Facility: Palo Verde Date of Exam:

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*		Total
1. Emergency and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18					6
	2	1	2	1				2	2			1	9					4
	Tier Totals	4	5	4				5	5			4	27					10
2. Plant Systems	1	3	2	3	3	2	2	3	3	2	2	3	28					5
	2	1	1	1	1	1	1	0	1	1	1	1	10					3
	Tier Totals	4	3	4	4	3	3	3	4	3	3	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)									
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					√		EA2.03 Ability to determine or interpret the following as they apply to a reactor trip: Reactor trip breaker position	4.2	1
000008 (APE 8) Pressurizer Vapor Space Accident / 3							Not sampled		
000009 (EPE 9) Small Break LOCA / 3					√		EA2.39 Ability to determine or interpret the following as they apply to a small break LOCA: Adequate core cooling	4.3	2
000011 (EPE 11) Large Break LOCA / 3						√	2.4.47 Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	3
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					√		AA2.09 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 high stator temperatures	3.4	4
000022 (APE 22) Loss of Reactor Coolant Makeup / 2						√	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	5
000025 (APE 25) Loss of Residual Heat Removal System / 4				√			AA1.02 Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: RCS inventory	3.8	6
000026 (APE 26) Loss of Component Cooling Water / 8			√				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	√						AK1.02 Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: Expansion of liquids as temperature increases	2.8	8
000029 (EPE 29) Anticipated Transient Without Scram / 1		√					EK2.06 Knowledge of the interrelations between the and the following an ATWS: Breakers, relays, and disconnects	2.9	9
000038 (EPE 38) Steam Generator Tube Rupture / 3	√						EK1.01 Knowledge of the operational implications of the following concepts as they apply to the SGTR: Use of steam tables	3.1	10
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4		√					EK2.2 Knowledge of the interrelations between the (Excess Steam Demand) 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.	3.2	11
000054 (APE 54; CE E06) Loss of Main Feedwater /4	√						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.	3.2	12
000055 (EPE 55) Station Blackout / 6			√				EK3.02 Knowledge of the reasons for the following responses as the apply to the Station Blackout: Actions contained in EOP for loss of offsite and onsite power	4.3	13
000056 (APE 56) Loss of Offsite Power / 6							Not Sampled		
000057 (APE 57) Loss of Vital AC Instrument Bus / 6			√				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Vital AC Instrument Bus: Actions contained in EOP for loss of vital ac electrical instrument bus	4.1	14

000058 (APE 58) Loss of DC Power / 6						√	2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.0	15
000062 (APE 62) Loss of Nuclear Service Water / 4				√			AA1.02 Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): Loads on the SWS in the control room	3.2	16
000065 (APE 65) Loss of Instrument Air / 8				√			AA1.05 Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: RPS	3.3	17
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6		√					AK2.03 Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Sensors, detectors, indicators	3.0	18
(W E04) LOCA Outside Containment / 3							N/A for CE design		
(W E11) Loss of Emergency Coolant Recirculation / 4							N/A for CE design		
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4							N/A for CE design		
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18/6

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1	√						AK1.21 Knowledge of the operational implications of the following concepts as they apply to Continuous Rod Withdrawal: Integral rod worth	2.9	19
000003 (APE 3) Dropped Control Rod / 1							Not sampled		
000005 (APE 5) Inoperable/Stuck Control Rod / 1				√			AA1.01 Ability to operate and / or monitor the following as they apply to the Inoperable / Stuck Control Rod: CRDS	3.6	20
000024 (APE 24) Emergency Boration / 1							Not sampled		
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2							Not sampled		
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7							Not sampled		
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7							Not sampled		
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8							Not sampled		
000037 (APE 37) Steam Generator Tube Leak / 3							Not sampled		
000051 (APE 51) Loss of Condenser Vacuum / 4							Not sampled		
000059 (APE 59) Accidental Liquid Radwaste Release / 9		√					AK2.02 Knowledge of the interrelations between the Accidental Liquid Radwaste Release and the following: Radioactive-gas monitors	2.7	21
000060 (APE 60) Accidental Gaseous Radwaste Release / 9						√	2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual	4.2	22
000061 (APE 61) Area Radiation Monitoring System Alarms / 7							Not sampled		
000067 (APE 67) Plant Fire On Site / 8							Not sampled		
000068 (APE 68; BW A06) Control Room Evacuation / 8		√					AK2.01 Knowledge of the interrelations between the Control Room Evacuation and the following: Auxiliary shutdown panel layout	3.9	23
000069 (APE 69; W E14) Loss of Containment Integrity / 5			√				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Containment Integrity: Guidance contained in EOP for loss of containment integrity	3.8	24
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4							Not sampled		
000076 (APE 76) High Reactor Coolant Activity / 9					√		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	2.7	25
000078 (APE 78*) RCS Leak / 3							Not sampled		
(W E01 & E02) Rediagnosis & SI Termination / 3							N/A for CE design		
(W E13) Steam Generator Overpressure / 4							N/A for CE design		
(W E15) Containment Flooding / 5							N/A for CE design		
(W E16) High Containment Radiation /9							N/A for CE design		
(BW A01) Plant Runback / 1							N/A for CE design		
(BW A02 & A03) Loss of NNI-X/Y/7							N/A for CE design		
(BW A04) Turbine Trip / 4							N/A for CE design		

(BW A05) Emergency Diesel Actuation / 6							N/A for CE design		
(BW A07) Flooding / 8							N/A for CE design		
(BW E03) Inadequate Subcooling Margin / 4							N/A for CE design		
(BW E08; W E03) LOCA Cooldown—Depressurization / 4							N/A for CE design		
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4					√		AA2.2 Ability to determine and interpret the following as they apply to the (Natural Circulation Operations): Adherence to appropriate procedures and operation within the limitations in the Facility's license and amendments.	2.9	26
(BW E13 & E14) EOP Rules and Enclosures							N/A for CE design		
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4				√			AA1.1 Ability to operate and / or monitor the following as they apply to the (RCS Overcooling) Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.3	27
(CE A16) Excess RCS Leakage / 2							Not sampled		
(CE E09) Functional Recovery							Not sampled		
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4							Not sampled		
K/A Category Point Totals:	1	2	1	2	2	1	Group Point Total:		9/4

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO)											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								√				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP	3.7	28
004 (SF1; SF2 CVCS) Chemical and Volume Control			√									K3.04 Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: RCPs	3.7	29
						√						K6.31 Knowledge of the effect of a loss or malfunction on the following CVCS components: Seal injection system and limits on flow range	3.1	30
005 (SF4P RHR) Residual Heat Removal							√					A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: Heatup/cooldown rates	3.5	31
											√	2.4.46 Ability to verify that the alarms are consistent with the plant conditions.	4.2	32
006 (SF2; SF3 ECCS) Emergency Core Cooling											√	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation	4.4	33
007 (SF5 PRTS) Pressurizer Relief/Quench Tank										√		A4.09 Ability to manually operate and/or monitor in the control room: Relationships between PZR level and changing levels of the PRT and bleed holdup tank	2.5	34
008 (SF8 CCW) Component Cooling Water	√											K1.04 Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems: RCS, in order to determine source(s) of RCS leakage into the CCWS	3.3	35
010 (SF3 PZR PCS) Pressurizer Pressure Control				√								K4.03 Knowledge of PZR PCS design feature(s) and/or interlock(s) which provide for the following: Over pressure control	3.8	36
					√							K5.01 Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: Determination of condition of fluid in PZR, using steam tables	3.5	37
012 (SF7 RPS) Reactor Protection		√										K2.01 Knowledge of bus power supplies to the following: RPS channels, components, and interconnections	3.3	38
				√								K4.08 Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: Logic matrix testing	2.8	39

