	KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
1	007EK1.04	Reactor Trip - Stabilization - Recovery / 1	3.6	3.9	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Decrease in reactor power following reactor trip (prompt drop and subsequent decay)
2	008AK2.02	Pressurizer Vapor Space Accident / 3	2.7	2.7	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sensors and detectors
3	009EA1.12	Small Break LOCA / 3	4.2	4.2	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	RPS
4	011EK2.02	Large Break LOCA / 3	2.6	2.7	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Pumps
5	015AA1.02	RCP Malfunctions / 4	2.8	2.7	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	RCP oil reservoir level and alarm indicators
6	022AA2.04	Loss of Rx Coolant Makeup / 2	2.9	3.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	How long PZR level can be maintained within limits
7	025AA2.03	Loss of RHR System / 4	3.6	3.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Increasing reactor building sump level
8	026AA1.01	Loss of Component Cooling Water / 8	3.1	3.1	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	CCW temperature indications
9	027AK2.03	Pressurizer Pressure Control System Malfunction / 3	2.6	2.8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Controllers and positioners
10	038EA2.10	Steam Gen. Tube Rupture / 3	3.1	3.3	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Flowpath for charging and letdown flows
11	054AK3.04	Loss of Main Feedwater / 4	4.4	4.6	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Actions contained in EOPs for loss of MFW

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
055EG2.2.37	Station Blackout / 6	3.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to determine operability and/or availability of safety related equipment
056AK1.03	Loss of Off-site Power / 6	3.1	3.4	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Definition of subcooling: use of steam tables to determine it
057AG2.4.6	Loss of Vital AC Inst. Bus / 6	3.7	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge symptom based EOP mitigation strategies.
058AK1.01	Loss of DC Power / 6	2.8	3.1	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Battery charger equipment and instrumentation
062AK3.01	Loss of Nuclear Svc Water / 4	3.2	3.5	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the nuclear service water coolers
065AK3.04	Loss of Instrument Air / 8	3	3.2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Cross-over to backup air supplies
BE04EG2.4.3	Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	2.7	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of events related to system operations/status that must be reported to internal orginizations or outside agencies.

12 13 14 15 16 17 18

	KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
19	024AA1.02	Emergency Boration / 1	3.7	3.5	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Boric acid pump
20	059AA1.03	Accidental Liquid RadWaste Rel. / 9	3	2.9	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Flow rate controller
21	060AK3.03	Accidental Gaseous Radwaste Rel. / 9	3.8	4.2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Actions contained in EOP for accidental gaseous-waste release
22	074EA2.06	Inad. Core Cooling / 4	4	4.6	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Changes in PZR level due to PZR steam bubble transfer to the RCS during inadequate core cooling
23	BA01AK2.2	Plant Runback / 1	3.5	3.5	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	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.
24	BA04AK3.2	Turbine Trip / 4	3.4	3.6	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Normal, abnormal and emergency operating procedures associated with (Turbine Trip).
25	BA06AG2.4.3	Shutdown Outside Control Room / 8	3.7	3.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to identify post-accident instrumentation.
26	BE08EG2.2.39	LOCA Cooldown - Depress. / 4	3.9	4.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of less than one hour technical specification action statements for systems.
27	BE14EK1.3	EOP Enclosures	3.2	3.2	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Annunciators and conditions indicating signals, and remedial actions associated with the (EOP Enclosures).

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
003A3.05	Reactor Coolant Pump	2.7	2.6	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	RCP lube oil and bearing lift pumps
004K1.02	Chemical and Volume Control	3.5	3.8	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	PZR and RCS temperature and pressure relationships
005A4.03	Residual Heat Removal	2.8	2.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	RHR temperature, PZR heaters and flow and nitrogen
005K2.01	Residual Heat Removal	3.0	3.2	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	RHR pumps
006K4.05	Emergency Core Cooling	4.3	4.4	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Autostart of HPI/LPI/SIP.
007A1.01	Pressurizer Relief/Quench Tank	2.9	3.1	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Maintaining quench tank water level within limits
007A2.06	Pressurizer Relief/Quench Tank	2.6	2.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Bubble formation in PZR
008K4.01	Component Cooling Water	3.1	3.3	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Automatic start of standby pump
010A1.08	Pressurizer Pressure Control	3.2	3.3	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Spray nozzle DT
012K6.04	Reactor Protection	3.3	3.6	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Bypass-block circuits
013K5.02	Engineered Safety Features Actuation	2.9	3.3	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	Safety system logic and reliability

