

Facility: _____		Date of Examination: _____
Examination Level: RO <input type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: _____
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations		
Conduct of Operations		
Equipment Control		
Radiation Control		
Emergency Procedures/Plan		
<p>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.</p>		
<p>* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1; randomly selected)</p>		

Facility: <u>Palo Verde</u>		Date of Examination: <u>11/04/13</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: _____
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R, D	[SRO A-1] Review 40DP-9OP06, Ops Department Repetitive Task Program, Appendix EC003, interpret data, take actions and determine appropriate Technical Specification LCO condition. K/A: 2.1.20 Ability to interpret and execute procedure steps. Importance Rating: 4.6
Conduct of Operations	R, N	[SRO A-2] Ensure crew compliance with Fatigue Rule program. K/A: 2.1.5 Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc. Importance Rating: 3.9
Equipment Control	R, M	[SRO A-3] Ensure compliance with Technical Specifications with regards to MSIVs. K/A: 2.2.22 Knowledge of limiting conditions for operations and safety limits. Importance Rating: 4.1
Radiation Control	R, M	[SRO A-4] Calculate dose, whose permission is needed to complete the task, and the required area posting. K/A: 2.3.13 Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. Importance Rating: 3.8
Emergency Procedures/Plan	R, N	[SRO A-5] Classify an event. K/A: 2.4.41 Knowledge of the emergency action level thresholds and classifications. Importance Rating: 4.6
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 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1; randomly selected)		

Facility: _____ Exam Level: RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Date of Examination: _____ Operating Test No.: _____	
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.			
b.			
c.			
d.			
e.			
f.			
g.			
h.			
In-Plant Systems® (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i.			
j.			
k.			
@ 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 (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator		4-6 / 4-6 / 2-3 $\leq 9 / \leq 8 / \leq 4$ $\geq 1 / \geq 1 / \geq 1$ - / - / ≥ 1 (control room system) $\geq 1 / \geq 1 / \geq 1$ $\geq 2 / \geq 2 / \geq 1$ $\leq 3 / \leq 3 / \leq 2$ (randomly selected) $\geq 1 / \geq 1 / \geq 1$	

Facility: <u>PVNGS</u>		Date of Examination: <u>11/04/13</u>	
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: _____	
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. [S-1] Throttle HPSI, Restore HPSI Flow In Response to Degrading Condition (K/A: 3.2 006 A4.07)	A, EN, N, L, S	2	
b. [S-2] SG Level Reduction (K/A: 3.4 035 A2.01)	D, L, S	4P	
c. [S-3] Fill a SIT (K/A: 3.3 006 A1.13)	P, S	3	
d. [S-4] Respond to a Loss of Nuclear Cooling Water (K/A: 3.8 008 A2.07)	D, A, S	8	
e. [S-5] Transfer 13.8 kV buses (K/A: 3.6 062 A4.01)	A, D, S	6	
f. [S-6] Calibration of Control Channel NI - 40OP-9NI01 (K/A: 3.7 015 A4.02)	N, S	7	
g. [S-9] CEA Operability Checks - 40ST-9SF01 (K/A: 3.1 001 A2.11)	A, N, L, S	1	
h.			
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i. [P-1] Start AFN Locally (K/A: 3.4 061 A2.03)	A, D, E, L	4S	
j. [P-2] X-tie EW Train B to SFP cooling (K/A: 3.8 033 A2.02)	D, E, R	8	
k. [P-3] Line Up OW Sumps During SGTR (K/A: 4.2 037 AK3.06)	D, E	3	
@ 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 / 4-6 / 2-3		
(C)ontrol room			
(D)irect from bank	$\leq 9 / \leq 8 / \leq 4$		
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$		
(EN)gineered safety feature	- / - / ≥ 1 (control room system)		
(L)ow-Power / Shutdown	$\geq 1 / \geq 1 / \geq 1$		
(N)ew or (M)odified from bank including 1(A)	$\geq 2 / \geq 2 / \geq 1$		
(P)revious 2 exams	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)		
(R)CA	$\geq 1 / \geq 1 / \geq 1$		
(S)imulator			

Facility: <u>PVNGS</u>		Date of Examination: <u>11/04/13</u>	
Exam Level: RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/>		Operating Test No.: _____	
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.	[S-1] Throttle HPSI, Restore HPSI Flow In Response to Degrading Condition (K/A: 3.2 006 A4.07)	A, EN, N, L, S	2
b.	[S-2] SG Level Reduction (K/A: 3.4 035 A2.01)	D, L, S	4P
c.	[S-9] CEA Operability Checks - 40ST-9SF01 (K/A: 3.1 001 A2.11)	A, N, L, S	1
d.			
e.			
f.			
g.			
h.			
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)			
i.	[P-1] Start AFN Locally (K/A: 3.4 061 A2.03)	A, D, E, L	4S
j.	[P-2] X-tie EW Train B to SFP cooling (K/A: 3.8 033 A2.02)	D, E, R	8
k.			
@ 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 (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power / Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator		4-6 / 4-6 / 2-3 $\leq 9 / \leq 8 / \leq 4$ $\geq 1 / \geq 1 / \geq 1$ - / - / ≥ 1 (control room system) $\geq 1 / \geq 1 / \geq 1$ $\geq 2 / \geq 2 / \geq 1$ $\leq 3 / \leq 3 / \leq 2$ (randomly selected) $\geq 1 / \geq 1 / \geq 1$	

Facility: PVNGS Scenario No.: 1 Op-Test No: 2013

Examiners: _____ Operators: _____

Initial Conditions: (100% power, MOC).

