Facility: IPEC Unit 2 Date of Examination: 2/4/2019

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

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R M	NA ROs
Conduct of Operations	R N	Prepare Reactivity Balance Load Change 1940012125 RO 3.9
Equipment Control	R N	Use A Flow Diagram to Determine Leak Isolation Boundaries 1940012241 RO – 3.9
Radiation Control	R M	Prepare a Gaseous Waste Release Permit 1940012311 RO – 3.8
Emergency Plan	M S	Perform initial NUE Notifications 1940012443 RO – 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)

Facility: IPEC Unit 2 Date of Examination: 2/4/2019

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

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R M	Spent Fuel Pit Loading 1940012142 RO – 2.5 SRO – 3.4
Conduct of Operations	R N	Review Reactivity Balance Load Change 1940012125 RO 3.9 SRO 4.2
Equipment Control	R N	Review a Check Off List 1940012214 RO – 3.9 SRO – 4.3
Radiation Control	R M	Review a Gaseous Waste Release Permit 1940012311 RO – 3.8 SRO – 4.3
Emergency Plan	R M	Classify Event and Complete Form EP-1, Part 1 1940012441 RO – 2.9 SRO – 4.6

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

Facility: IPEC Unit 2	Date of Examination: 2-4-2019
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. Retrieve A Dropped Rod 001000A408 RO – 3.7 SRO – 3.4	S A N	1
b. Place Excess Letdown In Service 004000A406 RO – 3.6 SRO – 3.1	S D	2
c. Depressurize the RCS to Refill the Pressurizer 006000A409 RO – 4.1 SRO – 4.2	S A	3
d. Start RCP FR-C.1 003000A402 RO – 2.9 SRO – 2.9	S D	4P
e. Manually Actuate Containment Spray 026000A401 RO – 4.5 SRO – 4.3	S A D EN	5
f. Swap 6.9 Bus 6 from 138kV to 13.8 kV 062000A401 RO – 3.3 SRO – 3.1	S N	6
g. Controlling Pressurizer Pressure Channel Failure 000027A215 RO – 3.7 SRO – 3.4	S L M	7
h. Terminate Containment Pressure Relief 029000A301 RO – 3.8 SRO – 4.0	S M A	8
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. Locally Start 22 AFW Pump 0610002130 RO – 4.4 SRO – 4.0	E D	4S
j. Lineup Backup Cooling to Charging Pumps 0080002130 RO – 4.4 SRO – 4.0	R E D	8
k. Swap Gas Decay Tanks 071000A405 RO – 2.6 SRO – 2.6	N R	9

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

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

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

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

Facility: IPEC Unit 2	Date of Examination: 2-4-2019
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. Retrieve A Dropped Rod 001000A408 RO – 3.7 SRO – 3.4	S A N	1
b.NA SRO		
c. Depressurize the RCS to Refill the Pressurizer 006000A409 RO – 4.1 SRO – 4.2	S A	3
d. Start RCP FR-C.1 003000A402 RO – 2.9 SRO – 2.9	S D	4P
e. Manually Actuate Containment Spray 026000A401 RO – 4.5 SRO – 4.3	S A D EN	5
f. Swap 6.9 Bus 6 from 138kV to 13.8 kV 062000A401 RO – 3.3 SRO – 3.1	S N	6
g. Controlling Pressurizer Pressure Channel Failure 000027A215 RO – 3.7 SRO – 3.4	S L M	7
h. Terminate Containment Pressure Relief 029000A301 RO – 3.8 SRO – 4.0	S N	8
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. Locally Start 22 AFW Pump 0610002130 RO – 4.4 SRO – 4.0	E D	4S
j. Lineup Backup Cooling to Charging Pumps 0080002130 RO – 4.4 SRO – 4.0	R E D	8
k. Swap Gas Decay Tanks 071000A405 RO – 2.6 SRO – 2.6	N R	9

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

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

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

Facility: Indian Point 2 Scenario No.: 1 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Reset simulator to 100% % power, 22 AFP OOS, 21 and 23 protected; 22 Circulator OOS, 21 Circulator is protected

Turnover: # 22 ABFP has been out-of-service for bearing oil line repair for 4 hours. It is expected back within the next 6 hours (ITS 3.7.5 – 72 hr AOT). 21 and 23 ABFP are protected equipment. 22 Circulator is out of service for motor replacement (Day 2), not expected to return this shift

Critical Tasks:

Insert negative reactivity into the core by at least 1 of the following methods before step 4 steps of FR-S.1 is complete:

- De-energize the Control Rod Drives / MG sets
- Manually insert the rods
- Establish Emergency Boration

