

8/8/02

## MS#2 EXAM OUTLINE COMMENTS

- Simulator outlines - Make sure CTs meet the criteria in App. D. section D.  
  
It may not be advisable to take double credit for a rapid down power as a normal evolution also. For the purposes of the NRC exam, the applicants are required to get both a normal and a reactivity and by designing your scenarios in this manner it may make it difficult for all applicants to receive their minimum numbers in these areas.
- Written SRO outline, seq #31, Tier 1, grp 2, may be better tested on the dynamic portion of the exam.
- Written SRO outline, general comments/cautions: make sure limit number of power supply type questions appears okay; make sure don't over sample ARM area looks - okay at this time; the questions must be written to meet both parts for dual part K/As.

In general looks like a good outline.

Dominion Nuclear Connecticut, Inc.  
Millstone Power Station  
Rope Ferry Road  
Waterford, CT 06385



**Dominion<sup>SM</sup>**

JUN 20 2002

Docket No. 50-336  
B18681

RE: 10 CFR 55.40(b)(3)

Mr. Richard Conte, Chief  
Operational Safety Branch, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, PA 19406

Millstone Nuclear Power Station, Unit No. 2  
Reactor Operator and Senior Operator Initial Examinations

In accordance with NUREG-1021 Examination Standard 201-2, this letter transmits the examination outlines for the Millstone Unit No. 2 Reactor Operator and Senior Operator Initial Examinations.

Pursuant to 10 CFR 55.40(b)(3), an authorized representative of the facility has approved the outlines contained in Attachment 1 prior to their submittal to the U.S. Nuclear Regulatory Commission for the Commission's review and approval. It is our belief that the enclosed materials are complete and ready-to-use.

Consistent with the guidance contained in NUREG-1021 Examination Standard 201, Attachment 1, the examination outline contained in Attachment 1 should be withheld from public disclosure until after the examination has been completed. No redacted versions are being supplied.

There are no regulatory commitments contained within this letter.

Should you have any questions regarding this submittal, please contact Mr. Michael J. Wilson at (860) 437-2916.

Very truly yours,

DOMINION NUCLEAR CONNECTICUT, INC.

FOR: J. Alan Price  
Site Vice President - Millstone

BY:

  
\_\_\_\_\_  
William J. Hoffner  
Manager, Nuclear Operations

cc: See next page

U.S. Nuclear Regulatory Commission  
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Attachment (1)

cc: w/o attachment

H. J. Miller, Region I Administrator  
R. B. Ennis, NRC Senior Project Manager, Millstone Unit No. 2  
NRC Senior Resident Inspector, Millstone Unit No. 2

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Docket No. 50-336  
B18681

Attachment 1

Millstone Nuclear Power Station, Unit No. 2

Reactor Operator and Senior Operator Initial Examinations  
Examination Outlines

Facility: Millstone Unit 2Date of Examination: 12/16/02Examination Level (circle one): (RO) / ~~SRO~~Operating Test Number: 1

Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	2.1.3	JPM to perform a review of turnover documents and discover a problem with removing "A" motor driven auxiliary feedwater pump and "B" Emergency Diesel Generator from service at the same time with Facility 2 protected.
	2.1.25	JPM to determine the required Shutdown Margin for a post trip condition and verify that Shutdown Margin is within the acceptance criteria.
	2.1.7	(SPARE) JPM to determine the appropriate color code for the Shutdown Safety Assessment and calculate a time to boil.
A.2	2.2.13	JPM to complete a manual tag out in order to safely remove the "A" Service Water Strainer from service for internal inspection.
A.3	2.3.10	JPM to read and interpret an RWP and survey map to determine highest radiation levels, highest contamination levels, stay time, and protective clothing requirements.
A.4	2.4.39	Question #1 to determine the appropriate reporting location for NON on-duty/on-call SERO personnel presently located in the protected area.
		Question #2 to determine the appropriate reporting location for NON on-duty/on-call SERO personnel who are presently NOT on site, but have been called in to provide shift relief coverage.

Facility: Millstone Unit 2Date of Examination: 12/16/02Examination Level (circle one): ~~RO~~ / (SRO)Operating Test Number: 1

Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	2.1.3	JPM to perform a review of turnover documents and discover a problem with removing both motor driven auxiliary feedwater pumps from service with Facility 2 protected. <i>EDG out not direct</i>
	2.1.4	JPM to determine appropriate staffing levels when a licensed operator is suddenly unable to perform licensed duties, determine which personnel are qualified to perform licensed duties, and call in the appropriate individual.
	2.1.7	(SPARE) JPM to determine the appropriate color code for the Shutdown Safety Assessment and calculate a time to boil.
A.2	2.2.13	JPM to determine, prior to approval, that incorrect components are listed on a tagging sheet for removing the "A" Service Water Strainer from service for internal inspection.
A.3	2.3.6	JPM to determine that a Radioactive Waste Discharge Permit cannot be authorized due to having less than the required number of Circulating Water Pumps in operation. <i>inadequate makeup inaccurate sample</i>
A.4	2.4.41	JPM to classify a Small Break LOCA/Excess Steam Demand event concurrent with a loss of offsite power. <i>← PAR</i>

Facility: <u>Millstone Unit 2</u>		Date of Examination: <u>12/16/02</u>
Exam Level (circle one): <u>(RO / SRO(I))</u> / SRO(U)		Operating Test No.: <u>1</u>
<b>B.1 Control Room Systems</b>		
System / JPM Title	Type Code*	Safety Function
a. Reactor Protection System/Respond to Failed Tc Instrument	N,S	7
b. Containment Cooling System/Shifting Containment Air Recirculation and Cooling Units	M,A,S	5
c. Emergency Diesel Generators/"A" DG Operability Test	M,A,S	6
d. Main Feedwater System/Start a Second Main Feedwater Pump	N,S,L	4(S)
e. Emergency Core Cooling System/HPSI Pump Operability Test	D,A,S	3
f. Chemical and Volume Control System/Manual Makeup to the VCT	D,A,S	1
g. Circulating Water System/Respond to Circulating Water Malfunction	N,A,S	8
h. (SPARE) Reactor Coolant Pump System/Respond to RCP Seal Problems	D,A,S	4(P)
<b>B.2 Facility Walk-Through</b>		
a. Rod Control Drive System/Startup and Parallel CEDM MG Sets	D	1
b. Instrument Air System/Supplying Emergency Backup Air to 2-CH-192	D,L,R	8
c. Containment System/Establish Manual Control of Hydrogen Purge Valve	D,R	5
d. (SPARE) Waste Gas Disposal System/Shift from "A" to "B" Waste Gas Decay Tank	N,R	9
*Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA		

Facility: <u>MP2</u>	Scenario No.: <u>ES02LI1</u>	Op-Test No.: <u>1</u>
Examiners: _____ Operators: _____		
_____		
_____		
Initial Conditions: <u>100% power, MOL, Eq. Xe., TBD ppm Boron SGBD @ 25 gpm per SG, 24E aligned to 24C, TDAFP OOS for bearing replacement</u>		
Turnover: <u>100% power, MOL, Eq. Xe., TBD ppm Boron, blend ratio: TBD SGBD @ 25 gpm per SG, 24E aligned to 24C, TDAFP OOS for bearing replacement, in TSAS 3.7.1.2.a and TRM II, 3.0, item 2, no other equipment OOS and no surveillance in progress or due.</u>		

Event No.	Malfunction No.	Event Type*	Event Description
1	CH07 RD0328	N/A R	Earthquake causing CEA #28 to slip 35 steps into the core.
2	N/A	R	Downpower to < 70% power for CEA recovery
3	RX11D	I	#2 SG Alternate steam flow transmitter failure
4	RD0132	M	2 <sup>nd</sup> dropped CEA - Manual reactor trip
5	ED02	C	RSST Fault - loss of off-site power
6	EG08A	C	A DG breaker failure to close
7	FW30B FW20B	M	Degradation/loss of the 'B' AFW pump

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



## 2. Exercise Brief:

The simulator will be prepared for the evaluation and the licensees will be briefed on the conduct of the evaluation and the areas in which they will be evaluated.

The simulator will be initialized at 100% power, MOL, Eq Xe, **TBD** ppm boron. The TDAFP is out of service for bearing replacement, TSAS 3.7.1.2.a is in effect. There is no surveillance in progress and no other equipment out of service.

Shortly following the shift turnover a seismic event will be experienced. Various vibration alarms will come in and a PEO will call in to report feeling ground movement. The seismic event will cause a CEA partial drop > 20 steps. The crew will enter AOP 2562 Earthquake and AOP 2556 CEA Malfunctions, perform the checks of 2562 and balance primary and secondary power. After the required notifications the crew will perform a downpower for CEA recovery. During the downpower, the alternate steam flow transmitter for #2 SG will start to fail low. Feed flow to #2 SG will trend down. The SPO must diagnose the problem, take manual control, deselect the failed transmitter and restore the FRV to auto. Later a second CEA will drop fully into the core. A manual trip is required in response to 2 dropped CEAs. On the trip the RSST will fault. Both EDGs will start, but the 'A' output breaker will not close automatically or manually. Due to no cooling water the 'A' EDG must be emergency tripped. The 'B' AFW pump will be started to feed the SGs and air will be x-tied from Unit 3. During 2525 the 'B' AFW pump will degrade such that feed will be inadequate during performance of the diagnostic flowchart. Degraded performance leads to a trip of the 'B' AFW pump. The US should diagnose a Loss of All Feed and transition to EOP 2537.

Main feed is unavailable due to the LNP. The TDAFP and 'B' AFW pump cannot be restored in time. 4160V bus 24C can be restored from Unit 3 and the 'A' AFW pump started to feed the steam generators. Based on time and SG level response, the US may determine that initiation of Once-Through-Cooling (OTC) is appropriate, especially lacking a second HPSI pump. The OTC option must be implemented if either SG level reaches 70".

The scenario may be terminated when feed has been restored to the SGs with level increasing or when OTC is fully implemented and the crew transitions to EOP 2540.