Turnover: Unit 1 is at 100% power (250 EFPD). HPSI "A" Pump is tagged out.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N BOP/SRO	Shift Condenser AR Pumps to ARN-P01D running with ARN-P01B shutdown for preventative maintenance in accordance with 40OP-9AR01, Condenser Air Removal, Section 6.2.
2	cmTRRC03RCNPT100X_4	I ATC/SRO	PT-100X fails low. Crew will select "Y" on Pressurizer Pressure Control selector switch and will reset the proportional heaters in accordance with alarm response. 40AL-9RK4A, Panel B04A Alarm Responses
3	mfTH06A f:0.6	C ALL (AOP/TS)	Small Steam Generator #1 tube leak requires entry into 40AO-9ZZ02, Excessive RCS Leakrate. [LCO 3.4.14 CONDITION B; LCO 3.4.18 CONDITION B] Tube leak is on Steam Generator 1 with a leakrate of ~8.1 gpm.
4	cmTRRX12SGBLT1123B_4	I BOP/SRO (TS)	CH B Steam Generator #2 WR Level Transmitter will fail low. Crew will address Technical Specifications and bypass affected channel and bistables in accordance with alarm response, 40AL-9RK5B, Panel B05B Alarm Responses. [LCO 3.3.1 CONDITION A; LCO 3.3.5 CONDITION A; LCO 3.3.11 CONDITION A]
5	cmCPTP04TCNP01B_5 cmCPTP04TCNP01A_1	C BOP/SRO (AOP)	Running Turbine Cooling Water pump 'A' experiences a shaft shear but will not trip and standby pump ('B') will fail to automatically start requiring crew to start manually. Crew will enter 40AO-9ZZ03, Loss of Cooling Water.
6	modify mfTH06A f:20	M ALL	Steam Generator #1 tube leak will degrade to beyond charging pump capacity. Crew will trip perform a Reactor Trip due to meeting criteria. 40EP-9EO01, SPTAs
7	mfMS03A f:30 r:5:00	M ALL	On the Reactor Trip, an ESD will develop on the affected Steam Generator (#1). This will require entry into 40EP-9EO09, Functional Recovery Procedure. CRITICAL TASK – Once SPTAs completed and FRP is entered, establish 1360-1600 gpm feed to ruptured Steam Generator prior to exiting HR-2 of FRP.
8	cmCPCC08SPAP01_5	C ATC/SRO	Spray Pond pump "A" will fail to auto start. Crew will manually start pump to supply cooling water to a running (unloaded) Diesel Generator.
9	cmBSRP01BSPZRPRLOAT_1 cmBSRP01BSPZRPRLOBT_1 cmBSRP01BSPZRPRLOCT_1 cmBSRP01BSPZRPRLODT_1	C BOP/SRO	SIAS/CIAS will fail to automatically initiate on low pressurizer pressure (1837 psia) requiring the crew to manually initiate. CRITICAL TASK – When the SIAS/CIAS setpoint is exceeded, manually initiate SIAS and CIAS prior to completion of SPTAs.
End point			Scenario may be ended once SIAS and CIAS have been manually initiated and Steam Generator #1 is being fed at 1360-1600 gpm.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	2
4. Major transients (1-2)	2
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical tasks (2-3)	2

CRITICAL TASK	JUSTIFICATION
Once SPTAs completed and FRP is entered, establish 1360-1600 gpm feed to ruptured Steam Generator prior to exiting HR-2 of FRP.	FSAR Chapter 15.6.3 analysis for a Steam Generator Tube Rupture event requires the establishment of a minimum 1360 in order to ensure tube coverage within the design basis time (>45% NR SGWL) to minimize dose to the public.
When the SIAS/CIAS setpoint is exceeded, manually initiate SIAS and CIAS prior to completion of SPTAs.	This task is a condition of license. Inadequate Safety Injection and Containment Isolation may result in loss of subcooled margin, core uncover, and/or degradation of a barrier to fission product release.

TURNOVER

Plant conditions:

Unit 1 is at 100% power.

The core is presently at 250 EFPD.

Risk Management Action Level is GREEN

HPSI "B" Pump is protected in accordance with 40DP-9AP21, Protected Equipment

Train B is protected.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

Equipment out of service:

HPSI "A" Pump is under clearance for bearing inspection. LCO 3.5.3 Condition B has been entered.

The pump is expected to return to service in 8 hours.

Planned shift activities:

Shift Condenser Air Removal Pumps to ARN-P01D running with ARN-P01B shutdown in preparation for preventative maintenance in accordance with **40OP-9AR01, Condenser Air Removal, Section 6.2.**

Sections 6.2.1 and 6.2.2 have been completed. An area operator has been briefed and is standing by.

CREW HANDOUT

Plant conditions:

Unit 1 is at 100% power.

The core is presently at 250 EFPD.

Risk Management Action Level is GREEN

HPSI "B" Pump is protected in accordance with 40DP-9AP21, Protected Equipment

Train B is protected.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

Equipment out of service:

HPSI "A" Pump is under clearance for bearing inspection. LCO 3.5.3 Condition B has been entered. The pump is expected to return to service in 8 hours.

Planned shift activities:

Shift Condenser Air Removal Pumps to ARN-P01D running with ARN-P01B shutdown in preparation for preventative maintenance in accordance with **40OP-9AR01, Condenser Air Removal, Section 6.2.**

Sections 6.2.1 and 6.2.2 have been completed. An area operator has been briefed and is standing by.

Facility: PVNGS Scenario No.: 2 Op-Test No.: 2013

Examiners: _____ Operators: _____

Initial Conditions: (2% power, MOC).

Turnover: Unit 1 is at ~2% power (200 EFPD). AFA-P01 is tagged out.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N BOP/SRO	Shift Stator Cooling Water pumps to P01A running with P01B in standby (including Auto Start Test) in accordance with 40OP-9CE01, Stator Cooling System, Section 6.5.
2	cmTRCH05HCCPT352C_1	I BOP/SRO (TS)	Channel 'C' Containment Pressure Transmitter fails high requiring the crew to bypass the affected channel and the CRS to address Technical Specifications. [LCO 3.3.5 CONDITION A] 41AL-1RK5A, Panel B05A Alarm Responses
3	cmTRCV01CHBTT221_1 f:550	I ATC/SRO (AOP)	Regen Heat Exchanger Letdown Temperature transmitter, CHB-TT-221 fails high causing CHB-UV-515 to isolate. Crew takes action in accordance with 40AL-9RK3A, Panel B03A Alarm Responses and 40AO-9ZZ05, Loss of Letdown for extended operations without letdown.
4	mfED10B rfEG40 f:500	C ATC/SRO (AOP/TS)	NBN-X04 faults. The DG 'B' governor fails low resulting in the diesel failing to come up to the required speed for the output breaker to automatically close causing a LOP of PBB-S04. [LCO 3.8.1 CONDITIONS A, B, and D; LCO 3.8.4 CONDITION C] 40AO-9ZZ12, Degraded Electrical
5	mfMS07 f:10	M ALL	ESD on common Main Steam common header outside containment. 40EP-9EO05, Excessive Steam Demand.
6	Scenario File "noMSIS"	C BOP/SRO	MSIS will fail to automatically initiate (setpoint 960 psia). CRITICAL TASK – Crew manually initiates MSIS after initiation setpoints are exceeded prior to completion of the SPTAs.
7	mfRD03G mfRD03L mfRD03M cmMVCV08CHEHV536_4	C ATC/SRO	Multiple CEAs stick out on the reactor trip. CHE-HV-536 fails to AUTO-Open. CRITICAL TASK – Crew establishes > 44 gpm boration prior to completion of the SPTAs. 40EP-9EO01, SPTAs
8	mfED02	M ALL	Loss of Grid on Reactor Trip.
9	mfFW21A	C ALL	Trip of AFN-P01. CRITICAL TASK – Implement the FRP to restore power to PBB-S04 and establish AFW flow to the SGs prior to completion of HR-2. 40EP-9EO09, Functional Recovery Procedure
End point	Crew has restored AFW flow to the SGs		

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	3
3. Abnormal events (2-4)	2
4. Major transients (1-2)	2
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical tasks (2-3)	3

CRITICAL TASK	JUSTIFICATION
Crew manually initiates MSIS after initiation setpoints are exceeded prior to completion of the SPTAs.	An MSIS ensures acceptable consequences during a Main Steam Line Break and will isolate both steam generators in the event of a low pressure condition. This prevents an excessive rate of heat removal and subsequent cooldown of the RCS.
Crew establishes > 44 gpm boration prior to completion of the SPTAs.	Having more than one full-strength CEA not insert upon a reactor trip places the unit in an unanalyzed condition with regards to reactivity control. All safety functions may be in jeopardy if reactivity contingency actions are not taken.
Implement the FRP to restore power to PBB-S04 and establish AFW flow to the SGs prior to completion of HR-2.	Failure to establish and maintain a heat sink will eventually result in the core overheating and fuel failure. In this case MVAC safety function is addressed to establish power to a feed source to recover heat removal capabilities.

