

Facility: PVNGS														Date of Exam: 10/28/2016			
Tier	Group	RO K/A Category Points											SRO-Only Points				
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G*	Total	A2	G*	Total	
1. Emergency & Abnormal Plant Evolutions	1	3	3	2	N/A			3	5	N/A			2	18			
	2	1	1	2	N/A			1	2	N/A			2	9			
	Tier Totals	4	4	4	N/A			4	7	N/A			4	27			
2. Plant Systems	1	4	3	3	3	1	2	2	3	2	3	2	28				
	2	1	1	2	1	2	0	0	0	0	1	2	10				
	Tier Totals	5	4	5	4	3	2	2	3	2	4	4	38				
3. Generic Knowledge and Abilities Categories				<u>1</u>		<u>2</u>		<u>3</u>		<u>4</u>							
				3		3		2		2		10					
<p>Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 Radiation Control K/A is allowed if the K/A is replaced by a K/A from another Tier 3 Category).</p> <p>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.</p> <p>3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted with justification; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.</p> <p>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.</p> <p>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.</p> <p>6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.</p> <p>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.</p> <p>8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in a category other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.</p> <p>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.</p> <p>G* Generic K/As</p>																	

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G*	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1		X					EK2.2 Knowledge of the interrelations between the (Reactor Trip Recovery) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility. (CFR: 41.7 / 45.7)	3.5	1
000008 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. (CFR: 43.5 / 45.13)	3.6	2
000009 Small Break LOCA / 3					X		EA2.36 Ability to determine or interpret the following as they apply to a small break LOCA: Difference between overcooling and LOCA indications (CFR 43.5 / 45.13)	4.2	3
000011 Large Break LOCA / 3			X				EK3.13 Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: Hot-leg injection/recirculation. (CFR 41.5 / 41.10 / 45.6 / 45.13)	3.8	4
000015/17 RCP Malfunctions / 4	X						AK1.02 Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): Consequences of an RCPS failure. (CFR 41.8 / 41.10 / 45.3)	3.7	5
000022 Loss of Rx Coolant Makeup / 2					X		AA2.03 Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: Failures of flow control valve or controller. (CFR 43.5/ 45.13)	3.1	6
000025 Loss of RHR System / 4						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	7
000026 Loss of Component Cooling Water / 8				X			AA1. 07 Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: Flow rates to the components and systems that are serviced by the CCWS; interactions among the components. (CFR 41.7 / 45.5 / 45.6)	2.9	8
000027 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. (CFR 41.7 / 45.7)	2.6	9

000029 ATWS / 1		X						EK2.06 Knowledge of the interrelations between the following and an ATWS: Breakers, relays, and disconnects. (CFR 41.7 / 45.7)	2.9	10
000038 Steam Gen. Tube Rupture / 3							X	2.4.31 Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3)	4.2	11
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4										
000054 (CE/E06) Loss of Main Feedwater / 4	X							EK1.1 Knowledge of the operational implications of the following concepts as they apply to the (Loss of Feedwater): Components, capacity, and function of emergency systems. (CFR: 41.8 / 41.10 / 45.3)	3.2	12
000055 Station Blackout / 6						X		EA1.07 Ability to operate and monitor the following as they apply to a Station Blackout: Restoration of power from offsite. (CFR 41.7 / 45.5 / 45.6)	4.3	13
000056 Loss of Off-site 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. (CFR 41.8 / 41.10 / 45.3)	3.7	14
000057 Loss of Vital AC Inst. Bus / 6						X		AA1.01 Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: Manual inverter swapping . (CFR 41.7 / 45.5 / 45.6)	3.7	15
000058 Loss of DC Power / 6							X	AA2.03 Ability to determine and interpret the following as they apply to the Loss of DC Power: DC loads lost; impact on ability to operate and monitor plant systems . (CFR: 43.5 / 45.13)	3.5	16
000062 Loss of Nuclear Svc 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 (CFR 41.4, 41.8 / 45.7)	3.6	17
000065 Loss of Instrument Air / 8							X	AA2.08 Ability to determine and interpret the following as they apply to the Loss of Instrument Air: Failure modes of air-operated equipment. (CFR: 43.5 / 45.13)	2.9	18
W/E04 LOCA Outside Containment / 3										
W/E11 Loss of Emergency Coolant Recirc. / 4										
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4										
000077 Generator Voltage and Electric Grid Disturbances / 6										
K/A Category Totals:	3	3	2	3	5	2		Group Point Total:		18

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO / SRO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G*	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1			X				AK3.01 Knowledge of the reasons for the following responses as they apply to the Continuous Rod Withdrawal : Manually driving rods into position that existed before start of casualty. (CFR 41.5 / 41.10 / 45.6 / 45.13)	3.2	19
000003 Dropped Control Rod / 1									
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1						X	AA2.02 Ability to determine and interpret the following as they apply to the Emergency Boration: When use of manual boration valve is needed. (CFR: 43.5 / 45.13)	3.9	20
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7									
000033 Loss of Intermediate Range NI / 7						X	2.1.32 Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12)	3.8	21
000036 (BW/A08) Fuel Handling Accident / 8									
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4			X				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: Loss of steam dump capability upon loss of condenser vacuum. (CFR 41.5,41.10 / 45.6 / 45.13)	2.8	22
000059 Accidental Liquid Radwaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9		X					AK2.02 Knowledge of the interrelations between the Accidental Gaseous Radwaste Release and the following: Auxiliary building ventilation system. (CFR 41.7 / 45.7)	2.7	23
000061 ARM System Alarms / 7									
000067 Plant Fire On-site / 8									
000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4	X						EK1.01 Knowledge of the operational implications of the following concepts as they apply to the Inadequate Core Cooling : Methods of calculating subcooling margin. (CFR 41.8 / 41.10 / 45.3)	4.3	24
000076 High Reactor Coolant Activity / 9						X	AA2.01 Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: Location or process point that is causing an Alarm. (CFR: 43.5 / 45.13)	2.7	25

