

Facility: <u>Diablo Canyon</u>		Date of Examination: <u>11/26/2012</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>L111</u>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (NRCL111-A1)	M, R	<p style="text-align: center;"><b>Determine if the RIL has been Exceeded</b></p> 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. (3.9) (modified from L061 Audit ADMRO1 and LJACO-04R)
Conduct of Operations (NRCL111-A2)	M, R	<p style="text-align: center;"><b>Determine Turbine Ramp Rate Restrictions</b></p> 2.1.32 Ability to explain and apply system limits and precautions. (3.8) (modified from L061 Audit ADMRO2 and LJACO-12R)
Equipment Control (NRCL111-A3)	M, R	<p style="text-align: center;"><b>Verify AFD is Within Tech Spec Limits</b></p> 2.2.42 Ability to recognize system parameters that are entry-level conditions for Technical Specifications. (3.9) (modified from L081 Audit ADMRO3 and LJAEC-11)
Radiation Control (NRCL111-A4)	M, R	<p style="text-align: center;"><b>Calculate Maximum Stay Time</b></p> 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. (3.2) (modified from L081 NRC ADMRO4 and LJARC-04)
Emergency Procedures/Plan		
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 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: <u>Diablo Canyon</u>		Date of Examination: <u>11/26/2012</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <u>L111</u>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations (NRCL111-A5)	M, R	<b>Determine if the RIL has been Exceeded</b> 2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc. (4.2) (modified from L061Audit ADMSRO1 and LJACO-04S)
Conduct of Operations (NRCL111-A6)	M, R	<b>Approve Movement of Spent Fuel Assemblies</b> 2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management. (4.6) (modified from L061 NRC and LJACO-14S)
Equipment Control (NRCL111-A7)	N, R	<b>Determine 230KV Operability (OP J-2:VIII)</b> 2.2.37 Ability to determine Operability and/or availability of safety-related equipment. (4.6) (new)
Radiation Control (NRCL111-A8)	M, R	<b>Calculate Maximum Stay Time</b> 2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions. (3.7) (modified from L081 NRC ADMSRO4 and LJARC-04)
Emergency Procedures/Plan (NRCL111-A9)	D, R	<b>Classify a Security Event</b> 2.4.41 Knowledge of emergency action level thresholds and classifications. (4.6) (from bank JPM LJE-031)
NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank ( $\leq 3$ for ROs; $\leq 4$ for SROs & RO retakes) (N)ew or (M)odified from bank ( $\geq 1$ ) (P)revious 2 exams ( $\leq 1$ ; randomly selected)		

Rev 2: rev follows initial submittal

Facility: <u>Diablo Canyon</u>		Date of Examination: <u>11/26/2012</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test Number: <u>L111</u>
Control Room Systems <sup>@</sup> (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
a. (C1) (025.AA1.03) Respond to RHR Leakage to the PRT **	A,C,E,L,N	4P
b. (C2) (026.A4.01) Check if Containment Spray should be Stopped **	C,E,EN,L,N	5
c. (S1) (006.A1.13) Respond to High Accumulator Pressure (LJC-009)	D,EN,S	3
d. (S2) (064.A4.06) Parallel DG 1-2 to Startup Power (LJC-087M)	M,S	6
e. (S3) (024.AA1.03) Emergency Borate due to Stuck Rods (LJC-063M)	E,L,M,S	1
f. (S4) (068.AA1.11/21) Perform Control Room Actions prior to Evacuation (LJC-021)	D,E,L,S	8
g. (S5) (006.A4.06) Terminate High Head ECCS Following a Safety Injection	A,E,EN,L,N,S	2
h. (S6) (E05.EA1.1) Initiate Bleed and Feed During a LOSHS Event (LJC-122)	A,E,D,L,S	4S
In-Plant Systems <sup>@</sup> (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. (P1) (064.A4.01) Perform Local Start of a DG (LJP-038) **	A,D,E,L	6
j. (P2) (028.A4.01) Operate the Hydrogen Recombiners (LJP-004M) **	E,L,M	5
k. (P3) (011.EA1.11) Establish CCW Train Separation (LJP-158) **	A,D,E,L,R	8
<p><sup>@</sup> 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.</p>		
* 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	- / - / $\geq 1$ (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	

\*\* both Control Room and all in-plant JPMs modified for performance on either unit

ES-301, Page 23 of 27

Rev 2

Rev 2: rev follows initial submittal

Facility: <u>Diablo Canyon</u>	Date of Examination: <u>11/26/2012</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>	Operating Test Number: <u>L111</u>

Control Room Systems<sup>@</sup> (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
a. (C1) (025.AA1.03) Respond to RHR Leakage to the PRT **	A,C,E,L,N	4P
b. (C2) (026.A4.01) Check if Containment Spray should be Stopped **	C,E,EN,L,N	5
c. (S1) (006.A1.13) Respond to High Accumulator Pressure (LJC-009)	D,EN,S	3
d. (S2) (064.A4.06) Parallel DG 1-2 to Startup Power (LJC-087M)	M,S	6
e. (S3) (024.AA1.03) Emergency Borate due to Stuck Rods (LJC-063M)	E,L,M,S	1
f.		
g. (S5) (006.A4.06) Terminate High Head ECCS Following a Safety Injection	A,E,EN,L,N,S	2
h. (S6) (E05.EA1.1) Initiate Bleed and Feed During a LOSHS Event (LJC-122)	A,E,D,L,S	4S

In-Plant Systems<sup>@</sup> (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

i. (P1) (064.A4.01) Perform Local Start of a DG (LJP-038) **	A,D,E,L	6
j. (P2) (028.A4.01) Operate the Hydrogen Recombiners (LJP-004M) **	E,L,M	5
k. (P3) (011.EA1.11) Establish CCW Train Separation (LJP-158) **	A,D,E,L,R	8

<sup>@</sup> 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	- / - / $\geq 1$ (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	

\*\* both Control Room and all in-plant JPMs modified for performance on either unit

