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

Facility: Three Mile Island	Date of Examination: 06/10/19
Examination Level: RO ☒ SRO ☐	Operating Test Number: TMI2019

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	N, R	Perform a Reactivity Balance at Power K/A: 2.1.25 (3.9)
Conduct of Operations	D, R	Complete RB Average Air Temperature Calculation K/A: 2.1.7 (4.4)
Equipment Control	N, R	Station Print Reading – Isolate Instrument Air Leak K/A: 2.2.41 (3.9)
Radiation Control		
Emergency Plan	D, S	Perform State and Local Event Notification K/A: 2.4.43 (3.2)

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

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

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

Facility: Three Mile Island — Date of Examination: 06/10/19

Examination Level: RO ☐ SRO ☒ — Operating Test Number: TMI2019

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	M, R	Issue a Controlled Key K/A: 2.1.13 (3.2)
Conduct of Operations	D, R	Calculate and Approve an SDM K/A: 2.1.37 (4.6)
Equipment Control	D, R	Evaluate completed surveillance and perform actions K/A: 2.2.37 (4.6)
Radiation Control	D, R	Authorize emergency personnel exposure in excess of 5 REM K/A: 2.3.4 (3.7)
Emergency Plan	N, R	EAL and PAR K/A: 2.4.44 (4.4)

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

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

Facility: Three Mile Island	Date of Examination: 06/10/19
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐	Operating Test Number: TMI2019

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

System/JPM Title	Type Code*	Safety Function
a. 001 / Respond to a dropped control rod - ICS fails to complete runback 003AA1.02 - Control Rod System	D, S	1
b. 013 / Manually Initiate ESAS – Alternate Path 013A4.01 – ECCS system	M, A, S, EN, L	2
c. 006 / Lower CFT level and pressure from the Control Room - 006 A4.02 – Core Flood System	D, S	3
d. 061 / Respond to Emergency Feedwater Actuation – ALT Path 061A2.05 – Emergency Feedwater	D, A, S	4S
e. 003 / Restore SI with a loss of ICCW 003A3.01 – Reactor Coolant Pump	D, A, S, P	4P
f. 007 / Pump RCDT to MWST 007A1.01 – Pressurizer Relief Tank	D, S	5
g. 064 / Energize 1E 4kV Bus from the SBO – Alternate Path 064A4.01 – Emergency Diesel Generators	M, A, L, S	6
h. 072 / Respond IAW OP-TM-MAP-C0101 Fuel Handling Incident in the Spent Fuel Pool – Radiation Monitors	N, S	7
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i.008 / Loss of Instrument Air – 008A2.05 – Intermediate Closed Cooling Water System	D, E, R	8
j. 071 / Purge of the Waste Gas System Radiation Monitor (RM-A-7) 071A4.09 – Waste Gas Disposal System	D, R	9
k. 061 / Respond to a failure of EF-P-2A and EF-V-30D 061A2.04 – Emergency Feedwater	D, E	4S

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

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

ES-301	Control Room/In-Plant Systems Outline	Form ES-301-2

Facility: Three Mile Island	Date of Examination: 06/10/19
Exam Level: RO ☐ SRO-I ☒ SRO-U ☐	Operating Test Number: TMI2019

Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U		
System/JPM Title	Type Code*	Safety Function
a. 001 / Respond to a dropped control rod - ICS fails to complete runback 003AA1.02 - Control Rod System	D, S	1
b. 013 / Manually Initiate – Alternate Path ESAS 013A4.01 – ECCS system	M, A, S, EN, L	2
c. 006 / Lower CFT level and pressure from the Control Room - 006 A4.02 – Core Flood System	D, S	3
d. 061 / Respond to Emergency Feedwater Actuation - ALT Path 061A2.05 – Emergency Feedwater	D, A, S	4S
e. 003 / Restore SI with a loss of ICCW 003A3.01 – Reactor Coolant Pump	D, A, S, P	4P
f. N/A		
g. 064 / Energize 1E 4kV Bus from the SBO – Alternate Path-064A4.01 – Emergency Diesel Generators	D, A, L, S	6
h. 072 / Respond IAW OP-TM-MAP-C0101 Fuel Handling Incident in the Spent Fuel Pool – Radiation Monitors	N, S	7
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i.008 / Loss of Instrument Air – 008A2.05 – Intermediate Closed Cooling Water System	D, E, R	8
j. 071 / Purge of the Waste Gas System Radiation Monitor (RM-A-7) 071A4.09 – Waste Gas Disposal System	D, R	9
k. 061 / Respond to a failure of EF-P-2A and EF-V-30D 061A2.04 – Emergency Feedwater	D, E	4S

