| Question | K/A Number<br>K/A Description | | K/A System | | Tier/Group | Importance RO/SRO | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1**<br>2501 | **SYS003** | **K5.01** | **Reactor Coolant Pump System (RCPS)** | | T/G 2 / 1 | **RO** | **3.3** | **SRO** | **3.9** |
| | Knowledge of the operational implications of the following concepts as they apply to the RCPS: (CFR: 41.5 / 45.7) | | | The relationship between the RCPS flow rate and the nuclear core operating parameters (quadrant power tilt, imbalance, DNB rate, local power density, difference in loop T-hot pressure) ................ | | | | | |
| **2**<br>2502 | **SYS004** | **K6.02** | **Chemical and Volume Control System** | | T/G 2 / 1 | **RO** | **2.5** | **SRO** | **2.6** |
| | Knowledge of the effect of a loss or malfunction on the following CVCS components: (CFR: 41.7 / 45.7) | | | Demineralizers and ion exchangers ................................ | | | | | |
| **3**<br>2503 | **SYS005** | **A1.02** | **Residual Heat Removal System (RHRS)** | | T/G 2 / 1 | **RO** | **3.3** | **SRO** | **3.4** |
| | Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: (CFR: 41.5 / 45.5) | | | RHR flow rate ................................................ | | | | | |
| **4**<br>2504 | **SYS005** | **K3.01** | **Residual Heat Removal System (RHRS)** | | T/G 2 / 1 | **RO** | **3.9** | **SRO** | **4.0** |
| | Knowledge of the effect that a loss or malfunction of the RHRS will have on the following: (CFR: 41.7 / 45.6) | | | RCS ........................................................ | | | | | |
| **5**<br>2505 | **SYS006** | **K1.14** | **Emergency Core Cooling System (ECCS)** | | T/G 2 / 1 | **RO** | **3.0** | **SRO** | **3.4*** |
| | Knowledge of the physical connections and/or cause-effect relationships between the ECCS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) | | | IAS ........................................................ | | | | | |
| **6**<br>2506 | **SYS006** | **K6.02** | **Emergency Core Cooling System (ECCS)** | | T/G 2 / 1 | **RO** | **3.4** | **SRO** | **3.9** |
| | Knowledge of the effect of a loss or malfunction on the following will have on the ECCS: (CFR: 41.7 / 45.7) | | | Core flood tanks (accumulators) ................................. | | | | | |
| **7**<br>2507 | **SYS007** | **K5.02** | **Pressurizer Relief Tank/Quench Tank System (PRTS)** | | T/G 2 / 1 | **RO** | **3.1** | **SRO** | **3.4** |
| | Knowledge of the operational implications of the following concepts as they apply to PRTS: (CFR: 41.5 / 45.7) | | | Method of forming a steam bubble in the PZR ....................... | | | | | |

| Question | K/A Number<br>K/A Description | | K/A System | | Tier/Group | Importance RO/SRO | | | |
|---|---|---|---|---|---|---|---|---|---|
| **8**<br>2508 | **SYS008** | **K4.02** | **Component Cooling Water System (CCWS)** | | T/G 2 / 1 | **RO** | **2.9** | **SRO** | **2.7** |
| | Knowledge of CCWS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) | | | Operation of the surge tank, including the associated valves and controls .. | | | | | |
| **9**<br>2509 | **SYS010** | **A1.07** | **Pressurizer Pressure Control System (PZR PCS)** | | T/G 2 / 1 | **RO** | **3.7** | **SRO** | **3.7** |
| | Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PZR PCS controls including: (CFR: 41.5 / 45.5) | | | RCS pressure ................................................ | | | | | |
| **10**<br>2510 | **SYS012** | **A2.02** | **Reactor Protection System (RPS)** | | T/G 2 / 1 | **RO** | **3.6** | **SRO** | **3.9** |
| | Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5) | | | Loss of instrument power ........................................ | | | | | |
| **11**<br>2511 | **SYS013** | **K2.01** | **Engineered Safety Features Actuation System (ESFAS)** | | T/G 2 / 1 | **RO** | **3.6*** | **SRO** | **3.8** |
| | Knowledge of bus power supplies to the following: (CFR: 41.7) | | | ESFAS/safeguards equipment control .............................. | | | | | |
| **12**<br>2512 | **SYS022** | **2.4.45** | **Containment Cooling System (CCS)** | | T/G 2 / 1 | **RO** | **4.1** | **SRO** | **4.3** |
| | SYS022 GENERIC | | | Ability to prioritize and interpret the significance of each annunciator or alarm. (CFR: 41.10 / 43.5 / 45.3 / 45.12) | | | | | |
| **13**<br>2513 | **SYS022** | **K1.01** | **Containment Cooling System (CCS)** | | T/G 2 / 1 | **RO** | **3.5** | **SRO** | **3.7** |
| | Knowledge of the physical connections and/or cause-effect relationships between the CCS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) | | | SWS/cooling system ........................................... | | | | | |

| Question | K/A Number | | K/A System | Tier/Group | Importance RO/SRO | | | |
|---|---|---|---|---|---|---|---|---|
| | K/A Description | | | | | | | |
| **14** | **SYS059** | **A2.06** | **Main Feedwater (MFW) System** | T/G 2 / 1 | **RO** | **2.7*** | **SRO** | **2.9*** |
| 2514 | 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: (CFR: 41.5 / 43.5 / 45.3 / 45.13) | | Loss of steam flow to MFW system ................................ | | | | | |
| **15** | **SYS025** | **K6.01** | **Ice Condenser System** | T/G 2 / 1 | **RO** | **3.4*** | **SRO** | **3.6*** |
| 2515 | Knowledge of the effect of a loss or malfunction of the following will have on the ice condenser system: (CFR: 41.7 / 45.7) | | Upper and lower doors of the ice condenser .......................... | | | | | |
| **16** | **SYS026** | **A2.09** | **Containment Spray System (CSS)** | T/G 2 / 1 | **RO** | **2.5*** | **SRO** | **2.9*** |
| 2516 | Ability to (a) predict the impacts of the following malfunctions or operations on the CSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) | | Radiation hazard potential of BWST ................................ | | | | | |
| **17** | **SYS039** | **K4.05** | **Main and Reheat Steam System (MRSS)** | T/G 2 / 1 | **RO** | **3.7** | **SRO** | **3.7** |
| 2517 | Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) | | Automatic isolation of steam line .................................. | | | | | |
| **18** | **SYS059** | **2.4.31** | **Main Feedwater (MFW) System** | T/G 2 / 1 | **RO** | **4.2** | **SRO** | **4.1** |
| 2518 | SYS059 GENERIC | | Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3) | | | | | |
| **19** | **SYS061** | **K2.01** | **Auxiliary / Emergency Feedwater (AFW) System** | T/G 2 / 1 | **RO** | **3.2*** | **SRO** | **3.3** |
| 2519 | Knowledge of bus power supplies to the following: (CFR: 41.7) | | AFW system MOVs ............................................. | | | | | |

