

Facility: Comanche Peak													Date of Exam: August 19, 2021					
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	3	3	3	N/A			3	3	N/A			3	18			6	
	2	1	2	2	N/A			2	1	N/A			1	9			4	
	Tier Totals	4	5	5	N/A			5	4	N/A			4	27			10	
2. Plant Systems	1	2	2	3	3	3	3	3	3	2	2	2	28			5		
	2	1	0	1	1	1	1	1	1	1	1	1	10			3		
	Tier Totals	3	2	4	4	4	4	4	4	3	3	3	38			8		
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4	7
				3		3		2		2								

- 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.

ES-401		PWR Examination Outline						Form ES-401-2	
		Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)							
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1									
000008 (APE 8) Pressurizer Vapor Space Accident / 3									
000009 (EPE 9) Small Break LOCA / 3					X		Ability to determine or interpret the following as they apply to a small break LOCA: CFR 43.5 / 45.13) EA2.36 Difference between overcooling and LOCA indications	4.2	41
000011 (EPE 11) Large Break LOCA / 3	X						Knowledge of the operational implications of the following concepts as they apply to the Large Break LOCA: CFR 41.8 / 41.10 / 45.3) EK1.01 Natural circulation and cooling, including reflux boiling	4.1	39
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4	X						Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): CFR 41.8 / 41.10 / 45.3) AK1.01 Natural circulation in a nuclear reactor power plant	4.4	47
000022 (APE 22) Loss of Reactor Coolant Makeup / 2									
000025 (APE 25) Loss of Residual Heat Removal System / 4						X	2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures. CFR: 41.10 / 43.2 / 45.6)	4.5	46
000026 (APE 26) Loss of Component Cooling Water / 8						X	2.2.44 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)	4.2	53
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		X					Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: CFR 41.7 / 45.7) AK2.03 Controllers and positioners	2.6	42
000029 (EPE 29) Anticipated Transient Without Scram / 1	X						Knowledge of the operational implications of the following concepts as they apply to the ATWS: CFR 41.8 / 41.10 / 45.3) EK1.03 Effects of boron on reactivity	3.6	40
000038 (EPE 38) Steam Generator Tube Rupture / 3				X			Ability to operate and monitor the following as they apply to a SGTR: (CFR 41.7 / 45.5 / 45.6) EA1.16 S/G atmospheric relief valve and secondary PORV controllers and indicators	4.4	48
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer <b>Uncontrolled Depressurization of all Steam Generators</b> / 4					X		Ability to determine and interpret the following as they apply to the (Uncontrolled Depressurization of all Steam Generators) (CFR: 43.5 / 45.13) EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.4	54
000054 (APE 54; CE E06) Loss of Main Feedwater / 4				X			Ability to operate and / or monitor the following as they apply to the Loss of Main Feedwater (MFW): (CFR 41.7 / 45.5 / 45.6) AA1.02 Manual startup of electric and steam-driven AFW pumps	4.4	55
000055 (EPE 55) Station Blackout / 6						X	2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)	3.8	41

000056 (APE 56) Loss of Offsite Power / 6			X				Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: (CFR 41.5,41.10 / 45.6 / 45.13) AK3.02 Actions contained in EOP for loss of offsite power	4.4	39
000057 (APE 57) Loss of Vital AC Instrument Bus / 6									
000058 (APE 58) Loss of DC Power / 6					X		Ability to determine and interpret the following as they apply to the Loss of DC Power: (CFR: 43.5 / 45.13) AA2.03 DC loads lost; impact on ability to operate and monitor plant systems	3.5	41
000062 (APE 62) Loss of Nuclear Service Water / 4			X				Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: (CFR 41.4, 41.8 / 45.7 ) AK3.01 The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the nuclear service water coolers	3.2*	39
000065 (APE 65) Loss of Instrument Air / 8			X				Knowledge of the reasons for the following responses as they apply to the Loss of Instrument Air: (CFR 41.5,41.10 / 45.6 / 45.13) AK3.08 Actions contained in EOP for loss of instrument air	3.7	47
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6		X					Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: (CFR: 41.4, 41.5, 41.7, 41.10 / 45.8) AK2.06 Reactor power	3.9	46
(W E04) LOCA Outside Containment / 3									
(W E11) Loss of Emergency Coolant Recirculation / 4				X			Ability to operate and / or monitor the following as they apply to the (Loss of Emergency Coolant Recirculation) (CFR: 41.7 / 45.5 / 45.6) EA1.3 Desired operating results during abnormal and emergency situations	3.7	53
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4		X					Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following: (CFR: 41.7 / 45.7) EK2.1 Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.7	42
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401		PWR Examination Outline						Form ES-401-2		
		Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)								
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#	
000001 (APE 1) Continuous Rod Withdrawal / 1		X					Knowledge of the interrelations between the Continuous Rod Withdrawal and the following: (CFR 41.7 / 45.7) AK2.07 Boric acid pump running lights	2.8	60	
000003 (APE 3) Dropped Control Rod / 1										
000005 (APE 5) Inoperable/Stuck Control Rod / 1										
000024 (APE 24) Emergency Boration / 1				X			Ability to operate and / or monitor the following as they apply to Emergency Boration: (CFR 41.7 / 45.5 / 45.6) AA1.26 Boric acid storage tank	3.3	58	
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2										
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7										
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7										
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8										
000037 (APE 37) Steam Generator Tube Leak / 3			X				Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: (CFR 41.5,41.10 / 45.6 / 45.13) AK3.02 Reset and check of Condensate air ejector exhaust monitor	3.2	61	
000051 (APE 51) Loss of Condenser Vacuum / 4										
000059 (APE 59) Accidental Liquid Radwaste Release / 9				X			Ability to operate and / or monitor the following as they apply to the Accidental Liquid Radwaste Release: (CFR 41.7 / 45.5 / 45.6) AA1.03 Flow rate controller	3.0*	64	
000060 (APE 60) Accidental Gaseous Radwaste Release / 9										
000061 (APE 61) Area Radiation Monitoring System Alarms / 7										
000067 (APE 67) Plant Fire On Site / 8										
000068 (APE 68; BW-A06) Control Room Evacuation / 8						X	2.4.3 Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4)	3.7	63	
000069 (APE 69; W E14) Loss of Containment Integrity - High Containment Pressure / 5										
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling – Degraded Core Cooling – Saturated Core Cooling / 4										
000076 (APE 76) High Reactor Coolant Activity / 9		X					Knowledge of the interrelations between the High Reactor Coolant Activity and the following: (CFR 41.7 / 45.7) AK2.01 Process radiation monitors	2.6	62	
000078 (APE 78*) RCS Leak / 3										

(W E01 & E02) Rediagnosis—SI Termination / 3	X							Knowledge of the operational implications of the following concepts as they apply to the (SI Termination) (CFR: 41.8 / 41.10, 45.3) EK1.2 Normal, abnormal and emergency operating procedures associated with (SI Termination)	3.4	59
(W E13) Steam Generator Overpressure / 4			X					Knowledge of the reasons for the following responses as they apply to the (Steam Generator Overpressure) (CFR: 41.5 / 41.10, 45.6, 45.13) EK3.2 Normal, abnormal and emergency operating procedures associated with (Steam Generator Overpressure)	2.9	65
(W E15) Containment Flooding / 5										
(W E16) High Containment Radiation / 9										
(BW A01) Plant Runback / 1										
(BW A02 & A03) Loss of NNI X/Y/Z										
(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—Depressurization / 4										
(BW E09; CE A13**; W E09 & E10) Natural Circulation Operations - Natural Circulation with Steam Void in Vessel with/without RVLIS / 4						X		Ability to determine and interpret the following as they apply to the (Natural Circulation Operations) (CFR: 43.5 / 45.13) EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.4	57
(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 Point Totals:	1	2	2	2	1	1	Group Point Total:			9