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
022K2.02	Containment Cooling	2.5	2.4	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Chillers
022K3.01	Containment Cooling	2.9	3.2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	Containment equipment subject to damage by high or low temperature, humidity and pressure
026K1.02	Containment Spray	4.1	4.1	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Cooling water
039A2.03	Main and Reheat Steam	3.4	3.7	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Indications and alarms for main steam and area radiation monitors (during SGTR)
039K5.05	Main and Reheat Steam	2.7	3.1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	Bases for RCS cooldown limits
059A1.03	Main Feedwater	2.7	2.9	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Power level restrictions for operation of MFW pumps and valves.
059A3.06	Main Feedwater	3.2	3.3	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Feedwater isolation
061K2.03	Auxiliary/Emergency Feedwater	4.0	3.8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	AFW diesel driven pump
062K3.02	AC Electrical Distribution	4.1	4.4	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	ED/G
063A4.02	DC Electrical Distribution	2.8	2.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Battery voltage indicator
063K3.01	DC Electrical Distribution	3.7	4.1	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	ED/G

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
064K6.08	Emergency Diesel Generator	3.2	3.3	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Fuel oil storage tanks
073G2.1.25	Process Radiation Monitoring	3.9	4.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to interpret reference materials such as graphs, monographs and tables which contain performance data.
073G2.4.45	Process Radiation Monitoring	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to prioritize and interpret the significance of each annunciator or alarm.
076G2.1.7	Service Water	4.4	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior and instrument interpretation.
078A4.01	Instrument Air	3.1	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Pressure gauges
103A2 03	Containment	3.5	3.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Phase A and B isolation

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
002K4.07	Reactor Coolant	3.1	3.5	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	Contraction and expansion during heatup and cooldown
016K3.07	Non-nuclear Instrumentation	3.6	3.7	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	ECCS
028K2.01	Hydrogen Recombiner and Purge Control	2.5	2.8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Hydrogen recombiners
035A1.01	Steam Generator	3.6	3.8	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	S/G wide and narrow range level during startup, shutdown and normal operations
045A4.01	Main Turbine Generator	3.1	2.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	Turbine valve indicators (throttle, governor, control, stop, intercept), alarms and annunciators
055G2.1.20	Condenser Air Removal	4.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to execute procedure steps.
071K5.04	Waste Gas Disposal	2.5	3.1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	Relationship of hydrogen/oxygen concentrations to flammability
072A3.01	Area Radiation Monitoring	2.9	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	Changes in ventilation alignment
079K1.01	Station Air	3.0	3.1	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	IAS
086A2.04	Fire Protection	3.3	3.9	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Failure to actuate the FPS when required, resulting in fire damage

	KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
66	G2.1.13	Conduct of operations	2.5	3.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of facility requirements for controlling vital / controlled access.
67	G2.1.31	Conduct of operations	4.6	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup.
68	G2.1.38	Conduct of operations	3.7	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the stations requirements for verbal communication when implamenting procedures
69	G2.2.15	Equipment Control	3.9	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to determine the expected plant configuration using design and configuration control documentaion
70	G2.2.23	Equipment Control	3.1	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to track Technical Specification limiting conditions for operations.
71	G2.2.44	Equipment Control	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
72	G2.3.15	Radiation Control	2.9	3.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiation monitoring systems
73	G2.3.7	Radiation Control	3.5	3.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to comply with radiation work permit requirements during normal or abnormal conditions
74	G2.4.19	Emergency Procedures/Plans	3.4	4.1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of EOP layout, symbols and icons.
75	G2.4.40	Emergency Procedures/Plans	2.7	4.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of the SRO's responsibilities in emergency plan implementation.

