Form 3.2-1 Administrative Topics Outline

Facility: **Beaver Valley Unit 2** Date of Examination: **4/18 thru 4/29, 2022**

Examination Level **RO** ☒ **SRO** ☐ Operating Test Number: **BV2LOT22 NRC**

Administrative Topic(Step 1)	Activity and Associated K/A (Step 2)	Type Code* (Step 3)
Conduct of Operations **(RO A 1.1)**	2.1.25 (3.9) Ability to interpret reference materials, such as graphs, curves, tables, etc. JPM 2AD-060 Perform a SDM, Use of Temperature Correction (RO)	R, N
Conduct of Operations **(RO A 1.2)**	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 (RO)	R, D
Equipment Control **(RO A 2)**	2.2.37 (3.6) Ability to determine operability and/or availability of safety related equipment. JPM 2AD-028 Complete Surveillance of RHS Pump (RO)	R, D
Radiation Control **(RO A 3)**	2.3.4 (3.2) Knowledge of radiation exposure limits under normal or emergency conditions. JPM 3AD-002 Determining Normal Radiation Exposure (RO)	R, M
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	(C)ontrol Room, (S)imulator, or Class(R)oom
Source and Source Criteria	(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)

Form 3.2-1 Administrative Topics Outline

Facility: **Beaver Valley Unit 2** Date of Examination: **4/18 thru 4/29, 2022**

Examination Level **RO** ☐ **SRO** ☒ Operating Test Number: **BV2LOT22 NRC**

Administrative Topic(Step 1)	Activity and Associated K/A (Step 2)	Type Code* (Step 3)
Conduct of Operations **(SRO A 1.1)**	2.1.25 (4.2) Ability to interpret reference materials, such as graphs, curves, tables, etc. JPM 2AD-061 Review a SDM, Use of Temperature Correction (SRO)	R, N
Conduct of Operations **(SRO A 1.2)**	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 Evaluate 1/M Data and Determine Required Actions (SRO)	R, D
Equipment Control **(SRO A 2)**	2.2.37 (4.6) Ability to determine operability and/or availability of safety related equipment. JPM 2AD-026 Review/Approve Completed Surveillance of RHS Pump (SRO)	R, D
Radiation Control **(SRO A 3)**	2.3.11 (4.3) Ability to control radiation releases. JPM 2AD-042 Determine Compensatory Actions for 2GWS-P1 and 2GWS-O2A-100A being OOS (SRO)	R, D
Emergency Plan **(SRO A 4)**	2.4.44 (4.4) Knowledge of Emergency Plan Protective Action Recommendations. JPM 2AD-037 Determine Protective Action Recommendations (Part 1) (SRO)	R, D

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

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: **Beaver Valley Unit 2** Date of Examination: **4/18 thru 4/29, 2022**
Exam Level: RO ☒ SRO(I) ☐ SRO(U) ☐ Operating Test No.: **BV2LOT22 NRC**

System / JPM Title Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U)	Type Code*	Safety Function
S1 –RCS Dilution (2CR-589)	A, D, S	1
S2 – Restore Trn B SI IAW ECA-0.2 (2CR-802)	A, N, EN, S	2
S3 – Perform LHSI Pump Surveillance (2CR-645)	D, L, EN, S	3
S4 – Start a Reactor Coolant Pump (2CR-613)	A, D, L, S	4P
S5 – 2FWE*P22 Full Flow Partial Test (uses 2OST-24.4A) (2CR-803)	A, N, L, S	4S
S6 –S/U CNMT Purge & Exhaust Thru the SLCRS Unfiltered Flowpath (2CR-154)	D, L, S	5
S7 – Perform A Hot Bus Transfer (2CR-523)	A, D, S	6
S8 – Perform QPTR Alarm Test (2CR-144)	D, S	7
In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
P1 – Control AFW (outside CR) during Cable Spreading Fire (2PL-178)	N, E, R	4S
P2 – Locally Startup the Containment Hydrogen Analyzers (2PL-047)	D	5
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	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1 (control room system)
(L)ow-power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3/ ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: **Beaver Valley Unit 2** Date of Examination: **4/18 thru 4/29, 2022**
Exam Level: RO ☐ SRO(I) ☒ SRO(U) ☐ Operating Test No.: **BV2LOT22 NRC**

