| Facility: Callaway | | Date of Examination: | 6/19/2009 |
|---|---|---|---|
| Examination Level: | RO | Operating Test Number: | |

| Administrative Topic (see Note) | Type Code* | Describe activity to be performed | |
|---|---|---|---|
| Conduct of Operations | P, R | 015 A1.04 (3.5) | Ability to predict and/or monitor changes in parameters to prevent exceeding design limits associated with operating the NIS controls including Quadrant Power Tilt Ratio |
| | | JPM: | Perform a QPTR Calculation |
| Conduct of Operations | N, R | 2.1.25 (3.9/4.2) | Ability to interpret reference materials such as graphs, curves, tables, etc. |
| | | JPM: | Determine RV Venting Time (EOP ADD 33) |
| Equipment Control | D, R | 2.2.13 (4.1) | Knowledge of tagging and clearance procedures. |
| | | JPM: | Tag out "B" Bulk Chemical Acid Transfer Pump (PKS02B) |
| Emergency Procedures/Plan | M, R | 2.4.39 (3.9) | Knowledge of RO responsibilities in emergency plan implementation. |
| | | JPM: | Visitor Control During an Event |

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
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)
(S)imulator

## RO Admin JPM Summary

A1a This is bank JPM ILE-A001-RO. It was used on the 2005 NRC Exam, but the values provided will differ from those given in 2005. In the 2005 exam, the candidate was cued as to the value of the NI detector currents. During this exam the candidate will be given a set of values that reflect what is being seen in the plant. He will then use this data to calculate Quadrant Power Tilt Ratio using the most current Curve Book and the surveillance procedure. Therefore, the values calculated will differ from those on the 2005 exam.

A1b This is a new JPM. The candidate is to determine the maximum RV Venting time using EOP Addendum 33. A marked up FR-I.3 will be provided.

A2 This is bank JPM ILE-A012-RO. Requires the candidate to prepare Workers Protection Assurance (WPA) / tagout on a Bulk Chemical Acid Transfer Pump.

A4 This is a Modified JPM obtained from a Ft. Calhoun Station NRC exam and made to be Callaway specific. This JPM requires that the candidate, as a newly licensed Reactor Operator, state where to escort a visitor under his control while in the Protected area and then to state where he is required to report following the previous actions. This is in accordance with the Callaway Emergency Plan.

| Facility: Callaway | | Date of Examination: 6/19/2009 | |
|---|---|---|---|
| Examination Level: | SRO | Operating Test Number: | |

| Administrative Topic (see Note) | Type Code* | Describe activity to be performed | |
|---|---|---|---|
| Conduct of Operations | D, P, R | 015 A1.04 (3.5) | Ability to predict and/or monitor changes in parameters to prevent exceeding design limits associated with operating the NIS controls including Quadrant Power Tilt Ratio |
| | | JPM: | Perform a QPTR Calculation |
| Conduct of Operations | D, R | 2.1.18 (3.8) | Ability to make accurate, clear, and concise logs, records, status boards, and reports. |
| | | JPM: | Determine Reportability Requirements |
| Equipment Control | D, S | 2.2.13 (4.3) | Knowledge of tagging and clearance procedures. |
| | | JPM: | Review WPA for "B" Bulk Chemical Acid Transfer Pump |
| Radiation Control | N, R | 2.3.4 (3.7) | Knowledge of radiation exposure limits under normal or emergency conditions. |
| | | JPM: | Determine if Dose limits will be exceeded |
| Emergency Plan | D, R | 2.4.41 (4.6) | Knowledge of the emergency action level thresholds and classifications. |
| | | JPM: | Emergency Event Classification |

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
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)
(S)imulator

## SRO Admin JPM Summary

A1a This is bank JPM ILE-A001-RO. It was used on the 2005 NRC Exam, but the values provided will differ from those given in 2005. In the 2005 exam, the candidate was cued as to the value of the NI detector currents. During this exam the candidate will be given a set of values that reflect what is being seen in the plant. He will then use this data to calculate Quadrant Power Tilt Ratio using the most current Curve Book and the surveillance procedure. Therefore, the values calculated will differ from those on the 2005 exam.

A1b This is bank JPM ILE-A025-SRO. Given a set of conditions, the SRO candidate will be required to inform the examiner of the time requirement and the agency requiring notification.

A2 This is bank JPM ILE-A013-SRO. Given a copy of Workers Protection Assurance (WPA) on a Bulk Chemical Acid Transfer the Pump, the SRO candidate will review the package for any apparent errors in its preparation.

A3 This is a new JPM. The SRO candidate will be given a set of conditions and the appropriate procedures in an emergency radiological situation. The SRO candidate, acting as the Emergency Coordinator, will determine the amount of allowed dose to be extended to a recently hired employee in this scenario.

A4 This is bank JPM ILE-A008-SRO. Given a set of conditions and a timeline of events, the SRO candidate will determine the correct Emergency Action level using the EAL charts provided.

| Facility: Callaway | | Date of Examination: 6/19/2009 | |
|---|---|---|---|
| Exam Level (circle one): *RO (only)*/SRO(I) / **SRO (U)** | | Operating Test No.: | |
| 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. | 001 Control Rod Drive System<br>Perform Control Rod Partial Movement Test | D, S | 1 |
| b. | **004 Chemical and Volume Control System**<br>**Remove Excess Letdown From Service** | **D, S** | **2** |
| c. | 010 Pressurizer Pressure Control System<br>Stuck Open Pressurizer Spray Valve | N, S, A, L, E | 3 |
| d. | **059 Main Feedwater System**<br>**Transfer S/G Level Control From Aux. Feed to Main Feed** | **D, S, L** | **4S** |
| e. | **026 Containment Spray System**<br>**Manually Actuate Containment Spray System** | **N, S, A, L** | **5** |
| f. | 062 AC Electrical Distribution<br>Energize / De-Energize Load Center NG01 | D, S, L | 6 |
| g. | 029 Containment Purge System<br>Re-establish Containment Purge After Isolation | N, S | 8 |
| *h.* | *015 Nuclear Instrumentation System*<br>*Respond to a Failed Power Range Instrument* | *D, S* | *7* |
| In-Plant Systems@ (3 for RO; 3 for SRO-I; 3 or 2 for **SRO-U**) | | | |
| i. | 064 Emergency Diesel Generators<br>NE01 Pre-start Checks | D, A | 6 |
| j. | **078 Instrument Air System**<br>**Respond to Loss of Instrument Air** | **D, A, E** | **8** |
| k. | **003 Reactor Coolant Pump System**<br>**Local RCP Seal Isolation** | **D, A, E, L** | **4P** |

| @ | 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 ( 5 ) / 2-3 ( 3 ) |
| (C)ontrol room | |
| (D)irect from bank | ≤ 8 ( 8 ) / ≤ 8 ( 8 ) / ≥ 4 ( 4 ) |
| (E)mergency or abnormal in-plant | ≥ 1 ( 3 ) / ≥ 1 ( 3 ) / ≥ 1 ( 2 ) |
| (L)ow-Power / Shutdown | ≥ 1 ( 5 ) / ≥ 1 ( 5 ) / ≥ 1 ( 3 ) |
| (N)ew or (M)odified from bank including 1(A) | ≥ 2 ( 3 ) / ≥ 2 ( 3 ) / ≥ 1 ( 1 ) |
| (P)revious 2 exams (randomly selected) | ≤ 3 ( 0 ) / ≤ 3 ( 0 ) / ≤ 2 ( 0 ) |
| (R)CA | ≥ 1 ( 1 ) / ≥ 1 ( 1 ) / ≥ 1 ( 1 ) |
| (S)imulator | |

## JPM Summary

JPM A - Bank JPM URO-SSF01C05J, Perform Control Rod Partial Movement Test. This JPM has the candidate operate the Control Rod Drive System by inserting rods in Shutdown Bank "A" at least 12 steps and then returning them to the their previous position.

