

TO: J. D'Antonio, Chief Examiner, NRC Region 1
FROM: D. Lavato, Facility Representative
SUBJ: 2/04 Initial License Operator Exam
DATE: January 16, 2004

I have enclosed 19 JPMS, 2 (1 RO, 1SRO) written examinations with associated documentation, copies of required procedures for performing the JPMS and 4 scenarios with the required EOPs/AOPs for the 2/04 Initial License Operator Examinations at Calvert Cliffs Nuclear Power Plant per NUREG 1021 Draft Revision 9, ES 201 for your review. Copies of modified questions with their originals are also enclosed.

I have included Forms ES-301-3, 4, 5, 6 and ES-401-6 as required.

A copy of the audit exam which you requested is included.
In accordance with Attachment 1 of ES 201, the enclosed materials "SHALL BE WITHHELD FROM PUBLIC DISCLOSURE UNTIL EXAMINATIONS ARE COMPLETE".

If you need any additional information, please call me at (410) 495-4586 or Mike Wasem at (410) 495-3638.

Sincerely,



D. Lavato

cc: 2004 NRC exam file

3/04 NRC EXAM DEVELOPMENT

Operations Training Unit

Two copies of each written exam are included. One copy is presented how the examinees will see it, including the handouts (references) they will be allowed to use. The other copy contains information that will help in your review process. This copy also contains the original question that was modified where applicable. I have included a marked-up question to explain the format of the information provided. I have also included marked up copies of the written outlines.

Given the following plant conditions:

- Unit One has tripped due to a loss P-13000-1
- 11 4KV bus is energized from 1A Diesel Generator
- PZR level is 100" and slowly lowering
- RCS pressure is 1920 PSIA and slowly lowering

The RO reports that only 12 Charging Pump is running and Pressure and Inventory is being monitored for positive trends.

What alternate actions must the CRS direct or verify?

- A. Verify SIAS actuation when RCS pressure reaches 1725 PSIA.
- ✓ B. Manually start 11 and 13 charging pumps to restore pressurizer level to greater than 101" and locally reset 11 pressurizer backup heater breaker.
- C. Isolate letdown, check that charging pumps automatically start to restore pressurizer level and reset pressurizer proportional heaters by momentarily placing the handswitches to OFF.
- D. Verify charging pumps start automatically to restore Pressurizer level to greater than 101", verify 12 and 14 pressurizer backup heaters start to restore RCS pressure.

A is incorrect, action should be taken so that SIAS does not actuate.

B is correct, charging pumps must be manually started, and heaters must be reset, and they will not operate below 101" in the pressurizer.

C is incorrect, letdown will automatically isolate, 11 and 13 charging pumps will not automatically start, and the proportional heaters will take a long time to restore RCS pressure.

D is incorrect, 11 and 13 charging pumps will not automatically start with the normal and alternate 4 KV bus feeder bkr's open and 12 and 14 heaters will not have power available.

References: EOP basis docs. 41.5, 43.5

17. = Question # on exam A. = LXR question bank number

B. = references

C. Source and Cognitive level

1 = memory/fund.

2 = comprehension

3 = analysis, synthesis or application

D. = lesson plan number

G = K/A number

E = objective number

F = Task number from JTA

H = RO importance rating

I = SRO importance ratings

J = Key word

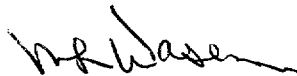
TO: J. D'Antonio, Chief Examiner, NRC Region 1
FROM: Mike Wasem, exam author
SUBJ: 2/04 Initial License Operator Exam
DATE: February 11, 2004

I have enclosed copies of the examination materials which include all the corrections and comments gathered during validation the week of February 2. Also, a proposed schedule and a copy of the security agreement with the most up to date signatures, as of today, are included.

In accordance with Attachment 1 of ES 201, the enclosed materials "SHALL BE WITHHELD FROM PUBLIC DISCLOSURE UNTIL EXAMINATIONS ARE COMPLETE".

If you need any additional information, please call me at (410) 495-3638.