Manually actuate Main Steam isolation before transition out of E-0

Manually start SI system pumps before transition out of ES-1.1

Event No.	Malf. No.	Event Type*	Event Description
1	XMT-RCS048A	I (ATC) I (BOP) I (CRS) TS(CRS)	RCS Loop 24 Cold Leg temperature failure (TE-441B) fails low
2	MAL-NIS004A	R (ATC) N (CRS) N (BOP) TS (CRS)	NI-41 fails High which results in a Tech Spec Shutdown
3	RLY-GEN007	M (ATC) M (CRS) M (BOP)	Main Generator output breakers trip
4	BKR-PPL003 BKR-PPL004	C (ATC)	Reactor Trip Failure
5	MAL-SGN005	M (ATC) M (CRS) M (BOP)	Steam Break in Turbine Hall, Auto closure MSIVs blocked
6	SWI-SGS002	C (CRS) C (BOP)	Phase A reset failure
7	AOV-RCS003A	C (BOP) C (CRS)	PRZR PORV Fails open

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

Facility: Indian Point 2 Scenario No.: 2 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 100% power. 21 Charging Pump and 21 CCW Pump are out of service.

Turnover: 21 Charging Pump (Day 3) and 21 CCW Pump (Day 3) out of service, none are expected to return this shift.

Critical Tasks:

Manually actuate at least one train of SIS-actuated safeguards before any of the following: Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to any FRP.

Isolate the faulted SG before transition out of E-2

Event No.	Malf. No.	Event Type*	Event Description
1	XMT-RCS020A	I (ATC) I (BOP) I (CRS) TS (CRS)	LT-460 (Pressurizer Level) fails low.
2	-	N (CRS) N (BOP) R (ATC)	Downpower
3	MAL-CRF002AV	C (CRS) C (ATC) TS(CRS)	Rod F-14 does not move when rods demanded.
4	MAL-SGN004A	M (ATC) M (BOP) M (CRS)	Steam line rupture upstream 23 MSIV
5	RLY-PPL487/488	C (ATC) C (CRS)	Failure of SI to actuate automatically.
6	MOC-AFW001	C (ATC) C (CRS)	Failure of 21 AFW pump to autostart
7	MOC-SWS005	C (BOP)	Failure of 21 SW pump to autostart.
8	MAL-RCS014C	M (ATC) M (BOP) M (CRS)	23 SGTR

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

Facility: Indian Point 2 Scenario No.: 3 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 100% power, 22 Circulator is OOS for motor replacement (Day 2)), 21 Circulator is protected

Turnover: 22 Circulator is OOS for motor replacement (Day 2

Critical Tasks:

Manually trip the main turbine before a severe (orange-path) challenge develops to either the sub-criticality or the integrity CSF or before transition to ECA-2.1, whichever happens first

Establish RCS bleed and feed prior to all SG levels reaching 14% WR.

Event No.	Malf. No.	Event Type*	Event Description
1	XMT-CFW005A	I(ATC) I(CRS) I(BOP) TS(CRS)	21B SG Feed Flow Controlling Channel (FT-418B) fails low
2	XMT-FHW015A	R(ATC) N(BOP) N(CRS) TS(CRS)	21 and 22 Heater Drain Pumps trip, Power reduction
3	FLX-CFW038	M(ATC) M(BOP) M(CRS)	Feed line break in the ABFP Building (Effects ALL SG)
4	MAL-TCA004 MAL-TCA005	C (ATC)	Turbine fails to trip
5	MOC-AFW001 MOC-AFW002	C(ATC)	21 and 23 Motor driven AFW pumps fail to operate, 22 AFP is started
6	CVH-ATS019B	M(ATC) M(BOP) M(CRS)	22 AFW pump trips on overspeed after flow is established
7	MOC-SIS002 MOC-SIS003	C(BOP) C(CRS)	21 and 22 SIP fail to auto start

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

Facility: Indian Point 2 Scenario No.: 5 Op-Test No.: 1

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: Initialize to 100% power IC

Turnover 21 EDG OOS LCO 3.8.1.b governor issues (8 hours ago), will return next shift, 21 Containment spray pump Out of service LCO 3.6.6 a (6 Hours ago)., 21 Containment Spray pump protected

Critical Tasks:
Establish at least 400 gpm AFW flow to the SGs before SG WR level decreases below 14%.

Manually start ESW pump(s) such that the EDG does not fail due to engine overheating.