| Question | K/A Number<br>K/A Description | K/A System | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|
| **20**<br>2520 | **SYS062 A3.05**<br>Ability to monitor automatic operation of the ac distribution system, including: (CFR: 41.7 / 45.5) | **AC Electrical Distribution System**<br>Safety-related indicators and controls .............................. | T/G 2 / 1 | **RO 3.5 SRO 3.6** |
| **21**<br>2521 | **SYS063 A3.01**<br>Ability to monitor automatic operation of the DC electrical system, including: (CFR: 41.7 / 45.5) | **DC Electrical Distribution System**<br>Meters, annunciators, dials, recorders, and indicating lights ............ | T/G 2 / 1 | **RO 2.7 SRO 3.1** |
| **22**<br>2522 | **SYS063 K4.01**<br>Knowledge of DC electrical system design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) | **DC Electrical Distribution System**<br>Manual/automatic transfers of control .............................. | T/G 2 / 1 | **RO 2.7 SRO 3.0*** |
| **23**<br>2523 | **SYS064 A4.08**<br>Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) | **Emergency Diesel Generator (ED/G) System**<br>Opening of the ring bus ........................................ | T/G 2 / 1 | **RO 3.2* SRO 3.2*** |
| **24**<br>2524 | **SYS073 K1.01**<br>Knowledge of the physical connections and/or cause-effect relationships between the PRM system and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) | **Process Radiation Monitoring (PRM) System**<br>Those systems served by PRMs .................................. | T/G 2 / 1 | **RO 3.6 SRO 3.9** |
| **25**<br>2525 | **SYS076 K3.07**<br>Knowledge of the effect that a loss or malfunction of the SWS will have on the following: (CFR: 41.7 / 45.6) | **Service Water System (SWS)**<br>ESF loads ..................................................... | T/G 2 / 1 | **RO 3.7 SRO 3.9** |
| **26**<br>2526 | **SYS078 A4.01**<br>Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) | **Instrument Air System (IAS)**<br>Pressure gauges .............................................. | T/G 2 / 1 | **RO 3.1 SRO 3.1** |

| Question | K/A Number | | K/A System / K/A Description | | Tier/Group | Importance RO/SRO | | | |
|---|---|---|---|---|---|---|---|---|---|
| **27** (2527) | **SYS078** | **K3.02** | **Instrument Air System (IAS)** — Knowledge of the effect that a loss or malfunction of the IAS will have on the following: (CFR: 41.7 / 45.6) | Systems having pneumatic valves and controls ....................... | T/G 2 / 1 | **RO** | **3.4** | **SRO** | **3.6** |
| **28** (2528) | **SYS103** | **A4.04** | **Containment System** — Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) | Phase A and phase B resets ..................................... | T/G 2 / 1 | **RO** | **3.5*** | **SRO** | **3.5*** |
| **29** (2529) | **SYS001** | **K6.13** | **Control Rod Drive System** — Knowledge of the effect of a loss or malfunction on the following CRDS components: (CFR: 41.7/45.7) | Location and operation of RPIS .................................. | T/G 2 / 2 | **RO** | **3.6** | **SRO** | **3.7** |
| **30** (2530) | **SYS011** | **K3.02** | **Pressurizer Level Control System (PZR LCS)** — Knowledge of the effect that a loss or malfunction of the PZR LCS will have on the following: (CFR: 41.7 / 45.6) | RCS ......................................................... | T/G 2 / 2 | **RO** | **3.5** | **SRO** | **3.7** |
| **31** (2531) | **SYS014** | **2.4.31** | **Rod Position Indication System (RPIS)** — SYS014 GENERIC | Knowledge of annunciator alarms, indications, or response procedures. (CFR: 41.10 / 45.3) | T/G 2 / 2 | **RO** | **4.2** | **SRO** | **4.1** |
| **32** (2532) | **SYS015** | **K2.01** | **Nuclear Instrumentation System (NIS)** — Knowledge of bus power supplies to the following : (CFR: 41.7) | NIS channels, components, and interconnections ..................... | T/G 2 / 2 | **RO** | **3.3** | **SRO** | **3.7** |
| **33** (2533) | **SYS016** | **K4.01** | **Non-Nuclear Instrumentation System (NNIS)** — Knowledge of NNIS design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) | Reading of NNIS channel values outside control room ................ | T/G 2 / 2 | **RO** | **2.8*** | **SRO** | **2.9*** |

| Question | K/A Number K/A Description | | K/A System | | Tier/Group | Importance RO/SRO | | | |
|---|---|---|---|---|---|---|---|---|---|
| **34** 2534 | **SYS028** | **A2.01** | **Hydrogen Recombiner and Purge Control System (HRPS)** | | T/G 2 / 2 | **RO** | **3.4*** | **SRO** | **3.6*** |
| | Malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) | | | Hydrogen recombiner power setting, determined by using plant data book ........................................... | | | | | |
| **35** 2535 | **SYS033** | **A1.02** | **Spent Fuel Pool Cooling System (SFPCS)** | | T/G 2 / 2 | **RO** | **2.8** | **SRO** | **3.3** |
| | Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Spent Fuel Pool Cooling System operating the controls including: (CFR: 41.5 / 45.5) | | | Radiation monitoring systems .................................... | | | | | |
| **36** 2536 | **SYS035** | **K1.01** | **Steam Generator System (S/GS)** | | T/G 2 / 2 | **RO** | **4.2** | **SRO** | **4.5** |
| | Knowledge of the physical connections and/or cause-effect relationships between the S/GS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) | | | MFW/AFW systems ............................................ | | | | | |
| **37** 2537 | **SYS045** | **K5.23** | **Main Turbine Generator (MT/G) System** | | T/G 2 / 2 | **RO** | **2.7** | **SRO** | **2.8** |
| | Knowledge of the operational implications of the following concepts as the apply to the MT/B System: (CFR: 41.5 / 45.7) | | | Relationship between rod control and RCS boron concentration during T/G load increases .................................. | | | | | |
| **38** 2538 | **SYS071** | **K4.06** | **Waste Gas Disposal System (WGDS)** | | T/G 2 / 2 | **RO** | **2.7*** | **SRO** | **3.5*** |
| | Knowledge of design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7) | | | Sampling and monitoring of waste gas release tanks .................. | | | | | |
| **39** 2539 | **EPE007** | **EK3.01** | **Reactor Trip** | | T/G 1 / 1 | **RO** | **4.0** | **SRO** | **4.6** |
| | Knowledge of the reasons for the following as the apply to a reactor trip: (CFR 41.5 /41.10 / 45.6 / 45.13) | | | Actions contained in EOP for reactor trip ........................... | | | | | |