TURNOVER

Plant conditions:

Unit 1 is at ~2% power (being controlled 1.5%-2.5% power).

40OP-9ZZ04, Plant Startup Mode 2 To Mode 1, has been completed up to and including step 4.3.20.

The plant has been at 2% power for 11 hours awaiting repair of AFA-P01.

The core is presently at 250 EFPD.

Risk Management Action Level is ORANGE.

Train B is protected equipment.

AF "B" is protected in accordance with 40DP-9AP21, Protected Equipment.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

CEDMCS is in Manual Sequential

Steam Bypass Master Controller SGN-PIC-1010 is in Local Setpoint with SBCV 1001 in manual

Pressurizer is in "Boron Equalization"

AFN-P01 is in service feeding the SGs thru the Feedwater Isolation bypasses (SGN-HS-1143/1145)

Maintenance has just been performed on the Auto Start Test valve for the Stator Cooling Water system and is awaiting retest.

Equipment out of service:

Auxiliary Feedpump "A" (AFA-P01) is tagged out due to a noisy bearing. LCO 3.7.5 Conditions "A" and "B" have been entered. It is expected to return to service in 7 hours.

Planned shift activities:

Shift Stator Cooling Water pumps to P01A running with P01B in standby (including Auto Start Test) in accordance with 40OP-9CE01, Stator Cooling System, Section 6.5. An Area Operator has been briefed and is standing by.

CREW HANDOUT

Plant conditions:

Unit 1 is at ~2% power (being controlled 1.5%-2.5% power).

40OP-9ZZ04, Plant Startup Mode 2 To Mode 1, has been completed up to and including step 4.3.20.

The plant has been at 2% power for 11 hours awaiting repair of AFA-P01.

The core is presently at 250 EFPD.

Risk Management Action Level is ORANGE.

Train B is protected equipment.

AF "B" is protected in accordance with 40DP-9AP21, Protected Equipment.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

CEDMCS is in Manual Sequential

Steam Bypass Master Controller SGN-PIC-1010 is in Local Setpoint with SBCV 1001 in manual

Pressurizer is in "Boron Equalization"

AFN-P01 is in service feeding the SGs thru the Feedwater Isolation bypasses (SGN-HS-1143/1145)

Maintenance has just been performed on the Auto Start Test valve for the Stator Cooling Water system and is awaiting retest.

Equipment out of service:

Auxiliary Feedpump "A" (AFA-P01) is tagged out due to a noisy bearing. LCO 3.7.5 Conditions "A" and "B" have been entered. It is expected to return to service in 7 hours.

Planned shift activities:

Shift Stator Cooling Water pumps to P01A running with P01B in standby (including Auto Start Test) in accordance with **40OP-9CE01, Stator Cooling System, Section 6.5**. An Area Operator has been briefed and is standing by.

Facility: PVNGS Scenario No.: 3 Op-Test No.: 2013

Examiners: _____ Operators: _____

Initial Conditions: (100% power, MOC).

Turnover: Unit 1 is at 100% power (250 EFPD). HPSI "A" Pump is tagged out.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N BOP/SRO	Shift CEDM HVAC to B/D running with A/C in standby fans in accordance with 40OP-9HC01, Containment HVAC, Section 4.4.
2	cmTRMS03MTNPT11A_1 f:839 r:1	I BOP/SRO (AOP)	TLI Channel 1, 1 st Stage Pressure Transmitter to Reactor Regulating System, fails high requiring the crew to take actions in accordance with 40AO-9ZZ16, RRS Malfunctions.
3	cmTRMS17SGNFT1011_4	I BOP/SRO	Steam Generator flow transmitter FT-1011 will fail low requiring the crew to place it in maintenance mode and remove the three-element lockout on the DFWCS in accordance with associated alarm response procedure, 40AL-9RK6A, Panel B06A Alarm Responses
4	mfRP06C1 mfRP06C2 cmCPRH02SIAP03_5	C ALL (AOP/TS)	An inadvertent Train 'A' SIAS occurs requiring entry into 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations and 40AO-9ZZ05, Loss of Letdown. Crew will identify that Containment Spray Pump 'A' failed to auto-start. [LCO 3.3.6 CONDITION D; LCO 3.5.3 CONDITION A; LCO 3.6.6 CONDITION A; LCO 3.6.3 CONDITION A; LCO 3.4.9 CONDITION A]
5	mfRD02B f:100	R – SRO, ATC C - BOP (AOP/TS)	CEA 15 will drop requiring entry into 40AO-9ZZ11, CEA Malfunctions. The crew will begin a power reduction. [LCO 3.1.5 CONDITION A] CRITICAL TASK – Crew begins power reduction within 10 minutes of dropped CEA.
6	mfTH01A f:1	M ALL	RCS leak that exceeds the capacity of the charging pumps requiring a Reactor Trip. 40EP-9EO01, SPTAs
7	mfED10B (NBN-X04 fault) cmBKEG03PBBS04B_2	C ATC/SRO	A phase-to-phase fault will occur on NBN-X04 causing PBB-S04 to lose power. The DG supply breaker will fail to automatically close requiring the Reactor Operator to manually close it onto PBB-S04. CRITICAL TASK – Crew will close 'B' DG supply breaker to energize PBB-S04 prior to completion of SPTAs.
8	cmCPSI01SIBP02_5	C ATC/SRO	HPSI Pump "B" will fail to auto start. CRITICAL TASK – Crew will manually start HPSI "B" prior to exiting SPTAs.
End point	Crew establishes adequate HPSI flow to RCS per Standard Appendix 2.		

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	3
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	3

CRITICAL TASK	JUSTIFICATION
Crew begins power reduction within 10 minutes of dropped CEA.	The FSAR assumes the operators takes action within 900 seconds to reduce power. This assumption is used to ensure the core does not exceed DNBR or LPD limits. Although the FSAR states 900 seconds, Tech Specs requires a power reduction per the COLR which requires a power reduction within 10 minutes.
Crew will close 'B' DG supply breaker to energize PBB-S04 prior to completion of SPTAs.	With HPSI "A" pump unavailable, PBB-S04 is required to be powered up in order to achieve adequate safety injection during a LOCA.
Crew will manually start HPSI "B" prior to exiting SPTAs.	HPSI "B" pump will fail to start automatically requiring it to be manually started. Inadequate Safety Injection may result in loss of subcooled margin and/or core uncovery.