Event No.	Malf. No.	Event Type*	Event Description
1	XMT-MSS053A	I (ATC) I (BOP) I (CRS) TS (CRS)	Turbine First Stage Pressure (PT-412A) fails low
2	MOT-CNM012A	C (BOP) TS(CRS)	25 FCU Trip
3	CNH-PCS019B	C (ATC)	LC-459D (Pressurizer Level Controller) fails low
4	MAL-RCS014A	R (ATC) N (CRS) N (BOP) TS (CRS)	21 Steam Generator Tube Leak (120 GPD), Tech Spec shutdown
5	XMT-CFW037A	M (ATC) M (BOP) M (CRS)	PT-408B (MBFP Suction pressure) fails low
6	MAL-EPS006E	M (ATC) M (BOP) M (CRS)	6.9kv bus 5 faults when the Unit trips, 22 EDG trips on overcrank, 23 EDGs output breaker does not automatically close
7	MOC-SWS008	C (BOP)	23 Service Water pump does not autostart

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

2nd (different format) copy of outlines listing all Q#'s and identifying replaced K/A's.

ES-401, Rev. 11 **PWR Examination Outline** **Form ES-401-2**

Facility: Indian Point Unit 2 Date of Exam: February 2019

Tier	Group	RO K/A Category Points											SRO-Only Points		
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	3	3	6
	2	1	1	2				2	2			1	9	2	2	4
	Tier Totals	4	4	5				5	5			4	27	5	5	10
2. Plant Systems	1	3	2	3	3	2	3	3	2	2	3	2	28	3	2	5
	2	1	1	1	1	1	1	1	1	1	1	0	10	2	1	3
	Tier Totals	4	3	4	4	3	4	4	3	3	4	2	38		3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	7
		2			2			3			3			1	2	2	2	

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, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 Radiation Control K/A is allowed if the K/A 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 associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems 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 KAs.
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..

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
007EA2.01	Reactor Trip - Stabilization - Recovery / 1	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Decreasing power level from available indications
Q1															
008AK1.01	Pressurizer Vapor Space Accident / 3	3.2	3.7	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Thermodynamics and flow characteristics of open or leak- ing valves
Q2															
Replaced with 00962.1.7 ~~000EG2.2.12~~	~~Small Break LOCA / 3~~	~~3.7~~	~~4.1~~	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	~~Knowledge of surveillance procedures.~~
Q3															
011EA1.15	Large Break LOCA / 3	4.2	4.2	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	RCS temperature and pressure
Q4															
022AA2.01	Loss of Rx Coolant Makeup / 2	3.2	3.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Whether charging line leak exists
Q5															
025AK1.01	Loss of RHR System / 4	3.9	4.3	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Loss of RHRS during all modes of operation
Q6															
027AK2.03	Pressurizer Pressure Control System Malfunction / 3	2.6	2.8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Controllers and positioners
Q7															
029EK3.06	ATWS / 1	4.2	4.3	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Verifying a main turbine trip; methods
Q8															
038EK3.08	Steam Gen. Tube Rupture / 3	4.1	4.2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Criteria for securing RCP
Q9															
040AK2.01	Steam Line Rupture - Excessive Heat Transfer / 4	2.6	2.5	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Valves
Q10															
054AG2.4.18	Loss of Main Feedwater / 4	3.3	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the specific bases for EOPs.
Q11															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
055EA1.02	Station Blackout / 6	4.3	4.4	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Manual ED/G start
Q12															
056AK3.01	Loss of Off-site Power / 6	3.5	3.9	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Order and time to initiation of power for the load sequencer
Q13															
057AA2.06	Loss of Vital AC Inst. Bus / 6	3.2	3.7	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	AC instrument bus alarms for the inverter and alternate power source
Q14															
058AG2.4.20	Loss of DC Power / 6	3.8	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of operational implications of EOP warnings, cautions and notes.
Q15															
WE04EK1.1	LOCA Outside Containment / 3	3.5	3.9	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Components, capacity, and function of emergency systems.
Q16															
WE05EA1.3	Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	3.8	4.2	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Desired operating results during abnormal and emergency situations.
Q17															
WE11EK2.2	Loss of Emergency Coolant Recirc. / 4	3.9	4.3	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems and relations between the proper operation of these systems to the operation of the facility.

