

Facility: **BVPS UNIT 1 RO**Date of Exam 4/9 thru 4/20/2012

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	3				3	3			3	18				
	2	2	2	1				2	1			1	9				
	Tier Totals	5	5	4				5	4			4	27				
2. Plant Systems	1	2	2	3	3	3	2	2	3	2	3	3	28				
	2	1	1	0	1	1	1	1	1	1	1	1	10				
	Tier Totals	3	3	3	4	4	3	3	4	3	4	4	38				
3. Generic Knowledge and Abilities Category					1		2		3		4		10				
					3		2		3		2						

## Note:

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

ES-401		PWR Examination Outline						Form ES-401-2		
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1(RO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000007 Reactor Trip - Stabilization - Recovery / 1 [Question 1]					X		EA2 Ability to determine or interpret the following as they apply to a reactor trip:  EA2.03 Reactor trip breaker position.  (CFR 41.7 / 45.5 / 45.6)	4.2	1	
000008 Pressurizer Vapor Space Accident / 3 [Question 2]		X					AK2 Knowledge of the interrelations between the Pressurizer Vapor Space Accident and the following:  AK2.01 Valves.  (CFR 41.7 / 45.7)	2.7*	1	
000009 Small Break LOCA / 3 [Question 3]		X					EK2 Knowledge of the interrelations between the small break LOCA and the following:  EK2.03 S/Gs.  (CFR 41.7 / 45.7)	3.0	1	
000011 Large Break LOCA / 3 [Question 4]					X		EA2 Ability to determine or interpret the following as they apply to a Large Break LOCA:  EA2.10 Verification of adequate core cooling.  (CFR 43.5 / 45.13)	4.5	1	
000022 Loss of Reactor Coolant Makeup / 2 [Question 5]					X		AA2 Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup:  AA2.04 How long PZR level can be maintained within limits.  (CFR: 43.5 / 45.13)	2.9	1	
000025 Loss of RHR System / 4 [Question 6]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System:  AK1.01 Loss of RHRS during all modes of operation.  (CFR: 41.8 / 41.10 / 45.3)	3.9	1	
000026 Loss of Component Cooling Water / 8 [Question 7]				X			AA1 Ability to operate and/or monitor the following as they apply to the Loss of Component Cooling Water:  AA1.02 Loads on the CCWS in the control room.  (CFR 41.7 / 45.5 / 45.6)	3.2	1	
000027 Pressurizer Pressure Control System Malfunction / 3 [Question 8]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions:  AK1.02 Expansion of liquids as temperature rises.  (CFR 41.8 / 41.10 / 45.3)	2.8	1	
000029 ATWS / 1 [Question 9]			X				EK3 Knowledge of the reasons for the following responses as they apply to the ATWS:  EK3.12 Actions contained in EOP for ATWS.  (CFR 41.5 / 41.10 / 45.6 / 45.13)	4.4	1	

ES-401		PWR Examination Outline						Form ES-401-2		
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1(RO) Continued										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000038 Steam Generator Tube Rupture / 3 [Question 10]	X						EK1 Knowledge of the operational implications of the following concepts as they apply to the SGTR:  EK1.02 Leak rate vs. pressure drop.  (CFR 41.8 / 41/10 / 45.3)	3.2	1	
000040 Steam Line Rupture – Excessive Heat Transfer / 4 [Question 11]				X			AA1 Ability to operate and / or monitor the following as they apply to the Steam Line Rupture:  AA1.02 Feedwater isolation.  (CFR 41.7 / 45.5 / 45.6)	4.5	1	
000054 Loss of Main Feedwater / 4 [Question 12]						X	2.2.44 Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.  (CFR 41.5 /43.5 / 45.12)	4.2	1	
000055 Station Blackout / 6 [Question 13]			X				EK3 Knowledge of the reasons for the following responses as they apply to the Station Blackout:  EK3.02 Actions contained in EOP for loss of offsite and onsite power.  (CFR 41.5 / 41.10 / 45.6 / 45.13)	4.3	1	
000056 Loss of Off-site Power / 6 [Question 14]			X				AK3 Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power:  AK3.01 Order and time to initiation of power for the load sequencer.  (CFR 41.5 / 41.10 / 45.6 / 45.13 )	3.5	1	
000058 Loss of DC Power / 6 [Question 15]						X	2.4.47 Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.  (CFR: 41.10 / 43.5 / 45.12)	4.2	1	
000062 Loss of Nuclear Service Water / 4 [Question 16]						X	2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry conditions for emergency and abnormal operating procedures.  (CFR: 41.10 / 43.2 / 45.6)	4.5	1	
000077 Generator Voltage and Electric Grid Disturbances /6 [Question 17]		X					AK2 Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following:  AK2.06 Reactor Power.  (CFR: 41.4 / 41.5 / 41.7 / 41.10 / 45.8)	3.9	1	

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1(RO) Continued									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
W/E04 LOCA Outside Containment /3 [Question 18]				X			EA1 Ability to operate and / or monitor the following as they apply to the (LOCA Outside Containment):  EA1.2 Operating behavior characteristics of the facility.  (CFR: 41.7 / 45.5 / 45.6)	3.6	1
K/A Category Point Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2(RO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000028 Pressurizer Level Malfunction / 2 [Question 19]		X					AK2 Knowledge of the interrelations between the Pressurizer Level Control Malfunctions and the following:  AK2.02 Sensors and detectors.  (CFR: 41.7 / 45.7)	2.6	1
000051 Loss of Condenser Vacuum / 2 [Question 20]						X	2.1.20 Ability to interpret and execute procedure steps.  (CFR: 41.10 / 43.5 / 45.12)	4.6	1
000061 ARM System Alarms / 7 [Question 21]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Area Radiation Monitoring (ARM) System Alarms:  AK1.01 Detector limitations.  (CFR 41.8 / 41.10 / 45.3)	2.5*	1
000067 Plant Fire On-site / 9 [Question 22]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Plant Fire on site:  AK1.02 Fire fighting.  (CFR: 41.8 / 41.10 / 45.3)	3.1	1
000068 Control Room Evacuation / 8 [Question 23]			X				AK3 Knowledge of the reasons for the following responses as they apply to the Control Room Evacuation:  AK3.10 Maintenance of PZR level, using pumps and heaters.  (CFR: 41.5 / 41.10 / 45.6 / 45.13)	3.9	1
W/E08 RCS Overcooling – PTS / 4 [Question 24]				X			EA1 Ability to operate and / or monitor the following as they apply to the (Pressurized Thermal Shock)  EA1.1 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)	3.8	1
W/E10 Natural Circulation with Steam Void in Vessel with/without RVLIS / 4 [Question 25]		X					EK2 Knowledge of the interrelations between the (Natural Circulation with Steam Void in Vessel with/without RVLIS) and the following:  EK2.1 Components and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.  (CFR: 41.7 / 45.7)	3.3	1
W/E14 High Containment Pressure / 5 [Question 26]					X		EA2 Ability to determine and interpret the following as they apply to the (High Containment Pressure):  EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations.  (CFR: 43.5 / 45.13)	3.3	1

