ES-301	Administrative Topics Outline	Form ES-301-1

Facility: Millstone Unit 2 Date of Examination: 09/10/2018

Examination Level: RO ☒ SRO ☐ Operating Test Number: ES18LI

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations (A1.1R)	R, D	K/A 2.1.25 Ability to interpret reference materials, such as graphs, curves and tables. Determine Maximum Rate of Change of Power.
Conduct of Operations (A1.2R)	R, D	K/A 2.1.20 Ability to interpret and execute procedure steps. Calculate Spent Fuel Pool Heatup Time To 150 F.
Equipment Control (A2R)	R, N	K/A 2.2.13 Knowledge of tagging and clearance procedures. Prepare a Clearance for the "A" Containment Spray Pump.
Radiation Control (A3R)	R, N	K/A 2.3.11 Ability to control radiation releases. Flow Rate and Discharge Volume Calculation for a Clean Radioactive Liquid Waste Discharge.

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

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

A1.1R Determine Maximum Rate of Change of Power (Bank JPM-08-04)

At the completion of this JPM the examinee has correctly determined the applicable Fuel Conditioning Category, maximum rate of change in power level, and the minimum amount of time required to achieve 100% power.

A1.2R Calculate Spent Fuel Pool Heatup Time to 150 F (NRC 2011 A2R)

At the completion of this JPM the examinee has correctly determined the Spent Fuel Pool (SFP) Heatup rate and time. The examinee is provided with a set of plant conditions and is directed to perform a calculation to determine when the SFP will reach 150 F.

A2R Prepare a Clearance for the "A" Containment Spray Pump (New)

At the completion of this JPM the examinee has correctly reviewed a clearance boundary associated with the "A" Containment Spray pump. The examinee must review a prepared clearance, determine the clearance is not adequate, and specify the deficiencies with the clearance.

A3R Flow Rate and Discharge Volume Calculation for a Clean Radioactive Liquid Waste Discharge (New)

At the completion of this JPM the examinee has used data provided to manually calculate the discharge flow rate and volume discharged. The manual calculation is required as a result of the inoperability of the flow recorder.

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Facility: Millstone Unit 2 Date of Examination: 09/10/2018

Examination Level: RO ☐ SRO ☒ Operating Test Number: ES18LI

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations (A1S)	R, D	K/A 2.1.5 Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. Shift Staffing Based on Administrative Requirements.
Conduct of Operations (A2S)	R, N	K/A 2.1.25 Ability to interpret reference materials, such as graphs, curves and tables. Review a Power Ascension Plan.
Equipment Control (A3S)	R, D	K/A 2.2.14 Knowledge of the process for controlling equipment configuration or status. Approve a Clearance Boundary.
Radiation Control (A4S)	R, D	K/A 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. Radiological Assessment and Task Supervision.
Emergency Plan (A5S)	R, D	K/A 2.4.41 Knowledge of the emergency action level thresholds and classifications. EAL Classification and PARs.

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

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

A1S Shift Staffing Based on Administrative Requirements (NRC 2008 A1.1S)

At the completion of this JPM, the SRO will determine who is fit for duty and can be called in for shift coverage when the on shift RO becomes incapacitated (cannot perform licensed activities). The examinee must determine how soon a relief must report for work, which relief is immediately eligible to assume shift duties, and for those reliefs not eligible the reason they are not eligible.

A2S Review a Power Ascension Plan (New)

At the completion of this JPM, the SRO has reviewed the provided power ascension plan and determined that it does not meet procedural requirements and identifies which specific requirements are not met. The SRO must assess the Fuel Conditioning Category, maximum rate of change in power level, and the minimum amount of time required to achieve 100% power.

A3S Approve a Clearance Boundary (NRC 2008 A2S)

Given a completed Clearance Sheet and associated documents the examinee is tasked with reviewing and approving the Tag Clearance. Upon review the examinee will determine that the Clearance is not adequate to perform the work proposed since the tags for pump power supply and pump discharge stop valve are not correct.

A4S Radiological Assessment and Task Supervision (NRC 2011 A3S)

At the completion of this JPM, the SRO has analyzed the given conditions and designated which PEO should perform each of the two specified tasks, based on the radiological concerns of each. The SRO is provided with radiation information for the area, time to complete the tasks for an experienced PEO and newly qualified PEO, current exposure for the year for the two PEOs.

A5S EAL Classification and PARs (Bank JPM-187)

At the completion of this JPM the examinee has correctly classified the event and provided the appropriate Protective Action Recommendations (PARs). The examinee classifies a General Emergency Alpha, due to the loss of three barriers, within 15 minutes. And then determines the PARs, within 15 minutes of the classification time, with associated evacuation and sheltering information. The examinee also generates an IRF associated with this JPM.

Facility:	Millstone Unit 2	Date of Examination:	09/10/2018
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐		Operating Test Number:	ES18LI

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
S1 Manual Makeup to the VCT (KA 004 A2.06)	A,D,S	1
S2 Inadvertent AEAS Actuation (KA 013 A2.06)	EN,N,S	2
S3 Respond to a Failed Open PORV (KA 010 A2.03)	A,D,S	3
S4 Respond to CTMT Sump Clogging (KA 011 EA1.11)	A,D,L,S	4(P)
S5 Containment Isolation and CRAC Operation due to Fuel Handling Accident (KA 103 A4.01)	A,M,S	5
S6 Transfer Electrical Buses from the NSST to the RSST (KA 062 A4.01)	N,S	6
S7 Securing of CVCS due to VCT Level Instrument Failure (RO Only) (KA 016 A2.02)	N,S	7
S8 Change the Setpoint of the SJAE RM 5099 (KA 071 A4.25)	D,S	9

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

P1 Supplying Emergency Backup Air to 2-CH-192 (KA 2.1.23)	D,E,R	8
P2 Local Manual Air Start of the Emergency Diesel Generator (KA 064 A4.06)	D,E	6
P3 Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump (KA 054 AA1.02)	A,D,E,L	4(S)

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for R /SRO-I/SRO-U
(A)lternate path	4–6/4–6 /2–3
(C)ontrol room	
(D)irect from bank	≤ 9/≤ 8/≤ 4
(E)mergency or abnormal in-plant	≥ 1/≥ 1/≥ 1
(EN)gineered safety feature	≥ 1/≥ 1/≥ 1 (control room system)
(L)ow-Power/Shutdown	≥ 1/≥ 1/≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/≥ 1
(P)revious 2 exams	≤ 3/≤ 3/≤ 2 (randomly selected)
(R)CA	≥ 1/≥ 1/≥ 1
(S)imulator	

S1 Manual Makeup to the VCT - Alternate Path - (NRC 2011 Bank JPM-022)

At the completion of this JPM the examinee has recognized a malfunction with Boric Acid injection, during attempted manual makeup to the Volume Control Tank (VCT), and terminates the dilution. The examinee is provided with a Blend Ratio and is directed to raise VCT level by 2%. The examinee must set up the Boric Acid and Primary Makeup Water controllers with the proper blend, align the system for the blend, determine the number of gallons required for a 2% change to the VCT and initiate the blended makeup. Once the blend commences the examinee determines there is no Boric Acid flow and terminates the dilution.

S2 Inadvertent AEAS Actuation (New)

At the completion of this JPM the examinee has reset the Engineered Safety Features Actuation System (ESFAS). The examinee will be directed to complete procedure steps for an inadvertent Auxiliary Exhaust Actuation Signal (AEAS). The examinee will check Spent Fuel Pool radiation is less than 50 mr/hr, align Condenser Air Removal to the Unit 2 Stack and then reset the AEAS signal on the ESFAS.

S3 Respond to a Failed Open PORV - Alternate Path - (Bank JPM-280(A))

The examinee will carry out Immediate Operator Actions for a failed open Power Operated Relief Valve (PORV). At the completion of this JPM the examinee will recognize that PORV, RC-402 has failed open by any or all of the following; RCS pressurizer lowering, Main Control Board annunciator and valve indicator lights. They will then verify RCS pressure < 2,250 psia and close the PORV Block valve RC-403. The Block valve will fail to close. This will require the examinee to take contingency action to trip the reactor. The manual reactor trip must be initiated prior to an automatic trip for the JPM to completed successfully.

S4 Respond to CTMT Sump Clogging - Alternate Path - (Bank JPM-156)

At the completion of this JPM the examinee will have performed SRAS supplemental actions, assessed HPSI pump post SRAS performance, determined that HPSI pump performance is degraded as a result of sump clogging, and taken Contingency Actions to stop the running Containment Spray (CS) pumps. The examinee will determine that HPSI performance is still degraded after stopping the CS pumps and will implement additional Contingency Actions to throttle HPSI to a flow value greater than or equal to the minimum ECCS flow for decay heat removal.

S5 Containment Isolation and CRAC Operation due to Fuel Handling Accident - Alternate Path (Modified NRC 2011 Bank JPM-S5.1)

At the completion of this JPM, the examinee will have performed the actions of AOP 2577, Fuel Handling Accident, Section 3.0, Fuel Handling Accident in Containment. This includes performing the applicable actions to have containment evacuated, isolate containment ventilation and place a full train of Control Room A/C (CRAC) in service in "Recirc." mode. When the examinee places the running train of CRAC (Facility 1) in Recirc per the AOP, the running exhaust fan, F-31A, will trip and its exhaust damper will close. This will require the examinee to proceed to the next part of the step covering "Facility 2" CRAC and fully start that facility and place it in Recirc. mode.

S6 Transfer Electrical Buses from the NSST to the RSST (New)

At the completion of this JPM the examinee has transferred a 6.9 KV bus and a 4.16 KV bus from the Normal Station Service Transformer (NSST) to the Reserve Station Service Transformer (RSST). The examinee will ensure the RSST is energized from the 345 KV bus to both the 6.9 KV and 4.16 KV windings. They will then perform switch manipulations to transfer both a 6.9 KV bus and 4.16 KV bus from the NSST to the RSST.

