

Facility: **BVPS UNIT 1 RO**

Date of Exam **7/7 thru 7/18 2014**

| 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 | 4 | 2 | | | | 3 | 3 | | | 3 | 18 | | | |
| | 2 | 1 | 2 | 1 | | | | 2 | 2 | | | 1 | 9 | | | |
| | Tier Totals | 4 | 6 | 3 | | | | 5 | 5 | | | 4 | 27 | | | |
| 2. Plant Systems | 1 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 28 | | | |
| | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 10 | | | |
| | Tier Totals | 3 | 2 | 4 | 4 | 3 | 3 | 4 | 5 | 3 | 3 | 4 | 38 | | | |
| 3. Generic Knowledge and Abilities Category | | | | | 1 | 2 | 3 | 4 | | | | | 10 | | | |
| | | | | | 3 | 3 | 2 | 2 | | | | | | | | |

Note:

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

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: EK2.02 Breakers, relays and disconnects (CFR 41.7 / 45.7) | 2.6 | 1 |
| 000008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)/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 |
| 000011 Large Break LOCA/3 [Question 3] | | | X | | | | EK3 Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: EK3.09 Maintaining D/Gs available to provide standby power (CFR 41.5 / 41.10 / 45.6 / 45.13) | 4.2 | 1 |
| 000015/000017 Reactor Coolant Pump (RCP) Malfunctions/4 [Question 4] | | 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 5] | | | | | | 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 |
| 000025 Loss of Residual Heat Removal System (RHRS)/4 [Question 6] | | X | | | | | AK2. Knowledge of the interrelations between the Loss of Residual Heat Removal System and the following: AK2.05 Reactor building sump (CFR 41.7 / 45.7) | 2.6 | 1 |
| 000027 Pressurizer Pressure Control System (PZR PCS) Malfunction/3 [Question 7] | | | | X | | | AA1 Ability to operate and / or monitor the following as they apply to the Pressurizer Pressure Control Malfunctions: AA1.02 SCR-controlled heaters in manual mode (CFR 41.7 / 45.5 / 45.6) | 3.1* | 1 |
| 000029 Anticipated Transient Without Scram (ATWS)/1 [Question 8] | X | | | | | | EK1 Knowledge of the operational implications of the following concepts as they apply to the ATWS: EK1.05 definition of negative temperature coefficient as applied to large PWR coolant systems (CFR 41.8 / 41.10 / 45.3) | 2.8 | 1 |
| 000040 Steam Line Rupture/4 [Question 9] | X | | | | | | AK1 Knowledge of the operational implications of the following concepts as they apply to Steam Line Rupture: AK1.07 Effects of feedwater introduction on dry S/G (CFR 41.8 / 41.10 / 45.3) | 3.4 | 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 | # |
|--|--------|--------|--------|--------|--------|---|---|------|---|
| 000054 Loss of Main Feedwater (MFW)/4 [Question 10] | | | | X | | | AA1 Ability to operate and / or monitor the following as they apply to the Loss of Main Feedwater (MFW): AA1.03 AFW auxiliaries, including oil cooling water supply (CFR 41.7 / 45.5 / 45.6) | 3.5 | 1 |
| 000056 Loss of Offsite Power/6 [Question 11] | | | | | | 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) | 4.2 | 1 |
| 000057 Loss of Vital AC Electrical Instrument Bus/6 [Question 12] | | | 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 | 1 |
| 000058 Loss of DC Power/6 [Question 13] | X | | | | | | AK1 Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: AK1.01 Battery charger equipment and instrumentation (CFR 41.8 / 41.10 / 45.3) | 2.8 | 1 |
| 000062 Loss of Nuclear Service Water/4 [Question 14] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to the Loss of Nuclear Service Water: AA2.06 The length of time after the loss of SWS flow to a component before that component may be damaged (CFR: 43.5 / 45.13) | 2.8* | 1 |
| 000065 Loss of Instrument Air/8 [Question 15] | | | | | 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) | 2.6 | 1 |
| 000077 Generator Voltage and Electric Grid Disturbances/6 [Question 16] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: AA2.09 Operational status of emergency diesel generators (CFR: 41.5 and 43.5 / 45.5, 45.7, and 45.8) | 3.9 | 1 |
| W/E04 LOCA Outside Containment/3 [Question 17] | | | | | | 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 |

| ES-401 | PWR Examination Outline | | | | | | Form ES-401-2 | | |
|---|-------------------------|--------|--------|--------|--------|---|--|-----|-----------|
| Emergency and Abnormal Plant Evolutions - Tier 1/Group 1(RO) <i>Continued</i> | | | | | | | | | |
| E/APE # / Name / Safety Function | K 1 | K 2 | K 3 | A 1 | A 2 | G | K/A Topic(s) | IR | # |
| WE11 Loss of Emergency Coolant Recirculation/4 [Question 18] | | | | 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 |
| K/A Category Point Totals: | 3 | 4 | 2 | 3 | 3 | 3 | Group Point Total: | | 18 |

Emergency and Abnormal Plant Evolutions - Tier 1/Group 2(RO)

| E/APE # / Name / Safety Function | K | K | K | A | A | G | K/A Topic(s) | IR | # |
|---|---|---|---|---|---|---|---|-----|---|
| | 1 | 2 | 3 | 1 | 2 | | | | |
| 000003 Dropped Control Rod/1 [Question 19] | X | | | | | | AK1 Knowledge of the operational implications of the following concepts as they apply to Dropped Control Rod: AK1.10 Definitions of core quadrant power tilt (CFR 41.8 / 41.10 / 45.3) | 2.6 | 1 |
| 000005 Inoperable/Stuck Control Rod/1 [Question 20] | | X | | | | | AK2 Knowledge of the interrelations between the Inoperable / Stuck Control Rod and the following: AK2.02 Breakers, relays, disconnects, and control room switches (CFR 41.7 / 45.7) | 2.5 | 1 |
| 000028 Pressurizer (PZR) Level Control Malfunction/2 [Question 21] | | | | X | | | AA1 Ability to operate and / or monitor the following as they apply to the Pressurizer Level Control Malfunctions: AA1.04 Regenerative heat exchanger and temperature limits (CFR 41.7 / 45.5 / 45.6) | 2.7 | 1 |
| 000060 Accidental Gaseous Radwaste Release/9 [Question 22] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: AA2.04 The effects on the power plant of isolating a given radioactive-gas leak (CFR: 43.5 / 45.13) | 2.6 | 1 |
| 000061 Area Radiation Monitoring (ARM) System Alarms/7 [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 | 1 |
| 000067 Plant fire on site/9 [Question 24] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to the Plant Fire on Site: AA2.12 Location of vital equipment within fire zone (CFR: 43.5 / 45.13) | 2.9 | 1 |
| W/E06 Degraded Core Cooling/4 [Question 25] | | | | | | X | 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12) | 3.9 | 1 |
| W/E08 Pressurized Thermal Shock/4 [Question 26] | | | X | | | | EK3 Knowledge of the reasons for the following responses as they apply to the (Pressurized Thermal Shock) 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) | 3.4 | 1 |

