

Facility: Beaver Valley Unit 2 RODate of Exam 12/7 thru 12/18 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	3				3	3			3	18			
	2	2	1	2				1	1			2	9			
	Tier Totals	5	4	5				4	4			5	27			
2. Plant Systems	1	2	2	3	3	3	2	2	3	2	3	3	28			
	2	0	1	1	2	1	1	1	0	1	1	1	10			
	Tier Totals	2	3	4	5	4	3	3	3	3	4	4	38			
3. Generic Knowledge and Abilities Category					1		2		3		4		10			
					2		3		2		3					

Note:

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

G* Generic K/As

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 / 1 [Question 1]		X					EK2 Knowledge of the interrelations between a reactor trip and the following: EK2.03 Reactor trip status panel (CFR 41.7 / 45.7)	3.5	1
000008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) / 3 [Question 2]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to a Pressurizer Vapor Space Accident: AK1.01 Thermodynamics and flow characteristics of open or leaking Valves (CFR 41.8 / 41.10 / 45.3)	3.2	1
000015/000017 Reactor Coolant Pump (RCP) Malfunctions / 4 [Question 3]		X					AK2 Knowledge of the interrelations between the Reactor Coolant Pump Malfunctions (Loss of RC Flow) and the following: AK2.07 RCP seals (CFR 41.7 / 45.7)	2.9	1
000022 Loss of Reactor Coolant Makeup / 2 [Question 4]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Loss of Reactor Coolant Makeup: AK1.03 Relationship between charging flow and PZR level (CFR 41.8 / 41.10 / 45.3)	3.0	1
000025 Loss of Residual Heat Removal System (RHRS) / 4 [Question 5]					X		AA2 Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: AA2.04 Location and isolability of leaks (CFR: 43.5 / 45.13)	3.3*	1
000026 Loss of Component Cooling Water (CCW) / 8 [Question 6]			X				AK3 Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: AK3.03 Guidance actions contained in EOP for Loss of CCW (CFR 41.5, 41.10 / 45.6 / 45.13)	4.0	1
000027 Pressurizer Pressure Control System (PZR PCS) Malfunction / 3 [Question 7]						X	2.1.28 Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	4.1	1
000029 Anticipated Transient Without Scram (ATWS) / 1 [Question 8]		X					EK2 Knowledge of the interrelations between the and the following an ATWS: EK2.06 Breakers, relays, and disconnects (CFR 41.7 / 45.7)	2.9*	1

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 (SGTR) / 3 [Question 9]			X				EK3 Knowledge of the reasons for the following responses as they apply to the SGTR: EK3.03 Automatic actions associated with high radioactivity in S/G sample lines (CFR 41.5 / 41.10 / 45.6 / 45.13)	3.6*	1
000054 Loss of Main Feedwater (MFW) / 4 [Question 10]					X		AA2 Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): AA2.02 Differentiation between loss of all MFW and trip of one MFW pump (CFR: 43.5 / 45.13)	4.1	1
000055 Loss of Offsite and Onsite Power (Station Blackout) / 6 [Question 11]						X	2.4.18 Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)	3.3	1
000056 Loss of Offsite Power / 6 [Question 12]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: AK1.01 Principle of cooling by natural convection (CFR 41.8 / 41.10 / 45.3)	3.7	1
000057 Loss of Vital AC Electrical Instrument Bus / 6 [Question 13]					X		AA2 Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: AA2.03 RPS panel alarm annunciators and trip indicators (CFR: 43.5 / 45.13)	3.7	1
000062 Loss of Nuclear Service Water / 4 [Question 14]			X				AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: AK3.04 Effect on the nuclear service water discharge flow header of a loss of CCW (CFR 41.4, 41.8 / 45.7)	3.5	1
000065 Loss of Instrument Air / 8 [Question 15]						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
000077 Generator Voltage and Electric Grid Disturbances / 6 [Question 16]				X			AA1 Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: AA1.04 Reactor controls (CFR: 41.5 and 41.10 / 45.5, 45.7, and 45.8)	4.1	1

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/E11 Loss of Emergency Coolant Recirculation / 4 [Question 17]				X			EA1 Ability to operate and / or monitor the following as they apply to the (Loss of Emergency Coolant Recirculation) EA1.3 Desired operating results during abnormal and emergency situations (CFR: 41.7 / 45.5 / 45.6)	3.7	1
W/E12 Uncontrolled Depressurization of all Steam Generators /4. [Question 18]				X			EA1 Ability to operate and / or monitor the following as they apply to the (Uncontrolled Depressurization of all Steam Generators) 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