## 3. Plant/Simulator differences that may affect the scenario are:

None

4. Duration: 1.5 hours

All Control Room Conduct, Operations and Communications shall be in accordance with Master Manual 14 (MP-14). Review the Simulator Operating Limits (design limits of plant) and Simulator Modeling Limitations and Anomalous Response List prior to performing this training scenario. The instructor should be aware if any of these limitations may be exceeded.

Facility: <u>MP2</u>	Scenario No.: <u>ES02LI2</u>	Op-Test No.: <u>2</u>
Examiners: _____ Operators: _____		
_____		
_____		
Initial Conditions: <u>100% power, MOL, Eq. Xe., TBD ppm Boron SGBD @ 25 gpm per SG, 24E aligned to 24C</u>		
Turnover: <u>100% power, MOL, Eq. Xe., TBD ppm Boron, blend ratio: TBD SGBD @ 25 gpm per SG, 24E aligned to 24C, no equipment OOS and no surveillance in progress or due.</u>		

Event No.	Malfunction No.	Event Type*	Event Description
1	CW02C	C	C Traveling Screen DP high
2	SG01B	C	SGTL in #2 SG
3	CV17A	C	Boric Acid Pump coupling broken
4	N/A	R	Downpower due to SGTL
5	N/A	N	Downpower due to SGTL
6	SG02B	M	Steam generator tube rupture
7	RX01A	C	Main spray valve stuck open on trip
8	RX15B	C	'A' Steam dump to condenser stuck closed

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

## 2. Exercise Brief:

The simulator will be prepared for the evaluation and the licensees will be briefed on the conduct of the evaluation and the areas in which they will be evaluated.

The simulator will be initialized at 100% power, MOL, Eq Xe, **TBD** ppm boron. There is no equipment out of service and no surveillance in progress.

Shortly after taking the shift, the 'C' traveling screen DP will start a ramp increase due to a sheared pin in the drive gear. In response to the alarm, the crew will enter AOP 2517, Circulating Water Malfunctions. The crew will need to x-tie water-boxes due to the loss of the 'C' Circ pump.

Next a 2 gpm SGTL will cause an N16 radmonitor alarm followed by a SJAE alarm. The crew will enter AOP 2569, verify the leak, log TSAS 3.4.6.2.c, and enter AOP 2575 to commence a Rapid Downpower. When the PPO starts borating, the selected boric acid pump will not develop discharge pressure due to a failed coupling. The PPO will need to identify the failure and select the other pump. Tech Spec LCO 3.1.2.2 should be referenced to ensure its requirements are still met. When forcing pressurizer sprays, one of the valves will stick partially open. This will not be noticeable until the plant is tripped. During the downpower the SGTL will become a SGTR. The crew should respond to the increased loss rate and MSLRM alarm and manually trip the plant. The PPO should identify the failed open spray valve during EOP 2525 and stop the associated RCPs. The US should perform the diagnostic flowchart, diagnose a SGTR and transition to EOP 2534. A cooldown to <515° F on both loop Thots must be performed. During the initial cooldown, PIC-4216 will fail causing the 'A' Steam Dump to go closed. This must be diagnosed and the SD&BV controller HIC-4165 used to continue the cooldown. The ruptured generator must then be isolated. Following isolation of the ruptured generator, the primary-to-secondary leak rate should be minimized by controlling RCS pressure at the lower end of the allowable pressure range and the RCS cooldown should be resumed.

When the ruptured generator has been isolated, the cooldown resumed, and RCS pressure being controlled at the lower end the exam scenario may be terminated.

## 3. Plant/Simulator differences that may affect the scenario are:

None

4. Duration: 1.5 hours

All Control Room Conduct, Operations and Communications shall be in accordance with Master Manual 14 (MP-14). Review the Simulator Operating Limits (design limits of plant) and Simulator Modeling Limitations and Anomalous Response List prior to performing this training scenario. The instructor should be aware if any of these limitations may be exceeded.

Facility: MP2 Scenario No.: ES02LI3 Op-Test No.: 3

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 100% power, MOL, Eq. Xe., TBD ppm Boron SGBD @ 25 gpm per SG, 24E aligned to 24C, TDAFP OOS for bearing replacement, small pre-existing steam leak in containment (not RCS)

Turnover: 100% power, MOL, Eq. Xe., TBD ppm Boron, blend ratio: TBD SGBD @ 25 gpm per SG, 24E aligned to 24C, TDAFP OOS for bearing replacement, in TSAS 3.7.1.2.a and TRM II, 3.0, item 2, no other equipment OOS and no surveillance in progress or due, small pre-existing steam leak in containment (not RCS)

Event No.	Malfunction No.	Event Type*	Event Description
1	I/O C06/7* BB4	C	SW pump A strainer DP rising/sheared drive pin
2	CV01	C	Unisolable RCS leak on CVCS letdown line
3	N/A	R	Shutdown due to RCS leak
4	N/A	N	Shutdown due to RCS leak
5	CV01	M	RCS leak size increases to SBLOCA
6	ED02	C	RSST fault - Loss of off-site power
7	MS01B	M	Excess Steam Demand in Containment
8	ES03J	C	'C' HPSI Failure to start on SIAS
9	CC01A	C	'A' RBCCW Pump trip

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

## 2. Exercise Brief:

The simulator will be prepared for the evaluation and the licensees will be briefed on the conduct of the evaluation and the areas in which they will be evaluated.

The simulator will be initialized at 100% power, MOL, Eq Xe, **TBD** ppm boron. A small steam leak exists in containment causing the containment sump to need pumping every four hours. The TDAFP is out of service for bearing replacement, TSAS 3.7.1.2.a is in effect. There is no surveillance in progress and no other equipment out of service.

Shortly after taking the shift the 'A' SW pump strainer trouble alarm will come in. PEO dispatched for local checks will report a sheared pin and DP high. The crew will need to swap to the 'B' SW pump. Next an unisolable RCS leak will ramp in on the letdown line in containment. The crew will need to determine that this is an RCS leak and not a worsening of the steam leak. They will then enter AOP 2568. The crew will perform the actions of AOP 2568 trying to determine the location and isolability of the leak. The crew should determine that the leak is unisolable and enter AOP 2575 or OP 2204 to shut the plant down. During the downpower the leak will degrade to the point of exceeding CVCS capability. A manual trip should be ordered. On the plant trip, a large ESDE will occur on #2 SG inside CTMT and the RSST will fault. When the EDGs start and load their respective buses the 'A' RBCCW pump will trip. The 'B' RBCCW pump may not be started on the 'A' header if containment pressure is > 20 psig. ESAS actuation module AM614 will fail resulting in 'C' HPSI pump and the 'B' Battery Room Exhaust fan not auto starting on SIAS/CIAS/EBFAS/MSIS. The SPO will need to monitor for dry-out of the #2 SG and operate the ADV to stabilize RCS temperatures.

The US will perform the diagnostic flowchart, diagnose two events, and transition to EOP 2540. In EOP 2540 the US will identify success paths and prioritize the safety functions. The PPO should identify failure of the 'C' HPSI pump to start and start it manually. The crew will need to isolate the faulted SG, stabilize RCS temperature and pressure, identify HPSI stop/throttle criteria met, and control HPSI to avoid PTS.

When the above have been completed, the exam scenario may be terminated.

## 3. Plant/Simulator differences that may affect the scenario are:

None

4. Duration: 1.5 hours

All Control Room Conduct, Operations and Communications shall be in accordance with Master Manual 14 (MP-14). Review the Simulator Operating Limits (design limits of plant) and Simulator Modeling Limitations and Anomalous Response List prior to performing this training scenario. The instructor should be aware if any of these limitations may be exceeded.

Facility: MP2 Scenario No.: ES02LI4 Op-Test No.: 4

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 100% power, MOL, Eq. Xe., TBD ppm Boron SGBD @ 25 gpm per SG, 24E aligned to 24C, 'B' EDG OOS - cleaning and refilling oil sump

Turnover: 100% power, MOL, Eq. Xe., TBD ppm Boron, blend ratio: TBD SGBD @ 25 gpm per SG, 24E aligned to 24C, 'B' EDG OOS - cleaning and refilling oil sump, in TSAS 3.8.1.1.b, TDAFP has been verified operable & line surveillance due in 3 hours, no other equipment OOS and no other surveillance in progress or due

Event No.	Malfunction No.	Event Type*	Event Description
1	RP19C	I	'C' RPS Lower NI Fails low
2	CW04C	C	'C' Waterbox Condenser Tube Leak
3	FW01	C	Isolated condenser tube leak becomes vacuum leak
4	N/A	R	Downpower due to vacuum leak
5	N/A	N	Downpower due to vacuum leak
6	TC04	M	Turbine load shed causes trip
7	ED02	C	RSST Fault - Loss of Off-site Power
8	ES03I	C	'A' HPSI Pump failure to start on SIAS
9	RC06B	M	Stuck open PORV - LOCA

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

## 2. Exercise Brief:

The simulator will be prepared for the evaluation and the licensees will be briefed on the conduct of the evaluation and the areas in which they will be evaluated.

The simulator will be initialized at 100% power, MOL, Eq Xe, **TBD** ppm boron. The 'B' EDG is OOS for cleaning and refilling of the lube oil sump due to trace contaminants found in the most recent sample. The unit is in TSAS 3.8.1.1.b. A sample of the 'A' EDG lube oil was taken and found to be free of any contaminants and the TDAFP has been proven Operable. Off-site lines surveillance was performed 5 hours earlier, therefore due in 3 hours. There is no other surveillance in progress and no other equipment out of service.

Shortly after the crew takes the watch the Channel 'C' RPS lower power range NI will fail low. This will actuate a number of annunciators associated with RPS 'C' trips as well as a "CEA Dropped - NIS" alarm. The crew will need to diagnose the cause of the alarms, bypass affected bistables on RPS 'C' and enter Tech Spec 3.3.1.1, table 3.3-1, Action 2.

