Facility: **Palo Verde Nuclear Generating Station** Date of Exam: **April 2015**

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	4	N/A			3	3	N/A		2	18			6
	2	1	2	1				1	2			2	9			4
	Tier Totals	4	5	5				4	5			4	27			10
2. Plant Systems	1	3	3	3	2	2	2	3	2	2	3	3	28			5
	2	1	1	1	2	1	1	0	1	1	0	1	10			3
	Tier Totals	4	4	4	4	3	3	3	3	3	3	4	38			8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
		2			3			2			3							

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).
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 associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; 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' 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 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.

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)						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						EK1.06 **Knowledge of the operational implications of the following concepts as they apply to the reactor trip**: Relationship of emergency feedwater flow to S/G and decay heat removal following reactor trip . (CFR 41.8 / 41.10 / 45.3)	3.7	1
000008 Pressurizer Vapor Space Accident / 3		X					AK2.02 **Knowledge of the interrelations between the Pressurizer Vapor Space Accident and the following:** Sensors and detectors. **(CFR 41.7 / 45.7)**	2.7*	2
000009 Small Break LOCA / 3						X	2.4.6 **Knowledge of EOP mitigation strategies.** (CFR: 41.10 / 43.5 / 45.13)	3.7	3
000009 Small Break LOCA / 3					X		Ability to determine or interpret the following as they apply to a small break LOCA: Existence of adequate natural circulation (CFR 43.5 / 45.13)	4.2	4
000011 Large Break LOCA / 3							EA2.09 **Ability to determine or interpret the following as they apply to a Large Break LOCA**: Existence of adequate natural circulation. (CFR 43.5 / 45.13)	4.2	
000015/17 RCP Malfunctions / 4				X			AA1.22 **Ability to operate and / or monitor the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow):** RCP seal failure/malfunction. **(CFR 41.7 / 45.5 / 45.6)**	4.0	5
000022 Loss of Rx Coolant Makeup / 2									
000025 Loss of RHR System / 4	X						AK1.01 **Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System:** Loss of RHRS during all modes of operation. **(CFR 41.8 / 41.10 / 45.3)**	3.9	6
000026 Loss of Component Cooling Water / 8			X				AK3.01 **Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water:** The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the CCWS coolers. **(CFR 41.5,41.10 / 45.6 / 45.13)**	3.2*	7

000027 Pressurizer Pressure Control System Malfunction / 3			X				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. **(CFR 41.5,41.10 / 45.6 / 45.13)**	2.8	8
000029 ATWS / 1				X			EA1.12 **Ability to operate and monitor the following as they apply to a ATWS:** M/G set power supply and reactor trip breakers. (CFR 41.7 / 45.5 / 45.6)	4.1	9
000038 Steam Gen. Tube Rupture / 3	X						EK1.01 **Knowledge of the operational implications of the following concepts as they apply to the SGTR:** Use of steam tables (CFR 41.8 / 41.10 / 45.3)	3.1	10
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4		X					AK2.02 **Knowledge of the interrelations between the Steam Line Rupture and the following:** Sensors and detectors. **(CFR 41.7 / 45.7)**	2.6*	11
000054 (CE/E06) Loss of Main Feedwater / 4						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)	4.0	12
000055 Station Blackout / 6				X			EA1.06 **Ability to operate and monitor the following as they apply to a Station Blackout:** Restoration of power with one ED/G. (CFR 41.7 / 45.5 / 45.6)	4.1	13
000056 Loss of Off-site Power / 6			X				AK3.01 **Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power:** Order and time to initiation of power for the load sequencer. **(CFR 41.5,41.10 / 45.6 / 45.13)**	3.5	14
000057 Loss of Vital AC Inst. Bus / 6					X		AA2.19 **Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus:** The plant automatic actions that will occur on the loss of a vital ac electrical instrument bus. **(CFR: 43.5 / 45.13)**	4.0	15
000058 Loss of DC Power / 6									
000062 Loss of Nuclear Svc Water / 4					X		AA2.01 **Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water:** Location of a leak in the SWS. **(CFR: 43.5 / 45.13)**	2.9	16
000065 Loss of Instrument Air / 8			X				AK3.04 **Knowledge of the reasons for the following responses as they apply to the Loss of Instrument Air:** Cross-over to backup air supplies **(CFR 41.5,41.10 / 45.6 / 45.13)**	3.0	17

~~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					AK2.07 **Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following:** Turbine / generator control. **(CFR: 41.4, 41.5, 41.7, 41.10 / 45.8)**	3.6	18
K/A Category Totals:	3	3	4	3	3	2	Group Point Total:		18

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ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)						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	2.1.28 **Knowledge of the purpose and function of major system components and controls.** (CFR: 41.7)	4.1	19
000003 Dropped Control Rod / 1	X						AK1.07 **Knowledge of the operational implications of the following concepts as they apply to Dropped Control Rod:** Effect of dropped rod on insertion limits and SDM. **(CFR 41.8 / 41.10 / 45.3)**	3.1	20
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1									
000028 Pressurizer Level Malfunction / 2			X				AK3.05 **Knowledge of the reasons for the following responses as they apply to the Pressurizer Level Control Malfunctions:** Actions contained in EOP for PZR level malfunction. **(CFR 41.5,41.10 / 45.6 / 45.13)**	3.7	21
000032 Loss of Source Range NI / 7		X					AK2.01 **Knowledge of the interrelations between the Loss of Source Range Nuclear Instrumentation and the following:** Power supplies, including proper switch positions. **(CFR 41.7 / 45.7)**	2.7*	22
000033 Loss of Intermediate Range NI / 7									
000036 (BW/A08) Fuel Handling Accident / 8									
000037 Steam Generator Tube Leak / 3						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)	3.9	23
000051 Loss of Condenser Vacuum / 4									
000059 Accidental Liquid Radwaste Rel. / 9							AA1.01 **Ability to operate and / or monitor the following as they apply to the Accidental Liquid Radwaste Release:** Radioactive-liquid monitor. **(CFR 41.7 / 45.5 / 45.6)**	3.5	
000059 Accidental Liquid Radwaste Rel. / 9		X					4.2 059 AK2.02 Knowledge of the interrelations between the Accidental Liquid Rad waste Release and the following: Radioactive-gas monitors (CFR 41.7 / 45.7)	2.7	24

000060 Accidental Gaseous Radwaste Rel. / 9									
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					X		AA2.02 **Ability to determine and interpret the following as they apply to the Loss of Containment Integrity:** Verification of automatic and manual means of restoring integrity. **(CFR: 43.5 / 45.13)**	3.9	25
000074 (W/E06&E07) Inad. Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									
~~W/EO1 & 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									
~~BW/E13&E14 EOP Rules and Enclosures~~									
CE/A11; W/E08 RCS Overcooling - PTS / 4				X			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. (CFR: 41.7 / 45.5 / 45.6)	3.3	26
CE/A16 Excess RCS Leakage / 2					X		AA2.2 **Ability to determine and interpret the following as they apply to the (Excess RCS Leakage):** Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. (CFR: 43.5 / 45.13)	2.9	27
CE/E09 Functional Recovery									
K/A Category Point Totals:	1	2	1	1	2	2	Group Point Total:		9

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)											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					A1.02 **Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCPS controls including:** RCP pump and motor bearing temperatures . (CFR: 41.5 / 45.5)	2.9	28
004 Chemical and Volume Control							X					A1.09 **Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including:** RCS pressure and temperature. (CFR: 41.5 / 45.5)	3.6	29
005 Residual Heat Removal	X											K1.10 **Knowledge of the physical connections and/or cause-effect relationships between the RHRS and the following systems:** CSS (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.2	30
006 Emergency Core Cooling												A4.05 **Ability to manually operate and/or monitor in the control room:** Transfer of ECCS flowpaths prior to recirculation. (CFR: 41.7 / 45.5 to 45.8)	3.9	
006 Emergency Core Cooling										X		A4.07 Ability to manually operate and/or monitor in the control room: ECCS pumps and valves (CFR: 41.7 / 45.5 to 45.8)	4.4	31
006 Emergency Core Cooling									X			A3.03 **Ability to monitor automatic operation of the ECCS, including:** ESFAS-operated valves. (CFR: 41.7 / 45.5)	4.1	32
007 Pressurizer Relief/Quench Tank					X							K5.02 **Knowledge of the operational implications of the following concepts as the apply to PRTS:** Method of forming a steam bubble in the PZR. (CFR: 41.5 / 45.7)	3.1	33
008 Component Cooling Water											X	2.1.28 **Knowledge of the purpose and function of major system components and controls.** (CFR: 41.7)	4.1	34

008 Component Cooling Water			X								K3.02 **Knowledge of the effect that a loss or malfunction of the CCWS will have on the following:** CRDS.	2.9	35
010 Pressurizer Pressure Control						X					K6.03 **Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS:** PZR sprays and heaters. (CFR: 41.7 / 45.7)	3.2	36
012 Reactor Protection		X									K2.01 **Knowledge of bus power supplies to the following:** RPS channels, components, and interconnections (CFR: 41.7)	3.3	37
012 Reactor Protection							X				A2.01 **Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:** Faulty bistable operation. (CFR: 41.5 / 43.5 / 45.3 / 45.5)	3.1	38
013 Engineered Safety Features Actuation										X	2.4.31 **Knowledge of annunciator alarms, indications, or response procedures**. (CFR: 41.10 / 45.3)	4.2	39
013 Engineered Safety Features Actuation			X								K3.03 Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Containment (CFR: 41.7 / 45.6)	4.2	41
022 Containment Cooling	X										K1.04 **Knowledge of the physical connections and/or cause/effect relationships between the CCS and the following systems:** Chilled water. (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.9*	40
022 Containment Cooling											K3.01 **Knowledge of the effect that a loss or malfunction of the CCS will have on the following:** Containment equipment subject to damage by high or low temperature, humidity, and pressure. (CFR: 41.7 / 45.6)		
											3.2 013 K3.03 (4.3/4.7) Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Containment		41

~~025 Ice Condenser~~													
026 Containment Spray									X		A4.05 **Ability to manually operate and/or monitor in the control room:** Containment spray reset switches. (CFR: 41.7 / 45.5 to 45.8)	3.5	42
039 Main and Reheat Steam											K5.05 **Knowledge of the operational implications of the following concepts as they apply to the MRSS:** Bases for RCS cooldown limits. (CFR: 441.5 / 45.7)	2.7	
039 Main and Reheat Steam					X						K5.01 (2.9/3.1) Knowledge of the operational implications of the following concepts as they apply to the MRSS: Definition and causes of steam/water hammer. (CFR: 41.5 / 45.7)	2.9	43
059 Main Feedwater								X			A2.11 **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 control system. (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.0*	44
061 Auxiliary/Emergency Feedwater	X										K1.07 **Knowledge of the physical connections and/or cause/effect relationships between the AFW and the following systems:** Emergency water source. (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.6	45
061 Auxiliary/Emergency Feedwater		X									K2.02 **Knowledge of bus power supplies to the following:** AFW electric drive pumps. (CFR: 41.7)	3.7*	46
062 AC Electrical Distribution									X		A3.05 **Ability to monitor automatic operation of the ac distribution system, including:** Safety-related indicators and controls. (CFR: 41.7 / 45.5)	3.5	47
062 AC Electrical Distribution							X				A1.03 **Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ac distribution system controls including:** Effect on instrumentation and controls of switching power supplies. (CFR: 41.5 / 45.5)	2.5	48

063 DC Electrical Distribution			X								K3.01 **Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following:** ED/G. (CFR: 41.7 / 45.6)	3.7*	49
064 Emergency Diesel Generator				X							K4.02 **Knowledge of ED/G system design feature(s) and/or interlock(s) which provide for the following:** Trips for ED/G while operating (normal or emergency). (CFR: 41.7)	3.9	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									K2.08 **Knowledge of bus power supplies to the following:** ESF-actuated MOVs. (CFR: 41.7)	3.1*	53
078 Instrument Air										X	2.4.11 **Knowledge of abnormal condition procedures.** (CFR: 41.10 / 43.5 / 45.13)	4.0	54
103 Containment				X							K4.06 Knowledge **of containment system design feature(s) and/or interlock(s) which provide for the following:** Containment isolation system. (CFR: 41.7)	3.1	55
K/A Category Point Totals:	3	3	3	2	2	2	3	2	2	3	3	Group Point Total:	28

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											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			X									K3.02 **Knowledge of the effect that a loss or malfunction of the CRDS will have on the following:** RCS. (CFR: 41.7/45.6)	3.4*	56
002 Reactor Coolant	X											K1 07 **Knowledge of the physical connections and/or cause-effect relationships between the RCS and the following systems:** Reactor vessel level indication system. (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.5*	57
011 Pressurizer Level Control														
014 Rod Position Indication											X	2.2.12 **Knowledge of surveillance procedures.** (CFR: 41.10 / 45.13)	3.7	58
015 Nuclear Instrumentation		X										K2.01 **Knowledge of bus power supplies to the following**: NIS channels, components, and interconnections. (CFR: 41.7)	3.3	59
016 Non-nuclear Instrumentation														
017 In-core Temperature Monitor														
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control						X						Knowledge of the effect of a loss or malfunction on the following will have on the HRPS: Hydrogen recombiners (CFR: 41.7 / 45.7)	2.6	64
029 Containment Purge														
033 Spent Fuel Pool Cooling												A3.02 **Ability to monitor automatic operation of the Spent Fuel Pool Cooling System including:** Spent fuel leak or rupture. (CFR: 41.7 / 45.5)	2.9	
034 Fuel Handling Equipment														
035 Steam Generator				X								K4.03 **Knowledge of S/GS design feature(s) and/or interlock(s) which provide for the following:** Automatic blowdown and sample line isolation and reset. (CFR: 41.7)	2.6*	61

041 Steam Dump/Turbine Bypass Control											K5.01 **Knowledge of the operational implications of the following concepts as they apply to the SDS**: Relationship of no-load T-ave. to saturation pressure relief setting on Valves. (CFR: 41.5 / 45.7)	2.9	
041 Steam Dump/Turbine Bypass Control					X						Knowledge of the operational implications of the following concepts as the apply to the SDS: Reactivity feedback effects (CFR: 41.5 / 45.7)	3.1	62
045 Main Turbine Generator								X			A2.17 **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**: Malfunction of electrohydraulic control. (CFR: 41.5 / 43.5 / 45.3 / 45.5)	2.7*	63
055 Condenser Air Removal									X		A3.03 Ability to monitor automatic operation of the CARS, including: Automatic diversion of CARS exhaust (CFR: 41.7 / 45.5)	2.5	60
056 Condensate													
068 Liquid Radwaste											K6.10 **Knowledge of the effect of a loss or malfunction on the following will have on the Liquid Radwaste System:** Radiation monitors. (CFR: 41.7 / 45.7)	2.5	
071 Waste Gas Disposal													
072 Area Radiation Monitoring													
075 Circulating Water				X							K4.01 **Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following**: Heat sink. (CFR: 41.7)	2.5	65
079 Station Air													
086 Fire Protection													
K/A Category Point Totals:	1	1	1	2	1	1	0	1	1	0	1	Group Point Total:	10