013 (SF2 ESFAS) Engineered Safety Features Actuation							√				A1.02 Ability to predict and/or monitor changes in parameters (to Prevent exceeding design limits) associated with operating the ESFAS controls including: Containment pressure, temperature, and humidity	3.9	40
022 (SF5 CCS) Containment Cooling										√	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	41
025 (SF5 ICE) Ice Condenser											N/A for PV		
026 (SF5 CSS) Containment Spray		√									K2.02 Knowledge of bus power supplies to the following: MOVs	2.7	42
									√		A4.01 Ability to manually operate and/or monitor in the control room: CSS controls	4.5	43
039 (SF4S MSS) Main and Reheat Steam					√						K5.03 Knowledge of the operational implications of the following concepts as the apply to the MRSS: Effect of steam removal on reactivity	3.6	44
059 (SF4S MFW) Main Feedwater								√			A2.12 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: Failure of feedwater regulating valves	3.1	45
061 (SF4S AFW) Auxiliary/Emergency Feedwater						√					K6.01 Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Controllers and positioners	2.5	46
062 (SF6 ED AC) AC Electrical Distribution			√								K3.03 Knowledge of the effect that a loss or malfunction of the ac distribution system will have on the following: DC system	3.7	47
063 (SF6 ED DC) DC Electrical Distribution	√										K1.02 Knowledge of the physical connections and/or cause effect relationships between the DC electrical system and the following systems: AC electrical system	2.7	48
064 (SF6 EDG) Emergency Diesel Generator									√		A3.07 Ability to monitor automatic operation of the ED/G system, including: Load Sequencing	3.6	49
073 (SF7 PRM) Process Radiation Monitoring							√				A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM system controls including: Radiation levels	3.2	50
076 (SF4S SW) Service Water				√							K4.01 Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following: Conditions initiating automatic closure of closed cooling water auxiliary building header supply and return valves	2.5	51
								√			A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the SWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Service water header pressure	2.7	52

078 (SF8 IAS) Instrument Air	√								√			K1.05 Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: MSIV air	3.4
												A3.01 Ability to monitor automatic operation of the IAS, including: Air pressure	3.1
103 (SF5 CNT) Containment			√									K3.01 Knowledge of the effect that a loss or malfunction of the containment system will have on the following: Loss of containment integrity under shutdown conditions	3.3
053 (SF1; SF4P ICS*) Int. Control												N/A for CE design	
K/A Category Point Totals:	3	2	3	3	2	2	3	3	3	2	3	Group Point Total:	28/5

ES-401 PWR Examination Outline Form ES-401-2

Plant Systems—Tier 2/Group 2 (RO)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive									√			A3.06 Ability to monitor automatic operation of the CRDS, including: RCS temperature and pressure	3.9	56
002 (SF2; SF4P RCS) Reactor Coolant										√		A4.02 Ability to manually operate and/or monitor in the control room: Indications necessary to verify natural circulation from appropriate level, flow, and temperature indications and valve positions upon loss of forced circulation	4.3	57
011 (SF2 PZR LCS) Pressurizer Level Control												Not Sampled		
014 (SF1 RPI) Rod Position Indication											√	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	58
015 (SF7 NI) Nuclear Instrumentation												Not Sampled		
016 (SF7 NNI) Nonnuclear Instrumentation												Not Sampled		
017 (SF7 ITM) In-Core Temperature Monitor						√						K6.01 Knowledge of the effect of a loss or malfunction of the following ITM system components: Sensors and detectors	2.7	59
027 (SF5 CIRS) Containment Iodine Removal	√											K1.01 Knowledge of the physical connections and/or cause effect relationships between the CIRS and the following systems: CSS	3.4	60
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control		√										K2.01 Knowledge of bus power supplies to the following: Hydrogen recombiners	2.5	61
029 (SF8 CPS) Containment Purge												Not Sampled		
033 (SF8 SFPCS) Spent Fuel Pool Cooling												Not Sampled		
034 (SF8 FHS) Fuel-Handling Equipment												Not Sampled		
035 (SF 4P SG) Steam Generator												Not Sampled		
041 (SF4S SDS) Steam Dump/Turbine Bypass Control			√									K3.02 Knowledge of the effect that a loss or malfunction of the SDS will have on the following: RCS	3.8	62

045 (SF 4S MTG) Main Turbine Generator								√				A2.08 Ability to (a) predict the impacts of the following malfunctions or operation on the MT/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Steam dumps are not cycling properly at low load, or stick open at higher load (isolate and use atmospheric reliefs when necessary)	2.8	63
055 (SF4S CARS) Condenser Air Removal												Not Sampled		
056 (SF4S CDS) Condensate												Not Sampled		
068 (SF9 LRS) Liquid Radwaste												Not Sampled		
071 (SF9 WGS) Waste Gas Disposal				√								K4.04 Knowledge of design feature(s) and/or interlock(s) which provide for the following: Isolation of waste gas release tanks	2.9	64
072 (SF7 ARM) Area Radiation Monitoring					√							K5.01 Knowledge of the operational implications of the following concepts as they apply to the ARM system: Radiation theory, including sources, types, units, and effects	2.7	65
075 (SF8 CW) Circulating Water												Not Sampled		
079 (SF8 SAS**) Station Air												Not Sampled		
086 Fire Protection												Not Sampled		
K/A Category Point Totals:	1	1	1	1	1	1	0	1	1	1	1	Group Point Total:		10/3

Facility: Palo Verde		Date of Exam:				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.3	Knowledge of shift or short-term relief turnover practices.	3.7	66		
	2.1.15	Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.	2.7	67		
	2.1.					
	2.1.					
	2.1.					
	Subtotal		2			
2. Equipment Control	2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.	2.6	68		
	2.2.13	Knowledge of tagging and clearance procedures.	4.1	69		
	2.2.17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.	2.6	70		
	2.2.					
	2.2.					
	2.2.					
	Subtotal		3			
3. Radiation Control	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.4	71		
	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.	3.2	72		
	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.4	73		
	2.3.					
	Subtotal		3			
4. Emergency Procedures/Plan	2.4.29	Knowledge of the emergency plan.	3.1	74		
	2.4.26	Knowledge of facility protection requirements, including fire brigade and portable firefighting equipment usage.	3.1	75		
	2.4.					
	2.4.					
	2.4.					
	2.4.					
	Subtotal		2			
Tier 3 Point Total			10	10		

Facility: Palo Verde Date of Exam:

Tier	Group	RO K/A Category Points											**SRO**-Only Points		
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														2 2	1 2	

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000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1							Not Sampled		
000008 (APE 8) Pressurizer Vapor Space Accident / 3						√	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.	4.3	76
000009 (EPE 9) Small Break LOCA / 3							Not Sampled		
000011 (EPE 11) Large Break LOCA / 3						√	2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	77
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4							Not Sampled		
000022 (APE 22) Loss of Reactor Coolant Makeup / 2							Not Sampled		
000025 (APE 25) Loss of Residual Heat Removal System / 4							Not Sampled		
000026 (APE 26) Loss of Component Cooling Water / 8					√		AA2.04 The normal values and upper limits for the temperatures of the components cooled by CCW	2.9	78
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3							Not Sampled		
000029 (EPE 29) Anticipated Transient Without Scram / 1							Not Sampled		
000038 (EPE 38) Steam Generator Tube Rupture / 3							Not Sampled		
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4							Not Sampled		
000054 (APE 54; CE E06) Loss of Main Feedwater /4						√	2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.7	79
000055 (EPE 55) Station Blackout / 6					√		EA2.06 Ability to determine or interpret the following as they apply to a Station Blackout: Faults and lockouts that must be cleared prior to re- energizing buses	4.1	80
000056 (APE 56) Loss of Offsite Power / 6					√		AA2.37 Ability to determine and interpret the following as they apply to the Loss of Offsite Power: ED/G indicators for the following: voltage, frequency, load, load-status, and closure of bus tie breakers	3.8	81
000057 (APE 57) Loss of Vital AC Instrument Bus / 6							Not Sampled		
000058 (APE 58) Loss of DC Power / 6							Not Sampled		
000062 (APE 62) Loss of Nuclear Service Water / 4							Not Sampled		
000065 (APE 65) Loss of Instrument Air / 8							Not Sampled		
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6							Not Sampled		
(W E04) LOCA Outside Containment / 3							N/A for CE design		
(W E11) Loss of Emergency Coolant Recirculation / 4							N/A for CE design		