System / JPM Title Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U)	Type Code*	Safety Function
S1 –RCS Dilution (2CR-589)	A, D, S	1
S2 – Restore Trn B SI IAW ECA-0.2 (2CR-802)	A, N, EN, S	2
S3 – Perform LHSI Pump Surveillance (2CR-645)	D, L, EN, S	3
S4 – Start a Reactor Coolant Pump (2CR-613)	A, D, L, S	4P
S6 –S/U CNMT Purge & Exh Tru the SLCRS Unfiltered Flowpath (2CR-154)	D, L, S	5
S7 – Perform A Hot Bus Transfer (2CR-523)	A, D, S	6
S8 – Perform QPTR Alarm Test (2CR-144)	D, S	7
In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
P1 – Control AFW (outside CR) during Cable Spreading Fire (2PL-178)	N, E, R	4S
P2 – Locally Startup the Containment Hydrogen Analyzers (2PL-047)	D	5
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	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1 (control room system)
(L)ow-power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3/ ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: **Beaver Valley Unit 2** Date of Examination: **4/18 thru 4/29, 2022**
Exam Level: RO ☐ SRO(I) ☐ SRO(U) ☒ Operating Test No.: **BV2LOT22 NRC**

System / JPM Title Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U)	Type Code*	Safety Function
S2 – Restore Trn B SI IAW ECA-0.2 (2CR-802)	A, N, EN, S	2
S4 – Start a Reactor Coolant Pump (2CR-613)	A, D, L, S	4P
S6 –S/U CNMT Purge & Exh Tru the SLCRS Unfiltered Flowpath (2CR-154)	D, L, S	5
In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
P1 – Control AFW (outside CR) during Cable Spreading Fire (2PL-178)	N, E, 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	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1 (control room system)
(L)ow-power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3/ ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Facility: Beaver Valley Unit 2 2LOT22 Date of Exam: 04/18 through 4/29/2022

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2		G		Total
1. Emergency and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	**18**					6
	2	2	1	1				2	0			2	**8**					4
	Tier Totals	5	4	4				5	3			5	**26**					10
2. Plant Systems	1	5	2	2	2	2	3	3	3	2	3	1	**28**					5
	2	1	1	1	0	1	1	0	1	1	1	1	**9**					3
	Tier Totals	6	3	3	2	3	4	3	4	3	4	2	**37**					8
3. Generic Knowledge and Abilities Categories		CO			EC			RC		EM			**6**	CO	EC	RC	EM	7
		2			2			1		1								
4. Theory		Reactor Theory					Thermodynamics						**6**					
		3					3											

Notes: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control; EM = Emergency Procedures/Plan

* These systems/evolutions may be eliminated from the sample when Revision 2 of the K/A catalog is used to develop the sample plan

** These systems/evolutions are only included as part of the sample (as applicable to the facility) when Revision 2 of the K/A catalog is used to develop the sample plan