A small condenser tube leak will develop in 'C' waterbox. The crew will enter AOP 2516, Condenser Tube Leak and take action to secure 'C' circulating water pump, isolate and drain the 'C' waterbox, and monitor vacuum. After the waterbox is isolated the tube leak will become a small vacuum leak and the crew should enter AOP 2574, Loss of Vacuum. By starting the mechanical vacuum pumps the vacuum loss will be slowed, but not stopped. The crew will need to enter AOP 2575 to perform a rapid downpower. When the SPO is reducing turbine load, a relay for the load set motor will stick, driving load set downscale. The unit will trip on high pressurizer pressure due to the rapid backing up of RCS heat. PORV(s) will open on high pressure with the #2 PORV sticking open. The RSST will fault on the trip. With the 'B' EDG out of service only bus 24C/22E will be energized, therefore the PORV cannot be isolated. SIAS will actuate (manual or auto) as pressure drops, but actuation module AM514 fails to actuate. This prevents the 'A' HPSI pump from starting on the SIAS signal, but it can be started manually once the failure is identified.

After performing EOP 2525 the US should diagnose a LOCA and transition to EOP 2532. In the LOCA EOP the crew should identify that the leak may be isolated by restoring power to bus 24D/22F. 4160 V power should be cross-tied from MP3 and the PORV block valve should be closed. Once the leak has been secured the crew will need to take actions to avoid PTS.

When the above have been completed, the exam scenario may be terminated.

Title: Simulator Evaluation

ID Number: ES02LI4

Revision: 0

3. Plant/Simulator differences that may affect the scenario are:

None

4. Duration: 1.5 hours

All Control Room Conduct, Operations and Communications shall be in accordance with Master Manual 14 (MP-14). Review the Simulator Operating Limits (design limits of plant) and Simulator Modeling Limitations and Anomalous Response List prior to performing this training scenario. The instructor should be aware if any of these limitations may be exceeded.



Attachment

SCENARIO ATTRIBUTES CHECKLIST

Scenario Title:	Simulation Evaluation	Number:	ES02LI1
Technical Reviewer:	Richard N Spurr	Date:	5/21/2002

QUALITATIVE ATTRIBUTES

- Y   1. The initial conditions are realistic, in that some equipment and/or instrumentation may be out of service, but it does not cue the crew into expected events.
- Y   2. The scenario consists mostly of related events.
- Y   3. Each event description consists of:
- the point in the scenario when it is to be initiated
  - the malfunction(s) that are entered to initiate the event
  - the symptoms/cues that will be visible to the crew
  - the expected operator actions (by shift position)
  - the expected Emergency Plan classification
  - the event termination point (if applicable)
- Y   4. No more than one non-mechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident such as a seismic event.
- Y   5. The events are valid with regard to physics and thermodynamics.
- Y   6. Sequencing/timing of events is reasonable, and allows for the examination team to obtain complete evaluation results commensurate with the scenario objectives.
- N/A  7. If time compression techniques are used, scenario summary clearly so indicates. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.
- Y   8. The simulator modeling is not altered.
- Y   9. The scenario has been validated. Any open simulator performance deficiencies have been evaluated to ensure that functional fidelity is maintained while running the scenario.

Attachment

SCENARIO ATTRIBUTES CHECKLIST

Scenario Title:	<u>Simulator Evaluation</u>	Number:	<u>ES02LI2</u>
Technical Reviewer:	<u>Richard N Spurr</u>	Date:	<u>5/21/2002</u>

QUALITATIVE ATTRIBUTES

- Y 1. The initial conditions are realistic, in that some equipment and/or instrumentation may be out of service, but it does not cue the crew into expected events.
- Y 2. The scenario consists mostly of related events.
- Y 3. Each event description consists of:
- the point in the scenario when it is to be initiated
  - the malfunction(s) that are entered to initiate the event
  - the symptoms/cues that will be visible to the crew
  - the expected operator actions (by shift position)
  - the expected Emergency Plan classification
  - the event termination point (if applicable)
- Y 4. No more than one non-mechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident such as a seismic event.
- Y 5. The events are valid with regard to physics and thermodynamics.
- Y 6. Sequencing/timing of events is reasonable, and allows for the examination team to obtain complete evaluation results commensurate with the scenario objectives.
- N/A 7. If time compression techniques are used, scenario summary clearly so indicates. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.
- Y 8. The simulator modeling is not altered.
- Y 9. The scenario has been validated. Any open simulator performance deficiencies have been evaluated to ensure that functional fidelity is maintained while running the scenario.

Attachment

SCENARIO ATTRIBUTES CHECKLIST

Scenario Title: Simulation Evaluation                      Number: ES02LI3  
Technical Reviewer: Richard N Spurr                      Date: 5/21/2002

QUALITATIVE ATTRIBUTES

- Y   1. The initial conditions are realistic, in that some equipment and/or instrumentation may be out of service, but it does not cue the crew into expected events.
- Y   2. The scenario consists mostly of related events.
- Y   3. Each event description consists of:
- the point in the scenario when it is to be initiated
  - the malfunction(s) that are entered to initiate the event
  - the symptoms/cues that will be visible to the crew
  - the expected operator actions (by shift position)
  - the expected Emergency Plan classification
  - the event termination point (if applicable)
- Y   4. No more than one non-mechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident such as a seismic event.
- Y   5. The events are valid with regard to physics and thermodynamics.
- Y   6. Sequencing/timing of events is reasonable, and allows for the examination team to obtain complete evaluation results commensurate with the scenario objectives.
- N/A  7. If time compression techniques are used, scenario summary clearly so indicates. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.
- Y   8. The simulator modeling is not altered.
- Y   9. The scenario has been validated. Any open simulator performance deficiencies have been evaluated to ensure that functional fidelity is maintained while running the scenario.

Attachment

SCENARIO ATTRIBUTES CHECKLIST

Scenario Title:	Simulation Evaluation	Number:	ES02LI4
Technical Reviewer:	Richard N Spurr	Date:	5/21/2002

QUALITATIVE ATTRIBUTES

- Y   1. The initial conditions are realistic, in that some equipment and/or instrumentation may be out of service, but it does not cue the crew into expected events.
- Y   2. The scenario consists mostly of related events.
- Y   3. Each event description consists of:
- the point in the scenario when it is to be initiated
  - the malfunction(s) that are entered to initiate the event
  - the symptoms/cues that will be visible to the crew
  - the expected operator actions (by shift position)
  - the expected Emergency Plan classification
  - the event termination point (if applicable)
- Y   4. No more than one non-mechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident such as a seismic event.
- Y   5. The events are valid with regard to physics and thermodynamics.
- Y   6. Sequencing/timing of events is reasonable, and allows for the examination team to obtain complete evaluation results commensurate with the scenario objectives.
- N/A  7. If time compression techniques are used, scenario summary clearly so indicates. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.
- Y   8. The simulator modeling is not altered.
- Y   9. The scenario has been validated. Any open simulator performance deficiencies have been evaluated to ensure that functional fidelity is maintained while running the scenario.

Attachment      Guide No.: ES02LI1  
**SCENARIO ATTRIBUTES CHECKLIST**

**Note:** Following criteria list scenario traits that are numerical (quantitative) in nature. Credited malfunctions tasks and procedures should be bolded in the evaluation guide.

- |   |       |    |
|---|-------|----|
| 1. Total Malfunctions (TM) - Include EMs – (5 – 8)              | 6     |    |
| 1. RSST Loss  |       |    |
| 2. 'A' EDG Output Breaker Failure                               |       |    |
| 3. CEA #28 Slipped  |       |    |
| 4. #2 Steam Flow Transmitter Failure                            |       |    |
| 5. CEA #32 Dropped  |       |    |
| 6. Degrade/trip 'B' AFW Pump                                    |       |    |
| 2. Malfs after EOP entry (EMs) – (1 – 2)                        | 3     |    |
| 1. RSST Loss  |       |    |
| 2. 'A' EDG Output Breaker Failure                               |       |    |
| 3. Degrade/trip 'B' AFW Pump                                    |       |    |
| 3. Abnormal Events (AE) – (2 – 4)                               | 2     |    |
| 1. Loss of Off-site Power                                       |       |    |
| 2. CEA Malfunctions   |       |    |
| 4. Major Transients (MA) – (1 – 2)                              | 2     |    |
| 1. Trip due to 2 dropped CEA's                                  |       |    |
| 2. Loss of All Feed   |       |    |
| 5. EOPs entered requiring substantive actions (EU) - (1 – 2)    | 2     |    |
| 1. EOP 2525   |       |    |
| 2. EOP 2537   |       |    |
| 6. EOP Contingencies requiring substantive actions (EC) – (0-2) | 2     |    |
| 1. Trip 'A' EDG-No SW   |       |    |
| 2. Restore Bus 24C for 'A' AFW Pump                             |       |    |
| 7. Critical Tasks (CT)- (2 – 3)                                 | 2     |    |
| 1. Trip due to 2 dropped CEA's                                  |       |    |
| 2. Establish Primary-to-Secondary Heat Sink, <b>OR</b>          |       |    |
| 3. Establish OTC  |       |    |
| 8. Approximate Scenario Run Time: 60 to 90 min.                 | Total | 75 |
| 9. Technical Specifications exercised during the scenario.      | (Y/N) | Y  |

Attachment      Guide No.: ES02LI2  
**SCENARIO ATTRIBUTES CHECKLIST**

**Note:** Following criteria list scenario traits that are numerical (quantitative) in nature. Credited malfunctions tasks and procedures should be bolded in the evaluation guide.