TURNOVER

Plant conditions:

Unit 1 is at 100% power.

The core is presently at 250 EFPD.

Risk Management Action Level is GREEN

HPSI "B" Pump is protected in accordance with 40DP-9AP21, Protected Equipment

Train B is protected.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

Equipment out of service:

HPSI "A" Pump is under clearance for bearing inspection. LCO 3.5.3 Condition B has been entered.

The pump is expected to return to service in 8 hours.

Planned shift activities:

Shift CEDM HVAC such that fans B/D are running with A/C in standby in accordance with 40OP-9HC01, Containment HVAC, Section 4.4, for upcoming engineering evaluation of the system.

CREW HANDOUT

Plant conditions:

Unit 1 is at 100% power.

The core is presently at 250 EFPD.

Risk Management Action Level is GREEN

HPSI "B" Pump is protected in accordance with 40DP-9AP21, Protected Equipment

Train B is protected.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

Equipment out of service:

HPSI "A" Pump is under clearance for bearing inspection. LCO 3.5.3 Condition B has been entered. The pump is expected to return to service in 8 hours.

Planned shift activities:

Shift CEDM HVAC such that fans B/D are running with A/C in standby in accordance with 40OP-9HC01, Containment HVAC, Section 4.4, for upcoming engineering evaluation of the system.

Facility: PVNGS Scenario No.: 4 Op-Test No.: 2013

Examiners: _____ Operators: _____

Initial Conditions: (100% power, MOC).

Turnover: Unit 1 is at 100% power (250 EFPD). HPSI "A" Pump is tagged out.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N BOP/SRO	Remove Reactor Power Cutback System from service in accordance with 40OP-9SF04, Operation of the RPCS, Section 8.
2	mfSI03C f:0.6	I ATC/SRO (TS)	SIT-1A gas leak develops requiring the crew to address 40AL-9RK2B, Panel B02B Alarm Responses. Crew will pressurize SIT-1A in accordance with 40OP-9SI03, Safety Injection Tank Operations and the CRS will address Technical Specifications. [LCO 3.5.1 CONDITION B]
3	cmCPHV12HJNA02_2	C ATC/SRO	Control Room Normal AHU Fan A02 will trip on electrical protection. The alarm response procedure will direct the Reactor Operator to start a Control Room Essential AHU per 40OP-9HJ01, Control Building HVAC. 41AL-1RK2A, Panel B02A Alarm Responses
4	mfRP06G1 mfRP06G2	C ALL (TS/AOP)	An inadvertent Train 'A' Containment Spray Actuation will occur which will require entry into 40AO-9ZZ17, Inadvertent PPS-ESFAS Actuations. [LCO 3.3.6 CONDITION D; LCO 3.6.3 CONDITION A; LCO 3.6.6 CONDITION A; LCO 3.4.9 CONDITION A] CRITICAL TASK – Restore NCW flow to RCPs within 10 minutes of RCP Low NCW Flow alarms.
5	mfCW01A f:200	R – SRO, ATC C - BOP (AOP)	A Circulating Water leak will develop in the 1A section of the Main Condenser requiring entry into 40AO-9ZZ10, Condenser Tube Rupture. The crew will perform a downpower in order to isolate the affected loop.
6	mfEG02	M ALL	The Main Generator will trip resulting in the Main Turbine tripping. Without the RPCS in service, RPS trip setpoints are exceeded requiring a Reactor Trip. Crew enters Standard Post Trip Actions procedure. 40EP-9EO01, SPTAs
7	mfRD12A mfRP04A mfRP04C	C ATC/SRO	Due to a failure of the RPS system, an ATWS will occur. The crew will be required to open NGN-L03B2 and NGN-L10B2 breakers in order to trip the reactor. CRITICAL TASK – After RPS trip setpoint has been exceeded, ensure the contingency actions of Reactivity Control are taken prior to continuing on in SPTAs.
8	cmTRMS02SGNPT1024_1 f:900	I BOP/SRO	Steam Generator Pressure Transmitter PT-1024 will fail low. This will result in the SBCS not receiving a modulate demand to control SG pressure. The crew will take manual control of SBCS or SG ADVs in order to control SG pressure. CRITICAL TASK – Take manual control of SG pressure using SBCS or ADVs to control SG pressure below SG safety valve setpoints prior to completion of SPTAs.

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	2
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	3

CRITICAL TASK	JUSTIFICATION
Restore NCW flow to RCPs within 10 minutes of RCP Low NCW Flow alarms.	FSAR Chapter 7.6.2.1.3.1 states that either cooling water must be supplied or RCP shutdown must be completed within 30 minutes of losing Nuclear Cooling Water in order to protect the RCPs. PVNGS is procedurally bounded to restore cooling flow within 10 minutes of receipt of alarm in order to prevent RCP seal degradation.
After RPS trip setpoint has been exceeded, ensure the contingency actions of Reactivity Control are taken prior continuing on in SPTAs.	This is a condition of license. All safety functions may be in jeopardy if reactivity contingency actions are not taken upon exceeding a reactor trip setpoint.
Take manual control of SG pressure using SBCS or ADVs to control SG pressure below SG safety valve setpoints prior to completion of SPTAs.	Relying only upon steam generator safety valves to provide pressure control may result in an uncontrolled cooldown of the RCS and exceed allowable cooldown rates.

TURNOVER

Plant conditions:

Unit 1 is at 100% power.

The core is presently at 250 EFPD.

Risk Management Action Level is GREEN

HPSI "B" Pump is protected in accordance with 40DP-9AP21, Protected Equipment

Train B is protected.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

Equipment out of service:

HPSI "A" Pump is under clearance for bearing inspection. LCO 3.5.3 Condition B has been entered. The pump is expected to return to service in 8 hours.

Planned shift activities:

Remove Reactor Power Cutback System from service in accordance with 40OP-9SF04, Operation of the RPCS, Section 8, due to overheating components.

CREW HANDOUT

Plant conditions:

Unit 1 is at 100% power.

The core is presently at 250 EFPD.

Risk Management Action Level is GREEN

HPSI "B" Pump is protected in accordance with 40DP-9AP21, Protected Equipment

Train B is protected.

PC is NOT recircing the RWT.

Unit 2 is supplying the Aux Steam cross-tie header.

Equipment out of service:

HPSI "A" Pump is under clearance for bearing inspection. LCO 3.5.3 Condition B has been entered. The pump is expected to return to service in 8 hours.

Planned shift activities:

Remove Reactor Power Cutback System from service in accordance with 40OP-9SF04, Operation of the RPCS, Section 8, due to overheating components.