JPM B - Bank JPM URO-SBG04C47J, Remove Excess Letdown From Service. This JPM starts with Normal and excess Letdown in Service and requires the candidate to remove the excess letdown system from service and verify RCP Seal Water Leakoff is adequate.

JPM C - NEW JPM - 010 Pressurizer Pressure Control System Stuck Open Spray Valve. This Alternate Path JPM starts with the plant at power. A pressurizer spray valve then fails open and cannot be closed manually from the main control board. This will require the candidate to trip the reactor and stop 2 Reactor Coolant Pumps in order to stop the Pressurizer spray / depressurization.

JPM D - Bank JPM URO-SAE02C46J, Transfer S/G Level Control From Aux. Feed to Main Feed. This JPM starts in Mode 2 with the "B" Main Feed Pump running and both Motor Driven Auxiliary Feed Pumps running to Maintain Steam Generator Level. The candidate will be required to place main feed in control and prepare to shutdown the auxiliary feed water system.

JPM E - NEW JPM - 026 Containment Spray System, Manually Actuate Containment Spray System. This Alternate Path JPM starts with the Reactor tripped and containment Pressure elevated due to a Large Break LOCA. Containment pressure exceeds the Containment Spray Actuation System setpoint, but Containment spray does not actuate. The candidate will be given Attachment A of E-0, Reactor Trip or Safety Injection and told to complete Containment Spray verification.

JPM F - Bank JPM URO-SNG1C82J, Energize / De-Energize Load Center NG01. This JPM starts with the plant in a Mode that allows all loads to be stripped from NG01. The candidate will de-energize NG01 and then re-energize the bus.

JPM G - NEW JPM - 029 Containment Purge System, Re-establish Containment Purge After Isolation. This JPM has the candidate restore Containment Purge following an inadvertent Containment Purge Isolation. The candidate will end up re-establishing Containment Mini-purge to the containment.

JPM H - Bank JPM URO-SSE03C126J, Respond to a Failed Power Range Instrument. This JPM will start at some at power initial condition. Power Range Channel N42 will fail high. The candidate will operate the Nuclear Instrumentation system at the back panels in order to defeat the affected channel.

JPM I - Bank JPM EOS-SNE11048J(A), NE01 Pre-start Checks. This Alternate Path JPM has the candidate perform all of the local pre-start checks on the "A" Diesel Generator. There are two different Alternate Path sections, 1) Rocker Oil Reservoir High level is in alarm – requiring the candidate to drain the reservoir, 2) Limit switch is Engaged for the Overspeed Trip and Silver Knob is NOT pulled out – requiring the candidate to explain to the examiner how to reset the overspeed. The candidate will proceed until the step requiring control room actions.

JPM J - Bank JPM EOS-SKA11040J, Respond to Loss in Instrument Air. This Alternate Path JPM has the candidate simulate the local actions at the Air Compressors for a Loss of Instrument Air. When the candidate is verifying all of the compressors running, he is informed that the "B" Air Compressor has zero oil pressure and is making excessive noise. This will require the candidate to stop the air compressor and close its discharge valve as an alternate path. The candidate will then inform the control room of this status.

JPM K - Bank JPM EOS-AEO05061J(A), Local RCP Seal Isolation. This Alternate Path JPM has the candidate simulate isolating RCP seals per EOP Addendum 22. This JPM will take place inside the RCA. The alternate path comes when trying to isolate BGV0106, he finds it will not close, requiring the candidate to take actions per the "Response Not Obtained" (RNO) column in the procedure. Cues are given at some points in the JPM to prevent excessive movement to different levels of the Auxiliary Building. The JPM will be complete when all steps of EOP Addendum have been completed.

| | | | | |
|---|---|---|---|---|
| Facility: | Callaway | Scenario No.: | 1 | Op Test No.: |
| Examiners: | | Operators: | | |
| | | | | |
| | | | | |

| | |
|---|---|
| Initial Conditions: | The following is the plant /equipment status:<br>• Operating at 100% steady state power<br>• MDAFP "B" OOS for an oil change. Scheduled for completion on the PM shift. (Activate Lesson "al01b.lsn")<br>TS 3.7.5 Condition C, 72 hours |
| | |

| Event No. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| A | N/A | N, R (all) | Reduce Power to 95% for turbine valve testing |
| 1 | BBPT0455 | I (RO/SRO)<br>I - TS - SRO | Pressurizer Pressure Channel Failure<br>Insert Malfunction (BB) BBPT0455, Value= 1700 |
| 2 | JEPS209L | C (all) | Loss of ESF Bus NB02<br>Insert Remote Function (NB) JEPS209L, Value= Trip |
| 3 | ABPV00001_1 | C (BOP)<br>C–TS- SRO | "A" Atmospheric Steam Dump Fails Open<br>Insert Malfunction (AB), ABV0001_1, Value = 1, ramp = 20s |
| 4 | BBTE421A1 | I (RO) | RCS Loop RTD Failure<br>Insert Malfunction (BB) BBTE0421A1, Value = 650 |
| 5 | SF006 | C (all) | Nuclear Power Generation Accident / ATWS<br>Insert Malfunction (SF) SF006, Value = Both |
| 6 | EBB01C | M (all) | Steam Generator Tube Rupture<br>Insert Malfunction (BB) EBB01C, Value= 400, time delay = 10 sec, ramp = 300 secs, conditional of "jcrftr eq true" |
| 7 | BG | C (RO) | CCP Auto Start Failure<br>Insert Remote Function (BG) JLOASBI8_3, Value = Inhibit |
| | | | Same as SE: 2 |

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

**Callaway 2009 NRC Scenario #1**

This unit is at 100% steady state power. MDAFP B is out of service for scheduled maintenance.

Reduce power to 95% to perform turbine valve testing IAW OSP-AC-00003, Turbine Valve Stroke Test.

Pressurizer Pressure Channel 455 fails low. The crew should respond per OTO-BB-00006, Pressurizer Pressure Control Malfunction, defeat control system channel input and stabilize RCS pressure. I&C should be contacted to trip protective bistables and repair the failed channel.