| ES-401 | PWR Examination Outline | | | | | | Form ES-401-2 | | |
|---|-------------------------|--------|--------|--------|--------|---|---|-----|---|
| Emergency and Abnormal Plant Evolutions - Tier 1/Group 2(RO) <i>Continued</i> | | | | | | | | | |
| E/APE # / Name / Safety Function | K 1 | K 2 | K 3 | A 1 | A 2 | G | K/A Topic(s) | IR | # |
| WE13 Steam Generator Overpressure/4 [Question 27] | | X | | | | | EK2 Knowledge of the interrelations between the (Steam Generator Overpressure) 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) | 3.0 | 1 |
| K/A Category Point Totals: | 1 | 2 | 1 | 2 | 2 | 1 | Group Point Total: | | 9 |

Plant Systems

- Tier 2/Group 1(RO)

| System # / Name | K | K | K | K | K | K | A | A | A | A | G | K/A Topic(s) | IR | # |
|--|---|---|---|---|---|---|---|---|---|---|---|--|------|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | | | | |
| 003 Reactor Coolant Pump System (RCPS) [Question 28] | | | | | | | X | | | | | K6 Knowledge of the effect of a loss or malfunction on the following will have on the RCPS: K6.14 Starting requirements (CFR: 41.7 / 45.5) | 2.6 | 1 |
| 003 Reactor Coolant Pump System (RCPS) [Question 29] | | | X | | | | | | | | | K3 Knowledge of the effect that a loss or malfunction of the RCPS will have on the following: K3.02 S/G (CFR: 41.7 / 45.6) | 3.5 | 1 |
| 004 Chemical and Volume Control System (CVCS) [Question 30] | | | | X | | | | | | | | K4 Knowledge of CVCS design feature(s) and/or interlock(s) which provide for the following: K4.01 Oxygen control in RCS (CFR: 41.7) | 2.8 | 1 |
| 005 Residual Heat Removal System (RHRS) [Question 31] | | | | | X | | | | | | | K5 Knowledge of the operational implications of the following concepts as they apply the RHRS: K5.03 Reactivity effects of RHR fill water (CFR: 41.5 / 45.7) | 2.9* | 1 |
| 006 Emergency Core Cooling System (ECCS) [Question 32] | | | X | | | | | | | | | K3 Knowledge of the effect that a loss or malfunction of the ECCS will have on the following: K3.03 Containment (CFR: 41.7 / 45.6) | 4.2 | 1 |
| 007 Pressurizer Relief Tank/Quench Tank System (PRTS) [Question 33] | | | | | | | | | | | X | 2.2.12 Knowledge of surveillance procedures. (CFR: 41.10 / 45.13) | 3.7 | 1 |
| 007 Pressurizer Relief Tank/Quench Tank System (PRTS) [Question 34] | | | | | | | | X | | | | A2 Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Stuck-open PORV or code safety (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 3.9 | 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: K3.01 Loads cooled by CCWS (CFR: 41.7 / 45.6)* | 3.4 | 1 |
| 010 Pressurizer Pressure Control System (PZR PCS) [Question 36] | | | | | | | | | | | X | A4 Ability to manually operate and/or monitor in the control room: A4.03 PORV and block valves (CFR: 41.7 / 45.5 to 45.8) | 4.0 | 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 | # |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|--|-----|---|
| 010 Pressurizer Pressure Control System (PZR PCS) [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 | 1 |
| 012 Reactor Protection System [Question 38] | | X | | | | | | | | | | K2 Knowledge of bus power supplies to the following: K2.01 RPS channels, components, and interconnections (CFR: 41.7) | 3.3 | 1 |
| 012 Reactor Protection System [Question 39] | | | | | | X | | | | | | K6 Knowledge of the effect of a loss or malfunction of the following will have on the RPS: K6.01 Bistables and bistable test equipment (CFR: 41.7 / 45.7) | 2.8 | 1 |
| 013 Engineered Safety Features Actuation System (ESFAS) [Question 40] | X | | | | | | | | | | | K1 Knowledge of the physical connections and/or cause effect relationships between the ESFAS and the following systems: K1.03 CCS (CFR: 41.2 to 41.9 / 45.7 to 45.8) | 3.8 | 1 |
| Containment Cooling System (CCS) [Question 41] | | | | | | | | | X | | | A3 Ability to monitor automatic operation of the CCS, including: A3.01 Initiation of safeguards mode of operation (CFR: 41.7 / 45.5) | 4.1 | 1 |
| 026 Containment Spray System (CSS) [Question 42] | X | | | | | | | | | | | K1 Knowledge of the physical connections and/or cause/effect relationships between the CSS and the following systems: K1.01 ECCS (CFR: 41.2 to 41.9 / 45.7 to 45.8) | 4.2 | 1 |
| 026 Containment Spray System (CSS) [Question 43] | | | | | | | | | | X | | A4 Ability to manually operate and/or monitor in the control room: A4.05 Containment spray reset switches (CFR: 41.7 / 45.5 to 45.8) | 3.5 | 1 |
| 039 Main and Reheat Steam System (MRSS) [Question 44] | | | | | | | | | | | 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) | 3.9 | 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 | # |
| 039 Main and Reheat Steam System (MRSS) [Question 45] | | | | | | | X | | | | | A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MRSS controls including: A1.09 Main steam line radiation monitors (CFR: 41.5 / 45.5) | 2.5* | 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: A2.11 Failure of feedwater control system (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 3.0* | 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: K5.03 Pump head effects when control valve is shut (CFR: 41.5 / 45.7) | 2.6 | 1 |
| 062 AC Electrical Distribution System [Question 48] | | | | | | | 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 System [Question 49] | | | | | | | | | X | | | A3 Ability to monitor automatic operation of the DC electrical system, including: A3.01 Meters, annunciators, dials, recorders, and indicating lights (CFR: 41.7 / 45.5) | 2.7 | 1 |
| 064 Emergency Diesel Generator (ED/G) System [Question 50] | 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 | 1 |
| 073 Process Radiation Monitoring (PRM) System [Question 51] | | | | | | | X | | | | | A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM system controls including: A1.01 Radiation levels (CFR: 41.5 / 45.7) | 3.2 | 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 | | | | | | | | K4 Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following: K4.01 Conditions initiating automatic closure of closed cooling water auxiliary building header supply and return valves (CFR: 41.7) | 2.5* | 1 |
| 078 Instrument Air System (IAS) [Question 53] | | X | | | | | | | | | | K2 Knowledge of bus power supplies to the following: K2.01 Instrument air compressor (CFR: 41.7) | 2.7 | 1 |
| 103 Containment System [Question 54] | | | | | | | | | | | X | 2.1.19 Ability to use plant computers to evaluate system or component status. (CFR: 41.10 / 45.12) | 3.9 | 1 |
| 103 Containment System [Question 55] | | | | | | | | 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* | 1 |
| K/A Category Point Totals: | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | Group Point Total: | | 28 |