W/E01 & E02 Rediagnosis & SI Termination / 3												
W/E13 Steam Generator Over-pressure / 4												
W/E15 Containment Flooding / 5												
W/E16 High Containment Radiation / 9												
BW/A01 Plant Runback / 1												
BW/A02&A03 Loss of NNI-X/Y / 7												
BW/A04 Turbine Trip / 4												
BW/A05 Emergency Diesel Actuation / 6												
BW/A07 Flooding / 8												
BW/E03 Inadequate Subcooling Margin / 4												
BW/E08; W/E03 LOCA Cooldown - Depress. / 4												
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4				X						AA1.2 Ability to operate and / or monitor the following as they apply to the (Natural Circulation Operations): Operating behavior characteristics of the facility. (CFR: 41.7 / 45.5 / 45.6)	3.1	26
BW/E13&E14 EOP Rules and Enclosures												
CE/A11; W/E08 RCS Overcooling - PTS / 4												
CE/A16 Excess RCS Leakage / 2							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	27
CE/E09 Functional Recovery												
K/A Category Point Totals:	1	1	2	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	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G*	K/A Topic(s)	IR	#
003 Reactor Coolant Pump						X						K6.02 Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: RCP seals and seal water supply. (CFR: 41.7 / 45/5)	2.7	28
004 Chemical and Volume Control	X											K1.06 Knowledge of the physical connections and/or cause-effect relationships between the CVCS and the following systems: Makeup system to VCT. (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.1	29
004 Chemical and Volume Control									X			A4.06 Ability to manually operate and/or monitor in the control room: Letdown isolation and flow control valves (CFR: 41/7 / 45.5 to 45.8)	3.6	30
005 Residual Heat Removal									X			A4.02 Ability to manually operate and/or monitor in the control room: Heat exchanger bypass flow control. (CFR: 41.7 / 45.5 to 45.8)	3.4	31
005 Residual Heat Removal							X					A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the RHRs, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: RHR pump/motor malfunction (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.9	32
006 Emergency Core Cooling		X										K2.04 Knowledge of bus power supplies to the following: ESFAS-operated valves. (CFR: 41.7)	3.6	33
007 Pressurizer Relief/Quench Tank							X					A1.02 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including: Monitoring quench tank pressure. (CFR: 41.5 / 45.5)	2.7	34
008 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 (CFR: 41.7)	3.4	35
010 Pressurizer Pressure Control		X										K2.04 Knowledge of bus power supplies to the following: Indicator for code safety position (CFR: 41.7)	2.7	36
012 Reactor Protection									X			A3.06 Ability to monitor automatic operation of the RPS, including: Trip logic (CFR: 41.7 / 45.5)	3.7	37

012 Reactor Protection											X	2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	4.5	38
013 Engineered Safety Features Actuation			X									K4.01 Knowledge of ESFAS design feature(s) and/or interlock(s) which provide for the following: SIS reset. (CFR: 41.7)	3.9	39
022 Containment Cooling							X					A1.02 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: Containment pressure. (CFR: 41.5 / 45.5)	3.6	40
025 Ice Condenser														
026 Containment Spray	X											K1.01 Knowledge of the physical connections and/or cause effect relationships between the CSS and the following systems: ECCS (CFR: 41.2 to 41.9 / 45.7 to 45.8)	4.2	41
039 Main and Reheat Steam				X								K5.01 Knowledge of the operational implications of the following concepts as the apply to the MRSS: Definition and causes of steam/water hammer. (CFR: 441.5 / 45.7)	2.9	42
059 Main Feedwater			X									K3.02 Knowledge of the effect that a loss or malfunction of the MFW will have on the following: AFW system. (CFR: 41.7 / 45.6)	3.6	43
059 Main Feedwater			X									K4.02 Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following: Automatic turbine/reactor trip runback (CFR: 41.7)	3.3	44
061 Auxiliary/Emergency Feedwater											X	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	45
062 AC Electrical Distribution		X										K2.01 Knowledge of bus power supplies to the following: Major system loads (CFR: 41.7)	3.3	46
062 AC Electrical Distribution							X					A2.01 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: Types of loads that, if de-energized, would degrade or hinder plant operation (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.4	47

