressure trends.

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in NUREG-1021.

Tech Spec Table:

LCO	Condition	Action	Completion Time
3.3.1	A. One Channel Inoperable.	Place channel in bypass or trip. <u>OR</u> Prevent bypass of remaining channels.	1 HR 1 HR
Table 3.3.1-1 Functions: 3 (required), 4, and 5 (conservative but not required)			
3.8.1	A. One required offsite circuit inoperable.	Perform SR 3.8.1 for Operable required offsite circuit. <u>AND</u> Declare required features with no offsite power available inoperable when its redundant required feature is inoperable. <u>AND</u> Restore required offsite circuit to Operable status.	1 HR 24 HRs from discovery of no offsite power to one train concurrent with inoperability of redundant required features. 72 HRs

Procedures:

Event 1

OP-1106.012 – Electro-Hydraulic Oil System Operation Section 15

Event 2

OP-1203.012F – **K07-B4**, SASS Mismatch

OP-1105.001 – NI & RPS Operating Procedure (Section 9.0, Placing an RPS Channel in Manual Bypass)

T.S 3.3.1 Condition A

Event 3

OP-1203.012B – **K02-A1** – SU1 L.O. Relay Trip

OP-1107.001 – Electrical System Operations (Aligning SU2 for Auto-Transfer)

T.S. 3.8.1 Condition A

Event 4

OP-1203.012D – **K05-C1**, CW Pump Mtr Cooling water Flow Lo

OP-1104.08 – Circulating Water and Water Box Vacuum System Operation (Section 7 Instructions for Pump Start and Stop).

OP-1203.001 – ICS Abnormal Operation (Section 2 Undesired Power Change.

OP-1105.004 – Integrated Control System (Section 7.6 and 7.7 SG/RX Demand Transfer to Auto/Unit Load Demand Transfer to Auto).

-or-

OP-1203.045 – Rapid Plant Shutdown (Exhibit 1 Operation of SG/RX Demand Hand/Auto Station).

Event 5

OP-1203.016 – Loss of Condenser Vacuum

OP-1203.045 – Rapid Plant Shutdown (Section 1 Rapid Plant Shutdown Without Small SG Tube Leak).

Event 6

OP-1202.001 – Reactor Trip

Events 7, 8

OP-1202.003 – Overcooling

OP-1202.012 – Repetitive Tasks (RT-2 – Initiate HPI)

(RT-6 – Proper EFW Actuation and Control Verification)

(RT-19 – Check Proper Electrical Response)

(RT-18 – Check SG Tube Integrity)

(RT-9 – Verify Proper ESAS Actuation)

(RT-14 – Control RCS Pressure)

Simulator Instructions for Scenario 1

Recall IC 251

Verify the following:

- Install Caution card for P-75 Aux Feedwater Pump and make status board entry.
- Verify tags correct for HPI pumps (P36A OP, P36B STBY, and P36C ES)
- Verify low vacuum alarm set to 26.9" Hg

Insert override DO_HS2818R
 Insert override DO_HS2818G
 Insert malfunction FW621
 Insert malfunction RP247
 Insert malfunction RP248
 Insert malfunction RP249
 Insert malfunction TR458 to 1700.00000 in 20 on event 1
 Insert malfunction ED180 on event 2
 Insert malfunction CW084 after 180 on event 3
 Insert malfunction K05C1 to ON, on event 3
 Insert override DO_P3CLUB to On, on event 3
 Insert malfunction MC088 to 600.00000 on event 4
 Insert malfunction SW087 on event 4
 Insert override DI_PB9201 to TRUE on event 5
 Insert override DI_ICC0020 to FALSE
 Insert malfunction MS141 to 6.00000 on event 6

RED LP, AUX FDWTR PUMP, HS-2818
 GRN LP, AUX FDWTR PUMP, HS-2818
 EFIC CHANNELS A, B, D INITIATE MODULE OUTPUT FAILURE
 REACTOR TRIP RELAY KE2 FAILS
 REACTOR TRIP RELAY KE3 FAILS
 REACTOR TRIP RELAY KE4 FAILS
 RCS PRESSURE (PT1021) {NNIX} 1700-2500 PSIG
 START UP #1 TRANSFORMER FAILURE
 P3C MOTOR WINDING HEATUP
 K05 CW PMP MTR COOLING WTR FLOW LO
 RED LP, CW P3C LUBE WTR FLOW LO
 CONDENSER VACUUM LEAK 0-6000 SCFM
 C-5B AUTO START FAILURE
 TURBINE TRIP, PUSH BUTTON
 REACTOR TRIP, PB
 A OTSG SHIFT IN PSV 2696 LIFT&RESET 1-6 SET NO