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
005AK3.05	Inoperable/Stuck Control Rod / 1	3.4	4.2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Power limits on rod misalignment
Q19															
028AK3.03	Pressurizer Level Malfunction / 2	3.5	4.1	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	False indication of PZR level when PORV or spray valve is open and RCS saturated
Q20															
032AG2.4.2	Loss of Source Range NI / 7	4.5	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.
Q21															
060AA1.01	Accidental Gaseous Radwaste Rel. / 9	2.8	3	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Area radiation monitors
Q22															
068AA2.05	Control Room Evac. / 8	4.2	4.3	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Availability of heat sink
Q23															
076AK2.01	High Reactor Coolant Activity / 9	2.6	3	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Process radiation monitors
Q24															
WE08EK1.2	RCS Overcooling - PTS / 4	3.4	4.0	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Normal, abnormal and emergency operating procedures associated with (Natural Circulation Operations).
Q25															
WE10EA2.2	Natural Circ. With Seam Void/ 4	3.4	3.9	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.
Q26															
WE15EA1.3	Containment Flooding / 5	2.8	3.0	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Desired operating results during abnormal and emergency situations.
Q27															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
003K5.05	Reactor Coolant Pump	2.8	3.0	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	The dependency of RCS flow rates upon the number of operating RCPs
Q28															
004K3.04	Chemical and Volume Control	3.7	3.9	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	RCPS
Q30															
Replaced with 004K5.09 ~~004K5.40~~	~~Chemical and Volume Control~~	~~3.0~~	~~3.4~~	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	~~Response of PRT during bubble formation in PZR; in~~ crease in quench tank pressure when cycling PORV shows that complete steam bubble does not exist, that significant noncondensable gas is still present
Q29															
005K4.12	Residual Heat Removal	3.1	3.7	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Lineup for piggyback mode with CSS
Q31															
006K2.02	Emergency Core Cooling	2.5	2.9	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Valve operators for accumulators
Q32															
007K4.01	Pressurizer Relief/Quench Tank	2.6	2.9	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Quench tank cooling
Q33															
008A1.02	Component Cooling Water	2.9	3.1	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	CCW temperature
Q34															
010K2.02	Pressurizer Pressure Control	2.5	2.7	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Controller for PZR spray valve
Q35															
012K3.01	Reactor Protection	3.9	4.0	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	CRDS
Q36															
013K6.01	Engineered Safety Features Actuation	2.7	3.1	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Sensors and detectors
Q37															
022A1.02	Containment Cooling	3.6	3.8	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Containment pressure
Q39															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
Replaced With 022K.101 Q38	~~022K1.04~~	~~Containment Cooling~~	~~2.9~~	~~2.9~~	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	~~Chilled water~~
026A4.05	Containment Spray	3.5	3.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Containment spray reset switches
Q40															
039A3.02	Main and Reheat Steam	3.1	3.5	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Isolation of the MRSS
Q41															
059A3.02	Main Feedwater	2.9	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Programmed levels of the S/G
Q42															
059G2.1.23	Main Feedwater	4.3	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to perform specific system and integrated plant procedures during all modes of plant operation.
Q43															
061K6.01	Auxiliary/Emergency Feedwater	2.5	2.8	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Controllers and positioners
Q45															
061K6.02	Auxiliary/Emergency Feedwater	2.6	2.7	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Pumps
Q44															
062G2.4.47	AC Electrical Distribution	4.2	4.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.
Q46															
063K1.03	DC Electrical Distribution	2.9	3.5	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Battery charger and battery
Q48															
063K4.02	DC Electrical Distribution	2.9	3.2	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Breaker interlocks, permissives, bypasses and cross-ties.
Q47															
064K1.02	Emergency Diesel Generator	3.1	3.6	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	D/G cooling water system
Q49															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
073A2.02	Process Radiation Monitoring	2.7	3.2	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Detector failure
Q51															
073A4.01	Process Radiation Monitoring	3.9	3.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Effluent release
Q50															
076A1.02	Service Water	2.6	2.6	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Reactor and turbine building closed cooling water temperatures.
Q52															
Replaced with 076K3.07	~~076K3.02 Service Water~~	~~2.5~~	~~2.8~~	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	~~Secondary closed cooling water~~
Q53															
078A4.01	Instrument Air	3.1	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Pressure gauges
Q54															
Replaced with 103A2.03 Q55	~~103A2.04 Containment~~	~~3.5~~	~~3.6~~	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	~~Containment evacuation (including recognition of the alarm)~~