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000007 (EPE 7) Reactor Trip, Stabilization, Recovery (Question 1)				X			EA1 Ability to operate and monitor the following as they apply to a reactor trip: EA1.03 RCS pressure and temperature (CFR 41.7 / 45.5 / 45.6)	4.2	
000008 (APE 8) Pressurizer Vapor Space Accident (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	
000009 (EPE 9) Small-Break LOCA (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	
000011 (EPE 11) Large-Break LOCA (Question 4)	X						EK1 Knowledge of the operational implications of the following concepts as they apply to the Large Break LOCA: EK1.01 Natural circulation and cooling, including reflux boiling (CFR 41.8 / 41.10 / 45.3)	4.1	
000022 (APE 22) Loss of Reactor Coolant Makeup (Question 5)				X			AA1. Ability to operate and / or monitor the following as they apply to the Loss of Reactor Coolant Makeup: AA1.08 VCT level (CFR 41.7 / 45.5 / 45.6)	3.4	
000025 (APE 25) Loss of Residual Heat Removal System (Question 6)					X		AA2. Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: AA2.06 Existence of proper RHR overpressure protection (CFR: 43.5 / 45.13)	3.2	
000027 (APE 27) Pressurizer Pressure Control System Malfunction (Question 7)						X	2.1.20 Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12)	4.6	
000029 (EPE 29) Anticipated Transient Without Scram (Question 8)						X	2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	4.5	
000038 (EPE 38) Steam Generator Tube Rupture (Question 9)				X			EA1 Ability to operate and monitor the following as they apply to a SGTR: EA1.30 Safety injection and containment isolation systems (CFR 41.7 / 45.5 / 45.6)	4.0	

Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000054 (APE 54) Loss of Main Feedwater (Question 10)					X		AA2. Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): AA2.03 Conditions and reasons for AFW pump startup (CFR: 43.5 / 45.13)	4.1	
000055 (EPE 55) Station Blackout (Question 11)	X						EK1 Knowledge of the operational implications of the following concepts as they apply to the Station Blackout: EK1.02 Natural circulation cooling (CFR 41.8 / 41.10 / 45.3)	4.1	
000056 (APE 56) Loss of Offsite Power (Question 12)						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	
000057 (APE 57) Loss of Vital AC Instrument Bus (Question 13)			X				AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Vital AC Instrument Bus: AK3.01 Actions contained in EOP for loss of vital ac electrical instrument bus (CFR 41.5,41.10 / 45.6 / 45.13)	4.1	
000058 (APE 58) Loss of DC Power (Question 14)					X		AA2. Ability to determine and interpret the following as they apply to the Loss of DC Power: AA2.01 That a loss of dc power has occurred; verification that substitute power sources have come on line (CFR: 43.5 / 45.13)	3.7	
(W E04) LOCA Outside Containment (Question 15)		X					EK2. Knowledge of the interrelations between the (LOCA Outside Containment) and the following: EK2.2 Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility. (CFR: 41.7 / 45.7)	3.8	
(W E11) Loss of Emergency Coolant Recirculation (Question 16)			X				EK3. Knowledge of the reasons for the following responses as they apply to the (Loss of Emergency Coolant Recirculation) EK3.3 Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations (CFR: 41.5 / 41.10, 45.6, 45.13)	3.8	

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
(W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink (Question 17)	X						EK1. Knowledge of the operational implications of the following concepts as they apply to the (Loss of Secondary Heat Sink) EK1.3 Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Secondary Heat Sink). (CFR: 41.8 / 41.10, 45.3)	3.9	
(W E12) Uncontrolled Depressurization of All Steam Generators / 4 (Question 18)			X				EK3. Knowledge of the reasons for the following responses as they apply to the (Uncontrolled Depressurization of all Steam Generators) EK3.1 Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and reasons for these operating characteristics (CFR: 41.5 / 41.10, 45.6, 45.13)	3.5	
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000005 (APE 5) Inoperable/Stuck Control Rod (Question 19)						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	
000028 (APE 28) Pressurizer Level Control Malfunction (Question 20)				X			AA1. Ability to operate and / or monitor the following as they apply to the Pressurizer Level Control Malfunctions: AA1.01 PZR level reactor protection bistables (CFR 41.7 / 45.5 / 45.6)	3.8	
000032 (APE 32) Loss of Source Range Nuclear Instrumentation (Question 21)	X						AK1. Knowledge of the operational implications of the following concepts as they apply to Loss of Source Range Nuclear Instrumentation: AK1.01 Effects of voltage changes on performance (CFR 41.8 / 41.10 / 45.3)	2.5	
000060 (APE 60) Accidental Gaseous Radwaste Release (Question 22)						X	2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls. (CFR: 41.10 / 43.2 / 45.6)	4.6	
000061 (APE 61) Area Radiation Monitoring System Alarms (Question 23)				X			AA1. Ability to operate and / or monitor the following as they apply to the Area Radiation Monitoring (ARM)System Alarms: AA1.01 Automatic actuation (CFR 41.7 / 45.5 / 45.6)	3.6	
000067 (APE 67) Plant Fire On Site (Question 24)			X				AK3. Knowledge of the reasons for the following responses as they apply to the Plant Fire on Site: AK3.02 Steps called out in the site fire protection plan, FPS manual, and fire zone manual (CFR 41.5,41.10 / 45.6 / 45.13	2.5	
(W E09 & E10) Natural Circulation (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	
(W E08) RCS Overcooling—Pressurized Thermal Shock (Question 26)	X						EK1. Knowledge of the operational implications of the following concepts as they apply to the (Pressurized Thermal Shock) EK1.1 Components, capacity, and function of emergency systems. (CFR: 41.8 / 41.10, 45.3)	3.5	
K/A Category Point Totals:	**2**	**1**	**1**	**2**	**0**	**2**	Group Point Total:		**8**

