Facility: Palo Verde Date of Exam: May 6, 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	2	1	1				1	2			2	9					4
	Tier Totals	5	4	4				4	5			5	27					10
2. Plant Systems	1	2	3	2	2	2	2	3	3	3	3	3	28					5
	2	1	1	1	1	1	1	1	1	0	1	1	10					3
	Tier Totals	3	4	3	3	3	3	4	4	3	4	4	38					8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
		2			3			3			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					X		AA2.23 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: Criteria for throttling high-pressure injection after a small LOCA	3.6	1
000009 (EPE 9) Small Break LOCA / 3	X						EK1.02Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: Use of steam tables	3.5	2
000011 (EPE 11) Large Break LOCA / 3				X			EA1.09Ability to operate and monitor the following as they apply to a Large Break LOCA: Core flood tank initiation	4.3	3
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					X		AA2.10 Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): When to secure RCPs on loss of cooling or seal injection	3.7	4
000022 (APE 22) Loss of Reactor Coolant Makeup / 2			X				AK3.05 Knowledge of the interrelations between the Loss of Reactor Coolant Makeup and the following: Need to avoid plant transients	3.2	5
000025 (APE 25) Loss of Residual Heat Removal System / 4		X					AK2.03 Knowledge of the interrelations between the Loss of Residual Heat Removal System and the following: Service water or closed cooling water pumps	2.7	6
000026 (APE 26) Loss of Component Cooling Water / 8			X				AK3.04 Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: Effect on the CCW flow header of a loss of CCW	3.5	7
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		X					AK2.03 Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners	2.6	8
000029 (EPE 29) Anticipated Transient Without Scram / 1					X		EA2.05 Ability to determine or interpret the following as they apply to a ATWS: System component valve position indications	3.4	9
000038 (EPE 38) Steam Generator Tube Rupture / 3				X			EA1.17 Ability to operate and monitor the following as they apply to a SGTR: S/G sample isolation valve indicators	3.2	10
~~000040 (APE 40; BW E05;~~ CE E05; ~~W E12~~) Steam Line Rupture—Excessive Heat Transfer / 4				X			EA1.3 Ability to operate and / or monitor the following as they apply to the (Excess Steam Demand): Desired operating results during abnormal and emergency situations	3.4	11
000054 (APE 54; ~~CE E06~~) Loss of Main Feedwater /4						X	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	12
000055 (EPE 55) Station Blackout / 6									
000056 (APE 56) Loss of Offsite Power / 6	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: Principle of cooling by natural convection	3.7	13
000057 (APE 57) Loss of Vital AC Instrument Bus / 6						X	2.4.31 Knowledge of annunciator alarms, indications, or response procedures	4.2	14
000058 (APE 58) Loss of DC Power / 6	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: Battery charger equipment and instrumentation	2.8	15
000062 (APE 62) Loss of Nuclear Service Water / 4			X				AK3.02 Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: The automatic actions (alignments) within the nuclear service water resulting from the actuation of the ESFAS	3.6	16