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2(RO) Continued									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
W/E15 Containment Flooding / 5 [Question 27]				X			EA1 Ability to operate and / or monitor the following as they apply to the (Containment Flooding):  EA1.3 Desired operating results during abnormal and emergency situations.  (CFR: 41.7 / 45.5 / 45.6)	2.8	1
K/A Category Point Totals:	2	2	1	2	1	1	Group Point Total:		9

ES-401		PWR Examination Outline										Form ES-401-2		
		Plant Systems										- Tier 2/Group 1(RO)		
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 [Question 28]					X							K5 Knowledge of the operational implications of the following concepts as they apply to the RCPS:  K5.04 Effects of RCP shutdown on secondary parameters, such as steam pressure, steam flow, and feed flow.  (CFR: 41.5 / 45.7)	3.2	1
004 Chemical and Volume Control [Question 29]		X										K2 Knowledge of bus power supplies to the following:  K2.06 Control instrumentation.  (CFR: 41.7)	2.6*	1
005 Residual Heat Removal [Question 30]										X		A4 Ability to manually operate and/or monitor in the control room:  A4.03 RHR temperature, PZR heaters and flow, and nitrogen.  (CFR: 41.7 / 45.5 to 45.8)	2.8*	1
006 Emergency Core Cooling [Question 31]						X						K6 Knowledge of the effect of a loss or malfunction on the following will have on the ECCS:  K6.13 Pumps.  (CFR: 41.7 / 45.7)	2.8	1
Emergency Core Cooling [Question 32]											X	2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry level conditions for emergency and abnormal operating procedures.  (CFR: 41.10 / 43.2 / 45.6)	4.5	1
007 Pressurizer Relief/Quench Tank [Question 33]					X							K5 Knowledge of the operational implications of the following concepts as they apply to the PRTS:  K5.02 Method of forming a steam bubble in the PZR.  (CFR: 41.5 / 45.7)	3.1	1
008 Component Cooling Water [Question 34]										X		A3 Ability to monitor automatic operation of the CCWS, including:  A3.08 Automatic actions associated with the CCWS that occur as a result of a safety injection signal.  (CFR: 41.7 / 45.5)	3.6*	1
010 Pressurizer Pressure Control [Question 35]						X						K6 Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS:  K6.01 Pressure detection systems.  (CFR: 41.7 / 45.7)	2.7	1

ES-401		PWR Examination Outline											Form ES-401-2		
		Plant Systems											- Tier 2/Group 1(RO) Continued		
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	#
010 Pressurizer Pressure Control [Question 36]						X							K5 Knowledge of the operational implications of the following concepts as they apply to the PZR PCS:  K5.01 Determining of condition of fluid in PZR, using steam tables.  (CFR: 41.5 / 45.7)	3.5	1
012 Reactor Protection [Question 37]					X								K4 Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following:  K4.01 Trip logic when one channel OOC or in test.  (CFR: 41.7)	3.7	1
013 Engineered Safety Features Actuation [Question 38]		X											K1 Knowledge of the physical connections and/or cause-effect relationships between ESFAS and the following systems:  K1.07 AFW System.  (CFR: 41.2 to 41.9 / 45.7 to 45.8)	4.1	1
022 Containment Cooling [Question 39]			X										K2 Knowledge of bus power supplies to the following:  K2.01 Containment cooling fans.  (CFR: 41.7)	3.0*	1
023 Containment Spray [Question 40]									X				A2 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:  A2.04 Failure of spray pump.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.9	1
026 Containment Spray [Question 41]												X	2.2.39 Knowledge of less than or equal to one hour Technical Specifications for a system.  (CFR: 41.7 / 41.10 / 43.2 / 45.13)	3.9	1
039 Main and Reheat Steam [Question 42]					X								K4 Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following:  K4.07 Reactor building isolation.  (CFR: 41.7)	3.4	1
059 Main Feedwater [Question 43]				X									K3 Knowledge of the effect that a loss or malfunction of the MFW system will have on the following:  K3.02 AFW System.  (CFR: 41.7 / 45.6)	3.6	1
061 Auxiliary/Emergency Feedwater [Question 44]					X								K4 Knowledge of AFW design feature(s) and/or interlock(s) which provide for the following:  K4.08 AFW Recirculation.  (CFR: 41.7)	2.7	1



ES-401		PWR Examination Outline											Form ES-401-2	
		Plant Systems											- Tier 2/Group 1(RO) Continued	
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	#
062 AC Electrical Distribution [Question 45]							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AC Distribution System controls including:  A1.01 Significance of D/G load limits.  (CFR: 41.5 / 45.5)	3.4	1
063 DC Electrical Distribution [Question 46]							X					A1 Ability to predict and/or monitor changes in parameters associated with operating the DC electrical system controls including:  A1.01 Battery capacity as it is affected by discharge rate.  (CFR: 41.5 / 45.5)	2.5	1
063 DC Electrical Distribution [Question 47]											X	2.4.11 Knowledge of abnormal condition procedures.  (CFR: 41.10 / 43.5 / 45.13)	4.0	1
064 Emergency Diesel Generator [Question 48]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.08 Consequences of opening/closing breaker between buses (VARS, out-of-phase, voltage).  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7	1
073 Process Radiation Monitoring [Question 49]			X									K3 Knowledge of the effect that a loss or malfunction of the PRM system will have on the following:  K3.01 Radioactive effluent releases.  (CFR: 41.7 / 45.6)	3.6	1
076 Service Water [Question 50]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the SWS system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.01 Loss of SWS.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.5*	1
076 Service Water [Question 51]										X		A4 Ability to manually operate and/or monitor in the control room:  A4.04 Emergency heat loads.  (CFR: 41.7 / 45.5 to 45.8)	3.5*	1