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump (Question 27)					X							K5 Knowledge of the operational implications of the following concepts as they apply to the RCPS: K5.02 Effects of RCP coastdown on RCS parameters (CFR: 41.5 / 45.7)	2.8	
003 (SF4P RCP) 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	
004 (SF1; SF2 CVCS) Chemical and Volume Control (Question 29)											X	2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12)	3.9	
005 (SF4P RHR) Residual Heat Removal (Question 30)							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: A1.05 Detection of and response to presence of water in RHR emergency sump (CFR: 41.5 / 45.5)	3.3	
005 (SF4P RHR) Residual Heat Removal (Question 31)				X								K4 Knowledge of RHRS design feature(s) and/or interlock(s) which provide or the following: K4.03 RHR heat exchanger bypass flow control (CFR: 41.7)	2.9	
006 (SF2; SF3 ECCS) Emergency Core Cooling (Question 32)		X										K2 Knowledge of bus power supplies to the following: K2.02 Valve operators for accumulators (CFR: 41.7)	2.5	
006 (SF2; SF3 ECCS) Emergency Core Cooling (Question 33)						X						K6 Knowledge of the effect of a loss or malfunction on the following will have on the ECCS: K6.05 HPI/LPI cooling water (CFR: 41.7 / 45.7)	3.0	
007 (SF5 PRTS) Pressurizer Relief/Quench Tank (Question 34)			X									K3 Knowledge of the effect that a loss or malfunction of the PRTS will have on the following: K3.01 Containment (CFR: 41.7 / 45.6)	3.3	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
008 (SF8 CCW) Component Cooling Water (Question 35)							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCWS controls including: A1.02 CCW temperature (CFR: 41.5 / 45.5)	2.9	
008 (SF8 CCW) Component Cooling Water (Question 36)								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)	3.3	
010 (SF3 PZR PCS) Pressurizer Pressure Control (Question 37)				X								K4 Knowledge of PZR PCS design feature(s) and/or interlock(s) which provide for the following: K4.01 Spray valve warm-up (CFR: 41.7)	2.7	
012 (SF7 RPS) Reactor Protection (Question 38)						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	
013 (SF2 ESFAS) Engineered Safety Features Actuation (Question 39)		X										K2 Knowledge of bus power supplies to the following: K2.01 ESFAS/safeguards equipment control (CFR: 41.7)	3.6	
022 (SF5 CCS) Containment Cooling (Question 40)			X									K3 Knowledge of the effect that a loss or malfunction of the CCS will have on the following: K3.02 Containment instrumentation readings (CFR: 41.7 / 45.6)	3.0	
026 (SF5 CSS) Containment Spray (Question 41)										X		A4 Ability to manually operate and/or monitor in the control room: A4.01 CSS controls (CFR: 41.7 / 45.5 to 45.8)	4.5	
039 (SF4S MSS) Main and Reheat Steam (Question 42)									X			A3 Ability to monitor automatic operation of the MRSS, including: A3.02 Isolation of the MRSS (CFR: 41.5 / 45.5)	3.1	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
059 (SF4S MFW) Main Feedwater (Question 43)							X					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MFW controls including: A1.03 Power level restrictions for operation of MFW pumps and valves (CFR: 41.5 / 45.5)	2.7	
059 (SF4S MFW) Main Feedwater (Question 44)	X											191002 Sensors and Detectors K1.02 Temperature/density compensation requirements (CFR 41.7)	2.7	
061 (SF4S AFW) Auxiliary/Emergency Feedwater (Question 45)						X						K6 Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: K6.02 Pumps (CFR: 41.7 / 45.7)	2.6	
062 (SF6 ED AC) AC Electrical Distribution (Question 46)	X											191005 Motor and Generators K1.03 Causes of excessive current in motors and generators, such as low voltage, overloading, and mechanical binding (CFR 41.7)	2.7	
063 (SF6 ED DC) DC Electrical Distribution (Question 47)	X											K1 Knowledge of the physical connections and/or cause effect relationships between the DC electrical system and the following systems: K1.03 Battery charger and battery (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.9	
064 (SF6 EDG) Emergency Diesel Generator (Question 48)										X		A4 Ability to manually operate and/or monitor in the control room: A4.04 Remote operation of the air compressor switch (different modes) (CFR: 41.7 / 45.5 to 45.8)	3.2	
064 (SF6 EDG) Emergency Diesel Generator (Question 49)	X											K1 Knowledge of the physical connections and/or cause effect relationships between the ED/G system and the following systems: K1.04 DC distribution system (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.6	
073 (SF7 PRM) Process Radiation Monitoring (Question 50)								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: A2.02 Detector failure (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
076 (SF4S SW) Service Water (Question 51)									X			A3 Ability to monitor automatic operation of the SWS, including: A3.02 Emergency heat loads (CFR: 41.7 / 45.5)	3.7	
078 (SF8 IAS) Instrument Air (Question 52)										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	
078 (SF8 IAS) Instrument Air (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	
103 (SF5 CNT) Containment (Question 54)								X				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the containment system and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations A2.03 Phase A and B isolation (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.5	
K/A Category Point Totals:	**5**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**3**	**1**	Group Point Total:		**28**