Facility: Palo Verde														Date of Exam: November 1, 2013				
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	2	3	N/A			3	4	N/A			3	18	3	3	6	
	2	1	1	3	N/A			2	1	N/A			1	9	2	2	4	
	Tier Totals	4	3	6	N/A			5	5	N/A			4	27	5	5	10	
2. Plant Systems	1	3	2	3	3	2	2	2	3	3	3	2	28	3	2	5		
	2	1	1	1	1	1	0	0	1	2	1	1	10	1	1	3		
	Tier Totals	4	3	4	4	3	2	2	4	5	4	3	38	5	3	8		
3. Generic Knowledge and Abilities Categories				1	2	3	4						10	1	2	3	4	7
				3	3	2	2							2	2	1	2	

Note:

- 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).
- 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.
- 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.
- 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.
- 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.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- * 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.
- 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.
- 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.

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)						Form ES-401-2	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1	X						EK1.3 Knowledge of the operational implications of the following concepts as they apply to the (Reactor Trip Recovery): Annunciators and conditions indicating signals, and remedial actions associated with the (Reactor Trip Recovery).	3.0	1
000008 Pressurizer Vapor Space Accident / 3					X		AA2.30 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: Inadequate core cooling	4.3	2
000009 Small Break LOCA / 3						X	2.1.19 Ability to use plant computers to evaluate system or component status.	3.9	3
000011 Large Break LOCA / 3						X	2.4.1 Knowledge of EOP entry conditions and immediate action steps. (NEW) Re-sequenced questions 4 and 5. (NEW)	4.6	4
000015/17 RCP Malfunctions / 4	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): Natural circulation in a nuclear reactor power plant		5
000022 Loss of Rx Coolant Makeup / 2							Not Selected (NEW)		
000025 Loss of RHR System / 4				X			AA1.03 Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: LPI pumps	3.4	6
000026 Loss of Component Cooling Water / 8			X				AK3.02 Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: The automatic actions (alignments) within the CCWS resulting from the actuation of the ESFAS	3.6	7
000027 Pressurizer Pressure Control System Malfunction / 3		X					AK2.03 Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: Controllers and positioners	2.6	8

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)						Form ES-401-2	
000029 ATWS / 1				X			EA1.12 Ability to operate and monitor the following as they apply to a ATWS: M/G set power supply and reactor trip breakers	4.1	9
000038 Steam Gen. Tube Rupture / 3						X	2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes. (NEW)	3.8	10
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4					X		EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.	3.4	11
000054 (CE/E06) Loss of Main Feedwater / 4		X					EK2.1 Knowledge of the interrelations between the (Loss of Feedwater) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.3	12
000055 Station Blackout / 6			X				EK3.02 Knowledge of the reasons for the following responses as the apply to the Station Blackout: Actions contained in EOP for loss of offsite and onsite power	4.3	13
000056 Loss of Off-site Power / 6					X		AA2.46 Ability to determine and interpret the following as they apply to the Loss of Offsite Power: That the ED/Gs have started automatically and that the bus tie breakers are closed	4.2	14
000057 Loss of Vital AC Inst. Bus / 6					X		AA2.17 Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: System and component status, using local or remote controls	3.1	15
000058 Loss of DC Power / 6				X			AA1.02 Ability to operate and / or monitor the following as they apply to the Loss of DC Power: Static inverter dc input breaker, frequency meter, ac output breaker, and ground fault detector	3.1	16
000062 Loss of Nuclear Svc Water / 4			X				AK3.03 Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: Guidance actions contained in EOP for Loss of nuclear service water	4.0	17

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PWR Examination Outline
 Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)

Form ES-401-2

000065 Loss of Instrument Air / 8								Not Selected		
W/E04 LOCA Outside Containment / 3								Not Applicable		
W/E11 Loss of Emergency Coolant Recirc. / 4								Not Applicable		
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4								Not Applicable		
000077 Generator Voltage and Electric Grid Disturbances / 6	X							AK1.02 Knowledge of the operational implications of the following concepts as they apply to Generator Voltage and Electric Grid Disturbances: Over-excitation	3.3	18
K/A Category Totals:	3	2	3	3	4	3		Group Point Total:		18

ES-401		PWR Examination Outline							Form ES-401-2	
		Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)								
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1				X			AA1.01 Ability to operate and / or monitor the following as they apply to the Continuous Rod Withdrawal: Bank select switch	3.5	19	
000003 Dropped Control Rod / 1							Not Selected			
000005 Inoperable/Stuck Control Rod / 1							Not Selected			
000024 Emergency Boration / 1		X					AK2.01 Knowledge of the interrelations between Emergency Boration and the following: Valves	2.7	20	
000028 Pressurizer Level Malfunction / 2							Not Selected			
000032 Loss of Source Range NI / 7							Not Selected			
000033 Loss of Intermediate Range NI / 7 Randomly selected system 00069							Not Selected			
000036 (BW/A08) Fuel Handling Accident / 8	X						AK1.03 Knowledge of the operational implications of the following concepts as they apply to Fuel Handling Incidents: Indications of approaching criticality	4.0	22	
000037 Steam Generator Tube Leak / 3							Not Selected			
000051 Loss of Condenser Vacuum / 4					X		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Conditions requiring reactor and/or turbine trip	3.9	23	
000059 Accidental Liquid RadWaste Rel. / 9							Not Selected			

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)						Form ES-401-2		
000060 Accidental Gaseous Radwaste Rel. / 9							Not Selected		
000061 ARM System Alarms / 7							Not Selected		
000067 Plant Fire On-site / 8					X		2.4.34 Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	4.2	24
000068 (BW/A06) Control Room Evac. / 8			X				AK3.12 Knowledge of the reasons for the following responses as they apply to the Control Room Evacuation: Required sequence of actions for emergency evacuation of control room	4.1	25
000069 (W/E14) Loss of CTMT Integrity / 5 Rejected system 000033			X				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Containment Integrity: Guidance contained in EOP for loss of containment integrity. (NEW)	3.8	21
000074 (W/E06&E07) Inad. Core Cooling / 4				X			EA1.27 Ability to operate and monitor the following as they apply to a Inadequate Core Cooling: ECCS valve control switches and indicators	4.2	26
000076 High Reactor Coolant Activity / 9							Not Selected		
W/E01 & E02 Rediagnosis & SI Termination / 3							Not Applicable		
W/E13 Steam Generator Over-pressure / 4							Not Applicable		
W/E15 Containment Flooding / 5							Not Applicable		
W/E16 High Containment Radiation / 9							Not Applicable		
BW/A01 Plant Runback / 1							Not Applicable		
BW/A02&A03 Loss of NNI-X/Y / 7							Not Applicable		
BW/A04 Turbine Trip / 4							Not Applicable		
BW/A05 Emergency Diesel Actuation / 6							Not Applicable		