000065 (APE 65) Loss of Instrument Air / 8						X	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation	4.4	17
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6		X					AK2.07 Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Turbine / generator control	3.6	18
(W E04) LOCA Outside Containment / 3									
(W E11) Loss of Emergency Coolant Recirculation / 4									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4									
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									
000003 (APE 3) Dropped Control Rod / 1					X		AA2.01 Ability to determine and interpret the following as they apply to the Dropped Control Rod: Rod position indication to actual rod position	3.7	19
000005 (APE 5) Inoperable/Stuck Control Rod / 1									
000024 (APE 24) Emergency Boration / 1					X		AA2.06 Knowledge of the interrelations between Emergency Boration and the following: When boron dilution is taking place	3.6	20
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						X	2.1.30 Ability to locate and operate components, including local controls	4.4	21
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8		X					AK2.02 Knowledge of the interrelations between the Fuel Handling Incidents and the following: Radiation monitoring equipment (portable and installed)	3.4	22
000037 (APE 37) Steam Generator Tube Leak / 3	X						AK1.02 Knowledge of the operational implications of the following concepts as they apply to Steam Generator Tube Leak: Leak rate vs. pressure drop	3.9	26
000051 (APE 51) Loss of Condenser Vacuum / 4									
000059 (APE 59) Accidental Liquid Radwaste Release / 9			X				AK3.04 Knowledge of the reasons for the following responses as they apply to the Accidental Liquid Radwaste Release: Actions contained in EOP for accidental liquid radioactive-waste release	3.8	23
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 / 5									
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4									
000076 (APE 76) High Reactor Coolant Activity / 9				X			AA1.04 Ability to operate and / or monitor the following as they apply to the High Reactor Coolant Activity: Failed fuel-monitoring equipment	3.2	24
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									
(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/4	X						AK1.2 Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Operations): Normal, abnormal and emergency operating procedures associated with (Natural Circulation Operations)	3.2	25
(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						X	2.4.6 Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	3.7	27
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4									
K/A Category Point Totals:	2	1	1	1	2	2	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			A3.01 Ability to monitor automatic operation of the RCPS, including: Seal injection flow	3.3	28
004 (SF1; SF2 CVCS) Chemical and Volume Control									X			A3.14 Ability to monitor automatic operation of the CVCS, including: Letdown and charging flows	3.4	29
005 (SF4P RHR) Residual Heat Removal						X						K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger	2.5	30
006 (SF2; SF3 ECCS) Emergency Core Cooling				X								K4.06 Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: Recirculation of minimum flow through pumps	2.7	31
007 (SF5 PRTS) Pressurizer Relief/Quench Tank					X							K5.02 Knowledge of the operational implications of the following concepts as the apply to PRTS: Method of forming a steam bubble in the PZR	3.1	32
008 (SF8 CCW) Component Cooling Water			X									K3.01 Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: Loads cooled by CCWS	3.4	33
010 (SF3 PZR PCS) Pressurizer Pressure Control		X										K2.02 Knowledge of bus power supplies to the following: Controller for PZR spray valve	2.5	34
012 (SF7 RPS) Reactor Protection					X							K5.02 Knowledge of the operational implications of the following concepts as the apply to the RPS: Power Density	3.1	35
013 (SF2 ESFAS) Engineered Safety Features Actuation								X				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; LOCA	4.6	36
022 (SF5 CCS) Containment Cooling											X	2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.6	37
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray		X										K2.02 Knowledge of bus power supplies to the following: MOVs	3.4	38
039 (SF4S MSS) Main and Reheat Steam				X								K4.08 Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Interlocks on MSIV and bypass valves	3.3	39
059 (SF4S MFW) Main Feedwater									X			A3.02 Ability to monitor automatic operation of the MFW, including: Programmed levels of the S/G	2.9	40
061 (SF4S AFW) Auxiliary/Emergency Feedwater		X										K2.01 Knowledge of bus power supplies to the following: AFW system MOVs	4.0	41
062 (SF6 ED AC) AC Electrical Distribution	X											K1.03 Knowledge of the physical connections and/or cause effect relationships between the ac distribution system and the following systems: DC distribution	3.5	42
063 (SF6 ED DC) DC Electrical Distribution								X				A2.01 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: Grounds	2.5	43
064 (SF6 EDG) Emergency Diesel Generator						X						K6.08 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Fuel oil storage tanks	3.2	44
073 (SF7 PRM) Process Radiation Monitoring											X	2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	4.1	45

076 (SF4S SW) Service Water			X								K3.07 Knowledge of the effect that a loss or malfunction of the SWS will have on the following: ESF loads	3.7	46
078 (SF8 IAS) Instrument Air	X										K1.05 Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: MSIV air	3.4	47
103 (SF5 CNT) Containment							X				A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: Containment pressure, temperature, and humidity	3.7	48
053 (SF1; SF4P ICS*) Integrated Control													
003 (SF4P RCP) Reactor Coolant Pump										X	A4.02 Ability to manually operate and/or monitor in the control room: RCP motor parameters	2.9	49
005 (SF4P RHR) Residual Heat Removal							X				A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: Closed cooling water flow rate and temperature	2.5	50
010 (SF3 PZR PCS) Pressurizer Pressure Control							X				A1.06 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PZR PCS controls including: RCS heatup and cooldown effect on pressure	3.1	51
012 (SF7 RPS) Reactor Protection								X			A2.07 Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of dc control power	3.2	52
026 (SF5 CSS) Containment Spray										X	A4.05 Ability to manually operate and/or monitor in the control room: Containment spray reset switches	3.5	53
039 (SF4S MSS) Main and Reheat Steam										X	A4.01 Ability to manually operate and/or monitor in the control room: Main steam supply. valves	2.9	54
076 (SF4S SW) Service Water											X	2.2.37 Ability to determine operability and/or availability of safety related equipment.	3.6	55
K/A Category Point Totals:	2	3	2	2	2	2	3	3	3	3	3	Group Point Total:		28