Sincerely,



Mike Wasem

cc: 2004 NRC exam file

Here is a quick summary of the changes from the originally submitted materials:

SRO Administrative Topics Outline—Changed A.2 description of activity and K/A to better reflect intent of the JPM

Control Room/In-Plant Systems Outlines---Changed System/JPM Title to reflect the change out of one in-plant JPM and the modification of one Control Room JPM

SRO written:

Incorporated comments on questions 1, 2, 3, 4, 6, 7, 9, 11, 16, 19 and 21.
Included Electrical System LCOs and basis to handout associated w/15.
Replaced questions 10 and 25.

RO written:

Incorporated comments on questions 4, 12, 24 29, 32, 42, 45 and 73.
Replaced questions 18, 50, 55 and 74.

Changes to the written exams resulted in changes to items 6 and 7 of the Written Examination Quality Checklist, Form ES-401-6 to:

Bank	Modified	New
23/10	8/1	44/14

Memory	C/A
34/11	41/14

Scenarios:

Write ups of critical tasks.

#1—correct load reduction target, referenced TS for PORV failure, Actions for possible 2 CPUs being failed and SRO referencing table for OTCC success.

#2—added referencing TS 3.6.6 for loss of CCW

#3—reflect SGFP initial lineup change, added details for expected actions shifting GS and SGFPs to Main Steam

CCNPP

3/04 NRC EXAM DEVELOPMENT

Operations Training Unit

TO: J. D'Antonio, Chief Examiner, NRC Region 1
FROM: D.F. Lavato, Facility Representative
SUBJ: 3/04 Initial License Operator Exam Outlines
DATE: December 9, 2003

I have attached the required outlines for the March 2004 Initial License Operator Examinations at Calvert Cliffs Nuclear Power Plant per NUREG 1021 Revision 9 ES 201.

Additional information is attached which includes the Random Selection method used for the Written exam development and a proposed exam week schedule.

In accordance with Attachment 1 of ES 201, the enclosed materials "SHALL BE WITHHELD FROM PUBLIC DISCLOSURE UNTIL EXAMINATIONS ARE COMPLETE".

I have included form ES 201-2 with the test outlines. If you need any additional information, please call me at (410) 495-4586 or Mike Wasem at (410) 495-3638.

Sincerely,



D.F. Lavato

cc: 2004 NRC exam file

Scenario 1

In #:	#1	#2	#3	#4:
Time:	7:30a - 9:30a	9:30a - 11:30a	12:00p - 2:00p	2:00p - 4:00p
CRS	U1	U2	U3	I1
RO	I2	I3	I4	RO1
CRO	RO2	RO3	RO4	*

I1 = Instant SRO 1

U1 = Upgrade SRO 1

RO1 = Reactor Operator 1

Note: Could all be the same scenarios on DAY 1, since no one participates in more than one (1) scenario on each day and everyone participates in scenarios.

Scenario 2

Run #:	#1	#2	#3	#4:
Time:	7:30a – 9:30a	9:30a – 11:30a	12:00p – 2:00p	2:00p – 4:00p
CRS	I2	I3	I4	
RO	RO2	RO3	RO4	
CRO	RO1	I1	*	

- = Surrogate (can be same for both scenarios)

	0730	0750	0810	0830	0845	0900
U1	U.a	A.1.a	U.b	U.c	A1.b	
U2	U.b	U.a	A.1.a		U.c	A.1.b
U3	A1.a	U.b	U.a	A.1.b		U.c

	0915	0930	0945	1000	1020	1040
I1	I.c	A.1.b		I.a	A.1.a	I.d
I2		I.c	A.1.b	I.d	I.a	A.1.a
I3	A.1.b		I.c	A.1.a	I.d	I.a

	1200	1220	1240	1310	1330	1350
I4	I.a	A.1.a	I.d	I.c	A.1.b	
RO1	R.d	R.a	R.h		R.c	A.1.b
RO2	R.h	R.d	R.a	A.1.b		R.c

	1410	1430	1450	1510	1530
RO3	R.c	A.1.b	R.a	R.d	R.h
RO4	A.1.b	R.c	R.h	R.a	R.d

Evaluator	Candidates			
NRC 1	U1	I1	I4	RO3
NRC 2	U2	I2	RO1	RO4
NRC 3	U3	I3	RO2	

U= upgrade

I= instant

SRO

A=Admin

JPM

	0730	0750	0810	0850	0910	0930	0950
I1	I.e	I.f	I.g	I. b	A.3	A.2	A.4
I2	I.f	I.g	I.e	A.2	I.b	A.4	A.3
I3	I. g	I.e	I.f	A.3	A.4	I.b	A.2