| Question | K/A Number / K/A Description | | K/A System | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|
| **40** | **APE008** | **AK1.01** | **Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck O** | T/G 1 / 1 | **RO 3.2 SRO 3.7** |
| 2540 | Knowledge of the operational implications of the following concepts as they apply to a Pressurizer Vapor Space Accident: (CFR 41.8 / 41.10 / 45.3) | | Thermodynamics and flow characteristics of open or leaking valves ...................................................... | | |
| **41** | **EPE009** | **EK2.03** | **Small Break LOCA** | T/G 1 / 1 | **RO 3.0 SRO 3.3*** |
| 2541 | Knowledge of the interrelations between the small break LOCA and the following: (CFR 41.7 / 45.7) | | S/Gs ........................................................... | | |
| **42** | **APE015/017** | **2.1.32** | **Reactor Coolant Pump (RCP) Malfunctions** | T/G 1 / 1 | **RO 3.8 SRO 4.0** |
| 2542 | APE015/017 GENERIC | | Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12) | | |
| **43** | **APE022** | **AA1.09** | **Loss of Reactor Coolant Makeup** | T/G 1 / 1 | **RO 3.2 SRO 3.3** |
| 2543 | Ability to operate and / or monitor the following as they apply to the Loss of Reactor Coolant Makeup: (CFR 41.7 / 45.5 / 45.6) | | RCP seal flows, temperatures, pressures, and vibrations . . . . . . . . . . . . | | |
| **44** | **APE025** | **AA1.12** | **Loss of Residual Heat Removal System (RHRS)** | T/G 1 / 1 | **RO 3.6 SRO 3.5** |
| 2544 | Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: (CFR 41.7 / 45.5 / 45.6) | | RCS temperature indicators ..................................... | | |
| **45** | **APE027** | **AK2.03** | **Pressurizer Pressure Control System (PZR PCS) Malfunction** | T/G 1 / 1 | **RO 2.6 SRO 2.8** |
| 2545 | Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: (CFR 41.7 / 45.7) | | Controllers and positioners ...................................... | | |
| **46** | **APE040** | **AA2.03** | **Steam Line Rupture** | T/G 1 / 1 | **RO 4.6 SRO 4.7** |
| 2546 | Ability to determine and interpret the following as they apply to the Steam Line Rupture: (CFR: 43.5 / 45.13) | | Difference between steam line rupture and LOCA .................... | | |

| Question | K/A Number | | K/A System / K/A Description | | Tier/Group | Importance RO/SRO | | | |
|---|---|---|---|---|---|---|---|---|---|
| **47** 2547 | **APE054** | **AK1.02** | **Loss of Main Feedwater (MFW)** Knowledge of the operational implications of the following concepts as they apply to Loss of Main Feedwater (MFW): (CFR 41.8 / 41.10 / 45.3) | Effects of feedwater introduction on dry S/G ........................ | T/G 1 / 1 | **RO** | **3.6** | **SRO** | **4.2** |
| **48** 2548 | **EPE055** | **EA2.01** | **Loss of Offsite and Onsite Power (Station Blackout)** Ability to determine or interpret the following as they apply to a Station Blackout : (CFR 43.5 / 45.13) | Existing valve positioning on a loss of instrument air system ........... | T/G 1 / 1 | **RO** | **3.4** | **SRO** | **3.7** |
| **49** 2549 | **APE056** | **AA2.50** | **Loss of Offsite Power** Ability to determine and interpret the following as they apply to the Loss of Offsite Power: (CFR: 43.5 / 45.13) | That load and VAR limits, alarm setpoints, frequency and voltage limits for ED/Gs are not being exceeded .................. | T/G 1 / 1 | **RO** | **2.8*** | **SRO** | **3.1** |
| **50** 2550 | **APE058** | **2.1.27** | **Loss of DC Power** APE058 GENERIC | Knowledge of system purpose and/or function. (CFR: 41.7) | T/G 1 / 1 | **RO** | **3.9** | **SRO** | **4.0** |
| **51** 2551 | **APE062** | **AK3.04** | **Loss of Nuclear Service Water** Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: (CFR 41.4, 41.8 / 45.7 ) | Effect on the nuclear service water discharge flow header of a loss of CCW | T/G 1 / 1 | **RO** | **3.5** | **SRO** | **3.7** |
| **52** 2552 | **APE065** | **2.4.20** | **Loss of Instrument Air** APE065 GENERIC | Knowledge of the operational implications of EOP warnings, cautions, and notes. (CFR: 41.10 / 43.5 / 45.13) | T/G 1 / 1 | **RO** | **3.8** | **SRO** | **4.3** |
| **53** 2553 | **APE077** | **AK2.03** | **Generator Voltage and Electric Grid Disturbances** Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: (CFR: 41.4, 41.5, 41.7, 41.10 / 45.8) | Sensors, detectors, indicators.................................................. | T/G 1 / 0 | **RO** | **3.0** | **SRO** | **3.1** |

| Question | K/A Number<br>K/A Description | K/A System | | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|
| **54**<br>2554 | **WE04 EK1.3**<br><br>Knowledge of the operational implications of the following concepts as they apply to the (LOCA Outside Containment)<br>(CFR: 41.8 / 41.10, 45.3) | **LOCA Outside Containment** | Annunciators and conditions indicating signals, and remedial actions associated with the (LOCA Outside Containment). | T/G 1 / 1 | **RO 3.5 SRO 3.9** |
| **55**<br>2555 | **WE05 EK3.2**<br><br>Knowledge of the reasons for the following responses as they apply to the (Loss of Secondary Heat Sink)<br>(CFR: 41.5 / 41.10, 45.6, 45.13) | **Loss of Secondary Heat Sink** | Normal, abnormal and emergency operating procedures associated with (Loss of Secondary Heat Sink). | T/G 1 / 1 | **RO 3.7 SRO 4.1** |
| **56**<br>2556 | **WE11 EA1.1**<br><br>Ability to operate and / or monitor the following as they apply to the (Loss of Emergency Coolant Recirculation)<br>(CFR: 41.7 / 45.5 / 45.6) | **Loss of Emergency Coolant Recirculation** | Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features. | T/G 1 / 1 | **RO 3.9 SRO 4.0** |
| **57**<br>2557 | **APE024 AK2.04**<br><br>Knowledge of the interrelations between Emergency Boration and the following: (CFR 41.7 / 45.7) | **Emergency Boration** | Pumps . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | T/G 1 / 2 | **RO 2.6 SRO 2.5** |
| **58**<br>2558 | **APE028 AK1.01**<br><br>Knowledge of the operational implications of the following concepts as they apply to Pressurizer Level Control Malfunctions: (CFR 41.8 / 41.10 / 45.3) | **Pressurizer (PZR) Level Control Malfunction** | PZR reference leak abnormalities ................................ | T/G 1 / 2 | **RO 2.8* SRO 3.1*** |
| **59**<br>2559 | **APE032 2.1.27**<br><br>APE032 GENERIC | **Loss of Source Range Nuclear Instrumentation** | Knowledge of system purpose and/or function. (CFR: 41.7) | T/G 1 / 2 | **RO 3.9 SRO 4.0** |
| **60**<br>2560 | **APE033 AA1.03**<br><br>Ability to operate and / or monitor the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: (CFR 41.7 / 45.5 / 45.6) | **Loss of Intermediate Range Nuclear Instrumentation** | Manual restoration of power ...................................... | T/G 1 / 2 | **RO 3.0* SRO 3.2*** |