Facility: <u>Diablo Canyon</u>		Date of Examination: <u>11/26/2012</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/>		Operating Test Number: <u>L111</u>
Control Room Systems <sup>@</sup> (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. (S3) (024.AA1.03) Emergency Borate due to Stuck Rods (LJC-063M)	E,L,M,S	1
f.		
g. (S5) (006.A4.06) Terminate High Head ECCS Following a Safety Injection	A,E,EN,L,N,S	2
h.		
In-Plant Systems <sup>@</sup> (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. (P1) (064.A4.01) Perform Local Start of a DG (LJP-038) **	A,D,E,L	6
j. (P2) (028.A4.01) Operate the Hydrogen Recombiners (LJP-004M) **	E,L,M	5
k. (P3) (011.EA1.11) Establish CCW Train Separation (LJP-158) **	A,D,E,L,R	8
<p><sup>@</sup> 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.</p>		
* 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	≤ 9 / ≤ 8 / ≤ 4	
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	
(EN)gineered safety feature	- / - / ≥ 1 (control room system)	
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1	
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	
(R)CA	≥ 1 / ≥ 1 / ≥ 1	
(S)imulator		



\*\* All in-plant JPMs modified for performance on either unit

ES-301, Page 23 of 27

Rev 2

Rev 2: rev follows initial submittal

Facility: Diablo Canyon														Date of Exam: 22 November 2012				
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	2	3	3	N/A			3	3	N/A			4	18	3	3	6	
	2	0	2	1	N/A			2	2	N/A			2	9	2	2	4	
	Tier Totals	2	5	4	N/A			5	5	N/A			6	27	5	5	10	
2. Plant Systems	1	3	2	3	3	2	3	3	2	3	2	2	28	3	2	5		
	2	2	1	1	1	0	0	2	1	0	1	1	10	0	1	2	3	
	Tier Totals	4	3	4	4	2	3	5	3	4	3	3	38	4	4	8		
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4	7
				2		3		3		2				2	1	2	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  $\pm 1$  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 / 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									
000008 Pressurizer Vapor Space Accident / 3	X						<b>Knowledge of the operational implications of the following concepts as they apply to a Pressurizer Vapor Space Accident:</b> <b>(CFR 41.8 / 41.10 / 45.3)</b>  AK1.02 Change in leak rate with change in pressure	3.1	1
000009 Small Break LOCA / 3		X					<b>Knowledge of the interrelations between the small break LOCA and the following:</b> <b>(CFR 41.7 / 45.7)</b>  EK2.03 S/Gs	3.0	2
000011 Large Break LOCA / 3			X				<b>Knowledge of the reasons for the following responses as they apply to the Large Break LOCA:</b> <b>(CFR 41.5 / 41.10 / 45.6 / 45.13)</b>  EK3.13 Hot-leg injection/recirculation	3.8	3
000015/17 RCP Malfunctions / 4				X			<b>Ability to determine and interpret the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow):</b> <b>(CFR 43.5 / 45.13)</b>  AA2.09 When to secure RCPs on high stator temperatures	3.4	4
000022 Loss of Rx Coolant Makeup / 2							2.4.21 <b>Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.</b> (CFR: 41.7 / 43.5 / 45.12)		
000022 Loss of Rx Coolant Makeup / 2						X	2.4.11 <b>Knowledge of abnormal operating condition procedures.</b> (CFR 41.10 / 43.5 / 45.13)	4.0	5

000025 Loss of RHR System / 4				X		<b>Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System:</b>  (CFR 41.7 / 45.5 / 45.6)  AA1.09 LPI pump control switch, indicators, ammeter running lights, and flow meter	3.2	6
000026 Loss of Component Cooling Water / 8								
000027 Pressurizer Pressure Control System Malfunction / 3				X		<b>Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions:</b>  (CFR: 43.5 / 45.13)  AA2.14 RCP injection flow	2.8	7
000029 ATWS / 1	X					<b>Knowledge of the operational implications of the following concepts as they apply to the ATWS:</b>  (CFR 41.8 / 41.10 / 45.3)  EK1.03 Effects of boron on reactivity	3.6	8
000038 Steam Gen. Tube Rupture / 3								
<b>000040</b> (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4		X				<b>Knowledge of the interrelations between the Steam Line Rupture and the following:</b>  (CFR 41.7 / 45.7)  AK2.01 Valves	2.6*	9
000054 (CE/E06) Loss of Main Feedwater / 4								
000055 Station Blackout / 6				X		<b>Ability to operate and monitor the following as they apply to a Station Blackout:</b>  (CFR 41.7 / 45.5 / 45.6)  EA1.05 Battery, when approaching fully discharged	3.3	10
000056 Loss of Off-site Power / 6					X	<b>2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.</b>  (CFR: 41.5 / 43.5 / 45.12 / 45.13)	4.4	11

000057 Loss of Vital AC Inst. Bus / 6			X				<b>Knowledge of the reasons for the following responses as they apply to the Loss of Vital AC Instrument Bus:</b> <b>(CFR 41.5,41.10 / 45.6 / 45.13)</b> AK3.01 Actions contained in EOP for loss of vital ac electrical instrument bus	4.1	12
000058 Loss of DC Power / 6			X				<b>Knowledge of the reasons for the following responses as they apply to the Loss of DC Power:</b> <b>(CFR 41.5,41.10 / 45.6 / 45.1)</b> AK3.02 Actions contained in EOP for loss of dc power	4.0	13
000062 Loss of Nuclear Svc Water / 4						X	2.2.38 <b>Knowledge of conditions and limitations in the facility license.</b> <b>(CFR: 41.7 / 41.10 / 43.1 / 45.13)</b>	3.6	14
000065 Loss of Instrument Air / 8						X	2.4.31 <b>Knowledge of annunciator alarms, indications, or response procedures.</b> <b>(CFR: 41.10 / 45.3)</b>	4.2	15
W/E04 LOCA Outside Containment / 3									
W/E11 Loss of Emergency Coolant Recirc. / 4						X	<b>Ability to determine and interpret the following as they apply to the (Loss of Emergency Coolant Recirculation)</b> <b>(CFR: 43.5 / 45.13)</b> EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	3.4	16
BW/E04; <b>W/E05</b> Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4			X				<b>Knowledge of the interrelations between the (Loss of Secondary Heat Sink) and the following:</b> <b>(CFR: 41.7 / 45.7)</b> EK2.2 Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	3.9	17