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)						Form ES-401-2		
BW/A07 Flooding / 8							Not Applicable		
BW/E03 Inadequate Subcooling Margin / 4							Not Applicable		
BW/E08; W/E03 LOCA Cooldown - Depress. / 4							Not Applicable		
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4							Not Selected		
BW/E13&E14 EOP Rules and Enclosures							Not Applicable		
CE/A11; W/E08 RCS Overcooling - PTS / 4			X				AK3.3 Manipulation of controls required to obtain desired operating results during abnormal and emergency situations. (NEW)	3.1	27
CE/A16 Excess RCS Leakage / 2							Not Selected		
CE/E09 Functional Recovery							Not Selected		
K/A Category Point Totals:	1	1	3	2	1	1	Group Point Total:	9	

ES-401												PWR Examination Outline		Form ES-401-2	
												Plant Systems - Tier 2/Group 1 (RO)			
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#	
003 Reactor Coolant Pump			X									K3.02 Knowledge of the effect that a loss or malfunction of the RCPS will have on the following: S/G	3.5	28	
004 Chemical and Volume Control					X							K5.26: Knowledge of the operational implications of the following concepts as they apply to the CVCS: Relationship between VCT pressure and NPSH for charging pumps (NEW)	3.1	29	
005 Residual Heat Removal		X										K2.01 Knowledge of bus power supplies to the following: RHR pumps	3.0	30	
006 Emergency Core Cooling												K4.11 Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: Reset of SIS	3.9	31	
				X				X				A2.11 Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Rupture of ECCS header	4.0	32	
007 Pressurizer Relief/Quench Tank							X					A1.02 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including: Maintaining quench tank pressure	2.7	33	
008 Component Cooling Water	X										X	K1.05 Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems: Sources of makeup water	3.0	34	
												2.2.12 Knowledge of surveillance procedures.	3.7	35	
010 Pressurizer Pressure Control						X						K6.01 Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: Pressure detection systems	2.7	36	

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO)										Form ES-401-2		
012 Reactor Protection										X	A4.03 Ability to manually operate and/or monitor in the control room: Channel blocks and bypasses	3.6	37
013 Engineered Safety Features Actuation			X							X	K3.01 Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Fuel	4.4	38
											A3.01 Ability to monitor automatic operation of the ESFAS including: Input channels and logic	3.7	39
022 Containment Cooling				X							K4.04 Knowledge of CCS design feature(s) and/or interlock(s) which provide for the following: Cooling of control rod drive motors	2.8	40
025 Ice Condenser											Not Applicable		
026 Containment Spray	X										K1.01 Knowledge of the physical connections and/or cause effect relationships between the CSS and the following systems: ECCS	4.2	41
039 Main and Reheat Steam										X	A4.04 Ability to manually operate and/or monitor in the control room: Emergency feedwater pump turbines	3.8	42
059 Main Feedwater				X						X	K3.02 Knowledge of the effect that a loss or malfunction of the MFW will have on the following: AFW system	3.6	43
											A2.11 Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure of feedwater control system	3.0	44
061 Auxiliary/Emergency Feedwater					X					X	K5.05: Knowledge of the operational implications of the following concepts as they apply to the AFW: Feed line voiding and water hammer. (New)	2.7	45
											A3.03 Ability to monitor automatic operation of the AFW, including: AFW S/G level control on automatic start	3.9	46

062 AC Electrical Distribution														K2.01 Knowledge of bus power supplies to the following: Major system loads	3.0	47
	X							X						A2.12 Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Restoration of power to a system with a fault on it	3.2	48
063 DC Electrical Distribution				X										K4.02 Knowledge of DC electrical system design feature(s) and/or interlock(s) which provide for the following: Breaker interlocks, permissives, bypasses and cross-ties	2.9	49
064 Emergency Diesel Generator						X						X		K6.07 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Air receivers	2.7	50
														A4.01 Ability to manually operate and/or monitor in the control room: Local and remote operation of the ED/G	4.0	51
073 Process Radiation Monitoring	X													K1.01 Knowledge of the physical connections and/or cause effect relationships between the PRM system and the following systems: Those systems served by PRMs	3.6	52
076 Service Water									X					A3.02 Ability to monitor automatic operation of the SWS, including: Emergency heat loads	3.7	53
078 Instrument Air												X		2.1.30 Ability to locate and operate components, including local controls.	4.4	54
103 Containment							X							A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: Containment pressure, temperature, and humidity	3.7	55
K/A Category Point Totals:	3	2	3	3	2	2	2	3	3	3	2			Group Point Total:		28

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive												Not Selected		
002 Reactor Coolant											X	2.4.11 Knowledge of abnormal condition procedures.	4.0	56
011 Pressurizer Level Control		X										K2.01 Knowledge of bus power supplies to the following: Charging pumps	3.1	57
014 Rod Position Indication					X							K5.02 Knowledge of the operational implications of the following concepts as they apply to the RPIS: RPIS independent of demand position	2.8	58
015 Nuclear Instrumentation												Not Selected		
016 Non-nuclear Instrumentation			X									K3.02 Knowledge of the effect that a loss or malfunction of the NNIS will have on the following: PZR LCS	3.4	59
017 In-core Temperature Monitor												Not Selected		
027 Containment Iodine Removal												Not Selected		
028 Hydrogen Recombiner and Purge Control								X				A2.02 Malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: LOCA condition and related concern over hydrogen	3.5	60
029 Containment Purge												Not Selected		

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO)											Form ES-401-2					
033 Spent Fuel Pool Cooling				X											K4.01 Knowledge of design feature(s) and/or interlock(s) which provide for the following: Maintenance of spent fuel level	2.9	61
034 Fuel Handling Equipment															Not Selected		
035 Steam Generator													X		A4.02 Ability to manually operate and/or monitor in the control room: Fill of dry S/G (NEW)	2.7	62
041 Steam Dump/Turbine Bypass Control													X		A3.02 Ability to monitor automatic operation of the SDS, including: RCS pressure, RCS temperature, and reactor power	3.3	63
045 Main Turbine Generator	X														K1.06 Knowledge of the physical connections and/or cause-effect relationships between the MT/G system and the following systems: RCS, during steam valve test	2.6	64
055 Condenser Air Removal															Not Selected		
056 Condensate															Not Selected		
068 Liquid Radwaste															Not Selected		
071 Waste Gas Disposal															Not Selected		
072 Area Radiation Monitoring													X		A3.01 Ability to monitor automatic operation of the ARM system, including: Changes in ventilation alignment. (NEW)	2.9	65
075 Circulating Water															Not Selected		
079 Station Air															Not Selected		
086 Fire Protection															Not Selected		
K/A Category Point Totals:	1	1	1	1	1	0	0	1	2	1	1				Group Point Total:		10

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Form ES-401-2

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PWR Examination Outline
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)