ES-401		PWR Examination Outline										Form ES-401-2			
Plant Systems										- Tier 2/Group 1(RO) Continued					
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	#	
078 Instrument Air [Question 52]	X											K1 Knowledge of the physical connections and/or cause-effect relationships between IAS and the following systems:  K1.02 Service Air.  (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.7*	1	
078 Instrument Air [Question 53]										X		A4 Ability to manually operate and/or monitor in the control room:  A4.01 Pressure gauges.  (CFR: 41.7 / 45.5 to 45.8)	3.1	1	
103 Containment [Question 54]			X									K3 Knowledge of the effect that a loss or malfunction of the containment system will have on the following:  K3.02 Loss of containment integrity under normal conditions.  (CFR: 41.7 / 45.6)	3.8	1	
103 Containment [Question 55]									X			A3 Ability to monitor automatic operation of the containment system, including:  A3.01 Containment isolation.  (CFR: 41.7 / 45.5)	3.9	1	
Category Point Totals:	2	2	3	3	3	2	2	3	2	3	3	Group Point Total:		28	

ES-401		PWR Examination Outline											Form ES-401-2	
		Plant Systems											- Tier 2/Group 2(RO)	
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	#
015 Nuclear Instrumentation [Question 56]					X							K5 Knowledge of the operational implications of the following concepts as they apply to the NIS:  K5.04 Factors affecting accuracy and reliability of calorimetric calibrations.  (CFR: 41.5 / 45.7)	2.6	1
016 Non-nuclear Instrumentation [Question 57]				X								K4 Knowledge of NNIS design feature(s) and/or interlock(s) which provide for the following:  K4.01 Reading of NNIS channel values outside control room.  (CFR: 41.7)	2.8*	1
017 In-Core Temperature Monitor System (ITM) [Question 58]						X						K6 Knowledge of the effect of a loss or malfunction of the ITM system components:  K6.01 Sensors and detectors.  (CFR: 41.7 / 45.7)	2.7	1
029 Containment Purge [Question 59]											X	2.4.9 Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.  (CFR: 41.10 / 43.5 / 45.13)	3.8	1
045 Main Turbine Generator [Question 60]							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with MT/G system controls including:  A1.05 Expected response of primary plant parameters (temperature and pressure) following T/G trip.  (CFR: 41.5 / 45.5)	3.8	1
055 Condenser Air Removal [Question 61]	X											K1 Knowledge of the physical connections and/or cause-effect relationships between the CARS and the following systems:  K1.06 PRM system.  (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.6	1
068 Liquid Radwaste [Question 62]									X			A3 Ability to monitor automatic operation of the Liquid Radwaste system including:  A3.02 Automatic isolation.  (CFR: 41.7 / 45.5)	3.6	1
071 Waste Gas Disposal [Question 63]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System; and (b) based on those on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.08 Meteorological changes.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.5	1

ES-401		PWR Examination Outline											Form ES-401-2				
Plant Systems															- Tier 2/Group 2(RO) Continued		
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	#			
075 Circulating Water [Question 64]		X										K2 Knowledge of bus power supplies to the following: K2.03 Emergency/essential SWS pumps. (CFR: 41.7)	2.6*	1			
086 Fire Protection [Question 65]										X		A4 Ability to manually operate and/or monitor in the control room: A4.01 Fire water pumps. (CFR: 41.7 / 45.5 to 45.8)	3.3	1			
K/A Category Point Totals:	1	1	0	1	1	1	1	1	1	1	1	Group Point Total:		10			

ES 401		Generic Knowledge and Abilities Outline (Tier 3)		Form ES-401-3		
Ability: <u>BVPS UNIT 1 RO</u>		Date of Exam <u>4/09 thru 4/20/2012</u>				
Category	K/A#	Topic	RO		SRO Only	
			IR	#	IR	#
1. Conduct of Operations	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) [Question 66]	4.4	1		
	2.1.19	Ability to use plant computers to evaluate system or component status.  (CFR: 41.10 / 45.12) [Question 67]	3.9	1		
	2.1.38	Knowledge of the stations requirements for verbal communications when implementing procedures.  (CFR: 41.10 / 45.13) [Question 68]	3.7*	1		
	Subtotal			3		
2. Equipment Control	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) [Question 69]	4.2	1		
	2.2.43	Knowledge of the process to track inoperable alarms.  (CFR: 41.10 / 43.5 / 45.13) [Question 70]	3.0	1		
	Subtotal			2		
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.  (CFR: 41.12 / 43.4 / 45.10) [Question 71]	3.2	1		
	2.3.5	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personal monitoring equipment, etc.  (CFR: 41.11 / 41.12 / 43.4 / 45.9) [Question 72]	2.9	1		
	2.3.7	Ability to comply with radiation work permit requirements during normal or abnormal conditions.  (CFR: 41.12 / 45.10) [Question 73]	3.5	1		
	Subtotal			3		
4. Emergency Procedures/ Plan	2.4.34	Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.  (CFR: 41.10 / 43.5 / 45.13) [Question 74]	4.2	1		
	2.4.49	Ability to perform without references to procedures those actions that require immediate operation of system components and controls.  (CFR: 41.10 / 43.2 / 45.6) [Question 75]	4.6	1		
	Subtotal			2		
Tier 3 Point Total				10		

Facility: **BVPS UNIT 1 SRO**Date of Exam 4/09 thru 4/20/2012

Tier	Group	RO K/A Category Points												SRO ONLY Points				
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	TOTAL	A2	G*	TOTAL		
1. Emergency & Abnormal Plant Evolutions	1													3	3	6		
	2													2	2	4		
	Tier Totals													5	5	10		
2. Plant Systems	1													3	2	5		
	2													0	2	1	3	
	Tier Totals													5	3	8		
3. Generic Knowledge and Abilities Category														1	2	3	4	7
																2	2	