S7 Securing of CVCS due to VCT Level Instrument Failure (RO Only) (New)

At the completion of this JPM the examinee has identified the lost of vital instrument bus VA-10 and isolated Charging and Letdown. A loss of VA-10 will fail one of the VCT level instruments causing the Charging pump suction to transfer from the Volume Control Tank (VCT) to the Refueling Water Storage Tank (RWST). This starts boration of the RCS. If this boration is not stopped additional complications resulting from the loss of VA-10 (one Feedwater Regulating valve locks up) will challenge the ability to maintain the plant operating. The examinee must recognize that a loss of VA-10 has occurred in the mist of multiple alarms. And take immediate operator actions to secure Charging and Letdown by closing a Letdown valve and turning off all Charging pumps.

S8 Change the Setpoint of the SJAE RM 5099 (NRC 2005 Bank JPM-120)

At the completion of this JPM the examinee will have adjusted the setpoint of the Steam Jet Air Ejector Radmonitor (RM 5099) to a new setpoint. The examinee will be provided a SJAE Radiation Monitor RM 5099 & PPC Alarm Setpoint Change Request. Then using this information the setpoint will be changed and then verified.

P1 Supplying Emergency Backup Air to 2-CH-192 (NRC 2011 Bank JPM-045)

At the completion of this JPM the examinee will have aligned a Backup Air supply to the valve that aligns water from the Refueling Water Storage Tank (RWST) to the suction of the Charging pumps (CH-192). This alignment provides borated water to the Reactor Coolant system (RCS) for reactivity control. The examinee must sign onto a Radiation Work Permit (RWP), enter the Radiation Control Area (RCA), go to the backup air bottle location, and simulate valve manipulations to align Backup Air at a specified pressure.

P2 Local Manual Air Start of the Emergency Diesel Generator (NRC 2008 Bank JPM-060A(B))

At the completion of this JPM, the examinee will have performed a local manual air start of the “A” (“B”) Emergency Diesel Generator EDG). The examinee must go to the EDG, which is located outside the RCA. Then simulate resetting the local panel alarms, simulate ensuring the Shutdown Relay (SDR) is reset, simulate unlocking and closing the EDG Air Start Vent Header isolation valves, simulate coordination to have the EDG Manual Start Switch placed in start in the control room, and simulate locally starting the EDG by pressing on the levers on the Control Air Supply valves. Once the EDG has simulated starting the lever is released and the Air Start Vent Header isolation valves are simulated opened and locked to return the system to a normal configuration.

P3 Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump (Bank JPM-085(A))

At the completion of this JPM, the examinee has simulated manually starting the Turbine Driven Auxiliary Feedwater (TDAFW) pump locally. The examinee must simulate checking temperatures in the area, simulate opening the steam supply to the Turbine, identify that the TDAFW pump has tripped, and simulate closing the steam supply. Once the steam supply valve is simulated closed the examinee simulates valve manipulation to drain water out of the steam supply piping, and simulates resetting the TDAFW pump mechanical overspeed trip latch. Once the TDAFW pump turbine is reset the examinee simulates opening the steam supply valve and simulates adjusting the speed control knob to raise the TDAFW pump speed to a condition required to feed the Steam Generators. Local speed indication, Steam Generator pressure and TDAFW pump discharge pressure are indications utilized by the examinee to simulate starting and bringing the TDAFW pump to the conditions required to feed the Steam Generators.

Facility: Millstone Unit 2 Date of Examination: 09/10/2018

Exam Level: RO ☐ SRO-I ☒ SRO-U ☐ Operating Test Number: ES18LI

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
S1 Manual Makeup to the VCT (KA 004 A2.06)	A,D,S	1
S2 Inadvertent AEAS Actuation (KA 013 A2.06)	EN,N,S	2
S3 Respond to a Failed Open PORV (KA 010 A2.03)	A,D,S	3
S4 Respond to CTMT Sump Clogging (KA 011 EA1.11)	A,D,L,S	4(P)
S5 Venting Containment via Hydrogen Purge using EBFS to Millstone Stack (RO Only) (KA 103 A3.01)	A,M,S	5
S6 Transfer Electrical Buses from the NSST to the RSST on a Plant Downpower (KA 062 A4.01)	N,S	6
S7 Securing of CVCS due to VCT Level Instrument Failure (KA 016 A2.02)	N,S	7
S8 Change the Setpoint of the SJAE RM 5099 (KA 071 A4.25)	D,S	9

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

P1 Supplying Emergency Backup Air to 2-CH-192 (KA 2.1.23)	D,E,R	8
P2 Local Manual Air Start of the Emergency Diesel Generator (KA 064 A4.06)	D,E	6
P3 Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump (KA 054 AA1.02)	A,D,E,L	4(S)

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for R /SRO-I/SRO-U

(A)lternate path (C)ontrol room	4–6/4–6 /2–3
(D)irect from bank	≤ 9/≤ 8/≤ 4
(E)mergency or abnormal in-plant	≥ 1/≥ 1/≥ 1
(EN)gineered safety feature	≥ 1/≥ 1/≥ 1 (control room system)
(L)ow-Power/Shutdown	≥ 1/≥ 1/≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/≥ 1
(P)revious 2 exams	≤ 3/≤ 3/≤ 2 (randomly selected)
(R)CA	≥ 1/≥ 1/≥ 1
(S)imulator	

S1 Manual Makeup to the VCT - Alternate Path - (NRC 2011 Bank JPM-022)

At the completion of this JPM the examinee has recognized a malfunction with Boric Acid injection, during attempted manual makeup to the Volume Control Tank (VCT), and terminates the dilution. The examinee is provided with a Blend Ratio and is directed to raise VCT level by 2%. The examinee must set up the Boric Acid and Primary Makeup Water controllers with the proper blend, align the system for the blend, determine the number of gallons required for a 2% change to the VCT and initiate the blended makeup. Once the blend commences the examinee determines there is no Boric Acid flow and terminates the dilution.

S2 Inadvertent AEAS Actuation (New)

At the completion of this JPM the examinee has restored ventilation and reset the Engineered Safety Features Actuation System (ESFAS). The examinee will be directed to complete procedure steps for an inadvertent Auxiliary Exhaust Actuation Signal (AEAS). The examinee will check Spent Fuel Pool radiation is less than 50 mr/hr, align Condenser Air Removal to the Unit 2 Stack and then reset the AEAS signal on the ESFAS.

S3 Respond to a Failed Open PORV - Alternate Path - (Bank JPM-280(A))

The examinee will carry out Immediate Operator Actions for a failed open Power Operated Relief Valve (PORV). At the completion of this JPM the examinee will recognize that PORV, RC-402 has failed open by any or all of the following; RCS pressurizer lowering, Main Control Board annunciator and valve indicator lights. They will then verify RCS pressure < 2,250 psia and close the PORV Block valve RC-403. The Block valve will fail to close. This will require the examinee to take contingency action to trip the reactor. The manual reactor trip must be initiated prior to an automatic trip for the JPM to completed successfully.

S4 Respond to CTMT Sump Clogging (RO Only) - Alternate Path - (Bank JPM-156)

At the completion of this JPM the examinee will have performed SRAS supplemental actions, assessed HPSI pump post SRAS performance, determined that HPSI pump performance is degraded as a result of sump clogging, and taken Contingency Actions to stop the running Containment Spray (CS) pumps. The examinee will determine that HPSI performance is still degraded after stopping the CS pumps and will implement additional Contingency Actions to throttle HPSI to a flow value greater than or equal to the minimum ECCS flow for decay heat removal.

S5 Venting Containment via Hydrogen Purge using EBFS to Millstone Stack - Alternate Path (Modified NRC 2008 Bank JPM-034)

At the completion of this JPM the examinee has commenced venting (depressurizing) Containment using the Hydrogen Purge flow path and the Enclosure Building Filtration Systems (EBFS) to the Millstone Stack. They then must stop the venting operation when the automatic function does not shut the Hydrogen Purge valves. All procedure steps will have been completed, up to but not including, starting the EBFS train that will be used. The examinee will start and align the selected EBFS train and then aligns the Containment Purge system to commence the Containment depressurization. Once the depressurization has commenced, a Hydrogen Purge Isolation Valve Hi Radiation alarm on the main control boards will be received. The automatic function associated with this alarm is the closure of the Hydrogen Purge valves. This will not occur. The examinee must take action to shut the Hydrogen Purge valves.

S6 Transfer Electrical Buses from the NSST to the RSST on a Plant Downpower (New)

At the completion of this JPM the examinee has transferred 6.9 KV a busses from the NSST to the RSST. The examinee will ensure the Reserve Station Service Transformer (RSST) is energized from the 345 kV bus and perform switch manipulations to transfer both 6.9 kV busses from the Normal Station Service Transformer (NSST) to the RSST.

S7 Securing of CVCS due to VCT Level Instrument Failure (New)

At the completion of this JPM the examinee has identified the lost of vital instrument bus VA-10 and isolated Charging and Letdown. A loss of VA-10 will fail one of the VCT level instruments causing the Charging pump suction to transfer from the Volume Control Tank (VCT) to the Refueling Water Storage Tank (RWST). This starts boration of the RCS. If this boration is not stopped additional complications resulting from the loss of VA-10 (one Feedwater Regulating valve locks up) will challenge the ability to maintain the plant operating. The examinee must recognize that a loss of VA-10 has occurred in the mist of multiple alarms and take immediate operator actions to secure Charging and Letdown by closing a Letdown valve and turning off all Charging pumps.

S8 Change the Setpoint of the SJAE RM 5099 (NRC 2005 Bank JPM-120)

At the completion of this JPM the examinee will have adjusted the setpoint of the Steam Jet Air Ejector Radmonitor (RM 5099) to a new setpoint. The examinee will be provided a SJAE Radiation Monitor RM 5099 & PPC Alarm Setpoint Change Request. Then using this information the setpoint will be changed and then verified.

P1 Supplying Emergency Backup Air to 2-CH-192 (NRC 2011 Bank JPM-045)

At the completion of this JPM the examinee will have aligned a Backup Air supply to the valve that aligns water from the Refueling Water Storage Tank (RWST) to the suction of the Charging pumps (CH-192). This alignment provides borated water to the Reactor Coolant system (RCS) for reactivity control. The examinee must sign onto a Radiation Work Permit (RWP), enter the Radiation Control Area (RCA), go to the backup air bottle location, and simulate valve manipulations to align Backup Air at a specified pressure.