000077 Generator Voltage and Electric Grid Disturbances / 6				X			<b>Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances:</b> <b>(CFR: 41.5 and 41.10 / 45.5, 45.7, and 45.8 )</b> AA1.01 Grid frequency and voltage	3.6	18
K/A Category Totals:	2	3	3	3	3	4	Group Point Total:		18/6

ES-401	PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO / SRQ)						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	#
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1									
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1					X		<b>Ability to determine and interpret the following as they apply to the Emergency Boration:</b> <b>(CFR: 43.5 / 45.13)</b> AA2.04 Availability of BWST	3.4	19
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7									
000033 Loss of Intermediate Range NI / 7									
000036 (BW/A08) Fuel Handling Accident / 8									
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4						X	<b>2.1.32 Ability to explain and apply system limits and precautions</b> <b>(CFR: 41.10 / 43.2 / 45.12)</b>	3.8	20
000059 Accidental Liquid RadWaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9		X					<b>Knowledge of the interrelations between the Accidental Gaseous Radwaste Release and the following:</b> <b>(CFR 41.7 / 45.7)</b> AK2.02 Auxiliary building ventilation system	2.7	21
000061 ARM System Alarms / 7									
000067 Plant Fire On-site / 8									
000068 (BW/A06) Control Room Evac. / 8									
000069 (WE14) Loss of CTMT Integrity / 5			X				<b>Knowledge of the reasons for the following responses as they apply to the High Containment Pressure:</b> <b>(CFR 41.5,41.10 / 45.6 / 45.13)</b> EK3.3 manipulation of controls required to obtain desired operating results during abnormal and emergency situations.	3.5	22

000074 (W/E06&E07) Inad. Core Cooling / 4											
000076 High Reactor Coolant Activity / 9				X							
W/E01 & E02 Rediagnosis & SI Termination / 3							X				
W/E13 Steam Generator Over-pressure / 4											
W/E15 Containment Flooding / 5			X								
W/E16 High Containment Radiation / 9											
BW/A01 Plant Runback / 1											
BW/A02&A03 Loss of NNI-X/Y / 7											
BW/A04 Turbine Trip / 4											
BW/A05 Emergency Diesel Actuation / 6											
BW/A07 Flooding / 8											
BW/E03 Inadequate Subcooling Margin / 4											
BW/E08; W/E03 LOCA Cooldown - Depress. / 4											
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4				X							
BW/E13&E14 EOP Rules and Enclosures											



CE/A11; W/E08 RCS Overcooling - PTS / 4					X		<b>Ability to determine and interpret the following as they apply to the (Pressurized Thermal Shock)</b>  (CFR: 43.5 / 45.13)  EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3.4	27
CE/A16 Excess RCS Leakage / 2									
CE/E09 Functional Recovery									
K/A Category Point Totals:	0	2	1	2	2	2	Group Point Total:		9/4

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO / 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						X						<b>Knowledge of the effect of a loss or malfunction on the following will have on the RCPS:</b>  (CFR: 41.7 / 45/5)  K6.04 Containment isolation valves affecting RCP operation	2.8	28
004 Chemical and Volume Control							X					<b>Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including:</b>  (CFR: 41.5 / 45.5)  A1.01 Activity levels in primary system	2.9	29
005 Residual Heat Removal			X									<b>Knowledge of the effect that a loss or malfunction of the RHRS will have on the following:</b>  (CFR: 41.7 / 45.6)  K3.05 ECCS	3.7	30
006 Emergency Core Cooling									X			<b>Ability to monitor automatic operation of the ECCS, including:</b>  (CFR: 41.7 / 45.5)  A3.02 Pumps	4.1	31
007 Pressurizer Relief/Quench Tank	X											<b>Knowledge of the physical connections and/or cause effect relationships between the PRTS and the following systems:</b>  (CFR: 41.2 to 41.9 / 45.7 to 45.8)  K1.03 RCS	3.0	32

008 Component Cooling Water										X	2.1.30 <b>Ability to locate and operate components, including local controls.</b>  (CFR: 41.7 / 45.7)	4.4	33
010 Pressurizer Pressure Control	X										<b>Knowledge of bus power supplies to the following:</b>  (CFR: 41.7)  K2.02 Controller for PZR spray valve	2.5	34
012 Reactor Protection			X								<b>Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following:</b>  (CFR: 41.7)  K4 06 Automatic or manual enable/disable of RPS trips	3.2	35
013 Engineered Safety Features Actuation										X	<b>Ability to manually operate and/or monitor in the control room:</b>  (CFR: 41.7 / 45.5 to 45.8)  A4.01 ESFAS-initiated equipment which fails to actuate	4.5	36
022 Containment Cooling							X				<b>Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:</b>  (CFR: 41.5 / 43.5 / 45.3 / 45.13)  A2.04 Loss of service water	2.9*	37
028 Hydrogen Recombiner and Purge System				X							<b>Knowledge of the operational implications of the following concepts as they apply to the HRPS:</b>  (CFR: 41.5/45.7)  K5.02 Flammable hydrogen concentration	3.4	38

026 Containment Spray								X						<b>Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including:</b>  (CFR: 41.5 / 45.5)  A1.04 Containment humidity	3.1	39
039 Main and Reheat Steam	X													<b>Knowledge of the physical connections and/or cause-effect relationships between the MRSS and the following systems:</b>  (CFR: 41.2 to 41.9 / 45.7 to 45.8)  K1.07 AFW	3.4*	40
059 Main Feedwater									X					<b>Ability to monitor automatic operation of the MFW, including:</b>  (CFR: 41.7 / 45.5)  A3.06 Feedwater isolation	3.2*	41
061 Auxiliary/Emergency Feedwater					X									<b>Knowledge of the operational implications of the following concepts as the apply to the AFW:</b>  (CFR: 41.5 / 45.7)  K5.01 Relationship between AFW flow and RCS heat transfer	3.6	42
062 AC Electrical Distribution		X												<b>Knowledge of bus power supplies to the following:</b>  (CFR: 41.7)  K2.01 Major system loads	3.3	43
063 DC Electrical Distribution			X											<b>Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following:</b>  (CFR: 41.7 / 45.6)  K3.01 ED/G	3.7*	44