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump											X	2.2.39 Knowledge of less than or equal to one hour Technical Specification action statements for systems. (CFR: 41.7 / 41.10 / 43.2 / 45.13)	3.9	13
004 (SF1; SF2 CVCS) Chemical and Volume Control			X									Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: (CFR: 41.7/45/6) K3.04 RCPS	3.7	23
005 (SF4P RHR) Residual Heat Removal							X					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRs controls including: (CFR: 41.5 / 45.5) A1.07 Determination of test acceptability by comparison of recorded valve response times with Tech-Spec requirements	2.5	12
006 (SF2; SF3 ECCS) Emergency Core Cooling	X											Knowledge of the physical connections and/or cause-effect relationships between the ECCS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.02 ESFAS	4.3	2
007 (SF5 PRTS) Pressurizer Relief/Quench Tank					X							Knowledge of the operational implications of the following concepts as the apply to PRTS: (CFR: 41.5 / 45.7) K5.02 Method of forming a steam bubble in the PZR	3.1	5
008 (SF8 CCW) Component Cooling Water								X				Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.03 High/low CCW temperature	3.0	6
010 (SF3 PZR PCS) Pressurizer Pressure Control					X							Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: (CFR: 41.5 / 45.7) K5.01 Determination of condition of fluid in PZR, using steam tables	3.5	28
012 (SF7 RPS) Reactor Protection						X						Knowledge of the effect of a loss or malfunction of the following will have on the RPS: (CFR: 41.7 / 45/7) K6.06 Sensors and detectors	2.7*	25
013 (SF2 ESFAS) Engineered Safety Features Actuation		X										Knowledge of bus power supplies to the following: (CFR: 41.7) K2.01 ESFAS/safeguards equipment control	3.6*	1
022 (SF5 CCS) Containment Cooling										X		Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.05 Containment readings of temperature, pressure, and humidity system	3.8	10
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray							X					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including: (CFR: 41.5 / 45.5) A1.03 Containment sump level	3.5	18

039 (SF4S MSS) Main and Reheat Steam				X														Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4.06 Prevent reverse steam flow on steam line break	3.3	27		
059 (SF4S MFW) Main Feedwater																	X	Ability to manually operate and monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.11 Recovery from automatic feedwater isolation	3.1	4		
061 (SF4S AFW) Auxiliary/Emergency Feedwater																	X	Ability to monitor automatic operation of the AFW, including: (CFR: 41.7 / 45.5) A3.04 Automatic AFW isolation	4.1	21		
062 (SF6 ED AC) AC Electrical Distribution																		X	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: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.08 Consequences of exceeding voltage limitations	2.7	11	
063 (SF6 ED DC) DC Electrical Distribution																		X	2.2.38 Knowledge of conditions and limitations in the facility license. (CFR: 41.7 / 41.10 / 43.1 / 45.13)	3.6	8	
064 (SF6 EDG) Emergency Diesel Generator																		X	Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: (CFR: 41.7 / 45.7) K6.07 Air receivers	2.7	9	
073 (SF7 PRM) Process Radiation Monitoring																			X	Knowledge of the physical connections and/or cause-effect relationships between the PRM system and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.01 Those systems served by PRMs	3.6	14
076 (SF4S SW) Service Water																			X	Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41/7) K4.06 Service water train separation	2.8	7
078 (SF8 IAS) Instrument Air																			X	Ability to monitor automatic operation of the IAS, including: (CFR: 41.7 / 45.5) A3.01 Air pressure	3.1	19
103 (SF5 CNT) Containment																			X	Knowledge of the effect that a loss or malfunction of the containment system will have on the following: (CFR: 41.7 / 45.6) K3.03 Loss of containment integrity under refueling operations	3.7	3
053 (SF1; SF4P ICS*) Integrated Control																						
004 (SF1; SF2 CVCS) Chemical and Volume Control																			X	Knowledge of bus power supplies to the following: (CFR: 41.7) K2.02 Makeup pumps	2.9	24
008 (SF8 CCW) Component Cooling Water																			X	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCWS controls including: (CFR: 41.5 / 45.5) A1.01 CCW flow rate	2.8	22
012 (SF7 RPS) Reactor Protection																			X	Knowledge of the operational implications of the following concepts as they apply to the RPS: (CFR: 41.5 / 45.7) K5.01 DNB	3.3*	20





ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive														
002 (SF2; SF4P RCS) Reactor Coolant						X						Knowledge of the effect or a loss or malfunction on the following RCS components: (CFR: 41.7 / 45.7) K6.07 Pumps	2.5	30
011 (SF2 PZR LCS) Pressurizer Level Control	X											Knowledge of the physical connections and/or cause-effect relationships between the PZR LCS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.04 RPS	3.8	31
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation					X							Knowledge of the operational implications of the following concepts as they apply to the NIS: (CFR: 41.5 / 45.7) K5.04 Factors affecting accuracy and reliability of calorimetric calibrations	2.6	38
016 (SF7 NNI) Nonnuclear Instrumentation			X									Knowledge of the effect that a loss or malfunction of the NNIS will have on the following: (CFR: 41.7 / 45.6) K3.02 PZR LCS	3.4*	36
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge										X		Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.04 Containment evacuation signal	3.5	29
033 (SF8 SFPCS) Spent Fuel Pool Cooling										X		2.1.28 Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	4.1	32
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control							X					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SDS controls including: (CFR: 41.5 / 45.5) A1.02 Steam pressure	3.1	33
045 (SF 4S MTG) Main Turbine Generator									X			Ability to monitor automatic operation of the MT/G system, including: (CFR: 41/7 / 45.5) A3.08 Determination from throttle and governor indicators of turbine trip: several indications, including CRDS trip alarm	3.3*	37
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														

075 (SF8 CW) Circulating Water									X						Ability to (a) predict the impacts of the following malfunctions or operations on the circulating water system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.01 Loss of intake structure	3.0*	35
079 (SF8 SAS**) Station Air				X											Knowledge of SAS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4.01 Cross-connect with IAS	2.9	34
086 Fire Protection																	
050 (SF 9 CRV*) Control Room Ventilation																	
K/A Category Point Totals:	1	0	1	1	1	1	1	1	1	1	1	1	1	1	Group Point Total:		10

Facility: Comanche Peak		Date of Exam:				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.23	Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)	4.3	67		
	2.1.29	Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc. (CFR: 41.10 / 45.1 / 45.12)	4.1	72		
	2.1.43	Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc. (CFR: 41.10 / 43.6 / 45.6)	4.1	69		
	Subtotal			3		
2. Equipment Control	2.2.4	(multi-unit license) Ability to explain the variations in control board/control room layouts, systems, instrumentation, and procedural actions between units at a facility. (CFR: 41.6 / 41.7 / 41.10 / 45.1 / 45.13)	3.6	70		
	2.2.14	Knowledge of the process for controlling equipment configuration or status. (CFR: 41.10 / 43.3 / 45.13)	3.9	74		
	2.2.35	Ability to determine Technical Specification Mode of Operation. (CFR: 41.7 / 41.10 / 43.2 / 45.13)	3.6	68		
	Subtotal			3		
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions. (CFR: 41.12 / 43.4 / 45.10)	3.2	75		
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9)	2.9	73		
	Subtotal			2		
4. Emergency Procedures/Plan	2.4.6	Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	3.7	66		
	2.4.17	Knowledge of EOP terms and definitions. (CFR: 41.10 / 45.13)	3.9	71		
	Subtotal			2		
Tier 3 Point Total				10		

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		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total		
1. Emergency and Abnormal Plant Evolutions	1												18	3	3	6		
	2				N/A					N/A			9	2	2	4		
	Tier Totals												27	5	5	10		
2. Plant Systems	1												28	3	2	5		
	2												10	1	1	3		
	Tier Totals												38	5	3	8		
3. Generic Knowledge and Abilities Categories				1	2	3	4						10	1	2	3	4	7
														2	2	1	1	

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  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.

