Facility:	Limerick	Date of Examination:	12/02/19
Examination Level: RO ☒ SRO ☐		Operating Test Number:	1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R, M	G2.1.7 (Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. IMPORTANCE RO 4.4 / SRO 4.7) Administrative Actions on a Thermal Limit Violation (LOJPM6732)
Conduct of Operations	R, N	G2.1.25 (Ability to interpret reference materials, such as graphs, curves, tables, etc. IMPORTANCE RO 3.9 / SRO 4.2) Loss of MCR Annunciators (LOJPM6730)
Equipment Control	R, N	G2.2.37 (Ability to determine operability and/or availability of safety related equipment. IMPORTANCE RO 3.6 / SRO 4.6) Evaluate Jet Pump Operability (LOJPM6731)
Radiation Control	R, D	G2.3.14 (Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities, IMPORTANCE RO 3.4) Radioactive Substance Spill (LOJPM3122)
Emergency Plan		

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: Limerick | Date of Examination: 12/02/19

Examination Level: RO ☐ SRO ☒ | Operating Test Number: 1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R, M	G2.1.7 (Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. IMPORTANCE RO 4.4 / SRO 4.7) Administrative Actions on a Thermal Limit Violation (LOJPM6732)
Conduct of Operations	R, N	G2.1.25 (Ability to interpret reference materials, such as graphs, curves, tables, etc. IMPORTANCE RO 3.9 / SRO 4.2) Loss of MCR Annunciators (LOJPM6730)
Equipment Control	R, N	G2.2.37 (Ability to determine operability and/or availability of safety related equipment. IMPORTANCE RO 3.6 / SRO 4.6) Evaluate Jet Pump Operability (LOJPM6731)
Radiation Control	R, D	G2.3.14 (Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities, IMPORTANCE SRO 3.8) Transportation Accident Involving Radioactive Material (LOJPM6123)
Emergency Plan	N, S	G2.4.41 (Knowledge of the emergency action level thresholds and classifications. IMPORTANCE SRO 4.6) ERP Classification and Reporting (Time Critical) (LOJPM3143)

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: Limerick	Date of Examination: 12/02/19
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐	Operating Test Number: 1

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. Resetting ASD Speed Hold (System 202002 – Recirculation Flow Control System, A1.01; 3.6)(LOJPM3529)	A, D, S	1 – Reactivity Control
b. Correct FWLCS Feed Flow Error (System 259002 – Reactor Water Level Control System, A2.02; 3.3) (LOJPM3157)	N, S	2 – Rx Water Inventory Control
c. Main Turbine Bypass Valve Exercising (System 241000 – Reactor / Turbine Pressure Regulating System; A4.06; 3.9)(LOJPM3083)	D, S	3 – Reactor Pressure Control
d. HPCI Manual Slow Start (System 206000 – High Pressure Coolant Injection System; A4.12; 4.0) (LOJPM3522)	A, D, EN, S	4 – Heat Removal From Core
e. Perform a Unit 1 Group 2A NSSSS Isolation Reset (System 223002 – Primary Containment Isolation System/ NSSSS; A4.03; 3.6)(LOJPM3071)	D, EN, L, S	5 – Containment Integrity
f. Shutdown the D11 Diesel Generator (System 264000 – Emergency Generators; A4.04; 3.7)(LOJPM3027)	D, EN, S	6 – Electrical
g. Transfer RHRSW from Bypass to Spray (System 400000 – Component Cooling Water System (CCWS), A4.01; 3.1) (LOJPM3158)	EN, N, S	8 – Plant Service Systems
h. Swap of in service RERS Fans (System 288000 – Plant Ventilation Systems, A4.01; 3.1) (LOJPM3156)	A, EN, N, S	9 – Radioactivity Release
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. HPCI / RCIC High Area Temperature Isolation Bypass (System – 206000, HPCI System/ 217000 RCIC System; A2.10 / A2.15; 4.0 / 3.8) (LOJPM2263)	D, E, R	2 – Rx Water Inventory Control
j. T-363, Vent Main Generator During ELAP (System 295003 – Abnormal Plant Evolutions; AK2.06; 3.4) (LOJPM2271)	D, E, L, R	6 – Electrical
k. Start ESW Pump Per SE-1 (System 400000 – Component Cooling Water System (CCWS), A2.01; 3.1/3.2) (LOJPM2258)	A, D, E, L, R	8 – Plant Service Systems