A bus lockout occurs on NB02. The emergency diesel NE02 starts but the output breaker will not close due to the lockout condition. The crew should respond per OTO-NB-00002, Loss of Power to NB02. They will ensure reactor power <100%, throttle Auxiliary Feedwater flow, refer to Tech Specs and direct Electrical Maintenance to perform required testing and repairs.

After the plant is stabilized "A" SG Atmospheric Steam Dump fails open with a 20 sec. ramp is inserted. The crew will respond using OTO-AB-00001, STEAM DUMP MALFUNCTION.

RCS Loop 2 Thot RTD fails high, resulting in an OT$\Delta$T trip signal. The reactor fails to trip automatically and manually. The crew should enter FR-S.1, Response to Nuclear Power Generation/ATWS. The reactor will be shutdown approximately two minutes after PG19 and PG20 feeder breakers are opened due to the rod drive MG set coast down.

10 seconds after the Reactor Trip, a Tube Rupture occurs on Steam Generator C. The tube rupture will ramps to 250 gpm resulting in a Safety Injection. The crew should complete FR-S.1 and transition to E-0, Rx Trip or Safety Injection. CCP A will fail to start automatically and will have to be started manually. The crew will then transition to E-3, Steam Generator Tube Rupture. The scenario is complete when RCS cooldown is commenced.

A Site Emergency should be declared based on EAL SS2.1, Failure of the Reactor Protection System, or EAL FS1.1, SGTR supplying the TD AFP which is a loss of RCS and Containment Barrier.

**Critical Tasks:**

Event #1 CT – Control Pressurizer Pressure to prevent an automatic Reactor trip due to the failed channel.

Event #5 CT – Insert negative Reactivity into the core by at least one of the following methods before completing immediate actions steps of FR-S.1

- De-energize PG19 and PG20
- Insert Control Rods
- Establish emergency boration flow

Event #7 CT – Establish flow from at least one high head ECCS pump before a transition from E-0.

Event #6 CT – Isolate Feedwater flow into and steam flow from SG C before a transition to ECA-3.1 occurs.

| References |
|---|
| OTG-ZZ-00004 |
| OTG-ZZ-00004, ADD 03 |
| OSP-AC-00003 |
| OTO-BB-00006 |
| OTO-NB-00002 |
| OTO-AB-00001 |
| E-0 |
| FR-S.1 |
| E-3 |
| EIP-ZZ-00101 |
| CSF-1, Attachment A |

| | | | | |
|---|---|---|---|---|
| Facility: | Callaway | Scenario No.: | 2 | Op Test No.: |
| Examiners: | | Operators: | | |

change to 65%

| | |
|---|---|
| Initial Conditions: | The following is the plant /equipment status:<br>• 50% steady state power<br>• ~~NE~~02 OOS (Activate Lesson "ne01b.lsn")<br>• TS 3.8.1.B, This Date, 0500<br>• OSP-NE-00003, 72 hours due in 4 hours<br>• **Ensure SG level channel 539 is selected for control** |
| Turnover: | |

| Event No. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| A | | ~~N, R (All)~~ R(RO) N(BOP, SRO) | Increase power to 65% |
| 1 | FBG04A | C (RO/SRO) | Seal Injection Filter "A" Clogs<br>Insert Malfunction (BG) FBG04A, Value = 100, ramp = 10 s |
| 2 | AELT0539 | I (BOP)<br>I–TS-SRO | Steam Generator Level Channel Fails High<br>Insert Malfunction (AE) AELT0539, Value = 100, ramp=15 s |
| 3 | SFH08_DR | ~~C, R~~ C(RO) C(BOP) or R(RO) C(BOP)<br>~~(RO/SRO)~~<br>C-TS-SRO | Dropped Control Rod<br>Insert Malfunction (SF) SFH08_DR, Value = stationary gripper |
| 4 | BB002_A | M (All) | LOCA<br>Insert Malfunction (BB) BB002_A, Value = 0-1300, Ramp in over 10 min. |
| 5 | BG<br>NEM8803B | C (RO) | High Head ECCS Pump Auto Start Failure/BIH Valve Failure<br>Insert Remote Function (BG) JLOASBI8_3, Value = Inhibit<br>Insert Remote Function (NG) NG04CKF2, Value = Close,<br>Condition of "jstsisa eq true" Same as SG! |
| 6 | JINHBSI | C (RO) | Automatic Safety Injection Failure<br>Insert Remote Function (SB) JINHBSI, Value = Both |
| 7 | PAL02_1<br>AL | C (BOP) | TDAFP Trip with MDAFP Auto Start Failure<br>Insert Malfunction (AL) PAL02_1, Value = True<br>Insert Remote Function (AL) JLOASBI8_1, Value = Inhibit |
| | | | |

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

**Callaway 2009 NRC Scenario #2**

The crew takes the shift at ~50% power with direction to increase power to 65%. Diesel Generator NE02 is out of service for preplanned maintenance.

Two minutes after power increase (including dilution) has begun, Seal Injection Filter "A" will clog stopping 100% of the flow going through it. The crew will respond the the lowering seal injection flow using OTO-BB-00002, RCP Off-Normal.

The controlling Steam Generator Level channel on SG "C" (AE LT-539) fails high. The crew should respond per OTO-AE-00002, Steam Generator Water Level Control Instrument Malfunctions, identify the failed channel, select an operable channel, and stabilize SG "C" level. Tech Specs 3.3.1 and 3.3.2 apply.

Approximately twelve (12) minutes into the scenario, Rod H-8 drops into the core causing RCS temperature, pressure, and pressurizer level to lower. The crew should respond per OTO-SF-0001, Rod Control Malfunctions. TS 3.2.4 for QPTR will apply requiring the crew to reduce power to less than 50%.

A small RCS leak then develops after Tech specs have been addressed, which will steadily increase in size to a maximum value of 1300 gpm. The crew should diagnose the RCS leak and respond per OTO-BB-00003, RCS Excessive Leakage. When it is determined that the leak exceeds 50 gpm, the reactor should be tripped.

The crew should respond to the reactor trip by entering E-0, Reactor Trip or Safety Injection. When the determination is made that pressurizer pressure will not be maintained greater than 1849 psig, a manual Safety Injection should be initiated, since the AUTO SI was inhibited.

When the Safety Injection occurs, CCP A fails to automatically start and BIH inlet valve EM-HV-8803B fails to open due to the breaker opening. The crew should start CCP A and take action to open EM-HV-8803B.

While performing the actions of E-0, the crew should recognize the automatic start failure of MDAFP A and manually start the pump. The trip of the TDAFP should be identified and investigated.

The crew should perform the applicable actions of E-0 and at step 16, transition to E-1, Loss of Reactor or Secondary Coolant. CSF monitoring should commence when E-0 is exited.