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	#
000033 Loss of Intermediate Range Nuclear Instrumentation / 7 [Question 19]	X						AK1 Knowledge of the operational implications of the following concepts as they apply to Loss of Intermediate Range Nuclear Instrumentation: AK1.01 Effects of voltage changes on performance (CFR 41.8 / 41.10 / 45.3)	2.7	1
000059 Accidental Liquid Radwaste Release / 9 [Question 20]					X		AA2 Ability to determine and interpret the following as they apply to the Accidental Liquid Radwaste Release: AA2.02 The permit for liquid radioactive-waste release (CFR: 43.5 / 45.13)	2.9	1
000067 Plant fire on site / 9 [Question 21]			X				AK3 Knowledge of the reasons for the following responses as they apply to the Plant Fire on Site: AK3.04 Actions contained in EOP for plant fire on site (CFR 41.5,41.10 / 45.6 / 45.13)	3.3	1
000068 Control Room Evacuation / 8 [Question 22]		X					AK2 Knowledge of the interrelations between the Control Room Evacuation and the following: AK2.02 Reactor trip system (CFR 41.7 / 45.7)	3.7	1
000069 Loss of Containment Integrity / 5 [Question 23]			X				AK3 Knowledge of the reasons for the following responses as they apply to the Loss of Containment Integrity: AK3.01 Guidance contained in EOP for loss of containment integrity (CFR 41.5,41.10 / 45.6 / 45.13)	3.8*	1
W/E02 SI Termination / 3 [Question 24]						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
W/E03 LOCA Cooldown and Depressurization / 4 [Question 25]	X						EK1 Knowledge of the operational implications of the following concepts as they apply to the (LOCA Cooldown and Depressurization) EK1.2 Normal, abnormal and emergency operating procedures associated with (LOCA Cooldown and Depressurization). (CFR: 41.8 / 41.10 / 45.3)	3.6	1

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/E07 Saturated Core Cooling / 4 [Question 26]				X			EA1 Ability to operate and / or monitor the following as they apply to the (Saturated Core Cooling) 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)	3.6	1
W/E13 Steam Generator Overpressure / 4 [Question 27]						X	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)	4.3	1
K/A Category Point Totals:	2	1	2	1	1	2	Group Point Total:		9

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 System (RCPS) [Question 28]		X										K2 Knowledge of bus power supplies to the following: K2.01 RCPS (CFR: 41.7)	3.1	1
004 Chemical and Volume Control System [Question 29]					X							K5 Knowledge of the operational implications of the following concepts as they apply to the CVCS: K5.14 Reduction process of gas concentration in RCS: vent accumulated non-condensable gases from PZR bubble space, depressurized during cooldown or by alternately heating and cooling (spray) within allowed pressure band (drive more gas out of solution) (CFR: 41.5/45.7)	2.5	1
005 Residual Heat Removal System (RHRS) [Question 30]		X										K2 Knowledge of bus power supplies to the following: K2.03 RCS pressure boundary motor-operated valves (CFR: 41.7)	2.7*	1
006 Emergency Core Cooling System (ECCS) [Question 31]									X			A3 Ability to monitor automatic operation of the ECCS, including: A3.07 RHR pumps (CFR: 41.7 / 45.5)	3.6*	1
006 Emergency Core Cooling System (ECCS) [Question 32]				X								K4 Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: K4.01 Cooling of centrifugal pump bearings (CFR: 41.7)	2.6	1
007 Pressurizer Relief Tank/Quench Tank System (PRTS) [Question 33]				X								K4 Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: K4.01 Quench tank cooling (CFR: 41.7)	2.6	1
008 Component Cooling Water System (CCWS) [Question 34]											X	2.2.38 Knowledge of conditions and limitations in the facility license. (CFR: 41.7 / 41.10 / 43.1 / 45.13)	3.6	1
008 Component Cooling Water System (CCWS) [Question 35]			X									K3 Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: K3.03 RCP	4.1	1
010 Pressurizer Pressure Control System (PZR PCS) [Question 36]									X			A3 Ability to monitor automatic operation of the PZR PCS, including: A3.02 PZR pressure (CFR: 41.7 / 45.5)	3.6	1

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	#
012 Reactor Protection System (RPS) [Question 37]						X						K6 Knowledge of the effect of a loss or malfunction of the following will have on the RPS: K6.02 Redundant channels (CFR: 41.7 / 45.7)	2.9	1
013 Engineered Safety Features Actuation System (ESFAS) [Question 38]					X							K5 Knowledge of the operational implications of the following concepts as they apply to the ESFAS: K5.02 Safety system logic and reliability (CFR: 41.5 / 45.7)	2.9	1
022 Containment Cooling System (CCS) [Question 39]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.04 Loss of service water (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.9*	1
022 Containment Cooling System (CCS) [Question 40]										X		A4 Ability to manually operate and/or monitor in the control room: A4.05 Containment readings of temperature, pressure, and humidity system. (CFR: 41.7 / 45.5 to 45.8)	3.8	1
026 Containment Spray System (CSS) [Question 41]							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including: A1.01 Containment pressure (CFR: 41.5 / 45.5)	3.9	1
026 Containment Spray System (CSS) [Question 42]											X	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)	4.3	1
039 Main and Reheat Steam System (MRSS) [Question 43]			X									K3 Knowledge of the effect that a loss or malfunction of the MRSS will have on the following: K3.03 AFW pumps. (CFR: 41.7 / 45.6)	3.2*	1
039 Main and Reheat Steam System (MRSS) [Question 44]											X	2.4.1 Knowledge of EOP entry conditions and immediate action steps. (CFR: 41.10 / 43.5 / 45.13)	4.6	1