(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4							N/A for CE design		
K/A Category Totals:					3	3	Group Point Total:		18/6

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1							Not Sampled		
000003 (APE 3) Dropped Control Rod / 1						√	2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.7	82
000005 (APE 5) Inoperable/Stuck Control Rod / 1							Not Sampled		
000024 (APE 24) Emergency Boration / 1							Not Sampled		
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2					√		AA2.06 Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: Letdown flow indicator	2.8	83
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7						√	2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications	4.6	84
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7							Not Sampled		
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8							Not Sampled		
000037 (APE 37) Steam Generator Tube Leak / 3					√		AA2.09 Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: System status, using independent readings from redundant Condensate air ejector exhaust monitor	3.4	85
000051 (APE 51) Loss of Condenser Vacuum / 4							Not Sampled		
000059 (APE 59) Accidental Liquid Radwaste Release / 9							Not Sampled		
000060 (APE 60) Accidental Gaseous Radwaste Release / 9							Not Sampled		
000061 (APE 61) Area Radiation Monitoring System Alarms / 7							Not Sampled		
000067 (APE 67) Plant Fire On Site / 8							Not Sampled		
000068 (APE 68; BW A06) Control Room Evacuation / 8							Not Sampled		
000069 (APE 69; W E14) Loss of Containment Integrity / 5							Not Sampled		
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4							Not Sampled		
000076 (APE 76) High Reactor Coolant Activity / 9							Not Sampled		
000078 (APE 78*) RCS Leak / 3							Not Sampled		
(W E01 & E02) Rediagnosis & SI Termination / 3							N/A for CE design		
(W E13) Steam Generator Overpressure / 4							N/A for CE design		
(W E15) Containment Flooding / 5							N/A for CE design		
(W E16) High Containment Radiation /9							N/A for CE design		
(BW A01) Plant Runback / 1							N/A for CE design		
(BW A02 & A03) Loss of NNI-X/Y/7							N/A for CE design		
(BW A04) Turbine Trip / 4							N/A for CE design		
(BW A05) Emergency Diesel Actuation / 6							N/A for CE design		
(BW A07) Flooding / 8							N/A for CE design		
(BW E03) Inadequate Subcooling Margin / 4							N/A for CE design		
(BW E08; W E03) LOCA Cooldown—Depressurization / 4							N/A for CE design		
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4							Not Sampled		
(BW E13 & E14) EOP Rules and Enclosures							N/A for CE design		

(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4							Not Sampled			
(CE A16) Excess RCS Leakage / 2							Not Sampled			
(CE E09) Functional Recovery							Not Sampled			
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4							Not Sampled			
K/A Category Point Totals:					2	2	Group Point Total:			9/4

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (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												Not Sampled		
004 (SF1; SF2 CVCS) Chemical and Volume Control												Not Sampled		
005 (SF4P RHR) Residual Heat Removal												Not Sampled		
006 (SF2; SF3 ECCS) Emergency Core Cooling											√	2.4.6 Knowledge of EOP mitigation strategies.	4.7	86
007 (SF5 PRTS) Pressurizer Relief/Quench Tank								√				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the P S; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Overpressurization of the waste gas vent header	2.9	87
008 (SF8 CCW) Component Cooling Water												Not Sampled		
010 (SF3 PZR PCS) Pressurizer Pressure Control												Not Sampled		
012 (SF7 RPS) Reactor Protection												Not Sampled		
013 (SF2 ESFAS) Engineered Safety Features Actuation											√	2.4.31 Knowledge of annunciator alarms, indications, or response procedures.	4.1	88
022 (SF5 CCS) Containment Cooling								√				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of CCS Pump	3.2	89
025 (SF5 ICE) Ice Condenser												N/A for PV		
026 (SF5 CSS) Containment Spray												Not Sampled		
039 (SF4S MSS) Main and Reheat Steam												Not Sampled		
059 (SF4S MFW) Main Feedwater												Not Sampled		
061 (SF4S AFW) Auxiliary/Emergency Feedwater												Not Sampled		
062 (SF6 ED AC) AC Electrical Distribution												Not Sampled		
063 (SF6 ED DC) DC Electrical Distribution												Not Sampled		
064 (SF6 EDG) Emergency Diesel Generator											√	2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	4.0	90
073 (SF7 PRM) Process Radiation Monitoring												Not Sampled		
076 (SF4S SW) Service Water												Not Sampled		
078 (SF8 IAS) Instrument Air												Not Sampled		
103 (SF5 CNT) Containment												Not Sampled		

053 (SF1; SF4P ICS*) Int. Control												N/A for CE design		
K/A Category Point Totals:								2			3	Group Point Total:		28/5

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (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												Not Sampled		
002 (SF2; SF4P RCS) Reactor Coolant												Not Sampled		
011 (SF2 PZR LCS) Pressurizer Level Control								√				A2.07 Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Isolation of letdown	3.3	91
014 (SF1 RPI) Rod Position Indication												Not Sampled		
015 (SF7 NI) Nuclear Instrumentation												Not Sampled		
016 (SF7 NNI) Nonnuclear Instrumentation												Not Sampled		
017 (SF7 ITM) In-Core Temperature Monitor												Not Sampled		
027 (SF5 CIRS) Containment Iodine Removal												Not Sampled		
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control												Not Sampled		
029 (SF8 CPS) Containment Purge												Not Sampled		
033 (SF8 SFPCS) Spent Fuel Pool Cooling												Not Sampled		
034 (SF8 FHS) Fuel-Handling Equipment							√					A1.02 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the Fuel Handling System controls including: Water level in the refueling canal	3.7	92
035 (SF 4P SG) Steam Generator												Not Sampled		
041 (SF4S SDS) Steam Dump/Turbine Bypass Control												Not Sampled		
045 (SF 4S MTG) Main Turbine Generator												Not Sampled		
055 (SF4S CARS) Condenser Air Removal												Not Sampled		
056 (SF4S CDS) Condensate											√	2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	4.2	93
068 (SF9 LRS) Liquid Radwaste												Not Sampled		
071 (SF9 WGS) Waste Gas Disposal												Not Sampled		
072 (SF7 ARM) Area Radiation Monitoring												Not Sampled		
075 (SF8 CW) Circulating Water												Not Sampled		
079 (SF8 SAS**) Station Air												Not Sampled		
086 Fire Protection												Not Sampled		
K/A Category Point Totals:	0	0	0	0	0	0	1	1	0	0	1	Group Point Total:		10/3

