

Facility: TMI 1

Printed: 05/04/2009

Date Of Exam: 07/16/2009

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total		
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A			3	18	0	0	0	
	2	1	2	1	N/A			2	2	N/A			1	9	0	0	0	
	Tier Totals	4	5	4	N/A			5	5	N/A			4	27	0	0	0	
2. Plant Systems	1	3	2	3	3	2	2	3	3	2	3	2	28	0	0	0		
	2	1	1	1	1	1	1	0	1	1	1	1	10	0	0	0		
	Tier Totals	4	3	4	4	3	3	3	4	3	4	3	38	0	0	0		
3. Generic Knowledge And Abilities Categories					1	2	3	4					10	1	2	3	4	0
					3	3	2	2						0	0	0	0	

Note:

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- 7.* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

PWR RO Examination Outline

Printed: 07/22/2009

Facility: TMI 1

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Q#
000008 Pressurizer Vapor Space Accident / 3		X					AK2.01 - Valves	2.7*	1
000009 Small Break LOCA / 3			X				EK3.05 - CCWS radiation alarm	3.4	2
000011 Large Break LOCA / 3				X			EA1.17 - Safety parameter display system	3.5*	3
000015/000017 RCP Malfunctions / 4	X						AK1.05 - Effects of unbalanced RCS flow on in-core average temperature, core imbalance, and quadrant power tilt	2.7	4
000022 Loss of Rx Coolant Makeup / 2	X						AK1.04 - Reason for changing from manual to automatic control of charging flow valve controller	2.9	5
000025 Loss of RHR System / 4			X				AK3.03 - Immediate actions contained in EOP for Loss of RHRS	3.9	6
000027 Pressurizer Pressure Control System Malfunction / 3	X						AK1.01 - Definition of saturation temperature	3.1	7
000029 ATWS / 1		X					EK2.06 - Breakers, relays, and disconnects	2.9*	8
000038 Steam Gen. Tube Rupture / 3						X	2.4.21 - Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	4.0	9
000040 Steam Line Rupture - Excessive Heat Transfer / 4		X					AK2.02 - Sensors and detectors	2.6*	10
000054 Loss of Main Feedwater / 4				X			AA1.01 - AFW controls, including the use of alternate AFW sources	4.5	11
000055 Station Blackout / 6				X			EA1.06 - Restoration of power with one ED/G	4.1	12
000056 Loss of Off-site Power / 6						X	2.2.36 - Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	13
000057 Loss of Vital AC Inst. Bus / 6					X		AA2.04 - ESF system panel alarm annunciators and channel status indicators	3.7	14
000058 Loss of DC Power / 6					X		AA2.01 - That a loss of dc power has occurred; verification that substitute power sources have come on line	3.7	15
000077 Generator Voltage and Electric Grid Disturbances / 6						X	2.2.42 - Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	3.9	16

PWR RO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Q#
BW/E02 Reactor Trip - Stabilization - Recovery / 1			X				EK3.2 - Normal, abnormal and emergency operating procedures associated with (Vital System Status Verification)	3.0	17
BW/E04 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.2	18
K/A Category Totals:	3	3	3	3	3	3		Group Point Total:	18

PWR RO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Q#
000005 Inoperable/Stuck Control Rod / 1		X					AK2.02 - Breakers, relays, disconnects, and control room switches	2.5	19
000033 Loss of Intermediate Range NI / 7				X			AA1.01 - Power-available indicators in cabinets or equipment drawers	2.9	20
000037 Steam Generator Tube Leak / 3			X				AK3.08 - Criteria for securing RCP	4.1	21
000059 Accidental Liquid RadWaste Rel. / 9					X		AA2.05 - The occurrence of automatic safety actions as a result of a high PRM system signal	3.6	22
000074 Inad. Core Cooling / 4	X						EK1.05 - Definition of saturated liquid	2.8	24
000076 High Reactor Coolant Activity / 9						X	2.4.21 - Knowledge of the parameters and logic used to assess the status of safety functions including: 1. Reactivity control; 2. Core cooling and heat removal; 3. Reactor coolant system integrity; 4. Containment conditions; 5. Radioactivity release control.	4.0	25
BW/A05 Emergency Diesel Actuation / 6					X		AA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.5	23
BW/E08 LOCA Cooldown - Depress. / 4				X			EA1.3 - Desired operating results during abnormal and emergency situations	3.3	26
BW/E09 Natural Circ. / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.7	27
K/A Category Totals:	1	2	1	2	2	1		Group Point Total:	9