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Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.25	2.1.25 **Ability to interpret reference materials, such as graphs, curves, tables, etc.** (CFR: 41.10 / 43.5 / 45.12)	3.9	66		
	2.1.34	2.1.34 **Knowledge of primary and secondary plant chemistry limits.** (CFR: 41.10 / 43.5 / 45.12)	2.7	67		
	Subtotal					
2. Equipment Control	2.2.3	(multi-unit license) **Knowledge of the design, procedural, and operational differences between units.** (CFR: 41.5 / 41.6 / 41.7 / 41.10 / 45.12)	3.8	68		
	2.2.43	2.2.43 **Knowledge of the process used to track inoperable alarms.** (CFR: 41.10 / 43.5 / 45.13)	3.0	69		
	2.2.13	2.2.13 **Knowledge of tagging and clearance procedures.** (CFR: 41.10 / 45.13)	4.1	70		
	Subtotal					
3. Radiation Control	2.3.12	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	71		
	2.3.15	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	72		
	Subtotal					
4. Emergency Procedures / Plan	2.4.25	2.4.25 **Knowledge of fire protection procedures.** (CFR: 41.10 / 43.5 / 45.13)	3.3	73		
	2.4.35	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	74		
	2.4.43	2.4.43 **Knowledge of emergency communications systems and techniques**. (CFR: 41.10 / 45.13)	3.2	75		
	Subtotal					
Tier 3 Point Total				10		7

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Tier / Group	Randomly Selected K/A	Reason for Rejection
#4 T1/G1	4.1 009 EA2.37	We spent a great deal time and effort trying to develop a quality question for the original KA but a Large LOCA did not seem to fit the intent of the KA. Since we not able to write with plausible distracters we chose the same ability for a Small LOCA
#24 T1/G2	4.2 059 K2.02	We spent a great deal time and effort trying to develop a quality question for the original KA but with only 1 liquid radwaste monitor we were not able to write a question with plausible distracters. We chose to stay within system 059 and "spun" to a new KA.
#31 T2/G1	3.2 006 A4.07	Made numerous attempts to use the original KA to meet RO level knowledge requirements. In the LOCA EOP, steps 34 and 59 address the conditions, alignment and actions to transfer ECCS flowpaths. After applying the SRO question guidance we determined that every question we wrote came under SRO knowledge so we "spun" to another KA within the same system and ability.
#41 T2/G1	3.2 013 K3.03	The original KA was too similar to Q35 both questions would have asked CCW or CCWS to containment and what is cooled. The distracters for one would have been the correct answer for the other therefore we "spun" to another KA staying within the K3 hierarchy.
#43 T2/G1	3.4 039 K5.01	The original KA led us to write questions that were too similar to SRO question Q78; all had the same knowledge requirements (double jeopardy) with essentially the same answer and distracters. We kept the SRO KA and "spun" the RO within the same system and K5.
#60 T2/G2	3.4 055 A3.03	At PVNGS Spent Fuel Pool Cooling has no an automatic action or response so we could not write a question to meet this KA. We "spun" to a system not previously used in 3.4 and maintained the A3 hierarchy.
#62 T2/G2	3.4 041 K5.07	We spent a great deal of time and effort trying to develop a quality question for the original KA, but were unable to develop a question with plausible distracters. We chose to stay within system 041 and K5 then "spun" to 5.07.
#64 T2/G2	3.5 028 K6.01	We spent a great deal time and effort trying to develop a quality question for the original KA, but were unable to develop a question with plausible distracters. We "spun" to a system not previously used in T2/G2 but maintained the K6 hierarchy.

Facility: **Palo Verde Nuclear Generating Station** Date of Exam: **April 2015**

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				N/A					N/A			18	3	3	6
	2												9	3	1	4
	Tier Totals												27			10
2. Plant Systems	1												28	2	3	5
	2												10	1	2	3
	Tier Totals												38			8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7
														2	2	1	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 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).
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 associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; 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' 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 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.

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (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	1
000022 Loss of Rx Coolant Makeup / 2									
000025 Loss of RHR System / 4						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	2
000026 Loss of Component Cooling Water / 8									
000027 Pressurizer Pressure Control System Malfunction / 3									
000029 ATWS / 1									
000038 Steam Gen. Tube Rupture / 3						X	2.4.18 **Knowledge of the specific bases for EOPs**. (CFR: 41.10 / 43.1 / 45.13)	4.0	3
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4						X	2.4.30 **Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.** (CFR: 41.10 / 43.5 / 45.11)	4.1	6
000054 (CE/E06) Loss of Main Feedwater / 4									
000055 Station Blackout / 6									
000056 Loss of Off-site Power / 6					X		AA2.72 **Ability to determine and interpret the following as they apply to the Loss of Offsite Power:** Auxiliary feed flow. **(CFR: 43.5 / 45.13)**	4.1	4
000057 Loss of Vital AC Inst. Bus / 6									

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	5
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							2.4.30 **Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.** (CFR: 41.10 / 43.5 / 45.11)	4.1	
K/A Category Totals:					3	3	Group Point Total:		6

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (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					X		AA2.04 **Ability to determine and interpret the following as they apply to the Dropped Control Rod:** Rod motion stops due to dropped rod. **(CFR: 43.5 / 45.13)**	3.4*	7
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1									
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7									
000033 Loss of Intermediate Range NI / 7							AA2.08 **Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation:** Intermediate range channel operability. **(CFR: 43.5 / 45.13)**	3.3	
000036 (BW/A08) Fuel Handling Accident / 8						X	2.4.41 **Knowledge of the emergency action level thresholds and classifications.** (CFR: 41.10 / 43.5 / 45.11)	4.6	9
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)**	3.3	10
000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5					X		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Containment Integrity: Verification of automatic and manual means of restoring integrity **(CFR: 43.5 / 45.13)**	3.9	8
000074 (W/E06&E07) Inad. Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									
~~W/EO1 & 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									
~~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									
K/A Category Point Totals:					3	1	Group Point Total:		4

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (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											X	2.4.41 **Knowledge of the emergency action level thresholds and classifications.** (CFR: 41.10 / 43.5 / 45.11)	4.6	11
005 Residual Heat Removal														
006 Emergency Core Cooling														
007 Pressurizer Relief/Quench Tank														
008 Component Cooling Water														
010 Pressurizer Pressure Control								X				A2.02 **Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:** Spray valve failures. (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.9	12
012 Reactor Protection														
013 Engineered Safety Features Actuation														
022 Containment Cooling														
~~025 Ice Condenser~~														
026 Containment Spray								X				A2.07 **Ability to (a) predict the impacts of the following malfunctions or operations on the CSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:** Loss of containment spray pump suction when in recirculation mode, possibly caused by clogged sump screen, pump inlet high temperature exceeded cavitation, voiding), or sump level below cutoff (interlock) limit. (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.6	13

039 Main and Reheat Steam											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	
059 Main Feedwater													
061 Auxiliary/Emergency Feedwater										X	2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations. (CFR: 41.10 / 43.2 / 45.13)	4.2	14
062 AC Electrical Distribution													
063 DC Electrical Distribution													
064 Emergency Diesel Generator													
073 Process Radiation Monitoring										X	2.2.22 **Knowledge of limiting conditions for operations and safety limits.** (CFR: 41.5 / 43.2 / 45.2)	4.7	15
076 Service Water													
078 Instrument Air													
103 Containment													
K/A Category Point Totals:								2			3	Group Point Total:	5

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (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											X	2.2.12 **Knowledge of surveillance procedures.** (CFR: 41.10 / 45.13)	4.1	16
014 Rod Position Indication														
015 Nuclear Instrumentation														
016 Non-nuclear Instrumentation														
017 In-core Temperature Monitor														
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control														
029 Containment Purge														
033 Spent Fuel Pool Cooling														
034 Fuel Handling Equipment											X	2.1.1 Knowledge of Conduct of Shift Operations	3.8	17
035 Steam Generator								X				A2.01 **Ability to (a) predict the impacts of the following malfunctions or operations on the S/GS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:** Faulted or ruptured S/Gs. (CFR: 41.5 / 43.5 / 45.3 / 45.5)	4.5	18
041 Steam Dump/Turbine Bypass Control														
045 Main Turbine Generator														
055 Condenser Air Removal														
056 Condensate														
068 Liquid Radwaste														
071 Waste Gas Disposal														
072 Area Radiation Monitoring														
075 Circulating Water														
079 Station Air														
086 Fire Protection														

K/A Category Point Totals:							1			2	Group Point Total:		3

Facility: **Palo Verde Nuclear Generating Station**		Date of Exam: **April 2015**				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.1	2.1.1 **Knowledge of conduct of operations requirements.** (CFR: 41.10 / 45.13)			4.2	19
	2.1.5	2.1.5 **Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.** (CFR: 41.10 / 43.5 / 45.12)			3.9	20
	Subtotal					
2. Equipment Control	2.2.20	2.2.20 **Knowledge of the process for managing troubleshooting activities.** (CFR: 41.10 / 43.5 / 45.13)			3.8	21
	2.2.18	2.2.18 **Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.** (CFR: 41.10 / 43.5 / 45.13)			3.9	22
	Subtotal					
3. Radiation Control	2.3.13	2.3.13 **Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.** (CFR: 41.12 / 43.4 / 45.9 / 45.10)			3.8	23
	Subtotal					
4. Emergency Procedures / Plan	2.4.40	2.4.40 **Knowledge of SRO responsibilities in emergency plan implementation**. (CFR: 41.10 / 43.5 / 45.11)			4.5	24
	2.4.23	2.4.23 **Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.** (CFR: 41.10 / 43.5 / 45.13)			4.4	25
	Subtotal					
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
#6 (81) T1/G1	2.4.30	A great deal time and effort were spent trying to develop a quality question to match this generic KA with system 007. There are limited reports associated with grid disturbances therefore I was unable to come up with plausible distracters. We kept the KA and "spun" to an unused system in T1/G1.
#8 (83) T1/G2	4.2 069 AA2.02	PVNGS does not have Intermediate Range Detectors so we "spun" to a new system but retained the AA2 hierarchy.
#14 (89) T2/G1	2.2.36	The original KA, 2.2.44, is the ability to interpret CR indications and verify the status of a system… This is an RO task and ability we could not develop an SRO question to the original KA. We "spun" to a new 2.2 generic KA and system.
#17 (92) T2/G2	2.1.1	We were not able to develop a question to the original KA, discussed with Chief Examiner and "spun" to a new Generic KA. We maintained the tie to Fuel Handling/Dry Cask operations.

Facility: PVNGS Date of Examination: April 2015

Examination Level: RO X SRO Operating Test Number: **2015 NRC**

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R M	A1 – Determine Ability to Stand Shift (2.1.4 3.3/3.8)
Conduct of Operations	R M	A2 – Shutdown Margin Calculation (2.1.37 4.3/4.6; 2.1.20 4.6/4.6)
Equipment Control	R M	A3 – Technical Review of a Tag Assignment Sheet (2.2.13 4.1/4.3)
Radiation Control	R M	A4 – Perform RO Radiological Tasks (2.3.13 3.4/3.8)
Emergency Procedures/Plan	N/A	N/A - This Topic not selected for ROs

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)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

2015 NRC Exam RO Admin JPM Summary

A1, Determine ability to stand shift with training and license proficiency: This JPM requires the RO to determine if he/she meets the requirements for watchstanding proficiency, including participation in LOCT, in accordance with 40DP-9OP02, Conduct of Shift Operations. The JPM is modified from the original JPM (2012 NRC A-1) in that previous watchstanding dates and hours are changed and participation in training has also changed. In 2012, the reason for not being able to stand a watch was not meeting proficiency requirements. In 2015, the reason is not being current in training.

A2, Shutdown Margin Calculation: This JPM requires the RO to calculate a Shutdown Margin (SDM) in accordance with 72ST-9RX14, Shutdown Margin, Modes 3, 4 and 5; and the Unit 1 Core Data Book. This JPM is modified from the original JPM (from 2010 NRC Exam) in that parameters, such as current boron concentration and time in core life, have changed. Additionally, a planned cooldown to 500°F was added to the Initial Conditions, which now requires the applicant to determine, rather than be given, the Most Conservative Tcold. The number of stuck rods was increased from 1 to 2, which impacts the Acceptance Criteria for the Xenon Adjusted Required Boron Concentration from "met" to "not met."

A3, Technical Review of a Tag Assignment Sheet: This JPM requires the RO to perform a technical review of a Tag Assignment Sheet and identify errors. This JPM is modified from the original JPM (2009 NRC Exam) in that the induced errors, such as positions of valves and required tags, have been changed.

A4, Perform RO Radiological Tasks: This JPM requires the RO to review given conditions and determine dose received for a task, required authorization for that dose, and posting requirements for the area where the task will be performed; in accordance with 75DP-9RP01, Radiation Exposure and Access Control, and 75DP-0RP01, Radiological Posting and Labeling. This JPM is modified from the original JPM (2013 NRC Exam) in that the exposures, the required approval, and the posting are all different.

Emergency Procedures/Plan Topic not selected for ROs

Facility: PVNGS	Date of Examination: April 2015
Examination Level: RO ☐ SRO X	Operating Test Number: **2015 NRC**

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R D P	A5 – Ensure Compliance with Fatigue Rule Program (2.1.5 2.9/3.9)
Conduct of Operations	R M	A6 – Review Shutdown Margin Calculation (2.1.37 4.3/4.6) (2.1.20 4.6/4.6)
Equipment Control	R M	A7 – Review Surveillance Test (2.2.12 3.7/4.1)
Radiation Control	R M	A8 – Perform SRO Radiological Tasks (2.3.13 3.4/3.8)
Emergency Procedures/Plan	R D	A9 – Classify Event and Make PARs (2.4.41 2.9/4.6) (2.4.44 2.4/4.4)

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 (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
(N)ew or (M)odified from bank (≥ 1)
(P)revious 2 exams (≤ 1; randomly selected)

2015 NRC Exam SRO Admin JPM Summary

A5 – Ensure Compliance with Fatigue Rule Program: This JPM requires the SRO to determine if crew members can assume the shift while meeting the fatigue requirements outlined in 01DP-0AP17, Managing Personal Fatigue. The JPM was randomly selected from the previous two NRC exams (2013) at PVNGS.

A6 – Review Shutdown Margin Calculation: This JPM requires the SRO to review a Shutdown Margin (SDM) calculation for accuracy in accordance with 72ST-9RX14, Shutdown Margin, Modes 3, 4 and 5; and the Unit 2 Core Data Book. This JPM is modified from the original JPM (2010 NRC A-5) in that induced errors have changed.