The crew should perform the applicable actions of E-1 and at step 12, transition to ES-1.2, Post LOCA Cooldown and Depressurization. The scenario may be terminated when RCS cooldown is initiated.

An ALERT should be declared based on EAL FA1.1, RCS Barrier Loss Indicator.

**Critical Tasks:**

Event #2 CT – Select an operable level channel or take manual control of SG C Level to prevent a Reactor Trip due to this failure.

Event #5 CT – Manually actuate at least one train of SIS before:

- Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to FRG or Completion of Step 3.a of ES-0.1

Event #6 CT – Establish flow from at least one high head ECCS pump before transitioning out of E-0

Event #7 – Start MDAFP Pump A to establish total AFW flow rate greater than 355,000 lbm/hr to the SGs before transition out of E-0.

| References |
|---|
| OTO-BB-00002 |
| OTO-AE-00002 |
| OTO-SF-00001 |
| OTO-BB-00003 |
| E-0 |
| E-1 |
| ES-1.2 |
| EIP-ZZ-00101 |

| | | | |
|---|---|---|---|
| Facility: | Callaway | Scenario No.: 3 | Op Test No.: |
| Examiners: | | Operators: | |
| | | | |
| | | | |

| | |
|---|---|
| Initial Conditions: | The following is the plant /equipment status:<br>• 100% steady state power<br>• CCW Pump B OOS. (Activate Lesson "eg01b.lsn")<br>TS 3.7.7 Info Only |
| Turnover: | |

| Event No. | Malf. No. | Event Type* | Event Description |
|---|---|---|---|
| 1 | ABPT0507 | I (All)<br>I–TS-SRO | Steam Header Pressure Channel Failure<br>Insert Malfunction (AB) ABPT0507, Value = 0, ramp = 60 secs |
| 2 | JNN2XFR | C (RO) | NN12 Inverter Trouble/Transfer<br>Insert Remote Function (NN) JNN2XFR, Value = Bypass CVT |
| 3 | BBLT0460_1 | I (RO)<br>I–TS-SRO | Pressurizer Level Channel 460 Failure<br>Insert Malfunction BBLT0460_1, Value = 0, ramp = 15secs |
| 4 | BBPCV0455 | C (RO) | Stuck Open PZR Spray Valve<br>Imf (BB) BBPCV0455C_2, Value = 0.1 |
| 5 | AE002 | M (All) | Feedwater Line Break Inside Containment<br>Imf (AE) AE002, Value = 500000, ramp = 30 secs, condition of "jmlpcs1 eq 1" |
| 6 | JINHBSLIS | C (BOP) | Steam Line Isolation Signal Failure<br>Irf (SB) JINHBSLIS, Value = Both |
| | | | |

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

**Callaway 2009 NRC Scenario #3**

The plant is operating at 100%, steady state power. CCW Pump B is Out of service pump bearing replacement. A 24 hour pump run will take place following maintenance.

Main Steam header pressure transmitter ABPT507 fails low, resulting in lowering Main Feedwater Pump speed and lowering SG levels. The crew should identify the failure and take manual control of Main Feedwater Pump speed to stabilize SG levels in accordance with OTO-AE-00001, Feedwater System Malfunction.

Following the ABPT507 failure, NN12 inverter will fail and transfer to the Bypass Constant Voltage Transformer. Technical Specification 3.8.7 applies. The Control Room Supervisor should identify the TS requirement to restore the inverter to operable status within 24 hours.

Pressurizer Level Channel 460 fails low. The crew should respond per OTO-BG-00001, Pressurizer Level Control Malfunctions, and restore PZR level. Technical Specification 3.3.1 applies.

Pressurizer Spray valve BB PCV-455C fails ~10% open. Eventually the crew should trip the reactor and secure RCPs B and D. Simulator Operator may have to make bigger to guide crew to trip.

Immediately upon the reactor trip, a feedwater line break occurs on SG B inside Containment. The crew should continue the actions of E-0, Reactor Trip or Safety Injection, following the Safety Injection.

The Main Steamline Isolation Valves will fail to automatically close in response to the Low Steam Line Pressure. The crew should manually isolate the Main Steamlines and complete the isolation of SG B in accordance with E-2, Faulted S/G Isolation.

The crew should then transition to ES-1.1, SI Termination. The scenario is complete when the Boron Injection Header is isolated.

An Alert should be declared per EAL HA2.1, Natural and Destructive Phenomena Affecting a Safe Shutdown Area.

**Critical Tasks:**

Event #1 CT – Take manual Control of MFP Speed to prevent a Turbine or Reactor Trip

Event #7 CT – Fast close MSIVs before a severe challenge develops to either subcriticality or Integrity CSFs or before transition to ECA-2.1.

Event #6 CT – Isolate SG B before a transition out of E-2

- MSIV Closed
- AFW Isolated from SG B

| References |
|---|
| OTO-AE-00001 |
| OTA-RK-00016 Addendum 26B |
| OTO-NN-00001 |
| OTO-BB-00006 |
| OTO-BG-00001 |
| E-0 |
| E-2 |
| ES-1.1 |
| CSF-1, Attachment A |
| EIP-ZZ-00101 |

| Facility: | ***Callaway*** | Date of Exam: | ***6/19/2009*** | Operating Test No.: ***2009-1*** |
|---|---|---|---|---|

| APPLICANT | EVENT TYPE | Scenarios | | | | | | | | | | | | TOTAL | MINIMUM(*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | | 2 | | | 3 | | | 4 | | | | | | |
| | | CREW POSITION | | | CREW POSITION | | | CREW POSITION | | | CREW POSITION | | | | | | |
| | | SRO | ATC | BOP | SRO | ATC | BOP | SRO | ATC | BOP | SRO | ATC | BOP | | R | I | U |
| **SROU-1** | RX | A | | | A 3 | | | | | | | | | **3** | | | **0** |
| | NOR | A | | | A | | | | | | | | | **2** | | | **1** |
| | I/C | 1 2 5 | | | 1 2 3 | | | | | | | | | **6** | | | **2** |
| | MAJ | 6 | | | 4 | | | | | | | | | **2** | | | **1** |
| | TS | 1 3 | | | 2 3 | | | | | | | | | **4** | | | **2** |
| **SROU-2** | RX | A | | | A 3 | | | | | | | | | **3** | | | **0** |
| | NOR | A | | | A | | | | | | | | | **1** | | | **1** |
| | I/C | 1 2 5 | | | 1 2 3 | | | | | | | | | **5** | | | **2** |
| | MAJ | 6 | | | 4 | | | | | | | | | **2** | | | **1** |
| | TS | 1 3 | | | 2 3 | | | | | | | | | **4** | | | **2** |
| **SROI-1** | RX | A | | | | A 3 | | | | | | | | **3** | | **1** | |
| | NOR | A | | | | A | | | | | | | | **2** | | **1** | |
| | I/C | 1 2 5 | | | | 1 3 5 6 | | 1 | | | | | | **8** | | **4** | |
| | MAJ | 6 | | | | 4 | | 5 | | | | | | **3** | | **2** | |
| | TS | 1 3 | | | | | | 1 3 | | | | | | **4** | | **2** | |
| **SROI-2** | RX | | A | | A 3 | | | | | | | | | **3** | | **1** | |
| | NOR | | A | | A | | | | | | | | | **2** | | **1** | |
| | I/C | | 1 2 4 5 | | 1 2 3 | | | | | | | | | **7** | | **4** | |
| | MAJ | | 6 | | 4 | | | | | | | | | **2** | | **2** | |
| | TS | | | | 2 3 | | | | | | | | | **2** | | **2** | |