Plant Systems

- Tier 2/Group 2(RO)

| System # / Name | K | K | K | K | K | K | A | A | A | A | G | K/A Topic(s) | IR | # |
|---|---|---|---|---|---|---|---|---|---|---|---|--|------|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | | | | |
| 001 Control Rod Drive System [Question 56] | | | | | | | X | | | | | K6 Knowledge of the effect of a loss or malfunction on the following CRDS components: K6.02 Purpose and operation of sensors feeding into the CRDS (CFR: 41.7/45.7) | 2.8 | 1 |
| 011 Pressurizer Level Control System (PZR LCS) [Question 57] | | | | | | | X | | | | | A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PZR LCS controls including: A1.04 T-ave (CFR: 41.5 / 45.5) | 3.1 | 1 |
| 014 Rod Position Indication System (RPIS) [Question 58] | | | | | | | | | | | X | 2.2.37 Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12) | 3.6 | 1 |
| 015 Nuclear Instrumentation System (NIS) [Question 59] | | | X | | | | | | | | | K3 Knowledge of the effect that a loss or malfunction of the NIS will have on the following: K3.01 RPS (CFR: 41.7 / 45.6) | 3.9 | 1 |
| 016 Non-Nuclear Instrumentation System (NNIS) stion 60] | | | | | | | | | 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* | 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: K4.01 Fuel protection from binding and dropping (CFR: 41.7) | 2.6 | 1 |
| 041 Steam Dump System (SDS)/Turbine Bypass Control [Question 62] | | | | | | | | X | | | | A2 Ability to (a) predict the impacts of the following malfunctions or operations on the SDS; and (b) based on those predictions use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.03 Loss of IAS (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 2.8 | 1 |
| 056 Condensate System [Question 63] | | | | | | | | X | | | | A2 Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.04 Loss of condensate pumps (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 2.6 | 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 System [Question 64] | | | | | | | | | | | X | A4 Ability to manually operate and/or monitor in the control room: A4.01 Emergency/essential SWS pumps (CFR: 41.7 / 45.5 to 45.8) | 3.2* | 1 |
| 086 Fire Protection System (FPS) [Question 65] | | | | | X | | | | | | | K5 Knowledge of the operational implication of the following concepts as they apply to the Fire Protection System: K5.03 Effect of water spray on electrical components (CFR: 41.5 / 45.7) | 3.1 | 1 |
| K/A Category Point Totals: | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | Group Point Total: | | 10 |

Facility: BVPS UNIT 1 RO

Date of Exam 7/7 thru 7/18 2014

| Category | K/A# | Topic | RO | | SRO Only | |
|-------------------------------|----------|---|------|-----------|----------|---|
| | | | IR | # | IR | # |
| 1. Conduct of Operations | 2.1.5 | Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. (CFR: 41.10 / 43.5 / 45.12) [Question 66] | 2.9* | 1 | | |
| | 2.1.20 | Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12) [Question 67] | 4.6 | 1 | | |
| | 2.1.27 | Knowledge of system purpose and/or function. (CFR: 41.7) [Question 68] | 3.9 | 1 | | |
| | Subtotal | | | | 3 | |
| 2. Equipment Control | 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) [Question 69] | 3.1 | 1 | | |
| | 2.2.37 | Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12) [Question 70] | 3.6 | 1 | | |
| | 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 71] | 3.9 | 1 | | |
| | Subtotal | | | | 3 | |
| 3. Radiation Control | 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 72] | 3.2 | 1 | | |
| | 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) [Question 73] | 3.4 | 1 | | |
| | Subtotal | | | | 2 | |
| 4. Emergency Procedures/ Plan | 2.4.2 | Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8) [Question 74] | 4.5 | 1 | | |
| | 2.4.31 | Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3) [Question 75] | 4.2 | 1 | | |
| | Subtotal | | | | 2 | |
| Tier 3 Point Total | | | | 10 | | |

Facility: BVPS UNIT 1 SRO

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| 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 | 1 | 2 | 2 | | |

Note:

