

PWR RO Examination Outline

Printed 07/13/2007

Facility: PVNGS

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			EA1.03 - RCS pressure and temperature	4.2	1
000008 Pressurizer Vapor Space Accident / 3					X		AA2.24 - Value at which turbine bypass valve maintains header pressure after a reactor trip	2.6	1
000009 Small Break LOCA / 3						X	2.4.15 - Knowledge of communications procedures associated with EOP implementation.	3.0	1
000011 Large Break LOCA / 3						X	2.3.2 - Knowledge of facility ALARA program.	2.5	1
000015/000017 RCP Malfunctions / 4		X					AK2.10 - RCP indicators and controls	2.8*	1
000022 Loss of Rx Coolant Makeup / 2			X				AK3.07 - Isolating charging	3.0*	1
000025 Loss of RHR System / 4					X		AA2.07 - Pump cavitation	3.4	1
000026 Loss of Component Cooling Water / 8				X			AA1.06 - Control of flow rates to components cooled by the CCWS	2.9	1
000027 Pressurizer Pressure Control System Malfunction / 3				X			AA1.01 - PZR heaters, sprays, and PORVs	4.0	1
000029 ATWS / 1	X						EK1.01 - Reactor nucleonics and thermo-hydraulics behavior	2.8	1
000038 Steam Gen. Tube Rupture / 3	X						EK1.03 - Natural circulation	3.9	1
000055 Station Blackout / 6						X	2.2.12 - Knowledge of surveillance procedures.	3.0	1
000056 Loss of Off-site Power / 6			X				AK3.02 - Actions contained in EOP for loss of offsite power	4.4	1
000057 Loss of Vital AC Inst. Bus / 6			X				AK3.01 - Actions contained in EOP for loss of vital ac electrical instrument bus	4.1	1
000058 Loss of DC Power / 6	X						AK1.01 - Battery charger equipment and instrumentation	2.8	1
000065 Loss of Instrument Air / 8					X		AA2.06 - When to trip reactor if instrument air pressure is decreasing	3.6*	1
CE/E05 Steam Line Rupture - Excessive Heat Transfer / 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	3.7	1
CE/E06 Loss of Main Feedwater / 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	3.5	1

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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

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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			AA1.03 - Reactor building containment evacuation alarm enable switch	3.5	1
000037 Steam Generator Tube Leak / 3					X		AA2.02 - Agreement/disagreement among redundant radiation monitors	3.4	1
000059 Accidental Liquid RadWaste Rel. / 9						X	2.1.28 - Knowledge of the purpose and function of major system components and controls.	3.2	1
000060 Accidental Gaseous Radwaste Rel. / 9			X				AK3.03 - Actions contained in EOP for accidental gaseous-waste release	3.8	1
000061 ARM System Alarms / 7					X		AA2.06 - Required actions if alarm channel is out of service	3.2	1
000069 Loss of CTMT Integrity / 5		X					AK2.03 - Personnel access hatch and emergency access hatch	2.8*	1
000074 Inad. Core Cooling / 4				X			EA1.27 - ECCS valve control switches and indicators	4.2	1
CE/A11 RCS Overcooling - PTS / 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	3.2	1
CE/A13 Natural Circ. / 4	X						EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the (Natural Circulation Operations)	3.1	1