A7 – Review Surveillance Test: This JPM requires the SRO to perform a technical review of a surveillance, Inoperable Power Sources Action Statement, and identify errors. This JPM is modified from the original JPM (2008 NRC SA3) in that the induced errors, such as transmission lines capable of power transmission, acceptance criteria, and operable redundant equipment, have been changed.

A8 – Perform SRO Radiological Tasks: This JPM requires the SRO to review given conditions and determine dose received for a task, required authorization for that dose, and determine who makes the entry; in accordance with 75DP-9RP01, Radiation Exposure and Access Control, and 75DP-0RP01, Radiological Posting and Labeling. This JPM is modified from the original JPM (2012 NRC A8) in that all of the dose values have changed and the individual to perform the task is different.

A9 – Classify Event and Make PARs: This JPM requires the SRO to review given conditions and determine the Emergency Action Level in accordance with EP-0900, Appendix L, and EP-0901, Classifications. It also requires the SRO to make Protective Action Recommendations in accordance with EP-0905, Protective Actions. This is modified Bank JPM EP008-CR-009. The modifications include requiring the use of Met Tower Data, requiring identification of Potentially Affected Sectors, and adding the Emergency Exposure Limit for Life-Saving.

Facility: **PVNGS** Date of Examination: **4/13/2015**
Exam Level: **RO** Operating Test No.: **2015NRC**

Control Room Systems@ (8 for **RO**; 7 for SRO-I; 2 or 3 for SRO-U)

JPM #	System/JPM Title	Type Code*	Safety Function
S1	CIAS Actuation/Verification (40EP-9EO03, Loss of Coolant Accident, Steps 13 & 14))	S NA L EN 3.5103 A3.01 3.9/4.2	5
S2	Perform BDAS Alarm Check (40EP-9EO10, Standard Appendix 8)	S L D 3.7 015 A3.03 3.9/3.9	7
S3	Reenergize NBN-X02 (Non ESF Transformer) and NBN-S02(Non-classs 4160v bus) (40OP-9NB01, 4.16 Non-Class 1E Power (NB))	S N 3.6 062 A4.07 3.1/3.1	6
S4	Place Containment Refueling Purge Subsystem in Service (40OP-9CP01, Containment Purge System)	S N L 3.8 029 A2.032.7/3.1	8
S5	Respond to a Pressurizer Pressure Instrument Failure (40AL-9RK4A, Panel B04A Alarm Responses)	S M A 4.2 027 AA1.01 4.0/3.9	3
S6	Reset Inadvertent MSIS (40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations)	S D P 3.2 013 A4.01 4.5/4.8	2
S7	Reconnect and Reset the Steam Bypass Control System (40OP-9SF05, Operation of Steam Bypass Control System)	S D 3.4 041 A4.08 3.0/3.1	4S
S8	Withdraw Reg Group 4; and Trip the Reactor when Continuous CEA Movement Occurs (40AO-9ZZ09, Reactor Power Cutback (Loss of Feedpump))	S A D 4.2 001 AA2.05 4.4/4.6	1
In-Plant Systems@ (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
P1	Energize PBB-S04 from EDG 'B' (40AO-9ZZ19, Control Room Fire)	A D E 4.2 068 AA1.10 3.7/3.9	8
P2	Align Charging Pump Discharge to Hot Leg Injection Train A HPSI (40EP-9EO10, Standard Appendix 208, Attachment 208-A)	N E R 3.1004 A2.14 3.8/3.9	1
P3	Reset Overspeed Trip on AFA-P01 (40EP-9EO10, Standard Appendix 112)	A DE 3.4 061 A2.05 3.1/3.4	4S

@	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 mayoverlap those tested in the control room.

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

JPM Summary:

S1, CIAS Actuation/Verification: This JPM will be conducted simultaneously with S2. After a LOCA a CIAS will fail to initiate. A CIAS is manually initiated and two sets of containment isolation valves fail to automatically close. The RO is directed to perform steps 13 and 14 from the LOCA procedure. After verifying a CIAS should have actuated, the RO manually initiates a CIAS. The next step is to ensure one isolation valve per containment penetration is closed. Two penetrations have both valves fail to close and the RO isolates at least one valve in each penetration.This is a NEW JPM. There are 3 critical steps in this JPM.

S2, BDAS Alarm Check: This JPM will be conducted simultaneously with S1. After aninadvertent Reactor Trip, an RCS leak develops and a CSAS is manually initiated on trend. The BOP is directed to perform Appendix 8, Boron Dilution Alarm Check, of the Standard Appendices.This is a Time Critical JPM because Boron Dilution Alarms must be confirmed operable within one hour after neutron flux is within the start-up range following a reactor shutdown.There are 11 critical steps in this JPM.

S3, Reenergize NBN-X02 (Non ESF Transformer and NBN-S02 (Non-Class 4160 v bus): This JPM will be conducted simultaneously with S4. The plant is in Mode 5 when the repairs to the 4160 bus NBN-S02 are completed. The RO is directed to restore power to NBN-X02 and NBN-S02 in accordance with 40OP-9NB01, 4.16 kV Non-Class 1E Power (NB), Section 6.6, Energizing 4.16 kV NBN-S02, beginning with Step 6.6.2.10. This is a NEW JPM. There are 3 critical steps in this JPM.

S4, Place Containment Refueling Purge Subsystem in Service: This JPM will be conducted simultaneously with S3. The plant is in Mode 5 when the BOP is directed to place the Containment Refueling Purge Subsystem in service in accordance with 40OP-9CP01, Containment Purge System, Section 7.0, Placing the Containment Refueling Purge Subsystem in Service with Power to CPA-2A/2B and CPB-3A/3B, beginning with Step 7.3.10. This is a NEW JPM. There are 3 critical steps in this JPM.

S5, Respond to a Pressurizer Pressure Instrument Failure: This JPM will be conducted simultaneously with S6.The plant is at power when and inadvertent MSIS occurs andPT-100X, Pressurizer Pressure Control Transmitter, fails LOW. HS-100, PPCS Selector Switch, fails in the “X” position (fails to transfer to the “Y” position). This results in an actual high pressure condition, as the heaters energize and the spray valves close. The RO is directed to respond to the alarms. The RO restores Pressurizer pressure in accordance with 40AL-9RK4A, Panel B04A Alarm Responses, window 4A01B, Group B. This is an Alternate Path JPM because the main spray valves will not open and the RO must initiate auxiliary spray to reduce RCS pressure. This is a modified JPM (from 2010 NRC Exam) because to the failure of the main spray valves.There are 3 critical steps in this JPM.

S6, Reset Inadvertent MSIS: This JPM will be conducted simultaneously with S5. It was randomly selected from among the 2012 and 2013 NRC Exam systems and controls JPMs using a random generator on an Excel spreadsheet. The plant is at power when and inadvertent MSIS occurs andPT-100X, Pressurizer Pressure Control Transmitter, fails LOW. The BOP is directed to reset the inadvertent MSIS in accordance with 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations, Appendix B, PPS-ESFAS Reset. There are 5 critical steps in this JPM.

S7, Reconnect and Reset the Steam Bypass Control System: This JPM will be conducted simultaneously with S8. It is an "RO Only" JPM. The plant is at power with the Steam Bypass Control System (SBCS) in Manual. The BOP is directed to reconnect and reset the SBCS in accordance with 40OP-9SF05, Operation of Steam Bypass Control System, Appendix C, Connecting and Resetting Steam Bypass Control System. There are 5 critical steps in this JPM.

S8, Withdraw Reg Group 4; and Trip the Reactor when Continuous CEA Movement Occurs (40AO-9ZZ09, Reactor Power Cutback (Loss of Feedpump))**:** This JPM will be conducted simultaneously with S7. It is an "RO Only" JPM. The RO is directed to borate complete Steps 30 and 31 of 40AO-9ZZ09 to restore normal CEA group overlap.. This is an Alternate Path JPM because the continuous CEA movement requires the RO to implement an ARP and manually trip the Reactor. There are 4 critical steps in this JPM.

P1, Energize PBB-S04 with EDG 'B': The Area Operator is directed to perform the actions of Appendix E of 40AO-9ZZ19, Control Room Fire. This Appendix separates the controls for the 'B' DG and 4160 SWGR breakers from the control room and starts EDG 'B' to supply PBB-S04. This is an Alternate Path JPM in that the DG breaker will not close electrically and the operator must go the contingency step and manually close the breaker. This is a Time Critical JPM because the operator must close the DG breaker and start the Spray Pond pump to supply cooling to the DG within a 15 minute period. There are 13 critical steps in this JPM.

P2, Align Charging Pump Discharge to Hot Leg Injection: The Area Operator is directed to align charging pump discharge to Hot Loeg Injection Train A HPSI in accordance with 40EP-9EO10, Standard Appendix 208, Attachment 208-A. This is a NEW JPM. There are 3 critical steps in this JPM.

P3, Reset Overspeed Trip on AFA-P01: The Area Operator is directed to reset an overspeed trip on the Turbine Driven Auxiliary Feedwater Pump in accordance with 40EP-9EO10, Standard Appendix 112. This JPM is the 4th most significant Key Operator Action in the PVNGS PRA. This is an Alternate Path JPM because the Latch Lever and the Trip Hook are not aligned, requiring the Operator to reset AFA-HV-54 (T&TV) in accordance with Contingency Action7.1. There are 6 critical steps in this JPM.

Facility: **PVNGS** Date of Examination: **4/13/2015**
Exam Level: **SRO-I** Operating Test No.: **2015 NRC**

Control Room Systems@ (8 for **RO**; 7 for SRO-I; 2 or 3 for SRO-U)			
JPM #	System/JPM Title	Type Code*	Safety Function
S1	CIAS Actuation/Verification (40EP-9EO03, Loss of Coolant Accident, Steps 13 & 14))	S N A L EN 3.5 103 A3.01 3.9/4.2	**5**
S2	Perform BDAS Alarm Check (40EP-9EO10, Standard Appendix 8)	S L D 3.7 015 A3.03 3.9/3.9	7
S3	Reenergize NBN-X02 (Non ESF Transformer) and NBN-S02 (Non-classs 4160v bus) (40OP-9NB01, 4.16 Non-Class 1E Power (NB))	S N 3.6 062 A4.07 3.1/3.1	6
S4	Place Containment Refueling Purge Subsystem in Service (40OP-9CP01, Containment Purge System)	S N L 3.8 029 A2.03 2.7/3.1	8
S5	Respond to a Pressurizer Pressure Instrument Failure (40AL-9RK4A, Panel B04A Alarm Responses)	S M A 4.2 027 A1.01 4.0/3.9	**3**
S6	Reset Inadvertent MSIS (40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations)	S D P 3.2 013 A4.01 4.5/4.8	2
S9	Isolate a Ruptured SG (40EP-9EO10 Standard Appendix 114)	S D A L 3.4 035 A2.01 4.5/4.6	4P
In-Plant Systems@ (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
P1	Energize PBB-S04 from EDG 'B' (40AO-9ZZ19, Control Room Fire)	A D E 4.2 068 AA1.10 3.7/3.9	8
P2	Align Charging Pump Discharge to Hot Leg Injection Train A HPSI (40EP-9EO10, Standard Appendix 208, Attachment 208-A)	N E R 3.1 004 A2.14 3.8/3.9	1
P3	Reset Overspeed Trip on AFA-P01 (40EP-9EO10, Standard Appendix 112)	A D E 3.4 061 A2.05 3.1/3.4	4S

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

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

JPM Summary:

S1, CIAS Actuation/Verification: This JPM will be conducted simultaneously with S2. After a LOCA a CIAS will fail to initiate. A CIAS is manually initiated and two sets of containment isolation valves fail to automatically close. The RO is directed to perform steps 13 and 14 from the LOCA procedure. After verifying a CIAS should have actuated, the RO manually initiates a CIAS. The next step is to ensure one isolation valve per containment penetration is closed. Two penetrations have both valves fail to close and the RO isolates at least one valve in each penetration. This is a NEW JPM. There are 3 critical steps in this JPM.

S2, BDAS Alarm Check: This JPM will be conducted simultaneously with S1. After an inadvertent Reactor Trip, an RCS leak develops and a CSAS is manually initiated on trend. The BOP is directed to perform Appendix 8, Boron Dilution Alarm Check, of the Standard Appendices. This is a Time Critical JPM because Boron Dilution Alarms must be confirmed operable within one hour after neutron flux is within the start-up range following a reactor shutdown. There are 11 critical steps in this JPM.

S3, Reenergize NBN-X02 (Non ESF Transformer and NBN-S02 (Non-Class 4160 v bus): This JPM will be conducted simultaneously with S4. The plant is in Mode 5 when the repairs to the 4160 bus NBN-S02 are completed. The RO is directed to restore power to NBN-X02 and NBN-S02 in accordance with 40OP-9NB01, 4.16 kV Non-Class 1E Power (NB), Section 6.6, Energizing 4.16 kV NBN-S02, beginning with Step 6.6.2.10. This is a NEW JPM. There are 3 critical steps in this JPM.

S4, Place Containment Refueling Purge Subsystem in Service: This JPM will be conducted simultaneously with S3. The plant is in Mode 5 when the BOP is directed to place the Containment Refueling Purge Subsystem in service in accordance with 40OP-9CP01, Containment Purge System, Section 7.0, Placing the Containment Refueling Purge Subsystem in Service with Power to CPA-2A/2B and CPB-3A/3B, beginning with Step 7.3.10. This is a NEW JPM. There are 3 critical steps in this JPM.

S5, Respond to a Pressurizer Pressure Instrument Failure: This JPM will be conducted simultaneously with S6. The plant is at power when and inadvertent MSIS occurs and PT-100X, Pressurizer Pressure Control Transmitter, fails LOW. HS-100, PPCS Selector Switch, fails in the "X" position (fails to transfer to the "Y" position). This results in an actual high pressure condition, as the heaters energize and the spray valves close. The RO is directed to respond to the alarms. The RO restores Pressurizer pressure in accordance with 40AL-9RK4A, Panel B04A Alarm Responses, window 4A01B, Group B. This is an Alternate Path JPM because the main spray valves will not open and the RO must initiate auxiliary spray to reduce RCS pressure. This is a modified JPM (from 2010 NRC Exam) because to the failure of the main spray valves. There are 3 critical steps in this JPM.

S6, Reset Inadvertent MSIS: This JPM will be conducted simultaneously with S5. It was randomly selected from among the 2012 and 2013 NRC Exam systems and controls JPMs using a random generator on an Excel spreadsheet. The plant is at power when and inadvertent MSIS occurs and PT-100X, Pressurizer Pressure Control Transmitter, fails LOW. The BOP is directed to reset the inadvertent MSIS in accordance with 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations, Appendix B, PPS-ESFAS Reset. There are 5 critical steps in this JPM.