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	#
059 Main Feedwater (MFW) System [Question 45]											X	A4 Ability to manually operate and monitor in the control room: A4.01 MFW turbine trip indication (CFR: 41.7 / 45.5 to 45.8)	3.1*	1
059 Main Feedwater (MFW) System [Question 46]								X				A2 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: A2.01 Feedwater actuation of AFW system (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.4*	1
061 Auxiliary / Emergency Feedwater (AFW) System [Question 47]					X							K5 Knowledge of the operational implications of the following concepts as the apply to the AFW: K5.02 Decay heat sources and magnitude (CFR: 41.5 / 45.7)	3.2	1
062 AC Electrical Distribution System [Question 48]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.08 Consequences of exceeding voltage limitations (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7	1
063 DC Electrical Distribution System [Question 49]	X											K1 Knowledge of the physical connections and/or cause effect relationships between the DC electrical system and the following systems: K1.02 AC electrical system (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.7	1
064 Emergency Diesel Generator (ED/G) System [Question 50]						X						K6 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: K6.07 Air receivers (CFR: 41.7 / 45.7)	2.7	1
073 Process Radiation Monitoring (PRM) System [Question 51]			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

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	#
076 Service Water System (SWS) [Question 52]							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SWS controls including: A1.02 Reactor and turbine building closed cooling water temperatures. (CFR: 41.5 / 45.5)	2.6*	1
078 Instrument Air System (IAS) [Question 53]	X											K1 Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: K1.03 Containment air (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.3*	1
103 Containment System [Question 54]				X								K4 Knowledge of containment system design feature(s) and/or interlock(s) which provide for the following: K4.01 Vacuum breaker protection (CFR: 41.7)	3.0*	1
103 Containment System [Question 55]										X		A4 Ability to manually operate and/or monitor in the control room: A4.09 Containment vacuum system (CFR: 41.7 / 45.5 to 45.8)	3.1*	1
K/A Category Point Totals:	2	2	3	3	3	2	2	3	2	3	3	Group Point Total:		28

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	#
001 Control Rod Drive System [Question 56]							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CRDS controls including: A1.04 PZR level and pressures (CFR: 41.5 / 45.5)	3.7	1
002 Reactor Coolant System (RCS) [Question 57]									X			A3 Ability to monitor automatic operation of the RCS, including: A3.03 Pressure, temperatures, and flows (CFR: 41.7 / 45.5)	4.4	1
011 Pressurizer Level Control System (PZR LCS) [Question 58]						X						K6 Knowledge of the effect of a loss or malfunction on the following will have on the PZR LCS: K6.05 Function of PZR level gauges as post accident monitors (CFR: 41.7 / 45.7)	3.1	1
028 Hydrogen Recombiner and Purge Control System (HRPS) [Question 59]					X							K5 Knowledge of the operational implications of the following concepts as they apply to the HRPS: K5.01 Explosive hydrogen concentration (CFR: 41.5 / 45.7)	3.4	1
Containment Purge System (CPS) [Question 60]			X									K3 Knowledge of the effect that a loss or malfunction of the Containment Purge System will have on the following: K3.01 Containment parameters (CFR: 41.7 / 45.6)	2.9	1
034 Fuel Handling Equipment System (FHES) [Question 61]				X								K4 Knowledge of design feature(s) and/or interlock(s) which provide for the following: K4.03 Overload protection (CFR: 41.7)	2.6	1
035 Steam Generator System (S/GS) [Question 62]				X								K4 Knowledge of S/GS design feature(s) and/or interlock(s) which provide for the following: K4.05 Amount of reserve water in S/G (CFR: 41.7)	2.9	1
045 Main Turbine Generator (MT/G) System [Question 63]										X		A4 Ability to manually operate and/or monitor in the control room: A4.01 Turbine valve indicators (throttle, governor, control, stop, intercept), alarms, and annunciators (CFR: 41.7 / 45.5 to 45.8)	3.1	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	#
072 Area Radiation Monitoring (ARM) System [Question 64]											X	2.4.46 Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12)	4.2	1
075 Circulating Water System [Question 65]		X										K2 Knowledge of bus power supplies to the following: K2.03 Emergency/essential SWS pumps (CFR: 41.7)	2.6*	1
K/A Category Point Totals:	0	1	1	2	1	1	1	0	1	1	1	Group Point Total:		10

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Category	K/A#	Topic	RO		SRO Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.29	Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc. (CFR: 41.10 / 45.1 / 45.12) [Question 66]	4.1	1		
	2.1.45	Ability to identify and interpret diverse indications to validate the response of another indication. (CFR: 41.7 / 43.5 / 45.4) [Question 67]	4.3	1		
	Subtotal			2		
2. Equipment Control	2.2.6	Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13) [Question 68]	3.0	1		
	2.2.15	Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tag-outs, etc. (CFR: 41.10 / 43.3 / 45.13) [Question 69]	3.9	1		
	2.2.39	Knowledge of less than or equal to one hour Technical Specification action statements for systems. (CFR: 41.7 / 41.10 / 43.2 / 45.13) [Question 70]	3.9	1		
	Subtotal			3		
3. Radiation Control	2.3.7	Ability to comply with radiation work permit requirements during normal or abnormal conditions. (CFR: 41.12 / 45.10) [Question 71]	3.5	1		
	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) [Question 72]	3.4	1		
	Subtotal			2		
4. Emergency Procedures/ Plan	2.4.6	Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13) [Question 73]	3.7	1		
	2.4.25	Knowledge of fire protection procedures. (CFR: 41.10 / 43.5 / 45.13) [Question 74]	3.3	1		
	2.4.39	Knowledge of RO responsibilities in emergency plan implementation. (CFR: 41.10 / 45.11) [Question 75]	3.9	1		
	Subtotal			3		
Tier 3 Point Total				10		