1. Total Malfunctions (TM) - Include EMs – (5 – 8) 6
  1. 'A' BA Pump Failed Coupling
  2. RC-100F Failed Open
  3. 'C' Traveling Screen Fouling
  4. 'B' SG Tube Leak
  5. 'B' SGTR
  6. 'A' SD&BV Stuck Closed
2. Malfs after EOP entry (EMs) – (1 – 2) 2
  1. RC-100F Failed Open
  2. 'A' SD&BV Stuck Closed
3. Abnormal Events (AE) – (2 – 4) 3
  1. Circ. Water Malfunctions
  2. 'B' SG Tube Leak
  3. Rapid Downpower
4. Major Transients (MA) – (1 – 2) 1
  1. 'B' SGTR
5. EOPs entered requiring substantive actions (EU) - (1 – 2) 2
  1. EOP 2525
  2. EOP 2534
6. EOP Contingencies requiring substantive actions (EC) – (0-2) 1
  1. EOP 2534
7. Critical Tasks (CT)- (2 – 3) 3
  1. Correct cause of RCS Depressurization
  2. Perform RCS C/D for SG Isolation
  3. Isolate Most Affected SG
8. Approximate Scenario Run Time: 60 to 90 min. Total 90
9. Technical Specifications exercised during the scenario. (Y/N) Y

SCENARIO ATTRIBUTES CHECKLIST

**Note:** Following criteria list scenario traits that are numerical (quantitative) in nature. Credited malfunctions tasks and procedures should be bolded in the evaluation guide.

1. Total Malfunctions (TM) - Include EMs – (5 – 8) 6
  1. RSST Loss
  2. ESAS Module AM614 Failure
  3. 'A' RBCCW Pump Trip
  4. ESDE in Containment
  5. 'A' SW Pump Strainer Failure
  6. RCS Leak on CVCS Letdown
2. Malfs after EOP entry (EMs) – (1 – 2) 4
  1. RSST Loss
  2. ESAS Module AM614 Failure
  3. 'A' RBCCW Pump Trip
  4. ESDE in Containment
3. Abnormal Events (AE) – (2 – 4) 2
  1. Loss of Off-site Power
  2. RCS Leak on CVCS Letdown
4. Major Transients (MA) – (1 – 2) 2
  1. ESDE in Containment
  2. SBLOCA on CVCS Letdown
5. EOPs entered requiring substantive actions (EU) - (1 – 2) 2
  1. EOP 2525
  2. EOP 2540
6. EOP Contingencies requiring substantive actions (EC) – (0-2) 2
  1. EOP 2540
  2. EOP 2540D for HR-2
7. Critical Tasks (CT)- (2 – 3) 3
  1. Manually Establish Minimum Design SI Flow
  2. Isolate the affected/most affected SG
  3. Establish RCS pressure control
8. Approximate Scenario Run Time: 60 to 90 min. Total 90
9. Technical Specifications exercised during the scenario. (Y/N) Y

Attachment      Guide No.: ES02LI4  
**SCENARIO ATTRIBUTES CHECKLIST**

**Note:** Following criteria list scenario traits that are numerical (quantitative) in nature. Credited malfunctions tasks and procedures should be bolded in the evaluation guide.

1. Total Malfunctions (TM) - Include EMs – (5 – 8) 6
  1. Loss of RSST
  2. ESAS Module AM514 Failure
  3. #2 PORV Stuck Open
  4. 'C' RPS Lower NI Failure
  5. Condenser Tube Leak
  6. Condenser Vacuum Leak
  7. Turbine CV's Ramp Closed
  
2. Malfs after EOP entry (EMs) – (1 – 2) 3
  1. Loss of RSST
  2. ESAS Module AM514 Failure
  3. #2 PORV Stuck Open
  
3. Abnormal Events (AE) – (2 – 4) 2
  1. Condenser Tube Leak
  2. Condenser Vacuum Leak
  
4. Major Transients (MA) – (1 – 2) 2
  1. #2 PORV Stuck Open-SBLOCA
  2. Turbine CV's Ramp Closed-Full Load Shed
  
5. EOPs entered requiring substantive actions (EU) - (1 – 2) 2
  1. EOP 2525
  2. EOP 2532
  
6. EOP Contingencies requiring substantive actions (EC) – (0-2) 0
  1. EOP 2532



**Attachment**      **Guide No.: ES02LI4**  
**SCENARIO ATTRIBUTES CHECKLIST**

7. Critical Tasks (CT)- (2 – 3) \_\_\_\_\_5\_\_\_\_\_
- 1. Establish Primary to Secondary Heat Sink
  - 2. Manually Establish Minimum SI Flow
  - 3. Perform a Plant Cooldown
  - 4. Isolate RCS Leakage
  - 5. Establish RCS Pressure Control
8. Approximate Scenario Run Time: 60 to 90 min. Total 90
9. Technical Specifications exercised during the scenario. (Y/N) Y

## **Description of the Process Used to Develop the 2002 Millstone 2 Exam Outline**

- I. Obtained copies of Forms ES-401.3 and 4, *PWR SRO and RO Examination Outlines*, and Form ES-401-5 *Generic Knowledge and Abilities Outline (Tier 3)*.
- II. Used the *Example Systematic Sampling Methodology* per ES-401, Attachment 1 to select the topics for the RO exam as follows:
  - A. Deleted all systems not applicable to Millstone 2 (W, BW).
  - B. Selected the topics for the exam by randomly selecting tokens.
  - C. If a group had more topics than required for a Tier/Group, tokens were then selected to randomly remove the topics that would not be covered.
  - D. If a group had less topics than required for a Tier/Group, each topic was selected once, then tokens were randomly drawn to determine which topics would receive double question coverage.
- III. Used the *Example Systematic Sampling Methodology* per ES-401, Attachment 1 to select the K/A categories for the RO exam for each topic.
- IV. Used the *Example Systematic Sampling Methodology* per ES-401, Attachment 1 to select the individual K/A statements for the RO exam as follows:
  - A. Any individual K/A statement with an importance rating of  $< 2.5$  was eliminated prior to the selection process.
  - B. If a K/A category had no importance rating  $\geq 2.5$ , another K/A category was randomly selected.
  - C. Prior to randomly selecting the individual K/A statements for Tier 1 and 2 “Generic” category, non-relevant K/A statements were removed.
- V. Verified each K/A category for the RO exam had at least 2 points in each tier. No changes required.

- VI. Adapted the SRO outline from the RO outline as follows:
  - A. Carried over all common topics to the SRO outline.
  - B. Used the *Example Systematic Sampling Methodology* per ES-401, Attachment 1 to select/remove topics for the SRO exam which differed from the RO exam.
- VII. Checked exam for balance of coverage. Found the SRO exam unbalanced toward Containment topics. Used the random selection process to deselect one Containment related K/A and determine an alternate, (CVCS).
- VIII. Evaluated selected K/As and found 8 that were non-relevant for MP2 and 3 for which a question with adequate discriminatory value could not be developed. Used the random selection process to replace with valid K/As. Rejected K/As and the reason for rejections are recorded on ES-401-10 equivalent.

Facility: Millstone Unit 2		10/2002 NRC EXAM		Exam Level: SRO									
Tier	Group	K/A Category Points											Point Total
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	
1. Emergency & Abnormal Plant Evolution	1	5	1	4				2	8			4	24
	2	3	3	2				3	3			2	16
	3	0	1	1				1	0			0	3
	Tier Totals	8	5	7				6	11			6	43
2. Plant Systems	1	1	2	1	2	2	0	2	1	2	3	3	19
	2	2	0	1	5	0	2	0	1	2	2	2	17
	3	0	1	1	1	0	1	0	0	0	0	0	4
	Tier Totals	3	3	3	8	2	3	2	2	4	5	5	40
3. Generic Knowledge and Abilities				Cat 1	Cat 2	Cat 3	Cat 4	17					
				3	4	5	5						

Note:

1. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., the "Tier Totals" in each K/A category shall not be less than two).
2. Actual point totals must match those specified in the table.
3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities
4. Systems/evolutions within each group are identified on the associated outline.
5. The shaded areas are not applicable to the category/tier.
- 6.\* The generic 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.
7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the RO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.

ES-401

PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier  
1/Group 1

Form ES-401-3

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
7	000001 Continuous Rod Withdrawal / 1	X						AK1.21; Knowledge of the operational implications of the following concepts as they apply to Continuous Rod Withdrawal: Integral rod worth.	2.9 3.2	1
10	000003 Dropped Control Rod / 1					X		AA2.04; Ability to determine and interpret the following as they apply to the Dropped Control Rod: Rod motion stops due to dropped rod	3.4 3.6	1
1	000005 Inoperable/Stuck Control Rod / 1						X	2.1.19: Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3.0 3.0	1
15	000011 Large Break LOCA / 3				X			EA1.04; Ability to operate and monitor the following as they apply to a Large Break LOCA: ESF actuation system in manual.	4.4 4.4	1
[Note 1]	W/E04 LOCA Outside Containment / 3									
[Note 1]	W/E02&E02 Rediagnosis SI Termination / 3									
2	000015/17 RCP Malfunctions / 4	X						AK1.01; Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): Natural circulation in the nuclear reactor power plant.	4.4 4.6	1
3	BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4					X		AA2.2; Ability to <u>determine</u> and <u>interpret</u> the following as they apply to the (Natural Circulation Operations): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	2.9 3.8	1

ES-401

PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier  
1/Group 1

Form ES-401-3

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
4	000024 Emergency Boration / 1	X						AK1.04; Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: Low temperature limits for boron concentration.	2.8 3.6	1
5	000026 Loss of Component Cooling Water / 8			X				AK3.04; Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: Effect on the CCW flow header of a loss of CCW.	3.5 3.7	1
24	000029 Anticipated Transient w/o Scram / 1					X		EA2.07; Ability to determine or interpret the following as they apply to a ATWS: Reactor trip breaker indicating lights.	4.2 4.3	1
16	000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4		X					EK2.1; Knowledge of the interrelations between the (Excess Steam Demand) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.3 3.6	1
17	000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4			X				EK3.2; Knowledge of the reasons for the following responses as they apply to the (Excess Steam Demand): Normal, abnormal, and emergency operating procedures associated with (Excess Steam Demand).	3.3 3.8	1