S9, Isolate a Rupted SG: This JPM is an "SRO Only" JPM. The RO is directed to isolate SG#2 due to a SG Tube Rupture. This is an Alternate Path JPM because the Downcomer Isolation valves will not close and the RO must perform the contingency to isolate other vavles. There are 4 critical steps in this JPM.

P1, Energize PBB-S04 with EDG 'B': The Area Operator is directed to perform the actions of Appendix E of 40AO-9ZZ19, Control Room Fire. This Appendix separates the controls for the 'B' DG and 4160 SWGR breakers from the control room and starts EDG 'B' to supply PBB-S04. This is an Alternate Path JPM in that the DG breaker will not close electrically and the operator must go the contingency step and manually close the breaker. This is a Time Critical JPM because the operator must close the DG breaker and start the Spray Pond pump to supply cooling to the DG within a 15 minute period. There are 13 critical steps in this JPM.

P2, Align Charging Pump Discharge to Hot Leg Injection: The Area Operator is directed to align charging pump discharge to Hot Loeg Injection Train A HPSI in accordance with 40EP-9EO10, Standard Appendix 208, Attachment 208-A. This is a NEW JPM. There are 3 critical steps in this JPM.

P3, Reset Overspeed Trip on AFA-P01: The Area Operator is directed to reset an overspeed trip on the Turbine Driven Auxiliary Feedwater Pump in accordance with 40EP-9EO10, Standard Appendix 112. This JPM is the 4th most significant Key Operator Action in the PVNGS PRA. This is an Alternate Path JPM because the Latch Lever and the Trip Hook are not aligned, requiring the Operator to reset AFA-HV-54 (T&TV) in accordance with Contingency Action7.1. There are 6 critical steps in this JPM.

Facility: **PVNGS** Date of Examination: **4/13/2015**
Exam Level: **SRO-U** Operating Test No.: **2015 NRC**

Control Room Systems@ (8 for **RO**; 7 for SRO-I; 2 or 3 for SRO-U)

JPM #	System/JPM Title	Type Code*	Safety Function
S1	CIAS Actuation/Verification (40EP-9EO03, Loss of Coolant Accident, Steps 13 & 14))	S N A L EN 3.5 103 A3.01 3.9/4.2	**5**
S2	Perform BDAS Alarm Check (40EP-9EO10, Standard Appendix 8)	S L D 3.7 015 A3.03 3.9/3.9	7
S9	Isolate a Ruptured SG (40EP-9EO10 Standard Appendix 114)	S D A L 3.2 006 A2.02 4.5/4.6	4P
In-Plant Systems@ (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
P1	Energize PBB-S04 from EDG 'B' (40AO-9ZZ19, Control Room Fire)	A D E 4.2 068 AA1.10 3.7/3.9	8
P2	Align Charging Pump Discharge to Hot Leg Injection Train A HPSI (40EP-9EO10, Standard Appendix 208, Attachment 208-A)	N E R 3.1 004 A2.14 3.8/3.9	1

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

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

JPM Summary:

S1, CIAS Actuation/Verification: This JPM will be conducted simultaneously with S2. After a LOCA a CIAS will fail to initiate. A CIAS is manually initiated and two sets of containment isolation valves fail to automatically close. The RO is directed to perform steps 13 and 14 from the LOCA procedure. After verifying a CIAS should have actuated, the RO manually initiates a CIAS. The next step is to ensure one isolation valve per containment penetration is closed. Two penetrations have both valves fail to close and the RO isolates at least one valve in each penetration. This is a NEW JPM. There are 3 critical steps in this JPM.

S2, BDAS Alarm Check: This JPM will be conducted simultaneously with S1. After an inadvertent Reactor Trip, an RCS leak develops and a CSAS is manually initiated on trend. The BOP is directed to perform Appendix 8, Boron Dilution Alarm Check, of the Standard Appendices. This is a Time Critical JPM because Boron Dilution Alarms must be confirmed operable within one hour after neutron flux is within the start-up range following a reactor shutdown. There are 11 critical steps in this JPM.

S9, Isolate a Rupted SG: This JPM is an "SRO Only" JPM. The RO is directed to isolate SG#2 due to a SG Tube Rupture. This is an Alternate Path JPM because the Downcomer Isolation valves will not close and the RO must perform the contingency to isolate other vavles. There are 4 critical steps in this JPM.

P1, Energize PBB-S04 with EDG 'B': The Area Operator is directed to perform the actions of Appendix E of 40AO-9ZZ19, Control Room Fire. This Appendix separates the controls for the 'B' DG and 4160 SWGR breakers from the control room and starts EDG 'B' to supply PBB-S04. This is an Alternate Path JPM in that the DG breaker will not close electrically and the operator must go the contingency step and manually close the breaker. This is a Time Critical JPM because the operator must close the DG breaker and start the Spray Pond pump to supply cooling to the DG within a 15 minute period. There are 13 critical steps in this JPM.

P2, Align Charging Pump Discharge to Hot Leg Injection: The Area Operator is directed to align charging pump discharge to Hot Loeg Injection Train A HPSI in accordance with 40EP-9EO10, Standard Appendix 208, Attachment 208-A. This is a NEW JPM. There are 3 critical steps in this JPM.

Facility: PVNGS Scenario No.: 1 (Rev. 2) Op-Test No: NRC - 2015

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: (100% power, MOC).
Turnover: See attached.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N BOP/SRO	Secure and isolate SG Blowdown from SG #1 1 in accordance with 40OP-9SG03, Operating the Steam Generator Blowdown System, Section 5.3**.**
2	cmCNCV01CHEPDIC240_2	C RO/SRO	CHN-PDIC-240, Charging Line to RC Loop 2A DP Control, fails LOW in the AUTO Mode. Crew responds in accordance with 40AL-9RK3A for 3A08A and 3A11B. Window 8A, Group C (PT ID CHPDS240).
3	mfAN_1B01A4	C RO/SRO	Auxiliary Transformer High Temperature. Crew responds in accordance with 40AL-9RK1B, window 1B01A (Point ID MAYS57, Unit Aux Xfmr MAN-X02 Trouble). The RO directs an Area Operator to locally investigate the trouble alarm. The AO uses 40AL-9MA01, UNIT AUX TRANSFORMER MAN-X02, Group H, High Winding Temp.
4	mfFW17B	C RO/BOP/ SRO (AOP)	'B' MFP trips, Reactor Power Cutback. The CRS implements 40AO-9ZZ09, Reactor Power Cutback (Loss of Feedpump), Section 3.0, Loss of Feedpump. **[LCO 3.2.4, Condition A]**
5	mfRP06L1 mfRP06L2 cmCPFW07AFBP01_6	C BOP/SRO (AOP/TS)	Inadvertent AFAS-1 Train B &AFB-P01 86 Lockout. Crew responds in accordance with 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations, Section 3.0, AFAS. **[LCO 3.7.5, Condition C]**
6	mfMC01A	M ALL	Loss of condenser vacuum (Trip Initiator). Crew should initiate a manual Reactor trip and enter 40EP-9EO01, Standard Post Trip Actions. The most likely initial diagnosis results in a transition to 40EP-9EO02, Reactor Trip.
7	cmCNRC03RCNPIC100_2	C RO/SRO	RCN-PIC-100, Pressurizer Master Controller, fails to 100% output in the AUTO mode. RO responds in accordance with ARP for B04 window B401B (PZR PRESS HI-LO), Group A, Pressurizer Pressure Ch X(Y) Lo. **(CRITICAL TASK: Close Pressurizer Spray Valves before a SIAS occurs at 1837 psig.)**

8	cmCPFW07AFNP01_6	M ALL	Loss of Feedwater 86 Lockout of AFN-P01. With the loss of vacuum disabling the MFPs, malfunctions of AFB and AFN, and AFA out of service; this results in a Loss of All Feedwater and the CRS rediagnoses the event. The CRS may initially transition to 40EP-9EO06, Loss of All Feedwater, and progress until Step 6. Since Step 6 cannot be accomplished, Contingency Action 6.1 directs a transition to 40EP-9EO09, Functional Recovery. **(CRITICAL TASK:** Establish a feed source to at least one steam generator to ensure restoration of level toward the normal band prior to lifting a primary safety valve.**)**
End point			The scenario may be ended once the selected Steam Generator is being fed to at a rate that raises SG level, and/or lowers/stabilizes RCS temperature, **OR** when deemed appropriate by the Lead Examiner.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	2
4. Major transients (1-2)	2
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical tasks (2-3)	2

CRITICAL TASK	JUSTIFICATION	REFERENCES
Close the Pressurizer Spray Valves before a SIAS occurs at 1837 psig.	Failure to close the Pressurizer Spray Valves prior to RCS pressure lowering to less than 1837 psig will result in a loss of subcooling, which could require securing all RCPs, unnecessarily complicating recovery strategies. 40DP-9AP06, SPTAs Technical Guidelines, Instruction Step: 5 RCS Pressure Control, Contingency Action 5.3, states: "Maintaining RCPs in operation supports the use of main PZR spray to depressurize to the point of HPSI injection if needed, provided there is adequate subcooling and RCP operating limits are maintained. It will also prevent needlessly stopping forced circulation cooling when significant leakage does not exist." Additionally, allowing a SIAS to unnecessarily actuate will also complicate mitigation strategies, as the crew will be required to shutdown unneeded equipment while implementing the FRP.	• PVNGS Critical Task RXTP-2, With a failure of PPCS to operate automatically, operate Pressurizer Heaters and Spray and maintain RCS pressure control within limitations as specified by the RCS Pressure-Temperature Curves. • CE SPTA-05 (CT-06), Establish RCS Pressure Control. • 40DP-9AP06, SPTAs Technical Guidelines, Instruction Step: 5 RCS Pressure Control, Contingency Action 5.3
Establish a feed source to at least one steam generator to ensure restoration of level toward the normal band prior to lifting a primary safety valve.	Failure to prevent dry-out in a SG leads to unnecessary complications in recovery strategy. When SG mass is reduced below 5000 lbm (see FSAR Section 15.2.8.2.3, part of Decrease in Heat Removal By the Secondary System), feedwater flow to that SG must be limited to prevent thermal shock, slowing recovery efforts. Standard Appendix 44, Feeding with the Condensate Pumps, Step 14.d (and 15.d), limits feed flow rate to 1000 gpm if a SG is dry. Excessive feedwater flow to a hot, dry SG can lead to structural damage to SG components (degradation of a fission product barrier), limiting the ability of the SG to remove heat from the RCS. According to 40OP-9SG02, Operating the SGs, Precaution and Limitation 3.7, there are about 16,000 gallons of water in the SG at 0%WR level.	• PVNGS Critical Task LOAF-2, Establish a feed source to at least one steam generator to ensure restoration of level toward the normal band prior to lifting a primary safety valve. • CE HR-01 (CT-08), Establish RCS Heat Removal. • FSAR Section 15.2.8.2.3, part of Decrease in Heat Removal By the Secondary System) • 40DP-9AP17, Standard Appendices Technical Guideline, Appendix 44.

2015 NRC Scenario 1 Overview	
Event 1	Secure and isolate SG Blowdown from SG #1 in accordance with 40OP-9SG03, Operating the Steam Generator Blowdown System, Section 5.3**.** This normal evolution involves entering new Blowdown Constants into the new Core Monitoring Computer per Appendix O. The BOP places SCN-HS-1, Steam Generator 1 Blowdown Path Selector, to theOFF position to stop flow. The BOP then verifies system response using Appendix G, Blowdown Verifications (per the "Stopping B/D" column). An AO is dispatched to perform a local lineup per Appendix I, Securing Steam Generator 1 Blowdown. The BOP will then close the SG 1 Blowdown Containment Isolation Valves (UV-500P/Q) and the 3 SG 1 Isolation Valves (HV-43, 41, 47). Cooling water to the Blowdown Heat Exchanger will remain in service. When SGE-HV-47 is closed, the next event may be initiated.

Event 2	CHN-PDIC-240, Charging Line to RC Loop 2A DP Control, fails LOW in the AUTO Mode. The crew is alerted by the following:
	
	• Annunciators:
	  ○ 3A08A (CHG HDR SYS TRBL)
	  ○ 3A11B (RCP SEAL INJ FLOW HI-HI OR LO)
	• This is a reverse-acting controller in that the actual DP goes low when the controller fails to 100% output.
	• As the DP in the charging header drops, RCP seal injection flow will lower to less than 6 gpm.
	
	Crew responds in accordance with 40AL-9RK3A for 3A08A and 3A11B. Window 8A, Group C (PT ID CHPDS240) directs the RO to take manual control of CHN-PDIC-240 and raise the DP to between 90 and 135 psid. The actions for window 11B require the RO to adjust affected RCP seal injection controllers and/or CHN-PDIC-240 to achieve charging header pressure between 2430 and 2500 psig and RCP seal injection flow between 6.0 and 7.5 gpm. The CRS may refer to 40AO-9ZZ04, Reactor Coolant Pump Emergencies.
	
	When seal injection flow and charging header pressure are adjusted, or at the discretion of the Lead Examiner, the next event can be initiated.