P2 Local Manual Air Start of the Emergency Diesel Generator (NRC 2008 Bank JPM-060A(B))

At the completion of this JPM, the examinee will have performed a local manual air start of the “A” (“B”) Emergency Diesel Generator EDG). The examinee must go to the EDG, which is located outside the RCA. Then simulate resetting the local panel alarms, simulate ensuring the Shutdown Relay (SDR) is reset, simulate unlocking and closing the EDG Air Start Vent Header isolation valves, simulate coordination to have the EDG Manual Start Switch placed in start in the control room, and simulate locally starting the EDG by pressing on the levers on the Control Air Supply valves. Once the EDG has

simulated starting the lever is released and the Air Start Vent Header isolation valves are simulated opened and locked to return the system to a normal configuration.

P3 Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump (Bank JPM-085(A))

At the completion of this JPM, the examinee has simulated manually starting the Turbine Driven Auxiliary Feedwater (TDAFW) pump locally. The examinee must simulate checking temperatures in the area, simulate opening the steam supply to the Turbine, identify that the TDAFW pump has tripped, and simulate closing the steam supply. Once the steam supply valve is simulated closed the examinee simulates valve manipulation to drain water out of the steam supply piping, and simulates resetting the TDAFW pump mechanical overspeed trip latch. Once the TDAFW pump turbine is reset the examinee simulates opening the steam supply valve and simulates adjusting the speed control knob to raise the TDAFW pump speed to a condition required to feed the Steam Generators. Local speed indication, Steam Generator pressure and TDAFW pump discharge pressure are indications utilized by the examinee to simulate starting and bringing the TDAFW pump to the conditions required to feed the Steam Generators.

Facility: Millstone Unit 2 Date of Examination: 09/10/2018

Exam Level: RO ☐ SRO-I ☐ SRO-U ☒ Operating Test Number: ES18LI

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
S1 Manual Makeup to the VCT (KA 004 A2.06)	A,D,S	1
S2 Inadvertent AEAS Actuation (KA 013 A2.06)	EN,N,S	2
S3 Respond to a Failed Open PORV (KA 010 A2.03)	A,D,S	3
S4 Respond to CTMT Sump Clogging (KA 011 EA1.11)	A,D,L,S	4(P)
S5 Venting Containment via Hydrogen Purge using EBFS to Millstone Stack (RO Only) (KA 103 A3.01)	A,M,S	5
S6 Transfer Electrical Buses from the NSST to the RSST on a Plant Downpower (KA 062 A4.01)	N,S	6
S7 Securing of CVCS due to VCT Level Instrument Failure (KA 016 A2.02)	N,S	7
S8 Change the Setpoint of the SJAE RM 5099 (KA 071 A4.25)	D,S	9

In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U

P1 Supplying Emergency Backup Air to 2-CH-192 (KA 2.1.23)	D,E,R	8
P2 Local Manual Air Start of the Emergency Diesel Generator (KA 064 A4.06)	D,E	6
P3 Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump (KA 054 AA1.02)	A,D,E,L	4(S)

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for R /SRO-I/SRO-U

(A)lternate path (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power/Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator	4–6/4–6 /2–3 ≤ 9/≤ 8/≤ 4 ≥ 1/≥ 1/≥ 1 ≥ 1/≥ 1/≥ 1 (control room system) ≥ 1/≥ 1/≥ 1 ≥ 2/≥ 2/≥ 1 ≤ 3/≤ 3/≤ 2 (randomly selected) ≥ 1/≥ 1/≥ 1

S1 Manual Makeup to the VCT - Alternate Path - (NRC 2011 Bank JPM-022)

At the completion of this JPM the examinee has recognized a malfunction with Boric Acid injection, during attempted manual makeup to the Volume Control Tank (VCT), and terminates the dilution. The examinee is provided with a Blend Ratio and is directed to raise VCT level by 2%. The examinee must set up the Boric Acid and Primary Makeup Water controllers with the proper blend, align the system for the blend, determine the number of gallons required for a 2% change to the VCT and initiate the blended makeup. Once the blend commences the examinee determines there is no Boric Acid flow and terminates the dilution.

S2 Inadvertent AEAS Actuation (New)

At the completion of this JPM the examinee has restored ventilation and reset the Engineered Safety Features Actuation System (ESFAS). The examinee is will be directed to complete procedure steps for an inadvertent Auxiliary Exhaust Actuation Signal (AEAS). The examinee will check Spent Fuel Pool radiation is less than 50 mr/hr, align Condenser Air Removal to the Unit 2 Stack and then reset the AEAS signal on the ESFAS.

S3 Respond to a Failed Open PORV - Alternate Path - (Bank JPM-280(A))

The examinee will carry out Immediate Operator Actions for a failed open Power Operated Relief Valve (PORV). At the completion of this JPM the examinee will recognize that PORV, RC-402 has failed open by any or all of the following; RCS pressurizer lowering, Main Control Board annunciator and valve indicator lights. They will then verify RCS pressure < 2,250 psia and close the PORV Block valve RC-403. The Block valve will fail to close. This will require the examinee to take contingency action to trip the reactor. The manual reactor trip must be initiated prior to an automatic trip for the JPM to completed successfully.

S4 Respond to CTMT Sump Clogging (RO Only) - Alternate Path - (Bank JPM-156)

At the completion of this JPM the examinee will have performed SRAS supplemental actions, assessed HPSI pump post SRAS performance, determined that HPSI pump performance is degraded as a result of sump clogging, and taken Contingency Actions to stop the running Containment Spray (CS) pumps. The examinee will determine that HPSI performance is still degraded after stopping the CS pumps and will implement additional Contingency Actions to throttle HPSI to a flow value greater than or equal to the minimum ECCS flow for decay heat removal.

S5 Venting Containment via Hydrogen Purge using EBFS to Millstone Stack - Alternate Path (Modified NRC 2008 Bank JPM-034)

At the completion of this JPM the examinee has commenced venting (depressurizing) Containment using the Hydrogen Purge flow path and the Enclosure Building Filtration Systems (EBFS) to the Millstone Stack. They then must stop the venting operation when the automatic function does not shut the Hydrogen Purge valves. All procedure steps will have been completed, up to but not including, starting the EBFS train that will be used. The examinee will start and align the selected EBFS train and then aligns the Containment Purge system to commence the Containment depressurization. Once the depressurization has commenced, a Hydrogen Purge Isolation Valve Hi Radiation alarm on the main control boards will be received. The automatic function associated with this alarm is the closure of the Hydrogen Purge valves. This will not occur. The examinee must take action to shut the Hydrogen Purge valves.

S6 Transfer Electrical Buses from the NSST to the RSST on a Plant Downpower (New)

At the completion of this JPM the examinee has transferred 6.9 KV a busses from the NSST to the RSST. The examinee will ensure the Reserve Station Service Transformer (RSST) is energized from the 345 kV bus and perform switch manipulations to transfer both 6.9 kV busses from the Normal Station Service Transformer (NSST) to the RSST.

S7 Securing of CVCS due to VCT Level Instrument Failure (New)

At the completion of this JPM the examinee has identified the lost of vital instrument bus VA-10 and isolated Charging and Letdown. A loss of VA-10 will fail one of the VCT level instruments causing the Charging pump suction to transfer from the Volume Control Tank (VCT) to the Refueling Water Storage Tank (RWST). This starts boration of the RCS. If this boration is not stopped additional complications resulting from the loss of VA-10 (one Feedwater Regulating valve locks up) will challenge the ability to maintain the plant operating. The examinee must recognize that a loss of VA-10 has occurred in the mist of multiple alarms and take immediate operator actions to secure Charging and Letdown by closing a Letdown valve and turning off all Charging pumps.

S8 Change the Setpoint of the SJAE RM 5099 (NRC 2005 Bank JPM-120)

At the completion of this JPM the examinee will have adjusted the setpoint of the Steam Jet Air Ejector Radmonitor (RM 5099) to a new setpoint. The examinee will be provided a SJAE Radiation Monitor RM 5099 & PPC Alarm Setpoint Change Request. Then using this information the setpoint will be changed and then verified.

P1 Supplying Emergency Backup Air to 2-CH-192 (NRC 2011 Bank JPM-045)

At the completion of this JPM the examinee will have aligned a Backup Air supply to the valve that aligns water from the Refueling Water Storage Tank (RWST) to the suction of the Charging pumps (CH-192). This alignment provides borated water to the Reactor Coolant system (RCS) for reactivity control. The examinee must sign onto a Radiation Work Permit (RWP), enter the Radiation Control Area (RCA), go to the backup air bottle location, and simulate valve manipulations to align Backup Air at a specified pressure.

P2 Local Manual Air Start of the Emergency Diesel Generator (NRC 2008 Bank JPM-060A(B))

At the completion of this JPM, the examinee will have performed a local manual air start of the “A” (“B”) Emergency Diesel Generator EDG). The examinee must go to the EDG, which is located outside the RCA. Then simulate resetting the local panel alarms, simulate ensuring the Shutdown Relay (SDR) is reset, simulate unlocking and closing the EDG Air Start Vent Header isolation valves, simulate coordination to have the EDG Manual Start Switch placed in start in the control room, and simulate locally starting the EDG by pressing on the levers on the Control Air Supply valves. Once the EDG has

simulated starting the lever is released and the Air Start Vent Header isolation valves are simulated opened and locked to return the system to a normal configuration.

P3 Local Manual Operation of the Turbine Driven Auxiliary Feedwater Pump (Bank JPM-085(A))

At the completion of this JPM, the examinee has simulated manually starting the Turbine Driven Auxiliary Feedwater (TDAFW) pump locally. The examinee must simulate checking temperatures in the area, simulate opening the steam supply to the Turbine, identify that the TDAFW pump has tripped, and simulate closing the steam supply. Once the steam supply valve is simulated closed the examinee simulates valve manipulation to drain water out of the steam supply piping, and simulates resetting the TDAFW pump mechanical overspeed trip latch. Once the TDAFW pump turbine is reset the examinee simulates opening the steam supply valve and simulates adjusting the speed control knob to raise the TDAFW pump speed to a condition required to feed the Steam Generators. Local speed indication, Steam Generator pressure and TDAFW pump discharge pressure are indications utilized by the examinee to simulate starting and bringing the TDAFW pump to the conditions required to feed the Steam Generators.