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

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

Appendix D	Scenario Outline	Form ES-D-1

ILT 18-01 NRC EXAM MATERIAL

Facility:	Three Mile Island		Scenario No.:	1	Op Test No.: TMI2019
Examiners:			Operators:		
Initial Conditions:	• 85% power, MOL as ordered by the load dispatcher.				
	• AH-E-18B is running for a surveillance (1303-5.5B)				
	• EF-P-1 is OOS for the next 24 hours.				
	• Main Feedwater Pumps in Manual				
Turnover:	Maintain 85% power				
Critical Tasks:	• CT-1 Shutdown reactor – ATWS				
	• CT-2 Restore feed to a dry OTSG				
	• CT-3 Establish a cooldown rate less than Guide 11 limits (if necessary)				

Event No.	Malf. No.	Event Type*	Event Description
1	CH630TCRC	TS CRS C ARO	AH-E-18 trip (ARO: Re-aligns ventilation, CRS: TS call).
2	RD10B	I CRS I URO I ARO	Uncontrolled inward rod motion, entry into OP-TM-AOP-070 (URO/ARO: Manual control of ICS)
3	MU06	TS CRS C URO	MU-V-18 fails partially closed (URO: Controls pzr level with HPI)
4	FW16A	C CRS R URO C ARO	'A' MFP Trips, manual runback required (URO/ARO: manual runback)
5	FW15B RD28 RD32	M CRS M URO M ARO	'B' MFP trips, Reactor Trip with an ATWS
6	FW18A FW18B	C CRS C URO C ARO	Sequential loss of all EFW pumps. Entry into OP-TM-EOP-004, Lack of Heat Transfer. (URO: Secures RCP, ARO: Condensate Booster pump cooling)
		C CRS C URO	(If required) HPI-PORV cooling, entry into OP-TM-EOP-009, HPI Cooling (URO: Opens PORV)

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

Facility:	Three Mile Island	Scenario No.:	2	Op Test No.:	TMI2019
Examiners:		Operators:			
Initial Conditions:	• 28% power				
	• RC-P-1B ready to start				
	• NI-8 OOS due to a failed power supply				
	• RPS Channel 'D' is in manual bypass, RPS logic is 2 out of 3 to trip				
Turnover:	Start RC-P-1B				
Critical Tasks:	• Isolate OTSG SG(s) (CT-17)				
	• Control HPI (CT-5)				

Event No.	Malf. No.	Event Type*	Event Description
1		N CRS N ARO	Start RC-P-1B IAW OP-TM-226-102 (ARO: Start RCP)
2	RCR42 RCR43	I CRS I URO	Pressurizer Spray Valve Failure (URO: Closes spray block valve)
3	NI15B	TS CRS C ARO	NI-6 failure (fails low) (ARO: Places RPS channel 'B' in tripped state)
4	RD0117	TS CRS C URO	Dropped rod group 7 (URO: Recovers dropped rod)
5	MS02A	C CRS R URO C ARO	Steam leak in RB entry into OP-TM-AOP-051 and 1102-4 (URO: Lower power, ARO: RB Emergency Cooling)
6	MS02A	M CRS M URO M ARO	Steam line rupture in RB, Reactor Trip, OP-TM-EOP-003, XHT entry.
7	FW19A	C CRS C ARO	EF-V-30A fails open, entry into OP-TM-424-901 (ARO: Closes EF-V-2A, secures EF-P-2A)