Instructions:

1. Circle the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must service in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must do one scenario, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

Facility: ***Callaway*** Date of Exam: ***6/19/2009*** Operating Test No.: ***2009-1***

| APPLICANT | EVENT TYPE | Scenarios | | | | | | | | | | | | TOTAL | MINIMUM(*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | | 2 (Spare) | | | 3 | | | 4 | | | | | | |
| | | CREW POSITION | | | CREW POSITION | | | CREW POSITION | | | CREW POSITION | | | | | | |
| | | SRO | ATC | BOP | SRO | ATC | BOP | SRO | ATC | BOP | SRO | ATC | BOP | | R | I | U |
| **SROI-3** | RX | | | A | A 3 | | | | | | | | | **2** | | **1** | |
| | NOR | | | A | A | | | | | | | | | **2** | | **1** | |
| | I/C | | | 2 3 5 | 1 2 3 | | | | 2 3 4 | | | | | **9** | | **4** | |
| | MAJ | | | 6 | 4 | | | | 5 | | | | | **3** | | **2** | |
| | TS | | | | 2 3 | | | | | | | | | **2** | | **2** | |
| **SROI-4** | RX | A | | | | A 3 | | | | | | | | **3** | | **1** | |
| | NOR | A | | | | A | | | | | | | | **2** | | **1** | |
| | I/C | 1 2 5 | | | | 1 3 5 6 | | | | | | | | **7** | | **4** | |
| | MAJ | 6 | | | | 4 | | | | | | | | **2** | | **2** | |
| | TS | 1 3 | | | | | | | | | | | | **2** | | **2** | |
| **RO-1** | RX | | A | | | | A | | | | | | | **2** | **1** | | |
| | NOR | | A | | | | A | | | | | | | **2** | **1** | | |
| | I/C | | 1 2 4 5 | | | | 1 2 | | | | | | | **6** | **4** | | |
| | MAJ | | 6 | | | | 4 | | | | | | | **2** | **2** | | |
| | TS | | | | | | | | | | | | | | **0** | | |
| **RO-2** | RX | | A | | | | A | | | | | | | **2** | **1** | | |
| | NOR | | A | | | | A | | | | | | | **2** | **1** | | |
| | I/C | | 1 2 4 5 | | | | 1 2 | | | | | | | **6** | **4** | | |
| | MAJ | | 6 | | | | 4 | | | | | | | **2** | **2** | | |
| | TS | | | | | | | | | | | | | | **0** | | |

Instructions:

1. Circle the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must service in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must do one scenario, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

Facility: ***Callaway*** Date of Exam: ***6/19/2009*** Operating Test No.: ***2009-1***

| APPLICANT | EVENT TYPE | Scenarios | | | | | | | | | | | | TOTAL | MINIMUM(*) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | | 2 (Spare) | | | 3 | | | 4 | | | | | | |
| | | CREW POSITION | | | CREW POSITION | | | CREW POSITION | | | CREW POSITION | | | | | | |
| | | SRO | ATC | BOP | SRO | ATC | BOP | SRO | ATC | BOP | SRO | ATC | BOP | | R | I | U |
| RO-3 | RX | | | A | | A | | | | | | | | 2 | 1 | | |
| | NOR | | | A | | A | | | | | | | | 2 | 1 | | |
| | I/C | | | 2 3 5 | | 1 2 4 5 | | | | | | | | 7 | 4 | | |
| | MAJ | | | 6 | | 6 | | | | | | | | 2 | 2 | | |
| | TS | | | | | | | | | | | | | | 0 | | |
| RO-4 | RX | | | A | | A 3 | | | | | | | | 3 | 1 | | |
| | NOR | | | A | | A | | | | | | | | 2 | 1 | | |
| | I/C | | | 2 3 5 | | 1 3 5 6 | | | | | | | | 7 | 4 | | |
| | MAJ | | | 6 | | 4 | | | | | | | | 2 | 2 | | |
| | TS | | | | | | | | | | | | | | 0 | | |
| RO-5 | RX | | A | | | | A | | | | | | | 2 | 1 | | |
| | NOR | | A | | | | A | | | | | | | 2 | 1 | | |
| | I/C | | 1 2 4 5 | | | | 2 7 | | | | | | | 6 | 4 | | |
| | MAJ | | 6 | | | | 4 | | | | | | | 2 | 2 | | |
| | TS | | | | | | | | | | | | | | 0 | | |
| | RX | | | | | | | | | | | | | | | | |
| | NOR | | | | | | | | | | | | | | | | |
| | I/C | | | | | | | | | | | | | | | | |
| | MAJ | | | | | | | | | | | | | | | | |
| | TS | | | | | | | | | | | | | | | | |

Instructions:

1. Circle the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must service in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must do one scenario, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

| SRO | ATC | BOP | Scenario # |
|---|---|---|---|
| U1 | R2 | R3 | 1 |
| U2 | R1 | R4 | 1 |
| I1 | R5 | I3 | 1 |
| I4 | I2 | SU | 1 |
| U1 | R3 | R2 | 2 |
| U2 | R4 | R1 | 2 |
| I3 | I1 | R5 | 2 |
| I2 | I4 | SU | 2 |
| I1 | I3 | SU | 3 |

Standby scenario used as needed

| Facility: ***Callaway*** | Date of Examination: ***6/19/2009*** | Operating Test No.: ***2009-1*** |
|---|---|---|

| Competencies | APPLICANTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SRO | | | | RO | | | | BOP | | | |
| | SCENARIO | | | | SCENARIO | | | | SCENARIO | | | |
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Interpret/Diagnose Events and Conditions | 1-7 | 1-7 | 1-6 | N/A | 1, 2, 4-7 | 1, 3, 4, 5, 6 | 1-5 | N/A | 2-6 | 2, 4, 6, 7 | 1, 2, 5, 6 | N/A |
| Comply With and Use Procedures (1) | A, 1-7 | A, 1-7 | A, 1-6 | N/A | A, 1, 2, 4-7 | A, 1, 3-6 | 1-5 | N/A | A, 2, 3, 5, 6 | A, 2, 3, 4, 6, 7 | 1, 2, 5, 6 | N/A |
| Operate Control Boards (2) | N/A | N/A | N/A | N/A | A, 1, 2, 4-7 | A, 1, 3-6 | 1-5 | N/A | A, 2, 3, 5, 6 | A, 2, 3, 4, 6, 7 | 1, 2, 5, 6 | N/A |
| Communicate and Interact | A, 1-7 | A, 1-7 | A, 1-6 | N/A | A, 1, 2, 4-7 | A, 1, 3-6 | 1-5 | N/A | A, 1-6 | A, 2, 3, 4, 6, 7 | 1, 2, 5, 6 | N/A |
| Demonstrate Supervisory Ability (3) | A, 1-7 | A, 1-7 | A, 1-6 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Comply With and Use Tech. Specs. (3) | 1, 3, 4 | 2, 3 | 1, 3 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