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
002 (SF2; SF4P RCS) Reactor Coolant (Question 55)					X							K5 Knowledge of the operational implications of the following concepts as they apply to the RCS: K5.13 Causes of circulation. (CFR: 41.5 / 45.7)	3.5	
011 (SF2 PZR LCS) Pressurizer Level Control (Question 56)			X									K3 Knowledge of the effect that a loss or malfunction of the PZR LCS will have on the following: K3.01 CVCS (CFR: 41.7 / 45.6)	3.2	
014 (SF1 RPI) Rod Position Indication (Question 57)										X		A4 Ability to manually operate and/or monitor in the control room: A4.04 Re-zeroing of rod position prior to startup (CFR: 41.7 / 45.5 to 45.8)	2.7	
017 (SF7 ITM) In-Core Temperature Monitor (Question 58)	X											K1 Knowledge of the physical connections and/or cause effect relationships between the ITM system and the following systems: K1.02 RCS (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.3	
016 (SF7 NNI) Nonnuclear Instrumentation (Question 59)									X			A3 Ability to monitor automatic operation of the NNIS, including: A3.02 Relationship between meter readings and actual parameter value (CFR: 41.7 / 45.5)	2.9	
033 (SF8 SFPCS) Spent Fuel Pool Cooling (Question 60)								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: A2.02 Loss of SFPCS (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7	
035 (SF 4P SG) Steam Generator (Question 61)											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)	3.1	