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

Facility:	Three Mile Island	Scenario No.: 3	Op Test No.: TMI2019
Examiners:		Operators:	
Initial Conditions:	• 2% power, MOL, ICS is in manual with reactivity control at the diamond		
	• Turbine Reset and all 6 Circulating Water Pumps are running for a PMT.		
	• FW-P-1B is operating with control on the air speed changer		
	• Engineers are doing systems walkdowns in the control tower and turbine building.		
	• Fuel is not deconditioned		
Turnover:	Raise reactor power to 10%, initiate a bleed to the 'B' RCBT		
Critical Tasks:	• Establish and Maintain Reactor Shutdown Requirements (CT-1)		
	• Control HPI (CT-2)		

Event No.	Malf. No.	Event Type*	Event Description
1		N CRS R URO N ARO	Raise reactor power from 3% to 10% (URO: Power ascension with ICS in Manual, ARO: Bleeds to 'B' RCBT)
2	RM0323	TS CRS	Reactor Building Hi Range Radiation Monitor, RM-G-23, Failure
3	RC04A	I CRS I URO	Pressurizer Level Transmitter fails, entry into OP-TM-MAP-G0105, OP-TM-MAP-G0205 (URO: Controls MU-V-17 in HAND)
4	ED40A EG21A	TS CRS C ARO	Loss of the 'D' 4kv Bus, EG-Y-1A fails to auto start (ARO: Starts EG-Y-1A)
5		C CRS C ARO	Cavitating Circ Water Pump (ARO: Secure cavitiating circ water pump)
6	MU07	I CRS I URO	Seal Flow Instrument Fails, RCP Seal flow High (URO: Normalizes Seal Injection)
7	PLA-4-9 PLB-8-3	M CRS M URO M ARO	Circ Water Rupture, Loss of Vacuum, Reactor Trip, Entry into EOP-001, Stuck Rods
8	TH06	C CRS C URO C ARO	RCS leak, PZR Level Cannot be maintained without HPI, Entry into EOP-006 (URO: Initiate HPI, ARO: Initiate EFW)

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

Facility: TMI Date of Exam: June 2019

Tier	Group	RO K/A Category Points												SRO-Only Points						
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*		Total		
1. Emergency and Abnormal Plant Evolutions	1	3	1	4	N/A			4	4	N/A		2	18	2		4		6		
	2	1	1	1				2	3			1	9	2		2		4		
	Tier Totals	4	2	5				6	7			3	27	4		6		10		
2. Plant Systems	1	3	2	2	3	2	2	2	3	4	3	3	29	2		3		5		
	2	1	0	1	2	0	2	2	0	0	1	0	9	2	0	1		3		
	Tier Totals	4	2	3	5	2	4	4	3	4	4	3	38	4		4		8		
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	7		
		3			3			1			3			2	2	1	2			

Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outline sections (i.e., except for one category in Tier 3 of the SRO-only section, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 radiation control K/A is allowed if it is replaced by a K/A from another Tier 3 category.)

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

G* Generic K/As

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

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

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1			X				K3.01 Knowledge of the reasons for the following as the apply to a reactor trip:	4.0	1
000008 (APE 8) Pressurizer Vapor Space Accident / 3					~~X~~		~~AA2.25 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: Expected leak rate from open PORV or code safety~~	2.8	~~2~~
					X		AA2.04 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: High-temperature computer alarm and alarm type	3.2	2
000009 (EPE 9) Small Break LOCA / 3						X	2.4.18 Knowledge of the specific bases for EOPs.		3
000011 (EPE 11) Large Break LOCA / 3	X						EK1.01 Knowledge of the operational implications of the following concepts as they apply to the Large Break LOCA : Natural circulation and cooling, including reflux boiling	4.1	4
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4			X				AK3.07 Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow) : Ensuring that S/G levels are controlled properly for natural circulation enhancement	4.1	5
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					X		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: Charging pump problems	3.2	6
000025 (APE 25) Loss of Residual Heat Removal System / 4			~~X~~				~~AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Residual Heat Removal System: Shift to alternate flowpath~~	~~3.1~~	~~7~~
						~~X~~	~~2.4.34 Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.~~	~~4.1~~	~~76~~
						X	2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.	4.2	76
000026 (APE 26) Loss of Component Cooling Water / 8				X			AA1.03 Ability to operate and / or monitor the following as they apply to the Loss of Component Cooling Water: SWS as a backup to the CCWS	3.6	8
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		X					AK2.03 Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners	2.6	9
000029 (EPE 29) Anticipated Transient Without Scram / 1			X				EK3.02 Knowledge of the reasons for the following responses as the apply to the ATWS: Starting a specific charging pump	3.1	10
						X	2.4.41 Knowledge of the emergency action level thresholds and classifications.	4.6	77
000038 (EPE 38) Steam Generator Tube Rupture / 3				X			EA1.36 Ability to operate and monitor the following as they apply to a SGTR: Cooldown of RCS to specified temperature	4.3	11