	1010	1030	1050	1110	1200	1220	1240
I4	I.b	A.3	A.4	A.2	I.e	I.f	I.g
RO1	A.1.a	R.b	A.4		R.g	R.e	R...
RO2	A.4	A.1.a	R.b		Rf	R.g	R.e

	1300	1320	1340	1400	1420	1440
RO3	R.e	R.f	R.g	A.1.a	R.b	A.4
RO4	R.g	R.e	R.f	A.4	A.1.a	R.b

	1500	1520	1540
U1	A.2	A.3	A.4
U2	A.3	A.4	A.2
U3	A.4	A.2	A.3

In plant

	0730	0800	0830	0900	0930	1000	1030	1100	1130	1200	1230
U1	U.i	U.j									
U2	U.j	U.i									
U3			U.j	U.i							
I1			I.i	I.j	I.k						
I2			I.j	I.k	I.i						
I3						I.i	I.j	I.k			
I4						I.j	I.k	I.i			
RO1						R.k	R.i	R.j			
RO2									R.i	R.j	R.k
RO3									R.j	R.k	R.i
RO4									R.k	R.i	R.j

NOTE: The "Exit" will be as determined by the Lead Examiner.

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions - Tier 1 Group 1 (RO/SRO)

Form ES-401-2



Exam #

1
2
3
4
5
6
7

E/APE #/Name/Safety Function	K			A		G	Number	K/A Topics	Imp.	SRO #
	1	2	3	1	2					
000007/E02 Reactor Trip - Recovery /1										
000008 Pzr Vapor Space Accident /3										
000009 Small Break LOCA /3										
000011 Large Break LOCA /3										
000015/17 RCP Malfunctions /4					x		AA2.10	W... CPs on loss of cooling or seal injection RCP Malfunctions 0872		1
000022 Loss of Rx Coolant Makeup /2										
000025 Loss of RHR System /4						x	2.1.12	Ability to apply Technical Specifications for a system Loss of RHR 001	4.0	1
000026 Loss of Comp. Cooling Water /8										
000027 Pzr Press. Ctrl. Sys. Malf. /3						x	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm PER CONTROL MALF SRO 001	3.6	1
000029 ATWS /1						x	EA2.01	Ability to determine or interpret reactor nuclear instrumentation as it applies to a ATWS ATWS SRO 001	4.7	1
000038 SG Tube Rupture/3										
000040CE05 Steam Line Rupture /4										
000054CE06 Loss of Feedwater /4						x	AA2.08	Ability to determine and interpret Steam flow-feed trend recorder Loss of FW SRO 003 ATWS SRO 001	3.3	1
000055 Station Blackout /6						x	2.1.20	... procedure steps SRO-201-7-1-03 003	4.2	1
000056 /Loss of Off Site Power /6										
000057 Loss of Vital AC Instrument Bus /6										
000058 Loss of DC Power /6						x	AA2.01	... and interpret that a loss of dc power has occurred: verification that ... power sources have come on line CRO-54-1-1-25 001	4.1	1
000062 Loss of Nuclear Service Water /4										
000065 Loss of Instrument Air /8										
K/A Category Totals				4	3					7

New

Cog. level 2 or 3

 Bank
 MOD

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 2 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	Number	K/A Topics	Imp.	SRO #
000001 Continuous Rod Withdrawal /1										
000003 Dropped Control Rod /1										
000005 Inoperable/Stuck Control Rod /1										
8 000024 Emergency Boration /1						x	2.2.22	Knowledge of limiting conditions for operations and safety limits CRO-107-1-3-28 4.1 0291		
000028 /Pzr Level Malfunction /2										
000032 Loss of Source Range NI /7										
000033 Loss of Intermediate Range NI /7										
000036 /Fuel Handling Accident /8										
9 000037 SG Tube Leak /3						x	2.1.33	Ability to recognize indications for system operating parameters which are entry-level conditions. Technical specifications CRO-202A-0-04-004	4.0	1
000051 Loss of Condenser vacuum /4										
000059 Accidental Liquid RadWaste Rel. /9										
000060 Accidental Gaseous Radwaste Rel./9										
000061 ARM System Alarms /7										
000067 Plant Fire on Site /8										
10 000068 Control Room Evac. /8						x	2.2.25	Knowledge of bases in technical specifications for limiting conditions and safety CRO-202-9A-2-01 001	3.7	1
000069 Loss of CTMT Integrity /5										
000074 Inadequate Core Cooling /4										
000076 High Reactor Coolant Activity /9										
CE/A11 RCS Overcooling/PTS /4										
CE/A13 Natural Circulation /4										
11 CE/A16 /Excessive RCS Leakage /2					x		AA2.1	selection of appropriate procedures during abnormal and emergency operations AOP-2A-03-003	3.5	1
12 CE/E09 /Functional Recovery					x		EA2.1	selection of appropriate procedures during abnormal or emergency operations SRO-201-8-1-19 019	4.4	1
K/A Category Totals					2	3		Group Point Total		5