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

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 | 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 |
| 000026 Loss of Component Cooling Water (CCW)/8 [Question 77] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: AA2.02 The cause of possible CCW loss (CFR: 43.5 / 45.13) | 3.6 | 1 |
| 000038 Steam Generator Tube Rupture (SGTR)/3 [Question 78] | | | | | | X | 2.1.32 Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12) | 4.0 | 1 |
| 000055 Loss of Offsite and Onsite Power (Station Blackout)/6 [Question 79] | | | | | X | | EA2 Ability to determine or interpret the following as they apply to a Station Blackout: EA2.01 Existing valve positioning on a loss of instrument air system (CFR 43.5 / 45.13) | 3.7 | 1 |
| W/E05 Loss of Secondary Heat Sink/4 [Question 80] | | | | | 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 |
| 12 Uncontrolled Depressurization of all Steam Generators/4 [Question 81] | | | | | | 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 |
| 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 | # |
|---|--------|--------|--------|--------|--------|---|---|------|---|
| 000037 Steam Generator (S/G) Tube Leak/3 [Question 82] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: AA2.09 System status, using independent readings from redundant Condensate air ejector exhaust monitor (CFR: 43.5 / 45.13) | 3.4* | 1 |
| 000059 Accidental Liquid Radwaste Release/9 [Question 83] | | | | | | X | 2.4.41 Knowledge of the emergency action level thresholds and classifications. (CFR: 41.10 / 43.5 / 45.11) | 4.6 | 1 |
| 000076 High Reactor Coolant Activity/9 [Question 84] | | | | | X | | AA2 Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: AA2.06 Response of PZR LCS to changes in the letdown flow rate (CFR: 43.5 / 45.13) | 2.5 | 1 |
| W/E10 Natural Circulation with Steam Void in Vessel with/without RVLIS/4 [Question 85] | | | | | | 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 |
| 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 | # |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|-----|---|
| 004 Chemical and Volume Control System [Question 86] | | | | | | | | 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: A2.26 Low VCT pressure (CFR: 41.5 / 43.5 / 45.3 / 45.5) | 3.0 | 1 |
| 022 Containment Cooling System (CCS) [Question 87] | | | | | | | | 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: A2.01 Fan motor over-current (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 2.7 | 1 |
| 063 DC Electrical Distribution System [Question 88] | | | | | | | | | | | X | 2.2.37 Ability to determine operability and/or availability of safety related equipment. (CFR: 41.7 / 43.5 / 45.12) | 4.6 | 1 |
| 064 Emergency Diesel Generator (ED/G) System [Question 89] | | | | | | | | 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: A2.02 Load, VARS, pressure on air compressor, speed droop, frequency, voltage, fuel oil level, temperatures (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 2.9 | 1 |
| 078 Instrument Air System (IAS) [Question 90] | | | | | | | | | | | 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 |
| 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 | # |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|--|-----|---|
| 015 Nuclear Instrumentation System (NIS) [Question 91] | | | | | | | | 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: A2.01 Power supply loss or erratic operation (CFR: 41.5 / 43.5 / 45.3 / 45.5) | 3.9 | 1 |
| 071 Waste Gas Disposal System (WGDS) [Question 92] | | | | | | | | 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 predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.02 Use of waste gas release monitors, radiation, gas flow rate, and totalizer (CFR: 41.5 / 43.5 / 45.3 / 45.13) | 3.6 | 1 |
| 079 Station Air System (SAS) [Question 93] | | | | | | | | | | | 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 |
| K/A Category Point Totals: | | | | | | | | 2 | | | 1 | Group Point Total: | | 3 |

Facility: BVPS UNIT 1 SRO

Date of Exam 7/7 thru 7/18 2014

| Category | K/A# | Topic | RO | | SRO Only | |
|-------------------------------|----------|---|----|---|----------|----------|
| | | | IR | # | IR | # |
| 1. Conduct of Operations | 2.1.39 | Knowledge of conservative decision making practices. (CFR: 41.10 / 43.5 / 45.12) [Question 94] | | | 4.3 | 1 |
| | 2.1.31 | Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup. (CFR: 41.10 / 45.12) [Question 95] | | | 4.3 | 1 |
| | Subtotal | | | | | 2 |
| 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 96] | | | 4.4 | 1 |
| | Subtotal | | | | | 1 |
| 3. Radiation Control | 2.3.5 | Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.11 / 41.12 / 43.4 / 45.9) [Question 97] | | | 2.9 | 1 |
| | 2.3.15 | Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc. (CFR: 41.12 / 43.4 / 45.9) [Question 98] | | | 3.1 | 1 |
| | Subtotal | | | | | 2 |
| 4. Emergency Procedures/ Plan | 2.4.3 | Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4) [Question 99] | | | 3.9 | 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: BVPS Unit 1 | | | Date of Exam 7/7 thru 7/18 2014 | | | Operating Test No.: BV1LOT14 NRC | | |
|------------------------------|------------------------------|--|--|--|--|---|--|--|
| Fr / Group | Randomly Selected K/A | Reason for Rejection | | | | | | |
| <u>RO OUTLINE</u> | | | | | | | | |
| 1/2 | 000067 AA2.06 | Question #24; At Beaver Valley the need for pressurizing the control room during a plant fire on site is an SRO decision based on the SRO's judgment of the control room environment. Therefore we are unable to construct a question that will have definitive criteria for the need to pressurize the control room. Randomly selected 000067 AA2.12 as a replacement. | | | | | | |
| 2/1 | 012 K6.07 | Question #39; Beaver Valley does not have a core protection calculator. Randomly selected 012 K6.01 as a replacement. | | | | | | |
| 2/1 | 039 2.2.25 | Question #44; Knowledge of TS bases is an SRO knowledge IAW the NRC Clarification guidance for SRO-only questions Rev. 1(3/11/10). Randomly selected 039 2.2.39 as a replacement. | | | | | | |
| 2/1 | 059 A2.07 | Question #46; Beaver Valley does not have MFW pump turbines. Randomly selected 059 A2.11 as a replacement. | | | | | | |
| 2/1 | 103 A2.05 | Question #55; Beaver Valley does not have any emergency containment entry procedures. Randomly selected 103 A2.03 as a replacement. | | | | | | |
| 2/2 | 015 K3.04 | Question #59; Beaver Valley does not have ICS. Randomly selected 015 K3.01 as a replacement. | | | | | | |
| 2/2 | 041 K2.02 | Question #62; Beaver Valley does not have ICS. Randomly selected 041 A2.03 as a replacement. | | | | | | |
| 3 | 2.3.11 | Question #71; Ability to control radiation releases has already been addressed in this exam with RO and SRO JPMs as well as Q# 92 of the written exam. In order to maintain exam balance, randomly selected 2.2.42 as a replacement. | | | | | | |
| 1/2 | 000060 AA2.04 | Question #22; Beaver Valley only has a single ARM that has automatic actions and this is already being addressed in Question #23. Randomly selected 000060 AA2.04 as a replacement. | | | | | | |
| 1/1 | 000025 AK3.02 | Question #6; Beaver Valley no longer isolates RHR low pressure piping on increasing pressure. Rather, this function is accomplished with the low pressure over pressurization protection system. The system employs the PORVs to relieve pressure without isolating the RHR low pressure piping. Therefore the K/A is not applicable to Beaver Valley. Discussed with the chief examiner and the decision was made to re-select a different K/A. Randomly selected 000025 AK3.03 as a replacement. | | | | | | |
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| Facility: BVPS Unit 1 | | Date of Exam 7/7 thru 7/18 2014 | Operating Test No.: BV1LOT14 NRC |
|------------------------------|-------------|---|---|
| | | <u>SRO OUTLINE</u> | |
| 1/1 | W/E12 2.4.1 | Question #81; Knowledge of EOP entry conditions and immediate actions is RO knowledge IAW the NRC Clarification guidance for SRO-only questions Rev. 1(3/11/10). Randomly selected W/E12 2.4.47 as a replacement. | |
| 2/2 | 027 A2.01 | Question #91; Beaver Valley has retired the containment iodine removal system and replaced it with a passive sodium tetraborate system. Randomly selected 015 A2.01 as a replacement. | |
| 3 | 2.1.44 | Question #95; Knowledge of RO duties in the control room is RO knowledge IAW the NRC Clarification guidance for SRO-only questions Rev. 1(3/11/10). Randomly selected 2.1.31 as a replacement. | |
| 3 | 2.4.8 | Question #99; Overlap with question 76 identical K/A creates overlap and potential double-jeopardy issues. Randomly selected 2.4.3 as a replacement. | |
| 2/1 | 064 A2.09 | Question # 89; Unable to develop a discriminatory question for the second part of the K/A which requires procedure use to address a malfunction regarding an EDG that fails to synchronize. Other than to call maintenance to effect repairs, there is no operational procedural guidance for this condition. Discussed with the chief examiner and the decision was made to re-select a different K/A. Randomly selected 064 A2.02 as a replacement. | |
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Facility: BVPS Unit 1