Facility: Palo Verde		Date of Exam:				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.25	Ability to interpret reference materials, such as graphs, curves, tables, etc.			4.2	94
	2.1.42	Knowledge of new and spent fuel movement procedures.			3.4	95
	2.1.					
	2.1.					
	2.1.					
	Subtotal				2	
2. Equipment Control	2.2.33	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.			4.4	96
	2.2.40	Ability to apply Technical Specifications for a system.			4.7	97
	2.2.					
	2.2.					
	2.2.					
	2.2.					
	Subtotal				2	
3. Radiation Control	2.3.2	Ability to approve release permits.			3.8	98
	2.3.					
	2.3.					
	2.3.					
	Subtotal				1	
4. Emergency Procedures/Plan	2.4.14	Knowledge of general guidelines for EOP usage.			4.5	99
	2.4.37	Knowledge of the lines of authority during implementation of the emergency plan.			4.1	100
	2.4.					
	2.4.					
	2.4.					
	2.4.					
	Subtotal				2	
Tier 3 Point Total						7

Tier / Group	Randomly Selected K/A	Reason for Rejection
1 / 2 (Q22)	060 G 2.2.36	Knowledge of analyzing the effect of maintenance activities on the status of limiting conditions for operations is an SRO level job function. Reselected 060 G 2.4.50
1 / 2 (Q25)	076 AA2.04	This K/A calls for using Process effluent radiation chart recorders. At PVNGS there are no chart recorders in the control room. Reselected 076 AA2.01
2 / 1 (Q33)	006 G 2.2.4	At PVNGS there are no variations in control board/control room layouts, system, Instrumentation, and procedural actions between the different units for Emergency Core Cooling. Reselected 006 G 2.1.7
2 / 1 (Q40)	013 A1.03	The K/A asks for the ability to monitor/ operate “Feedwater Header Differential” for ESFAS. There is no Feedwater Header Differential input into the ESFAS system. Reselected 013 A1.02
2 / 1 (Q49)	064 A3.08	The K/A is the ability to monitor consequences of an automatic transfer of the EDG back to automatic. At PVNGS there is no automatic transfer back to automatic for the EDG. Reselected 064 A3.07
2 / 2 (Q56)	001 A3.03	The K/A is the ability to monitor automatic operation of CRDS due to Axial Imbalance which at PVNGS is measured by ASI (Axial Shape Index). Automatic operation of CRDS is not affected by ASI at PVNGS. Reselected 001 A3.06
3 (Q69)	G 2.2.21	Knowledge of pre- and post-maintenance operability requirements is beyond the scope of the RO job function. Reselected G 2.2.13

Tier / Group	Randomly Selected K/A	Reason for Rejection
1 / 2 (Q84)	032 G 2.2.3	There are no differences between the units at PVNGS for Source Range Nuclear Instruments, nor are there any procedural differences. Reselected 032 G 2.2.42
2 / 1 (Q89)	022 A2.02	There is no direct correlation to motor vibration in CEDM fans to procedure steps. The action taken for motor vibration would be based on the severity of the motor vibration and therefore would be a subjective decision. There is no alarm or setpoint based on any containment fan motor vibration. Reselected 022 A2.06

Administrative Topics Outline

Facility: PVNGS		Date of Examination:	11/30/20
Examination Level SRO		Operating Test Number:	2020 NRC

Administrative Topic (see Note)	Type Code*	Describe Activity to be Performed	
(A1)	M, R	JPM:	Determine the active/inactive status of 3 licensed operators
		KA:	2.1.1
		IR:	4.2
(A2)	N, R	JPM:	Determine the required shutdown based on SGTL indications
		KA:	2.1.7
		IR:	4.7
(A3)	N, R	JPM:	Pressurizer Head Vent surveillance and LCO 3.4.12
		KA:	2.2.22
		IR:	4.7
(A4)	D, R	JPM:	Determine hold points for work in a HRA and required approval to continue work
		KA:	2.3.4
		IR:	3.7
(A5)	N, R	JPM:	EAL Classification FS1.1
		KA:	2.4.41
		IR:	4.4

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 **(1)** (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)

(N)ew or (M)odified from bank **(4)** (≥ 1)

(P)revious 2 exams **(0)** (≤ 1; randomly selected)

A1 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 modified JPM.

A2 The applicant will be directed to determine the required shutdown based on SGTL indications per 40AO-9ZZ02, Excessive RCS Leakrate, Appendix F, Steam Generator Tube Leak Guidelines. This is a new JPM.

A3 The applicant will be directed to evaluate the results of surveillance 73ST-9XI24, Reactor and Pressurizer Vent Valves – Inservice Test and determine the operability of Pressurizer Head Vents in accordance with LCO 3.4.12. Based on the number of inoperable Pressurizer vent paths the applicant will determine the required actions and associated completion times. This is a new JPM.

A4 The applicant will be directed to determine the expected dose for a job in a High Radiation Area, hold points for the job, what approval is needed to exceed limits, and which of the Auxiliary Operators listed will perform the job. This is a bank JPM.

A5 The applicant will be directed to classify an emergency event using EP-0901, Classifications, and the EAL classification charts. This is a new JPM.

Facility:	PVNGS	Date of Examination:	11/30/20
Exam Level:	SRO-I	Operating Test No.:	2020 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	(029 EA1.12) ECC Directed Turbine Unloading – ATWS	A, D, S	1
S2	(006 A3.08) Verify Recirculation Actuation Signal actuation	A, D, EN, L, S	2
S3	(009 EA1.09) Isolate High Pressure Seal Cooler Leak	A, L, N, S	3
S4	(035 A2.01) Appendix 33, SG 1 Level Reduction Checklist	A, D, L, S	4P
S5	(E06 EA1.1) Appendix 44, Feeding With the Condensate Pumps	L, N, S	4S
S6	(058 AA2.03) Respond to a Loss of Class Control Power during EDG Load Run	A, N, S	6
S7	(012 A2.02) Set CEAC inoperability flags in the Core Protection Calculators following a Loss of Instrument Bus Power	N, S	7
In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
P1	(064 A1.03) Manual Control of EDG Jacket Water Temperature	A, N	6
P2	(068 AA1.01) Operate ADVs at the RSD Panel	D, E	4S
P3	(033 A2.02) Leak in Fuel Pool Cooling Heat Exchanger, Swap Fuel Pool Cooling Heat Exchangers	N, R	8

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

NRC JPM Examination
Summary Description

S1 The applicant will be directed to perform a 100MW turbine load reduction per 40AO-9ZZ25, ECC Directed Turbine Unloading, Appendix A, Load Reduction. During the load reduction, the Main Turbine will trip and a RPCB signal will automatically occur. On the RPCB, one Subgroup of CEAs will fail to insert resulting in an automatic Reactor Trip signal. The Reactor will fail to automatically trip, requiring the applicant to recognize the ATWS condition and take action to manually trip the Reactor. This is a time-critical, alternate path, modified JPM 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 covered by Safety Function 2.

S3 The applicant will be directed to perform 40EP-9EO03, LOCA, step 10, isolation of a High Pressure Seal Cooler (HPSC) Leak. The applicant will stop all four RCPs, close the NC Containment Isolation Valves, isolate Controlled Bleedoff from the RCPs, direct an area operator to energize the HPSC Isolation Valves for the affected HPSC, then close the associated HPSC Isolation Valves from the Control Room. The applicant will determine that one the Controlled Bleedoff isolation valve for the affected RCP failed to close and will isolate bleedoff by closing the upstream isolation valves and the bleedoff relief valve isolation valve. This is an alternate path, bank JPM covered by Safety Function 3.

S4 The applicant will be directed to perform Appendix 33, SG 1 Level Reduction Checklist to control SG 1 level following a SG Tube Rupture. The applicant will take action to place High Rate SG Blowdown in service to the Condenser by operating valves from the Control Room and lower SG #1 level. However one of valves that must be opened must be bypassed in the field prior to operating in the Control Room to prevent severe water hammer and potential pipe damage locally in the field. This is an alternate path, bank JPM covered by Safety Function 4P. This JPM is directly related to PVNGS operating experience related to industrial safety.