ES-401	PWR Examination Outline							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)								
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4	X					X	AK1.04 Knowledge of the operational implications of the following concepts as they apply to Steam Line Rupture: Nil ductility temperature	3.2	12
						X	~~2.2.40 Ability to apply Technical Specifications for a system.~~	~~4.7~~	~~78~~
						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.	4.6	78
000054 (APE 54; CE E06) Loss of Main Feedwater /4					X		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): Differentiation between loss of all MFW and trip of one MFW pump	4.1	13
000055 (EPE 55) Station Blackout / 6					X		EA2.01Ability to determine or interpret the following as they apply to a Station Blackout: Existing valve positioning on a loss of instrument air system .	3.7	79
000056 (APE 56) Loss of Offsite Power / 6	~~X~~						~~AK1.03 Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: Definition of subcooling: use of steam tables to determine it~~	~~3.1~~	~~14~~
	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: Principle of cooling by natural convection	3.7	14
000057 (APE 57) Loss of Vital AC Instrument Bus / 6					X		AA2.20 Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: Interlocks in effect on loss of ac vital electrical instrument bus that must be bypassed to restore normal equipment operation	3.6	15
000058 (APE 58) Loss of DC Power / 6						X	~~2.2.44 Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.~~	~~4.4~~	~~80~~
						X	2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.7	80
000062 (APE 62) Loss of Nuclear Service Water / 4			X				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the nuclear service water coolers	3.2	16
000065 (APE 65) Loss of Instrument Air / 8				X			AA1.05 Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: RPS	3.3	17

ES-401	PWR Examination Outline							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)								
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6				X			AA1.04 Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: Reactor controls	4.1	7
					~~X~~		~~AA2.01 Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: Operating point on the generator capability curve~~	~~3.5~~	~~81~~
					X		AA2.09 Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: Operational status of emergency diesel generators	4.3	81
(W E04) LOCA Outside Containment / 3									
(W E11) Loss of Emergency Coolant Recirculation / 4									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4						~~X~~	~~2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.~~	~~4.6~~	~~18~~
						X	2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.6	18
K/A Category Totals:	3	1	4	4	4/2	2/4	Group Point Total:		18/6

ES-401	PWR Examination Outline							Form ES-401-2	
	Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)								
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1					X		AA2.04 Ability to determine and interpret the following as they apply to the Continuous Rod Withdrawal : Reactor power and its trend	4.2	19
000003 (APE 3) Dropped Control Rod / 1				X			AA1.01 Ability to operate and / or monitor the following as they apply to the Dropped Control Rod: Demand position counter and pulse/analog converter	2.9	20
000005 (APE 5) Inoperable/Stuck Control Rod / 1	X						AK1.06 Knowledge of the operational implications of the following concepts as they apply to Inoperable / Stuck Control Rod: Bases for power limit, for rod misalignment	2.9	21
000024 (APE 24) Emergency Boration / 1						~~X~~	~~2.4.31 Knowledge of annunciator alarms, indications, or response procedures.~~	~~4.1~~	~~82~~
						X	2.4.40 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	82
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2									
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7		X					AK2.01 Knowledge of the interrelations between the Loss of Source Range Nuclear Instrumentation and the following: Power supplies, including proper switch positions	2.7	22
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7					~~X~~		~~AA2.03 Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Indication of blown fuse~~	~~2.8~~	~~23~~
					X		AA2.12 Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Maximum allowable channel disagreement	2.5	23
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8					X		AA2.02 Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: Occurrence of a fuel handling incident	4.1	83
000037 (APE 37) Steam Generator Tube Leak / 3									
000051 (APE 51) Loss of Condenser Vacuum / 4									
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7									
000067 (APE 67) Plant Fire On Site / 8									
000068 (APE 68; BW A06) Control Room Evacuation / 8									