PWR RO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Q#
003 Reactor Coolant Pump										X		A4.04 - RCP seal differential pressure instrumentation	3.1	28
003 Reactor Coolant Pump				X								K4.04 - Adequate cooling of RCP motor and seals	2.8	29
004 Chemical and Volume Control			X									K3.07 - PZR level and pressure	3.8	30
005 Residual Heat Removal	X											K1.04 - CVCS	2.9	31
006 Emergency Core Cooling					X							K5.05 - Effects of pressure on a solid system	3.4	33
006 Emergency Core Cooling									X			A3.01 - Accumulators	4.0*	32
007 Pressurizer Relief/Quench Tank			X									K3.01 - Containment	3.3	35
008 Component Cooling Water										X		A4.05 - Normal CCW-header total flow rate and the flow rates to the components cooled by the CCWS	2.7*	54
008 Component Cooling Water							X					A1.02 - CCW temperature	2.9	36
010 Pressurizer Pressure Control	X											K1.05 - PRTS	3.4	37
012 Reactor Protection					X							K5.01 - DNB	3.3*	38
013 Engineered Safety Features Actuation							X					A1.02 - Containment pressure, temperature, and humidity	3.9	39
022 Containment Cooling							X					A1.01 - Containment temperature	3.6	40
026 Containment Spray		X										K2.01 - Containment spray pumps	3.4*	42
039 Main and Reheat Steam				X								K4.05 - Automatic isolation of steam line	3.7	44
039 Main and Reheat Steam								X				A2.05 - Increasing steam demand, its relationship to increases in reactor power	3.3	43
059 Main Feedwater										X		A4.08 - Feed regulating valve controller	3.0*	34
059 Main Feedwater								X				A2.06 - Loss of steam flow to MFW system	2.7*	45
061 Auxiliary/Emergency Feedwater						X						K6.02 - Pumps	2.6	46
062 AC Electrical Distribution											X	2.1.25 - Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	41
062 AC Electrical Distribution				X								K4.05 - Paralleling of ac sources (synchroscope)	2.7*	47
063 DC Electrical Distribution	X											K1.03 - Battery charger and battery	2.9	48
064 Emergency Diesel Generator						X						K6.07 - Air receivers	2.7	49

PWR RO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Q#
073 Process Radiation Monitoring								X				A2.01 - Erratic or failed power supply	2.5	50
076 Service Water		X										K2.04 - Reactor building closed cooling water	2.5*	52
076 Service Water											X	2.4.31 - Knowledge of annunciator alarms, indications, or response procedures.	4.2	51
078 Instrument Air									X			A3.01 - Air pressure	3.1	53
103 Containment			X									K3.01 - Loss of containment integrity under shutdown conditions	3.3*	55
K/A Category Totals:	3	2	3	3	2	2	3	3	2	3	2		Group Point Total:	28

PWR RO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Q#
001 Control Rod Drive		X										K2.03 - One-line diagram of power supplies to logic circuits	2.7*	56
002 Reactor Coolant						X						K6.02 - RCP	3.6	57
014 Rod Position Indication	X											K1.01 - CRDS	3.2*	58
015 Nuclear Instrumentation					X							K5.16 - Definition and calculation of quadrant tilt ratio	2.9	61
016 Non-nuclear Instrumentation			X									K3.09 - ESFAS	3.5*	59
027 Containment Iodine Removal								X				A2.01 - High temperature in the filter system	3.0*	60
035 Steam Generator											X	2.4.49 - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	64
035 Steam Generator									X			A3.01 - S/G water level control	4.0	62
041 Steam Dump/Turbine Bypass Control				X								K4.01 - RRG/ICS system	2.9*	63
075 Circulating Water										X		A4.01 - Emergency/essential SWS pumps	3.2*	65
K/A Category Totals:	1	1	1	1	1	1	0	1	1	1	1		Group Point Total:	10