S5 The applicant will be directed to perform Appendix 44, Feeding With the Condensate Pumps. The applicant will establish a flow path for feed directly from the Condensate Pumps and perform a controlled depressurization of the SG to re-establish feed flow. This is a new JPM covering Safety Function 4S.

S6 The applicant will be directed to reduce load on the ‘A’ EDG and disconnect the ‘A’ EDG from PBA-S03 following a EDG load run. When the applicant commences the load reduction, PKA-M41, Train ‘A’ Class DC Control Power Bus, will de-energize due to a fault. This will result in the ‘A’ EDG tripping however the EDG output breaker will remain closed due to the loss of control power. The applicant will diagnose the failure and direct an area operator to locally open the ‘A’ EDG output breaker to prevent damage to the ‘A’ EDG. This is an alternate path, new JPM covered by Safety Function 6.

S7 The applicant will be directed to set INOP flags for CEAC 2 in the Core Protection Calculators following a loss of power to PNC-D27 per 40AO-9ZZ13, Loss of Class Instrument or Control Power. The applicant will locate the correct CPC point ID, set the Function Enable keyswitch to ENABLED, and set a value of ‘2’ in each CPC module. This is a new JPM covered by Safety Function 7.

P1 The applicant will be directed to take manual control of Train ‘A’ EDG Jacket Water temperature per 40OP-9DG01, Emergency Diesel Generator A Section 6.11.5. Once taking manual control the applicant will recognize that temperature is lowering and must start the Jacket Water Circ Pump and ensure that Jacket Water Warmup Heater is in auto. This is an alternate path, new JPM covered by Safety Function 6.

P2 The applicant will be directed to perform ADV operations per 40AO-9ZZ18, Shutdown Outside the Control Room, Appendix D, ADV Operation to stabilize temperature after the CR was evacuated due to hot particle contamination. The applicant will take Local control of ADVs at the Remote Shutdown Panel and stabilize RCS temperature. This a bank JPM covered by Safety Function 4S.

P3 The applicant will be directed to swap Spent Fuel Pool heat exchangers due to a leak on the in-service heat exchanger per 40OP-9PC01, Fuel Pool Cooling. The applicant will perform a valve lineup to place the ‘B’ Fuel Pool heat exchanger in service and remove the ‘A’ Fuel Pool heat exchanger from service. This a new JPM covered by Safety Function 8.

Facility: PVNGS Date of Exam: 11/30/2020 Operating Test No.: 2020

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4 (spare)						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP		R	I	U
I1	RX	-					-		-		-	-	-	**0**		**1**	
	NOR	-					-		-		-	-	-	**0**		**1**	
	I/C	1,2,3, 4,6					1,4,5		2,3,4, 7		1,3,4,	2,3,4,	3,4	**12**		**4**	
	MAJ	5					8		6		5,6	5,6	5,6	**3**		**2**	
	TS	1,2					-		-		1,3	-	-	**2**		**2**	
I2	RX		-		-					-				**0**		**1**	
	NOR		-		-					-				**0**		**1**	
	I/C		2,3,4, 7		2,4,5, 6,7					1,5				**11**		**4**	
	MAJ		5		8					6				**3**		**2**	
	TS		-		2,5					-				**2**		**2**	
I3	RX			-		-		-						**0**		**1**	
	NOR			-		-		-						**0**		**1**	
	I/C			1,2,4, 6		3,5,6 7		1,4,5						**11**		**4**	
	MAJ			5		8		6						**3**		**2**	
	TS			-		-		1,5						**2**		**2**	
I4	RX	-					-		-					**0**		**1**	
	NOR	-					-		-					**0**		**1**	
	I/C	1,2,3, 4,6					1,4,5		2,3,4, 7					**12**		**4**	
	MAJ	5					8		6					**3**		**2**	
	TS	1,2					-		-					**2**		**2**	

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls" (ATC) and "balance-of-plant" (BOP) positions. Instant SROs (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 instrument or component 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 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: 11/30/2020 Operating Test No.: 2020

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP		R	I	U
I5	RX		-		-					-				**0**		**1**	
	NOR		-		-					-				**0**		**1**	
	I/C		2,3,4,7		2,4,5,6,7					1,5				**11**		**4**	
	MAJ		5		8					6				**3**		**2**	
	TS		-		2,5					-				**2**		**2**	
I6	RX			-		-		-						**0**		**1**	
	NOR			-		-		-						**0**		**1**	
	I/C			1,2,4,6		3,5,6 7		1,4,5						**11**		**4**	
	MAJ			5		8		6						**3**		**2**	
	TS			-		-		1,5						**2**		**2**	
I7	RX	-					-		-					**0**		**1**	
	NOR	-					-		-					**0**		**1**	
	I/C	1,2,3,4,6					1,4,5		2,3,4,7					**12**		**4**	
	MAJ	5					8		6					**3**		**2**	
	TS	1,2					-		-					**2**		**2**	
I8	RX		-		-					-				**0**		**1**	
	NOR		-		-					-				**0**		**1**	
	I/C		2,3,4,7		2,4,5,6,7					1,5				**11**		**4**	
	MAJ		5		8					6				**3**		**2**	
	TS		-		2,5					-				**2**		**2**	

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls" (ATC) and "balance-of-plant" (BOP) positions. Instant SROs (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 instrument or component 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 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: 11/30/2020 Operating Test No.: 2020

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP		R	I	U
I9	RX			-		-		-						**0**		**1**	
	NOR			-		-		-						**0**		**1**	
	I/C			1,2,4,6		3,5,6 7		1,4,5						**11**		**4**	
	MAJ			5		8		6						**3**		**2**	
	TS			-		-		1,5						**2**		**2**	
I10	RX	-					-		-					**0**		**1**	
	NOR	-					-		-					**0**		**1**	
	I/C	1,2,3, 4,6					1,4,5		2,3,4, 7					**12**		**4**	
	MAJ	5					8		6					**3**		**2**	
	TS	1,2					-		-					**2**		**2**	
I11	RX		-		-					-				**0**		**1**	
	NOR		-		-					-				**0**		**1**	
	I/C		2,3,4, 7		2,4,5, 6,7					1,5				**11**		**4**	
	MAJ		5		8					6				**3**		**2**	
	TS		-		2,5					-				**2**		**2**	
I12	RX			-		-		-						**0**		**1**	
	NOR			-		-		-						**0**		**1**	
	I/C			1,2,4, 6		3,5,6 7		1,4,5						**11**		**4**	
	MAJ			5		8		6						**3**		**2**	
	TS			-		-		1,5						**2**		**2**	

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls" (ATC) and "balance-of-plant" (BOP) positions. Instant SROs (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 instrument or component 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 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: 11/30/2020 Operating Test No.: 2020

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP	SRO	OATC	BOP		R	I	U
I13	RX	-				-								**0**		**1**	
	NOR	-				-								**0**		**1**	
	I/C	1,2,3, 4,6				3,5,6 7								**9**		**4**	
	MAJ	5				8								**2**		**2**	
	TS	1,2				-								**2**		**2**	
I14	RX		-		-									**0**		**1**	
	NOR		-		-									**0**		**1**	
	I/C		2,3,4, 7		2,4,5, 6,7									**9**		**4**	
	MAJ		5		8									**2**		**2**	
	TS		-		2,5									**2**		**2**	

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls" (ATC) and "balance-of-plant" (BOP) positions. Instant SROs (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 instrument or component 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 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: 2020 NRC Exam
Examiners:	Operators:	
Initial Conditions: 100% power, MOC, AFA-P01 OOS		
Turnover: Maintain 100% power		