Event 3	Unit Auxiliary Transformer High Temperature. The crew is alerted by the following: • Annunciator 1B01A (UNIT AUX XFMR X02 PROT TRIP/TRBL) • Computer Point ID MAYS57, Unit Aux Xfmr MAN-X02 Trouble Crew responds in accordance with 40AL-9RK1B, window 1B01A (Point ID MAYS57, Unit Aux Xfmr MAN-X02 Trouble). The RO directs an Area Operator to locally investigate the trouble alarm. The AO uses 40AL-9MA01, UNIT AUX TRANSFORMER MAN-X02, Group H, High Winding Temp. The AO reports that winding temperature is 125°C and rising slowly. The AO also reports that all fans and oil pumps are operating. In accordance with Operator Action 4, the AO recommends a reduction in Unit Aux Xfmr load or a transfer to the alternate power source. 40AL-9RK1B, Point ID MAYS57, Unit Aux Xfmr MAN-X02 Trouble, Operator Action 4 prompts the crew to transfer bus NAN-S01 to NAN-S03 and bus NAN-S02 to NAN-S04, then refer to 40OP-9NA03, 13.8 kV Electrical System (NA), Section 7.0 and 11.0. Transfer actions involve placing the Synchronizing Switch to ON, closing the associated tie

2015 NRC Scenario 1 Overview	
	breaker, ensuring the supply breaker opens, checking for proper voltage, and turning off the Synchronizing Switch. When loads have been transferred, the AO reports that winding temperature on the Auxiliary Transformer is lowering slowly. After the report from the AO, or at the discretion of the Lead Examiner, the next event can be initiated.
Event 4	'B' MFP trips. Operators are alerted to the trip by the following: • Annunciator 6A09A (FWPT B TRIP) • Annunciator 4A11B (REAC PWR CUTBACK) The CRS implements 40AO-9ZZ09, Reactor Power Cutback (Loss of Feedpump), Section 3.0, Loss of Feedpump. On the cutback, CEA Groups 4 and 5 fully insert into the core, the Main Turbine sets back to approximately 60%, the runback circuit lowers load to match the secondary plant to the primary, and the Reactor Regulating System inserts CEAs to respond to the initial increase in Tave. Section 3.0 requires the crew to verify that subgroups 4, 5, and 22 have inserted and that Main Turbine load is less than 65%. The STA (or a designated Operator) performs Appendix D, Status Check RPCB Loss of Feedwater Pump. The BOP raises the Speed Bias on the operating MFP to zero or more and the BOP or RO checks that the RRS is adjusting CEAs to restore Tave/Tref to within 3°F. The Steam Bypass Control System (SBCS) is checked to ensure that main steam pressure is being controlled at setpoint. (SBCVs are not expected to be open at this point). The RO or BOP takes the RPCS out of service and the BOP reduces the load limit potentiometer until the potentiometer has control of the Main Turbine control valves. The BOP/RO places CEDMCs in Manual Sequential. The RO starts boron equalization. After the RO has started the boron equalization, or at the discretion of the Lead Examiner, the next event may be initiated.
Event 5	An inadvertent AFAS-1 Train B occurs and AFB-P01 fails due to an 86 lockout. Since AFA-P01 is out of service, it will not auto-start as designed. Crew responds in accordance with 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations, Section 3.0, AFAS. This section directs the crew to override and operate AFW valves as necessary to control SG levels. 2 minutes after the AFW valves are closed, AFB will trip on an 86 Lockout. Chemistry is informed that Blowdown lights 1 and 2 are isolated and Blowdown constants are updated. Once Blowdown constants have been updated in the CMC and PC, the next event may be initiated. With the failure of AFB-P01, the CRS enters Condition C of TS 3.7.5, since two trains of AFW (AFA tagged out, AFB failed) are now inoperable. After the CRS briefs the crew on entry into Condition C of LCO 3.7.5, or at the discretion of the Lead Examiner, the next event may be initiated.
Event 6	A loss of condenser vacuum occurs. This is a significant loss of vacuum; hence, no substantial action will be taken in Loss of Vacuum AOP prior to initiation of a Reactor trip. Crew should initiate a manual Reactor trip and enter 40EP-9EO01, Standard Post Trip Actions. This is the entry procedure for the Emergency Operating (EOP) System. This procedure is used for any event which actuates or requires a reactor trip. The crew checks each Safety Function and performs the Contingency Actions as required. Once the SPTAs are complete, the CRS selects the appropriate recovery procedure using the Diagnostic flowchart in 40EP-9EO01. The most likely initial diagnosis results in a transition to 40EP-9EO02, Reactor Trip.

2015 NRC Scenario 1 Overview	
Event 7	RCN-PIC-100, Pressurizer Master Controller, fails to 100% output in the AUTO mode, which causes both Pressurizer Spray Valves to open 100%. RO responds in accordance with ARP for B04 window B401B (PZR PRESS HI-LO), Group A, Pressurizer Pressure Ch X(Y) Lo. If the main spray valves are not closed, First Priority Operator Action 5 requires the operator to take manual control of RCN-PIK-100, Pressure Spray Control, and close the main spray valves. Recovery actions are also addressed in general terms in the SPTAs (Contingency Action 5.1) if the RCS Pressure Control acceptance criteria are not met. **CRITICAL TASK: Close the Pressurizer Spray Valves before a SIAS occurs at 1837 psig.** When the main spray valves are closed, or at the discretion of the Lead Examiner, the next event may be initiated.
Event 8	The CRS progresses through 40EP-9EO02, Reactor Trip, until Step 9, when AFN-P01 trips on an 86 lockout. With the loss of vacuum disabling the MFPs, malfunctions of AFB and AFN, and AFA out of service; this results in a Loss of All Feedwater and the CRS rediagnoses the event. The CRS may initially transition to 40EP-9EO06, Loss of All Feedwater, and progress until Step 6. Since Step 6 cannot be accomplished, Contingency Action 6.1 directs a transition to 40EP-9EO09, Functional Recovery. If the CRS recognizes that the FRP is the only procedure with guidance for establishing feedwater flow from the Condensate Pumps, he/she may transition directly to 40EP-9EO09. The CRS then implements 40EP-9EO09, Functional Recovery, to establish feedwater from the Condensate Pumps using Standard Appendix 44, Feeding with the Condensate Pumps. This Appendix involves selecting a SG to depressurize, lining up that SGs downcomer to accept flow, isolating that SG's economizer, tripping the FWPs, lining up feedwater heaters, ensuring adequate RCS makeup flow, and depressurizing the selected SG using atmospheric dump valves (ADVs). The CRS may elect to conserve inventory in the unselected SG by isolating it. **CRITICAL TASK: Establish feedwater flow from the Condensate Pumps and feed the selected/depressurized SG prior to opening of the primary safeties.** **EXAMINER NOTE:** Appendix 44 directly relates to Key Operator Action #7 (1.5%) of the PRA: Depressurize Steam Generators and Supply Alternate Feedwater.
End Point	The scenario may be ended once the selected Steam Generator is being fed to at a rate that raises SG level, and/or lowers/stabilizes RCS temperature, OR at the discretion of the Lead Examiner.

TURNOVER

Plant Conditions:

- Unit 1 is at 100% power
- The core is presently at 250 EFPD
- Risk Management Action Level is ORANGE
- AFA-P01 is out of service for unscheduled maintenance
- AFN-P01 and AFB-P01 are protected
- PC is NOT recircing the RWT
- Unit 2 is supplying the Aux Steam cross-tie header

Equipment Out of Service:

- AFA-P01 is under clearance for maintenance. LCO 3.7.5, Condition A and Condition B, have been entered. The pump is expected to return to service in 8 hours.

Planned Shift Activities:

- To support maintenance on SCN-HV-1A, SG #1 Normal Rate Blowdown Flow Control Valve, secure and isolate Steam Generator Blowdown from SG #1 in accordance with 40OP-9SG03, Operating the Steam Generator Blowdown System, Section 5.0. Cooling water to the Blowdown Heat Exchanger will remain in service. The clearance also will require the Containment Isolation Valves to be closed due to known leaking manual isolation valves. Chemistry has been briefed and has concurred with this approach.

Facility: PVNGS Scenario No.: 3 (Rev. 4) Op-Test No: NRC - 2015

Examiners: _____ Operators: _____

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Initial Conditions: (100% power, MOC).
Turnover: See attached.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N BOP/SRO	Place Reactor Power Cutback System in service in accordance with 40OP-9SF04, Operation of the Reactor Power Cutback System, Sections 6.1.1 and 6.1.2.
2	mfTH07	C RO/SRO (AOP/TS)	A small RCS Leak (approximately 4 gpm) develops. The crew initially responds using 74RM-9EF41, Radiation Monitoring System Alarm Response, for the RU-1 alarm. Operator Response 4 directs the crew to perform an RCS water inventory balance per 40ST-9RC02, ERFDADS (Preferred) Calculation of RCS Water Inventory. **[LCO 3.4.14, Condition A]**
3	mfCH01A mfCH01C cmCPCH03HCNA02B_5 cmCPCH03HCNA02D_5	C BOP/SRO (AOP)	CEDM Fans "A" and "C" Trip, standby fans (HCN-A02B and A02D) fail to automatically start. The BOP refers to 40AL-9RK7A for window 7A09B. CRS implements 40AO-9ZZ20, Loss of HVAC, Section 10.0, Loss of Containment Building HVAC – CEDM.
4	mfRC03A	C RO/SRO	RCP 1A Thrust Bearing oil leak. RO refers to the Alarm Response Procedure 40AL-9RJ01 for point RCL107 (Low), RCP 1A BRG OIL RESVR LEV. The ARP directs filling the RCP thrust bearing reservoir per 40OP-9RC01, Reactor Coolant Pump Operation. The operator uses Section 6.14 of 40OP-9RC01 to raise reservoir level. Operator Action 2.5 of the ARP prompts evaluation of 40AO-9ZZ04, Reactor Coolant Pump Emergencies, and the CRS may implement Section 3.0, Abnormal RCP Motor or Bearing Parameters.
5	doED_ZLS037271DS_W1 doRP_ZLSAAC02ALOP1_W1 mfAN_1A03D1	C BOP/SRO (TS)	The UV-1 LOV relay for PBA-S03 fails **[LCO 3.3.7, Condition A]**
6	mfED13A	C RO/BOP/SRO (AOP)	Loss of NNN-D11. The RO refers to 40AL-9RK1C, point NNYS3 (Bkr Ovld Trip). Operator Action 2 of the ARP then directs performance of 40AO-9ZZ14, Loss of Non-Class Instrument or Control Power. **[LCO 3.4.9, Condition A]**
7	mfTH08	M ALL	A Pressurizer Steam Space LOCA occurs
8	See scenario file	C BOP/SRO	ATWS occurs, requiring pressing Rx Trip pushbuttons. Crew implements 40EP-9EO01, Standard Post Trip Actions. When the SPTAs are complete, the CRS diagnosis a LOCA, then transitions

Facility: PVNGS Scenario No.: 3 (Rev. 4) Op-Test No: NRC - 2015

Examiners: _____ Operators: _____

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Initial Conditions: (100% power, MOC).
Turnover: See attached.

Event No.	Malf. No.	Event Type*	Event Description
			to 40EP-9EO03, Loss of Coolant Accident. **(CRITICAL TASK: Trip the Reactor prior to exiting Step 2 of SPTAs.)**
9	cmCPSI01SIAP02_6 cmCPSI01SIBP02_5	C RO/SRO	HPSI Pump "A" trips and HPSI Pump "B" fails to automatically start. **(CRITICAL TASK: Manually start HPSI Pump "B" prior to exiting SPTAs.)**
End point	N/A	ALL	The scenario may be terminated once the RCS cooldown has been initiated, at the discretion of the Chief Examiner.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	3
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

CRITICAL TASK	JUSTIFICATION	REFERENCES
Trip the Reactor prior to exiting Step 2 of SPTAs.	Failure to ensure that the Reactivity Control Safety Function is met will result in excess heat input into the RCS and overheating of the nuclear fuel (degradation of a fission product barrier). 40DP-9AP06, Standard Post Trip Actions Technical Guidelines, explain that, to ensure the Reactor is shutdown, operators must take Contingency Actions if the Reactor is not automatically shut down by the Plant Protection System.	• PVNGS SPTA-2, When a reactor trip setpoint is exceeded, ensure the SPTA Reactivity Control contingency actions are taken prior to the completion of the SPTAs. • CE SPTA-01, Establish Reactivity Control.
Manually start HPSI Pump "B" prior to exiting SPTAs.	Inadequate Safety Injection flow may result in loss of subcooled margin and/or core uncovery. Additionally, failure to establish SI flow may lead to an inappropriate transition to the Functional Recovery Procedure, which would complicate mitigation strategies. Failure to start HPSI will delay the point where SI throttle criteria are met. and could result in extended operation of the LPSI pumps without adequate flow through the pump, which could, in turn, result in LPSI pump damage (degraded ECCS). 40DP-9AP06, Standard Post TripActions Technical Guidelines, Instruction Step: 5 RCS Pressure Control, Contingency Action 5.2, states: "Pressurizer pressure dropping to the SIAS setpoint may be an indication of a primary system break. If SIAS does not initiate automatically, the operator should manually initiate SIAS. If SIAS has actuated, or is required to be actuated, then the operator is required to ensure that the proper equipment is in operation. In doing so, the operator should ensure that the SI pumps are running and that the injection valves are open." 40DP-9AP08, Loss of Coolant Accident Technical Guideline, Instruction Step:32 LPSI stop criteria, states: "The intent of this step is to prevent damaging the LPSI Pumps as a result of extendedoperation without adequate flow through the pump." To secure the LPSI pumps, RCS pressure must be under control of the operator. Without HPSI pumps, coolant loss out of the break will exceed makeup capacity and RCS pressure will drop, delaying the point where LPSI pumps can be secured. 40DP-9AP08, Instruction Step: 5 Ensure adequate SI flow, states: "This step ensures that Safety Injection flow is within the limits of the design basis."	• PVNGS SPTA-1, When the Safety Injection Actuation setpoint is exceeded; ensure adequate Safety Injection to meet Safety Function prior to the completion of the SPTAs. • CE SPTA-05, Establish RCS Pressure Control. • 40DP-9AP06, Standard Post TripActions Technical Guidelines, Instruction Step: 5 • 40DP-9AP08, Loss of Coolant Accident Technical Guideline, Instruction Step: 5 • 40DP-9AP08, Loss of Coolant Accident Technical Guideline, Instruction Step:32

2015 NRC Scenario 3 Overview	
Event 1	The BOP operator places the Reactor Power Cutback System (RPCS) in service in accordance with 40OP-9SF04, Operation of the Reactor Power Cutback System, Sections 6.1.1 and 6.1.2. This BOP, normal evolution involves testing the cutback circuits at the RPCS module and selecting the appropriate subgroups. After the subgroups have been selected for LOSS OF FEED PUMP, or at the discretion of the Lead Examiner, the next event can be initiated.
Event 2	A small RCS Leak (approximately 4 gpm) develops.The crew is alerted by the following: • Alarm on RU-1, Containment Atmosphere • Rising Containment Sump levels on BO7, RDN LI-410, RDN LI-10 • Rising Containment Sump levels on BO7, Yokogawa recorder RMN-TRJ-1, Points 17, 18, 18, and 20 The crew initially responds using 74RM-9EF41, Radiation Monitoring System Alarm Response, for the RU-1 alarm. RP and the Radiological Monitoring Technician are informed. Operator Response 4 directs the crew to perform an RCS water inventory balance per 40ST-9RC02, ERFDADS (Preferred) Calculation of RCS Water Inventory. When rising Containment sump levels and/or temperatures are observed, the CRS implements 40AO-9ZZ02, Excessive RCS Leakrate, Section 3.0, RCS Leakage.For this small leakage, Pressurizer level is relatively stable and letdown remains in service with the existing Charging Pump configuration. LCO 3.4.14, RCS Operational Leakage, is evaluated. Chemistry and RP are informed. The leakrate is quantified, most likely using Appendix B, ERFDADS Leak Rate Determination. This appendix directs the RO to secure Reactor Makeup and setup ERFDADS to run the calculation by selecting “RCS LEAK RATE” on the SPDS Overview screen and selecting “TREND-1” on the Analog Point Attributes screen. The trend is run for at least 15 minutes or until VCT level lowers to 15%. Once the leak rate has been determined, VCT makeup is restored. Since the leak is UNIDENTIFIED leakage and the calculated leak rate is approximately 4 gpm, the CRS enters LCO 3.4.14, Condition A. Once the CRS has determined that LCO 3.4.14, Condition A, must be entered, OR at the discretion of the Lead Examiner, the next event may be initiated.
Event 3	CEDM Fans “A” and “C” trip and the standby fans (HCN-A02B and A02D) fail to automatically start. The standby fans normally start on a low DP after a 120 second time delay.The crew is alerted by the following: • Brighter than green lights on the previously-running fans • Annunciator 7A09B (CEDM ACU COOL SYS TRBL), Group E • Computer alarm point HCYS49 (CEDM ACU A Fan A(C) Elect Prot) • SEAS/SEIS alarms (21B, CEDM NORM; 6D1,Non-ESF Load Shed) The BOP refers to 40AL-9RK7A for window 7A09B. CRS implements 40AO-9ZZ20, Loss of HVAC, Section 10.0, Loss of Containment Building HVAC – CEDM.Since RCS temperature is greater than 300°F, the crew has 40 minutes to restore CEDM cooling or trip the Reactor. The BOP waits for approximately two minutes, then start fans “B” and “D.” If they do not start the standby fans within 10 minutes; they must perform 40OP-9ZZ05, Power Operations, Section 8.0, Rapid Shutdown, to ensure the Unit is shut down