Facility: Millstone Unit 2 Scenario No.: 1 Op-Test No.: ES18LI1

Examiners: _____ Operators: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: 100% Power **IC-156**, steady state, Ch-X PZR Level OOS, Ch-Y PZR Level in service. **ENSURE "B" Charging pump is aligned to 22F (Facility 2).**

Turnover: 100% Power, steady state, 24E is aligned to 24C. Channel "X" Pressurizer Level Control is OOS for I&C, but is not being worked at this time. Severe electrical storms have been predicted for the area, but none are directly overhead at this time. SP 2654B, ***Forcing Pressurizer Sprays***, is ready to be performed.

Critical Tasks:

1. [SPTA-5] Manually shutdown the reactor (ATC).
2. [ESDE-6] Isolate the most affected SG (BOP).

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (ATC/S)	Force Pressurizer Sprays (per SP 2654B).
2	CH01A	C (ATC/S) TS (S)	Trip "A" Containment Air Recirc. Fan.
3	RD0108	C (BOP/S) TS (S)	CEA #8 drops fully into the core. Reduce turbine load and stabilize RCS temperature.
4	N/A	R (All)	Downpower to < 70% per AOP 2575.
5	05A1A2S23, C06/7-D01A, TPHA-6282A_3	C (BOP/S)	Trip of "A" TBCCW Pump, requires manual start of the standby TBCCW Pump.
6	RD0128	C (ATC/S)	2nd rod drop (RG-1 #28), requires a reactor trip.
7	MS01A, ED05C	M (ALL)	ESD in CTMT #1 S/G and loss of 24C on plant trip.
8	ES03L	I (ATC/S)	Failure of "B" CS Pump and Valve to trigger on CSAS.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Malfunctions after EOP entry (1–2)	1
2. Abnormal events (2–4)	4
3. Major transients (1–2)	1
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	0
6. Critical tasks (2–3)	2

Scenario 1 Summary:

The crew will take the shift with the unit at 100% Power **IC-156**, steady state, Ch-X PZR Level OOS, Ch-Y PZR Level in service, "B" Charging pump aligned to 22F (Facility 2).
The crew has been instructed to perform surveillance SP 2654B, Forcing Pressurizer Sprays.

Event 1: Upon taking the shift, the crew has been instructed to perform surveillance SP 2654B, ***Forcing Pressurizer Sprays***, to equalize RCS and pressurizer boron concentration. Once the surveillance is started and pressurizer pressure has been stabilized, Event 2 will be triggered.

Event 2: The "A" Containment Air Recirculation Fan, F-14A, will trip, triggering the CAR Fan Trip annunciator. The ATC should respond per ARP 2590A-009, ***CTMT AIR RECIRC FAN A TRIP*** and OP 2313A, ***Containment Air Recirculation and Cooling System***, to start the standby CAR fan in fast mode and properly align RBCCW flow to the fan's heat exchanger. The US should evaluate the lost CAR fan impact on Tech. Specs. Once this is accomplished, or at the examiners discretion, Event 3 will be triggered.

Event 3: Shutdown Group "B" CEA #8 will drop to the fully inserted position (0 steps withdrawn). The ATC should diagnose that one, and only one, CEA has dropped and the BOP should take the IOA of lowering main turbine load to stabilize RCS temperature. The crew will enter AOP 2585, ***Immediate Operator Actions***, then transition to AOP 2556, ***CEA Malfunctions***, and begin the process of recovering the dropped CEA. The US should also note the dropped rod impact on Tech. Specs.

Event 4: Per Technical Specifications, reactor power is required to be lowered to < 70% within one hour of the rod drop. This will required the crew to perform a plant downpower using AOP 2575, ***Rapid Downpower***. Once the power change evaluation is completed, or at the examiners discretion, Event 5 will be triggered.

Event 5: "A" TBCCW pump will trip, but the standby pump does not automatically start. The crew must manually start the standby TBCCW pump before the Main Turbine trips on high Stator Water Cooling temp. Once TBCCW system flow is restored to normal, or at the examiners discretion, Event 6 is triggered.

Event 6: Regulating Group 1, CEA #28 will drop into the core before the crew has a chance to recover the first dropped CEA. The MP2 core has not been analyzed for more than one CEA violating the Tech. Spec. alignment requirements, therefore, a manual plant trip is required IAW AOP 2556, ***CEA Malfunctions***.
The crew should then manually trip the plant and commence EOP 2525, ***Standard Post Trip Actions.***

Event 7: On the trip, an Excess Steam Demand Event will occur in containment and vital 4.16 kV bus 24C will de-energize due to a bus fault. During the performance of SPTA, the ATC should secure "A" & "C" RCPs and manually initiate SIAS, CIAS, EBFAS and MSI if not yet triggered automatically. The BOP should trip the "A" Emergency Diesel Generator and secure all feedwater to the #1 SG.

Event 8: When containment pressure reaches the CSAS setpoint, the CSAS signal will fail to start the "B" Containment Spray Pump or open the CS Pump discharge valve to containment. This, combined with the loss of Facility 1 power, will require the ATC to manually start the "B" CS pump and open the "B" CS valve.

The scenario will end when the crew has isolated the affected Steam Generator IAW EOP 2536, ***Excess Steam Demand Event***, or at the Examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
CH01A	"A" CAR Fan, F-14A, trip			E-2	Active		1
RD0108	CEA #8 Dropped Rod			E-3	Active		2
C06-D01A	TBCCW Pump Trip alarm C06/7-DA1			E-5	CRY-WOLF		3
RD0128	CEA #28 Dropped Rod			E-6	Active		4
MS01A	Main Steam Rupture "A" Header on trip			E-30	3.04		5
ED05C	Loss of 24C on the trip		1 min	E-30	Active		5
ES03L	ESAS Act. Mod. AM-609/610 failure when RCS Tavg < 518°F			E-22	Active		6
REMOTE FUNCTIONS							
C06-D01A	TBCCW Pump Trip alarm C06/7-DA1			E-10	NORMAL		3
OVERRIDES							
05A1A2 S23	"A" TBCCW Pump at **first** STOP			E-5	STOP		3
TPHS-6282A_3	"A" TBCCW Pump Amber light lit			E-5	A		3

Facility: Millstone Unit 2 Scenario No.: 2 Op-Test No.: ES18LI1

Examiners: _____ Operators: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: 100% Power **IC-231**, steady state, Ch-X PZR Level OOS, Ch-Y PZR Level in service. **ENSURE "B" Charging pump is aligned to 22F.**

Turnover: 100% Power, steady state, 24E is aligned to 24C. Channel "X" Pressurizer Level Control is OOS for I&C, but is not being worked at this time. Severe electrical storms have been predicted for the area, but none are directly overhead at this time.

Critical Tasks:

1. [OP 2260, EOP 2525 RCP Trip Criteria] RCPs with any abnormal operating condition prior to the trip should be secured. (ATC).
2. [LOOP-3] Establish a Primary-to-Secondary Heat Sink. (BOP).
3. [LOAF-4] Establish a Primary-To-Secondary Heat Sink. (ATC/BOP).

Event No.	Malf. No.	Event Type*	Event Description
1	02A2A5S5, RXHS-100-2_3, C03-C41	C (ATC/S) TS (S)	Pressurizer Proportional Heaters Group #2 feeder breaker trip, causing loss of Pressurizer Group #2 Proportional Heaters.
2	WD03	TS (BOP/S)	Containment Normal Sump level detector, L9155, fails low.
3	RC08B, RC09B		RCP "B" Upper and Middle Seal failures.
4	N/A	R (ALL)	Plant shutdown required due to 2 RCP failed seals.
5	RC28B	C (ATC/S)	"B" RCP High Vibration requiring a manual plant trip.
6	ED17C, FW20A	C (BOP/S)	Both Vital 4.16 kV buses fail to transfer to the RSST (LOOP), and "A" AFW Pump trips, requiring start of TDAFW pump
7	EG14B	C (All)	"B" EDG breaker fails open, requires "B" EDG manual trip (BOP) and securing of "B" & "D" RCPs (ATC).
8	FW20C	M (ALL)	Trip of TDAFW pump requires transition to EOP 2537, LOAF or EOP 2540/2540D, Functional Recovery of Heat Removal.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	2
3. Major transients (1–2)	1
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	0
6. Critical tasks (2–3)	3

Scenario 2 Summary:

The crew will take the shift with the unit at 100% Power **IC-231**, steady state, Ch-X PZR Level OOS, Ch-Y PZR Level in service, "B" Charging pump aligned to 22F.

Event 1: Immediately after the crew takes the watch, the Group #2 PZR Proportional Heater breaker will trip and annunciator C03-C41, ***PRESSURIZER HTR CNTL GP FEEDER BKR TRIP***, will alarm. The crew should reference ARP 2590B-227 and the US should log into the applicable Tech. Spec. Action Statement (TSAS). The ATC will need to energize at least one bank of PZR Backup Heaters and/or adjust the selected PZR pressure controller (PIC-100Y) automatic setpoint, in order to maintain PZR pressure constant at 2250 psia. Once RCS pressure has been stabilized, or at the examiners discretion, Event 2 is triggered.

Event 2: The sump level detector, L9155, will instantly fail low, triggering annunciator alarm C06/7-BA21, ***CTMT NORM SUMP LEVEL HI/LO***. The crew should refer to ARP 2590E-107 for annunciator C06/7-BA21. The US should evaluate the impact on Tech. Specs. Once this is accomplished, or at the examiners discretion, Event 3 is triggered.

Event 3: The upper and middle seals of "B" RCP will fail triggering various alarms on C02/3 pertaining to the "B" RCP seals. Based on ARP 2590B guidance for any of the RCP seal alarms, the crew should refer to AOP 2586, ***RCP Malfunctions***. Using the guidance of AOP 2586, the crew should determine that two RCP seals have failed or are substantially degraded, and a plant shutdown is required.

Event 4: IAW AOP 2586, the crew should utilize OP 2204, ***Load Changes***, and commence a plant shutdown. To speed up the power change, the OMOC or SM could express concern over the degraded RCP status and direct the crew to utilize AOP 2575, ***Rapid Downpower***, to shut down the plant more expeditiously. Once the power change evaluation is completed, or at the examiners discretion, Event 5 is triggered.