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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						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1(SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000015/17 RCP Malfunctions / 4 [Question 76]					X		AA2 Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow):  AA2.07 Calculation of expected values of flow in the loop with RCP secured.  (CFR: 43.5 / 45.13)	2.9	1
000057 Loss of Vital AC Inst. Bus / 6 [Question 77]						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	1
000065 Loss of Instrument Air / 8 [Question 78]					X		AA2 Ability to determine and interpret the following as they apply to the Loss of Instrument Air:  AA2.03 Location and isolation of leaks.  (CFR: 43.5 / 45.13)	2.9	1
W/E05 Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4 [Question 79]					X		EA2 Ability to determine and interpret the following as they apply to the (Loss of Secondary Heat Sink)  EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.  (CFR: 43.5 / 45.13)	4.3	1
W/E11 Loss of Emergency Coolant Recirc / [Question 80]						X	2.1.20 Ability to interpret and execute procedure steps.  (CFR: 41.10 / 43.5 / 45.12)	4.6	1
W/E12 Steam Line Rupture – Excessive Heat Transfer / 4 [Question 81]						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	1
K/A Category Point Totals:	0	0	0	0	3	3	Group Point Total:	6	

ES-401		PWR Examination Outline						Form ES-401-2		
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2(SRO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1 [Question 82]						X	2.2.44 Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.  (CFR: 41.5 / 43.5 / 45.12)	4.4	1	
000005 Inoperable / Stuck Control Rod / 1 [Question 83]					X		AA2 Ability to determine and interpret the following as they apply to the Inoperable / Stuck Control Rod:  AA2.03 Required actions if more than one rod is stuck or inoperable.  (CFR: 43.5 / 45.13)	4.4	1	
000036 Fuel Handling Accident / 8 [Question 84]					X		AA2 Ability to determine and interpret the following as they apply to the Fuel Handling Incidents:  AA2.02 Occurrence of a fuel handling incident.  (CFR: 43.5 / 45.13)	4.1	1	
W/E06 Inadequate Core Cooling / 4 [Question 85]						X	2.4.18 Knowledge of the specific bases for EOPs.  (CFR: 41.10 / 43.1 / 45.13)	4.0	1	
K/A Category Point Totals:	0	0	0	0	2	2	Group Point Total:	4		



ES-401		PWR Examination Outline										Form ES-401-2				
Plant Systems															- Tier 2/Group 1(SRO)	
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	#		
005 Residual Heat Removal [Question 86]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.04 RHR valve malfunction.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.9	1		
006 Emergency Core Cooling [Question 87]											X	2.2.22 Knowledge of limiting conditions for operations and safety limits.  (CFR: 41.5 / 43.2 / 45.2)	4.7	1		
008 Component Cooling Water [Question 88]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.01 Loss of CCW pump.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.6	1		
059 Main Feedwater [Question 89]											X	2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.  (CFR: 41.10 / 43.5 / 45.13)	4.5	1		
073 Process Radiation Monitoring [Question 90]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.01 Erratic or failed power supply.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.9*	1		
K/A Category Point Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5		

ES-401		PWR Examination Outline										Form ES-401-2		
		Plant Systems										- Tier 2/Group 2(SRO)		
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	#
011 Pressurizer Level Control [Question 91]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.05 Loss of PZR heaters.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.7	1
014 Rod Position Indication [Question 92]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the RPIS and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:  A2.03 Dropped Rod.  (CFR: 41.5 / 43.5 / 45.3 / 45.13)	4.1	1
034 Fuel Handling Equipment [Question 93]											X	2.4.9 Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.  (CFR: 41.10 / 43.5 / 45.13)	4.2	1
K/A Category Point Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:		3

ES 401		Generic Knowledge and Abilities Outline (Tier 3)		Form ES-401-3		
Facility: <u>BVPS UNIT 1 SRO</u>		Date of Exam <u>4/09 thru 4/20/2012</u>				
Category	K/A#	Topic	RO		SRO Only	
			IR	#	IR	#
1. Conduct of Operations	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) <b>[Question 94]</b>			4.7	1
	2.1.36	Knowledge of procedures and limitations involved in core alterations. (CFR: 41.10 / 43.6 / 45.7) <b>[Question 95]</b>			4.1	1
	Subtotal					2
2. Equipment Control	2.2.15	Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tagouts, etc. (CFR: 41.10 / 43.3 / 45.13) <b>[Question 96]</b>			4.3	1
	2.2.40	Ability to apply technical specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3) <b>[Question 97]</b>			4.7	1
	Subtotal					2
3. Radiation Control	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10) <b>[Question 98]</b>			3.8	1
	Subtotal					1
4. Emergency Procedures/ Plan	2.4.8	Knowledge of how abnormal operating procedures are used in conjunction with EOP's. (CFR: 41.10 / 43.5 / 45.13) <b>[Question 99]</b>			4.5	1
	2.4.44	Knowledge of emergency plan protective action recommendations. (CFR: 41.10 / 41.12 / 43.5 / 45.11) <b>[Question 100]</b>			4.4	1
	Subtotal					2
Tier 3 Point Total						7

Facility: BVPS UNIT 1      Date of Exam 4/9 thru 4/20 2012      Operating Test No.: 1LOT8 NRC		
er / Group	Randomly Selected K/A	Reason for Rejection
		<b><u>RO OUTLINE</u></b>
1/1	026 AA1.03	SWS backup to CCWS is not applicable at BVPS. 026AA1.02 reselected for Question #7.
1/1	027 AK1.01	Definition of saturation temperature is fundamental knowledge. Unable to construct a discriminatory question. Reselected based on 12/19 discussion with Lead Examiner. 027 AK1.02 reselected for Question # 8.
1/1	029 EK3.02	Starting specific charging pumps is not applicable to an ATWS at BVPS. 029 EK3.12 reselected for Question # 9.
1/1	040 AA1.22	Load sequencer status lights are not applicable to BVPS. 040 AA1.02 reselected for Question # 11.
1/1	054 2.2.1	*ES-401 D.1.b requires exclusion of generic K/As for Tier 1 & 2. These generic K/As were not suppressed and therefore were not automatically omitted using PWROG Random Generator (manually reselected from same generic group). 054 2.2.44 reselected for Question # 12.
1/1	062 2.4.37	* Same as above. 2.4.1 was initially reselected. Since BVPS Loss of Nuclear Service Water AOP contains no immediate action steps another section 2.4 Generic K/A was manually reselected. 062 2.4.4 reselected for Question # 16.
1/2	051 2.1.43	* Same as above. 051 2.1.20 reselected for Question # 20.
2/1	004 K2.02	Make-up pumps are not applicable to the BVPS design. <b>Author/Exam Lead believed this K/A was referencing positive displacement makeup pumps. Follow-up discussion with Lead Examiner revealed this K/A is referring to Primary Make-up (PG) pumps. Unit 1 currently uses Unit 2 PG pumps.</b> 004 K2.06 reselected for Question # 29.
2/1	025 2.4.39	Ice Condensers are not applicable to the BVPS design. 006 2.4.4 reselected for Question # 32.
2/1	025 K5.02	Ice Condensers are not applicable to the BVPS design. 007 K5.02 reselected for Question # 33.
2/1	026 2.2.41	* Same as above. 026 2.2.39 reselected for Question # 41.
2/1	063 2.4.12	* Same as above. 063 2.4.11 reselected for Question # 47.
2/2	029 2.4.26	* Same as above. 029 2.4.9 reselected for Question # 59.
2/2	068 A3.01	Evaporators are no longer used for Liquid Radwaste at BVPS. 068 A3.02 reselected for Question # 62.