2015 NRC Scenario 3 Overview	
	within 40 minutes of the loss of CEDM HVAC. NOTE: Both 40AL-9RK7A and 40AO-9ZZ20 provide direction to start the standby fans. When the standby CEDM fans are started, on Board 1, alarm 1A5D (120 VAC 1E PNL 28 INVERTER D TRBL) actuates. This is accompanied by an alarm on Computer Point ID PNYS4, 120 VAC INV D AC/DC STATUS. 40AL-9RK1A directs the RO to dispatch an AO to check indications on the inverter control panel. When dispatched, the AO reports that there is a red "LOSS OF SYNC" light on PND-N14 Inverter D. In accordance with the table under Operator Action 9, the ARP directs the AO to check the availability of the alternate supply, then depress the "SYNCHRONIZATION" button to clear the alarm When the standby fans have been started, or at the discretion of the Lead Examiner, the next event may be initiated.
Event 4	RCP 1A Thrust Bearing oil leak, resulting in low level. RO refers to the Alarm Response Procedure 40AL-9RJ01 for point RCL107 (Low), RCP 1A BRG OIL RESVR LEV. The alarm actuates at 64%. The ARP directs the crew to validate the alarm by calling up the PMS or ERFDADS point. It then directs filling the RCP thrust bearing reservoir per 40OP-9RC01, Reactor Coolant Pump Operation. The operator uses Section 6.14 of 40OP-9RC01 to raise reservoir level. Instruction 6.14.5 directs the operator to start (and hold) RCN-P02A, RCP Lift Oil Pump P02A, to begin filling the reservoir. When ERFDADS point RCL107 indicates level is between 64% and 85% (determined by CRS), the lift pump switch is allowed to spring-return to AUTO. Operator Action 2.5 of the ARP prompts evaluation of 40AO-9ZZ04, Reactor Coolant Pump Emergencies, and the CRS may implement Section 3.0, Abnormal RCP Motor or Bearing Parameters. Section 3.0 directs the crew to monitor Upper Thrust Bearing temperature (may use lift pump to slow the rate) and restore the reservoir level per Appendix C, Restoring RCP Oil Reservoir Levels. Once the RCP oil lift pump is returned to AUTO and the reservoir is filled per the CRS' direction, or at the discretion of the Lead Examiner, the next event may be initiated. **Examiner NOTE:** To prevent repetitive alarms and fill operations, the malfunction will be deleted when the first alarm actuates.

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Event 5	The UV-1 LOV relay for PBA-S03 fails. The crew is alerted by the following: • Annunciator 1A3D (UNDV A CH TRIP) • On Panel B01, the white light "PHASE AB 727-1" (for the 4.16KV BUS POTENTIAL INDICATION) is extinguished) • Computer alarm point SAYS19 (ESF BUS UNDV CH A-1) The RO refers to 41AL-1RK1A for window 1A03D. There are NO automatic actions for one channel UV trip. The ARP directs the operator to check the 4.16KV BUS POTENTIAL INDICATION lights and the RO observes that the "PHASE AB 727-1" light is off. Operator Action 3 of the ARP provides direction for only 1UV relay failure. Once alarm validity has been checked and the relay identified, the ARP directs the operator to bypass the malfunctioned relay in accordance with 40OP-9SA01, BOP ESFAS Modules Operation. The BOP uses Section 6.8, Placing BOP ESFAS Modules in Bypass. After obtaining a key and verifying Prerequisites and Initial Conditions are met, the BOP performs a lamp test (6.8.4), selects the proper relay channel (6.8.7), and checks that the opposite Train is NOT in Bypass (6.8.10). To complete the bypass, the BOP inserts the key, turns it clockwise ¼ turn, and verifies that the Bypass light is ON (6.8.11). When the BOP opens the BOP ESFAS Panel door, the CR will receive alarm 5A2D (BOP ESFAS IN TEST) and the alarm will clear when the door is closed. When the BOP turns the key to Bypass, the CR will receive alarm 5A3D (BOP ESFAS CH BYP), which is an expected alarm. The CRS evaluates TSs 3.3.7, 3.8.1, and 3.8.2. LCO 3.3.7, Diesel Generator (DG) – Loss of Voltage Start (LOVS), Condition A is entered because only one LOVS channel is inoperable. Condition A requires the failed channel to be placed in bypass or trip within 1 hour. LCO 3.8.1, AC Sources – Operating, is still met because the failed relay channel does not make offsite sources, the associated DG, nor the load sequencer inoperable. LCO 3.8.1, AC Sources – Shutdown, is not applicable because the Unit is NOT in Mode 5 or 6. Once the BOP ESFAS door keys are returned, the next event may be initiated.

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Event 6	Loss of NNN-D11. The crew is alerted by the following: • Annunciator 1C12B (120 VCA PNL D11/D12/15/16 TRBL) • Numerous annunciators on B03, B04, and other panels • Loss of power to recorders for Pressurizer level and VCT level/pressure • Numerous Computer alarm points The RO refers to 40AL-9RK1C, point NNYS3 (Bkr Ovld Trip), which prompts the RO to direct an AO to investigate the alarm. The AO reports that there is a ground detection indicating light on the center panel of the switchgear and that the bus feeder breaker 52-D11 has tripped. Operator Action 2 of the ARP then directs performance of 40AO-9ZZ14, Loss of Non-Class Instrument or Control Power. The crew walks down the control boards to evaluate affected equipment. FIN/electrical maintenance is informed and PR&C is notified to locate the ground. 40AO-9ZZ14 directs the crew to operate ADVs to control SG pressures. The RO places the following handswitches in Channel "X:" • RCN-HS-110, Level Control Selector Switch • RCN-HS-100-3, Heater Control Selector Switch • RCN-HS-100, Pressure Control Selector Switch The BOP ensures CEDMCS is NOT selected to Auto Sequential "AS." The RO ensures that no more than one Charging Pump is running and implements 40AO-9ZZ05, Loss of Letdown. The RO initially ensures no more than 1 Charging Pumps is running. At the direction of the CRS, the RO performs Appendix C, Extended Operations Without Letdown. The RO closes the Seal Injection Flow Control Valves and places all Charging Pumps in "PULL TO LOCK." The CRS/SM/STA evaluates the following TSs: • LCO 3.2.1, Linear Heat Rate (LHR) • LCO 3.2.2, Planer Radial Peaking Factors (Fxy) • LCO 3.2.3, Azimuthal Power Tilt (Tq) • LCO 3.2.4, Departure From Nucleate Boiling Ratio (DNBR) • LCO 3.2.5, Axial Shape Index (ASI) The CRS will perform 40DP-9OP05, Control Room Data Sheet Instructions, due to the loss of JSCALOR. Since JSCALOR is not available and COLSS is functioning, 40DP-9OP05, Instruction 3.3.11 directs the crew to record the current NKBDELTC values and establish that value as the current steady state maximum power. When the RO has completed the actions in 40AO-9ZZ05, Loss of Letdown, or at the discretion of the Lead Examiner, the next event may be initiated.
Event 7 & 8	A Pressurizer Steam Space LOCA occurs. PPS fails to initiate a Reactor Trip and the BOP uses the MANUAL REACTOR TRIP pushbuttons to trip the Reactor. Crew implements 40EP-9EO01, Standard Post Trip Actions. **(CRITICAL TASK: Trip the Reactor prior to exiting Step 2 of SPTAs)** While implementing the SPTAs, the RO observes that Pressurizer level is NOT trending to 33-53% and that RCS subcooling is less than 24°F, and then secures all RCPs. The RO also observes that Pressurizer pressure is less than 1837 psia and is NOT trending to 2225-2275 psia. The RO then ensures that SIAS is actuated. At this point, the RO may note that HPSI Pump "A" has tripped and HPSI Pump "B" has failedto

2015 NRC Scenario 3 Overview	
	automatically start. The RO should start HPSI Pump "B" at this time. **(CRITICAL TASK: Manually start HPSI Pump "B" prior to exiting SPTAs.)** When the SPTAs are complete, the CRS uses the Diagnostics Actions to determine thatthere is a LOCA in progress and then transitions to40EP-9EO03, Loss of Coolant Accident.
Event 9	HPSI Pump "A" trips and HPSI Pump "B" fails to automatically start. While implementing 40EP-9EO03, Loss of Coolant Accident, Instruction 5.a directs the crew to check the status of the HPSI and LPSI pumps. If not already noted in the SPTAs, the RO observes that HPSI Pump "A" has tripped and HPSI Pump "B" has failed to automatically start. If not already started, the RO shall start HPSI Pump "B" at this time. The crew then attempts to locate and isolate the leak, place the Hydrogen Analyzers in service, and ensure CIAS has properly actuated. The RO will ensure that at least one CS header flow is greater than 4350 gpm and isolateRCP control bleedoff flow. The Hydrogen Recombiners are placed in service.Since Containment pressure is less than 50 psig, and SI flow is within the SI delivery curves, one CS Pump is stopped. The crew directs an AO to reenergize SIAS Load Shed Panels in accordance with Appendix 21. The crew cools down the Steam generators (and RCS) using the ADVs (since SBCS is unavailable due to the loss of NNN-D11).
End Point	Scenario may be terminated upon transition to cooldown and after CRS briefs the crew, OR at the discretion of the Lead Examiner.

TURNOVER

Plant Conditions:

- Unit 1 is at 100% power.
- The core is presently at 250 EFPD.
- Risk Management Action Level is ORANGE.
- AFA-P01 is out of service for unscheduled maintenance.
- AFN-P01 and AFB-P01 are protected.
- PC is NOT recircing the RWT.
- Unit 2 is supplying the Aux Steam cross-tie header.
- At the request of Chemistry, the pressurizer is in boron equalization in accordance with 40OP-9ZZ05, Power Operations.

Equipment Out of Service:

- The Reactor Power Cutback System is out of service to replace overheating components. The components have been replaced.

- AFA-P01 is under clearance for maintenance. LCO 3.7.5, Condition A and Condition B, have been entered. The pump is expected to return to service in 8 hours.

Planned Shift Activities:

- Restore the RPCB System to service in accordance with 40OP-9SF04, Operation of the Reactor Power Cutback System, Sections 6.1.1 and 6.1.2.

Facility: PVNGS Scenario No.: 2 (Rev. 2) Op-Test No: NRC - 2015

Examiners: _____ Operators: _____

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Initial Conditions:(100% power, MOC).
Turnover: See attached

Event No.	Malf. No.	Event Type*	Event Description
1	None	N RO/SRO	Remove Pressurizer from boron equalization in accordance with 40OP-9ZZ05, Power Operations, Appendix H.6.
2	mfSI03C	C RO/SRO (TS)	SIT-1A gas leak. The crew initially responds in accordance with the alarm procedure for 40AL-9RK2C, SIT 1A-1B PRESS LOW (PZR INTLK). The ARP directs the crew to check SIT vent valves, potential drain lineups, and RDT level. If pressure is low, the ARP directs the crew to raise pressure using 40OP-9SI03, Safety Injection Tank Operations. **[LCO 3.5.1 Condition B]**
3	cmTRRX05RCNTT111Y_1	I BOP/SRO (AOP)	RCN-TT-111Y, Tcold Channel 1, fails LOW. Alarm response procedure 40AL-9RK4Ais referenced for operator response. 40AL-9RK4A directs the crew to determine if an instrument failure has occurred. If so, the ARP directs the crew to transition to 40AO-9ZZ16, RRS Malfunctions.
4	mfCC02A	C RO/BOP/ SRO (AOP/TS)	Loss of Nuclear Cooling Water due to leak in discharge header. The crew implements 40AO-9ZZ03, Loss of Cooling Water, Section 4.0. During the event, letdown isolates and the RO performs 40AO-9ZZ05, Loss of Letdown. **[LCO 3.4.9, Condition A]** **[LCO 3.7.7, Condition A]**
5	mfFW12A	M ALL	Feedwater Line Break Inside Containment (Economizer) (Trip Initiator). Crew may initiate a manual Reactor Trip and enter 40EP-9EO01, Standard Post Trip Actions. The CRS uses Section 4.0, Diagnostic Actions, to determine that an ESD is in progress and transitions to 40EP-9EO05, Excess Steam Demand.
6	mfRP07A mfRH01B	C RO/BOP/ SRO	Train "A" BOP ESFAS Sequencer fails on trip SIB-P03, CS Pump "B," trips after start **(CRITICAL TASK: Start CS Pump "A" prior to exiting the SPTAs.)**
7	cmCPFW07AFBP01_5	C BOP/SRO	AFB-P01, AF Pump "B," fails to automatically start **(CRITICAL TASK: Start Auxiliary Feedwater Pump "B" or "N" and establish feed to the unaffected SG prior to opening the primary safeties.)** **(CRITICAL TASK: Control primary and secondary systems to prevent lifting the primary safeties.)**
End point	N/A	ALL	Scenario may be terminated when SG #2 level is being maintained 45-60% NR, at the discretion of the Lead Examiner.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	2
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