Generic Knowledge and Abilities Outline (Tier 3)

PWR RO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Q#</u>
Conduct of Operations	2.1.19	Ability to use plant computers to evaluate system or component status.	3.9	66
	2.1.29	Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.	4.1	67
	2.1.42	Knowledge of new and spent fuel movement procedures.	2.5	68
	Category Total:			3
Equipment Control	2.2.12	Knowledge of surveillance procedures.	3.7	69
	2.2.13	Knowledge of tagging and clearance procedures.	4.1	71
	2.2.14	Knowledge of the process for controlling equipment configuration or status.	3.9	70
	Category Total:			3
Radiation Control	2.3.12	Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.2	72
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	73
	Category Total:			2
Emergency Procedures/Plan	2.4.3	Ability to identify post-accident instrumentation.	3.7	74
	2.4.43	Knowledge of emergency communications systems and techniques.	3.2	75
	Category Total:			2

Generic Total: 10

Facility: TMI 1

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Date Of Exam: 07/16/2009

Tier	Group	RO K/A Category Points											SRO-Only Points					
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2	G*	Total		
1. Emergency & Abnormal Plant Evolutions	1	0	0	0	N/A			0	0	N/A			0	0	3		3	6
	2	0	0	0	N/A			0	0	N/A			0	0	2		2	4
	Tier Totals	0	0	0	N/A			0	0	N/A			0	0	5		5	10
2. Plant Systems	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2		3	5
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
	Tier Totals	0	0	0	0	0	0	0	0	0	0	0	0	0	4		4	8
3. Generic Knowledge And Abilities Categories				1		2		3		4		0		1	2	3	4	7
				0		0		0		0				2	2	2	1	

Note:

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
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5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- 7.* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

PWR SRO Examination Outline

Printed: 07/23/2009

Facility: TMI 1

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Q#
000007 Reactor Trip - Stabilization - Recovery / 1						X	2.2.39 - Knowledge of less than or equal to one hour Technical Specification action statements for systems.	4.5	76
000011 Large Break LOCA / 3						X	2.1.25 - Ability to interpret reference materials, such as graphs, curves, tables, etc.	4.2	80
000026 Loss of Component Cooling Water / 8					X		AA2.06 - The length of time after the loss of CCW flow to a component before that component may be damaged	3.1*	77
000027 Pressurizer Pressure Control Malfunction / 3					X		AA2.10 - PZR heater energized/de-energized conditions.	3.6	78
000054 Loss of Main Feedwater / 4						X	2.4.30 - Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator.	4.1	79
BW/E05 Steam Line Rupture - Excessive Heat Transfer / 4					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	4.2	81
K/A Category Totals:	0	0	0	0	3	3		Group Point Total:	6

PWR SRO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Q#
000032 Loss of Source Range NI / 7					X		AA2.01 - Normal/abnormal power supply operation	2.9*	83
000074 Inad. Core Cooling / 4					X		EA2.04 - Relationship between RCS temperature and main steam pressure	4.2	82
BW/A02 Loss of NNI-X / 7						X	2.4.8 - Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	85
BW/A07 Flooding / 8						X	2.2.25 - Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	84
K/A Category Totals:	0	0	0	0	2	2	Group Point Total: 4		

PWR SRO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Q#
008 Component Cooling Water								X				A2.07 - Consequences of high or low CCW flow rate and temperature; the flow rate at which the CCW standby pump will start	2.8*	86
012 Reactor Protection											X	2.2.25 - Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	89
013 Engineered Safety Features Actuation											X	2.1.32 - Ability to explain and apply system limits and precautions.	4.0	88
062 AC Electrical Distribution								X				A2.06 - Keeping the safeguards buses electrically separate	3.9	90
078 Instrument Air											X	2.4.8 - Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	87
K/A Category Totals:	0	0	0	0	0	0	0	2	0	0	3	Group Point Total:	5	