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000069 (APE 69; W E14) Loss of Containment Integrity / 5	X						~~AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of Containment Integrity: Effect of pressure on leak rate~~	~~2.6~~	24
					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	24
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4						~~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.~~	~~4.2~~	~~84~~
						X	2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.4	84
000076 (APE 76) High Reactor Coolant Activity / 9									
000078 (APE 78*) RCS Leak / 3									
(W E01 & E02) Rediagnosis & SI Termination / 3									
(W E13) Steam Generator Overpressure / 4									
(W E15) Containment Flooding / 5									
(W E16) High Containment Radiation /9									
(BW A01) Plant Runback / 1					X		AA2.1 Ability to determine and interpret the following as they apply to the (Plant Runback): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3.7	85
(BW A02 & A03) Loss of NNI-X/Y/7									
(BW A04) Turbine Trip / 4									
(BW A05) Emergency Diesel Actuation / 6				X			AA1.3 Ability to operate and / or monitor the following as they apply to the (Emergency Diesel Actuation): Desired operating results during abnormal and emergency situations.	3.7	25
(BW A07) Flooding / 8						X	2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.0	26
(BW E03) Inadequate Subcooling Margin / 4									
(BW E08; W E03) LOCA Cooldown—Depressurization / 4									
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4									
(BW E13 & E14) EOP Rules and Enclosures			X				EK3.02 Knowledge of the reasons for the following responses as they apply to the (EOP Rules): Normal, abnormal and emergency operating procedures associated with (EOP Rules).	3.2	27
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									

ES-401	PWR Examination Outline								Form ES-401-2
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
(CE A16) Excess RCS Leakage / 2									
(CE E09) Functional Recovery									
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4									
K/A Category Point Totals:	1	1	1	2	3/2	1/2	Group Point Total:		9/4

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump				X								K4.03 Knowledge of RCPS design feature(s) and/or interlock(s) which provide for the following: Adequate lubrication of the RCP	2.5	28
											X	2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.6	54
004 (SF1; SF2 CVCS) Chemical and Volume Control		~~X~~										~~K2.07 Knowledge of bus power supplies to the following: Heat tracing~~	~~2.7~~	~~29~~
		X										K2.05 Knowledge of bus power supplies to the following: MOVs	2.7	29
											~~X~~	~~2.1.30 Ability to locate and operate components, including local controls.~~	~~4.0~~	~~86~~
											X	2.2.40 Knowledge of SRO responsibilities in emergency plan implementation.	4.5	86
005 (SF4P RHR) Residual Heat Removal						X						K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger	2.5	30
006 (SF2; SF3 ECCS) Emergency Core Cooling							X					A1.09 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ECCS controls including: Pump amperage, including start, normal and locked	2.8	31
										X		A4.02 Ability to manually operate and/or monitor in the control room: Valves	4.0	51
007 (SF5 PRTS) Pressurizer Relief/Quench Tank			X									K3.01 Knowledge of the effect that a loss or malfunction of the PRTS will have on the following:	3.3	32
008 (SF8 CCW) Component Cooling Water								X				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: PRMS alarm	3.3	33
								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: High/low CCW temperature	3.2	87
010 (SF3 PZR PCS) Pressurizer Pressure Control	X											K1.08 Knowledge of the physical connections and/or cause-effect relationships between the PZR PCS and the following systems: PZR LCS	3.2	34
					X							K5.02 Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: Constant enthalpy expansion through a valve	2.6	49