| Question | K/A Number | K/A System | K/A Description | | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|---|
| **61** 2561 | **APE059 AK1.01** | **Accidental Liquid Radioactive-Waste Release** | Knowledge of the operational implications of the following concepts as they apply to Accidental Liquid Radwaste Release: (CFR 41.8 / 41.10 / 45.3) | ypes of radiation, their units of intensity and the location of the sources of radiation in a nuclear power plant ........... | T/G 1 / 2 | **RO 2.7 SRO 3.1** |
| **62** 2562 | **APE068 AA1.01** | **Control Room Evacuation** | Ability to operate and / or monitor the following as they apply to the Control Room Evacuation: (CFR 41.7 / 45.5 / 45.6) | S/G atmospheric relief valve ..................................... | T/G 1 / 2 | **RO 4.3 SRO 4.5** |
| **63** 2563 | **APE069 2.4.50** | **Loss of Containment Integrity** | APE069 GENERIC | Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3) | T/G 1 / 2 | **RO 4.2 SRO 4.0** |
| **64** 2564 | **EPE074 EA2.01** | **Inadequate Core Cooling** | Ability to determine or interpret the following as they apply to a Inadequate Core Cooling : (CFR 43.5 / 45.13) | Subcooling margin ............................................. | T/G 1 / 2 | **RO 4.6 SRO 4.9** |
| **65** 2565 | **WE09 EK3.1** | **Natural Circulation Operations** | Knowledge of the reasons for the following responses as they apply to the (Natural Circulation Operations) (CFR: 41.5 / 41.10, 45.6, 45.13) | 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. | T/G 1 / 2 | **RO 3.3 SRO 3.6** |
| **66** 2566 | **GEN2.1 2.1.25** | **GENERIC - Conduct of Operations** | Conduct of Operations | Ability to interpret reference materials, such as graphs, curves, tables, etc. (CFR: 41.10 / 43.5 / 45.12) | T/G 3 / 0 | **RO 3.9 SRO 4.2** |
| **67** 2567 | **GEN2.1 2.1.26** | **GENERIC - Conduct of Operations** | Conduct of Operations | Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen). (CFR: 41.10 / 45.12) | T/G 3 / 0 | **RO 3.4 SRO 3.6** |

| Question | K/A Number / K/A Description | | K/A System | K/A Description | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|---|
| **68** 2568 | **GEN2.2** Equipment Control | **2.2.25** | **GENERIC - Equipment Control** | Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits. (CFR: 41.5 / 41.7 / 43.2) | T/G 3 / 0 | **RO 3.2 SRO 4.2** |
| **69** 2569 | **GEN2.2** Equipment Control | **2.2.42** | **GENERIC - Equipment Control** | Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3) | T/G 3 / 0 | **RO 3.9 SRO 4.6** |
| **70** 2570 | **GEN2.3** Radiation Control | **2.3.14** | **GENERIC - Radiation Control** | Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (CFR: 41.12 / 43.4 / 45.10) | T/G 3 / 0 | **RO 3.4 SRO 3.8** |
| **71** 2571 | **GEN2.3** Radiation Control | **2.3.5** | **GENERIC - Radiation Control** | 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) | T/G 3 / 0 | **RO 2.9 SRO 2.9** |
| **72** 2572 | **GEN2.3** Radiation Control | **2.3.7** | **GENERIC - Radiation Control** | Ability to comply with radiation work permit requirements during normal orabnormal conditions. (CFR: 41.12 / 45.10) | T/G 3 / 0 | **RO 3.5 SRO 3.6** |
| **73** 2573 | **GEN2.4** Emergency Procedures / Plan | **2.4.17** | **GENERIC - Emergency Procedures / Plan** | Knowledge of EOP terms and definitions. (CFR: 41.10 / 45.13) | T/G 3 / 0 | **RO 3.9 SRO 4.3** |
| **74** 2574 | **GEN2.4** Emergency Procedures / Plan | **2.4.39** | **GENERIC - Emergency Procedures / Plan** | Knowledge of RO responsibilities in emergency plan implementation. (CFR: 41.10 / 45.11) | T/G 3 / 0 | **RO 3.9 SRO 3.8** |
| **75** 2575 | **GEN2.4** Emergency Procedures / Plan | **2.4.50** | **GENERIC - Emergency Procedures / Plan** | Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 41.10 / 43.5 / 45.3) | T/G 3 / 0 | **RO 4.2 SRO 4.0** |

| Question | K/A Number / K/A Description | K/A System | | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|
| **76** 2576 | **SYS003 2.1.20** SYS003 GENERIC | **Reactor Coolant Pump System (RCPS)** | Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12) | T/G 2 / 1 | **RO 4.6 SRO 4.6** |
| **77** 2577 | **SYS005 A2.02** Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) | **Residual Heat Removal System (RHRS)** | Pressure transient protection during cold shutdown .................... | T/G 2 / 1 | **RO 3.5 SRO 3.7** |
| **78** 2578 | **SYS061 A2.06** Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.13) | **Auxiliary / Emergency Feedwater (AFW) System** | Back leakage of MFW .......................................... | T/G 2 / 1 | **RO 2.7 SRO 3.0** |
| **79** 2579 | **SYS076 A2.01** 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: (CFR: 41.5 / 43.5 / 45/3 / 45/13) | **Service Water System (SWS)** | Loss of SWS .................................................. | T/G 2 / 1 | **RO 3.5* SRO 3.7*** |
| **80** 2580 | **SYS063 2.1.23** SYS063 GENERIC | **DC Electrical Distribution System** | Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 41.10 / 43.5 / 45.2 / 45.6) | T/G 2 / 1 | **RO 4.3 SRO 4.4** |