Form 4.1-PWR	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Page 11	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
068 (SF9 LRS) Liquid Radwaste (Question 62)						**X**						K6 Knowledge of the effect of a loss or malfunction on the following will have on the Liquid Radwaste System: K6.10 Radiation monitors (CFR: 41.7 / 45.7)	2.5	
075 (SF8 CW) Circulating Water (Question 63)		**X**										K2 Knowledge of bus power supplies to the following: K2.03 Emergency/essential SWS pumps (CFR: 41.7)	2.6	
K/A Category Point Totals:	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	Group Point Total:		**9**

Facility: Beaver Valley Unit 2 2LOT22 Date of Exam: 04/18 through 4/29/2022

Generic Knowledge and Abilities—Tier 3 (RO)

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.1 **(Question 64)**	2.1.1 Knowledge of conduct of operations requirements. (CFR: 41.10 / 45.13)	3.8			
	2.1.18 **(Question 65)**	2.1.18 Ability to make accurate, clear, and concise logs, records, status boards, and reports. (CFR: 41.10 / 45.12 / 45.13)	3.6			
	Subtotal			**2**	N/A	
2. Equipment Control	2.2.42 **(Question 66)**	2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3)	3.9			
	2.2.35 **(Question 67)**	2.2.35 Ability to determine Technical Specification Mode of Operation. (CFR: 41.7 / 41.10 / 43.2 / 45.13)	3.6			
	Subtotal			**2**	N/A	
3. Radiation Control	2.3.14 **(Question 68)**	2.3.14 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (CFR: 41.12 / 43.4 / 45.10)	3.4			
	Subtotal			**1**	N/A	
4. Emergency Procedures/ Plan	2.4.18 **(Question 69)**	2.4.18 Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)	3.3			
	Subtotal			**1**	N/A	
Tier 3 Point Total				**6**		**7**

Theory—Tier 4 (RO)				
Category	K/A #	Topic	RO	
			IR	#
Reactor Theory	192002 (Question 70)	Neutron Life Cycle K1.14 Evaluate change in shutdown margin due to changes in plant parameters.	3.8	
	192005 (Question 71)	Control Rods (Full and/or Part Length) K1.03 Predict direction of change in reactor power for a chance in control rod position.	3.5	
	192006 (Question 72)	Fission Product Poisons K1.06 Describe the following processes and state their effect on reactor operations: Transient Xenon	3.2	
	Subtotal		N/A	**3**
Thermodynamics	193005 (Question 73)	Thermodynamic Cycles K1.03 Describe how changes in secondary system parameter affect thermodynamic efficiency.	2.5	
	193008 (Question 74)	Thermal Hydraulics K1.05 List the parameters that affect DNR and DNBR and describe their effect(s).	3.4	
	193010 (Question 75)	Brittle Fracture and Vessel Thermal Stress K1.01 State the brittle fracture made of failure.	2.8	
	Subtotal		N/A	**3**
Tier 4 Point Total				**6**

Facility: Beaver Valley Unit 2 2LOT22 Date of Exam: 4/18 through 4/29/2022

Tier	Group	RO K/A Category Points												SRO-Only Points						
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2		G		Total		
1. Emergency and Abnormal Plant Evolutions	1													3		3		6		
	2													2		2		4		
	Tier Totals													**5**		**5**		**10**		
2. Plant Systems	1													3		2		5		
	2														2	1		3		
	Tier Totals													**5**		**3**		**8**		
3. Generic Knowledge and Abilities Categories	CO			EC				RC		EM				CO	EC	RC	EM	**7**		
														1	**2**	**2**	**2**			
4. Theory	Reactor Theory							Thermodynamics												

Notes: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control;
EM = Emergency Procedures/Plan

* These systems/evolutions may be eliminated from the sample when Revision 2 of the K/A catalog is used to develop the sample plan

** These systems/evolutions are only included as part of the sample (as applicable to the facility) when Revision 2 of the K/A catalog is used to develop the sample plan