PWR SRO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Q#
011 Pressurizer Level Control								X				A2.02 - Excessive charging	3.2	93
017 In-core Temperature Monitor											X	2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	91
034 Fuel Handling Equipment								X				A2.03 - Mispositioned fuel element	4.0	92
K/A Category Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:	3	

Generic Knowledge and Abilities Outline (Tier 3)

PWR SRO Examination Outline

Printed: 05/04/2009

Facility: TMI 1

Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Q#</u>
Conduct of Operations	2.1.34	Knowledge of primary and secondary plant chemistry limits.	3.5	94
	2.1.43	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	95
	Category Total:			2
Equipment Control	2.2.6	Knowledge of the process for making changes to procedures.	3.6	96
	2.2.17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.	3.8	97
	Category Total:			2
Radiation Control	2.3.6	Ability to approve release permits.	3.8	98
	2.3.11	Ability to control radiation releases.	4.3	99
	Category Total:			2
Emergency Procedures/Plan	2.4.28	Knowledge of procedures relating to a security event (non-safeguards information).	4.1	100
	Category Total:			1
Generic Total:				7

Facility: <u>Three Mile Island</u>		Date of Examination: <u>7/6/09</u>	
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test Number: <u>289/2009301</u>	
Control Room Systems [@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)			
	System / JPM Title	Type Code*	Safety Function
a.	Emergency Borate due to multiple stuck rods	A,N	1
b.	ESAS Component Verification	A,N	2
c.	Venting the pressurizer to RCDT (WDL-T-3)	N,L	3
d.	Shift Emergency Feedwater Pump Suctions	D	4S
e.	Initiate RB Spray	A,N	5
f.	Energize 1E BUS from SBO	A,M	6
g.	Initiate and Isolate a RB Purge	A,N	8
h.	Shifting DHR Train "A" from Operating to Standby Mode	N,L	4P
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i.	Respond to loss of IA	A,E,N	8
j.	Initiate Emergency Boration IAW EOP-020	P,R,E,D	1
k.	Operate MS-V-3C locally	D	4
<p>[@] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.</p>			
* Type Codes		Criteria for RO / 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 (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			

THREE MILE ISLAND 2009 NRC RO EXAMINATION**JPM A** Initiate Emergency Boration, New Alternate Path JPM.

Safety significance, Failure to raise letdown to cause rise in injection may not allow enough boron injection to ensure 1% shutdown margin.

JPM B ESAS Component Verification, New Alternate Path JPM.

Safety Significance, Failure to place Injection and Building Spray pumps in Pull-To-Lock with loss of service water cooling and elevated closed cooling temperature may lead to eventual failure of 1 train of ESAS injection due to component over heating.

JPM C Venting the Pressurizer to RCDT (WDL-T-3), New Low Power JPM.

Safety significance, Failure to control venting may exceed the design cooldown rate on the pressurizer, or cause inadvertent radioactive gas release by over pressurizing RCDT.

JPM D Shift Emergency Feedwater Pump Suctions, Bank JPM.

Safety significance, Failure to complete swap will result in loss of final water supply to steam generators, and a loss of heat sink.

JPM E Initiate RB Spray, New Alternate Path JPM.

Safety significance, With elevated RB pressure Building Spray is used to reduce pressure, performance of the valve opening and pump start out of order would render the pump out of order.

JPM F Energize 1E Bus from SBO, Modified Alternate Path, Time Critical JPM, 07 NRC exam used a different alternate path, then the voltage regulator needed to be controlled manually, this time cooling water must be started manually.

Safety significance, Failure to establish cooling water would cause overheating of the only available power supply.

JPM G Initiate and Isolate a Reactor Building Purge, Modified Alternate Path JPM.

Safety significance, Alternate path is a high radiation alarm, Purge must be terminated when automatic closure of containment valves fails, significance would be a radiation release in excess of permit allowance.

JPM H Shifting DH Train A from Operating to Standby Mode, New JPM.

Safety significance, Failure to transfer cooling to remain train of DHR would result in an unplanned core heatup.

IP JPM I Respond to Loss of Instrument Air, New Alternate Path In-plant Engineered Safety Features JPM.