3	2.1.5	K/A not an RO function at BVPS. Reselected based on 12/19 discussion with Lead Examiner. 2.1.7 reselected for Question # 66.
3	2.2.25	TS Bases is SRO level knowledge IAW Region II white paper on SRO ONLY questions. 2.2.44 reselected for Question # 69.
3	2.2.4	BVPS is not a multi-unit license plant. 2.2.43 reselected for Question # 70
		<b><u>SRO OUTLINE</u></b>
1/1	W/E11 2.1.6	*ES-401 D.1.b requires exclusion of generic K/As for Tier 1 & 2. These generic K/As were not suppressed and therefore were not automatically omitted using PWROG Random Generator (manually reselected from same generic group). 2.1.20 reselected for Question # 80.
1/1	W/E12 2.1.35	* Same as above. 2.1.7 reselected for Question # 81.
1/2	01 2.2.15	* Same as above. 2.2.44 reselected for Question # 82.
1/2	05 AA2.02	Jog and run rod speeds are not applicable to BVPS. AA2.03 reselected for Question # 83.
1/2	W/E16 2.4.50	High Containment Radiation (FR-Z.3) was deleted at BVPS Unit 1. Not SRO K/A. W/E06 2.4.18 reselected for Question # 85.
2/1	006 2.2.43	* Same as above. 2.2.22 reselected for Question # 87.
2/1	008 A2.07	CCW Pump low flow auto start is not applicable to BVPS Design. A2.01 reselected for Question # 88.
2/1	059 2.3.15	* Same as above. 2.4.8 reselected for Question # 89. (manually reselected from Group 4 versus 3 since radiation control not applicable to main feedwater)
3	2.1.14	K/A not an SRO function at BVPS. Reselected based on 12/19 discussion with Lead Examiner. 2.1.36 reselected for Question # 95.

Facility: BVPS Unit 1Date of Examination: 4/9 thru 4/20/2012Examination Level **RO** ☒Operating Test Number 1LOT8 NRC

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (RO A.1.1)	N, R	2.1.7 (4.4)  Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.  (1AD-30) Calculate The RCS Initial Void Volume and Final Void Volume.
Conduct of Operations (RO A.1.2)	D, R	2.1.25 (3.9)  Ability to interpret reference materials, such as graphs, curves, tables, etc.  (1AD-008) Perform Shutdown Margin Calculation.
Equipment Control (RO A.2)	N, R	2.2.37 (3.6)  Ability to determine operability and/or availability of safety related equipment.  (1AD-027) Complete Surveillance of RHR Pump
Radiation Control (RO A.3)	D, R	2.3.11 (3.8)  Ability to control radiation releases.  (1AD-10) Determine GW Storage tank Discharge Bleed Flow Rate
Emergency Procedures/Plan		NOT EVALUATED

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 &amp; Criteria

(C)ontrol Room, (S)imulator, or Class(R)oom

(D)irect from bank ( $\leq 3$  for ROs;  $\leq 4$  for SROs & RO retakes)(N)ew or (M)odified from bank ( $\geq 1$ )(P)revious 2 exams ( $\leq 1$ ; randomly selected)

Facility: BVPS Unit 1Date of Examination: 4/9 thru 4/20/2012Examination Level **SRO** ☒Operating Test Number 1LOT8 NRC

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (SRO A.1.1)	N, R	2.1.43 (4.3)  Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc.  (1AD-019) Evaluate 1/M Plot and Determine Required Actions
Conduct of Operations (SRO A.1.2)	N, R	2.1.25 (4.2)  Ability to interpret reference materials, such as graphs, curves, tables, etc.  (1AD-031) Review Shutdown Margin Calculation
Equipment Control (SRO A.2)	N, R	2.2.37 (4.6)  Ability to determine operability and/or availability of safety related equipment.  (1AD-026) Review/Approve Completed Surveillance of RHR Pump
Radiation Control (SRO A.3)	N, R	2.3.11 (4.3)  Ability to control radiation releases.  (1AD-023) Review/Approve LW Discharge.
Emergency Procedures/Plan (SRO A.4)	N, R	2.4.40 (4.5)  Knowledge of SRO responsibilities in emergency plan implementation.  (1AD-015) Classify an Event (and determine PAR)

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 &amp; Criteria

(C)ontrol Room, (S)imulator, or Class(R)oom

(D)irect from bank ( $\leq 3$  for ROs;  $\leq 4$  for SROs & RO retakes)(N)ew or (M)odified from bank ( $\geq 1$ )(P)revious 2 exams ( $\leq 1$ ; randomly selected)

Facility: **BVPS UNIT 1**Date of Examination: **4/9 thru 4/20/2012**Exam Level: RO ☒Operating Test No.: **1LOT8 NRC**Control Room Systems<sup>@</sup> (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
<b>S1</b> - Emergency Borate RCS (1CR-511)	S, D, A, E	1
<b>S2</b> - Synchronize and Load <b>#1</b> Emergency Diesel Generator (1CR-524)	S, N, A, EN	6
<b>S3</b> - <i>Isolate SI Accumulators During a LOCA (1CR-642)</i>	<b>S, D, A, P, EN</b>	<b>3</b>
<b>S4</b> - Align SI Pumps for Hot/Cold Leg Recirculation (1CR-570)	S, D, A, E	2
<b>S5</b> - Establish a Containment Purge to Ventilation Duct (1CR-026)	N, S, L	8
<b>S6</b> - Respond to RCP #1 Seal Failure (1CR-040)	S, M, E, L	4P
<b>S7</b> - Control Room Evacuation (1CR-609)	S, D, A, E	4S
<b>S8</b> - Respond to an Intermediate Range Malfunction (1CR-106)	S, D, L	7