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	X											K1.05 Knowledge of the physical connections and/or cause-effect relationships between the CRDS and the following systems: NIS and RPS	4.5	56
002 (SF2; SF4P RCS) Reactor Coolant							X					A1.04 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCS controls including: Subcooling Margin	3.9	57
011 (SF2 PZR LCS) Pressurizer Level Control														
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation										X		A4.03 Ability to manually operate and/or monitor in the control room: Trip Bypasses	3.5	65
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					X							K5.03 Knowledge of the operational implications of the following concepts as they apply to the HRPS: Sources of hydrogen within containment	2.9	58
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling			X									K3.03 Knowledge of the effect that a loss or malfunction of the Spent Fuel Pool Cooling System will have on the following: Spent fuel temperature	3.0	59
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator								X				A2.06 Ability to (a) predict the impacts of the following malfunctions or operations on the SG; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Small break LOCA	4.5	60
041 (SF4S SDS) Steam Dump/Turbine Bypass Control						X						K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the SDS: Controller and positioners, including ICS, S/G, CRDS	2.7	61
045 (SF 4S MTG) Main Turbine Generator				X								K4.01 Knowledge of MT/G system design feature(s) and/or interlock(s) which provide for the following: Programmed controller for relationship between steam pressure at T/G inlet (impulse, first stage) and plant power level	2.7	62
055 (SF4S CARS) Condenser Air Removal											X	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.3	63
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										K2.03 Knowledge of bus power supplies to the following: Emergency/essential SWS pumps	2.6	64
079 (SF8 SAS**) Station Air														
086 Fire Protection														

050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:	1	1	1	1	1	1	1	1	0	1	1	Group Point Total:		10

Facility: Palo Verde		Date of Exam: May 6, 2021				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.28	Knowledge of the purpose and function of major system components and controls.	4.1	66		
	2.1.38	Knowledge of the station's requirements for verbal communications when implementing procedures.	3.7	67		
	Subtotal		2			
2. Equipment Control	2.2.21	Knowledge of pre- and post-maintenance operability requirements.	2.9	68		
	2.2.23	Ability to track Technical Specification limiting conditions for operations.	3.1	69		
	2.2.36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	70		
	Subtotal		3			
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	71		
	2.3.11	Ability to control radiation releases.	3.8	72		
	2.3.15	Ability to use radiation monitoring systems, Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	73		
	Subtotal		3			
4. Emergency Procedures/Plan	2.4.4	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5	74		
	2.4.29	Knowledge of the emergency plan.	3.1	75		
	Subtotal		2			
Tier 3 Point Total				10		7

Facility: Palo Verde Date of Exam: May 6, 2021

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	2												9	2	2	4
	Tier Totals												27	5	5	10
2. Plant Systems	1												28	3	2	5
	2												10	1	2	3
	Tier Totals												38	4	4	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
														1	2	2	2	

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000008 (APE 8) Pressurizer Vapor Space Accident / 3									
000009 (EPE 9) Small Break LOCA / 3						X	2.1.28 Knowledge of the purpose and function of major system components and controls.	4.1	76
000011 (EPE 11) Large Break LOCA / 3					X		EA2.13 Ability to determine or interpret the following as they apply to a Large Break LOCA: Difference between overcooling and LOCA indications	3.7	77
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4						X	2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.7	78
000022 (APE 22) Loss of Reactor Coolant Makeup / 2						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.	4.4	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					X		EA2.09 Ability to determine or interpret the following as they apply to a SGTR: Existence of natural circulation, using plant parameters	4.2	80
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 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									
000058 (APE 58) Loss of DC Power / 6					X		AA2.02 Ability to determine and interpret the following as they apply to the Loss of DC Power: 125V dc bus voltage, low/critical low, alarm	3.6	81
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									
(W E11) Loss of Emergency Coolant Recirculation / 4									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4									
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					X		AA2.03 Ability to determine and interpret the following as they apply to the Continuous Rod Withdrawal : Proper actions to be taken if automatic safety functions have not taken place	4.8	82
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									
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									
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 / 5									
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4						X	2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	4.6	83
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/7									
(BW A04) Turbine Trip / 4									
(BW A05) Emergency Diesel Actuation / 6									
(BW A07) Flooding / 8									
(BW E03) Inadequate Subcooling Margin / 4									
(BW E08; W E03) LOCA Cooldown—Depressurization / 4									
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4									
(BW E13 & E14) EOP Rules and Enclosures									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4					X		AA2.2 Ability to determine and interpret the following as they apply to the (RCS Overcooling): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	3.4	84
(CE A16) Excess RCS Leakage / 2						X	2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	85