Safety significance, PRA HAM1 requires the operator to bypass air dryer on failure of transfer valve.

IP JPM J Initiate Emergency Boration, Bank JPM.

Randomly chosen, was used on last NRC Exam, involves entry into RCA.

Safety significance, Failure to properly perform will result in inadequate shutdown margin.

IP JPM K Operate MS-V-3C Locally, Bank JPM.

Safety significance, Failure to control cooldown, with valve simulated failed open, valve must be closed or isolated locally.

Facility: <u>Three Mile Island</u>		Date of Examination: <u>7/6/09</u>	
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test Number: <u>289/2009301</u>	
Control Room Systems [@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)			
	System / JPM Title	Type Code*	Safety Function
a.	Emergency Borate due to multiple stuck rods	A,N	1
b.	ESAS Component Verification	A,N	2
c.	N/A SRO-I		
d.	Shift Emergency Feedwater Pump Suctions	D	4S
e.	Initiate RB Spray	A,N	5
f.	Energize 1E BUS from SBO	A,M	6
g.	Initiate and Isolate a RB Purge	A,N	8
h.	Shifting DHR Train "A" from Operating to Standby Mode	N,L	4P
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i.	Respond to loss of IA	A,E,N	8
j.	Initiate Emergency Boration IAW EOP-020	P,R,E,D	1
k.	Operate MS-V-3C locally	D	4
<p>[@] All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.</p>			
* Type Codes		Criteria for RO / 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 (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			

THREE MILE ISLAND 2009 NRC SRO EXAMINATION**JPM A** Initiate Emergency Boration, New Alternate Path JPM.

Safety significance, Failure to raise letdown to cause rise in injection may not allow enough boron injection to ensure 1% shutdown margin.

JPM B ESAS Component Verification, New Alternate Path JPM.

Safety Significance, Failure to place Injection and Building Spray pumps in Pull-To-Lock with loss of service water cooling and elevated closed cooling temperature may lead to eventual failure of 1 train of ESAS injection due to component over heating.

JPM D Shift Emergency Feedwater Pump Suctions, Bank JPM.

Safety significance, Failure to complete swap will result in loss of final water supply to steam generators, and a loss of heat sink.

JPM E Initiate RB Spray, New Alternate Path JPM.

Safety significance, With elevated RB pressure Building Spray is used to reduce pressure, performance of the valve opening and pump start out of order would render the pump out of order.

JPM F Energize 1E Bus from SBO, Modified Alternate Path, Time Critical JPM, 07 NRC exam used a different alternate path, then the voltage regulator needed to be controlled manually, this time cooling water must be started manually.

Safety significance, Failure to establish cooling water would cause overheating of the only available power supply.

JPM G Initiate and Isolate a Reactor Building Purge, Modified Alternate Path JPM.

Safety significance, Alternate path is a high radiation alarm, Purge must be terminated when automatic closure of containment valves fails, significance would be a radiation release in excess of permit allowance.

JPM H Shifting DH Train A from Operating to Standby Mode, New JPM.

Safety significance, Failure to transfer cooling to remain train of DHR would result in an unplanned core heatup.

IP JPM I Respond to Loss of Instrument Air, New Alternate Path In-plant Engineered Safety Features JPM.

Safety significance, PRA HAM1 requires the operator to bypass air dryer on failure of transfer valve.

IP JPM J Initiate Emergency Boration, Bank JPM.

Randomly chosen, was used on last NRC Exam, involves entry into RCA.

Safety significance, Failure to properly perform will result in inadequate shutdown margin.

IP JPM K Operate MS-V-3C Locally, Bank JPM.

Safety significance, Failure to control cooldown, with valve simulated failed open, valve must be closed or isolated locally.

THREE MILE ISLAND 2009 NRC SRO EXAMINATION

CONDUCT OF OPERATIONS (AI-1): Review and Approve an Estimated Critical Boron Concentration.

Given the applicable section of 1103-15B, and utilize the referenced figures and tables to perform an Estimated Critical Boron Calculation, determines / corrects the errors in form. Safety significance is improper calculation could lead to being less than 1% shutdown when establishing boron conditions for ECP.