In-Plant Systems<sup>@</sup> (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

<b>P1</b> - Vent Charging Pump Suction Header (1PL-057)	D, R, EN	2
<b>P2</b> - AMSAC System Trouble – PT Failure (PL-147)	D, E	7
<b>P3</b> - Transfer 120VAC Vital Power ( <b>1PL-524</b> )	N, A, E	6

@ All RO and SRO control room (and in-plant) systems must be different and serve different safety functions; all 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	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	- / - / $\geq 1$ (Control room system)
(L)ow-power / Shutdown	$\geq 1 / \geq 1 / \geq 1$
(N)ew or (M)odified from bank including 1(A)	$\geq 2 / \geq 2 / \geq 1$
(P)revious 2 exams	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)
(R)CA	$\geq 1 / \geq 1 / \geq 1$
(S)imulator	



Facility: **BVPS UNIT 1**Date of Examination: **4/9 thru 4/20/2012**Exam Level: SRO(I) ☒Operating Test No.: **1LOT8 NRC****Control Room Systems<sup>®</sup> (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)**

System / JPM Title	Type Code*	Safety Function
<b>S1</b> - Emergency Borate RCS (1CR-511)	S, D, A, E	1
<b>S2</b> - Synchronize and Load <b>#1</b> Emergency Diesel Generator (1CR-524)	S, N, A, EN	6
<b>S3</b> - <b>Isolate SI Accumulators During a LOCA (1CR-642)</b>	<b>S, D, A, P, EN</b>	<b>3</b>
<b>S4</b> - Align SI Pumps for Hot/Cold Leg Recirculation (1CR-570)	S, D, A, E	2
<b>S5</b> - Establish a Containment Purge to Ventilation Duct (1CR-026)	N, S, L	8
<b>S6</b> - Respond to RCP #1 Seal Failure (1CR-040)	S, M, E, L	4P
<b>S7</b> - Control Room Evacuation (1CR-609)	S, D, A, E	4S

**In-Plant Systems<sup>®</sup> (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)**

<b>P1</b> - Vent Charging Pump Suction Header (1PL-057)	D, R, EN	2
<b>P2</b> - AMSAC System Trouble – PT Failure (PL-147)	D, E	7
<b>P3</b> - Transfer 120VAC Vital Power ( <b>1PL-524</b> )	D, A, E	6

@ All RO and SRO control room (and in-plant) systems must be different and serve different safety functions; all 5SRO-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	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	- / - / $\geq 1$ (Control room system)
(L)ow-power / Shutdown	$\geq 1 / \geq 1 / \geq 1$
(N)ew or (M)odified from bank including 1(A)	$\geq 2 / \geq 2 / \geq 1$
(P)revious 2 exams	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)
(R)CA	$\geq 1 / \geq 1 / \geq 1$
(S)imulator	

Facility: **BVPS UNIT 1**Date of Examination: **4/9 thru 4/20/2012**Exam Level: SRO(U) ☒Operating Test No.: **1LOT8 NRC**Control Room Systems<sup>@</sup> (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
<b>S1</b> - Emergency Borate RCS (1CR-511)	S, D, A, E	1
<b>S3</b> - <i>Isolate SI Accumulators During a LOCA (1CR-642)</i>	<b>S, D, A, P, EN</b>	<b>3</b>
<b>S5</b> - Establish a Containment Purge to Ventilation Duct (1CR-026)	N, S, L	8
<b>In-Plant Systems<sup>@</sup> (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)</b>		
<b>P1</b> - Vent Charging Pump Suction Header (1PL-057)	D, R, EN	2
<b>P3</b> - Transfer 120VAC Vital Power (1PL-523)	D, A, E	6

**@** All RO and SRO control room (and in-plant) systems must be different and serve different safety functions; all 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	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	- / - / $\geq 1$ (Control room system)
(L)ow-power / Shutdown	$\geq 1 / \geq 1 / \geq 1$
(N)ew or (M)odified from bank including 1(A)	$\geq 2 / \geq 2 / \geq 1$
(P)revious 2 exams	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)
(R)CA	$\geq 1 / \geq 1 / \geq 1$
(S)imulator	

**Appendix D****Scenario Outline**

Facility:	<b>BVPS Unit 1</b>	Scenario No.:2	Op Test No.:	<u>1LOT8 NRC</u>
Examiners:	_____	Candidates:	_____	SRO
	_____		_____	ATC
	_____		_____	BOP

Initial Conditions: **IC 235:** 5% power, EOL, *Xe increasing*, CB "D" @ 115 steps, RCS boron - 664 ppm.

Turnover: Continue power increase IAW reactivity plan and commence turbine roll.  
PCV-1RC-456 isolated due to seat leakage, block valve closed. TS 3.4.11, *Condition A*

Critical Tasks:

- 1. E-3.A Isolate Ruptured S/G**
- 2. E-3.B Establish/maintain RCS temperature**
- 3. ECA-3.3.A Terminate Safety Injection**

Event No.	Malf. No.	Event Type	Event Description
1	N/A	(R) ATC (N) SRO	Raise power
2	IMF PRS08E (0 0) 2500 15 IMF PRS04B	(I) ATC, SRO (TS) SRO	PT-1RC-445 fails high, <i>PORV's 455D &amp; 456 open, ATC required to manually close PORV, PCV-1RC-455D</i>
3	IMF BST-CCW006 IMF CCW3A	(C) BOP, SRO (TS) SRO	"A" CCR pump trips, Auto start failure of "B" CCR pump
4	IMF MSS11 (0 0) 1400 1200	(C) BOP, SRO	Steam Dump pressure setpoint drifts low, steam dumps open in response, BOP required to manually control steam dumps
5	IMF RCS10B (0 0) 10.6 TRG 6 'IMF RCS10B (0 120) 16.4 600 10.6'	(C) ATC, SRO	"B" RCP high vibration – will require RCP/Rx trip
6	IMF RCS03A (1 120) 450	(M) - ALL	"A" SG - 450 gpm tube rupture
7	IMF MSS08A (5 0) 50	(C) BOP, SRO	Steam dump, PCV-1MS-106A fails at 50% following cooldown during E-3. Crew required to isolate steam lines and control RCS temperature via atmospheric steam dumps
8	IMF PRS09A (1 0) 0 IMF PRS09B (1 0) 0 IOR X071097O	(C) ATC, SRO	Pzr spray valves and remaining PORV fail to open during depressurization in E-3, will require transition to ECA-3.3

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

The crew will assume the shift at 5% power with instructions to raise power in accordance with the reactivity plan and 1OM-52.4.A.