CRITICAL TASK	JUSTIFICATION	REFERENCES
Start CS Pump "A" prior to exiting the SPTAs.	Failure to initiate Containment Spray when the Containment Spray Actuation Setpoint is reached could unnecessarily complicate mitigation strategies. Without spray on a FWLB, Containment pressure and temperature will be higher than expected and could unnecessarily result in harsh conditions in Containment and could result in degradation of a fission product barrier. Step 9.d of 40EP-9EO01, Standard Post Trip Actions, requires the crew to ensure Containment Spray Actuation Signal (CSAS) is actuated if containment pressure exceeds 8.5 psig. 40DP-9AP06, SPTAs Technical Guidelines, Instruction Step: 9 Containment Temperature, Pressure and Combustible Gas Control, states:**"**Ensure that at least one containment spray header is providing greater than the minimum required flow to maintain containment pressure below design pressure."	• PVNGS CT SPTA-4, When the Containment Spray Actuation setpoint is exceeded, ensure adequate Containment Spray to meet Safety Function prior to the completion of the SPTAs. • CE SPTA-10 (CT-15), Establish Containment Temperature and Pressure Control. • 40DP-9AP06, SPTAs Technical Guidelines, Instruction Step: 9
Control primary and secondary systems to prevent lifting the primary safeties.	40DP-9AP10, Excess Steam Demand Technical Guideline, states: "The second action is to stabilize RCS temperature and pressure. It is important to establish heat removal capability via the unaffected SG prior to the affected SG boiling dry." Failure to stabilize RCS temperature could lead to a solid Pressurizer, Pressurized Thermal Shock (PTS) of the RCS, or result in exceeding post accident Pressure/Temperature (P/T) limits. Either of these events will unnecessarily alter mitigation strategies.	• PVNGS CT ESD-1, Following a plant overcooling, stabilize RCS Temperature and operate Safety Injection to prevent lifting the primary safeties. • CE ESDE-05, Establish RCS Temperature Control, • ESDE-06, Establish RCS Pressure Control.
Start Auxiliary Feedwater Pump "B" or "N" and establish feed to the unaffected SG prior to opening the	40DP-9AP10, Excess Steam Demand Technical Guideline, 3.2, Procedure Strategy, states: "The second action is to stabilize RCS temperature and	• PVNGS CT ESD-2 • CE ESDE-08 (CT-08), Establish a RCS Heat

primary safeties.	pressure. It is important to establish heat removal capability via the unaffected SG prior to the affected SG boiling dry." Failure to stabilize RCS temperature could lead to a solid Pressurizer, Pressurized Thermal Shock (PTS) of the RCS, or result in exceeding post accident Pressure/Temperature (P/T) limits. Either of these events will unnecessarily alter mitigation strategies. If Auxiliary Feedwater Pump "B" is not started, it will not be possible to stabilize RCS temperature. 40DP-9AP17, Standard Appendices Technical Guideline, Appendix 2, Figures, states: "The upper subcooling limit curve is used toestablish the maximum post-accident limit on subcooling to significantly reduce thepossibility of pressurized thermal shock following a pressurized thermal shock transient." 40DP-9AP10, Excess Steam Demand Technical Guideline, Step Number: 21. Maintain RCS pressure within the P/T limits, states: "Basis:Maintaining the RCS within the acceptable limits of the post accident P/T curveensures that: • the cooldown rate is not exceeded • the core is covered by subcooled fluid • the concern for pressurized thermal shock is minimized by staying within the upper subcooled limit" 40DP-9AP10, Excess Steam Demand Technical Guideline, Step Number:14. Stabilize RCS temperature, states: "The main objective following an overcooling event is to minimize the stresses on thereactor vessel, return RCS temperature to within the Post Accident P/T limits andestablish stable RCS pressure and temperature until a cooldown to SDC entryconditions can be started."	Removal • 40DP-9AP10, Excess Steam Demand Technical Guideline, 3.2, Procedure Strategy • 40DP-9AP10, Excess Steam Demand Technical Guideline, Step Number:14 • 40DP-9AP17, Standard Appendices Technical Guideline, Appendix 2, Figures • 40DP-9AP10, Excess Steam Demand Technical Guideline, Step Number: 21

2015 NRC Scenario 2 Overview	
Event 1	The RO removes the Pressurizer from boron equalization in accordance with 40OP-9ZZ05, Power Operations, Appendix H.6. This RO, normal evolution involves deenergizing backup heaters, adjusting the Pressurizer Master Control, and placing the Spray Valve Selector in BOTH. After the Spray Valve Selector is placed in BOTH, the next event can be initiated.
Event 2	SIT-1A gas leak. The crew is alerted by the following: • Annunciator SIT 1A-1B PRESS LOW (PZR INTLK) • Lowering pressure indications for SIT-1A on B03 and ERFDADS The crew initially responds in accordance with the alarm procedure for 40AL-9RK2C, SIT 1A-1B PRESS LOW (PZR INTLK). The ARP directs the crew to check SIT vent valves, potential drain lineups, and RDT level. If pressure is low, the ARP directs the crew to raise pressure using 40OP-9SI03, Safety Injection Tank Operations**.** 40OP-9SI03 directs the operator to lineup nitrogen to the affected accumulator and raise pressure. Once pressure has been raised per the CRS direction, the nitrogen lineup is secured. Since pressure in SIT 1A drops below 600 psig, the CRS enters LCO 3.5.1, Safety Injection Tanks (SITs) – Operating, Condition A. The crew has 72 hours to restore the SIT to OPERABLE status.
Event 3	RCN-TT-111Y, Tcold Channel 1, fails LOW. The crew is alerted by the following: • Annunciator 4A10B (AMI (AUTOMATIC MOTION INHIBIT)) • Annunciator 4A08B (TAVG-TREF HI-LO) • Lowered setpoint indication on RCN-LIC-110, Level Setpoint Control Refer to Operator Information Manual, Page 60 of 88, RRS Functional. When TTY-111Y fails LOW, the input to the averaging circuit for Loop 1 Tave fails LOW. This causes the Loop 1 Tave input into the averaging circuit of both loop's Tave to be low. Since the selector switch at the RRS panel is selected to AVERAGE, the Tave output the PLCS will be low, reducing the Pressurizer level setpoint to near minimum. This causes letdown flow to increase. The AMI (AUTOMATIC MOTION INHIBIT) alarm actuates because the Loop 1 and Loop 2 Tave signals deviate by more than 5°F. In the SBCS, the Quick Open function of the bypass valves is blocked. A turbine runback demand signal will be sent to the RPCS, but no automatic action will occur until an actual runback actuation signal is generated (TLI or MFP Trip). In the DFWCS, the low Tave signal results in no feedwater flow, as the Reactor Trip Override Refill Demand senses that Tave is always below 564°F. B04A windows 8B (TAVG-TREF HI-LO) and 10B (AMI (AUTOMATIC MOTION INHIBIT)) are received and acknowledged. Alarm response procedure 40AL-9RK4Ais referenced for operator response. 40AL-9RK4A directs the crew to determine if an instrument failure has occurred. If so, the ARP directs the crew to transition to 40AO-9ZZ16, RRS Malfunctions. The crews implements Section 3.0, Temperature Instrument Failures. The BOP first ensures that CEDMCS is NOT in Auto sequential. The RO takes control of the Pressurizer Level Controller to maintain level between 33 and 53% (may refer to Appendix A, Pressurizer Level Setpoint Program). The AOP also directs the crew to select the unaffected instrument Tave 2 (Loop 2) at the RRS Test Panel. Once the unaffected instrument has been selected, CEDMCS is placed in the desired mode, and the PLCS is returned to Remote Auto, the next

2015 NRC Scenario 2 Overview	
	event may be initiated.
Event 4	Nuclear Cooling Water is lost due to a leak in the discharge header. The crew is alerted by the following: • Annunciator 7A07A (NUC CLG WTR SYS TRBL) • Annunciator 7A07B (NCWS PMPS DSCH HDR PRESS HI-LO) • Reduced current on running NC Pump • Automatic start of standby NC Pump, with amber light. The crew implements 40AO-9ZZ03, Loss of Cooling Water, Section 4.0. Since seal injection is in service, the crew has 10 minutes to restore cooling water to the RCPs. The AOP initially directs the crew to ensure an NC Pump is running. Since the leak is on the common discharge header, a running pump will still not deliver cooling flow to the RCPs. When the standby pump is started and discharge pressure is still low, the operators are directed to investigate for leaks. The Area 2 AO reports a significant leak on the common discharge header. The CRS should direct the BOP to secure any running pumps. The CRS refers to 40AO-9ZZ04, Reactor Coolant Pump Emergencies. The CRS should then direct the BOP perform Appendix A, Cross-connect EW to NC. Appendix A involves startup of a Spray Pond Pump and an Essential Cooling Water Pump. Nuclear cooling water is isolated from Containment and EW is aligned to NC. To limit heat load on EW and to ensure adequate cooling flow to the RCPs, flow to Normal Chilled Water is limited to 1 chiller.An Area Operator unlocks and throttles EWA-HCV-53, SDCHX A OUTLET ISOLATION, until all of the RCP low NC flow alarms are clear. Once the low flow alarms are clear, the BOP starts a Normal Chiller. When EW has been cross connected, the CRS enters LCO 3.7.7, Condition A, due to the inoperability of the cross-connected EW train. During the event, letdown isolates and the RO performs 40AO-9ZZ05, Loss of Letdown. If Pressurizer level exceeds 56%, the RO secures all charging pumps and the CRS enters LCO 3.4.9, Condition A. When the Normal Chiller is started, the next event can be initiated.

Event 5	Feedwater Line Break Inside Containment (Economizer) (Trip Initiator). The crew is alerted by the following:
	• Annunciators:
	  ○ 6A06A (FWCS PROCESS TRBL)
	  ○ 7B03A (CNTMT SUMPS TRBL)
	  ○ 7B03B (CNTMT SUMPS EXCESS LEAKAGE)
	• Containment pressure and temperature rising
	• Automatic initiation of SIAS, MSIS, CIAS and CSAS
	Various other alarms on B04, B05, and B06 are received and acknowledged. Alarm response procedures 40AL-9RK6A and 40AL-9RK7B may be referenced for operator response. Operators will have little time between receipt of the first alarm and an automatic Reactor trip to implement the alarm response.
	Crew may initiate a manual Reactor Trip and enter 40EP-9EO01, Standard Post Trip Actions.

2015 NRC Scenario 2 Overview	
Event 6	While implementing the SPTAs, the RO observes that the Train 'A' BOP ESFAS Sequencer failed and manually starts Train 'A' equipment. Since CS Pump 'B' trips on an 86 lockout, the RO must manually start CS Pump 'A' to ensure that containment spray flow is actuated following a CSAS. **(CRITICAL TASK: Start CS Pump "A" prior to exiting the SPTAs.)** While implementing the SPTAs, the BOP observes that AFB-P01, AF Pump "B," failed to start and manually starts the pump. Since CSAS has actuated, either the RO or the BOP secures all RCPs and the RO uses auxiliary spray and heaters to control RCS pressure. The CRS uses Section 4.0, Diagnostic Actions, to determine that an ESD is in progress and transitions to 40EP-9EO05, Excess Steam Demand. In 40EP-9EO05, the RO ensures that all Train "A" BOP ESFAS equipment is running as required. MSIS is actuated and SG #1 is identified as the most affected SG. Standard Appendix 113 is used to isolate SG #1. The SG is isolated by closing ADVs, MSIVs, MSIV Bypass, Economizer FWIVs, Downcomer Isolation Valves, Blowdown Containment Isolation Valves, steam trap isolation valves, AFA Steam Supply Valves, and AFW Isolation Valves. RCS temperature is stabilized by steaming the *least* affected SG. **(CRITICAL TASK: Start Auxiliary Feedwater Pump "B" or "N" and establish feed to the unaffected SG prior to opening the primary safeties.)** **(CRITICAL TASK: Control primary and secondary systems to prevent lifting the primary safeties.)**
End Point	Scenario may be terminated when SG #2 level is trending toward 45-60% NR, at the discretion of the Lead Examiner.

TURNOVER

Plant Conditions:

- Unit 1 is at 100% power.
- The core is presently at 250 EFPD
- Risk Management Action Level is ORANGE
- AFA-P01 is out of service for unscheduled maintenance
- AFN-P01 and AFB-P01 are protected
- PC is NOT recircing the RWT
- Unit 2 is supplying the Aux Steam cross-tie header
- At the request of Chemistry, the pressurizer is in boron equalization in accordance with 40OP-9ZZ05, Power Operations

Equipment Out of Service:

- AFA-P01 is under clearance for maintenance. LCO 3.7.5, Condition A and Condition B, have been entered. The pump is expected to return to service in 8 hours.

Planned Shift Activities:

- Chemistry has reported that the Pressurizer and RCS boron concentrations are within 10 ppm. The SM therefore directs you to remove the Pressurizer from boron equalization in accordance with 40OP-9ZZ05, Power Operations, Appendix H.6

Facility: PVNGS Scenario No.: 4 (Rev. 2) Op-Test No: NRC - 2015

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: (50% power, MOC).
Turnover: See attached

Event No.	Malf. No.	Event Type*	Event Description
1	cmBSEG03DGBPSL4_2 cmBSEG03DGBPSL6_2 cmBSEG03DGBPSL8_2 cmBSEG03DGBPSL10_2	N RO/SRO (TS)	Crew unloads and shuts down DG "B."DG trips on low lube oil pressure. For the Turnover, the crew will be provided a marked-up copy of 40OP-9DG02 (up to Step 6.7.2).The surveillance is complete and Step 7.5 of the ST directs the crew to continue operation of the DG per 40OP-9DG02. The RO will use Section 6.7, Unloading Train B Diesel Generator and will follow the direction of Appendix G, Loading and Unloading Schedule. **[LCO 3.8.1, Condition B]**
2	cmTRFW04SGNFT1112Y_1	I BOP/SRO	FT-1112Y, Total Feedwater Flow Transmitter, Fails LOW. BOP implements 40AL-9RK6A for annunciator 6A06A, Group A due to a SG 1 Feedwater Flow 8% Deviation (FWCSA:B12).
3	mfRD02B	C ALL (AOP/TS)	CEA 15 (Reg Group 5) slips half way into the core. Crew implements40AO-9ZZ11, CEA Malfunctions, Section 3.0, Dropped or Slipped CEA Mode 1 or 2. **[LCO 3.1.5, CEA Alignment, Condition A.]** **(Critical Task: Begin power reduction within 10 minutes of slipped CEA.)**
4	mfRP06H1 mfRP06H2 cmMVCC03NCBUV401_6	C RO/SRO (AOP/TS)	Inadvertent Train B CSAS, NCW Return from Containment Fails to Reopen. (Trip Initiator). Crew implements 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations, Section 5.0, CSAS. Crew implements 40EP-9EO01, SPTAs.
5	mfED02	M-All	During implementation of the SPTAs, a Loss of Offsite Power (LOOP) occurs. The CRS transitions to 40EP-9EO07, Loss of Offsite Power/Loss of Forced Circulation.
6	mfEG06A	M - All	DG "A" trips due to a generator differential. This results in a loss of all AC power (Blackout), requiring the CRS to transition to 40EP-9EO08, Blackout. **(Critical Task: Restore power to at least one vital AC bus within one hour of the Blackout.)**
End point	N/A	ALL	After the crew has restored power to at least one vital AC bus, the scenario may be terminated at the discretion of the Lead Examiner.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	2
4. Major transients (1-2)	2
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