063 DC Electrical Distribution										X			A3.01 Ability to monitor automatic operation of the DC electrical system, including: Meters, annunciators, dials, recorders, and indicating lights (CFR: 41.7 / 45.5)	2.7	48
063 DC Electrical Distribution			X										K4.02 Knowledge of DC electrical system design feature(s) and/or interlock(s) which provide for the following: Breaker interlocks, permissives, bypasses and cross-ties (CFR: 41.7)	2.9	49
064 Emergency Diesel Generator	X												K1.03 Knowledge of the physical connections and/or cause effect relationships between the ED/G system and the following systems: Diesel fuel oil supply system (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.6	50
064 Emergency Diesel Generator					X								K6.07 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Air receivers. (CFR: 41.7 / 45.7)	2.7	51
073 Process Radiation Monitoring										X			A4.02 Ability to manually operate and/or monitor in the control room: Radiation monitoring system control panel (CFR: 41.7 / 45.5 to 45.8)	3.7	52
076 Service Water	X												K1.09 Knowledge of the physical connections and/or cause- effect relationships between the SWS and the following systems: Reactor building closed cooling water (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.0	53
078 Instrument Air			X										K3.02 Knowledge of the effect that a loss or malfunction of the IAS will have on the following: Systems having pneumatic valves and controls (CFR: 41.7 / 45.6)	3.4	54
103 Containment								X					A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the containment system and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations Phase A and B isolation (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.5	55
K/A Category Point Totals:	4	3	3	3	1	2	2	3	2	3	2		Group Point Total:		28

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO / SRO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G*	K/A Topic(s)	IR	#
001 Control Rod Drive														
002 Reactor Coolant					X							K5.08 Knowledge of the operational implications of the following concepts as they apply to the RCS: Why PZR level should be kept within the programmed band. (CFR: 41.5 / 45.7)	3.4	56
011 Pressurizer Level Control										X		A4.05 Ability to manually operate and/or monitor in the control room: Letdown flow controller (CFR: 41.7 / 45.5 to 45.8)	3.2	63
014 Rod Position Indication														
015 Nuclear Instrumentation														
016 Non-Nuclear Instrumentation											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	57
017 In-Core Temperature Monitor														
027 Containment Iodine Removal					X							K5.01 Knowledge of the operational implications of the following concepts as they apply to the CIRCS: Purpose of charcoal filters. (CFR: 41.7 / 45.7)	3.1	58
028 Hydrogen Recombiner and Purge Control		X										K2.01 Knowledge of bus power supplies to the following: Hydrogen recombiner (CFR: 41.7)	2.5	59
029 Containment Purge			X									K3.01 Knowledge of the effect that a loss or malfunction of the Containment Purge System will have on the following: Containment parameters. (CFR: 41.7 / 45.6)	2.9	60
033 Spent Fuel Pool Cooling														
034 Fuel Handling Equipment														
035 Steam Generator														
041 Steam Dump/Turbine Bypass Control											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	61
045 Main Turbine Generator														

Facility: PVNGS		Date of Exam: 10/28/2016				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.14	Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trips, mode changes, etc. (CFR: 41.10 / 43.5 / 45.12)	3.1	66		
	2.1.26	Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen). (CFR: 41.10 / 45.12)	3.4	67		
	2.1.34	Knowledge of primary and secondary plant chemistry limits. (CFR: 41.10 / 43.5 / 45.12)	2.7	68		
	Subtotal			3		
2. Equipment Control	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity. (CFR: 41.5 / 41.10 / 43.5 / 43.6 / 45.1)	4.5	69		
	2.2.13	Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13)	4.1	70		
	2.2.12	Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)	3.7	71		
	Subtotal			3		
3. Radiation Control	2.3.12	Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10)	3.2	72		
	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	2.4.3	Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4)	3.7	74		
	2.4.14	Knowledge of general guidelines for EOP usage. (CFR: 41.10 / 45.13)	3.8	75		
	Subtotal			2		
Tier 3 Point Total				10		

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1 Question 7	025 G 2.2.12	The only surveillance procedure associated with a loss of RHR essentially boils down to asking what constitutes operability of the RHR system based on surveillance results, which would be SRO level knowledge. Reselected 025 G 2.2.44
1/1 Question 3	009 EA2.38	Unable to create plausible distractors for EA2.38, "Ability to determine or interpret the following as they apply to a small break LOCA: Existence of a head bubble". Reselected 009 EA2.36.
1/1 Question 9	027 AK3.04	Unable to create an operationally valid question with plausible distractors for 027 AK3.04, "Knowledge of the reasons for the following responses as they apply to the Pressurizer Pressure Control Malfunctions: Why, if PZR level is lost and then restored, that pressure recovers much more slowly". Reselected 027 AK2.03. Additionally, changed from a K3 to a K2 which makes the Tier 1 total for K2 and K3 4 items each instead of 3 K2 and 5 K3.
2/1 Question 30	004 A4.04	Calculating boron concentration changes is not an evolution performed by ROs at PVNGS. KA is not operationally relevant to the RO position at PVNGS. Reselected 004 A4.06.
2/1 Question 36	010 K2.03	PVNGS does not have PORVs. Reselected 010 K2.04 for pressurizer code safeties (in lieu of PORV).
2/1 Question 38	012 G 2.4.9	Accident mitigation strategies at PVNGS have very few changes based on whether the event takes place at high or low power, with the exception of an accident while on Shutdown Cooling. There are 3 other questions on the RO exam regarding RHR and Loss of RHR, therefore the topic would have been too highly sampled. Reselected 012 G 2.4.2.
2/1 Question 54	078 K3.03	PVNGS does not have the ability to cross tie IA between units and none of the systems which can be cross tied are cross tied using air operated valves. Reselected 078 K3.02.
2/1 Question 32	005 A2.01	PVNGS does not have any RHR related components in which a transmitter failure would require action to be taken (in all cases, enhanced monitoring would be all that is required), therefore the correct answer to any written exam item would effectively be "no action required". Reselected 005 A2.03.
2/1 Question 34	007 A1.03	The RDT (PVNGS equivalent of a quench tank) does not have any interlocks or automatic actions which occur based on quench tank temperature making this KA difficult to match with an operationally relevant question. Reselected 007 A1.02 for quench tank pressure.
2/1 Question 52	073 A4.03	PVNGS does not have the ability to perform or observe source checks for operability demonstration from the control room. Additionally, this task is not performed by operations. Topic does not apply to PVNGS and is not operationally relevant. Reselected 072 A4.02.
2/1 Question 47	062 A2.06	PVNGS electric plant is designed such that one class bus can be powered from the opposite side EDG or ESF transformer as there are always 2 breakers separating the buses, making 062 A2.06 non-applicable. Reselected 062 A2.01.
2/1 Question 55	103 A2.04	PVNGS does not have a Containment Evacuation alarm (retired in place). Reselected 103 A2.03.
2/2 Question 60	029 K3.02	After attempting to write a question using several different combinations of initial conditions, various containment parameters and different times at which the purge system would malfunction, each one either resulted in an answer of "no effect – entry may continue" or a correct answer which could legitimately be challenged due to procedural allowances under certain conditions. Since we couldn't make a question in which the loss of purge had a clear impact with a clear answer, we reselected 029 K3.01.
2/2 Question 63	068 A4.02	PVNGS is a zero liquid radwaste release plant. The other A4 topics in liquid radwaste were not applicable and/or operationally relevant at PVNGS. This was the only A in Tier 2 Group 2 so KA was replaced with an A4 from 011 Pressurizer Level Control System. Reselected 011 A4.05 due to recent plant OE regarding misoperation of the Pressurizer Level Control System, specifically in regards to swapping the letdown flow controller between remote/auto and local/auto control.
2/2 Question 65	086 K1.03	PVNGS has no direct or indirect connections between the Fire Protection System and the AFW System. Reselected 086 K1.02.