K/A Category Totals: 1 2 1 2 2 1

Group Point Total: 9

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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
003 Reactor Coolant Pump					X							K5.03 - Effects of RCP shutdown on T-ave., including the reason for the unreliability of T-ave. in the shutdown loop	3.1	1
004 Chemical and Volume Control					X							K5.30 - Relationship between temperature and pressure in CVCS components during solid plant operation	3.8	1
004 Chemical and Volume Control								X				A2.02 - Loss of PZR level (failure mode)	3.9	1
005 Residual Heat Removal				X								K4.10 - Control of RHR heat exchanger outlet flow	3.1	1
006 Emergency Core Cooling				X								K4.17 - Safety Injection valve interlocks	3.8	1
007 Pressurizer Relief/Quench Tank			X									K3.01 - Containment	3.3	1
007 Pressurizer Relief/Quench Tank					X							K5.02 - Method of forming a steam bubble in the PZR	3.1	1
008 Component Cooling Water	X											K1.01 - SWS	3.1	1
010 Pressurizer Pressure Control				X								K4.01 - Spray valve warm-up	2.7	1
012 Reactor Protection						X						K6.11 - Trip setpoint calculators	2.9*	1
013 Engineered Safety Features Actuation						X						K6.01 - Sensors and detectors	2.7*	1
013 Engineered Safety Features Actuation										X		A4.03 - ESFAS initiation	4.5	1
022 Containment Cooling	X											K1.04 - Chilled water	2.9*	1
026 Containment Spray							X					A1.01 - Containment pressure	3.9	1
039 Main and Reheat Steam			X									K3.04 - MFW pumps	2.5*	1
039 Main and Reheat Steam											X	2.2.22 - Knowledge of limiting conditions for operations and safety limits.	3.4	1
059 Main Feedwater							X					A1.03 - Power level restrictions for operation of MFW pumps and valves	2.7*	1
059 Main Feedwater											X	2.4.26 - Knowledge of facility protection requirements including fire brigade and portable fire fighting equipment usage.	2.9	1
061 Auxiliary/Emergency Feedwater		X										K2.02 - AFW electric driven pumps	3.7*	1
062 AC Electrical Distribution	X											K1.04 - Off-site power sources	3.7	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
062 AC Electrical Distribution										X		A4.04 - Local operation of breakers	2.6	1
063 DC Electrical Distribution								X				A2.01 - Grounds	2.5	1
064 Emergency Diesel Generator								X				A2.11 - Conditions (minimum load) required for unloading an ED/G	2.6	1
073 Process Radiation Monitoring			X									K3.01 - Radioactive effluent releases	3.6	1
076 Service Water		X										K2.04 - Reactor building closed cooling water	2.5*	1
078 Instrument Air									X			A3.01 - Air pressure	3.1	1
103 Containment							X					A1.01 - Containment pressure, temperature, and humidity	3.7	1
103 Containment									X			A3.01 - Containment isolation	3.9	1

K/A Category Totals: 3 2 3 3 3 2 3 3 2 2 2

Group Point Total: 28

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Plant Systems - Tier 2 / Group 2

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Sys/Evol # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
001 Control Rod Drive		X										K2.01 - One-line diagram of power supply to M/G sets	3.5	1
011 Pressurizer Level Control					X							K5.09 - Reason for manually controlling PZR level	2.6	1
015 Nuclear Instrumentation							X					A1.08 - Changes in RCS temperature	3.3*	1
016 Non-nuclear Instrumentation										X		A4.01 - NNI channel select controls	2.9*	1
017 In-core Temperature Monitor						X						K6.01 - Sensors and detectors	2.7	1
028 Hydrogen Recombiner and Purge Control								X				A2.02 - LOCA condition and related concern over hydrogen	3.5	1
033 Spent Fuel Pool Cooling			X									K3.03 - Spent fuel temperature	3.0	1
055 Condenser Air Removal	X											K1.06 - PRM system	2.6	1
072 Area Radiation Monitoring				X								K4.03 - Plant ventilation systems	3.2*	1
075 Circulating Water											X	2.1.1 - Knowledge of conduct of operations requirements.	3.7	1

K/A Category Totals: 1 1 1 1 1 1 1 1 0 1 1

Group Point Total: 10

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-3

<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.14	Knowledge of system status criteria which require the notification of plant personnel.	2.5	1
	2.1.23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	3.9	1
	Category Total:			2
Equipment Control	2.2.11	Knowledge of the process for controlling temporary changes.	2.5	1
	2.2.12	Knowledge of surveillance procedures.	3.0	1
	2.2.34	Knowledge of the process for determining the internal and external effects on core reactivity.	2.8	1
	Category Total:			3
Radiation Control	2.3.9	Knowledge of the process for performing a containment purge.	2.5	1
	2.3.11	Ability to control radiation releases.	2.7	1
	Category Total:			2
Emergency Procedures/Plan	2.4.5	Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.	2.9	1
	2.4.18	Knowledge of the specific bases for EOPs.	2.7	1
	2.4.21	Knowledge of the parameters and logic used to assess the status of safety functions including: 1. Reactivity control; 2. Core cooling and heat removal; 3. Reactor coolant system integrity; 4. Containment conditions; 5. Radioactivity release control.	3.7	1
	Category Total:			3

Generic Total: 10

PWR SRO Examination Outline

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Facility: PVNGS

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
033 Spent Fuel Pool Cooling								X				A2.03 - Abnormal spent fuel pool water level or loss of water level	3.5	1
056 Condensate								X				A2.04 - Loss of condensate pumps	2.8*	1
075 Circulating Water								X				A2.03 - Safety features and relationship between condenser vacuum, turbine trip, and steam dump	2.7*	1

