### Form 4.1-PWR Pressurized-Water Reactor Examination Outline

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

Notes: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control;

EM = Emergency Procedures/Plan

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

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

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| Form 4.1-PWR PWR Examination Outline Page 2 Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO) | | | | | | | | | | | | | | | | | | | |
| E/APE # / Name | | K1 | K2 | K3 | A1 | | A2 | | G | | K/A Topic(s) | | | | | IR | | # | |
| 000007 (EPE 7; BW E02&E10; CE E02)  Reactor Trip, Stabilization, Recovery | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000008 (APE 8) Pressurizer Vapor Space  Accident | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000009 (EPE 9) Small-Break LOCA | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000011 (EPE 11) Large-Break LOCA | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000015 (APE 15) Reactor Coolant Pump  Malfunctions | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000022 (APE 22) Loss of Reactor Coolant Makeup | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000025 (APE 25) Loss of Residual Heat Removal System | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000026 (APE 26) Loss of Component Cooling Water | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000027 (APE 27) Pressurizer Pressure Control System Malfunction | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000029 (EPE 29) Anticipated Transient Without Scram | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000038 (EPE 38) Steam Generator Tube  Rupture | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000040 (APE 40; BW E05; CE E05; W E12)  Steam Line Rupture—Excessive Heat Transfer | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000054 (APE 54; CE E06) Loss of Main  Feedwater | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000055 (EPE 55) Station Blackout | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000056 (APE 56) Loss of Offsite Power | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000057 (APE 57) Loss of Vital AC Instrument Bus | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000058 (APE 58) Loss of DC Power | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000062 (APE 62) Loss of Service Water | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000065 (APE 65) Loss of Instrument Air | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| 000077 (APE 77) Generator Voltage and Electric Grid Disturbances | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| (W E04) LOCA Outside Containment | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| (W E11) Loss of Emergency Coolant Recirculation | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| (BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
|  | |  |  |  |  | |  | |  | |  | | | | |  | |  | |
| K/A Category Totals: | |  |  |  |  | |  | |  | | Group Point Total: | | | | | | | 18/6 | |
| Form 4.1-PWR PWR Examination Outline Page 3  Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO) | | | | | | | | | | | | | | | | | | | |
| E/APE # / Name | | | | | K1 | | K2 | | K3 | | A1 | A2 | G | K/A Topic(s) | | IR | | # | |
| 000001 (APE 1) Continuous Rod Withdrawal | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000003 (APE 3) Dropped Control Rod | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000005 (APE 5) Inoperable/Stuck Control Rod | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000024 (APE 24) Emergency Boration | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000028 (APE 28) Pressurizer Level Control Malfunction | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000032 (APE 32) Loss of Source Range Nuclear Instrumentation | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000036 (APE 36; BW/A08) Fuel Handling Incidents | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000037 (APE 37) Steam Generator Tube Leak | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000051 (APE 51) Loss of Condenser Vacuum | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000059 (APE 59) Accidental Liquid Radwaste Release | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000060 (APE 60) Accidental Gaseous Radwaste Release | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000061 (APE 61) Area Radiation Monitoring System Alarms | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000067 (APE 67) Plant Fire On Site | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000068 (APE 68; BW A06) Control Room Evacuation | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000069 (APE 69; W E14) Loss of Containment Integrity | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000074 (EPE 74; W E06 & E07) Inadequate Core Cooling | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000076 (APE 76) High Reactor Coolant Activity | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| 000078 (APE 78\*) RCS Leak | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (W E01 & E02) Rediagnosis & SI Termination | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (W E13) Steam Generator Overpressure | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (W E15) Containment Flooding | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (W E16) High Containment Radiation | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW A01) Plant Runback | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW A02 & A03) Loss of NNI-X/Y | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW A04) Turbine Trip | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW A05) Emergency Diesel Actuation | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW A07) Flooding | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW E03) Inadequate Subcooling Margin | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW E08; W E03) LOCA Cooldown—Depressurization | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW E09; CE A13\*\*; W E09 & E10) Natural Circulation | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (BW E13 & E14) EOP Rules and Enclosures | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (CE A11\*\*; W E08) RCS Overcooling—Pressurized Thermal Shock | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (CE A16) Excess RCS Leakage | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (CE E09) Functional Recovery | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| (CE E13\*) Loss of Forced Circulation/LOOP/Blackout | | | | |  | |  | |  | |  |  |  |  | |  | |  | |
| K/A Category Point Totals: | | | | |  | |  | |  | |  |  |  | Group Point Total: | |  | | 8/4 | |