Form ES-401-2

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1							Not Selected		
000008 Pressurizer Vapor Space Accident / 3					X		AA2.29 Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: The effects of bubble in reactor vessel	4.2	1
000009 Small Break LOCA / 3							Not Selected		
000011 Large Break LOCA / 3						X	2.1.20 Ability to interpret and execute procedure steps. (New)	4.6	2
000015/17 RCP Malfunctions / 4							Not Selected		
000022 Loss of Rx Coolant Makeup / 2							Not Selected		
000025 Loss of RHR System / 4							Not Selected		
000026 Loss of Component Cooling Water / 8							Not Selected		
000027 Pressurizer Pressure Control System Malfunction / 3							Not Selected		
000029 ATWS / 1							Not Selected		
000038 Steam Gen. Tube Rupture / 3							Not Selected		

000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4							Not Selected		
000054 (CE/E06) Loss of Main Feedwater / 4							Not Selected		
000055 Station Blackout / 6					X		EA 2.02 Ability to determine or interpret the following as they apply to a Station Blackout: RCS core cooling through natural circulation cooling to S/G cooling (New)	4.6	3
000056 Loss of Off-site Power / 6							Not Selected		
000057 Loss of Vital AC Inst. Bus / 6							Not Selected		
000058 Loss of DC Power / 6					X		AA2.03 Ability to determine and interpret the following as they apply to the Loss of DC Power: DC loads lost; impact on ability to operate and monitor plant systems	3.9	4
000062 Loss of Nuclear Svc Water / 4						X	2.1.32 Ability to explain and apply system limits and precautions.	4.0	5
000065 Loss of Instrument Air / 8							Not Selected		
W/E04 LOCA Outside Containment / 3							Not Applicable		
W/E11 Loss of Emergency Coolant Recirc. / 4							Not Applicable		
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4							Not Applicable		
000077 Generator Voltage and Electric Grid Disturbances / 6						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	6

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PWR Examination Outline
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)

Form ES-401-2

K/A Category Totals:					3	3	Group Point Total:		6
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ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1							Not Selected		
000003 Dropped Control Rod / 1							Not Selected		
000005 Inoperable/Stuck Control Rod / 1							Not Selected		
000024 Emergency Boration / 1							Not Selected		
000028 Pressurizer Level Malfunction / 2							Not Selected		
000032 Loss of Source Range NI / 7							Not Selected		
000033 Loss of Intermediate Range NI / 7							Not Selected		
000036 (BW/A08) Fuel Handling Accident / 8						X	2.4.41 Knowledge of the emergency action level thresholds and classifications.	4.6	7
000037 Steam Generator Tube Leak / 3						X	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	8
000051 Loss of Condenser Vacuum / 4							Not Selected		
000059 Accidental Liquid RadWaste Rel. / 9							Not Selected		
000060 Accidental Gaseous Radwaste Rel. / 9							Not Selected		
000061 ARM System Alarms / 7							Not Selected		

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)						Form ES-401-2	
000067 Plant Fire On-site / 8						Not Selected		
000068 (BW/A06) Control Room Evac. / 8						Not Selected		
000069 (W/E14) Loss of CTMT Integrity / 5				X		EA2.02 Ability to determine or interpret the following as they apply to the Loss of Containment Integrity: Verification of automatic and manual means of restoring integrity	4.4	9
000074 (W/E06&E07) Inad. Core Cooling / 4						Not Selected		
000076 High Reactor Coolant Activity / 9						Not Selected		
W/E01 & E02 Rediagnosis & SI Termination / 3						Not Applicable		
W/E13 Steam Generator Over-pressure / 4						Not Applicable		
W/E15 Containment Flooding / 5						Not Applicable		
W/E16 High Containment Radiation / 9						Not Applicable		
BW/A01 Plant Runback / 1						Not Applicable		
BW/A02&A03 Loss of NNI-X/Y / 7						Not Applicable		
BW/A04 Turbine Trip / 4						Not Applicable		
BW/A05 Emergency Diesel Actuation / 6						Not Applicable		
BW/A07 Flooding / 8						Not Applicable		
BW/E03 Inadequate Subcooling Margin / 4						Not Applicable		
BW/E08; W/E03 LOCA Cooldown - Depress. / 4						Not Applicable		
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4						Not Selected		

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)						Form ES-401-2		
BW/E13&E14 EOP Rules and Enclosures								Not Applicable		
CE/A11; W/E08 RCS Overcooling - PTS / 4								Not Selected		
CE/A16 Excess RCS Leakage / 2								Not Selected		
CE/E09 Functional Recovery					X			EA2.1 Ability to determine and interpret the following as they apply to the (Functional Recovery): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	4.4	10
K/A Category Point Totals:					2	2		Group Point Total:		4

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (SRO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump (New 14)								X				Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP	3.9	14
004 Chemical and Volume Control												Not Selected		
005 Residual Heat Removal												Not Selected		
006 Emergency Core Cooling								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of flow path	4.3	11
007 Pressurizer Relief/Quench Tank												Not Selected		
008 Component Cooling Water												Not Selected		
010 Pressurizer Pressure Control												Not Selected		
012 Reactor Protection												Not Selected		
013 Engineered Safety Features Actuation											X	2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.7	12
022 Containment Cooling												Not Selected		
025 Ice Condenser												Not Applicable		

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (SRO)										Form ES-401-2				
026 Containment Spray											X	2.1.20 Ability to interpret and execute procedure steps.	4.6	13	
039 Main and Reheat Steam												Not Selected			
059 Main Feedwater												Not Selected			
061 Auxiliary/Emergency Feedwater												Not Selected			
062 AC Electrical Distribution												Not Selected			
063 DC Electrical Distribution												Not Selected			
064 Emergency Diesel Generator												Not Selected			
073 Process Radiation Monitoring												Not Selected			
076 Service Water												Not Selected			
078 Instrument Air												Not Selected			
103 Containment										X		A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the containment system and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Phase A and B isolation	3.8	15	
K/A Category Point Totals:										3		2	Group Point Total:		5

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (SRO)											Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive												Not Selected		
002 Reactor Coolant												Not Selected		
011 Pressurizer Level Control												Not Selected		
014 Rod Position Indication												Not Selected		
015 Nuclear Instrumentation											X	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.7	16
016 Non-nuclear Instrumentation												Not Selected		
017 In-core Temperature Monitor								X				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the ITM System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Core damage	4.1	17
027 Containment Iodine Removal												Not Selected		
028 Hydrogen Recombiner and Purge Control												Not Selected		
029 Containment Purge												Not Selected		
033 Spent Fuel Pool Cooling												Not Selected		
034 Fuel Handling Equipment				X								K4.02 Knowledge of design feature(s) and/or interlock(s) which provide for the following: Fuel movement	3.3	18

ES-401 Generic Knowledge and Abilities Outline (Tier 3) Form ES-401-3

Facility: Palo Verde		Date of Exam: November 1, 2013				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.1	Knowledge of conduct of operations requirements.	3.8	66		
	2.1.3	Knowledge of shift or short-term relief turnover practices.	3.7	67		
	2.1.29	Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc. (NEW)	4.1	68		
	2.1.5	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.			3.9	19
	2.1.34	Knowledge of primary and secondary plant chemistry limits. (New)			3.5	20
	Subtotal			3		2
2. Equipment Control	2.2.6	Knowledge of the process for making changes to procedures.	3.0	69		
	2.2.13	Knowledge of tagging and clearance procedures.	4.1	70		
	2.2.14	Knowledge of the process for controlling equipment configuration or status.	3.9	71		
	2.2.23	Ability to track Technical Specification limiting conditions for operations. (New)			4.6	21