*Instructions:*

*Circle the applicants' license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant.*

**Facility:** Callaway

Date Of Exam: 06/19/2009

| 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 & Abnormal Plant Evolutions | 1 | 3 | 3 | 3 | N/A | | | 3 | 3 | N/A | | 3 | 18 | 0 | | | 0 | 0 |
| | 2 | 1 | 2 | 1 | | | | 2 | 2 | | | 1 | 9 | 0 | | | 0 | 0 |
| | Tier Totals | 4 | 5 | 4 | | | | 5 | 5 | | | 4 | 27 | 0 | | | 0 | 0 |
| 2. Plant Systems | 1 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 28 | 0 | | | 0 | 0 |
| | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 | 0 | | 0 | 0 | 0 |
| | Tier Totals | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 38 | 0 | | | 0 | 0 |
| 3. Generic Knowledge And Abilities Categories | | 1 | | 2 | | 3 | | 4 | | | | | 10 | 1 | 2 | 3 | 4 | 0 |
| | | 3 | | 2 | | 2 | | 3 | | | | | | 0 | 0 | 0 | 0 | |

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.

## PWR RO Examination Outline

**Facility:** Callaway

**ES - 401** **Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1** **Form ES-401-2**

| E/APE # / Name / Safety Function | K1 | K2 | K3 | A1 | A2 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|
| 000007 Reactor Trip - Stabilization - Recovery / 1 | X | | | | | | EK1.02 - Shutdown margin | 3.4 | 1 |
| 000009 Small Break LOCA / 3 | | X | | | | | EK2.03 - S/Gs | 3.0 | 1 |
| 000015/000017 RCP Malfunctions / 4 | | | X | | | | AK3.02 - CCW lineup and flow paths to RCP oil coolers | 3.0 | 1 |
| 000022 Loss of Rx Coolant Makeup / 2 | X | | | | | | AK1.03 - Relationship between charging flow and PZR level | 3.0 | 1 |
| 000025 Loss of RHR System / 4 | | | X | | | | AK3.01 - Shift to alternate flowpath | 3.1 | 1 |
| 000026 Loss of Component Cooling Water / 8 | | | | X | | | AA1.05 - The CCWS surge tank, including level control and level alarms, and radiation alarm | 3.1 | 1 |
| 000027 Pressurizer Pressure Control System Malfunction / 3 | X | | | | | | AK1.03 - Latent heat of vaporization/condensation | 2.6 | 1 |
| 000038 Steam Gen. Tube Rupture / 3 | | | | | | X | 2.1.20 - Ability to interpret and execute procedure steps. | 4.6 | 1 |
| 000040 Steam Line Rupture - Excessive Heat Transfer / 4 | | X | | | | | AK2.02 - Sensors and detectors | 2.6* | 1 |
| 000056 Loss of Off-site Power / 6 | | | | X | | | AA1.31 - PZR heater group control switches | 3.3 | 1 |
| 000057 Loss of Vital AC Inst. Bus / 6 | | | X | | | | AK3.01 - Actions contained in EOP for loss of vital ac electrical instrument bus | 4.1 | 1 |
| 000058 Loss of DC Power / 6 | | | | X | | | AA1.03 - Vital and battery bus components | 3.1 | 1 |
| 000062 Loss of Nuclear Svc Water / 4 | | | | | | X | 2.4.8 - Knowledge of how abnormal operating procedures are used in conjunction with EOPs. | 3.8 | 1 |
| 000065 Loss of Instrument Air / 8 | | | | | | 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. | 4.2 | 1 |
| 000077 Generator Voltage and Electric Grid Disturbances / 6 | | | | | X | | AA2.09 –Operational status of Emergency Diesel Generators | 3.9 | 1 |
| W/E04 LOCA Outside Containment / 3 | | X | | | | | 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 | 3.8 | 1 |

## PWR RO Examination Outline

**Facility:** Callaway

**ES - 401** **Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1** **Form ES-401-2**

| E/APE # / Name / Safety Function | K1 | K2 | K3 | A1 | A2 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|
| W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4 | | | | | X | | EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations | 3.4 | 1 |
| W/E11 Loss of Emergency Coolant Recirc. / 4 | | | | | X | | EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations | 3.4 | 1 |
| **K/A Category Totals:** | **3** | **3** | **3** | **3** | **3** | **3** | **Group Point Total:** | | **18** |

## PWR RO Examination Outline

**Facility:** Callaway

**ES - 401** **Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2** **Form ES-401-2**

| E/APE # / Name / Safety Function | K1 | K2 | K3 | A1 | A2 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|
| 000028 Pressurizer Level Malfunction / 2 | | X | | | | | AK2.03 - Controllers and positioners | 2.6 | 1 |
| 000033 Loss of Intermediate Range NI / 7 | | | X | | | | AK3.01 - Termination of startup following loss of intermediate-range instrumentation | 3.2 | 1 |
| 000068 Control Room Evac. / 8 | | | | | X | | AA2.08 - S/G pressure | 3.9 | 1 |
| 000074 Inad. Core Cooling / 4 | | | | | X | | EA2.07 - The difference between a LOCA and inadequate core cooling, from trends and indicators | 4.1 | 1 |
| W/E03 LOCA Cooldown - Depress. / 4 | | | | X | | | EA1.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features | 4.0 | 1 |
| W/E09 Natural Circ. / 4 | X | | | | | | EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the Natural Circulation Operations | 3.3 | 1 |
| W/E13 Steam Generator Over-pressure / 4 | | | | | | X | 2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. | 4.4 | 1 |
| W/E15 Containment Flooding / 5 | | | | X | | | EA1.2 - Operating behavior characteristics of the facility | 2.7 | 1 |
| W/E16 High Containment Radiation / 9 | | X | | | | | EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features | 3.0 | 1 |
| **K/A Category Totals:** | **1** | **2** | **1** | **2** | **2** | **1** | **Group Point Total:** | | **9** |