(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														
007 (SF5 PRTS) Pressurizer Relief/Quench Tank														
008 (SF8 CCW) Component Cooling Water								X				A2.03 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: High/low CCW temperature	3.2	86
010 (SF3 PZR PCS) Pressurizer Pressure Control														
012 (SF7 RPS) Reactor Protection														
013 (SF2 ESFAS) Engineered Safety Features Actuation														
022 (SF5 CCS) Containment Cooling											X	2.4.9 Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	4.2	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														
064 (SF6 EDG) Emergency Diesel Generator								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Load, VARS, pressure on air compressor, speed droop, frequency, voltage, fuel oil level, temperatures.	2.9	88
073 (SF7 PRM) Process Radiation Monitoring								X				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Erratic or failed power supply	2.9	89

076 (SF4S SW) Service Water										X	2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	90
078 (SF8 IAS) Instrument Air													
103 (SF5 CNT) Containment													
053 (SF1; SF4P ICS*) Integrated Control													
K/A Category Point Totals:							3			2	Group Point Total:		5

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											X	2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	91
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation														
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor											X	2.1.20 Ability to interpret and execute procedure steps.	4.9	92
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														
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														
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				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the Fire Protection System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Manual shutdown of the FPS	3.1	93
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:								1			2	Group Point Total:		3

Facility: Palo Verde		Date of Exam: May 6, 2021				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.28	Knowledge of the purpose and function of major system components and controls.			4.1	94
	Subtotal					
2. Equipment Control	2.2.2	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.			4.6	95
	2.2.25	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.			4.2	96
	Subtotal					
3. Radiation Control	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			3.1	97
	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.			3.8	98
	Subtotal					
4. Emergency Procedures/Plan	2.4.18	Knowledge of the specific bases for EOPs.			4.0	99
	2.4.23	Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.			4.4	100
	Subtotal					
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection

Tier / Group	Randomly Selected K/A	Reason for Rejection

Administrative Topics Outline

Facility: PVNGS			Date of Examination: 4/26/2021
Examination Level RO			Operating Test Number: 2021 NRC
Administrative Topic (see Note)	Type Code*	Describe Activity to be Performed	
(A1)	M, R	JPM:	Determine the correct replacement bulbs to use for 3 control room handswitches
		KA:	2.1.1
		IR:	3.8
(A2)	D, R	JPM:	Calculate required boron concentration change for power ascension from 40-60% power per 40OP-9ZZ05, Power Operations
		KA:	2.1.37
		IR:	4.3
(A3)	D, R	JPM:	Perform 73ST-9XI52, Safety Injection Train B ECCS Throttle Valves – In Service Test
		KA:	2.2.12
		IR:	3.7
(A4)	M, R	JPM:	Determine the system clearance which will result in the lowest dose to the workers
		KA:	2.3.14
		IR:	3.4
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.			
*Type Codes & Criteria:	(C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) **(2)** (N)ew or (M)odified from bank (≥ 1) **(2)** (P)revious 2 exams (≤ 1; randomly selected) **(0)**		

A1 The applicant will be directed to determine the correct light bulb sizes/models to replace burned out bulbs on 3 Control Room handswitches using the Unit 1 Indicating Lamp Reference Index. This JPM was created (for the 2020 Annual Exam) based on multiple instances of incorrect bulbs being used in the Control Room. This is a modified JPM covering the Conduct of Operations section of the KA catalog.

A2 The applicant will be directed to determine the required change in boron concentration to perform a power ascension from 40% power to 60% power per 40OP-9ZZ05, Power Operations, and the Boron OAP (Operator Aid Program). This is a bank JPM covering the Conduct of Operations section of the KA catalog.

A3 The applicant will be directed to perform 73ST-9XI52, Safety Injection Train B ECCS Throttle Valves – In Service Test, and calculate the flow differential for LPSI injection valves based on valve stem travel. This is a bank JPM covering the Equipment Control section of the KA catalog.