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| Form 4.1-PWR PWR Examination Outline Page 4 Plant Systems—Tier 2/Group 1 (RO/SRO) | | | | | | | | | | | | | | |
| System # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | K/A Topic(s) | IR | # |
| 003 (SF4P RCP) Reactor Coolant Pump |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 004 (SF1; SF2 CVCS) Chemical and Volume Control |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 005 (SF4P RHR) Residual Heat Removal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 006 (SF2; SF3 ECCS) Emergency Core Cooling |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 007 (SF5 PRTS) Pressurizer Relief/Quench Tank |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 008 (SF8 CCW) Component Cooling Water |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 010 (SF3 PZR PCS) Pressurizer Pressure Control |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 012 (SF7 RPS) Reactor Protection |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 013 (SF2 ESFAS) Engineered Safety Features Actuation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 022 (SF5 CCS) Containment Cooling |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 025 (SF5 ICE) Ice Condenser |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 026 (SF5 CSS) Containment Spray |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 039 (SF4S MSS) Main and Reheat Steam |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 059 (SF4S MFW) Main Feedwater |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 061 (SF4S AFW)  Auxiliary/Emergency Feedwater |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 062 (SF6 ED AC) AC Electrical Distribution |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 063 (SF6 ED DC) DC Electrical Distribution |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 064 (SF6 EDG) Emergency Diesel Generator |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 073 (SF7 PRM) Process Radiation Monitoring |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 076 (SF4S SW) Service Water |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 078 (SF8 IAS) Instrument Air |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 103 (SF5 CNT) Containment |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 053 (SF1; SF4P ICS\*) Integrated Control |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| K/A Category Point Totals: |  |  |  |  |  |  |  |  |  |  |  | Group Point Total: | | 28/5 |

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| Form 4.1-PWR PWR Examination Outline Page 5 Plant Systems—Tier 2/Group 2 (RO/SRO) | | | | | | | | | | | | | | | | | |
| System # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | K/A Topic(s) | IR | | # | |
| 001 (SF1 CRDS) Control Rod Drive |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 002 (SF2; SF4P RCS) Reactor  Coolant |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 011 (SF2 PZR LCS) Pressurizer Level Control |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 014 (SF1 RPI) Rod Position Indication |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 015 (SF7 NI) Nuclear Instrumentation |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 016 (SF7 NNI) Nonnuclear Instrumentation |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 017 (SF7 ITM) In-Core Temperature Monitor |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 027 (SF5 CIRS) Containment Iodine Removal |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 028 (SF5 HRPS) Hydrogen Recombiner and Purge Control |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 029 (SF8 CPS) Containment Purge |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 033 (SF8 SFPCS) Spent Fuel Pool Cooling |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 034 (SF8 FHS) Fuel Handling Equipment |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 035 (SF 4P SG) Steam Generator |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 041 (SF4S SDS) Steam  Dump/Turbine Bypass Control |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 045 (SF 4S MT/G) Main Turbine Generator |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 055 (SF4S CARS) Condenser Air Removal |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 056 (SF4S CDS) Condensate |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 068 (SF9 LRS) Liquid Radwaste |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 071 (SF9 WGS) Waste Gas Disposal |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 072 (SF7 ARM) Area Radiation Monitoring |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 075 (SF8 CW) Circulating Water |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 079 (SF8 SAS\*\*) Station Air |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 086 (SF8 FP) Fire Protection |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| 050 (SF 9 CRV\*) Control Room Ventilation |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
|  |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  | |
| K/A Category Point Totals: |  |  |  |  |  |  |  |  |  |  |  | Group Point Total: | |  | | 9/3 | |

### Form 4.1-COMMON Common Examination Outline

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Facility: Date of Exam: | | | | | | | | | |
| **Generic Knowledge and Abilities—Tier 3 (RO/SRO)** | | | | | | | | | |
| Category | K/A # | | Topic | RO | | | SRO-Only | | |
| IR | | # | IR | | # |
| 1.  Conduct of Operations | 2.1. | |  |  | |  |  | |  |
| 2.1. | |  |  | |  |  | |  |
| 2.1. | |  |  | |  |  | |  |
| 2.1. | |  |  | |  |  | |  |
| Subtotal | | | N/A | |  | N/A | |  |
| 2.  Equipment Control | 2.2. | |  |  | |  |  | |  |
| 2.2. | |  |  | |  |  | |  |
| 2.2. | |  |  | |  |  | |  |
| 2.2. | |  |  | |  |  | |  |
| Subtotal | | | N/A | |  | N/A | |  |
| 3.  Radiation Control | 2.3. | |  |  | |  |  | |  |
| 2.3. | |  |  | |  |  | |  |
| 2.3. | |  |  | |  |  | |  |
| Subtotal | | | N/A | |  | N/A | |  |
| 4.  Emergency Procedures/  Plan | 2.4. | |  |  | |  |  | |  |
| 2.4. | |  |  | |  |  | |  |
| 2.4. | |  |  | |  |  | |  |
| Subtotal | | | N/A | |  | N/A | |  |
| **Tier 3 Point Total** | | | |  | | **6** |  | | **7** |
| **Theory—Tier 4 (RO)** | | | | | | | | | |
| Category | | K/A # | Topic | | RO | | | | |
| IR | | | # | |
| Reactor Theory | | 6 |  | |  | | |  | |
| 6 |  | |  | | |  | |
| 6 |  | |  | | |  | |
| Subtotal | | | N/A | | |  | |
| Thermodynamics | | 6 |  | |  | | |  | |
| 6 |  | |  | | |  | |
| 6 |  | |  | | |  | |
| Subtotal | | | N/A | | |  | |
| **Tier 4 Point Total** | | | | |  | | | **6** | |

### Form 4.1-1 Record of Rejected Knowledge and Abilities

Refer to Examination Standard (ES)-4.2, “Developing Written Examinations,” Section B.3, for deviations from the approved written examination outline.

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| Tier/Group | Randomly Selected K/A | Reason for Rejection |
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