073 Process Radiation Monitoring									X		<b>Ability to manually operate and/or monitor in the control room:</b>  (CFR: 41.7 / 45.5 to 45.8) A4.01 Effluent release	3.9	45
064 Emergency Diesel Generator					X						<b>Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system:</b>  (CFR: 41.7 / 45.7) K6.07 Air receivers	2.7	46
076 Service Water				X							<b>Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following:</b>  (CFR: 41/7)  K4.03 Automatic opening features associated with SWS isolation valves to CCW heat exchanges	2.9*	47
078 Instrument Air									X		<b>2.1.38 Ability to explain and apply system limits and precautions.</b>  (CFR: 41.10 / 43.2 / 45.12)	3.8	48
103 Containment								X			<b>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</b>  (CFR: 41.5 / 43.5 / 45.3 / 45.13)  A2.03 Phase A and B Isolation	3.5*	49

005 Residual Heat Removal									X								<b>Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including:</b>  (CFR: 41.5 / 45.5)  A1.03 Closed cooling water flow rate and temperature	2.5	50
039 Main and Reheat Steam																X	<b>Ability to monitor automatic operation of the MRSS, including:</b>  (CFR: 41.5 / 45.5)  A3.02 Isolation of the MRSS	3.1	51
059 Main Feedwater					X												<b>Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following:</b>  (CFR: 41.7)  K4.19 Automatic feedwater isolation of MFW	3.2	52
061 Auxiliary/Emergency Feedwater				X													<b>Knowledge of the effect that a loss or malfunction of the AFW will have on the following:</b>  (CFR: 41.7 / 45.6)  K3.02 S/G	4.2	53
064 Emergency Diesel Generator									X								<b>Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system:</b>  (CFR: 41.7 / 45.7)  K6.08 Fuel oil storage tanks	3.2	54
103 Containment	X																<b>Knowledge of the physical connections and/or cause effect relationships between the containment system and the following systems:</b>  (CFR: 41.2 to 41.9 / 45.7 to 45.8)  K1.01 CCS	3.6	55
K/A Category Point Totals:	3	2	3	3	2	3	3	2	3	2	2						Group Point Total:		28/5

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO / 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														
002 Reactor Coolant														
011 Pressurizer Level Control								X				<b>Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:</b>  (CFR: 41.5 / 43.5 / 45.3 / 45.13)  A2.03 Loss of PZR level	3.8	56
014 Rod Position Indication														
015 Nuclear Instrumentation	X											<b>Knowledge of the physical connections and/or cause effect relationships between the NIS and the following systems:</b>  (CFR: 41.2 to 41.9 / 45.7 to 45.8)  K1.01 RPS	4.1	57
016 Non-nuclear Instrumentation										X		<b>Ability to manually operate and/or monitor in the control room:</b>  (CFR: 41.7 / 45.5 to 45.8)  A4.01 NNI channel select controls	2.9*	58
017 In-core Temperature Monitor											X	<b>2.1.20 Ability to interpret and execute procedure steps.</b>  (CFR: 41.10 / 43.5 / 45.12)	4.6	59
027 Containment Iodine Removal		X										<b>Knowledge of bus power supplies to the following:</b>  (CFR: 41.7)  K2.01 Fans	3.1*	60

028 Hydrogen Recombiner and Purge Control																
029 Containment Purge							X							<b>Ability to predict and/or monitor changes in parameters to prevent exceeding design limits) associated with operating the Containment Purge System controls including:</b>  (CFR: 41.5 / 45.5)  A1.02 Radiation levels	3.4	61
033 Spent Fuel Pool Cooling						X								<b>Knowledge of design feature(s) and/or interlock(s) which provide for the following:</b>  (CFR: 41.7)  K4.03 Anti-siphon devices	2.6	62
034 Fuel Handling Equipment														<b>Ability to monitor automatic operation of the Fuel Handling System, including:</b>  (CFR: 41.7 / 45.5)  A3.01 Travel Limits		
034 Fuel Handling Equipment							X							<b>Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the Fuel Handling System controls including:</b>  (CFR: 41.7 / 45.5)  A1.02 Water level in the refueling canal	2.9	63
035 Steam Generator																
041 Steam Dump/Turbine Bypass Control				X										<b>Knowledge of the effect that a loss or malfunction of the SDS will have on the following:</b>  (CFR: 41.7 / 45.6)  K3.02 RCS	3.8	64
045 Main Turbine Generator																
055 Condenser Air Removal																
056 Condensate																
068 Liquid Radwaste																
071 Waste Gas Disposal																



072 Area Radiation Monitoring									X											<b>Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ARM system controls including:</b>  (CFR: 41.5 / 45.5)  A1.01 Radiation levels	3.4	65
075 Circulating Water																						
079 Station Air																						
086 Fire Protection																						
K/A Category Point Totals:	1	1	1	1	0	0	2	1	1	1	1	1	1	Group Point Total:							10/3	

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / 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									
000008 Pressurizer Vapor Space Accident / 3									
000009 Small Break LOCA / 3						X	<b>2.4.11 Knowledge of abnormal condition procedures.</b> (CFR: 41.10 / 43.5 / 45.13)	4.2	76
000011 Large Break LOCA / 3					X		<b>Ability to determine or interpret the following as they apply to a Large Break LOCA:</b> (CFR 43.5 / 45.13)  EA2.07 That equipment necessary for functioning of critical pump water seals is operable	3.2	77
000015/17 RCP Malfunctions / 4									
000022 Loss of Rx Coolant Makeup / 2									
000025 Loss of RHR System / 4									
000026 Loss of Component Cooling Water / 8									
000027 Pressurizer Pressure Control System Malfunction / 3					X		<b>Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions:</b> (CFR: 43.5 / 45.13)  AA2.18 Operable control channel	3.4	78
000029 ATWS / 1									
000038 Steam Gen. Tube Rupture / 3						X	<b>2.2.37 Ability to determine operability and/or availability of safety related equipment.</b> (CFR: 41.7 / 43.5 / 45.12)	4.6	79
<b>000040</b> (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4									
000054 (CE/E06) Loss of Main Feedwater / 4									
000055 Station Blackout / 6									
000056 Loss of Off-site Power / 6									
000057 Loss of Vital AC Inst. Bus / 6									