Facility: Beaver Valley Unit 2 SRODate of Exam 12/7 thru 12/18 2015

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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	1	2	2	

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- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
- On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in a category other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
- For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

G* Generic K/As

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	#
000009 Small Break LOCA / 3 [Question 76]					X		EA2 Ability to determine or interpret the following as they apply to a small break LOCA: EA2.05 The time available for action before PZR is empty, given the rate of decrease of PZR level (CFR 43.5 / 45.13)	3.9	1
000011 Large Break LOCA / 3 [Question 77]						X	2.4.41 Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11)	4.6	1
000040 Steam Line Rupture / 4 [Question 78]					X		AA2 Ability to determine and interpret the following as they apply to the Steam Line Rupture: AA2.05 When ESFAS systems may be secured (CFR: 43.5 / 45.13)	4.5	1
000058 Loss of DC Power / 6 [Question 79]						X	2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits. (CFR: 41.5 / 41.7 / 43.2)	4.2	1
4 LOCA Outside Containment / 3 [Question 80]						X	2.4.11 Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)	4.2	1
W/E05 Loss of Secondary Heat Sink / 4 [Question 81]					X		EA2 Ability to determine and interpret the following as they apply to the (Loss of Secondary Heat Sink) EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations. (CFR: 43.5 / 45.13)	4.4	1
K/A Category Point Totals:					3	3	Group Point Total:		6

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	#
000003 Dropped Control Rod / 1 [Question 82]						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
000024 Emergency Boration / 1 [Question 83]						X	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6)	4.4	1
W/E06 Degraded Core Cooling / 4 [Question 84]						X	EA2 Ability to determine and interpret the following as they apply to the (Degraded Core Cooling) EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations. (CFR: 43.5 / 45.13)	4.2	1
W/E09 Natural Circulation Operations / 4 [Question 85]						X	EA2 Ability to determine and interpret the following as they apply to the (Natural Circulation Operations) EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. (CFR: 43.5 / 45.13)	3.8	1
K/A Category Point Totals:	0	0	0	0	2	2	Group Point Total:		4

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	#
003 Reactor Coolant Pump System (RCPS) [Question 86]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.02 Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP (CFR: 41.5 / 43.5 / 45.3 / 45/13)	3.9	1
004 Chemical and Volume Control System [Question 87]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.33 Fact that isolating cation demineralizer stops boron dilution and enables restoration of normal boron concentration (CFR: 41.5/ 43/5 / 45/3 / 45/5)	3.3	1
013 Engineered Safety Features / tion System (ESFAS) [Question 88]											X	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)	4.3	1
076 Service Water System (SWS) [Question 89]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the SWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.02 Service water header pressure (CFR: 41.5 / 43.5 / 45/3 / 45/13)	3.1	1
078 Instrument Air System (IAS) [Question 90]											X	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)	4.1	1
K/A Category Point Totals:								3			2	Group Point Total:		5

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	#
033 Spent Fuel Pool Cooling System (SFPCS) [Question 91]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the Spent Fuel Pool Cooling System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Inadequate SDM (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.5	1
041 Steam Dump System (SDS)/Turbine Bypass Control [Question 92]											X	2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3)	4.0	1
079 Station Air System (SAS) [Question 93]								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the SAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Cross-connection with IAS (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.2	1
K/A Category Point Totals:								2			1	Group Point Total:		3

Locality: Beaver Valley Unit 2 SRODate of Exam 12/7 thru 12/18 2015

Category	K/A#	Topic	RO		SRO Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.4	Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. (CFR: 41.10 / 43.2) [Question 94]			3.8	1
	2.1.36	Knowledge of procedures and limitations involved in core alterations. (CFR: 41.10 / 43.6 / 45.7) [Question 95]			4.1	1
	Subtotal					2
2. Equipment Control	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) [Question 96]			4.6	1
	Subtotal					1
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions. (CFR: 41.12 / 43.4 / 45.10) [Question 97]			3.7	1
	2.3.11	Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10) [Question 98]			4.3	1
	Subtotal					2
4. Emergency Procedures/ Plan	2.4.29	Knowledge of the emergency plan. (CFR: 41.10 / 43.5 / 45.11) [Question 99]			4.4	1
	2.4.44	Knowledge of emergency plan protective action recommendations. (CFR: 41.10 / 41.12 / 43.5 / 45.11) [Question 100]			4.4	1
	Subtotal					2
Tier 3 Point Total						7