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
001K4.07	Control Rod Drive	3.7	3.8	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Rod stops
Q56															
011K6.03	Pressurizer Level Control	2.9	3.3	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Relationship between PZR level and PZR heater control circuit
Q57															
017A1.01	In-core Temperature Monitor	3.7	3.9	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Core exit temperature
Q58															
Replaced with 035K5.03	~~028K5.04 Hydrogen Recombiner and Purge Control~~	~~2.6~~	~~3.2~~	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	~~The selective removal of hydrogen~~
~~Q60~~ Q61															
029A4.04	Containment Purge	3.5	3.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Containment evacuation signal
Q59															
Replaced with 041K2.01 Q62	~~041K2.02 Steam Dump/Turbine Bypass Control~~	2.8	2.8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	~~IGS inverter breakers~~
045K3.01	Main Turbine Generator	2.9	3.2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Remainder of the plant
Q63															
055A3.03	Condenser Air Removal	2.5	2.7	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Automatic diversion of CARS exhaust
Q64															
056A2.04	Condensate	2.6	2.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Loss of condensate pumps
Q65															
033K1.05	Spent Fuel Pool Cooling	2.7	2.8	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Connection with RWST
Q60															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.13 Q66	Conduct of operations	2.5	3.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of facility requirements for controlling vital / controlled access.
~~G2.1.27~~ G2.1.40 Q67 Replaced with	~~Conduct of operations~~	~~3.9~~	~~4~~	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	~~Knowledge of system purpose and or function.~~
G2.2.35 Q68	Equipment Control	3.6	4.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to determine Technical Specification Mode of Operation
G2.2.41 Q69	Equipment Control	3.5	3.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to obtain and interpret station electrical and mechanical drawings
G2.3.14 ~~Q70~~ Q71	Radiation Control	3.4	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities
G2.3.15 Q72	Radiation Control	2.9	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiation monitoring systems
G2.3.7 Q70	Radiation Control	3.5	3.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to comply with radiation work permit requirements during normal or abnormal conditions
G2.4.28 Q73	Emergency Procedures/Plans	3.2	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of procedures relating to emergency response to sabotage.
G2.4.42 Q74	Emergency Procedures/Plans	2.6	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of emergency response facilities.
G2.4.49 Q75	Emergency Procedures/Plans	4.6	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
015AG2.1.20	Nuclear Instrumentation / 7	4.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to interpret and execute procedure steps
Q76															
026G2.1.19	Loss of Component Cooling Water / 8	3.9	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to use plant computers to evaluate system or component status
Q77															
056AA2.45	Loss of Off-site Power / 6	3.6	3.9	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Indicators to assess status of ESF breakers (tripped/ not-tripped) and validity of alarms (false/not-false)
Q78															
065AA2.06	Loss of Instrument Air / 8	3.6	4.2	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	When to trip reactor if instrument air pressure is de-creasing
Q80															
062AA2.04	Loss of Nuclear Service Water / 4	2.5	2.9	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	The normal values and upper limits for the temperatures of the components cooled by SWS
Q79															
077G2.4.1	Generator Voltage and Electric Grid Disturbances / 6	4.6	4.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of EOP entry conditions and immediate action steps
Q81															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
001AA2.02	Continuous Rod Withdrawal / 1	4.2	4.2	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Position of emergency boration valve
WE13G2.4.35	Steam Generator Overpressure / 4	3.8	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of local auxiliary operator tasks during emergency and the resultant operational effects
061AA2.03	ARM System Alarms / 7	3	3.3	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Setpoints for alert and high alarms
069AG2.2.36	Loss of CTMT Integrity / 5	3.1	4.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions of operations

Replaced with 00WE02 AA2.02 Q84

Q85

Replaced with 036AA2.02 Q82

Q83

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
012A2.01	Reactor Protection	3.1	3.6	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Faulty bistable operation
Q87															
039A2.03	Main and Reheat Steam	3.4	3.7	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Indications and alarms for main steam and area radiation monitors (during SGTR)
Q88															
062A2.12	AC Electrical Distribution	3.2	3.6	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Restoration of power to a system with a fault on it
Q89															
006G2.4.45	Emergency Core Cooling	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to prioritize and interpret the significance of each annunciator or alarm.
Q 86															
103G2.2.44	Containment	4.2	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	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
Q90															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
034A2.01	Fuel Handling Equipment	3.6	4.4	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Dropped fuel element
Q91															
068A2.04	Liquid Radwaste	3.3	3.3	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Failure of automatic isolation
Q92															
071G2.2.38	Waste Gas Disposal	3.6	4.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of conditions and limitations in the facility license.
Q93															

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.41	Conduct of operations	2.8	3.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the refueling processes
Q94															
G2.2.13	Equipment Control	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of tagging and clearance procedures.
Q95															
G2.2.40	Equipment Control	3.4	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to apply technical specifications for a system.
Q96															
G2.3.12	Radiation Control	3.2	3.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiological safety principles pertaining to licensed operator duties
Q98															
Replaced with G2.3.11 Q97	~~G2.3.14~~	~~Radiation Control~~	~~3.4~~	~~3.8~~	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	~~Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities~~
G2.4.30	Emergency Procedures/Plans	2.7	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of events related to system operations/status that must be reported to internal orginizations or outside agencies.
Q100															
G2.4.8	Emergency Procedures/Plans	3.8	4.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.
Q99															

Facility: IPEC Printed: 11/20/2018

Date Of Exam: 02/04/2019

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 & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18	0	0	0
	2	1	1	2				2	2			1	9	0	0	0
	Tier Totals	4	4	5				5	5			4	27	0	0	0
2. Plant Systems	1	3	2	3	3	2	3	3	2	2	3	2	28	0	0	0
	2	1	1	1	1	1	1	1	1	1	1	0	10	0 / 0	0	0
	Tier Totals	4	3	4	4	3	4	4	3	3	4	2	38	0	0	0
3. Generic Knowledge And Abilities Categories		1			2			3			4		10	1	2	3	4	0
		2			2			3			3			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: 11/20/2018