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
012 (SF7 RPS) Reactor Protection								X				~~A2.07 Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of dc control power~~	~~3.2~~	~~35~~
								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of instrument power	3.6	35
	X											K1.02 Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: 125V dc system	3.4	50
013 (SF2 ESFAS) Engineered Safety Features Actuation			X									K3.01 Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Fuel	4.4	36
022 (SF5 CCS) Containment Cooling									X			A3.01 Ability to monitor automatic operation of the CCS, including: Initiation of safeguards mode of operation	4.1	37
											X	2.2.12 Knowledge of surveillance procedures.	4.1	88
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray		X										K2.01 Knowledge of bus power supplies to the following: Containment spray pumps	3.4	38
039 (SF4S MSS) Main and Reheat Steam							X					A1.05 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MRSS controls including: RCS T-ave	3.2	39
								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the MRSS; and (b) based on predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Indications and alarms for main steam and area radiation monitors (during SGTR)	3.7	89
059 (SF4S MFW) Main Feedwater	X											K1.07 Knowledge of the physical connections and/or cause effect relationships between the MFW and the following systems: ICS	3.2	40
									X			A3.03 Ability to monitor automatic operation of the MFW, including: Feedwater pump suction flow pressure	2.5	53

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
061 (SF4S AFW) Auxiliary/Emergency Feedwater				~~X~~								~~K4.13 Knowledge of AFW design feature(s) and/or interlock(s) which provide for the following: Initiation of cooling water and lube oil~~	~~2.7~~	~~41~~
				X								K4.02 Knowledge of AFW design feature(s) and/or interlock(s) which provide for the following: AFW automatic start upon loss of MFW pump, S/G level, blackout, or safety injection	4.5	41
									X			A3.02 Ability to monitor automatic operation of the AFW, including: RCS cooldown during AFW operations	4.0	52
062 (SF6 ED AC) AC Electrical Distribution				X								K4.03 Knowledge of ac distribution system design feature(s) and/or interlock(s) which provide for the following: Interlocks between automatic bus transfer and breakers	2.8	42
							~~X~~					~~A1.03 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ac distribution system controls including: Effect on instrumentation and controls of switching power supplies~~	~~2.5~~	~~55~~
										X		A.4.03 Ability to manually operate and/or monitor in the control room: Synchroscope, including an understanding of running and incoming voltages	2.8	55
063 (SF6 ED DC) 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	43
064 (SF6 EDG) Emergency Diesel Generator						X						K6.08 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Fuel oil storage tanks	3.2	44
073 (SF7 PRM) Process Radiation Monitoring											X	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.4	45
					X							K5.01 Knowledge of the operational implications as they apply to concepts as they apply to the PRM system: Radiation theory, including sources, types, units, and effects	2.5	64
076 (SF4S SW) Service Water											X	2.2.12 Knowledge of surveillance procedures.	3.7	46
078 (SF8 IAS) Instrument Air										X		A4.01 Ability to manually operate and/or monitor in the control room: Pressure gauges	3.1	47
											~~X~~	~~2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.~~	~~4.2~~	~~90~~
											X	2.2.37 Ability to determine operability and/or availability of safety related equipment.	4.6	90

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
103 (SF5 CNT) Containment								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the containment system and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Phase A and B isolation		48
053 (SF1; SF4P ICS*) Integrated Control														
K/A Category Point Totals:	3	2	2	3	2	2	2	3/2	4	3	3/3	Group Point Total:		29/5