Facility: Beaver Valley Unit 2 Date of Exam 12/7 thru 12/18 2015 Operating Test No.: BV2LOT15 NRC		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	000025 AA2.05	Question #5; Beaver Valley does not use Residual Heat Removal (RHRS) for Low Pressure Injection (LPI). Randomly selected 025 AA2.04 as a replacement.
1/1	057 AA2.11	Question #13; There is no interface between the MFP running indicator and controller, and the Vital AC busses at Beaver Valley. Reselect due to lack of applicability. Discussed with Chief Examiner. Randomly selected 057 AA2.03 as a replacement.
2/1	026 A1.02	Question #41; Beaver Valley does not operate the CNMT Spray Sytem based on CNMT temperature. Procedurally the EOPs use CNMT pressure. The procedures do not refer to CNMT Temp for any control functions of CSS. Randomly selected 026 A1.01 as a replacement.
2/1	059 A2.07	Question #46; Beaver Valley does not have MFW pump turbines. Randomly selected 059 A2.01 as a replacement.
2/2	041 G2.4.41	Question #92; 041 Steam Dump System (SDS)/Turbine Bypass Control 2.4.41 Knowledge of the emergency action level thresholds and classifications. Reselected due to oversampling. Similar to Q77 (011 G2.4.41). Randomly selected 041 G2.4.50 as a replacement.
2/1	013 G2.4.1	Question #88; G2.4.1, Knowledge of EOP entry conditions and immediate action steps. Unable to write a discriminatory SRO level question. The K/A is RO level knowledge. Randomly selected 013 G2.4.20 as a replacement.
2/2	034 K1.04	Question #61; K1 Knowledge of the physical connections and/or cause effect relationships between the Fuel Handling System and the following systems: NIS. Unable to write a discriminatory question. Randomly selected 034 K4.03 as a replacement.
1/2	WE02 G2.4.21	Question #24; 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. Unable to write a discriminatory question. Randomly selected WE02 G2.2.44 as a replacement.
2/1	026 G2.2.12	Question #42; 2.2.12 Knowledge of surveillance procedures. Unable to write a discriminatory question with the limited opportunities available with Cnmt Cooling surveillances. Randomly selected 026 G2.1.23 as a replacement.

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Administrative JPMs

RO A1.1	<ul style="list-style-type: none"> • Modify the Task Standard to match the direction given in the procedure, remove the statement to recommend no further rod withdrawal, add statement to insert all control rods. • Modify the Initial Conditions to add that the plant tripped from 100% power, clarify that this is not a startup following a refueling outage. • Modify step 4.1 to remove recommended action then made step 4.2 critical. Added procedure 2OM-50.4.D as reference
RO A1.2	<ul style="list-style-type: none"> • Modify the initial conditions to remove the statements related to turnover at beginning and end of shifts. • Modify the directions to document the reasons for determining if the license is active or inactive. (Note these comments were from the outline submittal, not walkthrough week)
RO A2	<ul style="list-style-type: none"> • Modify step 4 to address potential question and local operator action for recirculation valves.
RO A3	<ul style="list-style-type: none"> • No comments.
SRO A1.1	<ul style="list-style-type: none"> • Modify the Task Standard to match the direction given in the procedure, remove the statement to recommend no further rod withdrawal. • Modify the Initial Conditions to add that the plant tripped from 100% power, clarify that this is not a startup following a refueling outage. • Modify step 4.1 to remove recommended action. Added procedure 2OM-50.4.D as reference
SRO A1.2	<ul style="list-style-type: none"> • No comments.
SRO A2	<ul style="list-style-type: none"> • Add numbering to the Initiating Cue to define what the candidate is expected to perform and report. Modify step 4 note to include the possibility that the candidate may direct field manipulations of the recirculation valves. Modify step 8.3 to include the Shift manager may be one of the two approving SROs. • Modify step 4 to address potential question and local operator action for recirculation valves. • Modify Step 8 to note that the Shift Manager may be one of the two approving SROs.
SRO A3	<ul style="list-style-type: none"> • Modify initial conditions to clarify that the worker (add name) has no previous accident or emergency exposure. • Split initiating cue into two numbered parts.

December 2015 Beaver Valley Unit 2 Operating Exam NRC Review Comments

SRO A4	<ul style="list-style-type: none"> • Modify the Answer Key to identify the critical items on the form. • Modify the initiating cue to include a statement that the General Announcement has been made to the crew at 1000 hours. • Add note to step 5 that refers to the critical items that are highlighted on the answer key. • The selection of "Drill" or "Actual Emergency" is not critical since this evaluation is performed in a classroom setting.
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Simulator JPMs

S1	<ul style="list-style-type: none"> • JPM is Alternate Path due to actions to align alternate flow path in the procedure. ES-301-2 (RO/SRO) modified. • No changes to JPM.
S2	<ul style="list-style-type: none"> • Added PAB Operator is stationed at 2SGC-RQI100 Radiation Monitor skid to the Initial conditions. • Added cue for initial DRMS point 1065 being cyan due to expected RP actions. • Added Booth Operator cue for annunciator A4-5H when venting sample lines. • Added procedure steps to evaluator cues to help follow along with work direction. Modified flowrates in JPM step 8 & 10 as requested. • Added evaluator note stating the completion of step 19.2 or 20.1 will meet the task standard. • Removed critical step to verify position indication lights of 2SGC-HCV100 since the valve controller is actually the critical step. • Made minor place keeping correction to procedure step IV.A.8.d of plant procedure. • Corrected procedure step number on candidate direction sheet.
S3	<ul style="list-style-type: none"> • No changes to JPM.
S4	<ul style="list-style-type: none"> • Minor change of moving Booth Operator cue to precede step 15.
S5	<ul style="list-style-type: none"> • Corrected JPM steps 8 and 22 to state correct Data sheet 3. • Changed Task Standard to "Annunciator A4-5H, "POWER RANGE HIGH/LOW SP FLUX DEVIATION/AUTO DEFEAT" verified by performing QPTR Alarm check with setpoints determined to be +/-10 μA of the answer key".