Event No.	Time	Event Type*	Event Description
1		N-(BOP) N-(SRO)	Rotate operating EH Oil Pumps P-14A in service Secure P-14B.
2		I-(BOP) I-(ATC) I-(SRO) TS	Controlling RCS pressure transmitter fails causing pressure indication to drift low. (T.S. 3.3.1 RPS Condition A)
3		C-(BOP) C-(SRO) TS	Startup 1 Transformer is deenergized due to Lockout caused by sudden pressure. (T.S. 3.8.1 Condition A).
4		C-(BOP) R-(ATC) C-(SRO)	Circ Water Pump Motor Cooling Flow Low
5		R-(ATC) C-(BOP) C-(SRO) MC-(BOP) AOP	Condenser Vacuum Leak (5000 SCFM) C-5B Condenser Vacuum Pump will fail to autostart.
6		M-(ALL) MC-(ATC)	Main Generator Trips at 25.5" Vac. RPS Failed.
		M-(ATC) M-(SRO) (CT)	CO3 Manual Trip Pushbutton Failed
7		M-(ALL)	MSSV Stuck Open transition to overcooling.
8		C-(ATC) (CT)	Half Trip of MSLI.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Tech Spec, (MC)Manual Control

Form 3.3-2 Required Operator Actions

Facility:	ANO-1	Scenario #:	2 Rev. 4
Scenario Source:	FEB 2018 ANO-1	Op. Test #:	2022-04
Examiners:	_____	Applicants/	_____
	_____	Operators:	_____
	_____		_____

Initial Condition:

- 95% Power
- 12 EFPD
- #1 EDG SW cooling valve is failed closed.
- #2 EDG will not Auto-Start but will manually start.
- ICS Steam Generator/Reactor Demand (SG/RX) AUTO button is failed.
- Ensure the RPS and EFIC Manual Bypass Keys Available.
- Hang Equipment OOS Caution Card on C-28B indicating lights

Turnover:

- Unit 2 is in Cold Shutdown (forced outage)
- C-28B Instrument Air Compressor Out of Service for troubleshooting.

Critical Tasks:

CT-1 #2 EDG must be started within 15 minutes of entering Blackout conditions.

CT-2 Primary to secondary heat transfer or HPI Cooling must be established prior to an automatic actuation of ESAS.

Event No.	Malfunction No.	Event Type*	Event Description
1	N/A	TS	Oil leak on P-34A outboard motor bearing. <i>(Technical Specification 3.5.2 ECCS Condition A)</i>
2	NI236	I-(BOP) I-(SRO) TS, AOP	Power Range NI (NI-5) fails low. <i>(Technical Specification 3.3.1, RPS Instrumentation and 3.3.11, EFIC System Instrumentation)</i>
3	B5148 B5122	R-(ATC) R-(SRO)	Loss of 500kV transmission line. Dispatcher orders power reduction to ≤700MW in 20 minutes (ICS in HAND).
4	RX150	I-(ATC) I-(BOP) MC-(ATC/BOP) I-(SRO)	Main Turbine EHC fails to respond to ICS signal requiring MANUAL control of the Main Turbine.
5	CV062	C-(SRO) C-(BOP) C-(ATC)	Trip of the running Makeup Pump (P-36B)
6	ED183	M-(ALL)	Loss of Offsite Power/Reactor Trip
7	DG176 CV3806	C-(BOP) C-(SRO) (CT)	#1 EDG Service Water Cooling valve (CV-3806) fails to open #2 EDG doesn't auto-start. Must depress the manual start button.
8	FW076	C-(ALL) (CT)	P-7A EFW pump trips after approx. 5 min. A3 powered from A4 or the AAC Diesel Generator(power to P-7B) to provide primary to secondary heat removal or HPI Cooling Initiated.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Tech Spec, (MC)Manual Control