Bank JPM minor modifications to initial conditions. Previous NRC Exam 2005. This is an, SRO JPM RO is similar, though it is to perform a calculation.

CONDUCT OF OPERATIONS (AI-2): Maintain Minimum Shift Staffing, Control Overtime

Given a situation requiring the replacement of an RO on Shift determine from a list the allowable personnel to call out and simulate calling out a replacement.

Safety significance Failure to call out a qualified person would place the plant outside of its Technical Specification required staffing.

EQUIPMENT CONTROL (A2): Use Station Drawing to Predict Impact of Component Failure.

Given a report on a failure of a component in the plant determine from station electrical drawings the impact to plant operations. SRO is required to determine T.S. requirements. Safety significance This failure would be a latent failure that would result in bus load shed not working correctly under all assumed accident analysis.

Modified, TMI 2003 SRO JPM used an entirely different component, same task. RO task is the same without the addition of Technical Specification call.

RADIATION CONTROL (A3): Implement requirements of the ODCM for RMS operability.

Given plant condition must recognize that Gas Decay Tank Releases must be terminated and Auxiliary Building Exhaust may continue only with additional sampling.

Safety significance is the increased possibility of an unmonitored release.

Modified from Ginna 2008 JPM.

EMERGENCY PROCEDURES/PLAN (A4): Emergency Action Level Identification and Event Declaration.

Given plant data determine the appropriate event classification and fill out appropriate forms.

Safety significance Failure to complete proper classification in a timely manner could result in inadequate response by off site organizations.

Facility: Three Mile Island Date of Examination: 7/6/09
 Examination Level: RO SRO Operating Test Number: 289/2009301

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,P,D	Review and Approve an Estimated Critical Boron Concentration. 2.1.25 (4.2): Ability to interpret station reference materials such as graphs, curves, tables, etc.
Conduct of Operations	R,D	Maintain Minimum Shift Staffing, Control Overtime 2.1.5 (3.9) Ability to use procedures related to shift staffing, such as minimum crew compliment, overtime limitations, etc..
Equipment Control	R,M	Use Station Drawing to Predict Impact of Component Failure and Evaluate Technical Specification Implications. 2.2.41 (3.9) Ability to obtain and interpret station electrical and mechanical drawings.
Radiation Control	R,M	Implement the Requirements of ODCM for RMS Operability. 2.3.15 (3.1) Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
Emergency Procedures/Plan	R,N	Emergency Action Level Identification and Event Declaration. 2.4.41(4.6) Knowledge of the emergency action level thresholds and classifications.

NOTE: Needs to be administered one applicant at a time

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

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

Facility: <u>Three Mile Island</u>		Date of Examination: <u>7/6/09</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>289/2009301</u>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,P,D	Calculate an Estimated Critical Boron Concentration in accordance with 1103-15B, ESTIMATED CRITICAL CONDITIONS. 2.1.25 (3.9): Ability to interpret station reference materials such as graphs, curves, tables, etc.
Conduct of Operations	R,N	Complete RB Avg Temperature Calculation in accordance with 1301-1, SHIFT AND DAILY CHECKS. 2.1.7 (4.4) Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.
Equipment Control	R,M	Use Station Drawing to Predict Impact of Component Failure. 2.2.41 (3.5) Ability to obtain and interpret station electrical and mechanical drawings.
Radiation Control	N/A	N/A
Emergency Procedures/Plan	N,S	ERO Notification. 2.4.39 (3.9) Knowledge of RO responsibilities in emergency plan implementation.
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		
* Type Codes & Criteria: <ul style="list-style-type: none"> (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1; randomly selected) 		

THREE MILE ISLAND 2009 NRC RO EXAMINATION

CONDUCT OF OPERATIONS (AI-1): Calculate an Estimated Critical Boron Concentration in accordance with 1103-15B, ESTIMATED CRITICAL CONDITIONS

Given conditions, determine the applicable section of 1103-15B, and utilize the referenced figures and tables to perform an Estimated Critical Boron Calculation.

Safety significance improper calculation could lead to being less than 1% shutdown when establishing boron conditions for ECP.