ES-401		PWR Examination Outline						Form ES-401-2	
		Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)							
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1					X		Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6) EA2.04 If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP	4.6	76
000008 (APE 8) Pressurizer Vapor Space Accident / 3						X	2.4.41 Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)	4.6	80
000009 (EPE 9) Small Break LOCA / 3									
000011 (EPE 11) Large Break LOCA / 3									
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4									
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					X		Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: (CFR 43.5/ 45.13) AA2.02 Charging pump problems	3.7	79
000025 (APE 25) Loss of Residual Heat Removal System / 4									
000026 (APE 26) Loss of Component Cooling Water / 8									
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3									
000029 (EPE 29) Anticipated Transient Without Scram / 1									
000038 (EPE 38) Steam Generator Tube Rupture / 3									
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer Uncontrolled Depressurization of all Steam Generators / 4									
000054 (APE 54; CE E06) Loss of Main Feedwater / 4									
000055 (EPE 55) Station Blackout / 6									
000056 (APE 56) Loss of Offsite Power / 6									
000057 (APE 57) Loss of Vital AC Instrument Bus / 6						X	2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)	4.6	77
000058 (APE 58) Loss of DC Power / 6									
000062 (APE 62) Loss of Nuclear Service Water / 4									
000065 (APE 65) Loss of Instrument Air / 8									
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6									
(W E04) LOCA Outside Containment / 3					X		Ability to determine and interpret the following as they apply to the (LOCA Outside Containment) (CFR: 43.5 / 45.13) EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations	4.3	81

(W E11) Loss of Emergency Coolant Recirculation / 4											
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4						X		2.2.40 Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3)	4.7	78	
K/A Category Totals:								3	3	Group Point Total:	6

ES-401		PWR Examination Outline						Form ES-401-2	
		Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)							
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1									
000003 (APE 3) Dropped Control Rod / 1									
000005 (APE 5) Inoperable/Stuck Control Rod / 1									
000024 (APE 24) Emergency Boration / 1									
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2									
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7						X	Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: (CFR: 43.5 / 45.13) AA2.09 Effect of improper HV setting	2.9	84
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7									
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8						X	2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls. (CFR: 41.10 / 43.2 / 45.6)	4.4	83
000037 (APE 37) Steam Generator Tube Leak / 3									
000051 (APE 51) Loss of Condenser Vacuum / 4									
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7									
000067 (APE 67) Plant Fire On Site / 8									
000068 (APE 68; BW-A06) Control Room Evacuation / 8									
000069 (APE 69; W E14) Loss of Containment Integrity—High Containment Pressure / 5						X	Ability to determine and interpret the following as they apply to the (High Containment Pressure) (CFR: 43.5 / 45.13) EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.8	82
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling—Degraded Core Cooling—Saturated Core Cooling / 4						X	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)	4.3	85
000076 (APE 76) High Reactor Coolant Activity / 9									
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/Z									
(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—Depressurization / 4											
(BW E09; CE A13**; W E09 & E10) Natural Circulation Operations - Natural Circulation with Steam Void in Vessel with/without RVLIS /4											
(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 Point Totals:						2	2	Group Point Total:			4



ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)												Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump														
004 (SF1; SF2 CVCS) Chemical and Volume Control														
005 (SF4P RHR) Residual Heat Removal														
006 (SF2; SF3 ECCS) Emergency Core Cooling								X				Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 45.5) A2.07 Loss of heat tracing	3.1	89
007 (SF5 PRTS) Pressurizer Relief/Quench Tank														
008 (SF8 CCW) Component Cooling Water														
010 (SF3 PZR PCS) Pressurizer Pressure Control														
012 (SF7 RPS) Reactor Protection														
013 (SF2 ESFAS) Engineered Safety Features Actuation										X		2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits. (CFR: 41.5 / 41.7 / 43.2)	4.2	90
022 (SF5 CCS) Containment Cooling										X		2.4.18 Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)	4.0	87
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray														
039 (SF4S MSS) Main and Reheat Steam														
059 (SF4S MFW) Main Feedwater														
061 (SF4S AFW) Auxiliary/Emergency Feedwater														
062 (SF6 ED AC) AC Electrical Distribution														
063 (SF6 ED DC) DC Electrical Distribution								X				Ability to (a) predict the impacts of the following malfunctions or operations on the DC electrical systems; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.02 Loss of ventilation during battery charging	3.1	86
064 (SF6 EDG) Emergency Diesel Generator														
073 (SF7 PRM) Process Radiation Monitoring														
076 (SF4S SW) Service Water														



ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive														
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control														
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation														
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling														
034 (SF8 FHS) Fuel-Handling Equipment				X								Knowledge of design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) K4.03 Overload protection	3.3	91
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control														
045 (SF 4S MTG) Main Turbine Generator														
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate								X				Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) A2.04 Loss of condensate pumps	2.8*	92
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection											X	2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12)	4.3	93
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:				1				1			1	Group Point Total:		3

Facility: Comanche Peak		Date of Exam:				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.35	Knowledge of the fuel-handling responsibilities of SROs. (CFR: 41.10 / 43.7)			3.9	96
	2.1.36	Knowledge of procedures and limitations involved in core alterations. (CFR: 41.10 / 43.6 / 45.7)			4.1	95
	Subtotal					2
2. Equipment Control	2.2.11	Knowledge of the process for controlling temporary design changes. (CFR: 41.10 / 43.3 / 45.13)			3.3	97
	2.2.43	Knowledge of the process used to track inoperable alarms. (CFR: 41.10 / 43.5 / 45.13)			3.3	98
	Subtotal					2
3. Radiation Control	2.3.13	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)			3.8	94
	Subtotal					1
4. Emergency Procedures/Plan	2.4.22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations. (CFR: 41.7 / 41.10 / 43.5 / 45.12)			4.4	100
	2.4.44	Knowledge of emergency plan protective action recommendations. (CFR: 41.10 / 41.12 / 43.5 / 45.11)			4.4	99
	Subtotal					2
Tier 3 Point Total						7



## Task Summary

Facility: <b>CPNPP Units 1 and 2</b>		Date of Examination: <b>August 2021</b>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <b>NRC</b>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (RA1)	R, M	2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. (3.9) JPM: Determine RCS Dilution Requirements and Change in Reactivity (RO1009)
Conduct of Operations (RA2)	R, M	2.1.26 Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen). (3.4) JPM: Determine Electrical Safe Work Practice Requirements (BA1110)
Equipment Control (RA3)	R, M	2.2.13 Knowledge of tagging and clearance procedures. (4.1) JPM: Determine Clearance Release Requirements (RO5005)
Radiation Control (RA4)	R, M	2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions. (3.5) JPM: Determine RWP requirements (RWT056)
Emergency Procedures/Plan	—	—
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		
* 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)		

- RA1 The applicant is presented with a set of RCS conditions including time after shutdown, core burn-up, current boron concentration, and estimated critical boron concentration. The applicant will calculate the amount of dilution required to achieve the estimated critical boron concentration provided. The applicant will determine the change in reactivity that will be achieved based on diluting the RCS to the given estimated critical boron concentration. The critical steps include determination of RCS dilution (in gallons) required to achieve the estimated critical boron concentration and calculation of the change in reactivity that will be achieved based on diluting to the estimated critical boron concentration. This is a modified bank JPM. (K/A 2.1.25 - IR 3.9)
- RA2 The applicant is presented with a task to determine the Hazard Category, Personnel Protective Equipment requirements, Tool requirements, and Safety Boundary requirements for installing grounding straps on the Main Generator Isophase Bus in accordance with STA-124, Electrical Safe Work Practices. The critical steps will be to identify the Hazard/Risk Category, Clothing requirements, Hearing Protection requirements, Glove requirements, Boundaries and Maximum Time the Flash Suit/Hood can be worn continuously before an Air Blower is required. This is a modified bank JPM. (K/A 2.1.26 - IR 3.4)
- RA3 The applicant is presented a standard clearance in which SI Pump 2-02 has been tagged out for coupling inspection and lubrication. The applicant will review the clearance and determine the proper positions and release sequence of each component. The critical steps are to identify the correct release sequence and position of each component on the clearance. This is a modified bank JPM. (K/A 2.2.13 - IR 4.1).
- RA4 The applicant will be required to refer to the latest Radiation Work Permit associated with Used Fuel Outage 7 (UFO 7). The applicant will be assigned a specific task on the RWP and will be required to determine the following information: if entry into a High Radiation Area is allowed, additional requirements for entry into a posted neutron dosimetry required area, if alpha monitoring is required, and expected total dose received if work on the task takes 6 hours to complete. The critical steps will be to correctly determine the information above. This is a modified bank JPM. (K/A 2.3.7 - IR 3.5)