ES-401

PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier  
1/Group 1

Form ES-401-3

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
21	CE/A11; W/E08 RCS Overcooling - PTS / 4	X						AK1.3; Knowledge of the operational implications of the following concepts as they apply to the (RCS Overcooling): Annunciators and conditions indicating signals, and remedial actions associated with the (RCS Overcooling).	3.0 3.2	1
8	000051 Loss of Condenser Vacuum / 4					X		AA2.02; Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Conditions requiring reactor and/or turbine trip	3.9 4.1	1
9	000055 Station Blackout / 6			X				EK3.02; Knowledge of the reasons for the following responses as they apply to the Station Blackout: Actions contained in the EOP for loss of offsite and onsite power.	4.3 4.6	1
37	000057 Loss of Vital AC Elec. Inst. Bus / 6						X	2.1.33; Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	3.4 4.0	1
30	000059 Accidental Liquid RadWaste Rel. / 9				X			AA1.03; Ability to operate and/or monitor the following as they apply to the Accidental Liquid Radwaste Release: Flow rate controller.	3.0* 2.9	1
11	000062 Loss of Nuclear Service Water /4						X	2.4.11; Knowledge of abnormal condition procedures.	3.4 3.6	1
12	000067 Plant fire on site / 9	X						AK1.02; Knowledge of the operational implications of the following concepts as they apply to Plant Fire on Site: Fire fighting.	3.1 3.9	1

ES-401

PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier  
1/Group 1

Form ES-401-3

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
13	000068 (BW/A06) Control Room Evac. / 8					X		AA2.07; Ability to determine and interpret the following as they apply to the Control Room Evacuation: PZR level.	4.1 4.3	1
14	000069 (W/E14) Loss of CTMT Integrity / 5					X		AA2.01; Ability to determine and interpret the following as they apply to the Loss of Containment Integrity: Loss of containment integrity.	3.7 4.3	1
39	000069 (W/E14) Loss of CTMT Integrity / 5					X		AA2.02; Ability to determine and interpret the following as they apply to the Loss of Containment Integrity: Verification of automatic and manual means of restoring integrity.	3.9 4.4	1
42	000074 (W/E06&E07) Inad. Core Cooling / 4			X				EK3.07; Knowledge of the reasons for the following responses as they apply to the Inadequate Core Cooling: Starting up emergency feedwater and RCPs.	4.0 4.4	1
43	000074 (W/E06&E07) Inad. Core Cooling / 4					X		EA2.02; Ability to determine or interpret the following as they apply to a Inadequate Core Cooling: Availability of main or auxiliary feedwater.	4.6 4.9	1
[Note 1]	BW/E03 inadequate Subcooling Margin /4									
44	000076 High Reactor Coolant Activity / 9						X	2.1.32 Ability to explain and apply all system limits and precautions.	3.4 3.8	1
[Note 1]	BW/A02&A03 Loss of NNI-X/Y /7									
N/A	K/A Category Totals:	5	1	4	2	8	4	Group Point Total:		24



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PWR SRO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2

Form ES-401-3

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
18	000007 9BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1		X					EK2.2; Knowledge of the interrelations between the (Reactor Trip Recovery) 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 4.0	1
[Note 1]	BW/AO1 Plant Runback / 1									
[Note 1]	BW/A04 Turbine Trip / 4									
19	000008 Pressurizer Vapor Space Accident / 3					X		AA2.15; Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: ESF control board, valve controls, and indicators.	3.9 4.2	1
20	000009 Small Break LOCA / 3					X		EA2.06; Ability to determine and interpret the following as they apply to a small break LOCA: Whether PZR water inventory loss is imminent	3.8 4.3	1
[Note 1]	BW/E08; W/E03 LOCA Cooldown - Depress. / 4									
[Note 1]	W/E11 Loss of Emergency Coolant Recirc. / 4									
22	000022 Loss of Reactor Coolant Makeup / 2						X	2.4.46; Ability to verify that the alarms are consistent with plant conditions.	3.5 3.6	1
23	000025 Loss of RHR System / 4	X						AK1.01; Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: Loss of RHRS during all modes of operation.	3.9 4.3	1

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
6	000027 Pressurizer Pressure Control System Malfunction / 3	X						AK1.02; Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: Expansion of liquids as temperature increases.	2.8 3.1	1
45	000032 Loss of Source Range NI / 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* 3.1	1
25	000033 Loss of Intermediate Range NI / 7				X			AA1.01; Ability to operate and / or monitor the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Power-available indicators in cabinets or equipment drawers	2.9 3.1	1
26	000037 Steam Generator Tube Leak / 3			X				AK3.10; Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: Automatic actions associated with high radioactivity in S/G sample lines.	3.3* 3.7*	1
27	000038 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 4.2	1
28	000054 (CE/E06) Loss of Main Feedwater / 4				X			EA1.1; Ability to operate and / or monitor the following as they apply to the (Loss of Feedwater): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.0 3.9	1
[Note 1]	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary heat Sink / 4									

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
29	000058 Loss of DC Power / 6				X			AA1.03; Ability to operate and / or monitor the following as they apply to the Loss of DC Power: Vital and battery bus components.	3.1 3.3	1
31	000060 Accidental Gaseous Radwaste Rel. / 9					X		AA2.01; Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: A radiation-level alarm, as to whether the cause was due to a gradual (in time) signal increase or due to a sudden increase (a "spike"), including the use of strip-chart recorders, meter and alarm observations.	3.1 3.7	1
32	000061 ARM System Alarms / 7			X				AK3.02; Knowledge of the reasons for the following responses as they apply to the Area Radiation Monitoring (ARM) System Alarms: Guidance contained in alarm response for ARM system.	3.4 3.6	1
[No 1]	WE16 High Containment Radiation / 9									
35	000065 Loss of Instrument Air / 8						X	2.4.48; Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.	3.5 3.8	1
33	CE/E09 Functional Recovery		X					EK2.1; Knowledge of the interrelations between the (Functional Recovery) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.6 3.9	1
N/A	K/A Category Point Totals:	3	3	2	3	3	2	Group Point Total:		16

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Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
34	000028 Pressurizer Level Malfunction / 2				X			AA1.02; Ability to operate and / or monitor the following as they apply to the Pressurizer Level Control Malfunctions: CVCS	3.4 3.4	1
N/A	000036 (BW/A08) Fuel Handling Accident / 8							~ Random Deselection ~		
48	000056 Loss of Offsite Power / 6			X				AK3.02; Knowledge of the reasons for the following responses as they apply to the Loss of Offsite Power: Actions contained in EOP for loss of offsite power.	4.4 4.7	1
[Note 1]	BW/E13&E14 EOP Rules and Enclosures									
[Note 1]	BW/A05 Emergency Diesel Actuation / 6									
[Note 1]	BW/A07 Flooding / 8									
36	CE/A16 Excess RCS Leakage / 2		X					AK2.1; Knowledge of the interrelations between the (Excess RCS Leakage) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.2 3.5	1
[Note 1]	W/E13 Steam Generator Over-pressure / 4									
[Note 1]	W/E15 Containment Flooding / 5									
N/A	K/A Category Point Totals:	0	1	1	1	0	0	Group Point Total:		3

ES-401

PWR SRO Examination Outline  
Plant Systems - Tier 2/Group 1

Form ES-401-3

Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
38	001 Control Rod Drive											X	2.2.34; Knowledge of the process for determining the internal and external effects on core reactivity.	2.8 3.2*	1
40	003 Reactor Coolant Pump										X		A4.04; Ability to manually operate and/or monitor in the control room: RCP seal differential pressure instrumentation.	3.1 3.0	1
41	004 Chemical and Volume Control					X							K5.11; Knowledge of the operational implications of the following concepts as they apply to the CVCS: Thermal stress, brittle fracture, pressurized thermal shock.	3.6 3.9	1
60	004 Chemical and Volume Control	X											K1.24; Knowledge of the physical connections and/or cause-effect relationships between the CVCS and the following systems: RHRS	3.4 3.9	1
50	013 Engineered Safety Features Actuation			X									K3.03; Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Containment	4.3 4.7	1
51	013 Engineered Safety Features Actuation										X		A4.03; Ability to manually operate and/or monitor in the control room: ESFAS initiation.	4.5 4.7	1
65	014 Rod Position Indication										X		A4.04; Ability to manually operate and/or monitor in the control room: Re-zeroing of rod position prior to startup.	2.7 2.7	1
46	015 Nuclear Instrumentation									X			A3.01; Ability to monitor automatic operation of the NIS, including: Console and cabinet indications	3.8 3.8	1
47	017 In-core Temperature Monitor							X					A1.01; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ITM system controls including: Core exit temperature.	3.7 3.9	1

Seq. #	System # / Name	K1	K2	K3	K4	K5	K6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
54	022 Containment Cooling		X										K2.01; Knowledge of bus power supplies to the following: Containment cooling fans.	3.0* 3.1	1
56	022 Containment Cooling							X					A1.04; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS system controls including: Cooling water flow	3.2 3.3	1
[Note 1]	025 Ice Condenser														
57	026 Containment Spray				X								K4.02; Knowledge of CSS design feature(s) and/or interlock(s) which provide for the following: Neutralize boric acid to reduce corrosion and remove inorganic fission product iodine from steam (NAOH) in containment spray.	3.1 3.6	1
49	056 Condensate								X				A2.04; Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of condensate pumps.	2.6 2.8*	1
52	059 Main Feedwater											X	2.4.50; Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3 3.3	1
53	061 Auxiliary/Emergency Feedwater		X										K2.01; Knowledge of bus power supplies to the following: AFW system MOVs.	3.2* 3.3	1
74	063 DC Electrical Distribution									X			A3.01; Ability to monitor automatic operation of the DC electrical system, including: Meters, annunciators, dials recorders, and indicating lights.	2.7 3.1	1

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PWR SRO Examination Outline  
Plant Systems - Tier 2/Group 1