Event 5: The "B" RCP will begin to experience vibration levels exceeding the procedural limit for tripping the plant, per AOP 2586, ***RCP Malfunctions***. The crew should verify all CEAs fully inserted, main turbine tripped and commence EOP 2525, ***Standard Post Trip Actions.***

Event 6: On the trip, both Vital 4.16 kV buses fail to transfer to the RSST, causing ESAS to start both Emergency Diesel Generators (EDG). The EDGs will re-energize both vital buses, however, the loss of the non-vital 4.16 kVA buses will cause a loss of both Main Feedwater Pumps. Also on the trip, the "A" AFW Pump will trip, requiring the BOP to start the Turbine Driven Aux. Feedwater (TDAFW) pump.

Event 7: The "B" EDG output breaker will fail open, de-energizing vital bus 24D and requiring the BOP to emergency trip the "B" EDG. The loss of Fac. 2 RBCCW will require the ATC to secure the "B" & "D" RCPs.

Event 8: Three minutes after the TDAFW pump is started, it will trip. All attempts at restart will fail, resulting in a loss of all feedwater flow to both SGs. This will require EOP transition to either EOP 2537, ***Loss Of All Feedwater*** or EOP 2540, ***Functional Recovery.*** RCS Heat Removal Safety Function can be restored by using a Condensate pump to feed a SG or via Once-Through-Cooling and SI flow to the RCS.

The scenario will end when RCS Heat Removal Safety Function is restored or at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
ED17C	Failure of 24C & 24D transfer to RSST			E-0	Active		0
FW20A	"A" AFW pump trip/fail to start			E-30	Active		0
C03-C41	PZR Htr Cntrl Gp Feeder Bkr Trip alarm			E-1	ON		1
WD03	CTMT Normal Sump Level fails low			E-2	0%		2
RC08B	"B" RCP Middle Seal failed			E-3	50%		3
RC09B	"B" RCP Upper Seal failed			E-3	100%		3
RC28B	"B" RCP High Vibration		3 min.	E-5	30 mils		5
EG14B	"B" EDG output breaker trip			E-7	Active		5
FW20C	TDAFW pump trip	5 min.		E-29	Active		6
REMOTE FUNCTIONS							
IAR15E	Reset "E" IAC (IAC F3E Start PB)			E-10	START		6
OVERRIDES							
02A2A5S5	PZR Prop. Htr Gp-2 breaker OFF			E-1	OFF		1
RXHS-100-2_3	PZR Proptional Heater GP-2 Bkr AMBER light lit			E-1	A		1
RXHS-100-2_3	PZR Proptional Heater GP-2 Bkr AMBER light lit [if handswitch is reset]			E-10	NA		1

Facility: Millstone Unit 2 Scenario No.: 3 Op-Test No.: ES18LI1

Examiners: _____ Operators: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: 100% Power **IC-48**, steady state, Ch-X PZR Level OOS, Ch-Y PZR Level in service. **ENSURE "B" Charging pump is aligned to 22F (Facility 2)**

Turnover: 100% Power, steady state, 24E is aligned to 24C. Channel "X" Pressurizer Level Control is OOS for I&C, but is not being worked at this time. Severe electrical storms have been predicted for the area, but none are directly overhead at this time.

Critical Tasks:

1. [RC-3, CT-1] Perform a plant cooldown (BOP).
2. [RC-3, CT-2] Establish Reactivity Control (ATC).

Event No.	Malf. No.	Event Type*	Event Description
1	CC01A, C06-A6	C (TS) (BOP/S)	'A' RBCCW pump trip & alarm. Requires 'B' RBCCW pump put in service.
2	RC04	C (TS) (ATC/S)	RCS leak of ~20 gpm, Tech. Specs. requires a plant shut down.
3	N/A	R (ALL)	Plant shutdown required due to RCS leakage.
4	CVR50, CVR51	C (ATC/S)	CH-192, RWST to CVCS, Failed Closed, requires borating from BAST
5	RX12C	I (BOP/S)	#2 SG "Main" Level Transmitter (LT-5273) fails low.
6	ES02D, ED06E, RD0206, RD0207	M (ALL)	Inadvertent MSI Fac. 2, both MSIVs go closed causing a plant trip. On the trip, 480 VAC bus 22E de-energizes causing loss of "A" Chg. Pump and 2 CEAs fail to insert, requiring Emergency Boration.
7	CV04C	C (ATC/S)	30 seconds after the plant trip, "C" charging pump trips, requiring "B" charging pump be manually started for Emergency Boration.
8	CV04B, C02-C13	M (All)	Trip of remaining ("B") charging pump & alarm. Requires transition to EOP 2540/2540A, to recover Reactivity Safety Function.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Malfunctions after EOP entry (1–2)	1
2. Abnormal events (2–4)	4
3. Major transients (1–2)	2
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	1
6. Critical tasks (2–3)	2

Scenario 3 Summary:

The crew will take the shift with the unit at 100% Power **IC-48**, steady state, Ch-X PZR Level OOS, Ch-Y PZR Level in service, "B" Charging pump aligned to 22F (Facility 2).

Event 1: "A" RBCCW pump will trip, requiring the crew to start the "B" RBCCW pump and place it in service on the "A" RBCCW Header IAW AOP 2564, ***Loss of RBCCW***. The applicable Tech. Spec. entry will be made based on the initial loss of an operable Fac. 1 RBCCW pump.
Once flow on the "A" RBCCW Header is restored, or at the examiners discretion, Event 2 is triggered.

Event 2: An RCS leak into containment of about 20 gpm will occur, requiring the crew to enter AOP 2568, ***Reactor Coolant System Leak***, and perform the applicable actions. The crew should commence a plant shutdown based on the rate exceeding the administrative requirement for continued operation.

Event 3 and 4: Based on the guidance of AOP 2568, the crew will perform the actions of AOP 2575, ***Rapid Downpower***, to shut down to Mode 5 (**Event 3**). When the ATC attempts to borate from the RWST (preferred method), CH-192 fails to open on demand, requiring boration from the BAST.
Once the power change evaluation is completed, or at the examiners discretion, Event 5 is triggered.

Event 5: The #2 SG "Main" control channel level transmitter will fail low. In response to this failure, the #2 Main Feed Regulating Valve (MFRV) will automatically start to open causing #2 SG level to rise. The BOP should perform the required actions per AOP 2585, ***Immediate Operator Actions***, (IOA) to stabilize SG level. This will require taking manual control of the #2 SG MFRV and both main feed pumps to lower #2 SG feedwater flow. Once SG levels have been stabilized, the failed transmitter can be bypassed and the SG Feedwater Control System can be returned to automatic mode.
Once Main Feedwater Control is back in automatic mode, or at the examiners discretion, Event 6 is triggered.

Event 6: An inadvertent MSI actuation will occur, closing both of the MSIVs and causing a plant trip on load reject and a loss of normal feedwater flow. On the trip, Vital 480 VAC bus 22E will de-energize causing the loss of "A" charging pump, and 2 Shutdown CEAs will fail to insert requiring Emergency Boration.

Event 7: Approximately 30 seconds after the plant trip, the "C" charging pump will trip. This will cause a total loss of charging flow and boric acid injection, requiring the manual start of the standby "B" charging pump. Some time before the US begins the Diagnostic Flow Chart, Event 8 is triggered.

Event 8: The "B" charging pump will trip, causing a loss of the Reactivity Safety Function. This will require the crew to transition to EOP 2540/2540A, ***Functional Recovery of Reactivity Control***, and cooldown and depressurize the RCS to allow use of the HPSI pumps to inject boric acid into the RCS.

The scenario will end when the Reactivity Safety Function is restored, or at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
RD0206	CEA SD-6 Stuck fully withdrawn			E-0	Active		0
RD0207	CEA SD-7 Stuck fully withdrawn			E-0	Active		0
RD0208	CEA SD-8 Stuck fully withdrawn			E-0	Active		0
RD0209	CEA SD-9 Stuck fully withdrawn			E-0	Active		0
CC01A	"A" RBCCW pump trip			E-1	Active		1
C06-A06	"A" RBCCW Pump Overload Trip			E-1	ON		1
C06-A06	"A" RBCCW Pump Overload Trip			E-10	NORMAL		2
RC04	RCS Leak in CTMT (Rx Head Vent)			E-2	20 gpm		4
RX12C	#2 SG 'Main' Level transmitter failure		5 min	E-5	50%		5
ES02D	Fac. 2 Inadvertent MSI			E-6	Active		6
ED06E	Loss of bus 22E			E-30	Active		6
CV04C	"C" Charging pump trip			E-7	Active		7
C02-C13	"B" Charging Pp Lube Oil Pres Lo			E-8	Cry-Wolf		8
CV04B	"B" Charging pump trip			E-8	Active		8
REMOTE FUNCTIONS							
CVR50	CH-192 Operational Mode			E-0	MANUAL		0
CVR51	RWST Isolation Valve CH-192 (% open)			E-0	0%		0
CCR40	"B" RBCCW Breaker SIAS Block			E-11	NORM		3
OVERRIDES							

Facility: Millstone Unit 2 Scenario No.: 4 Op-Test No.: ES18LI1

Examiners: _____ Operators: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: 100% Power **IC-222**, steady state. Ch-X PZR Level OOS, Ch-Y PZR Level in service. **ENSURE "B" Charging pump is aligned to 22F (Facility 2)**

Turnover: 100% Power, steady state, 24E is aligned to 24C. Channel "X" Pressurizer Level Control is OOS for I&C, but is not being worked at this time. Severe electrical storms have been predicted for the area, but none are directly overhead at this time.

Critical Tasks:

1. [2260 ESD, CT-1] Attempt to secure feed flow to the affected SG within 15 minutes from the control room (BOP).
2. [ENT-1, CT-2] Trip 2 RCPs or trip RCPs based on RCS pressure (ATC).
3. [PC-1, CT-3] Establish RCS Pressure Control (ATC).