| Question | K/A Number / K/A Description | K/A System | | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|
| **81** 2581 | **SYS015 A2.01** 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: (CFR: 41.5 / 43.5 / 45.3 / 45.5) | **Nuclear Instrumentation System (NIS)** | Power supply loss or erratic operation ............................. | T/G 2 / 2 | **RO 3.5 SRO 3.9** |
| **82** 2582 | **SYS041 2.4.11** SYS041 GENERIC | **Steam Dump System (SDS)/Turbine Bypass Control** | Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13) | T/G 2 / 2 | **RO 4.0 SRO 4.2** |
| **83** 2583 | **SYS002 A2.02** Ability to (a) predict the impacts of the following malfunctions or operations on the RCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5) | **Reactor Coolant System (RCS)** | Loss of coolant pressure ........................................ | T/G 2 / 2 | **RO 4.2 SRO 4.4** |
| **84** 2584 | **APE015/017 AA2.02** Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): (CFR 43.5 / 45.13) | **Reactor Coolant Pump (RCP) Malfunctions** | Abnormalities in RCP air vent flow paths and/or oil cooling system ..... | T/G 1 / 1 | **RO 2.8 SRO 3.0** |
| **85** 2585 | **APE022 2.4.46** APE022 GENERIC | **Loss of Reactor Coolant Makeup** | Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12) | T/G 1 / 1 | **RO 4.2 SRO 4.2** |
| **86** 2586 | **APE027 AA2.10** Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions: (CFR: 43.5 / 45.13) | **Pressurizer Pressure Control System (PZR PCS) Malfunction** | PZR heater energized/de-energized condition ....................... | T/G 1 / 1 | **RO 3.3 SRO 3.6** |

| Question | K/A Number / K/A Description | K/A System | | Tier/Group | Importance RO/SRO |
|---|---|---|---|---|---|
| **87** 2587 | **EPE038 2.4.11** EPE038 GENERIC | **Steam Generator Tube Rupture (SGTR)** | Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13) | T/G 1 / 1 | **RO 4.0 SRO 4.2** |
| **88** 2588 | **APE058 AA2.02** Ability to determine and interpret the following as they apply to the Loss of DC Power: (CFR: 43.5 / 45.13) | **Loss of DC Power** | 125V dc bus voltage, low/critical low, alarm ......................... | T/G 1 / 1 | **RO 3.3* SRO 3.6** |
| **89** 2589 | **APE062 2.4.47** APE062 GENERIC | **Loss of Nuclear Service Water** | 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) | T/G 1 / 1 | **RO 4.2 SRO 4.2** |
| **90** 2590 | **APE003 2.2.40** APE003 GENERIC | **Dropped Control Rod** | Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3) | T/G 1 / 2 | **RO 3.4 SRO 4.7** |
| **91** 2591 | **APE069 AA2.02** Ability to determine and interpret the following as they apply to the Loss of Containment Integrity: (CFR: 43.5 / 45.13) | **Loss of Containment Integrity** | Verification of automatic and manual means of restoring integrity ....... | T/G 1 / 2 | **RO 3.9 SRO 4.4** |
| **92** 2592 | **APE076 2.4.11** APE076 GENERIC | **High Reactor Coolant Activity** | Knowledge of abnormal condition procedures. (CFR: 41.10 / 43.5 / 45.13) | T/G 1 / 2 | **RO 4.0 SRO 4.2** |
| **93** 2593 | **WE03 2.4.46** WE03 GENERIC | **LOCA Cooldown and Depressurization** | Ability to verify that the alarms are consistent with the plant conditions. (CFR: 41.10 / 43.5 / 45.3 / 45.12) | T/G 1 / 2 | **RO 4.2 SRO 4.2** |

| Question | K/A Number / K/A Description | K/A System | K/A Statement | Tier/Group | Importance RO | Importance SRO |
|---|---|---|---|---|---|---|
| **94** 2594 | **GEN2.1 2.1.4** Conduct of Operations | **GENERIC - Conduct of Operations** | Knowledge of individual licensed operator responsibilities related to shift staffing, such as medical requirements, "no-solo" operation, maintenance of active license status, 10CFR55, etc. (CFR: 41.10 / 43.2) | T/G 3 / 0 | **RO 3.3** | **SRO 3.8** |
| **95** 2595 | **GEN2.1 2.1.8** Conduct of Operations | **GENERIC - Conduct of Operations** | Ability to coordinate personnel activities outside the control room. (CFR: 41.10 / 45.5 / 45.12 / 45.13) | T/G 3 / 0 | **RO 3.4** | **SRO 4.1** |
| **96** 2596 | **GEN2.2 2.2.40** Equipment Control | **GENERIC - Equipment Control** | Ability to apply Technical Specifications for a system. (CFR: 41.10 / 43.2 / 43.5 / 45.3) | T/G 3 / 0 | **RO 3.4** | **SRO 4.7** |
| **97** 2597 | **GEN2.2 2.2.6** Equipment Control | **GENERIC - Equipment Control** | Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13) | T/G 3 / 0 | **RO 3.0** | **SRO 3.6** |
| **98** 2598 | **GEN2.3 2.3.12** Radiation Control | **GENERIC - Radiation Control** | 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) | T/G 3 / 0 | **RO 3.2** | **SRO 3.7** |
| **99** 2599 | **GEN2.3 2.3.14** Radiation Control | **GENERIC - Radiation Control** | Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (CFR: 41.12 / 43.4 / 45.10) | T/G 3 / 0 | **RO 3.4** | **SRO 3.8** |
| **100** 2600 | **GEN2.4 2.4.40** Emergency Procedures / Plan | **GENERIC - Emergency Procedures / Plan** | Knowledge of SRO responsibilities in emergency plan implementation. (CFR: 41.10 / 43.5 / 45.11) | T/G 3 / 0 | **RO 2.7** | **SRO 4.5** |

# FOR REVIEW ONLY - DO NOT DISTRIBUTE

## *Reference List for: 2010 MNS RO NRC Examination*

| *Question Number* | *Reference List* |
|---|---|
| 34 | U-1 Data Book Curve 1.8<br>EP Generic Enc G-1 End. 4 |
| 37 | Data Book Sect. 1.3 Enc. 4.3 |
| 40 | Steam Tables |
| 53 | Unit 1 & 2 Generator Capability Curves |
| 66 | EP/1/A/5000/F-0 Page 5 of 11 |

| | | | |
|---|---|---|---|
| Facility: McGuire | | Date of Examination: | 8/2/10 |
| Examination Level: | RO | Operating Test Number: | N10-1 |

| Administrative Topic (see Note) | Type Code* | Describe activity to be performed |
|---|---|---|
| Conduct of Operations | M, R | 2.1.37 (4.3) Knowledge of procedures, guidelines or limitations associated with reactivity management<br>JPM: Perform an ECP |
| Conduct of Operations | D, P, R | 2.1.25 (3.9) Ability to interpret reference materials, such as graphs, curves, tables, etc.<br>JPM: Determine Boric Acid Addition to FWST |
| Equipment Control | M, R | 2.2.12 (3.7) Knowledge of Surveillance Procedures.<br>JPM: Perform a Manual NC Leakage Calculation |
| Radiation Control | M, R | 2.3.11 (3.8) Ability to control radiation releases<br>JPM: Perform a Unit Vent Flow Calculation of a Containment Air Release |