Form ES-401-3

Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
55	068 Liquid Radwaste				X								K4.01; Knowledge of design feature(s) and/or interlock(s) which provide for the following: Safety and environmental precautions for handling hot, acidic, and radioactive liquids.	3.4 4.1	1
58	071 Waste Gas Disposal											X	2.1.8; Ability to coordinate personnel activities outside the control room.	3.8 3.6	1
59	072 Area Radiation Monitoring					X							K5.02; Knowledge of the operational implications of the following concepts as they apply to the ARM system: Radiation intensity changes with source distance.	2.5 3.2	1
N/A	K/A Category Point Totals:	1	2	1	2	2	0	2	1	2	3	3	Group Point Total:		19

ES-401

PWR SRO Examination Outline  
Plant Systems - Tier 2/Group 2

Form ES-401-3

Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
N/A	002 Reactor Coolant												~ RANDOM DESELECTED ~		
61	006 Emergency Core Cooling				X								K4.17; Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: Safety injection valve interlocks.	3.8 4.1	1
N/A	010 Pressurizer Pressure Control												~ RANDOM DESELECTED ~		
63	011 Pressurizer Level Control			X									K3.03; Knowledge of the effect that a loss or malfunction of the PZR LCS will have on the following: PZR PCS.	3.2 3.7	1
64	012 Reactor Protection	X											K1.01; Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: 120V vital/instrument power system.	3.4 3.7	1
66	016 Non-nuclear Instrumentation								X				A2.01; 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: Detector failure.	3.0* 3.1*	1
[Note 1]	027 Containment Iodine Removal														
83	028 Hydrogen Recombiner and Purge Control						X						K6.01; Knowledge of the effect of a loss or malfunction on the following will have on the HRPS: Hydrogen recombiners.	2.6 3.1	1
68	029 Containment Purge										X		A4.04; Ability to manually operate and/or monitor in the control room: Containment evacuation signal.	3.5 3.6	1
69	033 Spent Fuel Pool Cooling				X								K4.03; Knowledge of design feature(s) and/or interlock(s) which provide for the following: Anti-siphon devices.	2.6 2.9	1



Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
N/A	034 Fuel Handling Equipment												~ RANDOM DESELECTED ~		
70	035 Steam Generator										X		A4.08; Ability to manually operate and/or monitor in the control room: Recognition that increasing radiation levels in secondary systems may mean leaking and possibly ruptured S/G tubes.	4.1 4.4	
71	039 Main and Reheat Steam				X								K4.05; Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Automatic isolation of steam line	3.7 3.7	1
72	055 Condenser Air Removal	X											K1.06; Knowledge of the physical connections and/or cause-effect relationships between the CARS and the following systems: PRM system	2.6 2.6	1
73	062 AC Electrical Distribution											X	2.1.32; Ability to explain and apply all system limits and precautions.	3.4 3.8	1
75	064 Emergency Diesel Generator						X						K6.07; Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Air receivers	2.7 2.9	1
76	073 Process Radiation Monitoring				X								K4.01; Knowledge of PRM system design feature(s) and interlock(s) which provide for the following: Release termination when radiation exceeds setpoint.	4.0 4.3	1
77	075 Circulating Water				X								K4.01; Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following: Heat sink	2.5 2.8	1
78	079 Station Air											X	2.1.32; Ability to explain and apply all system limits and precautions.	3.4 3.8	1

ES-401		PWR SRO Examination Outline Plant Systems - Tier 2/Group 2											Form ES-401-3		
Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
79	086 Fire Protection									X			A3.01; Ability to monitor automatic operation of the Fire Protection System, including: Starting mechanisms of fire water pumps.	2.9 3.3	1
62	103 Containment									X			A3.01; Ability to monitor automatic operation of the Containment System, including: Containment isolation.	3.9 4.2	1
N/A	K/A Category Point Totals:	2	0	1	5	0	2	0	1	2	2	2	Group Point Total:		17

[Note 1] Grayed out rows are not applicable to Millstone Unit Two (CE designed plant)

ES-401

PWR SRO Examination Outline  
Plant Systems - Tier 2/Group 3

Form ES-401-3

Seq. #	System # / Name	K1	K2	K3	K4	K5	K6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
80	005 Residual Heat Removal		X										K2.03; Knowledge of bus power supplies to the following: RCS pressure boundary motor-operated valves.	2.7* 2.8*	1
81	007 Pressurizer Relief/Quench Tank				X								K4.01; Knowledge of PRTS design feature(s) and interlock(s) which provide for the following: Quench tank cooling.	2.6 2.9	1
N/A	008 Component Cooling Water												~RANDOM DESELECTED~		
85	041 Steam Dump/Turbine Bypass Control						X						K6.03; Knowledge of the effect of a loss or malfunction on the following will have on the SDS: Controller and positioners, including ICS, S/G, CRDS.	2.7 2.9	1
N/A	045 Main Turbine Generator												~RANDOM DESELECTED~		
N/A	076 Service Water												~RANDOM DESELECTED~		
67	078 Instrument Air			X									K3.02; Knowledge of the effect that a loss or malfunction of the IAS will have on the following: Systems having pneumatic valves and controls.	3.4 3.6	1
N/A	K/A Category Point Totals:	0	1	1	1	0	1	0	0	0	0	0	Group Point Total:		4

## Plant-Specific Priorities

Seq.	System / Topic	Recommended Replacement for	Reason	Points
Plant-Specific Priority Total: (limit 10)				

Facility: Millstone Unit 2			Date of Exam: 10/25/02	Exam Level: <b>SRO</b>	
Category	Seq.	K/A #	Topic	Imp.	Points
Conduct of Operations	89	2.1.25	Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data.	2.8/3.1	1
	88	2.1.14	Knowledge of system status criteria which require the notification of plant personnel.	2.5/3.3	1
	82	2.1.31	Ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup.	4.2/3.9	1
	Total				3
Equipment Control	84	2.2.2	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.	4.0/3.5	1
	86	2.2.21	Knowledge of pre- and post-maintenance operability requirements.	2.3/3.5	1
	91	2.2.12	Knowledge of surveillance procedures.	3.0/3.4	1
	90	2.2.27	Knowledge of the refueling process.	2.6/3.5	1
	Total				4
Radiation Control	92	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.	2.6/3.0	1
	93	2.3.2	Knowledge of facility ALARA program.	2.5/2.9	1
	94	2.3.9	Knowledge of the process for performing a containment purge.	2.5/3.4	1
	95	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9/3.3	1
	96	2.3.11	Ability to control radiation releases.	2.7/3.2	1
	Total				5
Emergency Procedures and Plan	97	2.4.12	Knowledge of general operating crew responsibilities during emergency operations.	3.4/3.9	1
	98	2.4.17	"Knowledge of EOP terms and definitions,	3.1/3.8	1
	99	2.4.25	Knowledge of fire protection procedures.	2.9/3.4	1
	87	2.4.46	Ability to verify that the alarms are consistent with the plant conditions.	3.5/3.6	1
	100	2.4.47	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	3.4/3.7	1
	Total				5
Tier 3 Target Point Total (RO/SRO)					17

Facility: Millstone Unit 2		2002 NRC EXAM		Exam Level: RO									
Tier	Group	K/A Category Points											Point Total
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	
1.  Emergency &  Abnormal  Plant Evolutions	1	5	0	3				0	4			4	16
	2	2	2	2				5	5			1	17
	3	0	1	0				1	0			1	3
	Tier Totals	7	3	5				6	9			6	36
2.  Plant  Systems	1	1	2	2	2	3	0	2	2	3	2	4	23
	2	2	2	1	5	0	1	1	1	2	3	2	20
	3	0	1	2	1	0	2	1	0	0	0	1	8
	Tier Totals	3	5	5	8	3	3	4	3	5	5	7	51
3. Generic Knowledge and Abilities					Cat 1	Cat 2	Cat 3	Cat 4	13				
					2	2	5	4					
<p>Note:</p> <ol style="list-style-type: none"> <li>1. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., the "Tier Totals" in each K/A category shall not be less than two).</li> <li>2. Actual point totals must match those specified in the table.</li> <li>3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities</li> <li>4. Systems/evolutions within each group are identified on the associated outline.</li> <li>5. The shaded areas are not applicable to the category/tier.</li> <li>6. * The generic 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.</li> <li>7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the RO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.</li> </ol>													

ES-401		PWR RO Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1						Form ES-401-4		
Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
1	000005 Inoperable/Stuck Control Rod / 1						X	2.1.19; Ability to use plant computer to obtain and evaluate parametric information on system or component status	3.0/ 3.0	1
2	000015/17 RCP Malfunctions / 4	X						AK1.01; Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions(Loss of RC Flow): Natural circulation in a nuclear reactor power plant.	4.4/ 4.6	1
3	BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4					X		AA2.2; Ability to determine and interpret the following as they apply to the (Natural Circulation Operations) Adherence to appropriate procedures and operation within the limitations in the facilities license and amendments.	2.9/ 3.8	1
4	000024 Emergency Boration / 1	X						AK1.04; Knowledge of the operational implications of the following concepts as they apply to Emergency Boration: Low temperature limits for Boron concentration.	2.8/ 3.6	1
5	000026 Loss of Component Cooling Water / 8			X				AK3.04; Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: Effect on the CCW flow header of a loss of CCW.	3.5/ 3.7	1
6	000027 Pressurizer Pressure Control System Malfunction / 3	X						AK1.02; Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions and the following: Expansion of liquids as temperature increases.	2.8/ 3.1	1
N/A	000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4							RANDOMLY DESELECTED		