000058 Loss of DC Power / 6					X		<b>Ability to determine and interpret the following as they apply to the Loss of DC Power:</b>  <b>(CFR: 43.5 / 45.13)</b>  AA2.03 DC loads lost; impact on ability to operate and monitor plant systems	3.9	80
000062 Loss of Nuclear Svc Water / 4									
000065 Loss of Instrument Air / 8									
W/E04 LOCA Outside Containment / 3									
W/E11 Loss of Emergency Coolant Recirc. / 4									
BW/E04; <b>W/E05</b> Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4									
EPE 007 Reactor Trip						X	<b>2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.</b>  <b>(CFR: 41.10 / 43.5 / 45.13)</b>	4.5	81
000077 Generator Voltage and Electric Grid Disturbances / 6									
K/A Category Totals:					3	3	Group Point Total:		18/ 6

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RQ / 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	#
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1									
000005 Inoperable/Stuck Control Rod / 1									
000024 Emergency Boration / 1						X	<b>2.4.2 Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.</b> (CFR: 41.7 / 45.7 / 45.8)	4.6	82
000028 Pressurizer Level Malfunction / 2									
000032 Loss of Source Range NI / 7									
000033 Loss of Intermediate Range NI / 7									
000036 (BW/A08) Fuel Handling Accident / 8					X		<b>Ability to determine and interpret the following as they apply to the Fuel Handling Incidents:</b> (CFR: 43.5 / 45.13) AA2.01 ARM system indications	3.9	83
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4									
000059 Accidental Liquid RadWaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9						X	<b>2.4.41 Knowledge of the emergency action level thresholds and classifications associated with Accidental Gaseous Radwaste Release.</b> (CFR: 41.10 / 43.5 / 45.11)	4.6	84
000061 ARM System Alarms / 7					X		<b>Ability to determine and interpret the following as they apply to the Area Radiation Monitoring (ARM) System Alarms:</b> (CFR: 43.5 / 45.13) AA2.04 Whether an alarm channel is functioning properly	3.5	85
000067 Plant Fire On-site / 8									
000068 (BW/A06) Control Room Evac. / 8									

000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									
W/E01 & E02 Rediagnosis & SI Termination / 3									
W/E13 Steam Generator Over-pressure / 4									
W/E15 Containment Flooding / 5									
W/E16 High Containment Radiation / 9									
BW/A01 Plant Runback / 1									
BW/A02&A03 Loss of NNI-X/Y / 7									
BW/A04 Turbine Trip / 4									
BW/A05 Emergency Diesel Actuation / 6									
BW/A07 Flooding / 8									
BW/E03 Inadequate Subcooling Margin / 4									
BW/E08; W/E03 LOCA Cooldown - Depress. / 4									
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4									
BW/E13&E14 EOP Rules and Enclosures									
CE/A11; W/E08 RCS Overcooling - PTS / 4									
CE/A16 Excess RCS Leakage / 2									
CE/E09 Functional Recovery									
K/A Category Point Totals:					2	2	Group Point Total:		9/4

ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 1 (RO / 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														
004 Chemical and Volume Control											X	<b>Knowledge of EOP entry conditions and immediate action steps.</b>  (CFR: 41.10 / 43.5 / 45.13)	4.8	86
005 Residual Heat Removal														
006 Emergency Core Cooling														
007 Pressurizer Relief/Quench Tank												<b>Ability to (a) predict the impacts of the following malfunctions or operations on the Pressurizer Relief Tank; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:</b>  (CFR: 41.5 /43.5 / 45.3 / 45.5)  A2.01 Stuck open PORV or Code Safety	4.2	88
008 Component Cooling Water														
010 Pressurizer Pressure Control														
012 Reactor Protection								X				<b>Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:</b>  (CFR: 41.5 / 43.5 / 45.3 / 45.5)  A2.07 Loss of dc control power	3.7	87
013 Engineered Safety Features Actuation														
022 Containment Cooling														
025 Ice Condenser														



ES-401	PWR Examination Outline Plant Systems - Tier 2/Group 2 (RO / 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														
002 Reactor Coolant								X				<b>Ability to (a) predict the impacts of the following malfunctions or operations on the RCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:</b>  (CFR: 41.5 / 43.5 / 45.3 / 45.5) A2.03 Loss of forced circulation	4. 1	91
011 Pressurizer Level Control														
014 Rod Position Indication														
015 Nuclear Instrumentation														
016 Non-nuclear Instrumentation														
017 In-core Temperature Monitor														
027 Containment Iodine Removal														
028 Hydrogen Recombiner and Purge Control														
029 Containment Purge														
033 Spent Fuel Pool Cooling														
034 Fuel Handling Equipment														
035 Steam Generator											X	<b>2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.</b>  (CFR: 41.7 / 43.5 / 45.12)	4. 6	92
041 Steam Dump/Turbine Bypass Control														
045 Main Turbine Generator														



055 Condenser Air Removal																				
056 Condensate																				
068 Liquid Radwaste																				
071 Waste Gas Disposal																				
072 Area Radiation Monitoring																				
075 Circulating Water																				
079 Station Air														X						
<b>2.4.4 Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.</b> (CFR: 41.10 / 43.2 / 45.6)																		4. 7	93	
086 Fire Protection																				
K/A Category Point Totals:														1						
															2	Group Point Total:	10/3			

Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.	<b>2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.</b> (CFR: 41.5 / 43.5 / 45.12 / 45.13)	4.4	66		
	2.1.	<b>2.1.9 Ability to direct personnel activities inside the control room.</b> (CFR: 41.10 / 45.5 / 45.12 / 45.13)	2.9*	67		
	2.1.	<b>2.1.36 Knowledge of procedures and limitations involved in core alterations.</b> (CFR: 41.10 / 43.6 / 45.7)			4.1	94
	2.1.	<b>2.1.45 Ability to identify and interpret diverse indications to validate the response of another indication.</b> (CFR: 41.7 / 43.5 / 45.4)			4.3	95
	2.1.					
	2.1.					
	Subtotal				2	
2. Equipment Control	2.2.	<b>2.2.14 Knowledge of the process for controlling equipment configuration or status.</b> (CFR: 41.10 / 43.3 / 45.13)	3.9	68		
	2.2.	<b>2.2.38 Knowledge of conditions and limitations in the facility license.</b> (CFR: 41.7 / 41.10 / 43.1 / 45.13)	3.6	69		
	2.2.	<b>2.2.44 Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.</b> (CFR: 41.5 / 43.5 / 45.12)	4.2	70		