SRO ONLY

ES-401, REV 9 **SRO T1G1 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

	KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
76	008AA2.20	Pressurizer Vapor Space Accident / 3	3.4	3.6	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	The effect of an open PORV on code safety, based on observation of plant parameters
77	015AA2.01	RCP Malfunctions / 4	3	3.5	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Cause of RCP failure
78	025AG2.4.50	Loss of RHR System / 4	4.2	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.
79	054AG2.4.35	Loss of Main Feedwater / 4	3.8	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of local auxiliary operator tasks during emergency and the resultant operational effects
80	058AG2.1.19	Loss of DC Power / 6	3.9	3.8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to use plant computer to evaluate system or component status.
81	BE04EA2.2	Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	3.6	4.4	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Adherence to appropriate procedures and operation within the limitations in the facility s license and amendments.

SRO only

ES-401, REV 9 **SRO T1G2 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
028AG2.4.47	Pressurizer Level Malfunction / 2	4.2	4.2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.
037AA2.01	Steam Generator Tube Leak / 3	3	3.4	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Unusual readings of the monitors; steps needed to verify readings
BE03EG2.4.6	Inadequate Subcooling Margin / 4	3.7	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge symptom based EOP mitigation strategies.
BE13EA2.1	EOP Rules	3.4	4	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Facility conditions and selection of appropriate procedures during abnormal and emergency

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SRO only

ES-401, REV 9 **SRO T2G1 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
006G2.2.42	Emergency Core Cooling	3.9	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to recognize system parameters that are entry-level conditions for Technical Specifications
007A2.03	Pressurizer Relief/Quench Tank	3.6	3.9	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Overpressurization of the PZR
061A2.08	Auxiliary/Emergency Feedwater	3.4	3.8	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	pump failure or improper operation
063G2.1.30	DC Electrical Distribution	4.4	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to locate and operate components, including local controls.
064G2.2.22	Emergency Diesel Generator	4.0	4.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of limiting conditions for operations and safety limits.

SRO only

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
016A2.01	Non-nuclear Instrumentation	3.0	3.1	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Detector failure
017G2.1.30	In-core Temperature Monitor	4.4	4.0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to locate and operate components, including local controls.
068G2.4.45	Liquid Radwaste	4.1	4.3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to prioritize and interpret the significance of each annunciator or alarm.

SRO only

ES-401, REV 9 **SRO T3 PWR EXAMINATION OUTLINE** **FORM ES-401-2**

KA	NAME / SAFETY FUNCTION:	IR RO	IR SRO	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	TOPIC:
G2.1.20	Conduct of operations	4.6	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to execute procedure steps.
G2.2.3	Equipment Control	3.8	3.9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	(multi-unit license) Knowledge of the design, procedural and operational differences between units.
G2.2.35	Equipment Control	3.6	4.5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to determine Technical Specification Mode of Operation
G2.3.12	Radiation Control	3.2	3.7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of radiological safety principles pertaining to licensed operator duties
G2.3.7	Radiation Control	3.5	3.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Ability to comply with radiation work permit requirements during normal or abnormal conditions
G2.4.13	Emergency Procedures/Plans	4.0	4.6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of crew roles and responsibilities during EOP usage.
G2.4.16	Emergency Procedures/Plans	3.5	4.4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines.