CRITICAL TASK	JUSTIFICATION	REFERENCES
Begin power reduction within 10 minutes of slipped CEA.	Section 15.4.3.2 of the FSAR assumes the operators takes action within 900 seconds to reduce power. This assumption is used to ensure the core does not exceed DNBR or LPD limits. Although the FSAR states 900 seconds, Tech Specs requires a power reduction per the COLR, which requires a power reduction within 10 minutes (via Figure 3.1.5-1). Failure to reduce power could result in not meeting the Shutdown Margin (SDM) requirements ofTS 3.1.2, SDM RTBs Closed. Inadequate SDM at power could lead to exceeding fuel design limits for normal shutdown and anticipated operational occurrences (degraded fission product barrier). The bases for TS 3.1.5 Control Element Assembly (CEA) Alignment, states: "Limits on CEA alignment and operability have been established, and all CEA positions are monitored andcontrolled during power operation to ensure that the powerdistribution and reactivity limits defined by the designpower peaking and SDM limits are preserved."	• PVNGS Critical Task FSAR-1, When Reactor Power is > 35% and any CEA is misaligned by greater than 6.6 inches from its group, start a power reduction within 10 minutes. • No equivalent CE Critical Task. • Section 15.4.3.2 of the FSAR • Bases for TS 3.1.5
Restore power to at least one vital AC bus within one hour of the Blackout.	FSAR Section 9.5.9.1, Station Blackout Evaluation, General, explains that the SBO 16 hour coping evaluation (based on NUMARC 87-00, Revision 1 criteria) assumes that an alternate AC power source is started and loaded within the first hour. Failure to restore alternate AC power within 1 hour will result in RCP seal leakage beyond that assumed in the SBO coping evaluation. This will, in turn, have an adverse impact on containment temperature and pressure (along with the loss of containment ventilation). 40DP-9AP13, Blackout Technical Guideline; Section 4.0, PROCEDURE STRATEGY states: "The next action is to restore	• PVNGS Critical Task SBO-1, Energize at least one class 4kv bus prior to exiting the Blackout Procedure. • CE SB0-4 (CT-03), Energize at Least One Vital AC Bus. • FSAR Section 9.5.9.1 • 40DP-9AP13, Blackout Technical Guideline; Instruction Step:13 • 40DP-9AP13, Blackout Technical Guideline;

CRITICAL TASK	JUSTIFICATION	REFERENCES
	electrical power. In the event that electrical power is not expected to be restored from Offsite power or a Diesel Generator within one hour, the Blackout Coping Strategy uses a SBOG to energize PBA-S03 which provides enough electrical capacity to cope with the blackout for 16 hours, by which time either offsite power or a Diesel Generator should be restored." 40DP-9AP13, Blackout Technical Guideline; Instruction Step:13Energize PBA-S03 from the SBOG(s), states:The Alternate AC (AAC) power source (SBOG) will be used to energize PBA-S03 within one hour of a Blackout.	Section 4.0

2015 NRC Scenario 4 Overview

Event 1	Crew unloads and shuts down DG "B" in accordance with 40OP-9DG02, Emergency Diesel Generator B.
	
	The Turnover indicates that the DG is being run for a surveillance. For the Turnover, the crew will be provided a marked-up copy of 40OP-9DG02 (up to Step 6.7.2).The surveillance is complete and Step 7.5 of the ST directs the crew to continue operation of the DGper 40OP-9DG02. The RO will use Section 6.7, Unloading Train B Diesel Generator and will follow the direction of Appendix G, Loading and Unloading Schedule. When PEB-SC-G02, Diesel Generator B Speed handswitch is placed in LOWER for the second time, the DG trips on low lube oil pressure.
	
	When DG B trips, the crew is alerted by the following annunciators on B01:
	
	• 1C16A (DG B TRIP)
	• 1C16C (DG B LO LUBE OIL PRESS TRIP)
	• 1C16D (DG B HI PRIORITY TRBL)
	
	A note at the beginning of Operator Actions for 40AL-9RK1C, window 1C16A, prompts the crew to evaluate LCOs 3.8.1, AC Sources – Operating, and 3.8.2, AC Sources – Shutdown. The RO confirms the trip and directs an AO to investigate locally (These responses are common to all three annunciator windows). The AO will report the following indications:
	
	• Low oil pressure annunciators
	• Significant oil leak on the lube oil expansion joint at the discharge of the Lube Oil Strainers.
	
	If asked for additional details, AO reports the following:
	
	• Annunciators:
	  ○ DGB01A (LUBE OIL LOW PRESSURE ENGINE)
	  ○ DGB02A (LUBE OIL LOW PRESSURE TURBO)
	  ○ DGB01D (LUBE OIL LOW PRESSURE ENGINE)
	  ○ DGB02D (LUBE OIL LOW PRESSURE TURBO)
	• DGN-PI-2, Engine Lube Oil Pressure (DGB-B01), reads 22 psig
	• DGN-PI-80, Lube Oil Pressure at Engine (Panel NW side of diesel), reads 18 psig.
	
	The CR may direct the AO to locally secure the lube oil pumps and turn off lube oil heaters.
	
	Since the Unit is in Mode 1, LCO 3.8.2 is not applicable. The CRS declares DG "B" inoperable and enters LCO 3.8.1, Condition B, since only 1 DG is inoperable. The crew has one hour to perform Surveillance Requirement 3.8.1.1 for the OPERABLE required offsite circuits. This SR verifies the breaker alignment and indicated power availability for each required offsite circuit.

2015 NRC Scenario 4 Overview

Event 2	FT-1112Y, Total Feedwater Flow Transmitter, Fails LOW. The crew is alerted by the following: • Annunciator 6A06A (FWCS PROCESS TRBL) • 0 FEED indicated on SG1 OVERVIEW screen on DFCS1 BOP implements 40AL-9RK6A for annunciator 6A06A, Group A due to a SG 1 Feedwater Flow 8% Deviation (FWCSA:B12).The DFWCS will automatically select Single Element Control. The BOP determines that FT-1112Y has failed low. The faulty transmitter is placed in the maintenance mode, the affected SG level setpoint is matched to actual level, the Three Element Lockout is removed and the alarm is cleared. When the alarm has cleared, or at the discretion of the Lead Examiner, the next event may be initiated.
Event 3	CEA 15 (Reg Group 5) slips half way into the core. The crew is alerted by the following: • Annunciators: o 4A08A (CEDMCS TRBL) o 4A09B (CWP (CEA WITHDRAWAL PROHIBIT)) o 5A13B (CPC/CEAC TRBL) o 5B01D (COLSS PC ALARM) o 5B01C (COLSS CMC ALARM) • CEA CRT indicates a Group 5 rod partially inserted, along with a CEA DEVIATION alarm • CEA DEV alarms on the DNBR/LPD Calculator Panels • No indicating lights for CEA 15 on the CEA AUTO/CONTROL STATUS panel on B04 • Computer alarm points: o SBYS76 (CEAC 1A DEVIATION (HI)) (several other similar alarms) o SBYS20 (CROSS CH COMPARISON FAIL) o RJALM2 (COLSS CPC AZTILT ALM) Crew implements40AO-9ZZ11, CEA Malfunctions, Section 3.0, Dropped or Slipped CEA Mode 1 or 2. Section 3.0 directs the BOP to place CEDMCS in “STANDBY” and perform Appendix E, Initial Actions. In Appendix E, an AO is dispatched to investigate at alarm panel J-SFN-C01D. AO reports that there is a “CWP” alarm and no breakers are open.I&C and Reactor Engineering are informed. The RO initiates Pressurizer boron equalization. Within 10 minutes, the crew begins a power reduction. **(CRITICAL TASK: Crew begins power reduction within 10 minutes of slipped CEA.)** The BOP initially lowers turbine load to raise Tave 3°F greater than Tref. The CRS determines that the initial power reduction is 15% (as directed by Instruction 14, Bullet 2) and calculates the amount of boron required. The BOP lowers turbine load to maintain Tave 3°F above Tref and the RO begins a boration at a minimum of 35 gpm. The power reduction follows the requirements of Appendix B, Core Power Reduction After a CEA Deviation. This Appendix establishes the minimum times allowed to complete the required downpower, based on the pre-event power level. The CRS may initiate Appendix J, LCO Required Action Tracker (normally SM or STA duty). During the downpower, the CRS refers to Appendix H, Required Power Ramp with a CEA Misalignment Greater than 6.6” Notes in the upper right corner explain that these curves reflect the initial power

2015 NRC Scenario 4 Overview	
	reduction required by LCO 3.1.5, CEA Alignment, Condition A. The CRS enters LCO 3.1.5 Condition A due to one CEA trippable and misaligned from it group by > 9.9 inches. The Required Action is to reduce THERMAL POWER in accordance with the limits in the COLR within 1 hour AND restore CEA alignment within 2 hours. Once the power reduction has started, or at the discretion of the Lead Examiner, the next event may be initiated.

Event 4	Inadvertent Train B CSAS occurs.(Trip Initiator) The crew is alerted by the following:
	
	• Annunciators:
	  ○ 2A04A (CSAS)
	  ○ 5B05B (LEG 1-3 CSAS B LEG 2-4)
	• All RCP XX LO NCW FLOW annunciators on RKN-UA-4D&E
	• All RCP XX TRBL annunciators on RKN-UA-4A
	
	Crew implements 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations, Section 5.0, CSAS. In 40AO-9ZZ17, Containment Spray Pump B is secured and the Containment Spray Header is isolated. When the RO attempts to open NCB-UV-401, NCW
	
	Containment Upstream Supply Isolation Valve, it will fail to open. Step 8 of the AOP directs the crew to trip the Reactor, stop all RCPs and isolate controlled bleedoff; if cooling water cannot be restored within 10 minutes. Crew implements 40EP-9EO01, Standard Post Trip Actions.

Event 5	During implementation of the SPTAs, a Loss of Offsite Power (LOOP) occurs. The crew is alerted by the following: • Observation that PBB-S04 is deenergized (DG “B” previously tripped). • Observation that only DG “A” is carrying PBA-S03. • Observation that non-class buses are deenergized. • Observation that no RCPs are running. The CRS may elect to start over with the SPTAs. The RO observes that no Charging Pumps are running and manually starts Charging Pump “A.” When SPTAs are complete, the CRS refers to Section 4.0, Diagnostic Actions, to diagnose the event and determine the appropriate recovery procedure. The CRS transitions to 40EP-9EO07, Loss of Offsite Power/Loss of Forced Circulation.40EP-9EO07 directs the crew to check that Safety Function Status Check acceptance criteria are met, inform Chemistry, and classify the event. Since a LOOP has occurred, the crew verifies that loads have sequenced onto PBA-S03. No charging pumps are running (Charging Pump “A” trips on the LOOP and is not automatically restarted), so the RO isolates seal injection and seal bleedoff and then resets the anti-pump condition on the always running Charging Pump (“A”/”1”) by placing the handswitch in “STOP.” Since CW flow to the Main Condenser is lost, so the BOP actuates MSIS. After the MSIS has actuated, an AO is dispatched to check Condenser Reheat Tray levels. When the AO reports levels are normal, the BOP overrides and opens trap isolation valves SGA-HS-1133 and 1134. The BOP controls Tc less than 570°F using the ADVs. Once the BOP establishes control of Tc with the ADVs and has established feed with AFA, or at the discretion of the Lead Examiner, the next event may be initiated.

2015 NRC Scenario 4 Overview	
Event 6	DG "A" trips due to a generator differential. The crew is alerted by the following: • Annunciator 1A01A (DG A TRIP) • PBA-S03 deenergized • Running class equipment on PBA-S03 no longer running This results in a loss of all AC power, requiring the CRS to transition to 40EP-9EO08, Blackout. In 40EP-9EO08, the crew actuates MSIS, informs the Energy Control Center of the Blackout. Security is dispatched to allow an AO access to the SBOGs and an AO is dispatched to start an SBOG using 40EP-9EO10, Appendix 111, Station Blackout Generator Operation. When the SBOG is running, the AO energizes NAN-S07. **NOTE:** Directing the AO to start an SBOG is directly related to a PRA cutset. Refer to Event ID AGT-FAILSTRT-2HR, CR Operators Fail to Direct WRF Operator to Start GTGs. The RO places all Charging Pumps in "PULL TO LOCK" and minimizes RCS leakage by isolating letdown, RCP controlled bleedoff, and RCS sample flowpaths. The BOP uses ADVs to control RCS Tc less than 570°F and maintains SG levels between 45-60% NR. An AO is dispatched to perform Attachment 80-A, Disable PBA-S03 Breakers. This Appendix disables breakers on PBA-S03 and ensures the bus feeder breakers are open. The RO performs Appendix 80, Align SBOG to PBA-S03 (BO). When the AO has completed Attachment 80-A and the RO has opened feeders to PBA-S03, the RO directs an AO to close NAN-S03AB, 13.8KV Supply from GTG. An AO is then directed to close NAN-S07D. When NAN-S07D is closed, the RO energizes PBA-S03 through the normal supply breaker. The RO also performs Appendix 53, Align Deenergized Buses. This Appendix is similar to Appendix 80 in that it ensures all feeder breakers are open and all breakers to major loads (RCPs, Circ Water Pumps) are open. When the AO reports that Attachment 80-A (81-A) is complete, essential equipment is then started in a controlled manner to ensure SBOG limitations are not exceeded. **(CRITICAL TASK: Restore power to at least one vital AC bus within one hour of the Blackout.)**
End Point	After the crew has restored power to at least one vital AC bus, the scenario may be terminated at the discretion of the Lead Examiner.

TURNOVER

Plant Conditions:

- Unit 1 is at 50% power, steady state conditions. Power was reduced by direction of the ECC due to grid instabilities.
- The core is presently at 250 EFPD
- Risk Management Action Level is GREEN
- PC is NOT recircing the RWT
- Unit 2 is supplying the Aux Steam cross-tie header
- DG 'B' is running in accordance with 40ST-9DG02, Diesel Generator B Test, and 40OP-9DG02, Emergency Diesel Generator B. The surveillance has been closed out and the DG has been running for 3.5 hours.
- At the request of Chemistry, the pressurizer is in boron equalization in accordance with 40OP-9ZZ05, Power Operations

Equipment Out of Service:

- **None**

Planned Shift Activities:

- Unload and Shutdown DG "B" in accordance with 40OP-9DG02, Emergency Diesel Generator B.
- Hold power at the current level until further direction is received from the ECC.