Event Number	Event Type*	Event Description
1	I (CRS, BOP), TS (CRS)	Steam Generator #2 Flow transmitter RCD-PDT-125D fails low
2	C (All), TS (CRS)	Inadvertent Train 'A' CSAS
3	C (CRS, OATC)	Loss of Letdown
4	C (All)	MFP Trip
5	M (All)	ESD inside Containment
6	C (CRS, BOP)	MSIS fails to auto actuate
7	C (OATC)	Train 'B' Containment Spray Pump trips ('A' CS Pump anti-pumped)
*(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 Event Summary NRC Exam Scenario # 1	Form ES-D-1

2020 NRC Exam Scenario # 1 Overview	
Event 1	Steam Generator #2 Flow transmitter RCD-PDT-125D will fail low. The crew will address the ARP and validate actual Steam Generator flow using alternate indications. The CRS will address Technical Specifications for the failed transmitter and direct the crew to bypass the affected RPS bistables.
Event 2	An inadvertent Train 'A' CSAS will occur. The crew will verify that an actual CSAS is not required and the CRS will enter 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations. The CRS will direct the crew to stop Train 'A' CS flow by stopping the 'A' CS Pump and closing the CS header isolation valve. The CRS will direct the restoration of NC flow by opening NCA-UV-402, NCW Containment Downstream Return Isolation Valve.
Event 3	The Train 'A' CSAS will also result in a loss of letdown. The CRS will enter 40AO-9ZZ05, Loss of Charging or Letdown, and direct the crew to either restore letdown or establish conditions for extended loss of Letdown.
Event 4	'A' MFP will trip causing a RPCB. The CRS will enter 40AO-9ZZ09, Reactor Power Cutback (Loss of Feedpump) and the crew will verify that all parameters are restoring. The CRS will direct the crew to remove RPCB from service.
Event 5	An ESD inside containment will require a manual Reactor trip. The CRS will enter 40EP-9EO01, Standard Post Trip Actions.
Event 6	SIAS and CIAS will actuate but MSIS will fail to auto-actuate and will require a manual actuation.
Event 7	'B' CS Pump will trip and 'A' CS Pump will require a manual start due to being anti-pumped during the inadvertent CSAS. The CS header isolation valve will be manually opened due to being overridden and closed during the inadvertent CSAS

Appendix D	Critical Task Summary NRC Exam Scenario # 1	Form ES-D-1

Critical Task # 1: When the Main Steam Isolation setpoints are exceeded, ensure Main Steam Isolation has actuated prior to automatic AFAS actuation.

Safety Significance: MSIS ensures acceptable consequences during an MSLB or FWLB (between the steam generator and the main feedwater check valve) either inside or outside containment. MSIS isolates both steam generators if either generator indicates a low pressure condition or a high level condition or if a high containment pressure condition exists. This prevents an excessive rate of heat extraction and subsequent cooldown of the RCS during these events.

Cueing: The crew should recognize the failure of MSIS to actuate when containment pressure exceeds 3.1 psig OR when either SG pressure lowers to less than 960 psia (both are setpoints for MSIS).

Measurable Performance Indicator: The crew will have to manually actuate MSIS by taking the four handswitches for each ESFAS channel actuation (on B05) to the actuate position. This can be confirmed by the red MSIS lights on the vertical section of B05 as well as the actuation logic lights for each actuation extinguishing on the horizontal section of B05. The AFAS actuation will occur at 25.2% wide range in either SG and will be indicated by the red AFAS-1 (or AFAS-2) light on the vertical section of B05.

Performance Feedback: The crew will have indication of successful actuations by observing the red SIAS/CIAS/MSIS lights on the vertical section of B05 as well as the actuation logic lights for each actuation extinguishing on the horizontal section of B05, as well as by observing the actuated equipment for each ESFAS actuation going to its actuated position.

Critical Task # 2: When the Containment Spray Actuation setpoint is exceeded, ensure adequate Containment Cooling to meet Safety Function requirements within 30 minutes of exceeding the CSAS setpoint.

Safety Significance: Potential degradation of any barrier to fission product release. Failure to maintain containment temperature and pressure control may challenge containment integrity.

Cueing: In addition to the procedural cue, the crew may use indications of Containment pressure, Containment temperature, Containment fan coolers, Containment Spray pumps, and Containment Spray flow to provide cue to perform elements of this task.

Measurable Performance Indicator: The task is identified by at least one member of the crew manipulating the controls to establish Containment Spray flow. If Containment pressure is > 8.5 psig, the crew should ensure a CSAS is actuated and at least one CS header is delivering > 4350 gpm on at least one header.

Performance Feedback: The task provides feedback by observing 4350 gpm on B02 and ERFDADS flow indicators and Containment pressure lowering.

NOTE: (Per NUREG-1021 Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a Critical Task identified in the post-scenario review

Appendix D	Driver Set-Up Instructions NRC Exam Scenario # 1	Form ES-D-1

Driver Setup Instructions	
	Reset to IC-20
	Run scenario file “NRC Scenario # 1”
	Hang OOS tags on AFA-P01

Appendix D	Crew Turnover Sheet NRC Exam Scenario # 1	Form ES-D-1

Plant Conditions:

- Unit 1 is operating at 100% power, MOC

Equipment Out of Service:

- AFA-P01 was taken out of service last shift for preventative maintenance
    - LCO 3.7.5 Condition A and B has been entered

Planned Shift Activities:

- Maintain 100% power

Appendix D	Scenario Outline	Form ES-D-1

Facility: Palo Verde	Scenario: 2	Test: 2020 NRC Exam
Examiners:	Operators:	
Initial Conditions: 50% power, MOC, AFA-P01 OOS		
Turnover: Maintain 50% power		

Event Number	Event Type*	Event Description
1	I (BOP)	Feed flow transmitter FT-1112X fails low
2	TS (CRS)	Class Battery Charger 'D' Trip
3	I (OATC)	VCT Level Transmitter CHN-LT-227 fails low
4	C (CRS, BOP)	Loss of PW Pump, standby pump FTAS
5	C (All), TS (CRS)	Dropped CEA
6	C (CRS, OATC)	2nd Dropped CEA, manual Reactor trip
7	C (CRS OATC)	After the Reactor trip, a Loss of Offsite Power occurs, and Train 'B' EDG output breaker fails to auto-close
8	M	Loss of all feed • Train 'A' EDG trips (no power to AFN-P01) • AFB-P01 Seized Shaft
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification		

Actual	Target Quantitative Attributes
9	Total malfunctions (5-8)
3	Malfunctions after EOP entry (1-2)
5	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 Event Summary NRC Exam Scenario # 2	Form ES-D-1

2020 NRC Exam Scenario # 2 Overview	
Event 1	Feed Flow transmitter FT-1112X will fail low. The crew will address the ARP and the failed transmitter will be placed in maintenance and the 3 element lockout will be removed. The crew will restore Feedwater flow to normal.
Event 2	Class Battery Charger 'D' will trip. The crew will address the ARP and determine the status of the Battery Charger and the CRS will address Technical Specifications.
Event 3	VCT Level Transmitter CHN-LT-227 will fail low. The crew will address the ARP and take action to re-align Charging Pump suction aligned to the VCT.
Event 4	The running Plant Cooling Water pump will trip and the standby pump will fail to auto-start. The crew will address the ARP and the CRS will enter 40AO-9ZZ03, Loss of Cooling Water. The crew will take action to start the standby pump manually.
Event 5	CEA 14 will drop. The CRS will enter 40AO-9ZZ11, CEA Malfunctions, and direct the crew to perform a downpower. The OATC will place CEDMCS in "Standby". The downpower performed will raise Tavg 3°F greater than Tref. The CRS will address Technical Specifications for the deviated CEA.
Event 6	A second CEA will drop requiring a manual Reactor trip. The CRS will enter 40EP-9EO01, Standard Post Trip Actions
Event 7	After the Reactor trip, there will be a Loss of Offsite Power. Train 'A' EDG will trip, causing a loss of Class Bus PBA-S03. Train 'B' EDG output breaker will fail to automatically close. The crew will take action to manually close the Train 'B' EDG output breaker to re-energize 4kV Class Bus PBB-S04.
Event 8	AFB-P01 will trip on a seized shaft. The CRS will enter 40EP-9EO09 Functional Recovery. The crew will align Train 'B' EDG to PBA-S03 and AFN-P01 will be started to restore Feedwater.