OBJECTIVES FOR SCENARIO

- 1) Evaluate individual ability to recognize and implement Technical Specifications.
- 2) Evaluate individual ability to recognize and respond to a Power Range Nuclear Instrument failure.
- 3) Evaluate individual ability to perform a controlled power reduction as directed by the system dispatcher to maintain grid stability.
- 4) Evaluate individual ability to recognize and respond to a failure of the main turbine control system to respond to ICS demand.
- 5) Evaluate individual ability to respond to loss of Makeup Pump.
- 6) Evaluate individual ability to respond to an automatic Reactor Trip.
- 7) Evaluate individual ability to respond to a loss of offsite power (Degraded Power).
- 8) Evaluate individual ability to identify and respond to failure of an EDG cooling water valve.
- 9) Evaluate individual ability to identify and respond to failure if an EDG to auto-start.
- 10) Evaluate individual ability to identify and respond to loss of primary to secondary cooling (Overheating).
- 11) Evaluate individual ability to restore AC power to vital equipment.
- 12) Evaluate individual ability to ensure core cooling by various means.

Target Quantitative Attributes (Section D.5.d)	Actual Attributes
Malfunctions after EOP entry (1-2)	2
Abnormal Events (2-4)	4
Major Transients (1-2)	1
EOPs entered requiring substantive actions (1-2)	2
EOP contingencies requiring substantive actions (≥ 1 per scenario set)	1
Critical Tasks (≥ 2)	2

SCENARIO 2 NARRATIVE

C-28B Instrument Air Compressor is Out of Service for troubleshooting.

This scenario starts with plant power at 95%. The Waste Control Operator will contact the control room and inform them that all the oil has leaked out of the outboard motor bearing on P-34A Decay Heat Pump. The crew will declare P-34A INOPERABLE and the CRS will enter T.S. 3.5.2 Condition A (ECCS). **(TS)**

After the T.S. is entered, power range nuclear instrument NI-5 will fail downscale. Due to this signal being fed through a high auctioneer, the input to ICS will be unaffected, but the failure will result in the inoperability of the "A" RPS channel and the "A" EFIC channel. A momentary RPS TROUBLE annunciator (K08-C3) will be received as well as REACTOR TRIP ON LOSS OF FEEDWATER BYP/TROUBLE (K15-B1) and REACTOR TRIP ON MAIN TURBINE TRIP BYPASS TROUBLE (K15-C1) will be locked into alarm. The SRO should enter 1203.021, Loss of Neutron Flux Indication AOP, Section 1 for Loss of One or More Power Range NI Channels. The SRO should reference **TS.3.3.1 (Reactor Protection System Instrumentation)** for the "A" RPS Channel and **TS 3.3.11 (Emergency Feedwater Initiation and Control System Instrumentation)** for the "A" EFIC Channel. "A" RPS and EFIC channels should be immediately declared inoperable and placed in bypass or trip within 1 hour of the inoperability. **(I-BOP) (I-SRO) (TS)**

A loss of a 500 kV transmission line will occur, and the system dispatcher will notify the control room that a load reduction to ≤ 700 MWe is required to maintain grid stability. Power must be lowered within 20 minutes to prevent transmission line overheat. The SRO should enter 1203.045, Rapid Plant Shutdown AOP, Section 1 (No Tube Leak). The SRO will direct the ATC to adjust the rate of change to a value that will ensure that the target value (700MW) will be reached within the 20-minute time frame. The ATC will lower the Unit Load Demand (ULD) station to < 735 MWe (NOTE: *House loads are ~ 35 MWe. Gross output of 735 MWe will result in net output of 700 MWe*). **(R-ATC) (R-SRO)**

When the power reduction is started, the main turbine will fail to respond to changing ICS demand which will result in lowering steam header pressure and generator output not lowering as desired. The SRO will enter 1203.001 ICS Abnormal Operation AOP, Section 2, Undesired Power Change. The SRO should direct the ATC place the SG/RX Master demand into HAND and then direct the BOP operator to place the main turbine controls in MAN. The ATC will then lower reactor power by means of the SG/RX Demand station and the BOP will maintain steam header pressure in the band designated by the SRO (usually 880 to 910 psig). The ATC and BOP will coordinate and lower power until gross generation is ≤ 735 MW. The AUTO pushbutton on the SG/RX demand station is failed so restoration back to auto will not be possible. **(I-ATC) (I-BOP) (I-SRO) (MC-ATC/BOP)**