A4 The applicant will be directed to determine the clearance which result in the lowest dose received by the operators hanging the clearance to remove a valve with a hot spot. The applicant will be provided a diagram of the valves in the system and based on the number of valves and the distance of the valves (both upstream and downstream) from the valve to be removed, and perform dose rate calculations to determine the valves to be used for the clearance. This is a modified JPM covering the Radiation Control section of the KA catalog.

Administrative Topics Outline

Facility: PVNGS		Date of Examination:	4/26/2021
Examination Level SRO		Operating Test Number:	2021 NRC
Administrative Topic (see Note)	Type Code*	Describe Activity to be Performed	
(A5)	M, R	JPM:	Determine maximum stay time based on heat stress evaluation
		KA:	2.1.26
		IR:	3.6
(A6)	D, R	JPM:	Determine Time to SDC with TS Evaluation
		KA:	2.1.25
		IR:	4.2
(A7)	D, R	JPM:	Determine the impacts of a failed Startup Channel NI to refueling activities and Technical Specificaitons
		KA:	2.2.40
		IR:	4.7
(A8)	M, R	JPM:	Determine the maximum dose for a pregnant AO and the reporting requirements
		KA:	2.3.4
		IR:	3.7
(A9)	M, R	JPM:	Classify an event in MODE 6 and complete NAN Emergency Message Form
		KA:	2.4.41
		IR:	4.6
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.			
*Type Codes & Criteria:	(C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) **(2)** (N)ew or (M)odified from bank (≥ 1) **(3)** (P)revious 2 exams (≤ 1; randomly selected) **(0)**		

A5 The applicant will be directed to determine the maximum required stay time in a high heat work area and determine the minimum required recovery time following the work per 1DP-0IS17, Heat Stress Prevention Program. This is a modified JPM covering the Conduct of Operations section of the KA catalog.

A6 The applicant will be directed to determine the time by which SDC must be placed in service per Appendix 4, Time to SDC. The applicant will be provided conditions post-trip (feed rates, CST level, time since trip) and they will have to use the provide chart to determine how much time until the unit is required to be on SDC. The applicant will also be required to determine the time at which the CST will go inoperable during the cooldown. This is a bank JPM covered by the Conduct of Operations section of the KA catalog.

A7 The applicant will be directed to determine the Technical Specification impact of a failed Startup Channel NI and the subsequent impact on an upcoming refueling evolution. Following the Technical Specification evaluation, the applicant will refer to an outage evolution table and determine whether or not the evolution may proceed with one failed Startup Channel NI. This is a bank JPM covering the Equipment Operations section of the KA catalog.

A8 The applicant will be directed to determine the remaining allowable dose for an AO who has declared a pregnancy. The applicant will be provided with a timeline of events and dose history for the AO. The applicant will also have to determine any applicable required reporting requirements as a result the received dose. This is a modified JPM covering the Radiation Control section of the KA catalog.

A9 The applicant will be directed to evaluate plant conditions in MODE 6 and determine if the conditions warrant an EAL call (and to determine the EAL call if applicable). The event is a loss of SDC in MODE 6 that will result in a slow heatup. The cue indicates that SDC will not be restored for 30 minutes which will raise RCS temp above the threshold for an EAL call and will be of a duration to require an alert declaration. The applicant will also complete the Emergency Notification Form for the event. This is a bank JPM covering the Emergency Procedures / Plan section of the KA catalog.

Facility:	PVNGS	Date of Examination:	4/26/2021
Exam Level:	**SRO(U)** / SRO(I) / RO	Operating Test No.:	2021 NRC

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
S1 (RO ONLY)	Perform an Emergency Boration using HPSI Injection in MODE 4 per 40AO-9ZZ01, Emergency Boration	A, D, L, S	1
S2	Disable Auto Makeup to the VCT per 40OP-9CH01, CVCS Normal Operations	N, S	2
S3	**Respond to a PPCS Malfunction and mitigate the malfunction per 40AL-9RK4A, B04 Alarm Response Procedure**	**A, D, S**	**3**
S4	Restore Seal Injection following an extended loss of letdown per 40AO-9ZZ05, Loss of Charging or Letdown	A, D, S	4P
S5	**Respond to Gen Seal Oil Pump Trip during Turbine Load Adjustment**	**A, N, S**	**4S**
S6	**Reset CSAS Actuation per Appendix 29, CSAS Check / Reset**	**EN, L, N, S**	**5**
S7	Respond to a Containment Purge Radiation Monitor alarm per 74AL-9SQ01, Radiation Monitoring System Alarm and Validation Response	EN, N, S	7
S8	Immediate actions of 40AO-9ZZ18, Shutdown Outside Control Room	D, S	8
In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
P1	**Align a Charging Pump suction to the RWT during a Control Room Fire**	**A, D, E, R**	**1**
P2	Reset Overspeed Trip on AFA-P01 – Appendix	A, D, E	4S
P3	**Reset EDG following Low Lube Oil Trip – Appendix 55**	**E, N**	**6**