## Task Summary

Facility: <b>CPNPP Units 1 and 2</b>		Date of Examination: <b>August 2021</b>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <b>NRC</b>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (SA1)	R, D, P	2.1.42 Knowledge of new and spent fuel movement procedures. (3.4) JPM: Determine Close Contact Fuel Assembly Movement (FH1305)
Conduct of Operations (SA2)	R, D	2.1.2 Knowledge of operator responsibilities during all modes of plant operation. (4.4) JPM: Identify Reduced Inventory Contingencies (SO1002)
Equipment Control (SA3)	R, N	2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (4.6) JPM: Determine Technical Specification (SO1005)
Radiation Control (SA4)	R, M	2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. (3.7) JPM: Determine Radiation Levels and Reporting Requirements (SO1112)
Emergency Procedures/Plan (SA5)	R, M	2.4.41 Knowledge of the emergency action level thresholds and classifications. (4.6) JPM: Classify an Emergency Plan Event (SO1136)
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		
* 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)		



- SA1 The applicant will determine the correct close contact movement for identified fuel assemblies in accordance with RFO-302, Handling of Fuel Assemblies. Three separate fuel moves are required to be analyzed for close contact. The critical steps are to describe the correct close contact fuel movement for each assembly. This is a direct from bank JPM previously used on the 2018 NRC exam. (K/A 2.1.42 - IR 3.4)
- SA2 The applicant will identify the Reactor Coolant System Reduced Inventory contingencies regarding the Containment Equipment Hatch being removed per IPO-010A, Reactor Coolant System Reduced Inventory Operations, Attachment 1, Shiftly Checklist. Critical steps include identifying Reduced Inventory contingencies when it is determined that the standby RHR Pump is not available. This is a direct from bank JPM. (K/A 2.1.2 - IR 4.4)
- SA3 The applicant will be provided a set of conditions and will be required to determine any Technical Specification Limiting Conditions for Operation that may be impacted by the given conditions, including the associated CONDITION, REQUIRED ACTION, and COMPLETION TIME for each applicable specification. The critical steps will include identifying the correct Technical Specification LCO along with the correct condition, required action, and completion time. This is a new JPM (K/A 2.2.42 - IR 4.6)
- SA4 The applicant will determine written and oral Reporting Requirements for an overexposure event per STA-501, Nonroutine reporting. The critical steps will be to calculate the dose received while performing activities in the plant and determine the correct oral and written Reporting Requirements for an overexposure event. This is a modified bank JPM. (K/A 2.3.4 - IR 3.7)
- SA5 The applicant will determine the appropriate Emergency Plan Classification in accordance with EPP-201, Assessment of Emergency Action Levels, Emergency Classification, and Plan Activation. The critical steps will be to determine the correct classification and notification time. This is a modified bank JPM. (K/A 2.4.41 - IR 4.6)

Facility: <b>CPNPP 1 &amp; 2</b>		Date of Examination: <b>August 2021</b>	
Exam Level: RO SRO(I) <b>SRO (U)</b>		Operating Test Number: <b>NRC</b>	
Control Room Systems (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)			
	System / JPM Title	Type Code*	Safety Function
S-1	001 – Control Rod Drive System (RO1008) Perform Control Rod Exercises (RO ONLY)	D, S	1
S-2	004 – Chemical and Volume Control System (RO1335) Emergency Boration from the RWST	A, D, S	2
S-3	<b>061 – Auxiliary/Emergency Feedwater System (RO3505)</b> <b>Align Station Service Water to Auxiliary Feedwater System</b>	<b>A, EN, L, N, S</b>	<b>4S</b>
S-4	<b>035 – Steam Generator System (RO1111)</b> <b>Verify Natural Circulation</b>	<b>A, L, M, S</b>	<b>4P</b>
S-5	<b>064 – Emergency Diesel Generator System (RO4302)</b> <b>Loss of Both 6.9 KV Safeguard Busses</b>	<b>A, D, EN, L, S</b>	<b>6</b>
S-6	015 – Nuclear Instrumentation System (RO1818) Respond to a Source Range Channel Energizing at Power	N, S	7
S-7	086 – Component Cooling Water System (RO3603) Rotate Component Cooling Water Pumps	A, D, S	8
S-8	071 – Waste Gas Disposal System (RO4001) Establish Sample Flow to South Vent Stack Wide Range Gas Monitor Low Range Radiation Detector	N, S	9
In-Plant Systems® (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
P-1	<b>013 – Emergency Safety Feature Actuation System (AO5422)</b> <b>Restore SCW Surge Tank Level to Maintain Cooling to ESF Pump Rooms</b>	<b>E, L, N, R</b>	<b>2</b>
P-2	056 – Condensate System (AO3529) Secondary System Isolation following Steam Generator Tube Rupture	E, L, N	4S
P-3	<b>086 – Fire Protection System (AO4405)</b> <b>Perform Actions for a Fire in Containment</b>	<b>D, E, R</b>	<b>8</b>

<p>* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.</p>	
*Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 <b>(5)</b> / 4-6 <b>(5)</b> / 2-3 <b>(3)</b>
(C)ontrol room	
(D)irect from bank	≤ 9 <b>(5)</b> / ≤ 8 <b>(4)</b> / ≤ 4 <b>(2)</b>
(E)mergency or abnormal in-plant	≥ 1 <b>(3)</b> / ≥ 1 <b>(3)</b> / ≥ 1 <b>(2)</b>
(EN)gineered safety feature	≥ 1 <b>(2)</b> / ≥ 1 <b>(2)</b> / ≥ 1 <b>(2)</b> <small>(control room system)</small>
(L)ow-Power / Shutdown	≥ 1 <b>(5)</b> / ≥ 1 <b>(5)</b> / ≥ 1 <b>(4)</b>
(N)ew or (M)odified from bank including 1(A)	≥ 2 <b>(6)</b> / ≥ 2 <b>(6)</b> / ≥ 1 <b>(3)</b>
(P)revious 2 exams	≤ 3 <b>(0)</b> / ≤ 3 <b>(0)</b> / ≤ 2 <b>(0)</b> <small>(randomly selected)</small>
(R)CA	≥ 1 <b>(2)</b> / ≥ 1 <b>(2)</b> / ≥ 1 <b>(2)</b>
(S)imulator	<b>(8)</b> / <b>(7)</b> / <b>(3)</b>