December 2015 Beaver Valley Unit 2 Operating Exam NRC Review Comments

S6	<ul style="list-style-type: none"> JPM is not alternate path, alarm is already in at the start of the JPM. ES-301-2 (RO/SRO) modified. Removed pictures from JPM Word document and modified picture #1 to show high vibration values on the meters. Limited JPM picture use to 2 pictures, and modified appropriate Evaluator Cues.
S7	<ul style="list-style-type: none"> Separated JPM step 2 into two separate steps. Changed old JPM step 3 to match procedure step. Clarified switches to be operated, and phases to be monitored when candidate is monitoring voltages
S8	<ul style="list-style-type: none"> Added bullet for 'CNMT is not accessible' in the Initial Conditions to prevent role play for an Operator in containment during the RCP startup.

Plant JPMs

P1	<ul style="list-style-type: none"> Added procedure steps 3 & 4 to JPM for ease of evaluating candidate.
P2	<ul style="list-style-type: none"> No changes to JPM.
P3	<ul style="list-style-type: none"> No changes to JPM.

Scenarios

Sc1	<ul style="list-style-type: none"> Page 2, Scenario outline, corrected SG pressure transmitter as channel 4 not channel 3. Throughout – added procedure titles to scripting. Page 8, Added NOTE with information that crew is required to place alternate channel in service within 24 hours. Page 9, Enhanced ROLE PLAYS for tripping of bistables.
Sc2	<ul style="list-style-type: none"> Throughout – added procedure titles to scripting. Page 11, Modified scripting to state that the crew may initially attempt to stabilize SG level using manual control of the main feed regulating valve. Page 21, Added a NOTE and emphasis to components required to be verified/manipulated to meet requirements of CT-17, Isolation of a faulted SG.

December 2015 Beaver Valley Unit 2 Operating Exam NRC Review Comments

Sc3	<ul style="list-style-type: none"> Throughout – added procedure titles to scripting. Page 6, Enhanced ROLE PLAY for field operator identification of Safeguards leak. Page 14, Enhanced ROLE PLAY for status of the turbine driven aux feedwater pump.
Sc4	<ul style="list-style-type: none"> Swapped events 1 and 2, added additional turnover information (oil leak) as a reason to swap Component cooling water pumps. Throughout – added procedure titles to scripting. Added additional CIA actuation individual component failure, 2HVP*MOD22B failed to auto close, to event 10. Page 17, Added a NOTE and emphasis to components required to be verified/manipulated to meet requirements of CT-18, Isolation of a ruptured SG. Page 18, Scripted actions for cooldown if the main condenser is isolated due to a MSLI occurrence.

General Questions	<ul style="list-style-type: none"> Why does the MFRV need to be returned to Automatic Control? Per 2OM-24.4.IF procedure, if not desired to trip Bistables for the Level Channel (for example if another channel was already tripped), then the MFRV may be operated in Manual as long as a Basis For Continued Operation is generated within 24 hours.
General Questions	<ul style="list-style-type: none"> How does the Brass coupling operate on the Trip Throttle valve. The brass split coupling will move up and down with the stem of the valve. When the valve trips, the coupling will lower with the shaft and the valve seats. When the handle is turned clockwise to raise the sliding nut to the latch position, the brass coupling will remain in the down position. After latching, when the handwheel is turned counter clockwise, the stem rises as does the brass coupling

Facility: Beaver Valley Unit 2Date of Examination: 12/7 thru 12/18 2015Examination Level **RO** ☒ **SRO** ☐Operating Test Number BV2LOT15 NRC

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (RO A 1.1)	D, R	2.1.43 (4.1) Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc. JPM 2AD-016 Plot and Evaluate 1/M Data
Conduct of Operations (RO A 1.2)	N, R	2.1.4 (3.3) Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. JPM 3AD-023 Determine if License Status is Maintained Active (RO)
Equipment Control (RO A 2)	N, R	2.2.41 (3.5) Ability to obtain and interpret station electrical and mechanical drawings. JPM 2AD-048 Determine Isolation Boundary Points and Mark on Plant VOND
Radiation Control (RO A 3)	D, R	2.3.11 (3.8) Ability to control radiation releases. JPM 2AD-010 Determine GW Storage Tank Discharge Bleed Flow Rate
Emergency Plan (RO A 4)		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 (which would require all 5 items).