SRO-U will perform S-3. S-5. S-6, P-1, and P-3

@	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.

* Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 **(6)** / 4-6 **(5)** / 2-3 **(3)**
(C)ontrol room	
(D)irect from bank	≤ 9 **(6)** / ≤ 8 **(5)** / ≤ 4 **(2)**
(E)mergency or abnormal in-plant	≥ 1 **(3)** / ≥ 1 **(3)** / ≥ 1 **(2)**
(EN)gineered safety feature	≥ 1 **(2)** / ≥ 1 **(2)** / ≥ 1 **(1)** (control room system)
(L)ow Power / Shutdown	≥ 1 **(2)** / ≥ 1 **(2)** / ≥ 1 **(1)**
(N)ew or (M)odified from bank including 1(A)	≥ 2 **(5 – 1A)** / ≥ 2 **(5 – 1A)** / ≥ 1 **(3 – 1A)**
(P)revious 2 exams	≤ 3 **(0)** / ≤ 3 **(0)** / ≤ 2 **(0)** (randomly selected)
(R)CA	≥ 1 **(1)** / ≥ 1 **(1)** / ≥ 1 **(1)**
(S)imulator	

NRC JPM Examination
Summary Description

S1 The applicant will be directed to perform an emergency boration (in MODE 4) per 40AO-9ZZ01, Emergency Boration. The normal boration path will fail and the applicant will have to use HPSI injection to borate via alternate means. This is a bank alternate path JPM covering Safety Function 1.

S2 The applicant will be directed to disable VCT auto-makeup due to being in end of cycle core conditions in which boration flowrate is too low for the controller to adequately control it. This evolution is performed per 40OP-9CH01, CVCS Normal Operations. This is a new JPM covering Safety Function 2.

S3 The applicant will be directed to respond to a failed instrument in the PPCS system which results in rising RCS pressure. The failure will be mitigating by using the associated ARP and the pressure rise must be corrected prior to a manual or automatic reactor trip. This is an alternate path bank JPM covering Safety Function 3.

S4 The applicant will be directed to restore RCP Seal Injection following extended operations with letdown isolated per 40AO-9ZZ05. The applicant will establish seal injection flow and restore seal injection flow to automatic. This is an alternate path bank JPM covering Safety Function 4P.

S5 The applicant will be directed to adjust Main Turbine load during a power ascension. When the applicant makes a load adjustment, the Generator Seal Oil Pump will trip and the Emergency Seal Oil Pump will fail to auto start. When the Emergency Pump is

started, it will also trip, forcing the applicant to manually trip the Main Turbine. This is a new alternate path JPM covering Safety Function 4S.

S6 The applicant will be directed to reset a Containment Spray Actuation Signal (CSAS) following an ESD inside Containment. The applicant will perform the signal reset at the PPS cabinet, then reposition equipment which had actuated. This is a new JPM covering Safety Function 5.

S7 The applicant will be directed to respond to a high alarm on Containment Purge Radiation Monitor RU-37. The ARP will direct the applicant to ensure CPIAS and CREVAS have actuated and to verify that all components have gone to their actuated positions. The applicant will take manual action to ensure all components are in their proper end state. This is a new JPM covering Safety Function 7.

S8 The applicant will be directed to perform the immediate actions of 40AO-9ZZ18, Shutdown Outside Control Room. These actions include tripping the reactor, stopping one RCP in each loop, taking local auto control of the PLCS master controller, and establishing a setpoint of 50%. This is a bank JPM covering Safety Function 8.

P1 The applicant will be directed to align a Charging Pump suction to a borated water source per 40AO-9ZZ19, Control Room Fire. The applicant will be unable to realign a valve in the RCA from the electrical control panel and will have to locally manually open the valve to establish the lineup. This is an alternate path bank JPM covering Safety Function 1.