Bank JPM minor modifications to initial conditions. Previous NRC Exam 2005 This is an RO JPM, SRO is similar, though it is to approve a faulted version of the calculation (Identifying errors).

CONDUCT OF OPERATIONS (AI-2): Complete RB Avg Temperature Calculation in accordance with 1301-1, SHIFT AND DAILY CHECKS.

Given data from AH-TR-655 calculate an average temperature for RB above and below 320' elevation. Temperature above will be above allowable limit, calculation below will have less than required operable detectors.

Safety significance Technical Specification Bases list the temperature as necessary to maintain the Containment Temperature and Pressure within design basis for a LOCA, Also to maintain instrument temperatures within design limits.

New JPM, SRO is similar but requires identification of Technical Specification 3.17 requirements.

EQUIPMENT CONTROL (A2): Use Station Drawing to Predict Impact of Component Failure.

Given a report on a failure of a component in the plant determine from station electrical drawings the impact to plant operations.

Safety significance This failure would be a latent failure that would result in bus load shed not working correctly under all assumed accident analysis.

Modified, TMI 2003 SRO JPM used an entirely different component, same task. SRO task is the same with the addition of Technical Specification call.

RADIATION CONTROL (A4): ERO Notification.

Given a call out form the candidate must call out the appropriate response personnel for an ALERT, this is an Alternate path JPM in that the normal auto-dial does not work and the backup method must be used.

Safety Significance Failure to properly call out the Emergency Response personnel may lead to impaired ability to coordinate with outside agencies.

Modified from Brunswick 2008 Exam – RO only JPM

COPY 5

Facility:	Three Mile Island	Scenario No.:	2	Op Test No.:	NRC
Examiners:	_____	Operators:	_____	_____	_____
Initial Conditions:	<ul style="list-style-type: none"> • (Temporary IC-42) • 85% Power • MU-P-1B is OOS due to an oil leak • ICS Rate of Change at 1%/min 				
Turnover:	Reduce power to secure FW-P-1B				
Critical Tasks:	<ul style="list-style-type: none"> • Establish FW Flow and Feed SG(s) (CT-10)(Rule 4.0) • Initiate HPI (CT-2) • Trip All RCPs (CT-1)(Rule 1.0) 				
Event No.	Malfunction No.	Event Type*	Event Description		
1		N CRS R URO N ARO	Power reduction to <560 MWe		
2	IC25 FW11B	C ARO	FW-V-17B Fails to Respond in Auto FW-V-16B Fails As Is		
3	RD0135 IC16	C CRS C URO C ARO	Dropped rod in Group 7 (TS)		
4	TH03A	C CRS C URO	32 gpm RCS Leak: Hot Leg Nozzle (TS)		
5	FW15A ICR01 ICR03	M CRS M URO M ARO	Main FW Pump 1A Trip results in Reactor Trip		
6	ICR01 ICR03	C ARO	HSPS setpoint for the OTSG EFW automatic control is set at 0.		
7	TH04A	M CRS M URO M ARO	Large RCS Leak: Hot Leg Nozzle		
8	ES01A ES01B ES04A ES04B	C URO	ESAS Auto Actuation Failure		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