Date of Examination: 7/7 thru 7/18 2014

Examination Level **RO** **SRO**

Operating Test Number BV1LOT14 NRC

| Administrative Topic (See Note) | Type Code* | Describe activity to be performed |
|---|------------|---|
| Conduct of Operations (RO A.1.1) | M, R | <p>2.1.23 (4.3)</p> <p><i>Ability to perform specific system and integrated plant procedures during all modes of plant operation.</i></p> <p>(1AD-007) Perform an ECP Calculation</p> |
| Conduct of Operations (RO A.1.2) | M, R | <p>2.1.43 (4.1)</p> <p><i>Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc.</i></p> <p>(1AD-016) Plot and Evaluate 1/M Data</p> |
| Equipment Control (RO A.2) | N, R | <p>2.2.13 (4.1)</p> <p><i>Knowledge of tagging and clearance procedures.</i></p> <p>(1AD-047) Prepare a Clearance Tagout for FW-P-3B</p> |
| Radiation Control (RO A.3) | D, R | <p>2.3.11 (3.8)</p> <p><i>Ability to control radiation releases.</i></p> <p>(1AD-004) Perform Decay Tank Discharge Pre-Release Verification</p> |
| Emergency Procedures/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, when all 5 are required.

*Type Codes & Criteria

- (C)ontrol Room, (S)imulator, or Class(R)oom
- (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
- (N)ew or (M)odified from bank (≥ 1)
- (P)revious 2 exams (≤ 1; randomly selected)

Facility: BVPS Unit 1

Date of Examination: 7/7 thru 7/18 2014

Examination Level **RO** **SRO**

Operating Test Number BV1LOT14 NRC

| Administrative Topic (See Note) | Type Code* | Describe activity to be performed |
|--|------------|--|
| Conduct of Operations (SRO A.1.1) | M, R | <p>2.1.23 (4.4)</p> <p>Ability to perform specific system and integrated plant procedures during all modes of plant operation.</p> <p>(1AD-011) Review an ECP Calculation</p> |
| Conduct of Operations (SRO A.1.2) | N, R | <p>2.1.3 (3.9)</p> <p>Knowledge of shift or short-term relief turnover practices.</p> <p>(1AD-048) Determine Availability for Call-in (3 ROs)</p> |
| Equipment Control (SRO A.2) | N, R | <p>2.2.17 (3.8)</p> <p>Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.</p> <p>(1AD-041) Perform a Risk Assessment [1FW-P-3A] Maintenance</p> |
| Radiation Control (SRO A.3) | N, R | <p>2.3.11 (4.3)</p> <p>Ability to control radiation releases.</p> <p>(1AD-042) Determine Compensatory Actions for RM-P-1GW-108 and O2A-1GW-110-1 Being OOS</p> |
| Emergency Procedures/Plan (SRO A.4) | N, S | <p>2.4.41 (4.6)</p> <p>Knowledge of the emergency action level thresholds and classifications.</p> <p>(1AD-046) Classify an Emergency Event (Scenario Specific)</p> |

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

*Type Codes & Criteria

- (C)ontrol Room, (S)imulator, or Class(R)oom
- (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes)
- (N)ew or (M)odified from bank (≥ 1)
- (P)revious 2 exams (≤ 1; randomly selected)

Facility: BVPS Unit 1
 Exam Level: RO SRO(I) SRO(U)

Date of Examination: 7/7/ thru 7/18 2014
 Operating Test No.: BV1LOT14 NRC

Control Room Systems[@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

| System / JPM Title | Type Code* | Safety Function |
|--|---------------|-----------------|
| S1 – Shift From Main F/W Reg. Valves to Bypasses (1CR-072) | S, D | 4S |
| S2 – Discharge Laundry and Contaminated Shower Drain Tank - (High radiation alarm received - No Auto Actions occur) (1CR-658) | S, N, A | 9 |
| S3 – Rod Control Assembly Partial Movement Test - (Rod fails to move during performance of the test) (1CR-596) | S, D, A | 1 |
| S4 – Drain SIS Accumulator - (Low pressure alarm received during draining) (1CR-659) | S, N, A, EN | 3 |
| S5 – Place Excess Letdown in Service (1CR-056) | S, D | 2 |
| S6 – Respond to High PRT Temperature - (High PRT level received during spray down of PRT) (1CR-661) | S, N, A | 5 |
| S7 – X-Fer 4KV Emer Bus from EDG to Normal Feed - (EDG overcurrent occurs and EDG auto actions fails to occur) (1CR-660) | S, N, A | 6 |
| S8 – Respond to a Loss of the RHR System (RHR pump trips requiring RCP start) (1CR-594) | S, D, A, L, E | 4P |