Event No.	Malf. No.	Event Type*	Event Description
1	SI01C	C (ATC/S)	Safety Injection Loop 2A Check Valve Leakage
2	SW09A	C (BOP/S) TS (S)	"A" Service Water Pump strainer failure. Requires swap to "B" SW pump as Fac. 1 pump.
3	SG01B	C (ATC/S) TS (S)	#2 Steam Generator Tube Leak.
4	N/A	R (All)	Plant Shutdown required due to SGTL.
5	SG02B	M	#2 Steam Generator Tube Rupture, requires a plant trip.
6	MS07B	C (BOP/S)	Main Steam Safety Valve fails open on plant trip, requires all feed be secured to #2 SG.
7	FW35B	C (BOP/S)	Aux. Fd. Reg. Valve, FW43B, fails open. Requires closing of FW-44 (and possibly securing of TDAFP) to isolate feed to #2 SG.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	3
3. Major transients (1–2)	1
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	1
6. Critical tasks (2–3)	3

Scenario 4 Summary:

The crew will take the shift with the unit at 100% Power **IC-222**, steady state. Ch-X PZR Level OOS, Ch-Y PZR Level in service, "B" Charging pump aligned to 22F (Facility 2).

Event 1: Immediately after taking the watch, the Safety Injection Loop 2A Check Valve will begin to leak by, resulting in a high pressure in the SIT Tank #3 Loop Header and triggering alarm C01-C14, "***SIS TO LOOP 2A PRES HI***". The crew will utilize ARP 2590A-055 and take action to manually vent the header to the PDT and restore the header pressure to normal.
Once SIT Header pressure has been restored, or at the examiners discretion, Event 2 is triggered.

Event 2: The "A" Service Water (SW) strainer will clog and fail to automatically backwash, triggering annunciator C06/7-CB4, ***SW PUMP A STNR TROUBLE***. The PEO investigating will report strainer ΔP is 4 psid and slowly rising and the strainer will NOT backwash even after a manual attempt. The crew will be forced to place the standby SW pump in operation on the Facility 1 SW Header IAW OP 2326A, ***Service Water System*** and secure the running pump. The Facility 1 SW Header OPERABLE Tech. Specs. will be briefly entered until the spare SW pump breaker SIAS interlock is cleared.
Once the SW pump swap evolution has been completed, or at the examiners discretion, Event 3 is triggered.

Event 3: A 10 gpm tube leak will occur on the #2 Steam Generator, requiring entry into AOP 2569, ***Steam Generator Tube Leak***. The crew will utilize AOP 2569 to evaluate the tube leaks size, location and need to shutdown the plant.

Event 4: The tube leak exceeds the limit for continued power operation and the crew will commence a plant shutdown using AOP 2575, ***Rapid Downpower***.

Once the power change evaluation is completed, or at the examiners discretion, Event 5 is triggered.

Event 5: The #2 Steam Generator tube leak will degrade to a 600 gpm tube rupture, requiring a plant trip.

EOP 2525, ***Standard Post Trip Actions***, will then be carried out.

Event 6: On the plant trip, a Main Steam Safety Valve will fail full open, requiring all feed be secured to #2 SG.

Event 7: Aux. Feed Reg. Valve, FW43B, will fail full open, requiring FW-44 be closed to isolate AFW flow to the #2 SG. Also, the TDAFP must be secured if it was started.

The ESD from the stuck open MSSV, combined with the SGTR, will require the transition to EOP 2540, ***Functional Recovery***, and EOP 2540E, ***Functional Recovery of Containment Isolation***, to mitigate the event.

The scenario will end when the CTMT Safety Function has been addressed, or at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
SI01C	Safety Inj. Loop 2A check valve leakage			E-1	50%		1
SI01C	Safety Inj. Loop 2A check valve leakage	1 sec.		E-10	DELETE		2
SW09A	"A" SW pump strainer failure		10 min.	E-2	50%		3
SG01B	#2 SG Tube Leak			E-3	10 gpm		5
SG02B	#2 SG Tube Rupture			E-5	600 gpm		6
MS07B	MSSV MS-239 fails full open (100%)			E-30	8E05		7
REMOTE FUNCTIONS							
SWR31	"B" SW Pump SIAS/LNP permissive			E-12	NORM		4
FWR60	FW-43B, Aux. Feed Reg. Valve, Local			E-7	MANUAL		8
FWR64	FW-43B, Aux. Feed Reg. Valve, position			E-7	100%		8
MSR13	MS-202 Disconnect Closed			E-14	RI		9
OVERRIDES							

Facility: Millstone Unit 2 Scenario No.: 5 Op-Test No.: ES18LI1

Examiners: _____ Operators: _____ SRO

_____ _____ ATC

_____ _____ BOP

Initial Conditions: ~76% Power IC-266, steady state.

Ensure the following:

1. VCT gas pressure is low enough to not require venting.
2. Turnover states Reactivity Plan meets fuel conditioning criteria.
3. CEA GP-7 Position form is filled out for 15 minutes ago.
4. Previously completed steps of OP 2204 are signed off.
5. Makeup integrator is set for **1000 gal**.

Turnover: ~76% Power. Plant startup following a mid-cycle forced outage due to a major storm. The plant is no longer in AOP 2560, ***Storms, High Winds and High Tides***, however, severe electrical storms have been predicted for the CT area, but none are directly overhead at this time. All components and equipment aligned per existing plant power level; power ascension will hold at 90% for main turbine control valve testing. Ch. "X" PZR Level Controller OOS for I&C, but is not being worked at this time; 24E aligned to 24C.

Critical Tasks:

1. [LOCA-9, CT-1] Manually establish the required minimum safety injection flow (ATC).
2. [LOCA-12, CT-2] Trip any RCP not satisfying RCP operating limits (ATC).

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R (ALL)	Raise power to approximately 90%.
2	ES02F	I (TS) (ATC/S)	Inadvertent CTMT Spray Actuation, Facility 2
3	WD02B, WD04	C (TS) (BOP/S)	CTMT Sump strainer clogs when pumping the sump and isolation valve SSP-16.2 fails to close when the sump pump is secured.
4	CW02B	C (BOP/S)	"B" Traveling Screen rising ΔP, requires lowering "B" Circulating Water Pump speed.
5	TC01, RC03D	M	Main Turbine trip causes plant trip. LB-LOCA on the plant trip.
6	ES04F, RH01A	C (ATC/S)	Loss of ESAS Actuation Cabinet 6, requires manual actuation of Fac. 2 equipment, and loss of "A" LPSI requires "B" LPSI be started.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual
1. Malfunctions after EOP entry (1–2)	1
2. Abnormal events (2–4)	3
3. Major transients (1–2)	1
4. EOPs entered/requiring substantive actions (1–2)	1
5. EOP contingencies requiring substantive actions (0–2)	0
6. Critical tasks (2–3)	2

Scenario 5 Summary:

The crew will take the shift with the unit at ~76% power (**IC-266**), near the end of a mid-cycle power ascension, Ch. "X" PZR Level Controller OOS for I&C, but is not being worked at this time; 24E aligned to 24C. All other components and equipment aligned per the existing plant power level. The crew will be instructed to raise power to ~90% (no restrictions on the rate) and hold there for Main Turbine Control Valve testing.

Event 1: Immediately after taking the watch, the crew will raise power to approximately 90% in preparation for Main Turbine Control Valve testing.
Once the power change evaluation is completed, or at the examiners discretion, Event 2 is triggered.

Event 2: ESFAS Facility 2 Containment Spray will inadvertently actuate, starting the containment spray pump and opening the containment spray isolation valve on that facility. The crew must recognize this as an instrument failure of ESAS and take the actions for the alarm C01-D34, ***CSAS ACTUATION SIG CH 2 TRIP***. ARP 2590A-136 (C01-D34) and AOP 2571, ***Inadvertent ESFAS Actuation***, give guidance to diagnose and mitigate the inadvertent CSAS.
Once CSAS has been returned to a normal configuration, the crew should progress to Event 3.

Event 3: The running of CTMT Spray will fill the CTMT normal sump above the high level alarm, requiring the crew to pump it to lower level. Shortly after the pump is started, the sump pump discharge strainer will clog, triggering annunciator C06/7-BB21, ***CTMT NORM SUMP DIS PRESS HI*** and causing pump flow to go to zero. ARP 2590E-108 (C06/7-BB21) gives guidance to secure the sump pump and have Maintenance check out the strainer. When the sump pump is secured, both pump discharge valves are supposed to close automatically, but one valve will fail open violating the CTMT Isolation Tech. Spec. Manual operation of the valve's control panel switch will fail to close the valve.
Once the Tech. Spec. applicability has been noted, or at the examiners discretion, Event 4 is triggered.

Event 4: "B" Traveling Screen ΔP will begin to rise, eventually triggering alarm C06/7-D10, ***TRAVELING SCREEN ΔP HI.*** ARP 2590E-056 directs the crew to AOP 2517, ***Circulating Water Malfunctions***. The investigating PEO will report the "B" traveling screen is operating fine, but seems to be catching the brunt of the seaweed coming in with the tide. IAW AOP 2517, the crew will lower the "B" Circ. Water pump speed as necessary to maintain traveling screen ΔP below the Circ. Pump trip value of 30 psid.
Once the above actions have been taken, or at the examiners discretion, Event 5 is triggered.

Event 5: The Main Turbine will trip causing a plant trip. On the trip, a Large-Break LOCA will occur. EOP 2525, ***Standard Post Trip Actions***, will then be carried out.