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000015 (APE 15) Reactor Coolant Pump Malfunctions [Question 76]						X	2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 41.5 / 43.2 / 45.2)	4.7	
000026 (APE 26) Loss of Component Cooling Water [Question 77]						X	2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)	4.0	
000062 (APE 62) Loss of Service Water [Question 78]						X	2.4.11 Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13)	4.2	
000065 (APE 65) Loss of Instrument Air [Question 79]					X		AA2. Ability to determine and interpret the following as they apply to the Loss of Instrument Air: AA2.06 When to trip reactor if instrument air pressure is de-creasing (CFR: 43.5 / 45.13)	4.2	
000077 (APE 77) Generator Voltage and Electric Grid Disturbances [Question 80]					X		AA2. Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: AA2.08 Criteria to trip the turbine or reactor (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8)	4.4	
(W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink [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	
K/A Category Totals:					**3**	**3**	Group Point Total:		**6**

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal [Question 82]					X		AA2. Ability to determine and interpret the following as they apply to the Continuous Rod Withdrawal: AA2.03 Proper actions to be taken if automatic safety functions have not taken place. (CFR: 43.5 / 45.13)	4.8	
000037 (APE 37) Steam Generator Tube Leak [Question 83]						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	
000051 (APE 51) Loss of Condenser Vacuum [Question 84]					X		AA2. Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: AA2.02 Conditions requiring reactor and/or turbine trip (CFR: 43.5 / 45.13)	4.1	
000069 (APE 69; W E14) Loss of Containment Integrity [Question 85]						X	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)	4.5	
K/A Category Point Totals:					**2**	**2**	Group Point Total:		**4**

Form 4.1-PWR	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Page 4		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
012 (SF7 RPS) Reactor Protection [Question 86]											**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	
039 (SF4S MSS) Main and Reheat Steam [Question 87]											**X**	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13)	4.3	
063 (SF6 ED DC) DC Electrical Distribution [Question 88]								**X**				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the DC electrical systems; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Grounds (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.2	
076 (SF4S SW) Service Water [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: A2.01 Loss of SWS	3.7	
103 (SF5 CNT) Containment [Question 90]								**X**				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the containment system and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations A2.02 Necessary plant conditions for work in containment (CFR: 41.5 / 43.5 / 45.3 / 45.13)	3.2	
K/A Category Point Totals:								**3**			**2**	Group Point Total:		**5**

Form 4.1-PWR	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Page 5	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive [Question 91]								**X**				A2 Ability to (a) predict the impacts of the following malfunction or operations on the CRDS- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.02 Loss of power source to reactor trip breakers (CFR: 41.5/43.5/45.3/45.13)	4.3	
015 (SF7 NI) Nuclear Instrumentation [Question 92]								**X**				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the NIS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.02 Faulty or erratic operation of detectors or compensating components (CFR: 41.5 / 43.5 / 45.3 / 45.5)	3.5	
071 (SF9 WGS) Waste Gas Disposal [Question 93]											**X**	2.1.30 Ability to locate and operate components, including local controls. (CFR: 41.7 / 45.7)	4.0	
K/A Category Point Totals:								**2**			**1**	Group Point Total:		**3**

Facility: Beaver Valley Unit 2 2LOT22 Date of Exam: 4/18 through 4/29/2022

Generic Knowledge and Abilities—Tier 3 (SRO)

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.38	Knowledge of the station's requirements for verbal communications when implementing procedures. (CFR: 41.10 / 45.13) [Question 94]			3.8	
	Subtotal		N/A		N/A	1
2. Equipment Control	2.2.13	Knowledge of tagging and clearance procedures. (CFR: 41.10 / 45.13) [Question 95]			4.3	
	2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc. (CFR: 41.10 / 43.5 / 45.13) [Question 96]			3.9	
	Subtotal		N/A		N/A	2
3. Radiation Control	2.3.11	Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10) [Question 97]			4.3	
	2.3.12	Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 45.9 / 45.10) [Question 98]			3.7	
	Subtotal		N/A		N/A	2
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 99]			4.1	
	2.4.41	Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11) [Question 100]			4.6	
	Subtotal		N/A		N/A	2
Tier 3 Point Total						**7**