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

* Type Codes	Criteria for **R** /SRO-I/SRO-U	
(A)lternate path	**4–6**/4–6 /2–3	4
(C)ontrol room		
(D)irect from bank	**≤ 9**/≤ 8/≤ 4	8
(E)mergency or abnormal in-plant	**≥ 1**/≥ 1/≥ 1	3
(EN)gineered safety feature	**≥ 1**/≥ 1/≥ 1 (control room system)	5
(L)ow-Power/Shutdown	**≥ 1**/≥ 1/≥ 1	3
(N)ew or (M)odified from bank including 1(A)	**≥ 2**/≥ 2/≥ 1	3
(P)revious 2 exams	**≤ 3**/≤ 3/≤ 2 (randomly selected)	0
(R)CA	**≥ 1**/≥ 1/≥ 1	3
(S)imulator		8

Facility: Limerick Date of Examination: 12/02/19

Exam Level: RO ☐ SRO-I ☒ SRO-U ☐ Operating Test Number: 1

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. Resetting ASD Speed Hold (System 202002 – Recirculation Flow Control System, A1.01; 3.6)(LOJPM3529)	A, D, S	1 – Reactivity Control
b. Correct FWLCS Feed Flow Error (System 259002 – Reactor Water Level Control System, A2.02; 3.3) (LOJPM3157)	N, S	2 – Rx Water Inventory Control
c. Main Turbine Bypass Valve Exercising (System 241000 – Reactor / Turbine Pressure Regulating System; A4.06; 3.9)(LOJPM3083)	D, S	3 – Reactor Pressure Control
d. HPCI Manual Slow Start (System 206000 – High Pressure Coolant Injection System; A4.12; 4.0) (LOJPM3522)	A, D, EN, S	4 – Heat Removal From Core
e. Perform a Unit 1 Group 2A NSSSS Isolation Reset (System 223002 – Primary Containment Isolation System/ NSSSS; A4.03; 3.6)(LOJPM3071)	D, EN, L, S	5 – Containment Integrity
g. Transfer RHRSW from Bypass to Spray (System 400000 – Component Cooling Water System (CCWS), A4.01; 3.1) (LOJPM3158)	EN, N, S	8 – Plant Service Systems
h. Swap of in service RERS Fans (System 288000 – Plant Ventilation Systems, A4.01; 3.1) (LOJPM3156)	A, EN, N, S	9 – Radioactivity Release
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. HPCI / RCIC High Area Temperature Isolation Bypass (System – 206000, HPCI System/ 217000 RCIC System; A2.10 / A2.15; 4.0 / 3.8) (LOJPM22363)	D, E, R	2 – Rx Water Inventory Control
j. T-363, Vent Main Generator During ELAP (System 295003 – Abnormal Plant Evolutions; AK2.06; 3.4) (LOJPM2271)	D, E, L, R	6 – Electrical
k. Start ESW Pump Per SE-1 (System 400000 – Component Cooling Water System (CCWS), A2.01; 3.1/3.2) (LOJPM2258)	A, D, E, L, R	8 – Plant Service Systems

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

* Type Codes	Criteria for R /**SRO-I**/SRO-U	
(A)lternate path	4–6/**4–6** /2–3	4
(C)ontrol room		
(D)irect from bank	≤ 9/**≤ 8**/≤ 4	7
(E)mergency or abnormal in-plant	≥ 1/**≥ 1**/≥ 1	3
(EN)gineered safety feature	≥ 1/**≥ 1**/≥ 1 (control room system)	4
(L)ow-Power/Shutdown	≥ 1/**≥ 1**/≥ 1	3
(N)ew or (M)odified from bank including 1(A)	≥ 2/**≥ 2**/≥ 1	3
(P)revious 2 exams	≤ 3/**≤ 3**/≤ 2 (randomly selected)	0
(R)CA	≥ 1/**≥ 1**/≥ 1	3
(S)imulator		7

Facility: Limerick Date of Examination: 12/02/19

Exam Level: RO ☐ SRO-I ☐ SRO-U ☒ Operating Test Number: 1

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. Resetting ASD Speed Hold (System 202002 – Recirculation Flow Control System, A1.01; 3.6)(LOJPM3529)	A, D, S	1 – Reactivity Control
h. Swap of in service RERS Fans (System 288000 – Plant Ventilation Systems, A4.01; 3.1) (LOJPM3156)	A, EN, N, S	9 – Radioactivity Release