7	CE/A11; W/E08 RCS Overcooling - PTS / 4	X					AK1.3; Knowledge of the operational implications of the following concepts as they apply to the (RCS Overcooling) Annunciators and conditions indication signals, and remedial actions associated with the (RCS overcooling).	3.0/ 3.2	1
8	000051 Loss of Condenser Vacuum / 4					X	AA2.02; Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Conditions requiring reactor and/or turbine trip	3.9/ 4.1	1
9	000055 Station Blackout / 6			X			EK3.02; Knowledge of the reasons for the following responses as they apply to the Station Blackout: Actions contained in EOP for loss of offsite and onsite power.	4.3/ 4.6	1
10	000057 Loss of Vital AC Elec. Inst. Bus / 6					X	2.4.10; Knowledge of annunciator response procedures.	3.0/ 3.1	1
11	000062 Loss of Nuclear Service Water /4					X	2.4.11: Knowledge of abnormal condition procedures.	3.4/ 3.6	1
12	000067 Plant fire on site / 9	X					AK1.02; Knowledge of the operational implications of the following concepts as they apply to Plant Fire on Site: Fire fighting	3.1/ 3.9	1
13	000068 (BW/A06) Control Room Evac. / 8					X	AA2.07; Ability to determine and interpret the following as they apply to the Control Room Evacuation: PZR Level.	4.1/ 4.3	1
14	000069 (W/E14) Loss of CTMT Integrity / 5					X	AA2.01; Ability to determine and interpret the following as they apply to the Loss of Containment Integrity.	3.7/ 4.3	1
15	000074 (W/E06&E07) Inad. Core Cooling / 4			X			EK3.07; Knowledge of the reasons for the following responses as they apply to the Inadequate Core Cooling: Starting up emergency feedwater and RCPs.	4.0/ 4.4	1

[Note 1]	BW/E03 inadequate Subcooling Margin /4									
16	000076 High Reactor Coolant Activity / 9						X	2.1.32; Ability to explain and apply all system limits and precautions.	3.4/ 3.8	1
[Note 1]	BW/A02&A03 Loss of NNI-X/Y /7									
	K/A Category Totals:	5	0	3	0	4	4	Group Point Total:		16

[Note 1] Grayed out rows are not applicable to Millstone Unit Two (CE designed plant)



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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2

Form ES-401-4

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
N/A	000001 Continuous Rod Withdrawal / 1							RANDOMLY DESELECTED		
17	000003 Dropped Control Rod / 1					X		AA2.04; Ability to determine and interpret the following as they apply to the Dropped Control Rod: Rod motion stops due to dropped rod.	3.4/ 3.6	1
18	000007 9BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1		X					EK2.2; Knowledge of the interrelations between the (Reactor Trip Recovery) and the following: Facilities heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and the relations between the proper operation of these systems to the operation of the facility.	3.5/ 4.0	1
[Note 1]	BW/AO1 Plant Runback / 1									
[Note 1]	BW/A04 Turbine Trip / 4									
19	000008 Pressurizer Vapor Space Accident / 3					X		AA2.15; Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident and the following: ESF Control Board, valve controls, and indicators.	3.9/ 4.2	1
20	000009 Small Break LOCA / 3					X		EA2.06; Ability to determine or interpret the following as they apply to the small break LOCA: Whether PZR water inventory loss is imminent.	4.0/ 4.1	1
21	000011 Large Break LOCA / 3				X			EA1.04; Ability to operate and monitor the following as they apply to a Large Break LOCA: ESF Actuation system in manual.	4.4/ 4.4	1
[Note 1]	W/E04 LOCA Outside Containment / 3									
[Note 1]	BW/E08; W/E03 LOCA Cooldown - Depress. / 4									
[Note 1]	W/E11 Loss of Emergency Coolant Recirc. / 4									
[Note 1]	W/E02&E02 Rediagnosis SI Termination / 3									
22	000022 Loss of Reactor Coolant Makeup / 2						X	2.4.46; Ability to verify that the alarms are consistent with the plant conditions.	3.5/ 3.6	1
23	000025 Loss of RHR System / 4	X						AK1.01; Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: Loss of RHRS during all modes of operation.	3.9/ 4.3	1

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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2

Form ES-401-4

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
24	000029 Anticipated Transient w/o Scram / 1					X		EA2.07; Ability to determine and interpret the following as they apply to a ATWS: Reactor Trip Breaker indicating lights.	4.2/ 4.3	1
N/A	000032 Loss of Source Range NI / 7							RANDONALLY DESELECTED		
25	000033 Loss of Intermediate Range NI / 7				X			AA1.01; Ability to operate and / or monitor the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Power-available indicators in cabinets or equipment drawers.	3.2./ 3.6	1
26	000037 Steam Generator Tube Leak / 3			X				AK3.10; Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: Automatic actions associated with high radioactivity in S/G sample lines.	3.3*/ 3.7*	1
27	000038 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/ 4.2	1
28	000054 (CE/E06) Loss of Main Feedwater / 4				X			EA1.1; Ability to operate and/or monitor the following as they apply to the (Loss of Feedwater) Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.0/ 3.9	1
[Note 1]	BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary heat Sink / 4									
29	000058 Loss of DC Power / 6				X			AA1.03; Ability to operate and / or monitor the following as they apply to the Loss of DC Power: Vital and battery bus components	3.1/ 3.3	1
30	000059 Accidental Liquid RadWaste Rel. / 9				X			AA1.03; Ability to operate and / or monitor the following as they apply to the Accidental Liquid RadWaste Release: Flow Rate Controller	3.0/ 2.9	1
31	000060 Accidental Gaseous Radwaste Rel. / 9					X		AA2.01; Ability to determine and interpret the following as they apply to the Accidental Gaseous RadWaste: A radiation-level alarm, as to whether the cause was due to a gradual (in time) signal increase or due to a sudden increase (a "spike"), including the use of strip chart recorders, meter and alarm observations.	3.1/ 3.7	1

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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2

Form ES-401-4

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
32	000061 ARM System Alarms / 7			X				AK3.02; Knowledge of the reasons for the following responses as they apply to the Area Radiation Monitor (ARM) System Alarms: Guidance contained in alarm response for ARM System.	3.4/ 3.6	1
[Note 1]	W/E16 High Containment Radiation / 9									
33	CE/E09 Functional Recovery		X					EK2.1; Knowledge of the interrelations between the (Functional Recovery) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.6/ 3.9	1
N/A	K/A Category Totals:	2	2	2	5	5	1	Group Point Total:		17

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PWR RO Examination Outline  
Emergency and Abnormal Plant Evolutions - Tier 1/Group 3

Form ES-401-4

Seq. #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
34	000028 Pressurizer Level Malfunction / 2				X			AA1.02; Ability to operate and / or monitor the following as they apply to the Pressurizer Level Control Malfunctions: CVCS	3.4/ 3.4	1
N/A	000036 (BW/A08) Fuel Handling Accident / 8							RANDOMALY DESELECTED		
N/A	000056 Loss of Off-site Power / 6							RANDOMALY DESELECTED		
35	000065 Loss of Instrument Air / 8						X	2.4.48; Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.	3.5/ 3.8	1
[Note 1]	BW/E13&E14 EOP Rules and Enclosures									
[Note 1]	BW/A05 Emergency Diesel Actuation / 6									
[Note 1]	BW/A07 Flooding / 8									
36	CE/A16 Excess RCS Leakage / 2		X					AK2.1; Knowledge of the interrelations between the (Excess RCS Leakage) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.2/ 3.5	1
[Note 1]	W/E13 Steam Generator Over-pressure / 4									
[Note 1]	W/E15 Containment Flooding / 5									
N/A	K/A Category Point Totals:	0	1	0	1	0	1	Group Point Total:		3

[Note 1] Grayed out rows are not applicable to Millstone Unit Two (CE designed plant)

Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Points
37	001 Control Rod Drive				X								K4.10; Knowledge of CRDS design feature(s) and/or interlock(s) which provide for the following: Trip signals that would prevent reset of reactor trip signals.	3.6/ 3.8	1
38	001 Control Rod Drive											X	2.2.34; Knowledge of the process for determining the internal and external effects on core reactivity.	3.8/ 4.1	1
39	003 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.	2.7/ 3.1	1
40	003 Reactor Coolant Pump										X		A4.04; Ability to manually operate and/or monitor in the control room: RCP seal differential pressure instrumentation.	3.1/ 3.0	1
41	004 Chemical and Volume Control					X							K5.11; Knowledge of the operational implications of the following concepts as they apply to the CVCS: Thermal stress, brittle fracture, PTS.	2.6/ 3.1	1
42	004 Chemical and Volume Control										X		A4.02; Ability to manually operate and/or monitor in the control room: Calculation of ECP and related boration/dilution/reactivity relationships.	3.2/ 3.9	1
43	013 Engineered Safety Features Actuation			X									K3.02; Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: RCS	4.3/ 4.5	1
44	013 Engineered Safety Features Actuation									X			A3.01; Ability to monitor automatic operation of the ESFAS including: Input channels and logic	3.7*/ 3.9	1

Seq. #	System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
45	015 Nuclear Instrumentation			X									K3.01; Knowledge of the effect that a loss or malfunction of NIS will have on the following: RPS	3.9/ 4.3	1
46	015 Nuclear Instrumentation									X			A3.01; Ability to monitor automatic operation of the NIS including: Console and Cabinet Indications.	3.8/ 3.8	1
47	017 In-core Temperature Monitor							X					A1.01; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ITM System controls including: Core Exit Temperature.	3.7/ 3.9	1
48	022 Containment Cooling		X										K2.01; Knowledge of bus power supplies to the following: Containment cooling fans.	3.0*/ 3.1	1
[Note 1]	025 Ice Condenser														
49	056 Condensate								X				A2.04; Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of Condensate Pumps.	2.6/ 2.8*	1
50	056 Condensate											X	2.1.32; Ability to explain and apply all system limits and precautions.	3.4/ 3.8	1
51	059 Main Feedwater	X											K1.05; Knowledge of the physical connections and/or cause-effect relationships between the MFW and the following systems: RCS	3.1*/ 3.2	1
52	059 Main Feedwater											X	2.4.50; Ability to verify alarm setpoints and operate controls identified in the alarm response manual.	3.3/ 3.3	1
53	061 Auxiliary/Emergency Feedwater		X										K2.01; Knowledge of bus power supplies to the following: AFW system MOVs	3.2*/ 3.3	1