Tier / Group	Randomly Selected K/A	Reason for Rejection
2 / 1 Q 51	G2.1.25	This KA requires the interpretation of, for example, a graph or table. Because a document of this nature could not be found, a suitable question could not be constructed. Another KA was randomly selected from section G2.1 of the KA manual. (SMG)
2/1 Q 48	063 A4.02	Could not formulate a question that did not border on minutia due to the subject of the K/A – Battery Voltage Indicator. Randomly selected another K/A from the A4 section. (CDS)
SRO 1/1 Q 80	058 Gen. 2.1.19	Unable to write an acceptably-discriminating question at the SRO level for the K/A. Randomly selected another generic K/A from the list in NUREG 1021 ES-401.D.1.b (058 2.2.40) (TJF)
SRO T3 Q95	2.2.36	This is not a Multi Unit license facility. (GWA)
RO 1/1 Q18	BE04 G2.4.20	Not able to write RO level question. (GWA)
RO T3 Q74	2.4.19	Only EOP symbol would be immediate action steps. No discriminating question. (GWA)
RO 2/1 Q39	022K2.01	ANO-1 does not have containment chillers. Changed to fan cooling units. (GWA)
RO 2/1 Q46	061K2.01	ANO-1 does not have diesel AFW pump. (GWA)
SRO 2/1 Q89	063 Gen 2.1.30	Unable to write question at the SRO level for this KA which addresses ability to operate local controls. Replaced with Generic 2.2.42 which concerns Technical Specifications and is much more appropriate for SRO. (JWC-ANO)
RO 1/1 Q5	015 AA1.02	Unable to write question at the RO level for this KA since the question would be about nuclear trivia or a reference would need to be provided causing the question to be a direct lookup. Replaced with 015 AA1.05. (JWC-ANO)
RO 1/1 Q9	027 AK2.02	This exam bank question was originally linked to AK2.03, AK2.02 is not appropriate for this question therefore this KA was replaced. (JWC-ANO)
RO 2/2 Q 64	079 K1.01	Unit 1 no longer has a Service Air compressor. Unit 1 Service Air is supplied from Unit 2, Unit 1 simply has a Service Air header. Replaced with Instrument Air KA 078 K1.05. (JWC-ANO)
RO 1/1 Q 3	009EA1.13	Changed from RPS to ESFAS because of B&W Design.

RO 1/2 Q 25	BA06A.G.2.4.3	Tasks in-plant more appropriate post accident for RO.

Facility: ANO-1 Date of Examination: 2-25-2013

Examination Level: RO ☒ SRO ☐ Operating Test Number: 2013-1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations A1. 2.1.23 (Imp 4.3)	N/R	A1JPM-RO-TTB: Perform Time to Boil and Time to Core Uncovery calculations. Ability to perform specific system and integrated plant procedures during all modes of plant operation.
Conduct of Operations A2. 2.1.20 (Imp 4.6)	N/R	A1JPM-RO-SFPMU: Perform SF Pool makeup calculation. Ability to determine and interpret procedure steps.
Equipment Control A3. 2.2.13 (Imp 4.1)	D/P/R	A1JPM-RO-HCRD4: Perform independent review of a prepared tag out. Knowledge of tagging and clearance procedures.
Radiation Control A4. 2.3.7 (Imp 3.5)	M/R	A1JPM-NRC-ADMINRWP1: Review RWP and determine maximum stay time. Ability to comply with radiation work permit requirements during normal or abnormal conditions.
Emergency Procedures/Plan	N/A	N/A

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

* Type Codes & Criteria:

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

Facility: ANO-1 Date of Examination: 2-25-2013

Examination Level: RO ☐ SRO ☒ Operating Test Number: 2013-1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations A5. 2.1.23 (Imp 4.4)	N/R	A1JPM-SRO-TTB: Review Time to Boil and Time to Core Uncovery calculations. Ability to perform specific system and integrated plant procedures during all modes of plant operation.
Conduct of Operations A6. 2.1.20 (Imp 4.6)	N/R	A1JPM-SRO-FIRE3: Respond to a fire system annunciator using procedures and TRM. Ability to interpret and execute procedure steps.
Equipment Control A7. 2.2.13 (Imp 4.3)	D/P/R	A1JPM-SRO-HCRD4: Authorize a tag out. Knowledge of tagging and clearance procedures.
Radiation Control A8. 2.3.7 (Imp 3.6)	M/R	A1JPM-NRC-ADMINRWP1: Review RWP and determine maximum stay time. (same as RO) Ability to comply with radiation work permit requirements during normal or abnormal conditions.
Emergency Procedures/Plan A9. 2.4.41 (Imp 4.6)	N/R	A1JPM-SRO-EAL10: Evaluate conditions and declare an EAL. Knowledge of the emergency action level thresholds and classifications.