NRC JPM Examination  
Summary Description

- S-1 The applicant will perform Control Rod Exercises for Control Bank D rods per OPT-106A, Control Rods Exercise. The critical steps include selecting the proper bank to be tested (Bank D), withdrawing the bank to the desired position, returning the bank to the pre-test position, placing the control rods in Manual to verify conditions to return to Auto are met, and then placing the control rods in Auto. This is a direct from bank JPM. This JPM is under the Reactivity Control Safety Function. This will be an RO only JPM. (K/A 001 A4.03 – IR 4.0 / 3.7)
- S-2 The applicant will be required to initiate Emergency Boration per ABN-107, Emergency Boration, for 2 stuck control rods following a reactor trip. The applicant will initially attempt to emergency borate per Attachment 1, Emergency Boration through Emergency Borate Valve 1-8104, however, this flowpath will be unavailable (after the running BAT pump trips.) The applicant will then be required to use attachment 4, Transfer of Charging Pump Suction to the RWST, (the only attachment that does not require the use of BAT pumps). The critical steps include opening one of the RWST to Charging Pump Suction Valves, closing both of the VCT to Charging Pump Suction Valves, and opening one of the CCP Miniflow Valves. This is a direct from bank JPM. This JPM is under the Reactor Coolant System Inventory Control Safety Function. (K/A 004 A2.14 – IR 3.8 / 3.9)
- S-3 Following an extended loss of A/C power and subsequent recovery of power, the applicant will be required to align the Station Service Water System to Supply the Auxiliary Feedwater System and feed a Steam Generator due to excessively low Condensate Storage Tank Level. The actions are per ABN-305, Auxiliary Feedwater System Malfunction. The applicant will select a train of Station Service Water to supply however the SSW to AFW pump suction valve will fail to open requiring the applicant to select the alternate train. The critical steps include closing all AFW isolation valves to the Steam Generators not being used as Heat Sink, placing all AFW pumps in Pull-Out, opening the SSW to AFW pump suction valves, opening the selected AFW pump suction valve, and starting the selected AFW pump. This is a new JPM. This JPM is under the Heat Removal from Reactor Core – Secondary Systems Safety Function. (K/A 061 A1.04 – IR 3.9 / 3.9)
- S-4 Following a Loss of all Thermal Barrier Cooling flow to the RCPs, RCP criteria was met, the unit was tripped and all RCPs were secured. The applicant is directed to verify Natural Circulation in accordance with EOS-0.1A, Reactor Trip Response, Attachment 3, Natural Circulation Verification. The alternate path portion of the JPM will require the applicant to increase dumping steam from all Steam Generators to the Main Condenser to establish Natural Circulation and maintain a symmetrical cooldown of the RCS. The Steam Dump controller will fail to respond and the applicant must dump steam using the ARVs. The critical steps include manually increasing demand on all four Steam Generator ARV controllers to establish Natural Circulation Cooldown. This is a modified bank JPM. This JPM is under the Heat Removal from Reactor Core – Primary Systems Safety Function. (K/A EPE E09 EA1.1 – IR 3.5 / 3.5)

- S-5 The applicant will respond to a loss of both 6.9 KV Safeguard Buses per ABN-601, Response to a 138/345 KV System Malfunction, Section 7.0, Loss of Both Safeguards Buses – MODE 1, 2, 3, or 4. The alternate path includes tripping the Reactor, stopping Reactor Coolant Pumps, and closing the Train A Emergency Diesel Generator Output Breaker. This is a direct from bank JPM. This JPM is under the Electrical Safety Function. This is a PRA significant action. (K/A 064 A4.06 – IR 3.9 / 3.9)
- S-6 Following Source Range Instrument N31 Energizing at Power, the applicant is required to perform the actions of ABN-701, Source Range Instrument Malfunction. Critical Steps will include bypassing the N31 Level Trip, placing the N31 High Flux at Shutdown switch in block, and removing the N31 Instrument Power Fuse to de-energize the high voltage. This is a new JPM. This JPM is under the Instrumentation Safety Function. (K/A 015 A2.02 – IR 3.1 / 3.5\*)
- S-7 The applicant will shift from Train A to Train B Component Cooling Water Pumps per SOP-502A, Component Cooling Water System, Step 5.2.1.1, Starting a Standby CCW Pump During Normal Operation, then Step 5.2.1.2, Placing a CCW Pump in Standby from Dual Pump Operation. The alternate path occurs when the Train B CCW Pump trips shortly after it is started. This is a direct from bank JPM under the Plant Service Systems Safety Function. (K/A 008 A2.01 – IR 3.3 / 3.6)
- S-8 The applicant will utilize the PC-11 to establish Sample Flow to the South Vent Stack Wide Range Gas Monitor Low Range Radiation Detector per SOP-706, Digital Radiation Monitoring System. The critical steps will include selecting the correct radiation monitor on the PC-11 and turning the associated sample pump on. This is a new JPM. This JPM is under the Radioactivity Release Safety Function. (K/A 071 A4.09 – IR 3.3 / 3.5)
- P-1 Actions of ABN-503, Safety Chilled Water System Malfunction are required to maintain Safety Chilled Water Surge Tank level during accident conditions (maintain cooling to ESF pump rooms). The applicant will locally fail open the Safety Chilled Water Surge Tank RMUW Supply Valve in accordance ABN-503 and OWI-206, Guidelines for Operation of Manual and Power Operated Valves, Section 6.3.2.G, Failing/Restoring a Simple Air Operated Valve (without handwheel). Critical Steps include closing the air supply to the filter regulator and opening the blowdown on the filter regulator. This is a new JPM. This JPM is under the Reactor Coolant System Inventory Control Safety Function. (K/A 013 A3.02 – IR 4.1 / 4.2)
- P-2 During Steam Generator Tube Rupture recovery actions, the applicant is required to perform field actions to isolate the condensate polishing demineralizers to minimize the spread of contamination to the secondary systems in accordance with EOP-3.0, Steam Generator Tube Rupture, Attachment 5, Secondary System Isolation. Critical Steps include closing the Condensate Supply Header to Condensate Polishing System Supply Header Isolation valves and isolating the 50 psi Auxiliary Steam Header. This is a new JPM. This JPM is under the Heat Removal from Reactor Core Secondary Systems Safety Function. (K/A G2.3.14 – IR 3.4 / 3.8)

- P-3 The applicant will perform actions for a fire in Containment per ABN-807A/B, Response to a Fire in the Containment Building, Attachment 1, Actions to be Taken by the Nuclear Equipment Operator. Critical Steps include de-energizing various breakers in the plant to preclude spurious valve actuations due to the fire. This is a direct from bank JPM. This JPM is under the Plant Service Systems Safety Function. (K/A 067 AA2.17 – IR 3.5 / 4.3)

Facility: <b>CPNPP 1 and 2</b>		Date of Exam: <b>08/09/21</b>			Operating Test No.: <b>NRC</b>												
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 (*)		
		CPNPP #1			CPNPP #2			CPNPP #3			CPNPP #4 (SPARE)						
		C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W 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
<b>SRO-U1</b>	RX	1			-									<b>1</b>	1	1	0
	NOR	-			1									<b>1</b>	1	1	1
	I/C	4			6									<b>10</b>	4	4	2
	MAJ	1			1									<b>2</b>	2	2	1
	TS	4			3									<b>7</b>	0	2	2
<b>SRO-U2</b>	RX	1			-									<b>1</b>	1	1	0
	NOR	-			1									<b>1</b>	1	1	1
	I/C	4			6									<b>10</b>	4	4	2
	MAJ	1			1									<b>2</b>	2	2	1
	TS	4			3									<b>7</b>	0	2	2
<b>SRO-U3</b>	RX	1			-									<b>1</b>	1	1	0
	NOR	-			1									<b>1</b>	1	1	1
	I/C	4			6									<b>10</b>	4	4	2
	MAJ	1			1									<b>2</b>	2	2	1
	TS	4			3									<b>7</b>	0	2	2
<b>SRO-I1</b>	RX	1				1			-					<b>2</b>	1	1	0
	NOR	-				-			-					<b>0</b>	1	1	1
	I/C	4				3			5					<b>12</b>	4	4	2
	MAJ	1				1			2					<b>4</b>	2	2	1
	TS	4				-			-					<b>4</b>	0	2	2
<b>SRO-I2</b>	RX		1		-				-					<b>1</b>	1	1	0
	NOR		-		1				-					<b>1</b>	1	1	1
	I/C		3		6				6					<b>15</b>	4	4	2
	MAJ		1		1				2					<b>4</b>	2	2	1
	TS		-		3				3					<b>6</b>	0	2	2
<b>RO1</b>	RX		1						-					<b>1</b>	1	1	0
	NOR		-						1					<b>1</b>	1	1	1
	I/C		3						4					<b>7</b>	4	4	2
	MAJ		1						1					<b>2</b>	2	2	1
	TS		-						-					<b>0</b>	0	2	2