In-Plant Systems[@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

| | | |
|---|------|----|
| P1 – Startup a Rod Drive MG (1PL-003) | D, L | 1 |
| P2 – Reset the Terry Turbine Trip Throttle Valve (1PL-004) | D, R | 4S |
| P3 – Place the Diesel Air Compressor in Service (1PL-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 (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: <u>BVPS Unit 1</u> | Date of Examination: <u>7/7/ thru 7/18 2014</u> | |
|--|---|-----------------|
| Exam Level: RO <input type="checkbox"/> SRO(I) <input checked="" type="checkbox"/> SRO(U) <input type="checkbox"/> | Operating Test No.: <u>BV1LOT14 NRC</u> | |
| Control Room Systems® (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF) | | |
| System / JPM Title | Type Code* | Safety Function |
| S1 – Shift From Main F/W Reg. Valves to Bypasses (1CR-072) | S, D | 4S |
| S2 – Discharge Laundry and Contaminated Shower Drain Tank - (High radiation alarm received - No Auto Actions occur) (1CR-658) | S, N, A | 9 |
| S3 – Rod Control Assembly Partial Movement Test - (Rod fails to move during performance of the test) (1CR-596) | S, D, A | 1 |
| S4 – Drain SIS Accumulator - (Low pressure alarm received during draining) (1CR-659) | S, N, A, EN | 3 |
| | | |
| S6 – Respond to High PRT Temperature - (High PRT level received during spray down of PRT) (1CR-661) | S, N, A | 5 |
| S7 – X-Fer 4KV Emer Bus from EDG to Normal Feed - (EDG overcurrent occurs and EDG auto actions fails to occur) (1CR-660) | S, N, A | 6 |
| S8 – Respond to a Loss of the RHR System (RHR pump trips requiring RCP start) (1CR-594) | S, D, A, L, E | 4P |
| In-Plant Systems® (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U) | | |
| P1 – Startup a Rod Drive MG (1PL-003) | D, L | 1 |
| P2 – Reset the Terry Turbine Trip Throttle Valve (1PL-004) | D, R | 4S |
| P3 – Place the Diesel Air Compressor in Service (1PL-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 (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 | | |

Appendix D

Scenario Outline

1L14N1

| | | | |
|------------|--------------------|----------------|----------------------------------|
| Facility: | BVPS Unit 1 | Scenario No. 1 | Op Test No.: <u>BV1LOT14 NRC</u> |
| Examiners: | _____ | Candidates: | _____ SRO |
| | _____ | | _____ ATC |
| | _____ | | _____ BOP |

Initial Conditions: **IC 68(29):** 100% power, EOL, Equ. XE Conditions, CB “D” @ 227 steps, RCS boron - 100 ppm.

Turnover: Maintain 100% power.
 “A” Train Priority,
 1FW-P-3B is OOS with 1FW-P-2 aligned to the “B” header IAW TS 3.7.5, Condition B.

- Critical Tasks:
- 1. CT-50 (FR-S.1.A)** Crew isolates the main turbine
 - 2. CT-3 (E-0.E)** Crew manually actuates CIB
 - 3. CT-11 (E-0.O)** Crew closes cnmt isolation valves
 - 4. CT-33 (ECA-2.1.A)** Crew controls the AFW flow rate

| Event No. | | Event Type | Event Description |
|-----------|--|--------------------------|---|
| 1 | | (TS) SRO | RCS loop 1, ch III, flow transmitter, FT-1RC-416 fails low. |
| 2 | | (C) ATC, SRO (TS) SRO | River water pump, 1WR-P-1A trips, requiring manual start of 1WR-P-1B. |
| 3 | | (C) ATC, SRO | “B” RCP thermal barrier leak/ TV-1CC-107B fails to auto close on high flow, requires manual closure. |
| 4 | | (R) ATC (N) BOP, SRO | “B” S/G feedwater leak inside CNMT requiring an unplanned power reduction per AOP |
| 5 | | (M) ALL | “B” feedwater leak increases once power is reduced to 94%. Reactor fails to trip from the control room, requires entry into FR-S.1. |
| 6 | | (M) ALL | Upon Rx trip, all 3 steam lines fault. |
| 7 | | (I) BOP, SRO | Automatic main steam line isolation failure, requires manual main steam line isolation. |
| 8 | | (I) ATC, SRO | Train “B” CIA fails to actuate along with train “A” valve MOV-1CH-378 failing to automatically close, ATC must manually actuate CIA or close MOV-1CH-378. |
| 9 | | (I) ATC, SRO | Automatic CIB actuation failure, requires manual actuation. |
| 10 | | (C) BOP, SRO | Control room dampers, 1VS-D-40-1A, 1B, 1C and 1D fail to automatically close, requires manual closing. |
| | | | |

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

After taking the shift at 100% power, RCS loop flow transmitter, FT-1RC-416 fails low. The crew will diagnose the indications and the SRO will address Tech Specs for the failed transmitter.

The 1A Reactor Plant River Water Pump, 1WR-P-1A then trips with an auto start failure of the standby pump, 1WR-P-1B. The SRO will direct the crew to perform the actions of AOP 1.30.2, River Water/ Main Intake Structure Loss, to start 1WR-P-1B and restore river water. The SRO will address Tech Specs.

A leak will then occur in the "B" RCP thermal barrier heat exchanger. The isolation valve, TV-1CC-107B, will fail to auto close on high flow and will require manual closure. The BOP will refer to the alarm response procedure and the SRO will direct closure of the valve.

A feedwater leak will occur inside of the containment, the SRO will direct the crew to commence a rapid power reduction IAW AOP 1.51.1, "Unplanned Power Reduction".

The feedwater leak will increase in size during the power reduction, due to degrading conditions, the SRO will direct the ATC to trip the reactor.

The reactor will fail to trip from the control room. The SRO will direct the ATC and BOP to perform the IOA's of FR-S.1, "Response to Nuclear Power Generation – ATWS. The turbine will also fail to automatically trip and must be manually tripped. The reactor will be tripped via a local operator after being dispatched and the crew will return to E-0.

When the reactor is tripped, all three main steam lines will fault inside of containment.

The main steam line isolation signal will fail to occur and the valves must be manually aligned.