Event 6: ESAS Actuation Cabinet 6 will lose power on the trip, requiring manual alignment of all Fac. 2 ESAS controlled components. In addition, "A" LPSI pump will trip 2 seconds after PZR pressure drops below 1600 psia, requiring the manual start of "B" LPSI pump to meet Safety Injection requirements.
After the completion of EOP 2525 SPTA, the crew will transition to EOP 2532, ***Loss Of Coolant Accident.***

The scenario will end when an RCS cooldown has been commenced, or at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
ES02F	Inadvertent CSAS Fac. 2			E-2	Active	Active	2
WD02B	CTMT sump isol. SSP-16.2 fails open			E-3	Active	Active	3
WD04	CTMT sump pump strainer clog		20 sec.	E-3	100%	100%	3
CW02B	"B" Traveling Screen high ΔP		180 sec.	E-4	20 psid	20 psid	4
TC01	Main Turbine Trip			E-5	Active	Active	5
RC03D	LB-LOCA on trip (Loop 2B Tc **100%**)	2 sec.		E-21	1E05	1E05	5
ES04F	ESAS Actuation Cabinet 6 power failure			E-21	Active	Active	5
RH01A	"A" LPSI pump trip	2 sec.		E-27	Active	Active	6
WD02B	CTMT sump isol. SSP-16.2 fails open	1 sec.		E-12	Delete	Delete	3
REMOTE FUNCTIONS							
CWR06B	"B" Screen Wash Pump Start			E-10		START	4
CWR07A	"A" Screens to Fast			E-10		FAST	4
CWR07B	"B" Screens to Fast			E-10		FAST	4
CWR07C	"C" Screens to Fast			E-10		FAST	4
CWR07D	"D" Screens to Fast			E-10		FAST	4
OVERRIDES							
05A1A2S37	CTMT SMP VLV SSP-16.1 CH 2			E-11	CLOSE	CLOSE	3
WDHS-9151_1	CTMT SUMP VLV SSP-16.1 CH 2 (GREEN)			E-11	NG	NG	3
WDHS-9151_2	CTMT SUMP VLV SSP-16.1 CH 2 (RED)			E-11	NR	NR	3
05A1A2S15	CTMT SMP VLV SSP-16.2 CH 1			E-12	CLOSE	CLOSE	3
WDHS-9150_1	CTMT SUMP VLV SSP-16.2 CH 1 (GREEN)			E-13	NG	NG	3
WDHS-9150_2	CTMT SUMP VLV SSP-16.2 CH 1 (RED)			E-13	NR	NR	3

Facility: Millstone Unit 2 Date of Exam: September 2018

Tier	Group	RO K/A Category Points											SRO-Only Points		
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total
1. Emergency and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	3	3	6
	2	2	2	2				1	1			1	9	2	2	4
	Tier Totals	5	5	5				4	4			4	27	5	5	10
2. Plant Systems	1	3	3	2	3	2	2	2	3	2	3	3	28	3	2	5
	2	1	1	1	1	0	1	1	1	1	1	1	10	0 2	1	3
	Tier Totals	4	4	3	4	2	3	3	4	3	4	4	38	5	3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1 2	3 4	7
		3			2			3			2			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 outline sections (i.e., except for one category in Tier 3 of the SRO-only section, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 radiation control K/A is allowed if it is replaced by a K/A from another Tier 3 category.)
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 outline. Systems or evolutions that do not apply at the facility should be deleted with justification. 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' 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 a category 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.

G* Generic K/As

* These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.

** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

ES-401	PWR Examination Outline							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)								
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000008 (APE 8) Pressurizer Vapor Space Accident / 3					X		AA2.05 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: PORV isolation (block) valve switches and indicators	3.9	76
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					X		AA2.10 Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): When to secure RCPs on loss of cooling or seal injection	3.7	77
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4						X	G2.1.43 Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc.	4.3	78
000054 (APE 54; CE E06) Loss of Main Feedwater /4					X		AA2.03 Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): Conditions and reasons for AFW pump startup	4.2	79
000057 (APE 57) Loss of Vital AC Instrument Bus / 6						X	G2.1.28 Knowledge of the purpose and function of major system components and controls.	4.1	80
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6						X	G2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	4.2	81
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1		X					EK2.02 Knowledge of the interrelations between a reactor trip and the following: Breakers, relays and disconnects	2.6	1
000008 (APE 8) Pressurizer Vapor Space Accident / 3			X				AK3.04 Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident: RCP tripping requirements	4.2	2
000009 (EPE 9) Small Break LOCA / 3	X						EK1.01 Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: Natural circulation and cooling, including reflux boiling	4.2	3
000011 (EPE 11) Large Break LOCA / 3		X					EK2.02 Knowledge of the interrelations between the and the following: Large Break LOCA: Pumps	2.6	4
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4	X						AK1.05 Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): Effects of unbalanced RCS flow on in-core average temperature, core imbalance, and quadrant power tilt	2.7	5
000022 (APE 22) Loss of Reactor Coolant Makeup / 2						X	G2.4.46 Ability to verify that the alarms are consistent with the plant conditions.	4.2	6
000025 (APE 25) Loss of Residual Heat Removal System / 4				X			AA1.12 Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: RCS temperature indicators	3.6	7
000026 (APE 26) Loss of Component Cooling Water / 8				X			AA1.02 Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: Loads on the CCWS in the control room	3.1	8
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3			X				AK3.04 Knowledge of the reasons for the following responses as they apply to the Pressurizer Pressure Control Malfunctions: Why, if PZR level is lost and then restored, that pressure recovers much more slowly	2.8	9

000029 (EPE 29) Anticipated Transient Without Scram / 1					X		EA2.01 Ability to determine or interpret the following as they apply to a ATWS: Reactor nuclear instrumentation	4.4	10
000038 (EPE 38) Steam Generator Tube Rupture / 3	X						EK1.03 Knowledge of the operational implications of the following concepts as they apply to the SGTR: Natural circulation	3.9	11
000040 (APE 40; CE E05) Steam Line Rupture—Excessive Heat Transfer / 4					X		EA2.2 Ability to determine and interpret the following as they apply to the (Excess Steam Demand): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	3.4	12
000054 (APE 54; CE E06) Loss of Main Feedwater /4		X					EK2.2 Knowledge of the interrelations between the (Loss of Feedwater) and the following: 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.	3.5	13
000055 (EPE 55) Station Blackout / 6				X			EA1.05 Ability to operate and monitor the following as they apply to a Station Blackout: Battery, when approaching fully discharged	3.3	14
000056 (APE 56) Loss of Offsite Power / 6						X	G2.4.9 Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	3.8	15
000058 (APE 58) Loss of DC Power / 6					X		AA2.03 Ability to determine and interpret the following as they apply to the Loss of DC Power: DC loads lost; impact on ability to operate and monitor plant systems	3.5	16
000062 (APE 62) Loss of Nuclear Service Water / 4						X	G2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9	17
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6			X				AK3.02 Knowledge of the reasons for the following responses as they apply to Generator Voltage and Electric Grid Disturbances: Actions contained in abnormal operating procedure for voltage and grid disturbances	3.6	18
K/A Category Totals:	3	3	3	3	3/3	3/3	Group Point Total:		18/6

ES-401	PWR Examination Outline							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)								
E/APE # / Name / Safety Function	K 1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000037 (APE 37) Steam Generator Tube Leak / 3					X		AA2.04 Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: Comparison of RCS fluid inputs and outputs, to detect leaks	3.7	82
000060 (APE 60) Accidental Gaseous Radwaste Release / 9					X		AA2.06 Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: Valve lineup for release of radioactive gases	3.8	83
000069 (APE 69) Loss of Containment Integrity / 5						X	G2.1.32 Ability to explain and apply system limits and precautions.	4.0	84
(CE A11**) RCS Overcooling—Pressurized Thermal Shock / 4						X	G2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	85
000001 (APE 1) Continuous Rod Withdrawal / 1	X						AK1.18 Knowledge of the operational implications of the following concepts as they apply to Continuous Rod Withdrawal: Fuel temperature coefficient	3.4	19
000003 (APE 3) Dropped Control Rod / 1	X						AK1.16 Knowledge of the operational implications of the following concepts as they apply to Dropped Control Rod: MTC	2.9	20
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7		X					AK2.01 Knowledge of the interrelations between the Loss of Source Range Nuclear Instrumentation and the following: Power supplies, including proper switch positions	2.7	21
000051 (APE 51) Loss of Condenser Vacuum / 4						X	G2.1.28 Knowledge of the purpose and function of major system components and controls.	4.1	22
000061 (APE 61) Area Radiation Monitoring System Alarms / 7				X			AA1.01 Ability to operate and / or monitor the following as they apply to the Area Radiation Monitoring (ARM)System Alarms: Automatic actuation	3.6	23
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4					X		EA2.05 Ability to determine or interpret the following as they apply to a Inadequate Core Cooling: Trends in water levels of PZR and makeup storage tank caused by various sized leaks in the RCS	3.4	24
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4		X					AK2.1 Knowledge of the interrelations between the (RCS Overcooling) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.2	25
(CE A16) Excess RCS Leakage / 2									

(CE E09) Functional Recovery			X				EK3.3 Knowledge of the reasons for the following responses as they apply to the (Functional Recovery): Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations.	3.7	26
(CE A13) Natural Circulation Operations			X				AK3.1 Knowledge of the reasons for the following responses as they apply to the (Natural Circulation Operations): 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.	3.4	27
K/A Category Point Totals:	2	2	2	1	1/2	1/2	Group Point Total:		9/4

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Problems associated with RCP motors, including faulty motors and current, and winding and bearing temperature problems	3.1	86
008 (SF8 CCW) Component Cooling Water											X	G2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	87
010 (SF3 PZR PCS) Pressurizer Pressure Control											X	G2.4.22 Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.	4.4	88
013 (SF2 ESFAS) Engineered Safety Features Actuation								X				A2.06 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Inadvertent ESFAS actuation	4.0	89
022 (SF5 CCS) Containment Cooling								X				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of service water	3.2	90
003 (SF4P RCP) Reactor Coolant Pump										X		A4.06 Ability to manually operate and/or monitor in the control room: RCP parameters	2.9	28
003 (SF4P RCP) Reactor Coolant Pump				X								K4.07 Knowledge of RCPS design feature(s) and/or interlock(s) which provide for the following: Minimizing RCS leakage (mechanical seals)	3.2	29
004 (SF1; SF2 CVCS) Chemical and Volume Control			X									K3.07 Knowledge of the effect that a loss or malfunction of the CVCS will have on the following: PZR level and pressure	3.8	30
005 (SF4P RHR) Residual Heat Removal										X		A4.03 Ability to manually operate and/or monitor in the control room: RHR temperature, PZR heaters and flow, and nitrogen	2.8	31
006 (SF2; SF3 ECCS) Emergency Core Cooling							X					A1.07 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ECCS controls including: Pressure, high and low	3.3	32
007 (SF5 PRTS) Pressurizer Relief/Quench Tank							X					A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including: Monitoring quench tank temperature	2.6	33
012 (SF7 RPS) Reactor Protection											X	G2.2.1 Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	4.5	34