2/2 Question 61	041 G 2.2.3	PVNGS has no design, procedural, or operational differences between units in regards to the Steam Dump/Turbine Bypass Control system. Reselected 041 G 2.2.44.
3 Question 71	G 2.2.20	Managing troubleshooting activities is an SRO only task at PVNGS and is therefore not operationally relevant for the RO portion of the written exam. Reselected G 2.2.12.

Facility: PVNGS		Date of Exam: 10/28/2016																			
Tier	Group	RO K/A Category Points												SRO-Only Points							
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G*	Total	A2	G*	Total					
1. Emergency & Abnormal Plant Evolutions	1																3	3	6		
	2																2	2	4		
	Tier Totals																5	5	10		
2. Plant Systems	1																2	3	5		
	2																1	1	3		
	Tier Totals																4	4	8		
3. Generic Knowledge and Abilities Categories																	1	2	3	4	7
																	2	2	1	2	

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

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G*	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1									
000008 Pressurizer Vapor Space Accident / 3									
000009 Small Break LOCA / 3									
000011 Large Break LOCA / 3									
000015/17 RCP 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. (CFR 43.5 / 45.13)	3.7	77
000022 Loss of Rx Coolant Makeup / 2									
000025 Loss of RHR System / 4						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	78
000026 Loss of Component Cooling Water / 8									
000027 Pressurizer Pressure Control System Malfunction / 3									
000029 ATWS / 1									
000038 Steam Gen. Tube Rupture / 3					X		EA2.15 Ability to determine and interpret the following as they apply to a SGTR: Pressure at which to maintain RCS during S/G cooldown	4.4	76
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4						X	2.4.6 Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	4.7	79
000054 (CE/E06) Loss of Main Feedwater / 4									
000055 Station Blackout / 6						X	2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. (CFR: 41.7 / 43.5 / 45.12)	4.6	80
000056 Loss of Off-site Power / 6									
000057 Loss of Vital AC Inst. Bus / 6									
000058 Loss of DC Power / 6									
000062 Loss of Nuclear Svc Water / 4									
000065 Loss of Instrument Air / 8									
W/E04 LOCA Outside Containment / 3									
W/E11 Loss of Emergency Coolant Recirc. / 4									
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4									

000077 Generator Voltage and Electric Grid Disturbances / 6					X		AA2.05 Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: Operational status of offsite circuit. (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)	3.8	81
K/A Category Totals:					3	3	Group Point Total:		6

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions – Tier 1/Group 2 (RO / SRO)						Form ES-401-2		
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G*	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1									
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1									
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7						X	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. (CFR: 41.5 / 43.5 / 45.12 / 45.13)	4.7	82
000033 Loss of Intermediate Range NI / 7									
000036 (BW/A08) Fuel Handling Accident / 8					X		AA2.03 Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: Magnitude of potential radioactive release (CFR: 43.5 / 45.13)	4.2	83
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4									
000059 Accidental Liquid Radwaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9									
000061 ARM System Alarms / 7									
000067 Plant Fire On-site / 8					X		AA2.16 Ability to determine and interpret the following as they apply to the Plant Fire on Site: Vital equipment and control systems to be maintained and operated during a fire. (CFR: 43.5 / 45.13)	4.0	84
000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									
W/E01 & E02 Rediagnosis & SI Termination / 3									
W/E13 Steam Generator Over-pressure / 4									
W/E15 Containment Flooding / 5									
W/E16 High Containment Radiation / 9									
BW/A01 Plant Runback / 1									
BW/A02&A03 Loss of NNI-XY / 7									
BW/A04 Turbine Trip / 4									
BW/A05 Emergency Diesel Actuation / 6									
BW/A07 Flooding / 8									
BW/E03 Inadequate Subcooling Margin / 4									
BW/E08; W/E03 LOCA Cooldown – Depress. / 4									
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4									