After the power increase is commenced, PT-1RC-445 will fail high causing PORV 455D and 456 to open, (per turnover, 456 previously isolated with block valve closed.) the ATC will be required to manually close PORV, PCV-1RC-455D. The US will respond and give direction IAW 1OM-6.4.IF, Attachment 2 and determine applicable Tech Spec actions.

The "A" CCR pump will then trip due to a faulty breaker with a failure of the "B" to auto start. The BOP will manually start the "B"; the US will dispatch an operator to place the "C" pump in service on the "AE" 4kv bus. The US will then address Technical Specifications.

When Tech Specs have been addressed, the steam dump pressure setpoint will drift low, causing the steam dumps to open and an RCS cooldown. The crew will take action to control steam dumps manually.

When steam dumps are in manual control, an RCP will show signs of high vibration, the crew will respond using AOP 1.6.8, "Abnormal RCP Operation". The vibration will increase in severity to the point where the Rx and RCP must be tripped.

As a result of the reactor trip a 450 gpm SGTR occurs on the "A" S/G. The crew will progress through E-0 and diagnose the "A" S/G as ruptured and transition to E-3. The crew will isolate the "A" S/G and cooldown to a target temperature. Following the Cooldown to target temperature, Condenser Steam Dump valve, PCV-1MS-06A will fail at 50% open, the crew will identify the failure and isolate the mainsteam lines and stabilize temperature using the "B" and "C" S/G atmospheric steam dump valves.

When the crew attempts to depressurize the RCS, the spray valves will not function, nor will the PZR PORV's, 456 was previously isolated on turnover – block valve will open but PORV will not, 455D was isolated per event 2, block valve will not open. 455C will fail to open via control switch, crew will then transition to ECA-3.3.

The scenario is terminated when the crew establishes a normal charging flow path in ECA-3.3.

Expected procedure flow path is E-0 → E-3 → ECA-3.3.

## Appendix D

## Scenario Outline

Facility: **BVPS Unit 1** Scenario No.:3 Op Test No.: 1LOT8 NRC  
 Examiners: \_\_\_\_\_ Candidates: \_\_\_\_\_ SRO  
 \_\_\_\_\_ ATC  
 \_\_\_\_\_ BOP

Initial Conditions: **IC 238 (18):** 100% power, MOL, Equ. XE Conditions, CB "D" @ 225 steps, RCS boron - 1019 ppm.

Turnover: Maintain 100% power.  
 PCV-1RC-456 isolated due to seat leakage, block valve closed. TS 3.4.11, *Condition A*  
**FW-P-2 Out of service, TS 3.7.5, Condition B**  
**Control Rods in Manual due to scheduled MSP on N-44**

Critical Tasks:

1. E-0.C Energize 1 AC Emergency Bus
2. E-0.D Manually actuate 1 train of Safety Injection
3. FR-H.1.A Establish feed flow to SG before Feed and Bleed is required
4. E-2.A Isolate faulted SG

Event No.	Malf. No.	Event Type	Event Description
1	IMF PRS08D (0 0) 2500 15	(I) ATC, SRO (TS) SRO	PT-1RC-444 fails high, requires ATC to close PORV and manually control RCS pressure.
2	IOR X121027L (12 0) ON	(TS) SRO	OCB-92 trips open, de-energizes SSST-1A
3	IMF AUX02A	(C) BOP, SRO	"A" Station air compressor trips, "B" fails to <i>auto</i> start – <b>BOP manually starts "B" air compressor</b> , Diesel Air compressor fails to auto start but will start locally.
4	IMF MSS18C (0 0) 2.5E5 300 0	(R) ATC (N) SRO, BOP	"C" SG Fault in MSVR, causes Rx overpower, requires emergency power reduction.
5	IMF CRF04BV (2 2) 1 IMF CRF04BT (2 4) 1	(C) ATC, SRO	2 Rods drop during power reduction – requires manual Rx trip. Loss of 4kv busses, "A", "B" and AE occurs on Rx trip
6	TRG 3 'IMF MSS18C (0 0) 6E5'	(M) ALL	"C" SG Steam Break occurs on Rx trip – causes Safety Inj.
7	IMF SIS10A <b>IMF SIS10B</b>	(C) ATC, SRO	<b>Automatic</b> SI fails to actuate – requires manual actuation.
8	IMF EPS11B (1 30) IMF INH53 (0 0) IMF EPS04F (1 10)	(C) BOP, SRO	"B" train 4kv emergency bus de-energizes, #2 EDG trips while loading, #1 EDG auto start inhibited, will start manually.
9	IMF FWM11C (4 30) IMF FWM11A (0 0)	(M) ALL	Loss of all Aux Feedwater flow, requires entry into FR-H.1

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

After taking the shift at 100% power, PT-1RC-444 will fail high causing the pzs spray valves and PORV PCV-1RC-455C to open. The ATC will close the PORV and spray valves to stabilize RCS pressure. The ATC will manually control pzs pressure for the remainder of the scenario. The SRO will utilize 1OM-6.4IF, Attachment 2 to address the Pressure transmitter failure. The SRO will address Technical Specifications for DNB and Shutdown panel instrumentation.

OCB-92 will then trip open, de-energizing SSST-1A, the SRO will address Technical Specifications and direct the BOP to perform OST-1.36.7, "Offsite to Onsite Power Distribution System Breaker Alignment Verification".

The "A" station air compressor will trip with auto start failures of the "B" station air compressor and the Diesel driven air compressor. The SRO will direct activities in accordance with AOP 1.34.1, "Loss of Station Instrument Air", the BOP will manually start the "B" station air compressor.

A fault will occur on the "C" S/G outside of containment upstream of the MSIV, the fault will ramp in over a 5 minute time period, RCS temperature will decrease and reactor power will increase. High temperature alarms will actuate in the main steam valve room and aux feed pump room.