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive														
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control								~~X~~				~~A2.06 Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:: Inadvertent PZR spray actuation~~	~~3.9~~	~~91~~
								X				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of PZR level	3.9	91
014 (SF1 RPI) Rod Position Indication			X									K3.02 Knowledge of the effect that a loss or malfunction of the RPIS will have on the following: Plant computer	2.5	56
015 (SF7 NI) Nuclear Instrumentation						X						K6.01 Knowledge of the effect of a loss or malfunction on the following will have on the NIS: Sensors, detectors, and indicators	2.9	57
016 (SF7 NNI) Nonnuclear Instrumentation				X								K4.03 Knowledge of NNIS design feature(s) and/or interlock(s) which provide for the following: Input to control systems	2.8	58
017 (SF7 ITM) In-Core Temperature Monitor				X								K4.01 Knowledge of ITM system design feature(s) and/or interlock(s) which provide for the following: Input to subcooling monitors	3.4	61
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control							~~X~~					~~A1.01 Ability to predict and/or monitor changes in parameter (to prevent exceeding design limits) associated with operating the HRPS controls including: Hydrogen concentration~~	~~3.4~~	~~59~~
029 (SF8 CPS) Containment Purge										X		A4.01 Ability to manually operate and/or monitor in the control room: Containment purge flow rate	2.5	60
033 (SF8 SFPCS) Spent Fuel Pool Cooling							X					A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Spent Fuel Pool Cooling System operating the controls including: Spent fuel pool water level	2.7	59
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control				~~X~~								~~K4.16 Knowledge of SDS design feature(s) and/or interlock(s) which provide for the following: Low main steam pressure~~	~~2.6~~	~~61~~
045 (SF 4S MTG) Main Turbine Generator							X					A1.05 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MT/G system controls including: Expected response of primary plant parameters (temperature and pressure) following T/G trip	3.8	62
055 (SF4S CARS) Condenser Air Removal											X	2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	92

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
056 (SF4S CDS) Condensate	X											K1.03 Knowledge of the physical connections and/or cause-effect relationships between the Condensate System and the following systems: MFW	2.6	63
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal								~~X~~				~~A2.07 Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of meteorological tower~~	~~2.9~~	~~93~~
								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Use of waste gas release monitors, radiation, gas flow rate, and totalizer	3.6	93
072 (SF7 ARM) Area Radiation Monitoring					X							~~K5.01 Knowledge of the operational implications of the following concepts as they apply to the ARM system: Radiation theory, including sources, types, units, and effects~~	~~2.7~~	~~64~~
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection						X						K6. Knowledge of the effect of a loss or malfunction on the Fire Protection System following will have on the : Fire, smoke, and heat detectors	2.6	65
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:	1	0	1	2	0	2	2	0/2	0	1	0/1	Group Point Total:		9/3

Facility: TMI		Date of Exam: June 2019				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.34	Knowledge of primary and secondary plant chemistry limits.	2.7	66		
	2.1.36	Knowledge of procedures and limitations involved in core alterations.	3.0	67		
	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.	4.1	68		
	2.1.5	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.			3.9	94
	2.1.8	Ability to coordinate personnel activities outside the control room.			4.1	95
	Subtotal			3		2
2. Equipment Control	~~2.2.37~~	~~Ability to determine operability and/or availability of safety related equipment.~~	~~3.6~~	~~69~~		
	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.	2.6	69		
	~~2.2.42~~	~~Ability to recognize system parameters that are entry-level conditions for Technical Specifications.~~	~~3.9~~	~~70~~		
	2.2.13	Knowledge of tagging and clearance procedures.	4.1	70		
	2.2.14	Knowledge of the process for controlling equipment configuration or status.	3.9	71		
	2.2.6	Knowledge of the process for making changes to procedures.			3.6	96
	2.2.19	Knowledge of maintenance work order requirements.			3.4	97
	Subtotal			3		2
3. Radiation Control	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	72		
	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.			3.7	98
	Subtotal			1		1
4. Emergency Procedures / Plan	2.4.3	Ability to identify post-accident instrumentation.	3.7	73		
	2.4.50	Ability to verify system alarm setpoints and operate controls identified in | the alarm response manual.	4.2	74		
	2.4.22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.	3.6	75		
	2.4.37	Knowledge of the lines of authority during implementation of the emergency plan.			4.1	99
	2.4.9	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.			4.2	100
	Subtotal			3		2
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
1 / 1	008 / AA2.25	Q2: Scenario #4 overlap with failed open PORV. Replaced with 008 AA2.04.
1 / 1	025 / AK3.01	Q7: System/AOP is oversampled with two SRO questions. Replace with 077 AA1.04
1 / 1	056 / AK 1.03	Q14: Calculation of SCM does not change with or without offsite power based on safety grade instrument usage. No requirement for the use of steam tables exists. Cannot make an operationally valid question to meet the KA. Replaced with 056 AK1.01
1 / 1	BW E04 / 2.4.49	Q18: No immediate actions are required on a Lack of Heat Transfer. Cannot make an operationally valid question to meet the KA. Replaced with KA BW E04 2.1.31.
1 / 2	033 / AA2.03	Q23: No fuse exists in the Intermediate Range Nuclear Instrument strings. Cannot make technically accurate question and meet the KA. Replaced with 033 AA2.12.
1 / 2	069 / AK1.01	Q24: Effects of pressure on leak rate is covered in generic fundamentals. Replaced with KA 069 AA2.02.
2 / 1	004 / K2.07	Q29: Power supply to heat tracing is minutia. Replaced with 004 KA 2.05
2 / 1	012 / A2.07	Q35: No DC control power exists to the Reactor Protection System. Replaced with 012 A2.02.
2 / 1	061 / K4.13	Q41: Cooling water and lube oil to the EFW pumps at Three Mile Island are not active systems. There is no start signal to initiate cooling water or lube oil to the pumps. Replaced with 061 K4.06.
2 / 1	061 / K4.06	Q41: Emergency Feedwater at Three Mile Island does not have startup permissives that other plants may have. Replaced with 061 K4.02.
2 / 2	062 / A1.03	Q55: Topic is oversampled. Changing AC power supplies is covered in question #38 (transfer to an Emergency Diesel) and #42 (transfer to another bus). The only other A1 K/A on Emergency Diesel Generator limits is covered in question 25. Replaced with 062 A4.03.
2 / 2	028 / A1.01	Q59: Hydrogen Recombiner and Purge System have no design basis function at Three Mile Island. Not appropriate for an Initial License Exam. Replace with 033 A1.01
2 / 2	041 / K4.16	Q61: The Steam Dump/Turbine Bypass system does not have a low main steam pressure function at Three Mile Island. The system protects against high main steam pressure. Other aspects of the system are tested in various questions. Topic oversampled. Replaced with 017 K4.01
2 / 2	072 / K5.01	Q64: Replaced K/A based on discretion of Chief Examiner (Presby). Replaced with 073 K5.01
3	2.2.37	Q69: Operability determinations are SRO only knowledge. Replaced with 2.2.17.
3	2.2.42	Q70: Could not make a Tier 3 KA with 3 plausible non-system topics for this KA. Replaced with 2.2.13