	2.2.	<b>2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.</b> (CFR: 41.10 / 43.2 / 45.13)			4.2	96
	2.2.					
	2.2.					
	Subtotal			3		1
3. Radiation Control	2.3.	<b>2.3.5 Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.</b> (CFR: 41.11 / 41.12 / 43.4 / 45.9)	2.9	71		
	2.3.	<b>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.</b> (CFR: 41.12 / 43.4 / 45.9 / 45.10)	3.4	72		
	2.3.	<b>2.3.15 Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.</b> (CFR: 41.12 / 43.4 / 45.9)	2.9	73		
	2.3.	<b>2.3.7 Ability to comply with radiation work permit requirements during normal or abnormal conditions.</b> (CFR: 41.12 / 45.10)			3.6	97
	2.3.	<b>2.3.12 Knowledge of radiological safety principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.</b> (CFR: 41.12 / 45.9 / 45.10)			3.7	98
	2.3.					
	Subtotal				3	

4. Emergency Procedures / Plan	2.4.	<b>2.4.20 Knowledge of operational implications of EOP warnings, cautions, and notes.</b> (CFR: 41.10 / 43.5 / 45.13)	3.8	74		
	2.4.	<b>2.4.1 Knowledge of EOP entry conditions and immediate action steps.</b> (CFR: 41.10 / 43.5/45.13)	4.6	75		
	2.4.	<b>2.4.22 Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.</b> (CFR: 41.7 / 41.10 / 43.5 / 45.12)			4.4	99
	2.4.	<b>2.4.37 Knowledge of the lines of authority during implementation of the emergency plan.</b> (CFR: 41.10 / 45.13)			4.1	100
	2.4.					
	2.4.					
	Subtotal				2	2
Tier 3 Point Total				10		7

Facility: Diablo Canyon (PWR) Scenario No.: 1 Op-Test No.: L111-NRC

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Initial Conditions:** 75%, MOL, steady-state conditions, 838 ppm boron

**Turnover:** Maintain current power level (for Htr #2 Drip Pp monitoring); place 120 gpm letdown in service (per chemistry) for minor crud burst cleanup. DG 1-3 is OOS.

Event No	Malf No.	Event Type*	Event Description
1	OP B-1A:XII, sec 6.3	N (ATC, BOP)	Places 120 gpm letdown in service (including 2 <sup>nd</sup> CCP)
2	pmp asw1/2	C (SRO, BOP)	ASW Pp 1-1 trips on OC (1-2 ASW Pp fails to start in auto, and is started manually) (TS)
3	mal gen4	C (ALL) R (ATC)	Full Load Rejection (from 75%); stabilizes @ 20-30% power
4	xmt rms23 vlv sgb13,14	I (SRO, BOP)	S/G Blowdown RM-23 fails high (with blowdown isolation; valves (FCV-498 & FCV-499) fails to isolate, but can be manually closed) (ECG)
5	xmt cvc19	I (SRO, ATC)	VCT level LT-112 fails low (causes continuous makeup; is stopped manually)
6	mal mss3b mal ppl3a	M (ALL) C (ATC)	Steamline 1-2 break OC (with ATWS on SI); the 1-2 S/G must be isolated (CT) ** (see next page); terminates SI once the faulted S/G is isolated; Reactor must be manually tripped on safety injection (CT)
7	mal ppl5a/5b	C (BOP)	Train A SI does not actuate, and must be manually aligned (including Phase A components)

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d) (from form ES301-4)	Actual Attributes
1. Total malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

Rev 2 comments: changed valve that fails on event 4; some timing changes

Rev 3 comments: changed per NRC validation comments

**SCENARIO SUMMARY – NRC #1**

1. (Normal Evolution) Crew places 120 gpm letdown in service per OP B-1A:XII, section 6.3 (for RCS cleanup)
2. Auxiliary Salt Water (ASW) Pump 1-1 trips on overcurrent (OC). ASW Pump 1-2 fails to start in automatic, but the BOP can place the pump in manual and start it. Actions will be per AR PK01-03 (for OC trip of 1-1 ASW PP); actions may also be taken per OP AP-10, Loss of Auxiliary Salt Water. **(TS)**
3. A full load rejection occurs on Unit 1 (due to a grid disturbance) (from 75% power). OP AP-2, Full Load Rejection, is implemented to stabilize the plant between 20-30% power on steam dumps.
4. The S/G Blowdown radiation monitor (RM-23) fails high, causing a blowdown isolation. Isolation valves (FCV-498 & 499, blowdown to discharge tunnel) fails to operate in automatic; the BOP recognizes the failure and completes the isolation manually; actions are taken per AR PK11-17, S/G Blowdown Hi Rad. The crew diagnoses that the high reading on the radiation monitor is a failure (due to comparisons with other monitors, the rate of failure, etc), and applies the appropriate Equipment Control Guideline (ECG) ECG 39.3.B). **(ECG)**
5. Volume Control Tank (VCT) level channel LT-112 fails low, causing a continuous (and erroneous) makeup signal. The crew diagnoses the level channel failure by comparing other VCT parameters, and by using OP AP-19, Malfunction of the Reactor Makeup Control System. The makeup system is secured, and makeup is accomplished (if needed) by using the manual mode (or enabling the auto mode for short periods).
6. A steamline break (outside containment) occurs on the 1-2 S/G, almost immediately causing the need for a Safety Injection (SI) and reactor trip\*\*. On the Safety Injection, Reactor Trip does not automatically occur (ATWS), causing the need for a manual reactor trip (which is successful) **(CT)**; transition to EOP FR-S.1 is, therefore, not required, and EOP E-0 is continued. The S/G will be isolated per EOP E-2, Faulted S/G Isolation **(CT)**, and ECCS will be terminated per EOP E-1.1, SI Termination.
7. Train A of SI does not occur automatically, and must be manually actuated.