Facility: <b>CPNPP 1 and 2</b>		Date of Exam: <b>08/09/21</b>			Operating Test No.: <b>NRC</b>												
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 (*)		
		CPNPP #1			CPNPP #2			CPNPP #3			CPNPP #4 (SPARE)						
		C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W P O S I T I O N			C R E W 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
<b>RO2</b>	RX			-		1								1	1	1	0
	NOR			-		-								-	1	1	1
	I/C			3		3								6	4	4	2
	MAJ			1		1								2	2	2	1
	TS			-		-								0	0	2	2
<b>RO3</b>	RX		1											1	1	1	0
	NOR		-				1							1	1	1	1
	I/C		3				4							7	4	4	2
	MAJ		1				1							2	2	2	1
	TS		-				-							0	0	2	2
<b>RO4</b>	RX			-		1								1	1	1	0
	NOR			-		-								0	1	1	1
	I/C			3		3								6	4	4	2
	MAJ			1		1								2	2	2	1
	TS			-		-								0	0	2	2
<b>RO5</b>	RX		1											1	1	1	0
	NOR		-				1							1	1	1	1
	I/C		3				4							7	4	4	2
	MAJ		1				1							2	2	2	1
	TS		-				-							0	0	2	2
<b>RO6</b>	RX			-		1								1	1	1	0
	NOR			-		-								0	1	1	1
	I/C			3		3								6	4	4	2
	MAJ			1		1								2	2	2	1
	TS			-		-								0	0	2	2
<b>RO7</b>	RX			-										0	1	1	0
	NOR			-			1							1	1	1	1
	I/C			3			4			4				11	4	4	2
	MAJ			1			1			2				4	2	2	1
	TS			-			-							0	0	2	2



Instructions:	
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 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 Instant SRO <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.
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 1-for-1 basis.
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.

Facility:	CPNPP 1 & 2	Scenario No.:	1	Op Test No.:	August 2021 NRC
Examiners:	_____	Operators:	_____		
	_____		_____		
	_____		_____		
Initial Conditions: 2-3% Power, BOL					
Turnover: Raise Reactor Power to 6% - 8%, RWST is recirculating with Containment Spray Pump 1-02 (See Turnover Sheet)					
<b>Critical Tasks:</b>					
<b>CT-1 – Manually start Safety Injection Pump 1-01 due to an automatic start failure on Safety Injection, prior to RVLIS 79” above Core Plate Light going DARK.</b>					
<b>CT-2 – Trip RCPs within 5 minutes upon a Loss of Subcooling per EOP-0.0A, Reactor Trip or Safety Injection or EOP-1.0A, Loss of Reactor or Secondary Coolant</b>					
Event No.	Malf. No.	Event Type*	Event Description		
1	-	R (RO, SRO)	Raise Reactor Power to 6% - 8%.		
2	SW01B	C (RO, BOP, SRO) TS (SRO)	SSW Pump 1-02 Trip		
3	RX12	I (BOP, SRO) TS (SRO)	Main Steam Header Transmitter PT-507 Fails High		
4	RX08A RX05A RC12	I (RO, SRO) TS (SRO)	Pressurizer Common Instrument Line Failure		
5	RC13	C (RO, SRO) TS (SRO)	40 gpm Pressurizer Leak		
6	RC12 RC13 RP07A	M (RO, BOP, SRO)	Spurious Safety Injection Train B, Automatic Safety Injection Train A Failure with a SBLOCA		
7	SI04D	C (BOP)	Safety Injection Pump 1-01 Auto Start Failure on Safety Injection Signal		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Technical Specifications					

Actual	Target Quantitative Attributes
6	Total malfunctions (5-8)
1	Malfunctions after EOP entry (1-2)
4	Abnormal events (2-4)
1	Major transients (1-2)
1	EOPs entered/requiring substantive actions (1-2)
0	EOP contingencies requiring substantive actions (0-2)
2	Critical tasks (2-3)

## **SCENARIO 1 SUMMARY**

### **Event 1**

Crew raises Reactor Power to 6%-8% per IPO-003A, Power Operations, Section 5.1, Warmup and Synchronization of the Turbine Generator.

### **\* Event 2**

Crew responds per ABN-501, Station Service Water System Malfunction Section 2.0, Station Service Water Pump Trip and ABN-502, Component Cooling Water Systems Malfunctions Section 2.0, CCW Pump Trip. Emergency Diesel 1-02 and Train B equipment are placed in Pull-Out. Technical Specifications 3.7.8 Condition B, 3.8.1 Condition B.

### **\* Event 3**

Crew responds per ABN-709, Steam Line Pressure, Steam Header Pressure, Turbine 1<sup>st</sup> Stage Pressure, and Feed Header Pressure Instrument Malfunction, Section 3.0 Steam Header Pressure Malfunction. Crew takes manual control of Steam Dump Pressure Controller 1-PK-507 controlling RCS Temperature. Technical Specification 3.4.1 Condition A

### **\*Event 4**

Crew takes manual control of Pressurizer Level and Pressure and responds per ABN-706, Pressurizer Level Instrument Malfunction, Section 2.0 Pressurizer Level Instrument Malfunction and ABN-705, Pressurizer Pressure Malfunction, Section 2.0 Pressurizer Pressure Instrument Malfunction. Both failed channels are bypassed then restored to automatic control. Technical Specifications 3.3.1 Condition E Function 6 and 8b, 3.3.2 Condition D Function 1d, and Condition L Function 8b.

### **\*\* Event 5**

When Crew defeats failed pressurizer pressure and level channels, the Pressurizer steam space leak will be initiated. Crew responds per ABN-103, Excessive Reactor Coolant Leakage Section 2.0, Excessive Reactor Coolant Leakage. Crew reduces letdown to 45 gpm restoring Pressurizer Level. Technical Specification 3.4.13 Condition A

### **\* Event 6**

Crew responds per EOP-0.0A, Reactor Trip or Safety Injection, manually initiates Safety Injection then transitions to EOP-1.0A, Loss of Reactor or Secondary Coolant.

### **Event 7**

Crew starts SIP 1-01 during performance of EOP-0.0A, Attachment 2, Safety Injection Actuation Alignment.

\* - *On Lead Examiner's Cue*

\*\* - *Starts automatically or on Lead Examiners Cue*

### **Termination Criteria**

Scenario will be terminated when the operators transition to EOS 1.2, Post LOCA Cooldown and Depressurization or at the Lead Examiner's discretion.

Scenario Event Description  
NRC Scenario 1

**Risk Significance:**

- Failure of risk important system prior to trip:      Loss of SSWP 1-02  
PRZR Common Instrument Line Failure
  
- Risk significant core damage sequence:              Loss of a Safety Train  
SBLOCA
  
- Risk significant operator actions:                      Manually Initiate Safety Injection  
Manually start the 1-01 SIP  
Trip all RCP's on loss of subcooling

Scenario Event Description  
NRC Scenario 1

**Critical Task Determination**

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
<p><b>CT-1</b> - Manually start Safety Injection Pump 1-01 due to an automatic start failure on Safety Injection, prior to RVLIS 79" above Core Plate Light going DARK.</p>	<p>Recognize a failure or an incorrect automatic actuation of SIP 1-01 to start, to provide adequate injection capability/core cooling for a SBLOCA with Train B SI OOS.</p>	<p>Procedurally driven from EOP-0.0A, Attachment 2 to provide makeup inventory to the RCS during accident conditions.</p>	<p>The operator will start SI Pump 1-01 using the handswitch on CB-02.</p>	<p>Indication pump start including light indication, flow and discharge pressure on CB-02.</p>
<p><b>CT-2</b> - Trip RCPs within 5 minutes upon a Loss of Subcooling per EOP-0.0A, Reactor Trip or Safety Injection or EOP-1.0A, Loss of Reactor or Secondary Coolant.</p>	<p>Take one or more actions that would prevent a challenge ability to cool the core during a SBLOCA.</p>	<p>Procedurally driven from EOP-0.0A and EOP-1.0A Foldout pages. Availability of Subcooling indication both on meters and computer.</p>	<p>The operator will secure ALL RCPs using the handswitches on CB-05.</p>	<p>Indication of pump stop including light indication, flow and motor current.</p>
<p><b>NOTE:</b> (Per NUREG-1021, Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.</p>				