ES-401		PWR RO Examination Outline Plant Systems - Tier 2/Group 1											Form ES-401-4		
Seq. #	System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
54	061 Auxiliary/Emergency Feedwater							X					A1.04; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the AFW System controls including: AFW source tank level.	3.9/ 3.9	1
55	068 Liquid Radwaste				X								K4.01; Knowledge of design feature(s) and/or interlock(s) which provide for the following: Safety and safety precautions for handling hot, acidic, and radioactive liquids.	3.4/ 4.1	1
56	068 Liquid Radwaste									X			A3.02; Ability to monitor automatic operation of the Liquid Radwaste System, including: Automatic isolation.	3.6/ 3.6	1
57	071 Waste Gas Disposal					X							K5.04; Knowledge of the operational implications of the following concepts as they apply to the Waste Gas Disposal System: Relationship of hydrogen/oxygen concentrations to flammability.	2.5/ 3.1	1
58	071 Waste Gas Disposal											X	2.1.8; Ability to coordinate personnel activities outside the control room.	3.8/ 3.6	1
59	072 Area Radiation Monitoring					X							K5.02; Knowledge of the operational implications of the following concepts as they apply to the ARM system: Radiation intensity changes with source distance.	2.5/ 3.2	1
N/A	K/A Category Point Totals:	1	2	2	2	3	0	2	2	3	2	4	Group Point Total:		23

[Note 1] Grayed out rows are not applicable to Millstone Unit Two (CE designed plant)

Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Pts
60	002 Reactor Coolant							X					A1.07; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCS controls including: Reactor differential temperature.	3.3/ 3.5	1
61	006 Emergency Core Cooling				X								K4.17; Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: Safety injection valve interlocks.	3.8/ 4.1	1
62	010 Pressurizer Pressure Control		X										K2.01; Knowledge of bus power supplies to the following: PZR Heaters	3.6/ 3.9	
63	011 Pressurizer Level Control			X									K3.03; Knowledge of the effect that a loss or malfunction of the PZR LCS will have on the following: PZR PCS	3.2/ 3.7	1
64	012 Reactor Protection	X											K1.01; Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: 120V vital/instrument power system.	3.4/ 3.7	1
65	014 Rod Position Indication										X		A4.04; Ability to manually operate and/or monitor in the control room: Rezeroing of rod position prior to startup.	2.7/ 2.7	1
66	016 Non-nuclear Instrumentation								X				A2.01; Ability to (a) predict the impacts of the following malfunctions or operations on the NNIS Channels; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Detector failure.	3.0* 3.1*	1
67	026 Containment Spray		X										K2.01; Knowledge of bus power supplies to the following: Containment spray pumps	3.4*/ 3.6	1
68	029 Containment Purge										X		A4.04; Ability to manually operate and/or monitor in the control room: Containment evacuation signal.	3.5/ 3.6	1
69	033 Spent Fuel Pool Cooling				X								K4.03; Knowledge of design feature(s) and/or interlock(s) which provide for the following: Anti-Siphon devices.	2.6/ 2.9	1
70	035 Steam Generator										X		A4.08; Ability to manually operate and/or monitor in the control room: Recognition that increasing radiation levels in secondary systems may mean leaking and possible ruptured S/G tubes.	4.1/ 4.4	1



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PWR RO Examination Outline  
Plant Systems - Tier 2/Group 2

Form ES-401-4

Seq. #	System # / Name	K1	K2	K3	K4	K5	K6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Pts
71	039 Main and Reheat Steam				X								K4.05; Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Automatic isolation of steam line.	3.7/ 3.7	1
72	055 Condenser Air Removal	X											K1.06; Knowledge of the physical connections and/or cause-effect relationships between the CARS and the following systems: PRM System.	2.6/ 2.6	1
73	062 AC Electrical Distribution											X	2.1.32; Ability to explain and apply all system limits and precautions.	3.4/ 3.8	1
74	063 DC Electrical Distribution									X			A3.01; Ability to monitor automatic operation of the DC Electrical System, including: Meters, annunciators, dials, recorders, and indicating lights.	2.7/ 3.1	1
75	064 Emergency Diesel Generator						X						K6.07; Knowledge of the effect of a loss or malfunction on the following will have on the ED/G System: Air Receivers	2.7/ 2.9	1
76	073 Process Radiation Monitoring				X								K4.01; Knowledge of PRM design feature(s) and/or interlock(s) which provide for the following: Release termination when radiation exceeds setpoint	4.0/ 4.3	1
77	075 Circulating Water				X								K4.01; Knowledge of Circulating Water design feature(s) and/or interlock(s) which provide for the following: Heat Sink	2.5/ 2.8	1
78	079 Station Air											X	2.1.32; Ability to explain and apply all system limits and precautions.	3.4/ 3.8	1
79	086 Fire Protection									X			A3.01; Ability to monitor automatic operation of the Fire Protection System including: Starting mechanisms of the fire water pumps.	2.9/ 3.3	1
N/A	K/A Category Point Totals:	2	2	1	5	0	1	1	1	2	3	2	Group Point Total:		20

ES-401		PWR RO Examination Outline Plant Systems - Tier 2/Group 3											Form ES-401-4		
Seq. #	System # / Name	K1	K2	K3	K4	K5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	Imp.	Pts
80	005 Residual Heat Removal		X										K2.03; Knowledge of bus power supplies to the following: RCS pressure boundary motor-operated valves.	2.7*/ 2.8*	1
81	007 Pressurizer Relief/Quench Tank				X								K4.01; Knowledge of PRTS design feature(s) and/or interlock(s) which provide for the following: Quench Tank Cooling	2.6/ 2.9	1
82	008 Component Cooling Water			X									K3.03; Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: RCPs	4.1/ 4.2	1
[Note 1]	027 Containment Iodine Removal														
83	028 Hydrogen Recombiner and Purge Control						X						K6.01; Knowledge of the effect of a loss or malfunction on the following will have on the HRPS: Hydrogen Recombiners.	2.6/ 3.1	1
84	034 Fuel Handling Equipment											X	2.2.28; Knowledge of new and spent fuel movement procedures.	2.6/ 3.5	1
85	041 Steam Dump/Turbine Bypass Control						X						K6.03; Knowledge of the effect of a loss or malfunction on the following will have on the SDS: Controller and positioners, including ICS, S/G, CRDS	2.7/ 2.9	1
86	045 Main Turbine Generator			X									K3.01; Knowledge of the effect that a loss or malfunction of the MT/G will have on the following: Remainder of the plant.	2.9/ 3.2	1
87	076 Service Water							X					A1.02; Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SWS controls including: Reactor and turbine building closed cooling water temperatures.	2.6*/ 2.6*	1
N/A	078 Instrument Air												RANDOMAIY DESELECTED		
N/A	103 Containment												RANDOMALY DESELECTED		
N/A	K/A Category Point Totals:	0	1	2	1	0	2	1	0	0	0	1	Group Point Total:		8

[Note 1] Grayed out rows are not applicable to Millstone Unit Two (CE designed plant)

ES-401	PWR RO Examination Outline Plant Systems - Tier 2/Group 3		Form ES-401-4
Plant-Specific Priorities			
System / Topic	Recommended Replacement for	Reason	Points
Plant-Specific Priority Total: (limit 10)			

ES-401

## Generic Knowledge and Abilities Outline (Tier 3)

Form ES-401-5

Facility: Millstone Unit 2		Date of Exam: 10/21/02		Exam Level: RO	
Category	K/A #	Topic	Imp.	Points	
Conduct of Operations	2.1.14	Knowledge of system status criteria which require the notification of plant personnel.	2.5/3.3	1	
	2.1.25	Ability to obtain and interpret station reference materials such as graphs, momographs, and tables which contain performance data.	2.8/3.1	1	
	Total			2	
Equipment Control	2.2.27	Knowledge of the refueling process.	2.6/3.5	1	
	2.2.12	Knowledge of surveillance procedures.	3.0/3.4	1	
	Total			2	
Radiation Control	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control.	2.6/3.0	1	
	2.3.2	Knowledge of facility ALARA program.	2.5/2.9	1	
	2.3.9	Knowledge of the process for performing a Containment Purge.	2.5/3.4	1	
	2.3.10	Ability to perform procedure to reduce excessive levels of radiation and guard against personnel exposure.	2.9/3.3	1	
	2.3.11	Ability to control radiation releases.	2.7/3.2	1	
	Total			5	
Emergency Procedures and Plan	2.4.12	Knowledge of general operating crew responsibilities during emergency operations.	3.4/3.9	1	
	2.4.17	Knowledge of EOP terms and definitions.	3.1/3.8	1	
	2.4.25	Knowledge of fire protection procedures.	2.9/3.4	1	
	2.4.47	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	3.4/3.7	1	
	Total			4	
Tier 3 Target Point Total (RO/SRO)				13	

**Record of Rejected K/As**

Tier/Group	Randomly Selected K/A	Reason for Rejection
RO		
1/1	AK1.03	Operation with <4 RCPs not allowed at MP2.
1/2	AA2.05	In-core TC map not used by operators in determining dropped CEA location.
1/2	AK3.08	RCPs not secured for SG tube leak at MP2.
1/2	AK3.09	Unrelated to K/A for MP2, maximum load change not required for SGTL.
1/3	AA1.05	Excess letdown is a manually initiated evolution at MP2, not a malfunction.
2/1	K5.40	Pressurizer flooded over and isolated from QT when drawing bubble at MP2.
2/1	K3.06	No effect on RRS at MP2
SRO		
1/1	EA2.01	"Inadequate Core Cooling" not an EOP at MP2, i.e.: determination of subcooling margin not procedurally significant.
2/1	A1.02	Question on this K/A won't discriminate between competent and not competent operator
2/1	K2.01	Power supplies to CS pumps, too basic
2/1	K3.02	Containment systems over-sampled; replaced with random selection (CVCS)
2/2	A1.01	Question on this K/A won't discriminate between competent and not competent operator