Facility: IPEC

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.	Points
000007 Reactor Trip - Stabilization - Recovery / 1					X		EA2.01 - Decreasing power level, from available indications	4.1	1
000008 Pressurizer Vapor Space Accident / 3	X						AK1.01 - Thermodynamics and flow characteristics of open or leaking valves	3.2	1
000009 Small Break LOCA / 3						X	2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.4	1
000011 Large Break LOCA / 3				X			EA1.15 - RCS temperature and pressure	4.2	1
000022 Loss of Rx Coolant Makeup / 2					X		AA2.01 - Whether charging line leak exists	3.2	1
000025 Loss of RHR System / 4	X						AK1.01 - Loss of RHRS during all modes of operation	3.9	1
000027 Pressurizer Pressure Control System Malfunction / 3		X					AK2.03 - Controllers and positioners	2.6	1
000029 ATWS / 1			X				EK3.06 - Verifying a main turbine trip; methods	4.2	1
000038 Steam Gen. Tube Rupture / 3			X				EK3.08 - Criteria for securing RCP	4.1	1
000040 Steam Line Rupture - Excessive Heat Transfer / 4		X					AK2.01 - Valves	2.6*	1
000054 Loss of Main Feedwater / 4						X	2.4.18 - Knowledge of the specific bases for EOPs.	3.3	1
000055 Station Blackout / 6				X			EA1.02 - Manual ED/G start	4.3	1
000056 Loss of Off-site Power / 6			X				AK3.01 - Order and time to initiation of power for the load sequencer	3.5	1
000057 Loss of Vital AC Inst. Bus / 6					X		AA2.06 - AC instrument bus alarms for the inverter and alternate power source	3.2	1
000058 Loss of DC Power / 6						X	2.4.20 - Knowledge of operational implications of EOP warnings, cautions, and notes.	3.8	1
W/E04 LOCA Outside Containment / 3	X						EK1.1 - Components, capacity, and function of emergency systems	3.5	1
W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4				X			EA1.3 - Desired operating results during abnormal and emergency situations	3.8	1
W/E11 Loss of Emergency Coolant Recirc. / 4		X					EK2.2 - Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility	3.9	1

PWR RO Examination Outline

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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.	Points
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

PWR RO Examination Outline

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Facility: IPEC

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.	Points
000005 Inoperable/Stuck Control Rod / 1			X				AK3.05 - Power limits on rod misalignment	3.4	1
000028 Pressurizer Level Malfunction / 2			X				AK3.03 - False indication of PZR level when PORV or spray valve is open and RCS saturated	3.5	1
000032 Loss of Source Range NI / 7						X	2.4.2 - Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.5	1
000060 Accidental Gaseous Radwaste Rel. / 9				X			AA1.01 - Area radiation monitors	2.8	1
000068 Control Room Evac. / 8					X		AA2.05 - Availability of heat sink	4.2	1
000076 High Reactor Coolant Activity / 9		X					AK2.01 - Process radiation monitors	2.6	1
W/E08 RCS Overcooling - PTS / 4	X						EK1.2 - Normal, abnormal and emergency operating procedures associated with Pressurized Thermal Shock	3.4	1
W/E10 Natural Circ. / 4					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.4	1
W/E15 Containment Flooding / 5				X			EA1.3 - Desired operating results during abnormal and emergency situations	2.8	1
K/A Category Totals:	**1**	**1**	**2**	**2**	**2**	**1**	**Group Point Total:**		**9**

PWR RO Examination Outline

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Facility: IPEC

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.	Points
003 Reactor Coolant Pump					X							K5.05 - The dependency of RCS flow rates upon the number of operating RCPs	2.8*	1
004 Chemical and Volume Control					X							K5.09 - Thermal shock: high component stress due to rapid temperature change	3.7	1
004 Chemical and Volume Control			X									K3.04 - RCPS	3.7	1
005 Residual Heat Removal				X								K4.12 - Lineup for piggyback mode with CSS	3.1	1
006 Emergency Core Cooling		X										K2.02 - Valve operators for accumulators	2.5*	1
007 Pressurizer Relief/Quench Tank				X								K4.01 - Quench tank cooling	2.6	1
008 Component Cooling Water							X					A1.02 - CCW temperature	2.9	1
010 Pressurizer Pressure Control		X										K2.02 - Controller for PZR spray valve	2.5	1
012 Reactor Protection			X									K3.01 - CRDS	3.9	1
013 Engineered Safety Features Actuation						X						K6.01 - Sensors and detectors	2.7*	1
022 Containment Cooling	X											K1.01 - SWS/cooling system	3.5	1
022 Containment Cooling							X					A1.02 - Containment pressure	3.6	1
026 Containment Spray										X		A4.05 - Containment spray reset switches	3.5	1
039 Main and Reheat Steam									X			A3.02 - Isolation of the MRSS	3.1	1
059 Main Feedwater									X			A3.02 - Programmed levels of the S/G	2.9	1
059 Main Feedwater											X	2.1.23 - Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.3	1
061 Auxiliary/Emergency Feedwater						X						K6.02 - Pumps	2.6	1
061 Auxiliary/Emergency Feedwater						X						K6.01 - Controllers and positioners	2.5	1
062 AC Electrical Distribution											X	2.4.47 - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	4.2	1
063 DC Electrical Distribution				X								K4.02 - Breaker interlocks, permissives, bypasses and cross-ties	2.9*	1