BW/E13&E14 EOP Rules and Enclosures										
CE/A11; W/E08 RCS Overcooling – PTS / 4										
CE/A16 Excess RCS Leakage / 2										
CE/E09 Functional Recovery							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)	4.4	85
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	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G*	K/A Topic(s)	IR	#
003 Reactor Coolant Pump														
004 Chemical and Volume Control														
005 Residual Heat Removal														
006 Emergency Core Cooling														
007 Pressurizer Relief/Quench Tank											X	2.2.38 Knowledge of conditions and limitations in the facility license. (CFR: 41.7 / 41.10 / 43.1 / 45.13)	4.5	86
008 Component Cooling Water														
010 Pressurizer Pressure Control														
012 Reactor Protection														
013 Engineered Safety Features Actuation								X				A2.06 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; Inadvertent ESFAS actuation (CFR: 41.5 / 43.5 / 45.3 / 45.13)	4.0	87
022 Containment Cooling														
025 Ice Condenser														
026 Containment Spray														
039 Main and Reheat Steam														
059 Main Feedwater								X				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Feeding a dry S/G. (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.4	88
061 Auxiliary/Emergency Feedwater														
062 AC Electrical Distribution														
063 DC Electrical Distribution														
064 Emergency Diesel Generator														
073 Process Radiation Monitoring											X	2.1.28 Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	4.1	89
076 Service Water														
078 Instrument Air														

103 Containment																			X	2.4.41 Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)	4.6	90	
K/A Category Point Totals:																				2	3	Group Point Total:	5

ES-401	PWR Examination Outline Plant Systems – Tier 2/Group 2 (RO / SRO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G*	K/A Topic(s)	IR	#
001 Control Rod Drive														
002 Reactor Coolant														
011 Pressurizer Level Control														
014 Rod Position Indication														
015 Nuclear Instrumentation														
016 Non-Nuclear Instrumentation														
017 In-Core Temperature Monitor											X	2.1.27 Knowledge of system purpose and/or function. (CFR: 41.7)	4.0	91
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control														
029 Containment Purge														
033 Spent Fuel Pool Cooling														
034 Fuel Handling Equipment						X						K6.01 Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System: Fuel handling equipment. (CFR: 41.7 / 45.7)	3.0	92
035 Steam Generator														
041 Steam Dump/Turbine Bypass Control														
045 Main Turbine Generator														
055 Condenser Air Removal														
056 Condensate														
068 Liquid Radwaste														
071 Waste Gas Disposal								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Use of waste gas release monitors, radiation, gas flow rate, and totalizer (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.6	93
072 Area Radiation Monitoring														
075 Circulating Water														
079 Station Air														
086 Fire Protection														
K/A Category Point Totals:						1		1			1	Group Point Total:		3

Facility: PVNGS		Date of Exam: 10/28/2016				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.15	Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc. (CFR: 41.10 / 45.12)			3.4	94
	2.1.42	Knowledge of new and spent fuel movement procedures. (CFR: 41.10 / 43.7 / 45.13)			3.4	95
	Subtotal					2
2. Equipment Control	2.2.21	Knowledge of pre- and post-maintenance operability requirements. (CFR: 41.10 / 43.2)			4.1	96
	2.2.38	Knowledge of conditions and limitations in the facility license. (CFR: 41.7 / 41.10 / 43.1 / 45.13)			4.5	97
						2
	Subtotal					
3. Radiation Control	2.3.11	Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10)			4.3	98
						1
	Subtotal					
4. Emergency Procedures / Plan	2.4.8	Knowledge of how abnormal operating procedures are used in conjunction with EOPs. (CFR: 41.10 / 43.5 / 45.13)			4.5	99
	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. (CFR: 41.10 / 43.5 / 45.13)			4.2	100
	Subtotal					2
Tier 3 Point Total						7

Administrative Topics Outline

Facility:	PVNGS	Date of Examination:	10/28/16
Examination Level	RO	Operating Test Number:	2016 NRC
Administrative Topic (see Note)	Type Code*	Describe Activity to be Performed	
Conduct of Operations (A1)	D, R	<p>JPM: Determine actual Pressurizer levels in MODE 5 and determine if reference leg backfills are required.</p> <p>K/A: 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.</p> <p>IR: 3.9 / 4.2</p>	
Conduct of Operations (A2)	M, R	<p>JPM: Determine the minimum required flash protection boundaries and EPE to rack out a breaker.</p> <p>K/A: 2.1.26 Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen, and hydrogen).</p> <p>IR: 3.4 / 3.6</p>	
Equipment Control (A3)	N, R	<p>JPM: Determine if acceptance criteria is met for PPS instrumentation channel checks.</p> <p>K/A: 2.2.12 Knowledge of surveillance procedures.</p> <p>IR: 3.7 / 4.1</p>	
Radiation Control (A4)	M, R	<p>JPM: Determine the valves which should be used for a clearance which will result in the lowest dose to the workers.</p> <p>K/A: 2.3.14 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.</p> <p>IR: 3.4 / 3.8</p>	
Emergency Plan			
<p>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.</p>			
<p>*Type Codes & Criteria:</p> <p style="padding-left: 40px;">(C)ontrol room, (S)imulator, or Class(R)oom</p> <p style="padding-left: 40px;">(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (1)</p> <p style="padding-left: 40px;">(N)ew or (M)odified from bank (≥ 1) (3)</p> <p style="padding-left: 40px;">(P)revious 2 exams (≤ 1; randomly selected) (0)</p>			