The crew will recognize the over power and begin an immediate power reduction in accordance with AOP 1.51.2, "Reactor Overpower".

The ATC will insert the control rods in response to the turbine load reduction, 2 rods will drop during the rod insertion, the immediate actions of AOP 1.1.8, "Rod Inoperability", will be taken and the reactor will be manually tripped due to more than 1 rod being dropped. When the reactor is tripped, the "A", "B" and "AE" 4KV buses will become de-energized on the transfer to offsite power.

Upon the Rx trip, the steam leak becomes a break resulting in an SI signal being initiated due to the faulted S/G. Safety Injection will not automatically actuate, requiring manual actuation to initiate SI flow.

EDG – 1 will fail to auto start and is required to be started manually.

The "DF" bus will be de-energized after the transfer to offsite power following the reactor trip. EDG-2 will auto start but trip while loading, and will not be recoverable

Aux Feedwater malfunctions will occur such that FW-P-3A fails completely, FW-P-3B will not have power and the turbine driven pump, FW-P-2 was OOS on turnover, and cannot be recovered due to high temperatures in the Aux feed pump room.

The crew will enter E-0 on the reactor trip, and then enter FR-H-1 due to no auxiliary feed water being available. When the crew dispatches an operator to start up FW-P-4, the dedicated Feedwater pump will start and supply Feedwater. After Feedwater has been established, the crew will return to E-0 and progress to diagnose the "C" S/G as being faulted and enter E-2 to isolate the "C" S/G.

The scenario will be terminated when the crew determines transition to ES-1.1 is appropriate. Expected procedure flow path is E-0 → FR-H.1 → E-0 → E-2.

**Appendix D**
**Scenario Outline**

Facility: <b>BVPS Unit 1</b>	Scenario No.: 4	Op Test No.: <u>1LOT8 NRC</u>
Examiners: _____	Candidates: _____	SRO
_____	_____	ATC
_____	_____	BOP

Initial Conditions: **IC 255(10):** 100% power, BOL, Equ. XE Conditions, CB “D” @ 225 steps, RCS boron - 1434 ppm.

Turnover: Maintain 100% power.  
PCV-1RC-456 isolated due to seat leakage, block valve closed. TS 3.4.11, *Condition A*

Critical Tasks:

- 1. FR-S.1.C Initiate negative reactivity**
- 2. FR-S.1.B Start Auxiliary Feedwater pumps**
- 3. E-0.O Close cnmt isolation valves**

Event No.	Malf. No.	Event Type	Event Description
1	IMF PRS06A (0 0) 0 5	(I) ATC, SRO (TS) SRO	LT-1RC-459 fails low, letdown isolates, crew removes channel from service.
2	N/A	(N) ATC, SRO	Restores letdown
3	<i>IMF TUR15 (0 0) 78 10 IMF CRF11BR 0</i>	<i>(C) ATC, SRO (TS) SRO</i>	<i>Turbine valve position limiter fails low, causes ~ 100 mw load reduction, 1 Rod stuck at ARO position.</i>
4	IMF FWM09C (1 0) 25 0	(C) BOP, SRO	“C” SG Feedwater valve, FCV-1FW-498, begins oscillating, requiring BOP to manually control level.
5	IMF TUR03E (0 0) 15 8	(C) BOP, SRO	Turbine high bearing vibration requires crew to manually trip the unit.
6	IMF CRF02A (5 0) IMF CRF12A IMF CRF12B	(M) ALL	Reactor fails to trip from the control room, requires entry into FR-S.1, ATC manually inserts control rods.
7	IMF INH20 IMF INH21 IMF INH35 IMF INH36	(C) BOP, SRO	All Aux Feedwater pumps fail to automatically start, requires BOP to start AFW pumps.
8	IMF MSS02C (4 0) 3.5E6 20 0	(M) ALL	Main steam line break downstream of MSIV’s, causes safety injection actuation.
9	IMF INH49 IMF VLV-SEA10 (0 0) 100 0 100	(C) ATC, SRO	Train “A” CIA fails to actuate along with train “B” valve MOV-1CH-381 failing to automatically close, ATC must manually actuate CIA or close MOV-1CH-381.

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

After taking the shift at 100% power, LT-1RC-459 will fail low, letdown will automatically isolate. The SRO will direct the ATC to remove the 459 channel from service in accordance with 1OM-6.4.IF.

The ATC will restore letdown using 1OM-7.4.AF, "Restoring Charging and Letdown," while the SRO reviews applicable Technical Specifications for the level transmitter failure.

A malfunction will then occur with the turbine valve position limiter causing a load rejection, rods will auto insert in response. Rod P-8 will be stuck at 225 steps and not insert with the rest of control bank D. At the same time, a malfunction will occur with the "C" main feed regulating valve, (FCV-1FW-498) causing oscillations in the "C" S/G level requiring the BOP to manually stabilize and control level. The SRO will enter AOP 1.35.2, "Load Rejection," initially and then after the plant has stabilized enter AOP 1.1.8, "Rod Inoperability," and address the rod misalignment with applicable technical specifications.

A main turbine bearing #5 will exhibit high vibrations, at 15 mils the ARP for A7-104, probable cause 5 will require a unit trip.

The ATC will unsuccessfully attempt to trip the reactor from BB-B and BB-A.

The SRO will enter FR-S.1 with the ATC and BOP performing the IOA's.

The reactor will be locally tripped 2 minutes after the crew dispatches an operator to locally trip the reactor.

The ATC will verify reactor power is <5% after which the SRO will return to E-0.

Additional malfunctions that occur during the ATWS condition are that all the Aux feed water pumps fail to automatically start, all can be manually started.

A main steam line break will also occur downstream of the MSIV's, this will be isolated via automatic MSLI. The safety injection that occurred as a result of the MSLB will fail to actuate the train "A" CIA signal, and MOV-1CH-381 (a train "B" CIA valve) will fail to automatically close. The crew will be required to isolate the containment penetration via either manually actuating Train "A" CIA or manually closing MOV-1CH-381.

After returning to E-0, the SRO will determine that SI is not required. The scenario will be terminated after the crew determines that transition to ES-1.1 is appropriate.

Expected procedure flow path is E-0 → FR-S.1 → E-0.