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

* Type Codes & Criteria:

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

Facility: Arkansas Nuclear One – Unit 1		Date of Examination: 2-25-2013
Exam Level: RO ☒ SRO-I ☒ SRO-U ☒		Operating Test No.: 2013-1
Control Room Systems@ (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
a. A1JPM-RO-EOP26 Perform Reactor Trip Immediate Actions 024 AK3.01 (RO 4.1/SRO 4.4) **RO/SRO-U/SRO-I**	A/D/EN/P/S	1 Reactivity Control
b. A1JPM-RO-LTOP2 Establish LTOP Protection during Cooldown of the RCS 006 A4.11 (RO 4.2/SRO 4.3) **RO/SRO-U/SRO-I**	D/L/S	3 Reactor Pressure Control
c. A1JPM-RO-MUP06 Perform RCS Delithiation 004 A1.11 (RO 3.0/SRO 3.0) **RO/SRO-I**	A/D/S	2 Reactor Coolant System Inventory Control
d. A1JPM-RO-AOP26 Respond to loss of Load Center B6 062 A2.01 (RO 3.4/SRO 3.9) **RO**	D/EN/S	6 Electrical
e. A1JPM-RO-HYD05 Place Hydrogen Recombiner M55A in Operation 028 A4.01 (RO 4.0/SRO 4.0) **RO/SRO-I**	A/N/L/S	5 Containment Integrity
f. A1JPM-RO-RPS01 Perform placing a RPS channel in Manual bypass 012 A4.03 (RO 3.6/SRO 3.6) **RO/SROU/SRO-I**	D/S	7 Instrumentation

g. A1JPM-RO-EOP21 Respond to Reactor Trip (Check both SG levels remain ≤ 410") 035 K4.01 (RO 3.6/SRO 3.8) **RO/SRO-I**	A/D/EN/L/S	4 Heat Removal From Reactor Core (Primary)
h. A1JPM-RO-ICW01 Contingency Actions for Loss of Two ICW pumps 008 A2.01 (RO 3.3/SRO 3.6) **RO/SRO-I**	D/S	8 Plant Service Systems
In-Plant Systems@ (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. A1JPM-RO-EFW05 Actions for CST Overheating due to Long Term Operation of EFW 061 A1.04 (RO 3.9/SRO 3.9) **RO/SRO-U/SRO-I**	L/N/E/R	4 Heat Removal From Reactor Core (Secondary)
j. A1JPM-RO-EDG13 DG1 Engine start at slow idle 064 A1.01 (RO 3.0/SRO 3.1) **RO/SRO-U/SRO-I**	A/D	6 Electrical
k. A1JPM-RO-GRW01 Commence Waste Gas Release 071 A4.26(RO 3.1/SRO 3.9) **RO/SRO-I**	D/P/R	9 Reactivity Release
@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.		