Critical Task # 1: Restore power to one Class 4kV Bus prior within 15 minutes of a Loss of All Offsite and Onsite AC Power

Safety Significance: The crew will have to take manual action to restore power to one Class 4kV Bus within 15 minutes to prevent a Site Area Emergency declaration. A Site Area Emergency initiates a significant movement of people throughout the state and levels of public concern that may result in injuries and possible death

Cueing: The crew will have indication of Blackout conditions with 0 amp indications on both Class 4kV Buses. There will be a LOP annunciator on B05 and ERFDADS and there will be procedural direction during SPTAs.

Measurable Performance Indicator: The crew will restore power to PBB-S04 by taking the synchronizing key and closing the Train 'B' EDG output breaker that failed to auto-close on the loss of power.

Performance Feedback: When the crew has closed the Train 'B' EDG output breaker, the breaker light on B01 will turn red, there will be 4kV voltage indication on PBB-S04, various alarms will clear on B01 annunciator panel, and partial lighting will restore in the control room

Critical Task # 2: Restore power to Train 'A' Class 4kV Bus PBA-S03 prior to exiting MVAC-2, DGs, and restore feed to at least one SG prior to exiting HR-1, SG with no SI

Safety Significance: The crew will have to restore feed water to at least one SG to ensure adequate inventory in the SG(s) to remove decay heat from the core.

Cueing: The crew will have indication of a complete loss of feed water due to the loss of offsite power tripping both Main Feedwater Pumps, the loss of power to PBB-S03 (loss of AFN-P01), the seized shaft on AFB-P01, and the OOS AFA-P01. There will also be indication provided by all feed water flow indicators indicating 0 gpm to each SG.

Measurable Performance Indicator: The crew will have to close breakers to connect the 'B' EDG to PBA-S03, start AFN-P01, and open downcomer control valves to commence feeding at least one SG.

Performance Feedback: When the crew has restored power to PBA-S03, started AFN-P01, and aligned a feed path to at least one SG, the crew will have indication of feed flow to at least one SG as well as a rising trend on SG level(s), and depending on feed flow rate, a lowering trend on RCS temperature.

NOTE: (Per NUREG-1021 Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a Critical Task identified in the post-scenario review

Appendix D	Driver Set-Up Instructions NRC Exam Scenario # 2	Form ES-D-1

Driver Setup Instructions	
	Reset to IC-16
	Run scenario file “NRC Scenario # 2”
	Hang OOS tags on AFA-P01

Appendix D	Crew Turnover Sheet NRC Exam Scenario # 2	Form ES-D-1

Plant Conditions:

- Unit 1 is operating at 50% power, MOC

Equipment Out of Service:

- AFA-P01 was taken out of service last shift for preventative maintenance
    - LCO 3.7.5 Condition A and B has been entered

Planned Shift Activities:

- Maintain 50% power

Appendix D	Scenario Outline	Form ES-D-1

Facility: Palo Verde	Scenario: 3	Test: 2020 NRC Exam
Examiners:	Operators:	
Initial Conditions: 100%, MOC, AFA-P01 OOS		
Turnover: Maintain 100% power		

Event Number	Event Type*	Event Description
1	I (CRS, BOP), TS (CRS)	Containment Pressure Transmitter HCA-PI-351A fails high
2	I (OATC)	Pressurizer Pressure Transmitter 100X fails low
3	C (OATC)	Letdown Relief valve PSV-345 fails open
4	C (CRS, OATC)	Extended Loss of Letdown
5	C (CRS, BOP), TS (CRS)	Loss of PKD-M44
6	M (All)	SBLOCA
7	C (OATC)	'B' HPSI sheared shaft, 'A' HPSI fails to auto-start
*(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS) Technical Specification		

Actual	Target Quantitative Attributes
7	Total malfunctions (5-8)
1	Malfunctions after EOP entry (1-2)
5	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 Event Summary NRC Exam Scenario # 3	Form ES-D-1

2020 NRC Exam Scenario # 3 Overview	
Event 1	Containment Pressure Transmitter HCA-PI-351A will fail high. The crew will address the ARP and validate actual Containment pressure using alternate indications. The CRS will address Technical Specifications for the failed transmitter and direct the crew to bypass the affected RPS bistables.
Event 2	Pressurizer Pressure Transmitter 100X will fail low. The crew will address the ARP and validate the failed transmitter. The crew will restore Pressurizer pressure control by transferring the Pressurizer pressure control channel selector to channel 'Y'.
Event 3	Letdown Intermediate Pressure relief valve PSV-345 will fail open. The crew will address the ARP and isolate Letdown.
Event 4	The CRS will enter 40AO-9ZZ05 Loss of Charging or Letdown and direct the crew to establish conditions for extended loss of Letdown.
Event 5	A loss of 125 VDC Class DC Bus PKD-M44 will occur. The CRS will enter 40AO-9ZZ13, Loss of Class Instrument or Control Power and address Technical Specifications. The crew will take action to re-close the 'D' Reactor Trip Circuit Breaker.
Event 6	A small break LOCA will occur. The leak will be ~ 300 gpm and will ramp in over one minute. The CRS will enter 40AO-9ZZ02, Excessive RCS Leakrate, and direct the crew to start all available Charging Pumps and isolate Letdown. The leakrate will exceed Charging pump capacity and the CRS will direct a manual Reactor trip.
Event 7	The CRS will enter 40EP-9EO01, Standard Post Trip Actions. When SIAS actuates, the 'B' HPSI pump will have a sheared shaft and 'A' HPSI will fail to auto-start. After SPTAs are complete, the CRS will transition to 40EP-9EO03 and direct the crew to place Hydrogen Analyzers in service.

Critical Task # 1: When the Safety Injection Actuation setpoint is exceeded, ensure adequate Safety Injection flow to meet Safety Function requirements within 30 minutes of exceeding the SIAS setpoint.

Safety Significance: This is based on a degraded core cooling system. Inadequate SI flow may result in loss of Subcooled margin and/or core uncovery, and increases the risk of core damage.

Cueing: Board indications will provide the initial cue that the crew has lost the required SI flow. Procedural direction will provide the cue to initiate SI flow. Safety Function Status Check is also a possible cue to the crew that they have lost a safety function.

Measurable Performance Indicator: The crew will restore SI flow by manually starting the HPSI pump that failed to auto-start ('A' HPSI pump).

Performance Feedback: When the crew has started the 'A' HPSI pump there will be indication of HPSI flow on B02 analog indicators and ERFDADS digital indicators.

Critical Task # 2: Place both Hydrogen Analyzers in service within 30 minutes of the LOCA

Basis for CT bounding criteria: Placing all available Hydrogen Analyzers in service within 30 minutes of the start of a LOCA is listed in the PVNGS Time Critical Action Program (TCA-55) and is based on the PVNGS UFSAR section 6.2.5.2.1.