P2 The applicant will be directed to reset the overspeed trip on Turbine Driven Auxiliary Feedwater Pump AFA-P01. This is an alternate path bank JPM covering Safety Function 4S.

P3 The applicant will be directed to locally reset the EDG Low Lube Oil trip in order to start and load the EDG. This is a new JPM covering Safety Function 6.

Facility: PVNGS Date of Exam: 4/26/2021 Operating Test No.: 1/2/3/4

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO-1 ☐	RX													0	1		
	NOR		1											1	1		
	I/C		2,4				1,3,4,7							6	4		
	MAJ		5				5							2	2		
	TS													0	0		
RO-2 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6		2,4,6								7	4		
	MAJ			5		5								2	2		
	TS													0	0		
RO-3 ☐	RX													0	1		
	NOR		1											1	1		
	I/C		2,4				1,3,4,7							6	4		
	MAJ		5				5							2	2		
	TS													0	0		
RO-4 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6		2,4,6								7	4		
	MAJ			5		5								2	2		
	TS													0	0		

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 (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* 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 *controlled* 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 I/C malfunctions on a one-for-one 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.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: PVNGS Date of Exam: 4/26/2021 Operating Test No.: 1/2/3/4

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO-5 ☐	RX													0	1		
	NOR		1											1	1		
	I/C		2,4				1,3,4,7							6	4		
	MAJ		5				5							2	2		
	TS													0	0		
RO-6 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6		2,4,6								7	4		
	MAJ			5		5								2	2		
	TS													0	0		
RO-7 ☐	RX													0	1		
	NOR		1											1	1		
	I/C		2,4				1,3,4,7							6	4		
	MAJ		5				5							2	2		
	TS													0	0		
RO-8 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6		2,4,6								7	4		
	MAJ			5		5								2	2		
	TS													0	0		

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 (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* 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 *controlled* 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 I/C malfunctions on a one-for-one 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.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: PVNGS Date of Exam: 4/26/2021 Operating Test No.: 1/2/3/4

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO-9 ☐	RX													0	1		
	NOR		1											1	1		
	I/C		2,4				1,3,4,7							6	4		
	MAJ		5				5							2	2		
	TS													0	0		
RO-10 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6		2,4,6								7	4		
	MAJ			5		5								2	2		
	TS													0	0		
RO-11 ☐	RX													0	1		
	NOR		1											1	1		
	I/C		2,4				1,3,4,7							6	4		
	MAJ		5				5							2	2		
	TS													0	0		
RO-12 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6		2,4,6								7	4		
	MAJ			5		5								2	2		
	TS													0	0		

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 (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* 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 *controlled* 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 I/C malfunctions on a one-for-one 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.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: PVNGS Date of Exam: 4/26/2021 Operating Test No.: 1/2/3/4

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO-13 ☐	RX													0	1		
	NOR													0	1		
	I/C			2,3,4,6			1,3,4,7		2,3,5,7					12	4		
	MAJ			5			5		6					3	2		
	TS													0	0		
SRO-I-1 ☐	RX													0		1	
	NOR	1												1		1	
	I/C	2,3,4,6				2,4,6		2,4,5,7						11		4	
	MAJ	5				5		6						3		2	
	TS	3,4						1,3						4		2	
SRO-I-2 ☐	RX													0		1	
	NOR		1											1		1	
	I/C		2,4		1,2,3,4,6,7					2,4,5				11		4	
	MAJ		5		5					6				3		2	
	TS				3,4									2		2	
SRO-U-1 ☐	RX													0			0
	NOR	1												1			1
	I/C	2,3,4,6			1,2,3,4,6,7									10			2
	MAJ	5			5									2			1
	TS	3,4			3,4									4			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 (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* 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 *controlled* 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 I/C malfunctions on a one-for-one 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.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: PVNGS Date of Exam: 4/26/2021 Operating Test No.: 1/2/3/4