Administrative Topics Outline
Task Summary

- A1 The applicant is provided with indicated Pressurizer level from three level instruments as well as current RCS temperature and pressure. The applicant will compare the data to graphs with a variety of data lines which they will use to interpolate the actual Pressurizer level per 40OP-9ZZ01, Cold Shutdown to Hot Standby Mode 5 to Mode 3. The applicant will then compare the three values to determine if reference leg backfills are required. This is a bank JPM.
- A2 The applicant will use 01DP-0IS13, Palo Verde Electrical Safe Work Practices, to evaluate a series of matrices listing a variety of electrical evolutions and voltage ranges and their corresponding safety requirements. This is a modified JPM. The bank version of this JPM uses a 4.16kV breaker and this JPM was changed to a 480V breaker. Both the flash protection boundary and the minimum required EPE are different from the original JPM.
- A3 The applicant is provided a list of indicated values for PPS related parameters which they will use to determine the maximum deviations between any two channels, and determine if the deviations are within the listed acceptance values per 40ST-9ZZM1, Operations Mode 1 Surveillances. This is a new JPM.
- A4 The applicant is provided a drawing with sets of valves (both upstream and downstream) which could be used to isolate a valve that has a point source hot spot. The applicant will utilize the curie-meter rem rule and point source equations to determine total expected dose for each possible isolation and select the isolation resulting in the lowest dose. This is a modified bank JPM. JPM was modified by changing the distances of the potential isolations from the valve to be isolated resulting in a different answer than the original JPM.

Administrative Topics Outline

Facility: PVNGS		Date of Examination: 10/28/16
Examination Level	SRO	Operating Test Number: 2016 NRC
Administrative Topic (see Note)	Type Code*	Describe Activity to be Performed
Conduct of Operations (A5)	N, R	JPM: Determine the active/inactive status of 3 licensed operators. K/A: 2.1.1 Knowledge of conduct of operations requirements. IR: 3.8 / 4.2
Conduct of Operations (A6)	M, R	JPM: Determine the minimum required flash protection boundaries and EPE to rack out a breaker. K/A: 2.1.26 Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen, and hydrogen). IR: 3.4 / 3.6
Equipment Control (A7)	D, R	JPM: Determine LCOs entered and exited given a timeline of events. K/A: 2.2.40 Ability to apply Technical Specifications for a system IR: 3.4 / 4.7
Radiation Control (A8)	N, R	JPM: Determine the maximum dose a pregnant AO may receive for the duration of pregnancy and any reporting requirements. K/A: 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. IR: 3.2 / 3.7
Emergency Plan (A9)	D, R	JPM: Determine EAL classification and fill out NAN Emergency Message Form. K/A: 2.4.41 Knowledge of the emergency action level thresholds and classifications. IR: 2.9 / 4.6

Administrative Topics Outline

Task Summary

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 is provided a list of all watches stood by three licensed operators during the previous quarter. The applicant must compare the watches stood by each individual to the requirements in 40DP-9OP02, Conduct of Shift Operations, and determine whether or not each of their licenses are active for the current quarter. This is a new JPM.
- A6 The applicant will use 01DP-0IS13, Palo Verde Electrical Safe Work Practices, to evaluate a series of matrices listing a variety of electrical evolutions and voltage ranges and their corresponding safety requirements. This is a modified JPM. The bank version of this JPM uses a 4.16kV breaker and this JPM was changed to a 480V breaker. Both the flash protection boundary and the minimum required EPE are different from the original JPM.
- A7 The applicant is provided a timeline of events during which various related pieces of plant equipment are declared inoperable and restored to operable status. The applicant must determine which LCO conditions are entered and exited, and at what times those conditions are entered or exited, based on the provided timeline. This is a bank JPM.
- A8 The applicant is provided with a timeline of events and dose history for a pregnant AO. The applicant must determine the remaining allowable dose for the AO and reporting requirements resulting from the listed conditions per 75DP-9RP01, Radiation Exposure and Access Control. This is a new JPM.
- A9 The applicant is provided with plant conditions which require an EAL classification to be declared. They will utilize all associated E-Plan procedures to determine the correct EAL. They will have 15 minutes to make the official declaration. When the event has been declared, they will fill out the NAN Emergency Message Form for the post-declaration notifications. They will have 13 minutes to complete the EP-0541 form (to allow time for the notifications to be made within the 15 minutes window). This is a time-critical, bank JPM.