## PWR RO Examination Outline

**Facility:** Callaway

**ES - 401** **Plant Systems - Tier 2 / Group 1** **Form ES-401-2**

| Sys/Evol # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 003 Reactor Coolant Pump | | | | X | | | | | | | | K4.02 - Prevention of cold water accidents or transients | 2.5 | 1 |
| 004 Chemical and Volume Control | | X | | | | | | | | | | K2.01 - Boric acid makeup pumps | 2.9 | 1 |
| 005 Residual Heat Removal | | X | | | | | | | | | | K2.03 - RCS pressure boundary motor-operated valves | 2.7* | 1 |
| 006 Emergency Core Cooling | | | | | | X | | | | | | K6.01 - BIT/borated water sources | 3.4 | 1 |
| 006 Emergency Core Cooling | | | | | | | | | X | | | A3.05 - Safety Injection Pumps | 4.2 | 1 |
| 007 Pressurizer Relief/Quench Tank | | | | | X | | | | | | | K5.02 - Method of forming a steam bubble in the PZR | 3.1 | 1 |
| 007 Pressurizer Relief/Quench Tank | | | | | | | | | | | X | 2.1.28 - Knowledge of the purpose and function of major system components and controls. | 4.1 | 1 |
| 008 Component Cooling Water | | | | | | | X | | | | | A1.01 - CCW flow rate | 2.8 | 1 |
| 010 Pressurizer Pressure Control | | | | X | | | | | | | | K4.01 - Spray valve warm-up | 2.7 | 1 |
| 012 Reactor Protection | | | | | | | | | | | X | 2.1.17 - Ability to make accurate, clear, and concise verbal reports. | 3.9 | 1 |
| 012 Reactor Protection | | | X | | | | | | | | | K3.04 - ESFAS | 3.8* | 1 |
| 013 Engineered Safety Features Actuation | | | | | | X | | | | | | K6.01 - Sensors and detectors | 2.7* | 1 |
| 022 Containment Cooling | X | | | | | | | | | | | K1.01 - SWS/cooling system | 3.5 | 1 |
| 026 Containment Spray | | | | | | | | X | | | | A2.03 – Failure of ESF | 4.1 | 1 |
| 039 Main and Reheat Steam | | | | | | | X | | | | | A1.09 - Main steam line radiation monitors | 2.5* | 1 |
| 059 Main Feedwater | | | X | | | | | | | | | K3.02 - AFW System | 3.6 | 1 |
| 059 Main Feedwater | | | | | | | | | | X | | A4.12 - Initiation of automatic feedwater isolation | 3.4 | 1 |
| 061 Auxiliary/Emergency Feedwater | | | | | X | | | | | | | K5.02 - Decay heat sources and magnitude | 3.2 | 1 |
| 062 AC Electrical Distribution | | | | | | | | | X | | | A3.01 - Vital ac bus amperage | 3.0 | 1 |
| 062 AC Electrical Distribution | | | | | | | X | | | | | A1.03 - Effect on instrumentation and controls of switching power supplies | 2.5 | 1 |
| 063 DC Electrical Distribution | X | | | | | | | | | | | K1.03 - Battery charger and battery | 2.9 | 1 |
| 064 Emergency Diesel Generator | X | | | | | | | | | | | K1.05 - Starting air system | 3.4 | 1 |

## PWR RO Examination Outline

**Facility:** Callaway

**ES - 401** **Plant Systems - Tier 2 / Group 1** **Form ES-401-2**

| Sys/Evol # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 073 Process Radiation Monitoring | | | | | | | | X | | | | A2.02 - Detector failure | 2.7 | 1 |
| 076 Service Water | | | | | | | | X | | | | A2.01 - Loss of SWS | 3.5* | 1 |
| 078 Instrument Air | | | | | | | | | | X | | A4.01 - Pressure gauges | 3.1 | 1 |
| 078 Instrument Air | | | X | | | | | | | | | K3.01 - Containment air system | 3.1* | 1 |
| 103 Containment | | | | | | | | | | | X | 2.4.14 - Knowledge of general guidelines for EOP usage. | 3.8 | 1 |
| 103 Containment | | | | X | | | | | | | | K4.01 - Vacuum breaker protection | 3.0* | 1 |
| **K/A Category Totals:** | **3** | **2** | **3** | **3** | **2** | **2** | **3** | **3** | **2** | **2** | **3** | **Group Point Total:** | | **28** |

## PWR RO Examination Outline

**Facility:** Callaway

**ES - 401** **Plant Systems - Tier 2 / Group 2** **Form ES-401-2**

| Sys/Evol # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 002 Reactor Coolant | | | | | | | X | | | | | A1.11 - Relative level indications in the RWST, the refueling cavity, the PZR and the reactor vessel during preparation for refueling | 2.7 | 1 |
| 015 Nuclear Instrumentation | X | | | | | | | | | | | K1.08 - RCS (pump start) | 2.6* | 1 |
| 027 Containment Iodine Removal | | | | | | | | X | | | | A2.01 - High temperature in the filter system | 3.0* | 1 |
| 028 Hydrogen Recombiner and Purge Control | | | | | | X | | | | | | K6.01 - Hydrogen recombiners | 2.6 | 1 |
| 029 Containment Purge | | | | | | | | | X | | | A3.01 - CPS isolation | 3.8 | 1 |
| 033 Spent Fuel Pool Cooling | | | | | | | | | | | X | 2.4.11 - Knowledge of abnormal condition procedures. | 4.0 | 1 |
| 035 Steam Generator | | | | | | | | | | X | | A4.02 - Fill of dry S/G | 2.7 | 1 |
| 068 Liquid Radwaste | | | | | X | | | | | | | K5.03 - Units of radiation, dose, and dose rate | 2.6 | 1 |
| 075 Circulating Water | | X | | | | | | | | | | K2.03 - Emergency/essential SWS pumps | 2.6* | 1 |
| 086 Fire Protection | | | | X | | | | | | | | K4.03 - Detection and location of fires | 3.1 | 1 |
| **K/A Category Totals:** | **1** | **1** | **0** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **Group Point Total:** | | **10** |

## Generic Knowledge and Abilities Outline (Tier 3)

## PWR RO Examination Outline

**Facility:** Callaway

**Form ES-401-3**

| Generic Category | KA | KA Topic | Imp. | Points |
|---|---|---|---|---|
| **Conduct of Operations** | 2.1.25 | Ability to interpret reference materials, such as graphs, curves, tables, etc. | 3.9 | 1 |
| | 2.1.29 | Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc. | 4.1 | 1 |
| | 2.1.32 | Ability to explain and apply system limits and precautions. | 3.8 | 1 |
| | | **Category Total:** | | **3** |
| **Equipment Control** | 2.2.14 | Knowledge of the process for controlling equipment configuration or status. | 3.9 | 1 |
| | 2.2.36 | Ability to analyze the effect of maintenance activities such as degraded power sources, on the status of limiting conditions for operations. | 3.1 | 1 |
| | | **Category Total:** | | **2** |
| **Radiation Control** | 2.3.4 | Knowledge of radiation exposure limits under normal or emergency conditions. | 3.2 | 1 |
| | 2.3.5 | Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personal monitoring equipment, etc. | 2.9 | 1 |
| | | **Category Total:** | | **2** |
| **Emergency Procedures/Plan** | 2.4.5 | Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions. | 3.7 | 1 |
| | 2.4.11 | Knowledge of abnormal condition procedures. | 4.0 | 1 |
| | 2.4.43 | Knowledge of emergency communications systems and techniques. | 3.2 | 1 |
| | | **Category Total:** | | **3** |
| | | **Generic Total:** | | **10** |