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
SRO-U-2 ☐	RX													0			0
	NOR	1												1			1
	I/C	2,3,4,6			1,2,3,4,6,7									10			2
	MAJ	5			5									2			1
	TS	3,4			3,4									4			2
SRO-U-3 ☐	RX													0			0
	NOR	1												1			1
	I/C	2,3,4,6			1,2,3,4,6,7									10			2
	MAJ	5			5									2			1
	TS	3,4			3,4									4			2
SRO-U-4 ☐	RX													0			0
	NOR	1												1			1
	I/C	2,3,4,6			1,2,3,4,6,7									10			2
	MAJ	5			5									2			1
	TS	3,4			3,4									4			2
SRO-U-5 ☐	RX													0			0
	NOR	1												1			1
	I/C	2,3,4,6			1,2,3,4,6,7									10			2
	MAJ	5			5									2			1
	TS	3,4			3,4									4			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 (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* 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 *controlled* 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 I/C malfunctions on a one-for-one 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.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: PVNGS Date of Exam: 4/26/2021 Operating Test No.: 1/2/3/4

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
SRO-U-6 ☐	RX													0			0
	NOR	1												1			1
	I/C	2,3,4,6			1,2,3,4,6,7									10			2
	MAJ	5			5									2			1
	TS	3,4			3,4									4			2
All scenario bean counts	RX																
	NOR	1	1														
	I/C	2,3,4,6	2,4	2,3,4,6	1,2,3,4,6,7	2,4,6	1,3,4,7	2,4,5,7	2,3,5,7	2,4,5	1,2,3,4,6,7	2,3,4,6	1,2,3,4,7				
	MAJ	5	5	5	5	5	5	6	6	6	5	5	5				
	TS	3,4			3,4			1,3			2,3						

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 (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* 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 *controlled* 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 I/C malfunctions on a one-for-one 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.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Appendix D	Scenario Outline	Form ES-D-1

Facility: Palo Verde	Scenario: 1	Test: 2021 NRC Exam
Examiners:	Operators:	
Initial Conditions: 2% Reactor Power, BOC		
Turnover: Maintain power stable, raise RCP 2A Bearing Oil Reservoir		

Event Number	Event Type*	Event Description
1	N (OATC)	Raise RCP 2A Bearing Oil Reservior
2	I (ALL)	RCS Loop 1 Tcold Instrument, TT-111X, Fails High
3	I (BOP), TS (CRS)	RCS Pressure Transmitter, RCB-PI-101B, Fails Low
4	C (ALL), TS (CRS)	Inadvertent Train 'A' SIAS Leg 2-4 / 'B' CEDM Fans Fail to Auto Start
5	M (ALL)	Loss of Offsite Power / 'A' EDG Trip / 'B' Spray Pond Pump Trip / 2 CEAs Fail to Insert
6	C (CRS, BOP)	AFAS Fails to Auto Actuate
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification		

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

Appendix D	Scenario Outline	Form ES-D-1

Facility: Palo Verde	Scenario: 2	Test: 2021 NRC Exam
Examiners:	Operators:	
Initial Conditions:		
Turnover:		

Event Number	Event Type*	Event Description
1	I (CRS, BOP)	SG #1 Steam Flow Transmitter, SGN-FT-1012, Fails Low
2	C (CRS, OATC)	'B' Charging Pump Trip (possible Loss of Letdown)
3	I (BOP), TS (CRS)	UV Relays 727-1 and 727-5 Fail
4	C (ALL), TS (CRS)	'A' NC Pump Trip / X-Tie NC and EW (Loss of Letdown if not during Event 2)
5	M (ALL)	1A RCP High Pressure Seal Cooler Leak
6	C (CRS, OATC)	CIVs Fail to Auto Close (K-Relay Failures)
7	I (CRS, BOP)	RRS Tavg Fails High
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification		

Actual	Target Quantitative Attributes
7	Total malfunctions (5-8)
2	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)

Appendix D	Scenario Outline	Form ES-D-1

Facility: Palo Verde	Scenario: 3	Test: 2021 NRC Exam
Examiners:	Operators:	
Initial Conditions: 100% Power, MOC		
Turnover: Maintain 100% power, 'B' NC Pump OOS		

Event Number	Event Type*	Event Description
1	TS (CRS)	'B' CS Header Isolation Valve, SIB-UV-671, Control Power Fuses Blow
2	I (ALL)	Turbine Load Input to RRS, TLI #2, Fails Low
3	I (OATC), TS (CRS)	Pressurizer Level Transmitter, LT-100X, Fails Low
4	C (CRS, BOP)	Stator Cooling Water Pump Trip, Standby Pump Fails to Auto Start
5	C (ALL)	Main Turbine Trip
6	M (ALL)	Loss of Coolant Accident
7	C (CRS, OATC)	'A' CS Pump Trip / 'B' CS Header Isolation Seized (cannot be opened locally)
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification		

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