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

i. HPCI / RCIC High Area Temperature Isolation Bypass (System – 206000, HPCI System/ 217000 RCIC System; A2.10 / A2.15; 4.0 / 3.8) (LOJPM22363)	D, E, R	2 – Rx Water Inventory Control
j. T-363, Vent Main Generator During ELAP (System 295003 – Abnormal Plant Evolutions; AK2.06; 3.4) (LOJPM2271)	D, E, L, R	6 – Electrical
k. Start ESW Pump Per SE-1 (System 400000 – Component Cooling Water System (CCWS), A2.01; 3.1/3.2) (LOJPM2258)	A, D, E L, R	8 – Plant Service Systems

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

* Type Codes	Criteria for R /SRO-I/**SRO-U**	
(A)lternate path	4–6/4–6 /**2–3**	3
(C)ontrol room		
(D)irect from bank	≤ 9/≤ 8/**≤ 4**	4
(E)mergency or abnormal in-plant	≥ 1/≥ 1/**≥ 1**	3
(EN)gineered safety feature	≥ 1/≥ 1/**≥ 1** (control room system)	1
(L)ow-Power/Shutdown	≥ 1/≥ 1/**≥ 1**	2
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/**≥ 1**	1
(P)revious 2 exams	≤ 3/≤ 3/**≤ 2** (randomly selected)	0
(R)CA	≥ 1/≥ 1/**≥ 1**	3
(S)imulator		2

Facility: Limerick 1 & 2 Scenario No.: SEG-4056E Rev 3 Op-Test No.: 1 .

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Unit 1 is at 5 % power with a startup in progress. Unit 2 is at 100% power.

Turnover: Startup is in progress per GP-2. Crew is to continue withdrawing control rods IAW rod move sheet until 1 Bypass Valve full open in preparation to enter OPCON 1.

Critical Tasks:

1. Inhibit Auto ADS
2. Perform Emergency Blowdown per T-112

Event No.	Malfunction Number	Event Type*	Event Description
1	N/A	R-RO	Withdraw control rods to raise power
2	MRD016D	C-RO	Control Rod (50-35) stuck
3	MPC482B MPC471H MPC472H	C-PRO TS-SRO	'1B' Drywell Chiller trip with both DW “H” fans tripping
4	MNS160A	C-PRO TS-SRO	Inadvertent Group 7 isolation
5	MMC074	C-RO	Loss of Main Condenser Vacuum
6	MED261	M-All	Grid Instability Resulting in Loss of Offsite Power
7	MHP447B	C-PRO	HPCI Aux Oil Pump Trips
8	MDG420C	C-PRO	D13 Diesel Auto Start Failure (Recoverable)
9	MRR440A	M-All	LOCA
10	MRC466	C-PRO	RCIC Turbine trip on overspeed (Recoverable after RPV Level reaches -100”)

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

Facility: Limerick 1 & 2 Scenario No.: SEG-4159E Rev 000 Op-Test No.: 1 .

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:
Unit 1 is at 100 % power. Unit 2 is at 100% power.

Turnover: Maintain 100% Power

Critical Tasks:
1. Inhibit Auto ADS
2. Perform Emergency Blowdown per T-112

Event No.	Malfunction Number	Event Type*	Event Description
1	MFW248A	C-RO	Inadvertent opening of 1A RFP min flow valve
2	MHP450	C-RO C-PRO TS-SRO	Inadvertent HPCI Start Up
3	VIM105A06-A09	R-RO C-PRO TS-SRO	Rising vibration on the 1A Reactor Recirculation Pump requiring shutdown
4	MMC548	C-PRO	Condensate Pump Discharge Header Rupture
5	MMC548	M-ALL	Loss of all condensate and feedwater pumps
6	MHP446B	C-PRO	HPCI fails to un-isolate
7	MRR440	C-PRO	Coolant Leak into Drywell
8	MCS183A	C-PRO	'1A' Core Spray Pump fails to auto start

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

Facility: Limerick 1 & 2 Scenario No.: SEG-6213E Rev 3 Op-Test No.: 1 .

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:

Unit 1 is at 100% power. Unit 2 is at 100% power.

Turnover:

Crew is required to swap the lube oil pumps for the 1B RFPT from the 1B1 to 1B2 for CMO Base line data collection. _____

Critical Tasks:

1. Manually Scram the Reactor
2. Insert Control Rods Manually
3. Perform Emergency Blowdown per T-112

Event No.	Malfunction Number	Event Type*	Event Description
1	N/A	N-PRO	Swap 1B RFP Lube Oil Pumps (S39.6.C)
2	MVIC108C MCN601C MRR507B	R-RO C-PRO	1C Cond PP vibes with ASD failure to Runback
3	MMS063A	C-RO	Closure of Inboard MSIV A
4	MRP406A	TS-SRO	Loss of power to Div I RRCS
5	MED263A	C-PRO TS-SRO	D11 Bus Lockout - Start C ESW pp or secure D11 EDG
6	MRC465 MRD556	C-RO	Steam Leak into RCIC room requiring reactor Shutdown with 3 control rods failure to Scram
7	MRC465 MRC464A MRC464B	M-ALL	RCIC steam leak with failure to auto isolate results in MSO exceeded in 2 areas
8	MFW245B	C-RO	1B Reactor Feed Pump Turbine High Pressure steam supply fails closed