**Facility:** Callaway

Date Of Exam: 06/19/2009

| 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 & Abnormal Plant Evolutions | 1 | 0 | 0 | 0 | N/A | | | 0 | 0 | N/A | | 0 | 0 | 3 | | | 3 | 6 |
| | 2 | 0 | 0 | 0 | | | | 0 | 0 | | | 0 | 0 | 2 | | | 2 | 4 |
| | Tier Totals | 0 | 0 | 0 | | | | 0 | 0 | | | 0 | 0 | 5 | | | 5 | 10 |
| 2. Plant Systems | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | | | 2 | 5 |
| | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | | 1 | 3 |
| | Tier Totals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | | | 3 | 8 |
| 3. Generic Knowledge And Abilities Categories | | 1 | | | 2 | | | 3 | | | 4 | | 0 | 1 | 2 | 3 | 4 | 7 |
| | | 0 | | | 0 | | | 0 | | | 0 | | | 1 | 2 | 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.

## PWR SRO Examination Outline

**Facility:** Callaway

**ES - 401** **Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1** **Form ES-401-2**

| E/APE # / Name / Safety Function | K1 | K2 | K3 | A1 | A2 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|
| 000008 Pressurizer Vapor Space Accident / 3 | | | | | X | | AA2.14 - Saturation temperature monitor | 4.4 | 1 |
| 000011 Large Break LOCA / 3 | | | | | | X | 2.3.4 - Knowledge of radiation exposure limits under normal or emergency conditions. | 3.7 | 1 |
| 000029 ATWS / 1 | | | | | X | | EA2.03 - Centrifugal charging pump ammeter | 3.1* | 1 |
| 000054 Loss of Main Feedwater / 4 | | | | | | X | 2.1.6 - Ability to manage the control room crew during plant transients. | 4.8 | 1 |
| 000055 Station Blackout / 6 | | | | | X | | EA2.04 - Instruments and controls operable with only dc battery power available | 4.1 | 1 |
| W/E12 - Steam Line Rupture - Excessive Heat Transfer / 4 | | | | | | X | 2.4.44 - Knowledge of emergency plan protective action recommendations. | 4.4 | 1 |
| **K/A Category Totals:** | **0** | **0** | **0** | **0** | **3** | **3** | **Group Point Total:** | | **6** |

## PWR SRO Examination Outline

**Facility:** Callaway

**ES - 401** **Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2** **Form ES-401-2**

| E/APE # / Name / Safety Function | K1 | K2 | K3 | A1 | A2 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|
| 000001 Continuous Rod Withdrawal / 1 | | | | | | X | 2.2.22 - Knowledge of limiting conditions for operations and safety limits. | 4.7 | 1 |
| 000067 Plant Fire On-site / 9 | | | | | X | | AA2.17 – Systems that may be affected by the fire | 3.5 | 1 |
| W/E06 Inad. Core Cooling / 4 | | | | | | X | 2.4.1 - Knowledge of EOP entry conditions and immediate action steps. | 4.8 | 1 |
| W/E14 Loss of CTMT Integrity / 5 | | | | | X | | EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments | 3.8 | 1 |
| **K/A Category Totals:** | **0** | **0** | **0** | **0** | **2** | **2** | **Group Point Total:** | | **4** |

## PWR SRO Examination Outline

**Facility:** Callaway

**ES - 401** **Plant Systems - Tier 2 / Group 1** **Form ES-401-2**

| Sys/Evol # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 026 Containment Spray | | | | | | | | X | | | | A2.02 - Failure of automatic recirculation transfer | 4.4* | 1 |
| 061 Auxiliary/Emergency Feedwater | | | | | | | | X | | | | A2.03 - Loss of dc power | 3.4 | 1 |
| 063 DC Electrical Distribution | | | | | | | | X | | | | A2.02 - Loss of ventilation during battery charging | 3.1 | 1 |
| 064 Emergency Diesel Generator | | | | | | | | | | | X | 2.4.45 - Ability to prioritize and interpret the significance of each annunciator or alarm. | 4.3 | 1 |
| 073 Process Radiation Monitoring | | | | | | | | | | | X | 2.1.28 - Knowledge of the purpose and function of major system components and controls. | 4.1 | 1 |
| **K/A Category Totals:** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **0** | **0** | **2** | **Group Point Total:** | | **5** |

# PWR SRO Examination Outline

**Facility:** Callaway

**ES - 401** **Plant Systems - Tier 2 / Group 2** **Form ES-401-2**

| Sys/Evol # / Name | K1 | K2 | K3 | K4 | K5 | K6 | A1 | A2 | A3 | A4 | G | KA Topic | Imp. | Points |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 016 Non-nuclear Instrumentation | | | | | | | | X | | | | A2.02 - Loss of power supply | 3.2* | 1 |
| 034 Fuel Handling Equipment | X | | | | | | | | | | | K1.03 - CVCS | 2.7* | 1 |
| 055 Condenser Air Removal | | | | | | | | | | | X | 2.4.16 - Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines. | 4.4 | 1 |
| **K/A Category Totals:** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **1** | **Group Point Total:** | | **3** |

## Generic Knowledge and Abilities Outline (Tier 3)

## PWR SRO Examination Outline

**Facility:** Callaway

**Form ES-401-3**

| Generic Category | KA | KA Topic | Imp. | Points |
|---|---|---|---|---|
| **Conduct of Operations** | 2.1.5 | Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. | 3.9 | 1 |
| | | **Category Total:** | | **1** |
| **Equipment Control** | 2.2.15 | Ability to determine the expected plant configuration using design and configuration control documentation, such as drawings, line-ups, tagouts, etc. | 4.3 | 1 |
| | 2.2.40 | Ability to apply Technical Specifications for a system. | 4.7 | 1 |
| | | **Category Total:** | | **2** |
| **Radiation Control** | 2.3.13 | Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. | 3.8 | 1 |
| | 2.3.14 | Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. | 3.8 | 1 |
| | | **Category Total:** | | **2** |
| **Emergency Procedures/Plan** | 2.4.21 | Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. | 4.6 | 1 |
| | 2.4.46 | Ability to verify that the alarms are consistent with the plant conditions. | 4.2 | 1 |
| | | **Category Total:** | | **2** |
| | | **Generic Total:** | | **7** |

| ES-401 | Record of Rejected K/As | Form ES-401-4 |
|---|---|---|

| Tier / Group | Randomly Selected K/A | Reason for Rejection |
|---|---|---|
| 2 / 1 | 026 A2.03 | No plant reference to support 026 A2.01. Randomly selected from within 026 A2 |
| 1 / 1 | 077 AA2.09 | No plant reference to support AA2.08. Randomly selected from within 077 AA2 |
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