During or after the power reduction is complete, the running Makeup Pump (P-36B) will trip due to an instantaneous overcurrent condition as reported from the field operator upon request to investigate. The SRO will enter AOP 1203.026, Loss of Reactor Coolant Makeup. Actions will be performed by both the ATC and BOP for this failure. **(ATC-C) (BOP-C) (SRO-C)**

CONTINUED ON NEXT PAGE

Once actions are complete for loss of the Makeup Pump, a loss of all offsite power will occur which will result in a reactor trip. The SRO will enter 1202.001, Reactor Trip EOP and direct completion of the Reactor Trip Immediate Actions.

(M-ALL)

After reactor trip immediate actions are complete, the SRO should enter 1202.007, Degrade Power EOP. The SRO will direct performance of RT-21 to verify proper operation of both EDGs. The crew should identify that CV-3806 is not open to supply the #1 EDG with cooling water. An Auxiliary Operator should be dispatched to open CV-3806 (*CV-3806 will not open manually*). When the AO reports that CV-3806 will not open, #1 EDG should be shutdown by placing it in Lockout. RT-21 will direct that the manual pushbutton on the #2 EDG be depressed (**CT-1 - #2 EDG must be started within 15 minutes of entering Blackout conditions.**) and the #2 EDG will start and energize vital bus A4. The SRO should direct the Unit 2 control room to start the Alternate AC (AAC) Generator and align its output to Unit 1. After a short delay, Unit 2 will report that the AAC Generator is running and ready for loading.

(C-BOP) (C-SRO)

P-7A EFW pump will trip after startup and will not be able to be reset. Per the Degraded Power EOP, the EFW should be realigned for restart. Vital bus A3 should be energized from the A4 bus or AAC Generator to provide power to P-7B electric EFW pump to supply feedwater to the SGs for primary-to-secondary cooling.

(SRO-CT) (BOP-CT) If conditions exist that require HPI cooling (*ERV opens in AUTO, RCS pressure \geq 2450 psig, RCS press approaches NDTT limit, or Overheating causes SCM to become inadequate*) then HPI Cooling is established using RT-4. **(CT-2 Primary to secondary heat transfer or HPI Cooling must be established prior to automatic actuation of ESAS.**

(C-ALL)

The scenario may be terminated when RCS cooling has been established via Primary-to-Secondary Heat Transfer **OR** HPI Cooling **OR** both **OR** at the direction the lead evaluator.

Critical Task Table:

	Safety significance	Initiating Cue	Measurable Performance Standard	Performance Feedback
CT1: #2 EDG must be started within 15 minutes of entering Blackout conditions.	Degraded Emergency Power Capacity	Failure of EDG #2 to auto start on degraded power condition.	Energize A4 within 15 minutes of LOOP. (Criteria to declare an SAE for a station blackout)	Status indicating lights, voltage, frequency and Kw loading for the diesel and A4 voltage indicated.
CT2: Primary to secondary heat transfer or HPI Cooling must be established prior to an automatic actuation of ESAS.	Mitigate inadequate heat flow from the core to heat sinks.	P-7A trips with no power available to P-7B. K12-B5 Annunciator "P7A Turbine Trip".	BOP and SRO should recognize power is not available to P-7B and energize A3 from the AACDG or A4 and restart P-7B.	P-7B is running and A3 is energized from the AACDG or A4.

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in NUREG-1021.

Tech Spec Table:

LCO	Condition	Action	Completion Time
3.5.2	A. One or more Trains inoperable.	Restore train(s) to operable status.	72 HRS
3.3.1	A. One Channel inoperable.	A.1 Place channel in bypass or trip. <u>OR</u> A.2 Prevent bypass of remaining channels.	1HR 1HR
Table 3.3.1-1	Functions: 1.a, 7, 8, 9, and 10		
3.3.11	A. One or more EFW initiation or Main Steam Line Isolation Function listed in Table 3.3.11-1 with one channel inoperable.	A.1 Place one channel in bypass.	1HR
Table 3.3.11-1	Function: 1.a		

Procedures:

Event 1

T.S. 3.5.2 Condition A

Event 2

OP-1203.012G – **K08-C3**, RPS Trouble

OP-1103.021 – Loss of Neutron Flux Indication (Section 1.0 Loss of One or More Power Range NI Channels)

T.S. 3.3.1 Conditions A

T.S. 3.3.11 Condition A

OP-1105.001 – NI & RPS Operating Procedure (Section 9.0 Placing an RPS Channel in Manual Bypass)

OP-1105.015 – Emergency Feedwater Initiation and Control (Section 15.0 EFIC Channel Maintenance Bypass Operation)

Event 3&4

OP-1203.045 – Rapid Plant Shutdown

OP-1203.001 – ICS Abnormal Operations (Section 1 Heat Transfer Upset)

Event 5

OP-1203.012I – **K10-A6**, HPI Pump Trip

OP-1203.026 – Loss of Reactor Coolant Makeup (Section 1 Loss of HPI Pump).

Event 6,7,8

OP-1202.001 – Reactor Trip

OP-1202.007 – Degraded Power

OP-1107.002 – ES Electrical System Operation (Section 13, Placing Alternate AC Generator (2K9) on Bus A3)

OP-1203.012K – **K12-B5**, P7A Turbine Trip

OP-1202.012 – Repetitive Tasks (RT-21 – Check EDG Operation)

(RT-14 – Control RCS Pressure)

(RT-5 – Proper EFW Actuation and Control Verification)

(RT-16a – Feeding Intact SG with EFW Nozzles)

Simulator Instructions for Scenario 2

Recall IC 252

Verify the following:

- Install Caution card for C-28B Instrument Air Compressor and make status board entry.
- Verify tags correct for HPI pumps (P36A STBY, P36B OP, and P36C ES)
- ENSURE Lead Evaluator has possession of RPS and EFIC Manual Bypass keys.

Insert malfunction CV3806 to 1.00000
 Insert malfunction DG176
 Insert malfunction NI236 on event 2
 Insert remote B5148 to OPEN on event 3
 Insert remote B5122 to OPEN on event 3
 Insert malfunction RX150 on event 4
 Insert override DI_JCC0016A to FALSE on event 4
 Insert malfunction CV062 on event 5
 Insert malfunction ED183 on event 6
 Insert malfunction FW076 on event 7

Serv Wtr to DG1 Clrs
 EDG 2 FAILS TO AUTO START
 NI-5 FAILS LO
 B5148 500KV PLEASANT HILL OR AUTO XFMR
 B5122 500KV TO PLEASANT HILL
 FREEZE ICS SIGNAL TO EHC AT CURRENT VALUE
 SG/RX H/A station will not return to AUTO
 B MAKEUP PUMP TRIP P36B
 LOSS OF OFF SITE POWER
 P7A STEAM DRIVEN EFW PUMP FAILURE

Event No.	Time	Event Type*	Event Description
1		TS	Oil leak on P-34A outboard motor bearing. <i>(Technical Specification 3.5.2 ECCS Condition A)</i>
2		I-(BOP) I-(SRO) TS, AOP	Power Range NI (NI-5) fails low. <i>(Technical Specification 3.3.1, RPS Instrumentation and 3.3.11, EFIC System Instrumentation)</i>
3		R-(ATC) R-(SRO)	Loss of 500kV transmission line. Dispatcher orders power reduction to ≤700MW in 20 minutes (ICS in HAND).
4		I-(ATC) I-(BOP) MC-(ATC/BOP) I-(SRO)	Main Turbine EHC fails to respond to ICS signal requiring MANUAL control of the Main Turbine.
5		C-(SRO) C-(BOP) C-(ATC)	Trip of the running Makeup Pump (P-36B)
6		M-(ALL)	Loss of Offsite Power/Reactor Trip
7		C-(BOP) C-(SRO) (CT)	#1 EDG Service Water Cooling valve (CV-3806) fails to open #2 EDG doesn't auto-start. Must depress the manual start button.
8		C-(ALL) (CT)	P-7A EFW pump trips after approx. 5 min. A3 powered from A4 or the AAC Diesel Generator (power to P-7B) to provide primary to secondary heat removal or HPI Cooling Initiated.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Tech Spec, (MC)Manual Control