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

Appendix D **Scenario Outline** **Form ES-D-1**

Facility: Limerick 1 & 2 Scenario No.: SEG-7017E Rev 000 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:

Unit 1 100% power. Unit 2 100% power.

Turnover: Maintain 100%.

Critical Tasks:

1. Inhibit Automatic ADS
2. Terminate and prevent injection per T-270 – First Lowering
3. Terminate and prevent injection per T-270 – Second Lowering
4. Implement T-215
5. Close the stuck open main steam safety relief valve

Event No.	Malfunction Number	Event Type*	Event Description
1	118 I-5	C-PRO R-RO	Loss of Iso-Phase Bus Cooling
2	MCW481A MCW486B	C-PRO	'1A' TECW Pump trip '1B' TECW fails to auto start
3	MHP001 MFP001 MFP002	C-PRO TS-SRO	Fire in HPCI with failure of Fire Pumps to Auto Start
4	MRD016I	C-RO TS-SRO	Control Rod Drifts Out
5	MPR003B	C-RO	Core Power Oscillations
6	MRP029D MSL559 MRP407C	M-ALL	ATWS The ATWS is mitigated by the insertion of control rods via T-215.
7	MRD024	C-RO	RDCS Inoperative after reactor shutdown
8	MAD140C	C-PRO	'1D' SRV fails open (electrical)

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

Facility: **Limerick Generating Station Units 1 and 2** Date of Exam: **December 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	3	3	N/A			4	4	N/A		3	20	4		3		7		
	2	1	1	1				1	1			2	7	1		2		3		
	Tier Totals	4	4	4				5	5			5	27	5		5		10		
2. Plant Systems	1	2	1	3	3	3	3	2	3	2	1	3	26	3		2		5		
	2	1	1	1	1	1	1	1	2	1	1	1	12	0	2	1		3		
	Tier Totals	3	2	4	4	4	4	3	5	3	2	4	38	5		3		8		
3. Generic Knowledge and Abilities Categories		1		2		3		4		10		1	2	3	4	7				
		3		2		2		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. 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	BWR Examination Outline Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)							Form ES-401-1	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
295001 (APE 1) Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					X		AA2.06 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Nuclear boiler instrumentation	3.3	76
295026 (EPE 3) Suppression Pool High Water Temperature / 5						X	G2.2.38 Knowledge of conditions and limitations in the facility license.	4.5	77
295018 (APE 18) Partial or Complete Loss of CCW / 8					X		AA2.03 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER: Cause for partial or complete loss	3.5	78
295038 (EPE 15) High Offsite Radioactivity Release Rate / 9						X	G2.2.12 Knowledge of surveillance procedures.	4.1	79
295021 (APE 21) Loss of Shutdown Cooling / 4					X		AA2.04 Ability to determine and/or interpret the following as they apply to LOSS OF SHUTDOWN COOLING: Reactor water temperature	3.6	80
295024 High Drywell Pressure / 5						X	G2.4.45 Ability to prioritize and interpret the significance of each annunciator or alarm.	4.3	81
295031 (EPE 8) Reactor Low Water Level / 2					X		EA2.02 Ability to determine and/or interpret the following as they apply to REACTOR LOW WATER LEVEL: Reactor power	4.2	82
295001 (APE 1) Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4				X			AA1.02 Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: RPS	3.3	1
295003 (APE 3) Partial or Complete Loss of AC Power / 6					X		AA2.04 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: System lineups	3.7	2
295004 (APE 4) Partial or Total Loss of DC Power / 6						X	G2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation	4.4	3
295005 (APE 5) Main Turbine Generator Trip / 3	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to MAIN TURBINE GENERATOR TRIP: Pressure effects on reactor power	4.0	4
295006 (APE 6) Scram / 1		X					AK2.02 Knowledge of the interrelations between SCRAM and the following: Reactor water level control system	3.8	5
295016 (APE 16) Control Room Abandonment / 7			X				AK3.01 Knowledge of the reasons for the following responses as they apply to CONTROL ROOM ABANDONMENT: Reactor SCRAM	4.1	6
295018 (APE 18) Partial or Complete Loss of CCW / 8				X			AA1.02 Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER: System loads	3.3	7
295019 (APE 19) Partial or Complete Loss of Instrument Air / 8					X		AA2.02 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR: Status of safety-related instrument air system loads	3.6	8
295021 (APE 21) Loss of Shutdown Cooling / 4						X	G2.4.35 Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	3.8	9