Safety Significance: Per the PVNGS UFSAR, Hydrogen Analyzers must be placed in service within 30 minutes of a LOCA. The crew must be aware of hydrogen concentration inside containment to ensure the Containment Temperature and Pressure Control safety function is met, to determine when hydrogen recombiners or hydrogen purge must be placed in service, and to monitor potential EAL escalation criteria based on containment hydrogen levels.

Cueing: The crew will have procedural direction to place Hydrogen Analyzers in service per 40EP-9EO03, LOCA.

Measurable Performance Indicator: The crew will open the inside and outside containment isolation valve for the Hydrogen Analyzers and place the Power/Control handswitch for each analyzer to the "ANALYZE" position. The H2 analyzers must be in service within 30 minutes of the LOCA.

Performance Feedback: The crew will have indication of the CIVs being open as indicated by a red light on each valve and the red ANALYZE light being illuminated on each Hydrogen Analyzer.

NOTE: (Per NUREG-1021 Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a Critical Task identified in the post-scenario review

Appendix D	Driver Set-Up Instructions NRC Exam Scenario # 3	Form ES-D-1

Driver Setup Instructions	
	Reset to IC-20
	Run scenario file “NRC Scenario # 3”
	Hang OOS tags on AFA-P01

Appendix D	Crew Turnover Sheet NRC Exam Scenario # 3	Form ES-D-1

Plant Conditions:

- Unit 1 is operating at 100% power, MOC

Equipment Out of Service:

- AFA-P01 was taken out of service last shift for preventative maintenance
    - LCO 3.7.5 Condition A and B has been entered

Planned Shift Activities:

- Maintain 100% power

Appendix D	Scenario Outline	Form ES-D-1

Facility: Palo Verde	Scenario: 4	Test: 2020 NRC Exam
Examiners:	Operators:	
Initial Conditions: 2%, BOC		
Turnover: Maintain power at 2%		

Event Number	Event Type*	Event Description
1	TS (CRS)	RU-31 fails high causing a CREFAS
2	I (OATC)	Seal Injection controller CHN-FIC-242 fails to 100%
3	C (All), TS (CRS)	Inadvertent 'B' AFAS-1
4	I (All)	TT-111Y fails high
5	M (All)	SGTR ramped over 5 minutes
6		10 minutes after the Reactor trip an ESD occurs on the ruptured SG outside of Containment
7	C (OATC)	One CEA stuck out on the Reactor trip
*(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)

Appendix D	Scenario Event Summary NRC Exam Scenario # 4	Form ES-D-1

2020 NRC Exam Scenario # 4 Overview	
Event 1	Fuel Pool Area Monitor RU-31 fails high causing a CREFAS and FBEVAS. The crew will address the ARP and verify the CREFAS and FBEVAS actuations. The CRS will address Technical Specifications.
Event 2	RCP 1B Seal Injection Flow controller CHN-FIC-242 fails to 100% causing the associated valve to close. The crew will address the ARP and take manual control of the controller and re-open the valve.
Event 3	A Train 'B' inadvertent AFAS occurs. The CRS will enter 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations. The crew will take action to stop feeding SG #1 with AFB-P01 to prevent overfeeding and Reactor power to rise.
Event 4	Loop 1A Temperature Transmitter TT-111Y fails high causing all charging pumps to causing letdown flow to lower and pressurizer level to rise. The crew will address the ARP and the CRS will enter 40AO-9ZZ16, RRS Malfunction. The crew will take manual control of Pressurizer level and and stabilize level. The CRS will direct the crew to select the unaffected Tavg on the Reactor Regulating System panel
Event 5	A SGTR occurs on SG #1. The leak will be ~ 400 gpm and will ramp in over one minute. The CRS will enter 40AO-9ZZ02, Excessive RCS Leakrate, and direct the crew to start all available Charging Pumps and isolate Letdown. The leakrate will exceed Charging pump capacity and the CRS will direct a manual Reactor trip.
Event 6	10 minutes after the Reactor trip an ESD occurs on the ruptured SG #1 outside of Containment. The CRS will enter 40EP-9EO09, Functional Recovery, and crew will feed SG #1 1360-1600 gpm.
Event 7	During the Reactor trip, one CEA will not insert into the core and the CRS will direct borating the RCS per 40EP-9EO10-103, Appendix 103: RCS Makeup / Emergency Boration

Critical Task # 1: Commence borating to the RCS at a rate of ≥ 26 gpm within 15 minutes of the reactor trip due to less than all full-strength CEAs being fully inserted.

Safety Significance: Per the Time Critical Action Program, commence emergency boration (MODES 3 – 5) within 15 minutes due to minimum shutdown margin less than limit in COLR. With less than all full strength CEAs fully inserted, the SDM is assumed to be less than minimum required. Justification for the 15 minutes is from 40DP-9ZZ04, Time Critical Action Program. Justification for the 26 gpm limit is from Technical Specification Bases for LCO 3.1.1, SDM – Reactor Trip Breakers Open.

Cueing: The crew will have indication of the stuck CEA from the Rod Bottom Light for the CEA failing to illuminate on the trip as well as the CPDS (CEA Position Display System) indicating one CEA failed to insert on the reactor trip.

Measurable Performance Indicator: The crew will align Charging Pump suction from the Refueling Water Tank (RWT) and ensure adequate Charging Pump flow of greater than or equal to 26 gpm. The crew will have to manually start a Charging Pump to achieve the minimum required boration flow of 26 gpm. Additionally, the crew will need to start at least one Charging Pump per step 4 of SPTAs for inventory control as well as to utilize Auxiliary Spray to control RCS pressure. Adequate boration flow can also be seen using the CVCS System Diagram using an ERFDADS computer display.

Performance Feedback: The crew will have indication of boration flow by ensuring the Charging Pump suction has been aligned to the Refueling Water Tank and Charging Pump flow is ≥ 26 gpm.

Critical Task # 2: Establish a feedrate of 1360-1600 gpm to SG #1 prior to exiting HR-2, RCS and Core Heat Removal, SG with SI.

Safety Significance: An event in which a SG has a tube leak or rupture concurrently with an unisolable steam leak to atmosphere will result in a radioactive release to the atmosphere. A feedrate of 1360-1600 gpm to the affected SG is performed in order to expeditiously establish sufficient inventory in the affected SG to ensure the U-tubes are covered (~ 45% NR), thus minimizing the release to the environment.

Cueing: The crew will have indication of SG tube leakage on SG #1 prior to the reactor trip from rad monitor alarms and, if called, confirmation from chemistry. The stuck open Main Steam Safety Valve will be indicated by an alarm window on Board 6 as well as a red LED MSSV position indicating light.

Measurable Performance Indicator: The crew will align 2 AFW pumps to supply feedwater to SG #1 for a total of 1360-1600 gpm, per step 15 of 40EP-9EO09, Functional Recovery, HR-2, SG with SI.

Performance Feedback: Total feed flow to the affected SG will be available using any ERFDADS computer terminal.

NOTE: (Per NUREG-1021 Appendix D) If an operator or the Crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a Critical Task identified in the post-scenario review

Appendix D	Driver Set-Up Instructions NRC Exam Scenario # 4	Form ES-D-1

Driver Setup Instructions	
	Reset to IC-8
	Run scenario file “NRC Scenario # 4”

Appendix D	Crew Turnover Sheet NRC Exam Scenario # 4	Form ES-D-1

Plant Conditions:

- Unit 1 is operating at 2% power

Equipment Out of Service:

- None

Planned Shift Activities:

- Maintain 2% power