*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)

Facility: Beaver Valley Unit 2Date of Examination: 12/7 thru 12/18 2015Examination Level **RO** ☐ **SRO** ☒Operating Test Number BV2LOT15 NRC

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (SRO A 1.1)	D, 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. JPM 2AD-019 Plot and Evaluate 1/M Data and Determine Required Actions
Conduct of Operations (SRO A 1.2)	N, R	2.1.4 (3.8) Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. JPM 3AD-024 Evaluate Operators Work History to Determine if License Status is Active (SRO)
Equipment Control (SRO A 2)	N, R	2.2.41 (3.9) Ability to obtain and interpret station electrical and mechanical drawings. JPM 2AD-049 Identify Isolation Boundary Points and Mark on Plant VOND then Identify Method of Plant Configuration Control
Radiation Control (SRO A 3)	M, R	2.3.4 (3.7) Knowledge of radiation exposure limits under normal or emergency conditions. JPM 2AD-038 Determine Emergency Exposure Authorization Limits
Emergency Plan (SRO A 4)	D, R	2.4.44 (4.4) Knowledge of emergency plan protective action recommendations. JPM 2AD-037 Determine Protective Action Recommendations (Part 1)

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics (which would require all 5 items).

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)

Facility: Beaver Valley Unit 2Date of Examination: 12/7/ thru 12/18 2015Exam Level: RO ☒ SRO(I) ☐ SRO(U) ☐Operating Test No.: BV2LOT15 NRC

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

System / JPM Title	Type Code*	Safety Function
S1 - Transfer to Hot Leg Recirculation (2CR-570)	S, D, EN, A	3
S2 - Discharge Steam Generator Blowdown Evaporator Test Tank [2SGC-TK23A] to Unit 2 Cooling Tower Blowdown. (2CR-660)	S, N, A	9
S3 - Rod Control Assembly Partial Movement Test - (Rods continue to move during performance of the test) (2CR-747)	S, N, A	1
S4 - Batch to the Refuel Water Storage Tank (2CR-537)	S, D	2
S5 - Perform QPTR Alarm Test (2CR-144)	S, D	7
S6 - Respond to Containment Air Recirculation Fan High Vibration Alarm (2CR-661)	S, N	5
S7 - Perform a Hot Bus Transfer (2CR-523)	S, D, A	6
S8 - Start A Reactor Coolant Pump (2CR-513)	S, D, A, L	4P

In-Plant Systems® (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

P1 - Uninterruptible Power Supply [UPS*VITBS2-3(4)] Shutdown (2PL-021)	D	6
P2 - Reset the Terry Turbine Trip Throttle Valve (2PL-004)	D, R	4S
P3 - Place the Diesel Air Compressor in Service (2PL-031)	D, E	8

@ All RO and SRO 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	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	$\geq 1 / \geq 1 / \geq 1$ (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: Beaver Valley Unit 2Date of Examination: 12/7/ thru 12/18 2015Exam Level: RO ☐ SRO(I) ☒ SRO(U) ☐Operating Test No.: BV2LOT15 NRC

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

System / JPM Title	Type Code*	Safety Function
S1 - Transfer to Hot Leg Recirculation (2CR-570)	S, D, EN, A	3
S2 - Discharge Steam Generator Blowdown Evaporator Test Tank [2SGC-TK23A] to Unit 2 Cooling Tower Blowdown. (2CR-660)	S, N, A	9
S3 - Rod Control Assembly Partial Movement Test - (Rods continue to move during performance of the test) (2CR-747)	S, N, A	1
S4 - Batch to the Refuel Water Storage Tank (2CR-537)	S, D	2
S6 - Respond to Containment Air Recirculation Fan High Vibration Alarm (2CR-661)	S, N	5
S7 - Perform a Hot Bus Transfer (2CR-523)	S, D, A	6
S8 - Start A Reactor Coolant Pump (2CR-513)	S, D, A, L	4P

In-Plant Systems® (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

P1 - Uninterruptible Power Supply [UPS*VITBS2-3(4)] Shutdown (2PL-021)	D	6
P2 - Reset the Terry Turbine Trip Throttle Valve (2PL-004)	D, R	4S
P3 - Place the Diesel Air Compressor in Service (2PL-031)	D, E	8

@ All RO and SRO 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	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	$\geq 1 / \geq 1 / \geq 1$ (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

2L15N1

Facility: **BVPS Unit 2** Scenario No. 1 Op Test No.: **BV2LOT15 NRC**
 Examiners: _____ Candidates: _____ SRO
 _____ ATC
 _____ BOP

Initial Conditions: **IC-142(15):** 48% power, MOL, Equ. XE Conditions, CB "D" @ 158 steps, RCS boron - 558 ppm.

Turnover: Maintain 48% power.