295023 (APE 23) Refueling Accidents / 8	X						AK1.03 Knowledge of the operational implications of the following concepts as they apply to REFUELING ACCIDENTS: Inadvertent criticality	3.7	10
295024 High Drywell Pressure / 5		X					EK2.11 Knowledge of the interrelations between HIGH DRYWELL PRESSURE and the following: Drywell spray (RHR) logic: Mark-I&II	4.2	11
295025 (EPE 2) High Reactor Pressure / 3			X				EK3.05 Knowledge of the reasons for the following responses as they apply to HIGH REACTOR PRESSURE: RCIC operation: Plant-Specific	3.6	12
295026 (EPE 3) Suppression Pool High Water Temperature / 5				X			EA1.03 Ability to operate and/or monitor the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Temperature monitoring	3.9	13
295028 (EPE 5) High Drywell Temperature (Mark I and Mark II only) / 5					X		EA2.06 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE: Torus/suppression chamber air space temperature: Plant-Specific	3.4	14
295030 (EPE 7) Low Suppression Pool Water Level / 5						X	G2.2.44 Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.2	15
295031 (EPE 8) Reactor Low Water Level / 2	X						EK1.03 Knowledge of the operational implications of the following concepts as they apply to REACTOR LOW WATER LEVEL: Water level effects on reactor power	3.7	16
295037 (EPE 14) Scram Condition Present and Reactor Power Above APRM Downscale or Unknown / 1		X					EK2.02 Knowledge of the interrelations between SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN and the following: RRCS: Plant-Specific	4.0	17
295038 (EPE 15) High Offsite Radioactivity Release Rate / 9			X				EK3.02 Knowledge of the reasons for the following responses as they apply to HIGH OFF-SITE RELEASE RATE: System isolations	3.9	18
600000 (APE 24) Plant Fire On Site / 8				X			AA1.09 Ability to operate and / or monitor the following as they apply to PLANT FIRE ON SITE: Plant fire zone panel (including detector location)	2.5	19
700000 (APE 25) Generator Voltage and Electric Grid Disturbances / 6					X		AA2.08 Ability to determine and/or interpret the following as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: Criteria to trip the turbine or reactor	4.3	20
K/A Category Totals:	3	3	3	4	4 / 4	3 / 3	Group Point Total:		20 / 7

ES-401	BWR Examination Outline Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)							Form ES-401-1	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
295012 (APE 12) High Drywell Temperature / 5						X	G2.2.25 Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	4.2	83
295022 (APE 22) Loss of Control Rod Drive Pumps / 1					X		AA2.01 Ability to determine and/or interpret the following as they apply to LOSS OF CRD PUMPS : Accumulator pressure	3.6	84
295032 (EPE 9) High Secondary Containment Area Temperature / 5						X	2.1.32 Ability to explain and apply system limits and precautions.	4.0	85
295002 (APE 2) Loss of Main Condenser Vacuum / 3						X	G2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	21
295007 (APE 7) High Reactor Pressure / 3	X						AK1.03 Knowledge of the operational implications of the following concepts as they apply to HIGH REACTOR PRESSURE: Pressure effects on reactor power	3.8	22
295014 (APE 14) Inadvertent Reactivity Addition / 1		X					AK2.09 Knowledge of the interrelations between INADVERTENT REACTIVITY ADDITION and the following: Rod control and information system: Plant-Specific	3.4	23
295015 (APE 15) Incomplete Scram / 1			X				AK3.01 Knowledge of the reasons for the following responses as they apply to INCOMPLETE SCRAM : Bypassing rod insertion blocks	3.4	24
295033 (EPE 10) High Secondary Containment Area Radiation Levels / 9				X			EA1.01 Ability to operate and/or monitor the following as they apply to HIGH SECONDARY CONTAINMENT AREA RADIATION LEVELS: Area radiation monitoring system	3.9	25
295035 (EPE 12) Secondary Containment High Differential Pressure / 5					X		EA2.02 Ability to determine and/or interpret the following as they apply to SECONDARY CONTAINMENT HIGH DIFFERENTIAL PRESSURE: Off-site release rate: Plant-Specific	2.8	26
295036 (EPE 13) Secondary Containment High Sump/Area Water Level / 5						X	G2.4.50 Ability to verify system alarm setpoints and operate controls identified in | the alarm response manual.	4.2	27
K/A Category Point Totals:	1	1	1	1	1 / 1	2 / 2	Group Point Total:		7 / 3