Facility:	CPNPP 1 & 2	Scenario No.:	3	Op Test No.:	August 2021 NRC
Examiners:	_____	Operators:	_____		
	_____		_____		
Initial Conditions: 100% power MOL – RCS Boron is 771 ppm (by sample). XST1 is out of service to place XST1A in service.					
Turnover: Maintain steady-state power conditions. Pressurizer Steam Space Sample is in progress.					
<b>Critical Tasks:</b>					
<b>CT-1 – Isolate Reactor Coolant System Leakage Paths in accordance with ECA-0.0A, Loss of All AC prior to initiation of Steam Generator depressurization.</b>					
<b>CT-2 – Restore Power to Bus 1EA2 in accordance with ECA-0.0A, Loss of All AC Power, prior to incorrectly placing equipment in PULL-OUT per ECA-0.0A, Step 8.</b>					
<b>CT-3 – Manually start RHR Pump 1-02, in accordance with EOP-0.0A, Reactor Trip or Safety Injection, Attachment 2, Safety Injection Actuation Alignment, OR EOP-1.0A, Loss of Reactor or Secondary Coolant, Attachment 1.A, Foldout for EOP-1.0A, due to an automatic start failure on Safety Injection, prior to RVLIS 47” above Core Plate Light going DARK.</b>					
Event No.	Malf. No.	Event Type*	Event Description		
1	ED07B	C (RO, BOP, SRO) TS (SRO)	Loss of Inverter (IV1PC2)		
2	ED05H	C (RO, BOP, SRO) TS (SRO)	86-1 LOR 6.9KV Safeguards Bus 1EA1		
3	LQY-553	C (BOP, SRO) TS (SRO)	SG 1-03 FCV (FCV-530) Oscillations		
4	OVRDE	C (RO, SRO)	Letdown Isolation Valve (HV-8160) fails closed. Place Excess Letdown in Service		
5	ED21A ED21B	M (RO, BOP, SRO)	Loss of 345 KV East and West busses		
6	EG15B	C (BOP, SRO)	EDG 1-01 out of service due to 86-1 LOR actions EDG 1-02 Auto/Emergency Start failure, Norm Start Required		
7	OVRD	C (RO, SRO)	Pressurizer Steam Space Sample Valves (1/1-4165A & 1/1-4176A) fail to auto close. Manual closure required		
8	RC08A2	M (RO, BOP, SRO)	LBLOCA occurs when DG 1-02 Normal Start is Performed		
9	RH01D	C (BOP)	RHR Pump 1-02 fails to auto-start from sequencer		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Technical Specifications					

Actual	Target Quantitative Attributes
9	Total malfunctions (5-8)
4	Malfunctions after EOP entry (1-2)
4	Abnormal events (2-4)
2	Major transients (1-2)
2	EOPs entered/requiring substantive actions (1-2)
1	EOP contingencies requiring substantive actions (0-2)
3	Critical tasks (2-3)

### **SCENARIO 3 SUMMARY**

The crew will assume the watch at 100% power per IPO-003A, Power Operations. XST1 is out of service to swap to XST1A. A Pressurizer Steam Space sample is in progress.

**\* Event 1**

The first event is a loss of Inverter IV1PC2, crew actions are in accordance with ABN-603, Loss of a Protection or Instrument Bus, and include stabilizing the plant, restoring an alternate power source, and verification of instrument restoration. The SRO will refer to Technical Specification LCOs 3.8.7 and 3.8.9 (applicable during the loss and exited upon power restoration).

**\* Event 2**

The next event is an 86-1 LOR resulting in a loss of 6.9 KV Safeguards Bus 1EA1. The crew will respond per ABN-602, Response to a 6900/480V System Malfunction. Actions include starting Centrifugal Charging Pump 1-02 and placing Emergency Diesel Generator 1-02 (without Station Service Water flow) in Pull-Out. Additionally, the crew will perform actions per ABN-602 to ensure necessary plant equipment is operating and affected equipment is placed in PULL OUT. The SRO will refer to Technical Specification LCOs 3.8.1, 3.8.4, and 3.8.9.

**\* Event 3**

The third event is an oscillation of feedwater controller FCV-530 in automatic. The BOP will diagnose improper control response, place 1-FK-530 in manual and control feedwater flow to restore SG 3 level to program. The crew will take the actions of ABN-710, Steam Generator Level Instrumentation Malfunction. The SRO will refer to Technical Specification LCOs 3.3.1 and 3.3.2.

**\* Event 4**

The fourth event is a loss of Letdown due to Letdown Isolation Valve (HV-8160) failing closed. Actions are per ABN-105, Chemical and Volume Control System Malfunction, and require controlling Charging and Seal Injection flows until Letdown can be restored. The RO will be directed to place Excess Letdown in service (Time Compression may be used to place Excess Letdown in service).

**\* Events 5, 6, 7**

The first major event is a loss of the 345 KV East & West busses resulting in a Loss of Offsite Power with Diesel Generator 1-01 previously out of service due to an 86-1 LOR on Safeguards Bus 1EA1. Diesel Generator 1-02 will fail to start automatically or Manually in Emergency; a Manual Normal start of DG 1-02 will be required in accordance with ECA-0.0A, Loss of All AC Power. The event is complicated by the Pressurizer Steam Space Sample in progress and the valves must be manually closed.

**\*\* Events 8 & 9**

A LBLOCA will occur (delayed by 120 seconds) when DG 1-02 is manually (normal) started. RHR Pump1-02 fails to auto-start from the SI sequencer; it is a critical task to manually start the only available RHR Pump. Entries into both FRP-0.1A, Response to Imminent Pressurized Thermal Shock Condition and FRZ-0.1, Response to High Containment Pressure, will be required; however, the actions of these procedures will not be substantive.

\* - *On Lead Examiner's Cue*





Scenario Event Description  
NRC Scenario 3

**Critical Task Determination**

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
<b>CT-1</b> – Isolate Reactor Coolant System Leakage Paths in accordance with ECA-0.0A, Loss of All AC prior to initiation of Steam Generator depressurization.	Take one or more actions that would prevent a challenge to plant safety.	Procedural direction at ECA-0.0A Step 3 to minimize RCS inventory loss. Valve position indication and letdown flow.	The operator will manually close the Primary Sample Isolation Valves.	Valve position will change and MLB indication for closed valve position.
<b>CT-2</b> – Restore Power to Bus 1EA2 in accordance with ECA-0.0A, Loss of All AC Power, prior to incorrectly placing equipment in PULL-OUT per ECA-0.0A, Step 8.	Recognize a failure or an incorrect automatic actuation of an ESF system or component resulting in degraded ECCS capacity.	Procedural direction at ECA-0.0A Step 5 to restore power via EDG 1-02 to Safeguard Bus 1EA2. Bus voltage indication and EDG parameters.	The operator will manually perform a normal start on EDG 1-02 using the handswitch on CB-11.	Indication of DG running and loading via bus voltage and frequency.
<b>CT-3</b> – Manually start Residual Heat Removal Pump 1-02 due to an automatic start failure on Safety Injection, prior to RVLIS 47" above Core Plate Light going DARK.	Recognize a failure or an incorrect automatic actuation of RHR Pump 1-01 to start, to provide adequate injection capability/core cooling for a LBLOCA with Train A RHR Pump out of service.	Procedurally driven from EOP-0.0A, Attachment 2 to provide makeup inventory to the RCS during accident conditions.	The operator will start RHR Pump 1-02 using the handswitch on CB-04.	Indication of pump start including light indication, flow and discharge pressure on CB-04.
<b>NOTE:</b> (Per NUREG-1021, Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.				