K/A Category Totals: 0 0 0 0 0 0 0 0 3 0 0 0

Group Point Total: 3

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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
006 Emergency Core Cooling								X				A2.03 - System leakage	3.7	1
010 Pressurizer Pressure Control											X	2.4.1 - Knowledge of EOP entry conditions and immediate action steps.	4.6	1
012 Reactor Protection								X				A2.04 - Erratic power supply operation	3.2	1
013 Engineered Safety Features Actuation											X	2.2.18 - Knowledge of the process for managing maintenance activities during shutdown operations.	3.6	1
022 Containment Cooling								X				A2.01 - Fan motor over-current	2.7	1

K/A Category Totals: 0 0 0 0 0 0 0 0 3 0 0 2

Group Point Total: 5

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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
000061 ARM System Alarms / 7						X	2.2.6 - Knowledge of the process for making changes in procedures as described in the safety analysis report.	3.3	1
000068 Control Room Evac. / 8					X		AA2.02 - Local boric acid flow	4.2*	1
000074 Inad. Core Cooling / 4					X		EA2.08 - The effect of turbine bypass valve operation on RCS temperature and pressure	4.6*	1
CE/E09 Functional Recovery					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	4.0	1

K/A Category Totals: 0 0 0 0 3 1

Group Point Total: 4

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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
000007 Reactor Trip - Stabilization - Recovery / 1					X		EA2.04 - If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP	4.4	1
000008 Pressurizer Vapor Space Accident / 3						X	2.4.1 - Knowledge of EOP entry conditions and immediate action steps.	4.6	1
000011 Large Break LOCA / 3					X		EA2.11 - Conditions for throttling or stopping HPI	4.3	1
000025 Loss of RHR System / 4					X		AA2.03 - Increasing reactor building sump level	3.8	1
000054 Loss of Main Feedwater / 4						X	2.4.47 - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	3.7	1
000065 Loss of Instrument Air / 8					X		AA2.08 - Failure modes of air -operated equipment	3.3	1

K/A Category Totals: 0 0 0 0 4 2

Group Point Total: 6

Generic Knowledge and Abilities Outline (Tier 3)

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<u>Generic Category</u>	<u>KA</u>	<u>KA Topic</u>	<u>Imp.</u>	<u>Points</u>
Conduct of Operations	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.4	1
	2.1.10	Knowledge of conditions and limitations in the facility license.	3.9	1
	2.1.34	Ability to maintain primary and secondary plant chemistry within allowable limits.	2.9	1
Category Total:				3
Equipment Control	2.2.3	(multi-unit) Knowledge of the design, procedural, and operational differences between units.	3.3	1
	Category Total:			
Radiation Control	2.3.3	Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g., waste disposal and handling systems).	2.9	1
	2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	3.1	1
	Category Total:			
Emergency Procedures/Plan	2.4.46	Ability to verify that the alarms are consistent with the plant conditions.	3.6	1
	Category Total:			
Generic Total:				7

PVNGS License Examination
Record of Rejected K/As

Exam Date 07/20/07

PVNGS Form ES-401-4

Tier / Group	Randomly Selected K/As	Reason for Rejection
1/1	EA2.12	No Reflux Boiling Spray available at PVNGS
1/1	AK3.02	Unable to develop a psychometrically sound question related SDC loop isolation during pressure increase
1/1	2.4.23	Unable to develop a psychometrically sound question relating Inst Air and prioritizing EOPs
1/1	AA2.03	Duplicate System and KA to SRO exam
1/2	AK3.09	PVNGS has no Load Change limits associated with a SGTL
1/2	AA2.01	No failure-indication light system associated with a radioactive liquid monitor at PVNGS
1/2	AA1.17	No bistable lights for Turbine Stop Valves at PVNGS
2/1	K4.27	NO Emergency Core Cooling accumulator Isolation valve at PVNGS
2/1	A1.05	Containment Spray chemical addition tanks abandoned at PVNGS
2/2	A3.01	No temperature control valves associated with Spent Fuel Pool cooling at PVNGS
1/1	2.1.34	(SRO) Unable to develop a psychometrically sound question related to Chemistry control and a small break LOCA
1/1	EA2.2	(SRO) Unable to develop a psychometrically sound question (good distracters) related to depressurizing the good SG during an ESD
1/2	2.2.14	(SRO) Unable to develop a psychometrically sound question related continuous CEA withdrawal and configuration changes
2/2	2.4.5	(SRO) Unable to develop a psychometrically sound question relating to Fuel Handling Equipment and procedure organization