Critical Tasks:

1. **CT-10 (E-0.M)** Crew closes PORV block MOV
2. **CT-13 (E-0.Q)** Crew manually trips turbine
3. **CT-43 (FR-H.1.A)** Crew establishes feedwater flow

Event No.	Malf. No.	Event Type	Event Description
1	XMT-RCS019A	(I,A) ATC, SRO (TS) SRO	Pressurizer level transmitter, 2RCS*LT459 drifts low.
2	XMT-MSS053A	(I,A) BOP, SRO (TS) SRO	2MSS*PT496 fails low over 30 sec, requires manual control of 2FWS*FCV498.
3	RCS02A	(C,A) ATC, SRO (TS) SRO	30 gpm RCS leak (unisolable)
4		(R) ATC (N) BOP, SRO	Ops management directed Emergency Shutdown, AOP 2.51.1.
5	RCS02A	(M) ALL	400 gpm loop A LOCA , requires manual Rx trip
6	EHC08A	(C) BOP, SRO	Auto main Turbine trip failure
7	VLV-RCS034A	(C) ATC, SRO	2RCS*PCV456 lifts/fails to reseal on Rx trip, requires manual closure of MOV block valve, 2RCS*MOV536.
8	PMP-AFW001, 2, LOA-AFW022	(M) ALL	Loss of all feed, Entry into FR-H.1, success path - main feed
9	VLV- MSC104,105,106	(C) ATC, SRO	2SSR-AOV117A, B, C, SG BD sample line auto isolation failure

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

E-0 → FR-H.1 → E-0 → E-1

Appendix D

Scenario Outline

2L15N2

Facility: **BVPS Unit 2** Scenario No. 2 Op Test No.: **BV2LOT15 NRC**
 Examiners: _____ Candidates: _____ SRO
 _____ ATC
 _____ BOP

Initial Conditions: **IC-143 (10):** 100% power, BOL, Equ. XE Conditions, CB "D" @ 227 steps, RCS boron - 1100 ppm.

Turnover: Maintain current plant conditions

Critical Tasks:

1. **CT-6 (E-0.I)** Crew establishes SIS Flow
2. **CT-52 (FR-S.1.C)** Crew inserts negative reactivity
3. **CT-17 (E-2.A)** Crew isolates the faulted SG

Event No.		Event Type	Event Description
1	XMT-MSS043A	(R) ATC (N) BOP/SRO	Load rejection – VPL failure, 2OM-26.4.X
2	GEN02	(C,A) BOP/SRO	MUG Voltage regulator overexcitation failure.
3	XMT-RCS030A	(I,A) ATC/SRO SRO T.S.	2RCS*PT444 drifts HIGH, PRZR pressure decreases, manual control of PRZR pressure required.
4	XMT-RCS002A	SRO T.S.	"A" RCS loop flow transmitter, 2RCS*FT415, fails low.
5	FLX-CFW33 PPL01A PPL01B	(M) ALL	2800 gpm Feedwater leak inside CNMT on "C" SG with an ATWS – Failure of auto/manual Rx trip on manual Rx trip attempt.
6	VLV-SIS069 VLV-SIS070	(C) ATC, SRO	2SIS*MOV867A and 2SIS*MOV867B auto open failure.
7	VLV-MSC021, 023, 024, 025	(C) BOP/SRO	"B" Train Hydrogen Analyzer fails to automatically start on SIS signal.
8	VLV-AFW014	(C) BOP/SRO	AFW valve, 2FWE*HCV100B, fails to close from the CR.

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

E-0 → FR-S.1 → E-0 → E-2

Appendix D

Scenario Outline

2L15N4

Facility:	BVPS Unit 2	Scenario No. 4	Op Test No.:	BV2LOT15 NRC
Examiners:	_____	Candidates:	_____	SRO
	_____		_____	ATC
	_____		_____	BOP

Initial Conditions: **IC 145:** 4.8% power, MOL, Rx S/U in progress, CB "D" @ 105 steps, RCS boron - 1349 ppm.

Turnover: Due to an oil leak, S/U 2CCS-P21B and S/D 2CCS-P21A IAW 2OM-28.4.H
Raise power to 15% to S/U main turbine IAW 2OM-52.4.A.

Critical Tasks:

1. **CT-11 (E-0.O)** CNMT isolation
2. **CT-18 (E-3.A)** Crew isolates ruptured SG
3. **CT-19 (E-3.B)** Crew establishes/maintains RCS temperature
4. **CT-20 (E-3.C)** Crew depressurizes RCS to meet SI termination criteria

Event No.	Malf. No.	Event Type	Event Description
1		(N) BOP/SRO	Due to oil leak, S/U 2CCS-P21B & S/D 2CCS-P21A.
2		(R) ATC (N) SRO	Normal power increase to 15% IAW 2OM-52.4.A
3	CNH-CFW11	(C,A) BOP/SRO	2FWS*FCV479, Bypass Feedwater valve controller fails as is in AUTO, requires manual operation.
4	PMP-CHS002	(C,A) ATC/SRO SRO (TS)	2CHS*P21B, Charging/ HHSI pump shaft seizure.
5		(N) ATC/SRO	Restore normal charging and letdown.
6	XMT-MSC038A	SRO (TS)	2LMS*PT952, CNMT pressure transmitter fails high.
7	PPL02A	(M) ALL	Spurious Rx trip.
8	RCS04B	(M) ALL	21B SG 520 gpm tube rupture.
9	PPL07B	(C) ATC/SRO	2CHS*P21C, Charging / HHSI auto start failure.
10	VLV-SEA015	(C) BOP/SRO	Train B CIA failure with 2CHS*MOV378 and 2HVP*MOD22B auto close failures.
11	VLV-RCS032,33,34	(C) ATC/SRO	PRZR PORV fails to close when opened for RCS depressurization in E-3, requires isolation.

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

E-0 → ES-0.1 → E-0 → E-3