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

*Type Codes & Criteria:
(C)ontrol room, **(0)** (S)imulator, **(0)** or Class(R)oom **(4)**
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) **(1)**
(N)ew or (M)odified from bank (≥ 1) **(3)**
(P)revious 2 exams (≤ 1; randomly selected) **(1)**

## RO Admin JPM Summary

A1a This is a modified JPM using Bank JPM-RT-RB:073 as its basis. The operator will be told that Reactor Startup is an hour away, and provided with a set of initial conditions. The operator will be asked to perform an Estimated Critical Position (ECP) in accordance with OP/0/A/6100/06 (Reactivity Balance Calculation), Enclosure 4.2 (Estimated Critical Rod Position). During the course of the ECP, the operator will be given a set of power history conditions, and asked to perform a Shutdown Fission Product Correction calculation in accordance with OP/0/A/6100/06 (Reactivity Balance Calculation), Enclosure 4.8 (Shutdown Fission Product Correction Calculation) in support of the ECP. This is the same JPM as the SRO Exam.

A1b This is a bank JPM, and previously used on the 2009 NRC Operating Test. The operator will be told that a leak, which is now isolated has lowered the FWST level to 440 inches, and that it has been decided to use the Recycle Holdup Tank (RHT) to refill the FWST. The operator will be told that Enclosure 4.4, (FWST Makeup Using the RHT), of OP/1/A/6200/014 (Refueling Water System) is in progress and completed through Step 3.9, and provided with Chemistry Data for the BAT and RHT. The operator will then be directed to determine the amount of Boric Acid needed to raise the FWST level to 480" using the RHT in accordance with Step 3.10 of Enclosure 4.4 of OP/1/A/6200/014 (Refueling Water System). The operator will be expected to calculate the amount of Boric Acid that must be added from the BAT to refill the FWST.

A2 This is a modified JPM using Bank JPMs ADM-NRC-A2-05 and 12 as its basis. The operator will be told that Unit 1 is at 100% power, the Unit 1 OAC point M1L4554 is out of service, and that PT/1/A/4200/040 (Reactor Coolant Leakage Detection) has been completed showing that NCS Leakage is 1.6 gpm. The operator will be given Enclosure 13.2 (NC Leakage Determination Using Manual Calculations) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) with the necessary raw data compiled on a Data Sheet; and directed to complete the calculations within the Enclosure. The operator will be expected to complete all calculations, and identify any Technical Specification Limits that have been exceeded.

A3 This is a modified JPM using Bank JPM ADM-NRC-A3-010 as its basis. The operator will be told that GWR Package # 2010013 for Unit 1 Containment Air Release is currently in use to conduct a series of Containment air releases, and that during the first release, conducted using Enclosure 4.2 (Air Release Mode With VQ Flow Monitor Operable) of OP/1/A/6450/017 (Containment Air Addition and Release), the Unit 1 VQ Monitor became inoperable. The operator will be told that the crew stopped the release and continued the air release using Enclosure 4.3 (Air Release Mode with VQ Flow Monitor Inoperable) of OP/1/A/6450/017 (Containment Air Addition and Release), and that three previous releases have been made; including the one which was made with the Unit 1 VQ Flow Monitor in operation. Finally, the operator will be provided with the pertinent data for the current release, and then be directed to calculate the volume released for the current release and to determine the total volume released from the Containment during all releases. The operator will be expected to calculate the volume of air released from the Containment during the final release, and determine the total volume of air released in the series of four releases.

| | | | |
|---|---|---|---|
| Facility: McGuire | | Date of Examination: | 8/2/10 |
| Examination Level: | SRO | Operating Test Number: | N10-1 |

| Administrative Topic (see Note) | Type Code* | Describe activity to be performed | |
|---|---|---|---|
| Conduct of Operations | M, R | 2.1.37 (4.6) | Knowledge of procedures, guidelines or limitations associated with reactivity management |
| | | JPM: | Perform an ECP |
| Conduct of Operations | D, P, R | 2.1.25 (4.2) | Ability to interpret reference materials, such as graphs, curves, tables, etc. |
| | | JPM: | Determine Boric Acid Addition to FWST |
| Equipment Control | M, R | 2.2.12 (4.1) | Knowledge of Surveillance Procedures. |
| | | JPM: | Perform/Review a Manual NC leakage Calculation |
| Radiation Control | M, R | 2.3.11 (3.8) | Ability to control radiation releases |
| | | JPM: | Perform a Unit Vent Flow Calculation of a Containment Air Release |
| Emergency Procedures/Plan | N, R | 2.4.44 (4.4) | Knowledge of emergency plan protective action recommendations. |
| | | JPM: | Provide an updated PAR |

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

*Type Codes & Criteria:

(C)ontrol room, **(0)** (S)imulator, **(0)** or Class(R)oom **(5)**
(D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) **(1)**
(N)ew or (M)odified from bank (≥ 1) **(4)**
(P)revious 2 exams (≤ 1; randomly selected) **(1)**

## SRO Admin JPM Summary

A1a This is a modified JPM using Bank JPM-RT-RB:073 as its basis. The operator will be told that Reactor Startup is an hour away, and provided with a set of initial conditions. The operator will be asked to perform an Estimated Critical Position (ECP) in accordance with OP/0/A/6100/06 (Reactivity Balance Calculation), Enclosure 4.2 (Estimated Critical Rod Position). During the course of the ECP, the operator will be given a set of power history conditions, and asked to perform a Shutdown Fission Product Correction calculation in accordance with OP/0/A/6100/06 (Reactivity Balance Calculation), Enclosure 4.8 (Shutdown Fission Product Correction Calculation) in support of the ECP. This is the same JPM as the RO Exam.

A1b This is a bank JPM, and previously used on the 2009 Operating Test. The operator will be told that a leak, which is now isolated has lowered the FWST level to 440 inches, below the Technical Specification Limit, and that it has been decided to use the Recycle Holdup Tank (RHT) to refill the FWST. The operator will be told that Enclosure 4.4 (FWST Makeup Using the RHT), of OP/1/A/6200/014 (Refueling Water System) is in progress and completed through Step 3.10, and provided with Chemistry Data for the BAT and RHT. The operator will then be directed to perform the Independent Verification (SRO aspect) of the calculation in Step 3.10 of Enclosure 4.4 to determine the amount of Boric Acid that must be added from the Boric Acid Tank (BAT), in order to raise the FWST Level to 480" using the RHT. The operator will discover two errors within the previous calculation, and determine the correct volume of Boric Acid to add. Following this, the operator will be given a makeup flowrate to the FWST and asked to identify the impact on the Technical Specification ACTION. The operator will be required to identify that ACTION C is applicable after one hour.