ES-401	BWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-1	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
203000 (SF2, SF4 RHR/LPCI) RHR/LPCI: Injection Mode								X				A2.02 Ability to (a) predict the impacts of the following on the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC); and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Pump trips	3.5	86
211000 (SF1 SLCS) Standby Liquid Control											X	2.1.23 Ability to perform specific system and integrated plant procedures during | all modes of plant operation.	4.4	87
215005 (SF7 PRMS) Average Power Range Monitor/Local Power Range Monitor								X				A2.01 Ability to (a) predict the impacts of the following on the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Power supply degraded	3.1	88
263000 (SF6 DC) DC Electrical Distribution											X	G2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.7	89
300000 (SF8 IA) Instrument Air								X				A2.01 Ability to (a) predict the impacts of the following on the INSTRUMENT AIR SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation: Air dryer and filter malfunctions	2.8	90
203000 (SF2, SF4 RHR/LPCI) RHR/LPCI: Injection Mode	X											K1.09 Knowledge of the physical connections and/or cause/effect relationships between RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) and the following: Emergency generators	3.8	28
205000 (SF4 SCS) Shutdown Cooling		X										K2.01 Knowledge of electrical power supplies to the following: Pump motors	3.1	29
205000 (SF4 SCS) Shutdown Cooling					X							K5.03 Knowledge of the operational implications of the following concepts as they apply to SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE): Heat removal mechanisms	2.8	30
206000 (SF2, SF4 HPCIS) High-Pressure Coolant Injection			X									K3.01 Knowledge of the effect that a loss or malfunction of the HIGH-PRESSURE COOLANT INJECTION SYSTEM will have on following: Reactor water level control: BWR-2,3,4	4.0	31
209001 (SF2, SF4 LPCS) Low-Pressure Core Spray				X								K4.09 Knowledge of LOW-PRESSURE CORE SPRAY SYSTEM design feature(s) and/or interlocks which provide for the following: Load sequencing	3.3	32
211000 (SF1 SLCS) Standby Liquid Control					X							K5.06 Knowledge of the operational implications of the following concepts as they apply to STANDBY LIQUID CONTROL SYSTEM: Tank level measurement	3.0	33
212000 (SF7 RPS) Reactor Protection						X						K6.04 Knowledge of the effect that a loss or malfunction of the following will have on the REACTOR PROTECTION SYSTEM : D.C. electrical distribution	2.8	34
212000 (SF7 RPS) Reactor Protection				X								K4.12 Bypassing of selected SCRAM signals (manually and automatically): Plant-Specific	3.9	35
215003 (SF7 IRM) Intermediate-Range Monitor							X					A1.03 Ability to predict and/or monitor changes in parameters associated with operating the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM controls including: RPS status	3.6	36

215004 (SF7 SRMS) Source-Range Monitor								X				A2.02 Ability to (a) predict the impacts of the following on the SOURCE RANGE MONITOR (SRM) SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: SRM inop condition	3.4	37
215005 (SF7 PRMS) Average Power Range Monitor/Local Power Range Monitor									X			A3.04 Ability to monitor automatic operations of the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM including: Annunciator and alarm signals	3.2	38
217000 (SF2, SF4 RCIC) Reactor Core Isolation Cooling											X	G2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	39
218000 (SF3 ADS) Automatic Depressurization	X											K1.03 Knowledge of the physical connections and/or cause/effect relationships between AUTOMATIC DEPRESSURIZATION SYSTEM and the following: Nuclear boiler instrument system	3.7	40
223002 (SF5 PCIS) Primary Containment Isolation/Nuclear Steam Supply Shutoff			X									K3.01 Knowledge of the effect that a loss or malfunction of the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF will have on following: Reactor water level	3.7	41
239002 (SF3 SRV) Safety Relief Valves			X									K3.01 Knowledge of the effect that a loss or malfunction of the RELIEF/SAFETY VALVES will have on following: Reactor pressure control	3.9	42
239002 (SF3 SRV) Safety Relief Valves					X							K5.04 Knowledge of the operational implications of the following concepts as they apply to RELIEF/SAFETY VALVES: Tail pipe temperature monitoring	3.3	43
259002 (SF2 RWLCS) Reactor Water Level Control				X								K4.04 Knowledge of REACTOR WATER LEVEL CONTROL SYSTEM design feature(s) and/or interlocks which provide for the following: Reactor water level setpoint setdown following a reactor scram	2.9	44
261000 (SF9 SGTS) Standby Gas Treatment											X	G2.1.31 Ability to locate control room switches, controls, and indications, and to | determine that they correctly reflect the desired plant lineup.	4.6	45
261000 (SF9 SGTS) Standby Gas Treatment						X						K6.03 Knowledge of the effect that a loss or malfunction of the following will have on the STANDBY GAS TREATMENT SYSTEM: Emergency diesel generator system	3.0	46
262001 (SF6 AC) AC Electrical Distribution						X						K6.03 Knowledge of the effect that a loss or malfunction of the following will have on the A.C. ELECTRICAL DISTRIBUTION: Generator trip	3.5	47
262001 (SF6 AC) AC Electrical Distribution							X					A1.01 Ability to predict and/or monitor changes in parameters associated with operating the A.C. ELECTRICAL DISTRIBUTION controls including: Effect on instrumentation and controls of switching power supplies	3.1	48
262002 (SF6 UPS) Uninterruptable Power Supply (AC/DC)								X				A2.01. Ability to (a) predict the impacts of the following on the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Under voltage	2.6	49