**The scenario is terminated once RHR pumps have been stopped in E-1.1 (approximately step 8 completed), at the discretion of the lead examiner.**

\*\* **CT / TCOA note:** Steam break was evaluated against Time Critical Operator Actions (TCOAs) # 18 & 19 (MSLB IC & OC); the break sizes, ramp times, initial power levels, and other conditions differ significantly from the conditions used in this scenario. For these reasons, the S/G isolation will remain critical (a critical task, per WOG), but no TCOA time limits are applied to this scenario.

Facility: Diablo Canyon (PWR)Scenario No.: 2Op-Test No.: L111-NRC

Examiners: \_\_\_\_\_

Operators: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Initial Conditions:** 2% with MFW in service, BOL, 1575 ppm boron**Turnover:** OP L-3, @ step 6.29, ready to raise power to 8%

Event No	Malf No.	Event Type*	Event Description
1	N/A	R (ATC)	Raise reactor power from 2% to ≈ 8% power
2	ser 0232 vlv pzs2 dsc pzs2	C (SRO, BOP)	At ≈ 3% power, Pzs PORV PCV-455C block valve 8000B causes ground, shorts out/goes mid-position, and then breaker trips (can't be closed) <b>(TS)</b>
3	xmt cvc16	I (SRO, BOP)	TE-130 fails low (causes TCV-130 to close in auto), causing high letdown temperature; manual control is used to restore letdown temperature
4	mal sei1 asisrst	C (SRO)	Earthquake (mod) causes construction crane impact on RWST about 35% level <b>(TS only)</b> (later will cause ECA-1.1 entry and CT)
5	cnv rcs2	C (ALL)	PCV-455B (Pzs spray valve) opens slightly on earthquake (mech bound, can't control from C/R); will fail fully open (requiring reactor trip and RCP S/D) (once RWST TS addressed)
6	mal rcs3d	C (ALL)	RCS leak starts and escalates (on aftershock), requiring manual SI
7	vlv sis3/sis4	C (BOP)	8801A/B fail to open on SI, requiring manual opening to establish high head ECCS injection <b>(CT)</b>
8	mal rcs3d asisrst	M (ALL)	SBLOCA and Loss of Emergency Coolant Recirculation (ECR): with low RWST level, causes transfer to cold leg recirc procedure and then loss of ECR procedure; M/U to RWST is directed, and ECCS flow is reduced <b>(CT)</b>

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d) (from form ES301-4)	Actual Attributes
8. Total malfunctions (5–8)	6
9. Malfunctions after EOP entry (1–2)	2
10. Abnormal events (2–4)	3
11. Major transients (1–2)	1
12. EOPs entered/requiring substantive actions (1–2)	2
13. EOP contingencies requiring substantive actions (0–2)	1
14. Critical tasks (2–3)	2

Rev 2 comments: deleted one event; adjusted timing; added one more ARP option

Rev 3 comments: changed per NRC validation comments

**SCENARIO SUMMARY – NRC #2**

1. Control Rods are pulled one full step at a time to raise power slowly from 2% to 8% power, in preparation for rolling the main turbine. (normal evolution)
2. At  $\approx$  3% power, a 480v Bus G ground alarm will signal a malfunction of Pzr PORV block valve 8000B. The valve will (shortly after the alarm) simulate a short/electrical problem, and move to mid-position (and not move thereafter); a few minutes later, the breaker for the valve (8000B) will trip open (and the ground alarm will clear. Tech Spec actions for TS 3.4.11.C will apply (1 hr to place associated PORV in MAN/CLOSED). **(TS)**
3. Letdown heat exchanger temperature element TE-130 will fail low, causing actual letdown temperature to rise and causes alarms, letdown divert from the demineralizers, and rising VCT temperature. OP AP-11, Malf of the CCW System, Sec D, will be used to take manual control of letdown temperature (TCV-130), and control temperature manually.
4. A moderate seismic event causes a large crane in the 115' tank area to tip over and puncture the RWST, about 1/3 of the way up from the bottom of the tank (and it drains slowly to that level). Tech Spec 3.5.4.B will be implemented (1 hr to restore, which is not possible). This failure sets up the final event (loss of emergency coolant recirc capability). **(TS)**
5. Also, one Pzr Spray Valve (PCV-455B) fails partially open (but remains within the ability of the pressure control system at this point). Once the RWST Tech Spec is addressed, the spray valve will fail full open, causing the need for a manual reactor trip, and trip of the 1-1 and 1-2 RCPs. The crew will stabilize in EOP E-0.1, Reactor Trip Response.
6. An RCS leak starts (aftershock) (slow ramp to 900 gpm), requiring actions to try to keep up with the leak, and then initiate a manual Safety Injection (SI) when those efforts fail.
7. On the SI, two of the charging injection isolation valves fail to open, but are opened manually in order to supply high-head ECCS injection. **(CT)**
8. The RCS leak escalates to a SBLOCA, and the crew proceeds (eventually) to ECA-1.1, Loss of Coolant Recirc Capability, where the crew will direct makeup to the RWST, and throttle ECCS flow to conserve RWST inventory. **(CT)**

The scenario is terminated once RWST makeup has been directed, and ECCS flow has been reduced, per EOP ECA-1.1.



Facility: Diablo Canyon (PWR)Scenario No.: 3Op-Test No.: L111-NRC

Examiners: \_\_\_\_\_

Operators: \_\_\_\_\_

**Initial Conditions:** 100% power, MOL, 774 ppm boron**Turnover:** DG 1-2 OOS

Event No	Malf No.	Event Type*	Event Description
1	N/A	N (ALL)	Swap to CCP 1-1 from CCP 1-3 per OP B-1A:V, sec 6.1
2	xmt pzt24	I (SRO, BOP)	Pzt Press transmitter PT-474 fails low (makes (2) PORVs inoperable) <b>(TS)</b>
3	xmt cvc4	I (SRO, ATC)	FT-128 (charging flow transmitter) fails low (actual charging flow goes high); manual control of FCV-128 is required
4	mal mfw2b ovr xc3i196o	C (ALL) R (ATC)	MFP 1-2 vibrations rise until ramp is required; the pump trips during the ramp (at ≈ 93% power), which causes a faster programmed ramp (≈ 50% power after ramp)
5	mal eps4d	C (SRO, BOP)	Loss of 4KV Vital Bus G (diff trip); alternate equipment is placed in service, and Tech Specs are implemented <b>(TS)</b>
6	Ser 1244 Xmt rcp38	C (ALL)	RCP 1-3 vibration coincident with motor bearing temperature increase (requires reactor trip and trip of RCP 1-3)
7	mal sei1 mal deg1a,c mal syd2	M (ALL)	Earthquake causes loss of Loss of all AC Power; the unit is backfed from 500KV power <b>(CT, TCOA)</b> , and RCS inventory control is established <b>(TCOA)</b> . RCP seal injection is isolated prior to starting a CCP <b>(CT, TCOA)</b>
8	vlv afw7	C (BOP)	TDAFP does not auto start on trip/loss of AC; must be manually started