Facility:	PVNGS	Date of Examination:	10/28/16
Exam Level:	RO SRO(I) SRO (U)	Operating Test No.:	2016 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	001 (RO ONLY) Perform CEA Operability Check	N, S	1
S2	013 Verify Recirculation Actuation Signal actuation	A, D, EN, L, S	2
S3	006 Raise Safety Injection Tank pressure	N, S	3
S4	003 Operate RCPs and seal bleedoff in response to a loss of NC	A, M, S	4P
S5	061 Loss of Turbine Water Cooling, Reducing Heat Loads on TC	A, D, L, S	4S
S6	022 Restoration of Containment Cooling	D, L, S	5
S7	062 Perform contingency actions for verification of vital auxiliaries in SPTAs	A, D, L, S	6
S8	015 De-energizing startup channels (40OP-9ZZ03, App D, section D.2.2)	L, N, S	7
In-Plant Systems [®] (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
P1	068 Align borated water source	A, D, E, R	8
P2	004 Respond to gas binding of a Charging Pump	E, N, R	2
P3	028 Place Purge Exhaust in service	E, D, R	5

RO: Will perform all simulator and in-plant JPMs

SRO(I): Will perform all simulator and in-plant JPMs with the exception of S-1

SRO(U): Will perform S-2, S-4, S-5, P-1, P-3 (**safety functions 2, 4P, 4S, 5 and 8**)

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

**NRC JPM Examination
Summary Description**

- S1 The applicant will perform 40ST-9SF01, CEA Operability Checks, Section 6.1, Exercising CEAs at Power, following the replacement of an ACTM card for CEA 66. The applicant will select the correct CEA, select the correct mode of operation, insert the CEA a minimum of 5" (minimum required for the ST) not to exceed 6.6" (TS limit for CEA deviation) and withdraw the CEA back to the upper electrical limit. This is a new JPM and is covered by safety function 1.
- S2 The applicant will be directed to perform 40EP-9EO03, LOCA, step 58, verification of RAS actuation. The applicant will determine that not all RAS actuated equipment automatically aligned to their actuated position and will take contingency actions in response to this condition. The applicant will have to identify the Train 'B' ESF pump suction valve from containment, SIB-UV-675, did not open and stop the Train 'B' HPSI and Train 'B' CS Pumps. This is a time critical, alternate path, bank JPM and is covered by safety function 2.
- S3 The applicant will be directed to raise pressure on Safety Injection Tank 1A per 40OP-9SI03, Safety Injection Tank Operations, Section 6.1, Pressurizing the Safety Injection Tanks to Establish or Maintain Normal Pressure. The applicant will align nitrogen to SIT 1A and commence raising pressure. The applicant must stop raising pressure after exceeding 615 psig (directed in cue) and prior to exceeding 625 psig (TS limit), and restore the normal nitrogen lineup. This is a new JPM and is covered by safety function 3.
- S4 The applicant will be directed to perform 40AO-9ZZ03, Loss of Cooling Water, Section 4.0, Nuclear Cooling Water, steps 5 and 6. The applicant will be required to perform the procedural diagnostic steps to determine what the cause of the loss of NC was (an

- inadvertent closure of an NC containment isolation valve), attempt to mitigate the event by reopening the containment isolation valve (won't reopen), and take the contingency actions to close the other two NC containment isolation valves, trip the reactor, stop all of the RCPs, and isolate seal bleedoff. One of the seal bleedoff isolation valves will fail to close and the applicant will have to isolate bleedoff using alternate means (closing the inside and outside seal bleedoff containment isolation valves and closing the bleedoff relief isolation valve). This is a time critical, alternate path, modified bank JPM and is covered by safety function 4P.
- S5 The applicant will be directed to perform 40AO-9ZZ03, Loss of Cooling Water, Appendix B, Minimize Cooling Load on TC, following a complete loss of Turbine Cooling Water. The applicant will isolate SG blowdown, transition to auxiliary feedwater, trip the Main Feedwater Pumps, stop all Condensate Pumps and stop both Heater Drain Pumps. In the setup of the JPM, both TC pumps will be tripped, the reactor will have been tripped, and Auxiliary Feedwater Pump B will be tagged out. The cue will direct transitioning to Auxiliary Feedwater Pump N, which will not be able to be started due to one of the suction valves being seized closed. The applicant will determine that Auxiliary Feedwater Pump A is the only viable option and will manually start Auxiliary Feedwater Pump A to supply feedwater and allow tripping of the Main Feedwater Pumps. This is an alternate path, bank JPM covered by safety function 4S.
- S6 The applicant will be directed to perform 40EP-9EO10, Standard Appendices, Appendix 17, Restoration of Containment Cooling. The applicant will have to restore chill water to containment, ensuring valves are operated in a particular sequence to ensure chill water reliefs do not lift, and reset and restart the appropriate Air Cooling Units to restore containment cooling. This is a bank JPM and is covered by safety function 5.
- S7 The applicant will be directed to perform the Vital Auxiliaries verification per 40EP-9EO01, Standard Post Trip Actions. The applicant will determine that the Train 'B' Class 4kV bus is de-energized with the 'B' EDG running and EDG output breaker open. The applicant will utilize the Standard Appendix 115 hard card to take contingency actions to re-energize the Train 'B' Class 4kV bus. Upon restoration of the bus, the applicant will then have to recognize that the associated Spray Pond Pump has not started automatically and start the pump manually within 2.6 minutes (time critical action). This is a time critical, alternate path, bank JPM covered by safety function 6.
- S8 The applicant will be directed to de-energize startup channel NIs per 40OP-9ZZ03, Reactor Startup, Appendix D, Checking NI Overlap and Turning Off Startup Channels. The applicant will de-energize high volts from the NIs, transfer detector display from startup channels to control channels, reset all trouble and high CPS alarms, and reset the Boron Dilution Alarm System (BDAS) alarm. This is a new JPM covering safety function 7.
- P1 The applicant will be directed to align Charging Pump suction to the Refueling Water Tank (RWT) per 40AO-9ZZ19, Control Room Fire, Appendix G, Upper Auxiliary Building Actions. The applicant will enter the aux building and attempt to realign the Charging Pump suction by operating valves from their associated load centers, however CHE-HV-536, RWT Gravity Feed to Charging Pump Suction Valve, will not open at the load center

requiring local manual operation of the valve. The other valves in the sequence will operate as expected from their load centers. This is a time critical, alternate path, bank JPM covered by safety function 8.