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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.	Points
063 DC Electrical Distribution	X											K1.03 - Battery charger and battery	2.9	1
064 Emergency Diesel Generator	X											K1.02 - ED/G cooling water system	3.1	1
073 Process Radiation Monitoring										X		A4.01 - Effluent release	3.9	1
073 Process Radiation Monitoring								X				A2.02 - Detector failure	2.7	1
076 Service Water							X					A1.02 - Reactor and turbine building closed cooling water temperatures	2.6*	1
076 Service Water			X									K3.07 - ESF loads	3.7	1
078 Instrument Air										X		A4.01 - Pressure gauges	3.1	1
103 Containment								X				A2.03 - Phase A and B isolation	3.5	1
K/A Category Totals:	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**Group Point Total:**		**28**

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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.	Points
001 Control Rod Drive				X								K4.07 - Rod stops	3.7	1
011 Pressurizer Level Control						X						K6.03 - Relationship between PZR level and PZR heater control circuit	2.9	1
017 In-core Temperature Monitor							X					A1.01 - Core exit temperature	3.7	1
029 Containment Purge										X		A4.04 - Containment evacuation signal	3.5	1
033 Spent Fuel Pool Cooling	X											K1.05 - RWST	2.7*	1
035 Steam Generator					X							K5.03 - Shrink and swell concept	2.8	1
041 Steam Dump/Turbine Bypass Control		X										~~K2.02 - ICS inverter breakers~~ K2.01	~~2.8~~ Q#62	1
045 Main Turbine Generator			X									K3.01 - Remainder of the plant	2.9	1
055 Condenser Air Removal									X			A3.03 - Automatic diversion of CARS exhaust	2.5*	1
056 Condensate								X				A2.04 - Loss of condensate pumps	2.6	1
K/A Category Totals:	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**Group Point Total:**		**10**

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-3

Generic Category	KA	KA Topic	Imp.	Points
Conduct of Operations	2.1.13	Knowledge of facility requirements for controlling vital / controlled access.	2.5	1
	~~2.1.27~~ 2.1.40	~~Knowledge of system purpose and/or function~~.	~~3.9~~ Q#67	1
		Category Total:		**2**
Equipment Control	2.2.35	Ability to determine Technical Specification Mode of Operation.	3.6	1
	2.2.41	Ability to obtain and interpret station electrical and mechanical drawings.	3.5	1
		Category Total:		**2**
Radiation Control	2.3.7	Ability to comply with radiation work permit requirements during normal or abnormal conditions.	3.5	1
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	1
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	1
		Category Total:		**3**
Emergency Procedures/Plan	2.4.28	Knowledge of procedures relating to a security event (non-safeguards information).	3.2	1
	2.4.42	Knowledge of emergency response facilities.	2.6	1
	2.4.49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	1
		Category Total:		**3**
		Generic Total:		**10**

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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				0	0			0	0	2			2	4	
	Tier Totals	0	0	0				0	0			0	0	5			5	10	
2. Plant Systems	1	0	0	0	0	0	0	0	0	0	0	0	0	3			2	5	
	2	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	5			3	8	
3. Generic Knowledge And Abilities Categories		1			2			3			4		0	1	2	3	4	7	
		0			0			0			0			1	2	2	2		

Note:

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only 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 SRO Examination Outline

Printed: 11/20/2018

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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.	Points
000015/000017 RCP Malfunctions / 4						X	2.1.20 - Ability to interpret and execute procedure steps.	4.6	1
000026 Loss of Component Cooling Water / 8						X	2.1.19 - Ability to use plant computers to evaluate system or component status.	3.9	1
000056 Loss of Off-site Power / 6					X		AA2.45 - Indicators to assess status of ESF breakers (tripped/not-tripped) and validity of alarms (false/not-false)	3.9	1
000062 Loss of Nuclear Svc Water / 4					X		AA2.04 - The normal values and upper limits for the temperatures of the components cooled by SWS	2.9*	1
000065 Loss of Instrument Air / 8					X		AA2.06 - When to trip reactor if instrument air pressure is decreasing	4.2	1
000077 Generator Voltage and Electric Grid Disturbances / 6						X	2.4.1 - Knowledge of EOP entry conditions and immediate action steps.	4.8	1
K/A Category Totals:	**0**	**0**	**0**	**0**	**3**	**3**	**Group Point Total:**		**6**