The safety injection that occurred as a result of the MSLB will fail to actuate the train "B" CIA signal, and train "A" CIA valve, MOV-1CH-378 will fail to automatically close. The ATC will recognize the failure and isolate the containment penetration via either manually actuating Train "B" CIA or manually closing MOV-1CH-378.

A CIB signal will fail to actuate on high containment pressure requiring the ATC to manually initiate CIB actuation. The control room ventilation dampers 1VS-D-40-1A through 1D will not close on the CIB signal requiring the BOP to manually close the dampers.

The SRO will transition to EOP E-2, "Faulted Steam Generator Isolation" based upon the rapid depressurization of the Steam Generators, then transition to ECA-2.1, "Uncontrolled Depressurization of All Steam Generators".

The scenario will be terminated after the crew evaluates if the LHSI pumps are to be secured in ECA-2.1.

Expected procedure flow path is E-0 → FR-S.1 → E-0 → E-2 → ECA-2.1

Appendix D

Scenario Outline

1L14N2

Facility: **BVPS Unit 1** Scenario No.: **2** Op Test No.: **BV1LOT14 NRC**
 Examiners: _____ Candidates: _____ SRO
 _____ ATC
 _____ BOP

Initial Conditions: **IC 67(17):** 65% power, MOL, Equ. XE Conditions, CB “D” @ 177 steps, RCS boron - 1102 ppm.

Turnover: Maintain current power level.
 1FW-P-3B OOS for maintenance, with 1FW-P-2 aligned to “B” header IAW TS 3.7.5, Condition B.
 Control rods are in manual due to I&C MSP in progress.

- Critical Tasks:
1. **CT-4 (E-0.F)** Establish AFW flow
 2. **CT-18 (E-3.A)** Isolate ruptured SG
 3. **CT-20 (E-3.C)** Crew depressurizes RCS
 4. **CT-21 (E-3.D)** Crew terminates SI

| Event No. | Malf. No. | Event Type | Event Description |
|-----------|-----------|--------------------------|--|
| 1 | | (C) ATC, SRO (TS) SRO | 1A charging pump trip, requires manual starting of 1B. |
| 2 | | (C) ATC, SRO (TS) SRO | 200 gpd “B” steam generator tube leak |
| 3 | | (R) ATC (N) BOP, SRO | Main feed pump, 1FW-P-1B trips, requires rapid power reduction (AOP 1.24.1) |
| 4 | | (M) ALL | “B” Main feed regulating valve, FCV-1FW-488 fails shut, leads to a Rx trip with a loss of offsite power. |
| 5 | | (C) BOP, SRO | Turbine driven aux feed pump, 1FW-P-2 trips on overspeed and motor driven aux feed pump, 1FW-P-3A fails to auto start, requiring manual start of 1FW-P-3A. |
| 6 | | (M) ALL | 500 gpm SGTR in the “B” steam generator. |
| 7 | | (C) BOP, SRO | Main steam line isolation valve on the ruptured SG, TV-1MS-101B failed open, requires the crew to perform an alternate MSLI alignment. |
| 8 | | (C) ATC, SRO | PRZR PORV fails open during depressurization requires closing of block valve. |
| | | | |

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

After taking the shift at 65% power, the running charging pump will trip. The SRO will enter AOP 1.7.1 to start the standby pump. The standby pump must be started and the backup pump will be aligned to replace the failed pump. Charging and letdown will be isolated per the AOP. The SRO will address Technical Specifications for the failed charging pump.

Subsequently, a 200 gpd SG tube leak will develop on the "B" SG. AOP 1.6.4 will be implemented. AOP 1.6.4 will provide direction to enter Mode 3 within 3 hours. The SRO will address Technical Specifications which also will require Mode 3 entry.

1FW-P-1B will trip, requiring the crew to rapidly reduce power to < 52% IAW AOP 1.24.1.

The "B" SG main feedwater regulating valve fails closed, resulting in a reactor trip.

Following the reactor trip, offsite power is lost.

Additionally, the 3A motor driven aux feed pump fails to automatically start but may be started manually. The turbine driven aux feed pump will start but trips during startup and can be recovered if requested.

As a result of the reactor trip, a 500 gpm steam generator tube rupture will occur in the "B" SG.

When isolating the "B" SG, the "B" main steam line isolation valve will fail open requiring the crew to close the "A" and "C" MSIV's.

Subsequently, the PRZR PORV used to depressurize the RCS will fail open and require the motor operated block valve be closed to stop the PORV leakage.

The scenario will be terminated when the crew has terminated safety injection.

Expected procedure flow path is E0 → E3.

Appendix D

Scenario Outline

1L14N3

Facility: **BVPS Unit 1** Scenario No.: **3** Op Test No.: **BV1LOT14 NRC**
 Examiners: _____ Candidates: _____ SRO
 _____ ATC
 _____ BOP

Initial Conditions: **IC 211: 5% power, BOL, Equ. XE Conditions, CB "D" @ 114 steps, RCS boron - 1851 ppm.**

Turnover: **Raise Power to 10-14% to place turbine online.**

Critical Tasks: **1. CT-12 (E-0.P), Manually actuate SLI
 2. CT-17 (E-2.A), Isolate faulted SG
 3. CT-48 (FR-P.1.A), Terminate ECCS flow / challenge to the integrity CSF**

| Event No. | Malf. No. | Event Type | Event Description |
|-----------|-----------|--------------------------|---|
| 1 | | (R) ATC (N) SRO | Raise Power to 10-14% |
| 2 | | (C) BOP, SRO (TS) SRO | Leak collection exhaust fan, 1VS-F-4A trips, requiring manual start of 1VS-F-4B |
| 3 | | (C) ATC, SRO | Charging flow control valve, FCV-1CH-122 fails shut in AUTO, requires manual control of PRZR level. |
| 4 | | (I) BOP, SRO | Main steam header pressure transmitter, PT-1MS-464 fails low, requiring manual control of condenser steam dumps. |
| 5 | | (C) BOP, SRO (TS) SRO | SG atmospheric relief valve, PCV-1MS-101B fails open, requires manual control of condenser steam dumps during failure and local operator isolation. |
| 6 | | (M) ALL | Steam Break inside cnmt on "B" SG |
| 7 | | (I) BOP, SRO | SLI auto actuation failure, requires manual MSLI. |
| 8 | | (C) BOP, SRO | Aux feedwater control valve failed open, requires alternate isolation method. |
| 9 | | (I) BOP, SRO | Control room emergency ventilation system fails to actuate on CIB signal, requiring manual initiation. |
| | | | |

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

The crew will assume the shift at 5% power with instructions to raise power to 10-14% to place the turbine online IAW the reactivity plan and 1OM-52.4.A. The ATC will initiate a dilution and withdraw control rods.