3	2.4.50	Q74: Could not make a question with 3 plausible distractors for this topic. Replaced with 2.1.20
3	2.4.22	Q75: Safety functions are SRO only knowledge. Replaced with 2.4.2.
3	2.4.2	Q75: Could not make a Tier 3 question to meet this KA. Replaced with 2.4.14
1 / 1	025 / 2.4.34	Q76: No RO task outside of the control room exists that is exclusively SRO knowledge on a loss of DHR. Replaced with 025 2.1.25.
1 / 1	040 / 2.4.40	Q78: Could not make a question with operational validity that applies system technical specifications during a steam line rupture. Replaced with 040 KA 2.4.21
1 / 1	058 / 2.2.44	Q80: Could not craft a question without trivial knowledge required to determine correct answer. Replaced with KA 058 2.2.22
1 / 1	077 / AA2.01	Q81: Could not make a question with appropriate level of difficulty for an initial license test. Replaced with 077 AA2.09.
1 / 2	024 / 2.4.31	Q82: Could not make an SRO-only question based on this generic K/A. Replaced with 024 KA 2.4.30
1 / 2	074 / 2.2.36	Q84: Could not make a question with operation validity that requires analyzing maintenance activities and Inadequate Core Cooling. Replaced with 074 2.4.49.
2 / 1	078 / 2.2.25	Q90: No technical specification exists for the Instrument Air System, therefore knowledge of the basis of a Technical Specification is not testable. Replaced with K/A 078 2.2.37
2 / 2	004 / 2.1.20	Q86: Could not make a question of adequate difficulty for an initial license exam. Replaced with 004 2.2.40
2 / 2	011 / A2.06	Q91: Overlap with Scenario 2 event. Replaced with 011 A2.03
2 / 2	071 / A2.07	Q93: Could not find an adequate tie between a waste gas release and a loss of the meteorological tower. Replaced with 071 A2.02