Facility: Palo Verde

Date of Exam: November 1, 2013

Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
	2.2.40	Ability to apply Technical Specifications for a system.			4.7	22
	Subtotal			3		2
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	72		
	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.	3.4	73		
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.			3.8	23
	Subtotal			2		1
4. Emergency Procedures / Plan	2.4.5	Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.	3.7	74		
	2.4.14	Knowledge of general guidelines for EOP usage.	3.8	75		
	2.4.9	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.			4.2	24
	2.4.28	Knowledge of procedures relating to a security event (non-safeguards information).			4.1	25
	Subtotal			2		2
Tier 3 Point Total				10		7

Tier / Group	Randomly Selected K/A	Reason for Rejection
# 4 T1/G1	2.4.1 Knowledge of EOP entry conditions and immediate action steps. Loss of Rx Coolant Makeup	Loss of Rx Coolant Makeup is not an EOP at PVNGS. Used same KA and randomly selected LOCA from the "Not Selected" systems.
# 10 T1/G1	2.2.42 Ability to recognize system parameters that are entry-level conditions for Tech Specs. Steam Generator Tube Rupture.	Randomly selected a new generic KA because during a SGTR entry level conditions for Tech Specs are not really applicable. This KA is more suited to a SGTL. 2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.
# 21 T1/G2	4.2 033 AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Termination of startup following loss of intermediate range Instrumentation	After a significant amount of effort and time I was not able to create a plausible question for this KA and system. Randomly selected a new system but retained AK3.01. 4.2 069 AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Containment Integrity: Guidance contained in EOP for loss of containment integrity.
# 27 T1/G2	4.4 A13 AK1.3 Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Operations): Annunciators and conditions indicating signals, and remedial actions associated with the (Natural Circulation Operations).	This KA was close to SRO #3 so we random selected another system that had not been chosen and retained the KA as close as possible. 4.4 A11 AK3.3 Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations.
# 29 T2/G1	3.2 004 K5.30 Knowledge of the operational implications of the following concepts as they apply to the CVCS: Relationship between temperature and pressure in CVCS components during solid plant operation	After a significant amount of effort and time I was not able to develop a discriminating question that was not GFEs in nature. We randomly selected a new K5. 3.2 004 K5.26: Knowledge of the operational implications of the following concepts as they apply to the CVCS: Relationship between VCT pressure and NPSH for charging pumps
# 45 T2/G1	3.4 061 K5.02 Knowledge of the operational implications of the following concepts as the apply to the AFW: Decay heat sources and magnitude.	After a significant amount of effort and time I was not able to develop a discriminating question that was not GFEs in nature. We randomly selected a new K5. 3.4 061 K5.05: Knowledge of the operational implications of the following concepts as they apply to the AFW: Feed line voiding and water hammer.

# 62 T2/G2	3.8 034 A4.02 Ability to manually operate and/or monitor in the control room: Neutron levels	This KA was too close to RO questions: Q21 Loss of SR instruments Q22 Fuel Handling Incidents – indications of approaching criticality. For these reasons we randomly selected a not selected system and retained the A4.02. 3.4 035 A4.02 Ability to manually operate and/or monitor in the control room: Fill of dry S/G
# 65 T2/G2	3.8 086 A1.05 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Fire Protection System operating the controls including: FPS lineups	After a significant amount of effort and time I was not able to create a plausible question for this KA and system. Randomly selected a new system and KA. 3.7 072 A3.01 Ability to monitor automatic operation of the ARM system, including: Changes in ventilation alignment.
#68 T3	2.1.44 Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	After a significant amount of effort and time I was not able to create a plausible question for this KA and system. Randomly selected a new system and KA. 2.1.29 Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.
When a K/A has been rejected, a new one is chosen using NKEG (NRC K/A Exam Generator) Version 1.1. It is noted which tier and group the rejected K/A is in, then a “New” random outline is generated using the aforementioned software. A corresponding tier and group K/A is chosen from the generated outline that is the same type of K/A (i.e. Generic for a Generic, A2 for an A2, etc. – within the applicable bounds of NUREGs 1021 and 1122). A question is now attempted with this K/A. If a question cannot be written or the K/A is not applicable, another randomly generated outline is created and the process is repeated.		

Tier / Group	Randomly Selected K/A	Reason for Rejection
#2 (77) T1/G1	2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. <u>ATWS</u>	System setpoints, interlocks and EOP entry conditions is RO knowledge. Random selection of Generics to 2.1.20 and LOCA. 2.1.20 Ability to interpret and execute procedure steps: Large Break LOCA
#3 (78) T1/G1	4.1 055 EA2.06 Ability to determine or interpret the following as they apply to a Station Blackout: <u>Faults and lockouts that must be cleared prior to re-energizing buses</u>	I was not able to develop a discriminating SRO level question; this KA is better suited to RO knowledge. Randomly selected a different ability from EA2. 4.1 055 EA2.02 Ability to determine or interpret the following as they apply to a Station Blackout: RCS core cooling through natural circulation cooling to S/G cooling
#14 (89) T2/G1	3.6 064 A2.06 Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: <u>Operating unloaded, lightly loaded, and highly loaded time limit</u>	Operating a DG is an RO task; After a significant amount of effort and time I was not able to develop a discriminating SRO level question. 3.4 003 A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP
#20 (95) G3	2.1.36 Knowledge of procedures and limitations involved in core alterations.	After a significant amount of effort and time I was not able to develop a discriminating SRO level question. Tried to incorporate TS definitions and LCOs but they are RO knowledge. 2.1.34 Knowledge of primary and secondary plant chemistry limits.
#21 (96) G3	2.2.7 Knowledge of the process for conducting special or infrequent tests.	After a significant amount of effort and time I was not able to develop a discriminating SRO level question. 2.2.23 Ability to track Technical Specification limiting conditions for operations.
#22 (97) G3	2.2.17 Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.	After a significant amount of effort and time I was not able to develop a discriminating SRO level question. 2.2.40 Ability to apply Technical Specifications for a system.

When a K/A has been rejected, a new one is chosen using NKEG (NRC K/A Exam Generator) Version 1.1. It is noted which tier and group the rejected K/A is in, then a "New" random outline is generated using the aforementioned software. A corresponding tier and group K/A is chosen from the generated outline that is the same type of K/A (i.e. Generic for a Generic, A2 for an A2, etc. – within the applicable bounds of NUREGs 1021 and 1122). A question is now attempted with this K/A. If a question cannot be written or the K/A is not applicable, another randomly generated outline is created and the process is repeated.