- P2 The applicant will be directed to determine the failed Charging Pump Pulsation Dampener Bladder following gas binding of a Charging Pump and isolate the failed pump per 40AO-9ZZ05, Loss of Charging or Letdown, Appendix I, Venting Charging Pumps and Header to the Recycle Drain Header. The applicant will check pulsation dampener supply pressure on the Charging Pumps and when the faulted pump is identified, will isolate the affected Charging Pump. This is a new JPM covered by safety function 2.
- P3 The applicant will be directed to place the Train 'A' Purge Exhaust Unit in service per 40EP-9EO10, Standard Appendices, Appendix 19, Containment Hydrogen Control, Attachment 19-J, Placing Purge Exhaust in Service. The applicant will align air to the hydrogen recombiner, unisolate service air purge line to containment, and energize the purge unit duct heater to place the purge exhaust unit in service. This is a bank JPM covered by safety function 5.

Facility:	PVNGS	Scenario No.:	1	Op Test No.:	2016 NRC Exam
Examiners:	_____	Operators:	_____	_____	_____
Initial Conditions: 2% power, MOC, AFA-P01 OOS					
Turnover: Maintain steady state operations, transfer from 'B' EHC Pump in service to 'A' EHC Pump in service.					
Event No.	Malf. No.	Event Type*	Event Description		
1		N (BOP)	Transfer from EHC Pump 'B' to EHC Pump 'A' in service		
2		I (ATC) TS (SRO)	Pressurizer Level Transmitter RCA-LI-110X fails to 100%		
3		C (SRO, BOP)	Plant Cooling Water Pump shaft shear, standby pump fails to auto start		
4		I (SRO, ATC, BOP)	Reactor Regulating System T _{HOT} fails high		
5		I (SRO, BOP) TS (SRO)	Inadvertent MSIS		
6		M (ALL)	Loss of Off-Site Power (trip initiator)		
7		C (ATC, SRO)	Full Strength CEA 57 fails to insert on trip – emergency boration		
8		C (BOP, SRO)	'B' EDG Output Breaker fails to close		
9		M (ALL)	Aux Feed Pump AFN-P01 overcurrent trip		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Technical Specifications					

Actual	Target Quantitative Attributes
8	Total malfunctions (5-8)
3	Malfunctions after EOP entry (1-2)
4	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)

Facility:	PVNGS	Scenario No.:	2	Op Test No.:	2016 NRC Exam
Examiners:	_____	Operators:	_____		
	_____		_____		
	_____		_____		
Initial Conditions: 100% power, MOC, AFA-P01 OOS					
Turnover: Maintain steady state operations, transfer house loads from the unit aux transformers to the startup transformers.					
Event No.	Malf. No.	Event Type*	Event Description		
1		N (ATC)	Transfer of House Loads from Unit Aux Xfmr to S/U Xfmrs		
2		I (CRS, BOP)	SG level transmitter fails to 53%		
3		C (CRS, BOP, ATC) TS (CRS)	Inadvertent Train 'B' CSAS		
4		R (BOP, ATC) C (CRS) TS (CRS)	CEA 66 drop		
5		M (ALL)	ESD inside containment		
6		C	NAN-S01 and NAN-S02 normal supply breakers 86LO on reactor trip.		
7		C (BOP)	SIAS/CIAS/MSIS fail to auto actuate		
8		C	Train 'A' CS Flow Control Valve SIA-UV-672 seized closed		
9		M (ALL)	Train 'B' CS Pump sheared shaft		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Technical Specifications					

Actual	Target Quantitative Attributes
8	Total malfunctions (5-8)
4	Malfunctions after EOP entry (1-2)
3	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)

Facility:	PVNGS	Scenario No.:	3	Op Test No.:	2016 NRC Exam
Examiners:	_____	Operators:	_____		
	_____		_____		
	_____		_____		
Initial Conditions: 100% power, MOC, AFA-P01 OOS					
Turnover:					
Event No.	Malf. No.	Event Type*	Event Description		
1		C (CRS, ATC, BOP) TS (CRS)	'A' Nuclear Cooling Water Pump trip, 'B' fails to auto start, also causes a loss of letdown and a loss of normal chillers		
2		I (CRS, ATC, BOP)	Loss of Non-Class Instrument Bus NNN-D15		
3		C (CRS, ATC)	Gas Binding on 'B' Charging Pump due to ruptured bladder on the suction stabilizer		
4		C (CRS, ATC, BOP) TS (CRS)	'B' Nuclear Cooling Water Pump trip, Cross-Tie NC and EW		
5		M (CRS, BOP, ATC)	2B RCP HP Seal Cooler Leak (trip initiator)		
6		C (CRS, ATC or BOP)	Train 'A' Class 4kV Bus PBA-S03 fault		
7		C (CRS, ATC, BOP)	Train 'B' BOP-ESFAS Sequencer failure		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Technical Specifications					

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)
3	Critical tasks (2-3)