NOTE: SCENARIO # 1

TO ALLOW LICENSEE TO REUSE ^{1, 14, 15} WAS THE SPARE & NOT USED - SO NOT INCLUDED

Facility:	Three Mile Island	Scenario No.:	3	Op Test No.:	NRC
Examiners:	_____	Operators:	_____	_____	_____
Initial Conditions:	<ul style="list-style-type: none"> • 100% power, MOC (Temp IC-43) • NS-P-1A OOS for Maintenance • NS-P-1B running on the 1P 480V bus • AH-E-1C is OOS for motor replacement 				
Turnover:	Maintain 100% power Operations				
Critical Tasks:	<ul style="list-style-type: none"> • Control RCS Inventory (CT-30) • Isolate Overcooling SGs (CT-17) 				
Event No.	Malfunction No.	Event Type*	Event Description		
1	RM0323	C CRS	RM-G23 Fails high (TS)		
2	ED03D	C CRS C URO C ARO	Aux Transformer B Fault Pressure (TS) NS-P-1B restart		
3	01A4S20 - ZDISRP1 C(3)	C ARO	SR-P-1C Fails to auto start		
4	MU06	C CRS C URO	MU-V-18 Fails Closed		
5	MS03A	N CRS R URO N ARO	Main Steam Leak in the Intermediate Building		
6	MS03A	M CRS M URO M ARO	Major steam leak in the Intermediate Building		
7	ICR13 FW11A MS04A	C URO C ARO	Main Steam Safety Valve fails to reseal. (MS-V-17A) SG A Lo Press Isolation Setpoint is at zero psig (Isolation failure) Startup Feedwater Valve FW-V-16A Fails at 100% Open (CT-17 and CT-30) (Overcooling)		
8	RD02010 RD02056	C CRS C URO	Two Control rods fail to fully insert		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

Facility:	Three Mile Island	Scenario No.:	4	Op Test No.:	NRC
Examiners:	_____	Operators:	_____	_____	_____
Initial Conditions:	<ul style="list-style-type: none"> • Reactor Power 5%, Plant Startup in progress (Temp IC-49) • 				
Turnover:	Continue power escalation and place turbine on line				
Critical Tasks:	<ul style="list-style-type: none"> • Establish FW Flow and Feed SGs (Rule 1) (CT-10) • Control SG Pressure (adjust TBVs/ADVs) to: Maintain RC Temperature Constant or Maintain Appropriate Pri-Sec ΔT/Cooldown Rate(CT-11) • Shutdown Reactor – ATWS (CT-24) 				
Event No.	Malfunction No.	Event Type*	Event Description		
1		N CRS R URO N ARO	Power Escalation		
2	MU01B	C CRS C URO	Makeup Pump 1B Trip (TS)		
3	RW04A	C CRS C ARO	Decay Heat River Water Pump Trip (TS)		
4	NI27A	C CRS C URO C ARO	RC3A-PT1 RC Narrow Range Pressure Transmitter Fails High		
5	FW15A	M CRS M URO M ARO	FW-P-1A Trip		
6	RD27A RD27B RD28	C URO	ATWS		
7	FW17 I/O Override	C CRS C ARO	EF-P-1 Trips on start EF-P-2B Fails to start		
8	FW-18A	C CRS C URO C ARO	EF-P-2A Trips		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

Facility:	Three Mile Island	Scenario No.:	5	Op Test No.:	NRC
Examiners:	_____	Operators:	_____	_____	_____
Initial Conditions:	<ul style="list-style-type: none"> (Temporary IC-58) 100% Power Full ICS Auto MU-P-1B OOS for oil replacement RPS Channel C is in Manual Bypass due to NI-7 OOS 1303-5.5 Control Room Emergency Filtering System "A" Operational Test is 2 hours into the 10 hour run. 				
Turnover:	Maintain 100% Power Operations				
Critical Tasks:	<ul style="list-style-type: none"> Minimize SCM (CT-7) Initiate HPI (CT-2) 				
Event No.	Malf. No.	Event Type*	Event Description		
1	13A8S06-ZDISAHE 18A(4)	I CRS I ARO	AH-E-18A trips (TS)		
2	NI21A	I CRS I ARO	NI-5 Total Power Summer Amp fails low causing a feedwater transient (TS)		
3	MU07	I CRS I URO	RCP Seal Injection Control Valve Fails (MU-V-32)		
4	MU19C	N CRS R URO N ARO	RC-P-1C #1 seal failure		
5	ICK314B	C ARO	Feedwater fails to re-ratio		
6	TC01	M CRS M URO M ARO	Turbine Trip/Reactor Trip		
7	TH15A	C CRS C URO	OTSG Tube Rupture High		
8	MS07A	C ARO	Atmospheric Dump Valve Fails Open		
9	TH16A	M CRS M URO M ARO	OTSG Tube Rupture Middle		
10	MU24C MU24D MU24E	C URO	MU-V-16A, MU-V-16B and MU-V-16C ES Alignment Failure		