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

Facility: **ANO** Date of Exam: **2/25/2013** Operating Test No.: **2013-1**

APPLICANT	EVENT TYPE	Scenarios									TOTAL	MINIMUM(*)		
		1			2			3						
		CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO R1, R3 R6, R8	RX					3					**1**	1	1	0
	NOR			1							**1**	1	1	1
	I/C			2, 6		5, 6, 7					**5**	4	4	2
	MAJ			5, 8		6, 8					**4**	2	2	1
	TS										**0**	0	2	2
RO R2, R5	RX		3								**1**	1	1	0
	NOR									1	**1**	1	1	1
	I/C		4, 7							4, 5, 9	**5**	4	4	2
	MAJ		5, 8							6, 7	**4**	2	2	1
	TS										**0**	0	2	2
RO R4, R7	RX								3		**1**	1	1	0
	NOR						1, 2		8		**3**	1	1	1
	I/C						4, 9		4, 6, 9		**5**	4	4	2
	MAJ						6, 8		6, 7		**4**	2	2	1
	TS										**0**	0	2	2
SRO-I S1, S2	RX		3								**1**	1	1	0
	NOR				1, 2, 3						**3**	1	1	1
	I/C		4, 7		4, 5, 6, 7, 9						**7**	4	4	2
	MAJ		5, 8		6, 8						**4**	2	2	1
	TS				5, 7, 9						**3**	0	2	2
SRO-U U1, U4	RX										**0**	1	1	0
	NOR	3					1, 2				**3**	1	1	1
	I/C	1, 2, 4, 6, 7					4, 9				**7**	4	4	2
	MAJ	5,8					6, 8				**4**	2	2	1
	TS	1, 2, 7, 8									**4**	0	2	2
SRO-U U2, U3	RX										**0**	1	1	0
	NOR	3			1, 2, 3			1, 3			**6**	1	1	1
	I/C	1, 2, 4, 6, 7			4, 5, 6, 7, 9			4, 6, 9			**13**	4	4	2
	MAJ	5, 8			6, 8			6, 7			**6**	2	2	1
	TS	1, 2, 7, 8			5, 7, 9						**7**	0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an Instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

Facility: **ANO-1** Scenario No.: **1** Op-Test No.: **2013-1**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:
- 100% Power.
- EFIC failed and will not auto-actuate.
- C-28B IA Compressor is out of service for overhaul.
- CV-3806 SW to #1 EDG is failed closed.
- #2 EDG will not Auto-Start.
- Provide picture of RS-4.

Turnover:
- Day shift – normal working day.
- C-28B IA Compressor is out of service for overhaul.
- Currently in a Severe Thunderstorm Warning for the next hour. All required actions of 1203.025, Natural Emergencies have been completed.
- Need to Drain RB Sump to 40%. This is not the first draining of the month and sampling is not required.

Event No.	Malf. No.	Event Type*	Event Description
1	CV-4400	N-(BOP) C-(SRO) **TS**	Perform draining of the Reactor Building Sump per 1104.014 with failure of CV-4400 to close. (Technical Specification 3.6.3, Reactor Building Isolation Valves)
2	Lightning strike DI-DG1S K01A1	N/A	Lightning strike #1 EDG auto-start #1 EDG Auto Start alarm
	CV-3806	C-(BOP) C-(SRO) **TS**	#1 EDG SW valve fails to open. #1 EDG shutdown
3	N/A	R-(ATC) N-(SRO)	Dispatcher directs a power reduction to 700MW in the next 15 minutes,
4	Lightning strike ED451	I-(ATC) I-(SRO)	Lighting strike Loss of NNI-Y power supply
5	ED183	M-(ALL)	Loss of Offsite Power/Degraded Power
6	DG176 DI_DG2_VR-LW	C-(BOP) C-(SRO) **CT**	#2 EDG will not auto start #2 EDG voltage low (<4100V)
7	FW621	C-(ATC) C-(SRO) **CT TS**	EFIC fails
8	DG173	M-(ALL) **TS**	#2 EDG will trip
	A901	N/A **CT**	Alternate AC Generator available

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

Facility: **ANO-1** Scenario No.: **2** Op-Test No.: **2013-1**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:
- 12 EFPD BOL
- Reactor Power ~2%
- Ready to place "A" MFW pump in service per step 17.16 of 1102.002 Plant Startup procedure.