263000 (SF6 DC) DC Electrical Distribution								X				A2.01 Ability to (a) predict the impacts of the following on the D.C. ELECTRICAL DISTRIBUTION; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Grounds	2.8	50
264000 (SF6 EGE) Emergency Generators (Diesel/Jet) EDG									X			A3.05 Ability to monitor automatic operations of the EMERGENCY GENERATORS (DIESEL/JET) including: Load shedding and sequencing	3.4	51
300000 (SF8 IA) Instrument Air										X		A4.01 Ability to manually operate and / or monitor in the control room: Pressure gauges	2.6	52
400000 (SF8 CCS) Component Cooling Water											X	G2.4.47 Ability to diagnose and recognize trends in an accurate and timely manner | utilizing the appropriate control room reference material.	4.2	53
K/A Category Point Totals:	2	1	3	3	3	3	2	3 / 3	2	1	3 / 2	Group Point Total:		26 / 5

ES-401	BWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Form ES-401-1	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
215001 (SF7 TIP) Traversing In-Core Probe								X				A2.02 Ability to (a) predict the impacts of the following on the TRAVERSING IN-CORE PROBE; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: High primary containment pressure: Mark-I&II	3.0	91
226001 (SF5 RHR CSS) RHR/LPCI: Containment Spray Mode											X	G2.4.41 Knowledge of the emergency action level thresholds and classifications.	4.6	92
233000 (SF9 FPCCU) Fuel Pool Cooling/Cleanup								X				A2.05 Ability to (a) predict the impacts of the following on the FUEL POOL COOLING AND CLEAN-UP; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Valve closures	2.5	93
201001 (SF1 CRDH) CRD Hydraulic								X				A2.04 Ability to (a) predict the impacts of the following on the CONTROL ROD DRIVE HYDRAULIC SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Scram conditions	3.8	54
201003 (SF1 CRDM) Control Rod and Drive Mechanism									X			A3.01 Ability to monitor automatic operations of the CONTROL ROD AND DRIVE MECHANISM including: Control rod position	3.7	55
202002 (SF1 RSCTL) Recirculation Flow Control										X		A4.08 Ability to manually operate and/or monitor in the control room: Recirculation system flow	3.3	56
204000 (SF2 RWCU) Reactor Water Cleanup											X	G2.1.20 Ability to interpret and execute procedure steps.	4.6	57
215002 (SF7 RBMS) Rod Block Monitor	X											K1.04 Knowledge of the physical connections and/or cause/effect relationships between ROD BLOCK MONITOR SYSTEM and the following: Recirculation system: BWR-3,4,5	3.1	58
223001 (SF5 PCS) Primary Containment and Auxiliaries		X										K2.09 Knowledge of electrical power supplies to the following: Drywell cooling fans: Plant-Specific	2.7	59
234000 (SF8 FH) Fuel-Handling Equipment			X									K3.03 Knowledge of the effect that a loss or malfunction of the FUEL HANDLING EQUIPMENT will have on following: Fuel handling operations	3.1	60
241000 (SF3 RTPRS) Reactor/Turbine Pressure Regulating				X								K4.16 Knowledge of REACTOR/TURBINE PRESSURE REGULATING SYSTEM design feature(s) and/or interlocks which provide for the following: Reactor cooldown	3.3	61
256000 (SF2 CDS) Condensate					X							K5.08 Knowledge of the operational implications of the following concepts as they apply to REACTOR CONDENSATE SYSTEM : Heat removal (transfer) mechanisms	2.6	62