After the power has raised to 6.4%, 1VS-F-4A will trip, the crew will respond using the ARP which will direct the BOP to manually start 1VS-F-4B. The SRO will address applicable TS.

After the power has raised to 8.0%, FCV-1CH-122 will fail closed in Auto, the ATC will be required to identify the failure and manually control FCV-1CH-122 to maintain Pzr level.

2 minutes after the crew blocks the Power Range Low Overpower Reactor trip, the main steam header pressure transmitter, MS-1PT-464 will fail low causing the condenser steam dumps to close in response. The ensuing RCS heatup will cause SG atmospheric steam relief valve, PCV-1MS-101B to fail open, causing Rx power to rise and Tav_g to drop due to the increased steam flow. The BOP will restore Rx power and Tav_g by manually controlling the condenser steam dumps. The crew will unsuccessfully attempt to close the valve from the control room and then dispatch an operator to locally isolate. The BOP will control the condenser steam dumps while a local operator isolates the failed open SG atmospheric valve.

A large steam break will then occur on the "B" SG inside of CNMT.

The crew will enter E-0 and transition to E-2 after diagnosing a faulted SG. The steam break is of a magnitude that will cause conditions for an Integrity Red Path and require the crew to transition to FR-P.1.

^ additional malfunctions occur during the event;

1. Automatic SLI fails to automatically actuate
2. "A" header AFW control valve will fail to close from the control room.
3. The control room emergency ventilation system, CREV's, fails to automatically actuate.

The scenario will be terminated when the crew has established normal charging flow in FR-P.1.

Expected procedure flow path is E-0 → E-2 → FR-P.1.

Appendix D

Scenario Outline

1L14N4

| | | | | | |
|------------|--------------------|---------------|-------|--------------|---------------------|
| Facility: | BVPS Unit 1 | Scenario No.: | 4 | Op Test No.: | <u>BV1LOT14 NRC</u> |
| Examiners: | _____ | Candidates: | _____ | | SRO |
| | _____ | | _____ | | ATC |
| | _____ | | _____ | | BOP |

Initial Conditions: **IC 62(18):** 81% power, MOL, Equilibrium Xe, CB "D" @ 206 steps, RCS boron - 1012 ppm.

Turnover: Rx is at 81% power due to isolating the condenser "D" Waterbox for cleaning. "A" Train Priority, 1FW-P-3B is OOS with 1FW-P-2 aligned to the "B" header IAW TS 3.7.5, Condition B.

- Critical Tasks:
- 1. CT-1 (E-0.A) – Manually Trip Reactor**
 - 2. CT-6 (E-0.I) – Establish 1 train of HHSI**
 - 3. CT-16 (E-1.C) – Manually trip RCPs**

| Event No. | Malf. No. | Event Type | Event Description |
|-----------|-----------|--------------------------|---|
| 1 | | (C) ATC, SRO (TS) SRO | The 1A boric acid transfer pump trips requiring aligning the standby train for service. |
| 2 | | (TS) SRO | Ch 2, cnmt pressure transmitter, PT-1LM-100B, fails high. |
| 3 | | (R) ATC (N) BOP, SRO | Cooling tower pump, CT-P-1C trips, causing degraded condenser vacuum, requiring power reduction. |
| 4 | | (I) ATC, SRO | Auto rod insertion fails on load reduction, ATC manually controls Tavg. |
| 5 | | (M) ALL | Condenser Low-Low vacuum causes turbine trip. |
| 6 | | (I) ATC, SRO | Auto Rx trip fails to occur, requires ATC to manually trip the reactor from BB-A. |
| 7 | | (C) BOP, SRO | Exciter circuit breaker fails to auto open on Rx trip, requires BOP to manually trip the exciter circuit breaker. |
| 8 | | (M) ALL | 1500 GPM LOCA one minute after Rx trip. |
| 9 | | (C) ATC, SRO | "A" charging pump, 1CH-P-1A trips, and "B" charging pump, 1CH-P-1B fails to auto start on Safety Injection, requiring manual start. |
| | | | |

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

After taking the shift, boric acid transfer pump, 1CH-P-2A will trip. SRO will direct placing the 2B boric acid transfer pump in service IAW 1OM-7.4.R, "Transfer of Inservice Boric Acid Tank". SRO will also address Technical Specifications.

After the crew has reestablished a boric acid flowpath, containment pressure ch 2 transmitter, PT-1LM-100B fails high. The SRO will enter 1OM-1.4.IF and review the Technical Specifications. The SRO will then contact I&C to trip the applicable bistables.

The "C" cooling tower pump will trip causing condenser vacuum to degrade. The crew will enter AOP 1.26.2, "Loss of Condenser Vacuum". While working through the Loss of Condenser Vacuum AOP, they will recognize the need to reduce turbine load to prevent exceeding hotwell temperature of 130 °F. At this point the SRO will enter AOP - 1.51.1, "Unplanned Power Reduction" and reduce turbine load.

The control rods will fail to auto insert during the turbine load reduction. The ATC will have to insert control rods in manual to maintain T_{avg} to T_{ref} .

During the load reduction the turbine will trip due to low condenser vacuum, the plant will be greater than 49% power (P-9), but the Rx will fail to auto trip. The ATC will successfully trip the reactor from Bench board "A".

During the immediate operator actions of E-0, the BOP will be required to manually open the exciter circuit breaker due to an auto open failure.

One minute after the Rx is manually tripped a 1500 GPM LOCA will occur on the "B" RCS loop. The LOCA will cause a Safety Injection actuation due to low RCS pressure. Upon the SI actuation the "A" charging pump will trip, and the "B" charging pump will fail to auto start, requiring the ATC to manually start the "B" charging pump to restore high head safety injection flow.

The crew will enter E-0, transition to E-1 due to containment parameters, and then to ES-1.2 to cooldown the RCS.

The scenario will be terminated when RCS cooldown is commenced in ES-1.2.

Expected procedure flow path is E-0 → E-1 → ES-1.2.