Turnover:
- Reactor Power is ~2%
- Ready to place the "A" MFW pump is service and secure P-75 AFW pump.
- Commence raising power when "A" MFW pump is in service.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N-(BOP) N-(SRO)	Place "A" MFW Pump in service and secure P-75 Aux FW pump.
2	N/A	N-(BOP) N-(SRO) **CT**	Reset anticipatory trip (ARTS) for the "A" MFW pump.
3	N/A	R-(ATC) N-(SRO)	Commence power escalation to 7% power.
4	CV6604	C-(BOP) C-(SRO)	Gland Seal regulator fails closed.
5	TR049	I-(ATC) I-(SRO) **TS**	Controlling Pressurizer level instrument fails low
6	ED452	C-(ATC) C-(SRO) M-(ALL)	Loss of ICS power requiring Manual Reactor Trip EFW Actuation.
7	CV2648 CV2626	C-(ATC) C-(SRO) **TS**	Failed EFW control valves cause overcooling
8	RC005	M-(ALL) **CT**	LOCA resulting in ESAS actuation and LOSM (Trip all RCPs within 2 minutes of LOSM)
9	ES660	C-(BOP) C-(SRO) **TS**	ES Standby HPI pump fails to auto-start

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

Facility: **ANO-1** Scenario No.: **3** Op-Test No.: **2013-1**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:
- 100% Power.
- EFIC failed and will not auto-actuate.
- P-4A Service Water Pump out of service for motor replacement.
- RPS is failed.
- Rx Trip pushbutton on C03 is failed

Turnover:
- P-4A Service Water Pump out of service for motor replacement.
- Add N2 to "A" CFT to ~585# per 1104.001 per step 11.0.
-

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N-(BOP) N-(SRO)	Add N2 to "A" CFT to raise pressure to ~585#
2 & 3	FW086	N/A	P-8A heater drain pump winding failure and trip
	N/A	R-(ATC) N-(SRO)	Power Reduction
4	TR580	I-(ATC) I-(BOP) I-(SRO)	Controlling Header Pressure fails low
5	CO_P14B CO_P14A DI_ICC0020	C-(BOP)	Operating EH pump trips Turbine trip >43%
6	RP246,7,8,9	C-(ATC) C-(SRO) **TS**	RPS is failed
	DI_ICC0020	C-(ATC) **TS**	C03 manual trip pushbutton failed
		M-(ALL) **CT**	Manual Reactor Trip
7 & 8	RC002	M-(ALL) **TS** **CT**	~150 GPM tube leak in the "B" SG
	N/A	N-(ATC)	Plant cooldown and depressuization
9	CV061	C-(ALL)	Operating HPI Pump trips

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

Facility: **ANO-1** Scenario No.: **4 R2** Op-Test No.: **2013-1**

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions:
- 100% MOL; Severe Thunderstorm Warning for Pope and Conway counties.
- #2 EDG Tagged out for repairs.

Turnover:
- National Weather service has issued a Severe Thunderstorm Warning for Pope and Conway Counties until 8:00 pm today. AOP 1203.025, Natural Emergencies, Section 3, Tornado Watch /Severe Thunderstorm Warning, all required actions have been completed.
- #2 EDG OOS for fuel leak repairs. 1104.036 Supplement 11 starting at step 2.4 is due right after turn-over.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (ALL)	Perform 1104.036 Supplement 11 for EDG #1.
2	TR568	I (ATC)	"A" OTSG operating level transmitter fails high.
3	DI_RX7460S DI_RX7460SP	I (SRO) **TS**	RB atmosphere radioactivity monitor fails low. TS 3.4.15 determination.
4	N/A	R (ATC) C (SRO) **TS**	#1 EDG inoperability (common mode) requires plant shutdown to comply with Technical Specifications.
5	RX150	I (BOP) **CT**	Turbine EHC fails to respond in auto mode for ICS (manual control required).
6	CV2692	C (ATC) **CT**	One MSIV for "B" OTSG drifts shut-requires manual reactor trip per EOP 1202.001.
7	MS131	M (ALL)	"A" OTSG steam leak in containment (MSLI activates). Transfer to 1202.003 overcooling if necessary.
8	ES264 CV2214	I (ATC) C (BOP) **TS**	Containment pressure >4psig but "B" train RBIC will fail to actuate automatically and an ICW isolation valve will fail open that should shut. Operator will be required to manually initiate "B" RBIC and verify shut the redundant ICW valve to ensure ICW isolated.

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