A2 This is a modified JPM using Bank JPMs ADM-NRC-A2-05 and 12 as its basis. The operator will be told that Unit 1 is at 100% power, the Unit 1 OAC point M1L4554 is out of service, and that PT/1/A/4200/040 (Reactor Coolant Leakage Detection) has been completed showing that NCS Leakage is 1.6 gpm. The operator will be given Enclosure 13.2 (NC Leakage Determination Using Manual Calculations) of PT/1/A/4150/001B (Reactor Coolant Leakage Calculation) with the necessary raw data compiled on a Data Sheet; and directed to complete the calculations within the Enclosure. The operator will be expected to complete all calculations in accordance with the provided Key, identify any Technical Specification Limits that have been exceeded, and (SRO aspect) identify with all Technical Specification ACTION.

A3 This is a modified JPM using Bank JPM ADM-NRC-A3-010 as its basis. The operator will be told that GWR Package # 2010013 for Unit 1 Containment Air Release is currently in use to conduct a series of Containment air releases, and that during the first release, conducted using Enclosure 4.2 (Air Release Mode

With VQ Flow Monitor Operable) of OP/1/A/6450/017 (Containment Air Addition and Release), the Unit 1 VQ Monitor became inoperable. The operator will be told that the crew stopped the release and continued the air release using Enclosure 4.3 (Air Release Mode with VQ Flow Monitor Inoperable) of OP/1/A/6450/017 (Containment Air Addition and Release), and that three previous releases have been made; including the one which was made with the Unit 1 VQ Flow Monitor in operation. Finally, the operator will be provided with the pertinent data for the current release, and then be directed to calculate the volume released for the current release and to determine the total volume released from the Containment during all releases. The operator will be expected to calculate the volume of air released from the Containment during the final release, and determine the total volume of air released in the series of four releases. This is the same JPM as the RO Exam.

A4 This is a new JPM. The operator will be placed in a post-accident condition with a Large Break LOCA with a release from the Containment. The operator will be told that a General Emergency has been declared, and provided with the initial Protective Action Recommendation (PAR). The operator will be given a subsequent set of plant conditions and meteorological data, and asked to provide an updated PAR in accordance with Enclosure 4.4 (Offsite Protective Recommendations) of RP/0/B/5700/029 (Notifications to Offsite Agencies from the Control Room). The operator will be expected to determine the Updated PAR for the subsequent conditions.

| | | | |
|---|---|---|---|
| Facility: | McGuire | Date of Examination: | 8/2/10 |
| Exam Level (circle one): | *RO (only)* / SRO(I) / **SRO (U)** | Operating Test No.: | N10-1 |

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 |
|---|---|---|
| a. 006 Emergency Core Cooling System<br>Transfer the NI Pumps from Cold Leg Recirc to Hot Leg Recirc | S, D, EN | 2 |
| **b. 005 Residual Heat Removal System**<br>**Respond to ND System Malfunction While at Mid Loop** | **S, D, A, L** | **4P** |
| **c. 056 Condensate System**<br>**Swap Hotwell/CM Booster Pumps** | **S, N, A** | **4S** |
| **d. 026 Containment Spray System**<br>**Manually Actuate Containment Spray System** | **S, P, D, A, EN** | **5** |
| e. APE 077 Generator Voltage and Electric Grid Disturbances<br>Separate From the Electrical Grid Due to Low Grid Frequency | S, N, A | 6 |
| f. 015 Nuclear Instrumentation System<br>Restore Repaired Power Range Channel to Service | S, P, M | 7 |
| g. 075 Circulating Water System<br>Isolate the Circulating Water System During Turbine Building Flooding | S, N | 8 |
| h. *010 Pressurizer Pressure Control System*<br>*Remove Pressurizer Heaters from Service* | *S, N, A* | *3* |

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

| System / JPM Title | Type Code* | Safety Function |
|---|---|---|
| i. EPE 029 ATWS<br>Locally Trip the Reactor | D, E | 1 |
| **j. 008 Component Cooling Water System**<br>**Makeup to the Unit 1 KC Surge Tanks** | **D, R, E** | **8** |
| **k. APE 057 Loss of Vital AC Electrical Instrument Bus**<br>Restore Power to KXB Power Panel Board Using Inverter SKX | **D, R, E** | **6** |

| @ | All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room. |
|---|---|
| * Type Codes | Criteria for RO / SRO-I / SRO-U |
| (A)lternate path | 4-6 (5) /4-6 (4) / 2-3 (3) |
| (C)ontrol room | |
| (D)irect from bank | ≤ 9 (6) /≤ 8 (6) / ≤ 4 (4) |
| (E)mergency or abnormal in-plant | ≥ 1 (3) /≥ 1 (3) / ≥ 1 (2) |
| (EN)gineered Safety Feature | - / - / ≥ 1 (1) (Control Room System) |
| (L)ow-Power / Shutdown | ≥ 1 (1) /≥ 1 (1) / ≥ 1 (1) |
| (N)ew or (M)odified from bank including 1(A) | ≥ 2 (5) / ≥ 2 (4) / ≥ 1 (1) |
| (P)revious 2 exams | ≤ 3 (2) / ≤ 3 (2)/ ≤ 2 (1) (Randomly Selected) |
| (R)CA | ≥ 1 (2 )/≥ 1 (2) / ≥ 1 (2) |
| (S)imulator | |

## JPM Summary

JPM A This is bank JPM-PS-NC-117. The operator will be told Unit 1 experienced a Loss of Coolant Accident six (6) hours ago, and that the plant is operating in the Cold Leg Recirculation mode. The operator will be directed to Transfer Recirculation to Hot Leg Recirc PER EP/1/A/5000/ES-1.4 (Transfer to Hot Leg Recirculation). The operator will be expected to align the NI System to the Hot Leg Recirc Mode.

JPM B This is bank JPM PS-ND-183A. The operator will be told that Unit 1 is in Mode 5 with the NC System drained to approximately 10 inches, that 1A ND Pump is in service to all four Cold Legs, and that ND flow has suddenly increased. The operator will be directed to implement AP/1/A/5500/19 (Loss of ND or ND System Leakage). The operator will be expected to take manual action to control flow, but recognize that attempts to manually control the RHR HX Outlet Valve and the Bypass Valve are ineffective (Alternate Path). The operator will be expected to throttle ND flow to less than 3000 gpm using the Cold Leg injection valve(s) and position the ND Heat Exchanger Outlet Manual Loaders so that when these valves are repaired, the ND flow will not be affected.