008 (SF8 CCW) Component Cooling Water		X										K2.02 Knowledge of bus power supplies to the following: CCW pump, including emergency backup	3.0	35
010 (SF3 PZR PCS) Pressurizer Pressure Control						X						K6.02 Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR	3.2	36
012 (SF7 RPS) Reactor Protection					X							K5.01 Knowledge of the operational implications of the following concepts as the apply to the RPS: DNB	3.3	37
013 (SF2 ESFAS) Engineered Safety Features Actuation								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based Ability on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Rapid depressurization	4.4	38
022 (SF5 CCS) Containment Cooling											X	G2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5	39
006 (SF2; SF3 ECCS) Emergency Core Cooling		X										K2.01 Knowledge of bus power supplies to the following: ECCS pumps	3.6	40
026 (SF5 CSS) Containment Spray			X									K3.01 Knowledge of the effect that a loss or malfunction of the CSS will have on the following: CCS	3.9	41
026 (SF5 CSS) Containment Spray		X										K2.02 Knowledge of bus power supplies to the following: MOVs	2.7	42
039 (SF4S MSS) Main and Reheat Steam								X				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the MRSS; and (b) based on predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Malfunctioning steam dump	3.4	43
059 (SF4S MFW) Main Feedwater								X				A2.07 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: Tripping of MFW pump turbine	3.0	44
059 (SF4S MFW) Main Feedwater	X											K1.03 Knowledge of the physical connections and/or cause-effect relationships between the MFW and the following systems: S/GS	3.1	45
061 (SF4S AFW) Auxiliary/Emergency Feedwater					X							K5.05 Knowledge of the operational implications of the following concepts as the apply to the AFW: Feed line voiding and water hammer	2.7	46
062 (SF6 ED AC) AC Electrical Distribution										X		A4.02 Ability to manually operate and/or monitor in the control room: Remote racking in and out of breakers	2.5	47
062 (SF6 ED AC) AC Electrical Distribution				X								K4.03 Knowledge of ac distribution system design feature(s) and/or interlock(s) which provide for the following: Interlocks between automatic bus transfer and breakers	2.8	48
063 (SF6 ED DC) DC Electrical Distribution	X											K1.02 Knowledge of the physical connections and/or cause-effect relationships between the DC electrical system and the following systems: AC electrical system	2.7	49

064 (SF6 EDG) Emergency Diesel Generator	X										K1.02 Knowledge of the physical connections and/or cause-effect relationships between the ED/G system and the following systems: D/G cooling water system	3.1	50
064 (SF6 EDG) Emergency Diesel Generator						X					K6.08 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Fuel oil storage tanks	3.2	51
073 (SF7 PRM) Process Radiation Monitoring				X							K4.01 Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: Release termination when radiation exceeds setpoint	4.0	52
076 (SF4S SW) Service Water										X	2.1.8 Ability to coordinate personnel activities outside the control room.	3.4	53
078 (SF8 IAS) Instrument Air								X			A3.01 Ability to monitor automatic operation of the IAS, including: Air pressure	3.1	54
103 (SF5 CNT) Containment								X			A3.01 Ability to monitor automatic operation of the containment system, including: Containment isolation	3.9	55
K/A Category Point Totals:	3	3	2	3	2	2	2	3/3	2	3	3/2 Group Point Total:		28/5

ES-401 PWR Examination Outline Form ES-401-2

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	#
016 (SF7 NNI) Nonnuclear Instrumentation								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the NNIS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of power supply	3.2	91
034 (SF8 FHS) Fuel Handling Equipment											X	G2.2.12 Knowledge of surveillance procedures.	4.1	92
072 (SF7 ARM) Area Radiation Monitoring								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the ARM system- and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Blown power-supply fuses	2.9	93
002 (SF2; SF4P RCS) Reactor Coolant								X				A2.03 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: Loss of forced circulation	4.1	56
011 (SF2 PZR LCS) Pressurizer Level Control		X										K2.02 Knowledge of bus power supplies to the following: PZR heaters	3.1	57
014 (SF1 RPI) Rod Position Indication	X											K1.01 Knowledge of the physical connections and/or cause-effect relationships between the RPIS and the following systems: CRDS	3.2	58
015 (SF7 NI) Nuclear Instrumentation										X		A4.03 Ability to manually operate and/or monitor in the control room: Trip bypasses	3.8	59
016 (SF7 NNI) Nonnuclear Instrumentation											X	G2.4.31 Knowledge of annunciator alarms, indications, or response procedures.	4.2	60
029 (SF8 CPS) Containment Purge				X								K4.03 Knowledge of design feature(s) and/or interlock(s) which provide for the following: Automatic purge isolation	3.2	61

033 (SF8 SFPCS) Spent Fuel Pool Cooling							X					A1.01 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: Spent fuel pool water level	2.7	62
045 (SF 4S MTG) Main Turbine Generator									X			A3.11 Ability to monitor automatic operation of the MT/G system, including: Generator trip	2.6	63
055 (SF4S CARS) Condenser Air Removal			X									K3.01 Knowledge of the effect that a loss or malfunction of the CARS will have on the following: Main condenser	2.5	64
068 (SF9 LRS) Liquid Radwaste						X						K6.10 Knowledge of the effect of a loss or malfunction on the following will have on the Liquid Radwaste System : Radiation monitors	2.5	65
K/A Category Point Totals:	1	1	1	1	0	1	1	1/2	1	1	1/1	Group Point Total:		10/3

Facility: Millstone Unit 2		Date of Exam: September 2018				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating Characteristics, reactor behavior, and instrument interpretation.			4.7	94
	2.1.1	Knowledge of conduct of operations requirements.	3.8	66		
	2.1.34	Knowledge of primary and secondary plant chemistry limits.	2.7	67		
	2.1.36	Knowledge of procedures and limitations involved in core alterations.	3.0	68		
	Subtotal			3		1
2. Equipment Control	2.2.14	Knowledge of the process for controlling equipment configuration or status.			4.3	95
	2.2.35	Ability to determine Technical Specification Mode of Operation.			4.5	96
	2.2.14	Knowledge of the process for controlling equipment configuration or status.	3.9	69		
	2.2.43	Knowledge of the process used to track inoperable alarms.	3.0	70		
	Subtotal			2		2
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.			3.7	97
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.			3.8	98
	2.3.11	Ability to control radiation releases.	3.8	71		
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	72		
	2.3.5	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	73		
	Subtotal			3		2
4. Emergency Procedures/Plan	2.4.1	Knowledge of EOP entry conditions and immediate action steps.			4.8	99
	2.4.11	Knowledge of abnormal condition procedures.			4.2	100
	2.4.23	Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.	3.4	74		
	2.4.25	2.4.25 Knowledge of fire protection procedures.	3.3	75		
	Subtotal			2		2
Tier 3 Point Total				10		7

Redraw

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	027 Pressure Pressure Control System Malfunction AK3.01	(Q9) Redraw. Overlap with simulator scenario (simulator scenario #2).
1/1	055 Station Blackout EA1.05	(Q14) Redraw. Millstone procedures do not provide any information as to what would occur when the battery is approaching fully discharged.
1/1	056 Loss of Offsite Power G2.4.8	(Q15) Redraw. Evaluates SRO knowledge.
1/2	001 Continuous Rod Withdrawal AK1.19	(Q19) Redraw. Not applicable to Millstone 2. Void coefficient concept associated with continuous rod withdrawal not linked on MP2.
2/1	003 Reactor Coolant Pump K4.02	(Q29) Redraw. Not applicable to Millstone 2. MP2 does not have cold water accidents associated with Reactor Coolant pumps.
2/1	007 Pressurizer Relief/Quench Tank G2.2.1	(Q34) Redraw. Over sample of a minor system.
2/1	022 Containment Cooling K2.01	(Q40) Redraw. Can't write a discriminating question. Power supply for containment cooling fans is low level knowledge.
2/1	026 Containment Spray K3.02	(Q42) Redraw. Not applicable to Millstone 2. MP2 doesn't have a recirculation spray system.
2/1	064 Emergency Diesel Generator K6.07	(Q50) Redraw. JPM Overlap. Question overlaps with JPM P-2.
2/1	073 Process Radiation Monitoring K4.02	(Q52) Redraw. Not applicable to Millstone 2. MP2 doesn't have a letdown radiation monitor.
2/1	076 Service Water G2.1.25	(Q53) Redraw. K/A over sampled. Also no reference material for service water.
3	1 Conduct of Operations G2.1.25	(Q67) Redraw. Over sampled.
3	2 Equipment Control G2.2.20	(Q69) Redraw. Not applicable to a reactor operator. Reactor operators perform no tasks associated with Troubleshooting.
3	4 Emergency Procedures/ Plan G2.4.43	(Q75) Redraw. Not applicable to a reactor operator. Reactor operators perform no tasks associated with emergency communications. SROs perform the emergency communication task.
1/1	008 Pressurizer Vapor Space Accident AA2.03	(Q76) Redraw. JPM Overlap. Question overlaps with JPM S-3.

1/1	015 Reactor Coolant Pump Malfunctions AA2.07	(Q77) Redraw. Not an Operator Task at MP2. Don't calculate expected flow with an RCP secured. Don't operate with RCP secured.
1/1	040 Steam Line Rupture – Excessive Heat Transfer G2.1.25	(Q78) Redraw. Not SRO. Also over sampled G2.1.25.
1/2	060 Accidental Gaseous Radwaste Release AA2.01	(Q83) Redraw. Can't write a discriminating question.
1/2	069 Loss of Containment Integrity G2.1.25	(Q84) Redraw. No reference material associated with loss of containment integrity procedure. Also K/A over sampled.
2/1	003 Reactor Coolant Pump A2.04	(Q86) Redraw. Not applicable to Millstone 2. MP2 doesn't have RCP seal injection.
2/1	003 Reactor Coolant Pump A2.03	(Q86) Redraw a second time. This system has been over sampled. The examination already has (4) RCP questions; 2, 28, 29, and 77.
2/1	010 Pressurizer Pressure Control G2.4.30	(Q88) Redraw. Can't write a discriminating question. Topic is Reporting associated with Pressurizer Pressure Control system.
2/2	027 Containment Iodine Removal G2.1.25	(Q92) Redraw. Not applicable to Millstone 2. MP2 doesn't have an iodine removal system. And over sampled.
3	3 Radiation Control G2.3.7	(Q98) Redraw. JPM Overlap. Question overlaps with SRO JPM AS4.
3	3 Radiation Control G2.3.14	(Q98) Redraw a second time. This K/A has been over sampled. Question 72 has the exact same K/A, and Q97 has essentially the same K/A.