PWR SRO Examination Outline

Printed: 11/20/2018

Facility: IPEC

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.	Points
000036 Fuel Handling Accident / 8					X		AA2.02 - Occurrence of a fuel handling incident	4.1	1
000069 Loss of CTMT Integrity / 5						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	1
W/E02 SI Termination / 3					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	4.0	1
W/E13 Steam Generator Over-pressure / 4						X	2.4.35 - Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	4.0	1
K/A Category Totals:	**0**	**0**	**0**	**0**	**2**	**2**	**Group Point Total:**		**4**

PWR SRO Examination Outline

Printed: 11/20/2018

Facility: IPEC

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.	Points
006 Emergency Core Cooling											X	2.4.45 - Ability to prioritize and interpret the significance of each annunciator or alarm.	4.3	1
012 Reactor Protection								X				A2.01 - Faulty bistable operation	3.6	1
039 Main and Reheat Steam								X				A2.03 - Indications and alarms for main steam and area radiation monitors (during SGTR)	3.7	1
062 AC Electrical Distribution								X				A2.12 - Restoration of power to a system with a fault on it	3.6	1
103 Containment											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	1
K/A Category Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**2**	**Group Point Total:**		**5**

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO 1/1	009 2.2.12	Knowledge of surveillance testing NA to SBLOCA. Replaced with 000009 2.1.07
RO 2/1	022 K1.04	Chilled water is not used for Containment Cooling. Replaced with 022000 K1.01
RO 2/1	076 K3.02	*076 A1.02 Service Water – Reactor and Turbine Building Closed Cooling Water Temperature* ***076 K3.02 Service Water Secondary Closed Cooling Water*** Oversample topic with 076000A1.02. Replaced with 076000 K3.07
RO 2/1	103 A2.04	*029 A4.04 Containment Purge – Containment Evacuation Alarm* ***103 A2.04 Containment – Containment Evacuation (including recognition of the alarm)*** Oversample topic with 029000 A4.04. Replaced with 103000 A2.03
RO 2/1	004 K5.40	IPEC does not use this method to draw a bubble in the PRT. Replaced with 004000 K5.09
RO 2/2	028 K5.04	IPEC Unit 2 has passive Hydrogen Recombiners. There are no procedure actions associated with Hydrogen Recombiners. Replaced with 035000 K5.03
SRO 1/ 2	001 EA2.02	Cannot write an SRO question; the procedure is too simple (place rods in manual or trip the reactor). Replaced with 00WE02 AA2.02
SRO 3	2.3.14	Oversample KA. Exact same KA is on RO Tier 3 outline. Replaced with 2.3.11.
SRO 1/ 2	061 AA2.03	Outline oversamples Radiation Monitor topics. Replaced with 000036 AA2.02.

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO 1/1 Q3	009 2.2.12	Knowledge of surveillance testing NA to SBLOCA. Replaced with 000009 2.1.07
RO 2/1 Q29	004 K5.40	IPEC does not use this method to draw a bubble in the PRT. Replaced with 004000 K5.09
RO 2/1 Q38	022 K1.04	Chilled water is not used for Containment Cooling. Replaced with 022000 K1.01
RO 2/1 Q53	076 K3.02	076 K3.02 Knowledge of the effect that a loss or malfunction of the SWS will have on the following: - Secondary closed cooling water REJECTED oversample topic with 076000A1.02. Replaced with 076000 K3.07
RO 2/1 Q55	103 A2.04	103 A2.04 Containment – Containment Evacuation (including recognition of the alarm) REJECTED oversample topic with 029000 A4.04. Replaced with 103000 A2.03
RO 2/2 ~~Q61~~ Q60	028 K5.04	IPEC Unit 2 has passive Hydrogen Recombiners. There are no procedure actions associated with Hydrogen Recombiners. Replaced with 035000 K5.03
RO 2/2 Q62	041 K2.02	041 K2.02 rejected ICS Inverter does not exist at IPEC. Replaced with 041 K2.01
RO 3 Q67	2.1.27	Per Chief Examiners recommendation, this KA does not lend itself to a Plant Wide Generic question. Replaced with 2.1.40
SRO 1/ 2 Q84	001 EA2.02	Cannot write an SRO question; the procedure is too simple (place rods in manual or trip the reactor). Replaced with 00WE02 AA2.02
SRO 1/ 2 Q82	061 AA2.03	Outline oversamples Radiation Monitor topics. Replaced with 000036 AA2.02.
SRO 3 Q97	2.3.14	Oversample KA. Exact same KA is on RO Tier 3 outline. Replaced with 2.3.11.