Facility: CPNPP 1 & 2	Scenario No.: 4	Op Test No.: August 2021 NRC	
Examiners:	Operators:		
_____	_____		
_____	_____		
_____	_____		
Initial Conditions: 100% power MOL – RCS Boron is 771 ppm. MDAFW Pump 1-02 is out of service for an oil change.			
Turnover: Maintain steady-state power conditions.			
<b>Critical Tasks:</b>			
<b>CT-1 – Manually initiate Train A and/or Train B Safety Injection, due to failure to automatically initiate, prior to exiting EOP-0.0A, Reactor Trip or Safety Injection.</b>			
<b>CT-2 – Stop all Reactor Coolant Pumps in accordance with FRH-0.1A, Response to Loss of Secondary Heat Sink, when Charging Pump SI flow cannot be established to the RCS, prior to establishing Secondary cooling with a Main Feedwater Pump.</b>			
<b>CT-3 – Establish Secondary cooling to at least one Steam Generator with a Main Feedwater Pump in accordance with FRH-0.1A, Response to Loss of Secondary Heat Sink, prior to indicated wide range level in three Steam Generators falling below 24%.</b>			
Event No.	Malf. No.	Event Type*	Event Description
1	RX05A	I (RO, SRO) TS (SRO)	Pressurizer Level Transmitter (LT-459) fails low.
2	CH10	C (BOP, SRO)	CRDM Vent Fan 1-01 Trips. Requires start of alternate fan.
3	CH21A	C (RO, BOP, SRO) TS (SRO)	Safety Chiller 1-05 trip
4	MS13B	C (RO, SRO)	SG 1-02 Steam Pressure Channel (PT-2326) fails high
5	CV01C OVRDE	M (RO, BOP, SRO)	CCP 1-02 trip on overcurrent, PDP start failure, RCP Radial Bearing high temperature requires Rx trip and stopping RCP
6	TC07C	C (BOP)	Main Turbine fails to trip on Rx trip, Manual pushbutton fails, requires tripping by securing EHC pumps
7	RP07A RP07B	C (RO)	Automatic Safety Injection actuation failure (both trains), Manual actuation required from CB-07
8	FW09A	M (RO, BOP, SRO)	TDAFWP trips, Loss of Heat Sink
9	OVRDE	C (BOP, SRO)	Selected MFW Pump fails to reset for Heat Sink recovery, Alternate pump will reset
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Technical Specifications			

Actual	Target Quantitative Attributes
9	Total malfunctions (5-8)
4	Malfunctions after EOP entry (1-2)
5	Abnormal events (2-4)
2	Major transients (1-2)
1	EOPs entered/requiring substantive actions (1-2)

1	EOP contingencies requiring substantive actions (0-2)
3	Critical tasks (2-3)

### **SCENARIO 4 SUMMARY**

**\* Event 1 -**

The first event is a failure low of Pressurizer Level channel. Crew actions are per ABN-706, Pressurizer Level Instrumentation Malfunction Section 2.0 and include manual control of pressurizer level, bypassing the failed channel and restoring pressurizer level control to automatic. The crew will be required to restore normal letdown to service due to letdown isolation. The SRO will refer to Technical Specification LCO 3.3.1.

**\* Event 2 -**

The operating CRDM vent fan trips. The crew will refer to 1-ALB-3A, Window 2.1, CNTMT FN MASTER TRIP, and ensure that at least one CRDM vent fan is in service, and manually start an alternate vent fan, per SOP-801A, Containment Ventilation System. They will use either Section 5.3.1, Control Rod Drive Mechanism Ventilation System Startup, or Section 5.3.3, Alternating Control Rod Drive Mechanism Ventilation Fans, for this evolution. The SRO may refer to the Technical Requirements Manual LCO 13.7.36 (depending on expediency of crew actions).

**\* Event 3 -**

The next event is a trip of the Train A Safety Chiller (1-05). Crew actions are per ABN-503, Safety Chilled Water System Malfunction and include starting the unaffected train (Train B) Component Cooling Water Pump and Centrifugal Charging Pump. The crew will then shutdown all equipment supplied by the affected train (Train A) and place the equipment in Pull-Out. This equipment includes RHR Pump 1-01, Containment Spray Pumps 1-01 & 1-03, MDAFWP 1-01, SI Pump 1-01, CCW Pump 1-01, and CCP 1-01. The SRO will refer to Technical Specification LCOs 3.7.19 and 3.7.5 (for loss of two trains of AFW).

**\* Event 4 -**

The next event is a failure high of Steam Line Pressure Transmitter PT-2326 causing SG 1-02 Atmospheric Relief Valve to open. The Reactor Operator will verify steam line pressure is below the lift pressure of 1125 psig and take manual control of 1-PK-2326 and close the ARV. The crew will take the actions of ABN-709, Steam Line Pressure, Steam Header Pressure, Turbine 1st-Stage Pressure and Feed Header Pressure Instrument Malfunction.

**\* Event 5 -**

The first major event is a trip of the last remaining Centrifugal Charging Pump, CCP 1-02. The crew will enter ABN-105, Chemical and Volume Control System Malfunction and take actions to isolate Letdown flow and attempt to start the Positive Displacement Pump (PDP). The PDP will fail to start when attempted by the Reactor Operator. The crew will then enter ABN-101, Reactor Coolant Pump Trip/Malfunction. RCP Radial Bearing temperatures will begin to rise and exceed RCP trip criteria setpoints due to the loss of Seal Injection flow necessitating a Reactor Trip and a trip of the affected RCP(s). The crew enter and take the actions of EOP-0.0A, Reactor Trip or Safety Injection and the Reactor Operator will secure the affected RCP(s) after performance of Immediate Operator Actions.

**\*\* Events 6 & 7 -**

The Reactor Trip will be complicated by the Main Turbine failing to automatically trip or trip from the manual pushbutton at CB-10. The Main Turbine will be tripped by the BOP by securing EHC pumps. The automatic and manual failure of the Main Turbine to trip will cause an RCS cooldown and lowering of SG pressures enough to meet automatic Safety Injection setpoints. Safety Injection will fail to automatically initiate and must be manually initiated from CB-07 by the Reactor Operator.



Scenario Event Description  
NRC Scenario 4

**Critical Task Determination**

<b>Critical Task</b>	<b>Safety Significance</b>	<b>Cueing</b>	<b>Measurable Performance Indicators</b>	<b>Performance Feedback</b>
<p>CT-1 – Manually initiate Train A and/or Train B Safety Injection, due to failure to automatically initiate, prior to exiting EOP-0.0A, Reactor Trip or Safety Injection.</p>	<p>Recognize a failure or an incorrect automatic actuation of an ESF system or component.</p>	<p>Procedural direction at EOP-0.0A Step 4 to determine if a Safety Injection is required and annunciators indicating that an SI should have occurred yet did not occur.</p>	<p>The operator will manually actuate Safety Injection using the handswitch on CB-07.</p>	<p>PCIP Window 1.8 annunciates indicating both trains of SI have actuated. Numerous equipment changes of state.</p>
<p>CT-2 - Stop all Reactor Coolant Pumps in accordance with FRH-0.1A, Response to Loss of Secondary Heat Sink, when Charging Pump SI flow cannot be established to the RCS, prior to establishing Secondary cooling with a Main Feedwater Pump.</p>	<p>Without a source of water to provide a heat sink on the secondary side of the SGs, RCP's are tripped to extend the effectiveness of the remaining water inventory of the SG's.</p>	<p>Procedurally driven at FRH-0.1A step 2 RNO a to immediately stop all RCPs and again at FRH-0.1A step 6</p>	<p>The operator will manually stop RCPs using the handswitches on CB-05.</p>	<p>Main Control Board lights and flow indications, loss of flow annunciators indicate the RCPs have stopped.</p>

Scenario Event Description  
NRC Scenario 4

<p>CT-3 - Establish Secondary cooling to at least one Steam Generator with a Main Feedwater Pump in accordance with FRH-0.1A, Response to Loss of Secondary Heat Sink, prior to indicated wide range level in three Steam Generators falling below 24%.</p>	<p>Take one or more actions that would prevent a challenge to plant safety.</p>	<p>Procedurally driven from FRH-0.1A to establish Main Feedwater flow to at least one SG. to reduce the overall temperature of the RCS.</p>	<p>The operator will reset the FW Isolation, reset and start a MFW pump, and manually throttle open the FW control bypass valve(s) to establish feed flow.</p>	<p>Feedwater flow to selected SG(s), rising on wide range SG Level indication(s).</p>
<p><b>NOTE:</b> (Per NUREG-1021, Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.</p>				