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

Target Quantitative Attributes (Per Scenario; See Section D.5.d) (from form ES301-4)	Actual Attributes
15. Total malfunctions (5–8)	7
16. Malfunctions after EOP entry (1–2)	1
17. Abnormal events (2–4)	5
18. Major transients (1–2)	1
19. EOPs entered/requiring substantive actions (1–2)	1
20. EOP contingencies requiring substantive actions (0–2)	2
21. Critical tasks (2–3)	2

Rev 4 comments: added comments from NRC validation

**SCENARIO SUMMARY – NRC #3**

1. Crew swaps from CCP 1-3 to CCP 1-1 per OP B-1A:V, section 6.1 (normal evolution).
2. Pressurizer pressure channel PT-474 fails low. System control is not affected (control is 2<sup>nd</sup> highest chan select), but since this channel provides the low press interlock for two Pzr PORVs (PCV-474 and PCV-455C), they must be declared INOPERABLE (block valves must be closed, and power removed). OP AP-5 is used to respond to the failure. **(TS)**
3. FT-128 (charging flow) fails low, causing actual charging flow to rise. FCV-128 (or HC-459D) must be taken to manual, and charging flow controlled by alternate indications for the remainder of the scenario. OP AP-17, section B, may be used to respond to the failure.
4. MFP 1-2 develops vibrations (moderate level) requiring the plant be ramped to  $\approx 50\%$  power @ 50-200 mw/min (per AR PK09-14). At  $\approx 93\%$  power, the 1-2 MFP will trip, initiating an even faster automatic programmed ramp down to  $\approx 50\%$  power. OP AP-25 and OP AP-15 will be used to respond to the ramp/trip.
5. Once the plant is stable at  $\approx 50\%$  power, 4KV bus G will trip on differential. OP AP-27 will be used to stabilize and respond to the loss of the bus, and restoration of equipment. **(TS)**
6. RCP 1-3 develops vibrations (“Danger” level) coincident with motor bearing temperature increase. The crew will respond by using AR PK05-05 and will trip the reactor and RCP 1-3 (stabilizing the plant in EOP E-0.1).
7. An earthquake will cause sequential electrical failures (loss of 230KV, DGs 1-1 & 1-3) which will result in a loss of all AC to the vital busses. Since backfeed (500KV) is available, the crew will backfeed the unit to restore power (**CT, part of TCOA**), and eventually restore RCS inventory control (**part of TCOA**), using EOP ECA-0.0 and ECA-0.1. The turbine driven AFW pump (TDAFP) does not auto-start from the trip of loss of busses, and must be started to restore AFW flow to the S/Gs. RCP seal cooling is isolated prior to restarting a CCP.  
**(CT, and part of TCOA). The TCOA is to backfeed the unit, isolate RCP seal cooling, and restore inventory control within 54 minutes (of loss of all AC). \*\*\***

**The scenario is terminated once the unit is backfed, vital buss(es) are restored, and RCS inventory control is restored.**

\*\*\* **(TCOA)** The loss of all AC was evaluated against TCOA #37 (station blackout); the conditions of the scenario are close enough to the TCOA conditions that both the TCOA and time limits are applicable: must complete 500KV backfeed, RCP seal isolation (just direction w/ 42 min), and restore RCS inventory control within 54 minutes (of loss of power).

ES-401

## Record of Rejected K/As

[Form ES-401-4](#)

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	APE 062 K1	KA catalog lists "none." Replaced with G.
1/1	APE 038 G – 2.2.36	Unable to write a test question for the system using this topic. Randomly selected a new KA.
1/2	APE 051 K1	Only KA has importance rating of less than 2.5. Randomly selected a new KA.
1/2	APE 051 G – 2.4.41	Unable to write a test question for the system using this topic. Randomly selected a new KA.
2/2	APE 029 K6	All KA have importance rating of less than 2.5. Randomly selected a new KA.
1/1	APE 062 2.2.38	KA selected for RO section of exam. KA is a SRO level question. Randomly selected a new KA
1/1	EPE W/E11 EA2.1	KA selected for RO section of exam. KA is a SRO level question. Randomly selected a new KA
1/1	APE 025 AA1.20	Unable to write question for this system interaction. Randomly selected a new KA.
1/2	APE 051 2.1.25	Unable to write a discriminatory question on KA. Randomly selected new KA.
2/1	025 K5.02	Unable to write a discriminatory question on KA due to not applicable to the plant. Randomly selected new KA.
1/1	EPE 029 EK1.02	KA selected is GFE level topic. Randomly selected new KA
2/2	034 A3.01	KA selected is SRO knowledge level. Randomly selected new KA.
2/2	034 A1.02	KA selected is SRO knowledge level. Randomly selected new KA.
1/1	WE05	Unable to write a discriminatory question on KA. Randomly selected new KA.
2/1	026 A2.09	Unable to write a discriminatory question on KA. Randomly selected new KA.
1/2	069 AK3.01	Unable to write a discriminatory RO question on KA. Randomly selected new KA.
2/2	068 2.4.21	Unable to write a discriminatory question on KA. Randomly selected new KA
3	2.4.37	KA selected for questions 75 and 100. Randomly selected new KA for question 75.

1/2	012 A2.07	KA selected is similar to 3 other selected KAs. Selected new KA.
1/1	022 G2.4.21	Unable to write a discriminatory question on KA. Randomly selected new KA
2/1	103 A2.04	This was a duplicate system and KA with question #90. Randomly selected new KA.