JPM C This is a new JPM. The operator will be told that Unit 1 is operating at 90% power in preparation for a Condensate System Pump Swap. The operator will be directed to start the C Hotwell Pump, and place the A Hotwell Pump in standby, and then start the C Condensate Booster Pump and place the A Condensate Booster Pump in standby using Enclosure 4.5 of OP/1/A/6250/001 (Condensate and Feedwater System). The operator will be expected to swap both sets of pumps in accordance with the procedure. During the course of swapping the Condensate Booster Pumps, the operator will recognize that the C Hotwell Pump Strainer High ΔP Annunciator will alarm (Alternate Path). The operator will be expected to use the Annunciator Response Procedure and re-start the A Hotwell Pump, and stop the C Hotwell Pump.

JPM D This JPM is a bank JPM, and was previously used on the 2008 NRC Operating Test. The operator will be placed in a Post-Reactor Trip situation and told that the crew has progressed from EP/1/A/5000/E-0 (Reactor Trip and/or Safety Injection) to EP/1/A/5000/ES-0.1 (Reactor Trip Response) due to a reactor trip. The operator will be told that after entry into ES-0.1 a LOCA occurs inside the Containment causing a Safety

Injection; and that the crew has now left ES-0.1 for EP/1/A/5000/FR-Z.1 (Response to High Containment Pressure) due to the Orange Path condition on the Containment Critical Safety Function, completing steps 1-9. The operator will be directed to check the NS System in Operation in accordance with step 10 of FR-Z.1. Although Containment Pressure will be > 3 psig, automatic actuation of Containment Spray (NS) will have failed. Additionally, the NS manual actuators will fail to operate requiring that the operator take manual action to start the NS Pumps and open the discharge valves. The operator will need to manually open the NS Pump discharge valves and manually start the NS Pumps. When attempts are made to manually open the A Train discharge valves, they will not open (Alternate Path), requiring the operator to make no attempt to start the 1A NS pump.

JPM E This is a new JPM. With the plant at 77% power, the operator will be told that the crew has entered AP/1/A/5500/05 (Generator Voltage and Electrical Grid Disturbances) due to low Electrical Grid frequency, and that the procedure is completed up to Step 15. The operator will be directed to separate from the Electrical Grid without delay in accordance with Step 15 of AP/1/A/5500/05 (Generator Voltage and Electrical Grid Disturbances). Since plant power is greater than 60%, the operator will be required to reduce load. When the operator attempts to operate the turbine in automatic, Turbine power will fail to lower (Alternate Path). The operator will be expected to recognize that the Turbine has failed, and lower power manually, and then disconnect the Turbine Generator from the Electrical Grid.

JPM F This JPM is a modified version of a similar JPM used on the 2009 NRC Operating Test. The Operator will be placed in a situation with Unit 1 at 100% power. The operator will be told that Power Range Channel N43 has previously failed low, and that the channel has been defeated in accordance with AP/1/A/5500/16, "Malfunction of Nuclear Instrumentation," Case III, "Power Range Malfunction." The operator will be asked to restore Power Range Channel N43 to service in accordance with Step 21 of AP16, "Malfunction of Nuclear Instrumentation," Case III, "Power Range Malfunction." The operator will be required to restore the channel to service in accordance with the procedure.

JPM G This is a new JPM. The operator will be told that there is massive flooding in the Turbine Building and that the crew has implemented AP/0/A/5500/44 (Plant Flooding), Enclosure 1 (Unit 1 Turbine Bldg Flooding). The operator will be directed to isolate the RC System by performing steps 6.d-v of the procedure, while the crew continues with EP/1/A/5000/E-0 (Reactor Trip and/or Safety Injection). The operator will be expected to take all pump and valve control switch manipulations to isolate the RC System. This task was chosen because Internal Flooding events are a large PRA contributor (15% CDF). This is a Time Critical JPM that must be complete in 40 Minutes.

JPM H This is a new JPM. The operator will be told that plant power has just been raised to 100% per OP/1/A/6100/003 (Controlling Procedure for Unit Operation). The operator will be directed to remove Pzr Heater Groups A, B and D from service per Enclosure 4.6 (Operation of Pzr Heaters) of OP/1/A/6100/003. The operator will be expected to remove the A, B and D Pzr Heater Groups from service in accordance with Step 3.4.4 of Enclosure 4.6. After the Pzr Pressure Master has been placed in MANUAL and its output has been adjusted, the Pzr variable Heaters (Group C) will fail (Alternate Path). The operator will be required to respond to MCB Annunciator 1AD6/D6 (PZR HTR CONTROLLER TROUBLE), and manually control pressure using the other heater groups. The operator will be expected to place at least one Pzr Heater Group in service in accordance with Step 3.3.1 (or equivalent) of Enclosure 4.6.

JPM I This is Bank JPM IC-RTB-016. The Operator will be told that Unit 1 is at 100% power when an ATWS occurred, and that the operating crew has entered EP/1/A/5000/FR-S.1 (Response to Nuclear Power Generation/ATWS). The operator will be directed to locally trip the reactor in accordance with Step 8.a RNO of FR-S.1. The operator will be expected to locally trip both Unit 1 Reactor Trip Breakers and shutdown both Rod Drive MG Sets.

JPM J This is bank JPM PSS-KC-165T. The operator will be told that Unit 1 is operating at 100% power when the KC Surge Tank A and B lo level computer alarms are received, that the surge tank levels are 3.9 feet and decreasing, and that AP/1/A/5500/21 (Loss of KC or KC System Leakage) has been implemented. Since the YM System will be out of service, the operator will be directed to initiate makeup to both Unit 1 KC Surge Tanks per AP/1/A/5500/21 (Loss of KC or KC System Leakage), Enclosure 3 (Aligning RN Makeup to KC Surge Tank). This is a Time Critical JPM. The operator will be expected to manipulate valves, and communicate with the C/R to restore KC Surge Tank level within ten minutes of dispatch. This is a Time Critical JPM that must be complete in 10 Minutes.

JPM K This is bank JPM EL-EPK-199. The operator will be told that AP/1/A/5500/15 (Loss of Vital or Aux Control Power) has been implemented due to a loss of Aux Control Power Panel Board KXB, and that prior to the event, all electrical systems were aligned in their normal operating configurations. The operator will be directed to energize KXB using inverter SKX per Enclosure 24 of AP/1/A/5500/15 (Loss of Vital or Aux Control Power). The operator will be expected to align Inverter SKX to provide power to KXB power panel board.