271000 (SF9 OG) Offgas						X						K6.02 Knowledge of the effect that a loss or malfunction of the following will have on the OFFGAS SYSTEM : Process radiation monitoring system	3.0	63
290001 (SF5 SC) Secondary Containment							X					A1.01 Ability to predict and/or monitor changes in parameters associated with operating the SECONDARY CONTAINMENT controls including: System lineups	3.1	64
290003 (SF9 CRV) Control Room Ventilation								X				A2.04 Ability to (a) predict the impacts of the following on the CONTROL ROOM HVAC ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Initiation/failure of fire protection system	3.1	65
K/A Category Point Totals:	1	1	1	1	1	1	1	2 / 2	1	1	1 / 1	Group Point Total:		12 / 3

Facility: **Limerick Generating Station Units 1 and 2** Date of Exam: **December 2019**

Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.41	Knowledge of the refueling process.			3.7	94
	2.1.9	Ability to direct personnel activities inside the control room.			4.5	95
	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	66		
	2.1.28	Knowledge of the purpose and function of major system components and controls.	4.1	67		
	2.1.25	Ability to interpret reference materials, such as graphs, curves, tables, etc.	3.9	68		
	Subtotal			3		2
2. Equipment Control	2.2.21	Knowledge of pre- and post-maintenance operability requirements.			4.1	96
	2.2.20	Knowledge of the process for managing troubleshooting activities.			3.8	97
	2.2.41	Ability to obtain and interpret station electrical and mechanical drawings.	3.5	69		
	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	70		
	Subtotal			2		2
3. Radiation Control	2.3.6	Ability to approve release permits.			3.8	98
	2.3.11	Ability to control radiation releases.	3.8	71		
	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.4	72		
	Subtotal			2		1
4. Emergency Procedures/Plan	2.4.11	Knowledge of abnormal condition procedures.			4.2	99
	2.4.13	Knowledge of crew roles and responsibilities during EOP usage.			4.6	100
	2.4.4	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.	4.5	73		
	2.4.26	Knowledge of facility protection requirements, including fire brigade and portable fire fighting equipment usage.	3.1	74		
	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.	3.8	75		
	Subtotal			3		2
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	295026 G2.2.38	#77 - 295005 (APE 5) Main Turbine Generator Trip / 3; G2.2.38 Knowledge of conditions and limitations in the facility license. LGS does not have facility license items associated with the Main Turbine Generator Trip
1/1	295038 G2.2.12	#79 - 295019 (APE 19) Partial or Complete Loss of Instrument Air / 8; G2.2.12 Knowledge of surveillance procedures. LGS does not have surveillance requirements associated with Instrument Air System
1/2	295012 G2.2.25	#83 - 295012 (APE 12) High Drywell Temperature / 5; G2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. We can not write an SRO level question to this generic K/A.
1/2	295032 G2.1.32	#85 - 295032 (EPE 9) High Secondary Containment Area Temperature / 5; G2.1.28 Knowledge of the purpose and function of major system components and controls. We can not write an SRO level question to this generic K/A.
2/1	211000 G2.1.23	#87 - 211000 (SF1 SLCS) Standby Liquid Control; G2.4.34 Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects. We can not write an SRO level question to this generic K/A.
1/2	295036 G2.4.50	#27 - 295036 (EPE 13) Secondary Containment High Sump/Area Water Level / 5; G2.4.3 Ability to identify post-accident instrumentation. LGS does not have Post-Accident instruments associated with this EPE
2/1	261000 G2.1.31	#45 - 261000 (SF9 SGTS) Standby Gas Treatment; G2.4.49 Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.; The SGTS does not have any immediate Operator Actions
2/1	262002 A2.01	#49 - 262002 (SF6 UPS) Uninterruptable Power Supply (AC/DC); A1.02 Ability to predict and/or monitor changes in parameters associated with operating the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) controls including: Motor generator outputs – This K/A is on the LGS Suppressed K/A list – LGS does not have UPS Motor Generators
2/1	400000 G2.4.47	#53 - 400000 (SF8 CCS) Component Cooling Water; G2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.; LGS has no EOP entry conditions for Component Cooling Water
1/1	295037 EK2.02	#17 - 295037 (EPE 14) Scram Condition Present and Reactor Power Above APRM Downscale or Unknown / 1; EK2.10 Knowledge of the interrelations between SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN and the following: Reactor pressure: Over sampling with Questions #4 and #22.