CCNPP NRC License Examination
 March 2004 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	Number	K/A Topics	Imp.	SRO #
003 Reactor Coolant Pump															
004 Chemical and Volume Control															
005 Residual Heat Removal															
006 Emergency Core Cooling															
007 Pressurizer Relief/Quench Tank															
13 008 Component Cooling Water								x				A2.07	Consequences of high or low flow rate and temperature: the flow rate at which the CCW standby pump will start <i>Component 2.8 / CCW SRO 001</i>		
010 Pressurizer Pressure Control															
012 Reactor Protection															
013 ESFAS															
14 022 Containment Cooling								x				A2.04	Ability to predict impacts of and correct or control-Loss of service water <i>Containment CCW SRO 001</i>	3.2	1
026 Containment Spray															
039 Main and Reheat Steam															
056 Condensate															
059 Main Feedwater															
061 Auxiliary Feedwater															
062 AC Electrical Distribution															
15 063 DC Electrical Distribution											x	2.1.32	<i>SRO 54-1-1-11 001</i> Ability to explain and apply all system limits and precautions	3.8	1
064 Emergency Diesel Generator															
073 Process Radiation Monitoring															
076 Service Water															
078 Instrument Air															
16 103 Containment											x	2.1.14	Knowledge of system status criteria which require the notification of plant personnel <i>Containment SRO 003</i>	3.3	1
K/A Category Point totals								2			2		Group Point Total		4

CCNPP NRC License Examination
 March 2004 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	Number	K/A Topics	Imp.	SRO #
001 Control Rod Drive															
002 Reactor Coolant															
17 011 Pressurizer Level Control								x				A2.05	Ability to predict the impacts of and correct or control-Loss of pressurizer heaters <i>PR LVL CONT SRO</i>	3.7	1
014 Rod Position Indication															
015 Nuclear Instrumentation															
016 Non-Nuclear Instrumentation															
017 In-Core Temperature Monitor															
027 Containment Iodine Removal															
028 H2 Recombiner and Purge Control															
029 Containment Purge															
033 Spent Fuel Pool Cooling															
18 034 Fuel Handling Equipment											x	2.4.49	Ability to perform w/o reference to procedures actions that require immediate operation <i>CRD-113-6-4-20 001</i>	4.0	1
035 Steam Generator															
041 Steam Dump/Turbine Bypass Control															
045 Main Turbine Generator															
055 Condenser Air Removal															
068 Liquid Radwaste															
071 Waste Gas Disposal															
072 Area Radiation Monitoring															
075 Circulating Water															
079 Station Air															
086 Fire Protection															
K/A Category Point totals								1			1		Group Point Total		2

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Generic Knowledge and Abilities Outline (Tier 3)

Form ES-401-3

Category	K/A #	Topic	SRO-Only	
			Imp.	#
1. Conduct of Operations 19 20	2.1.2	Knowledge of operator responsibilities during all modes of plant operation <i>SRO-204-1-013-002 002</i>	3.8	1
	2.1.15	Ability to manage short-term information such as night and standing orders <i>NITE/STANDING ORDERS 001</i>	3.0	1
	Subtotal			2
2. Equipment Control 21	2.2.22	Knowledge of limiting conditions for operation and safety limits <i>CRP-212-1-1-02 003</i>	4.1	1
	Subtotal			1
3. Radiation Control 22 23	2.3.3	Knowledge of SRO responsibilities for auxiliary systems which are outside the control room <i>SRO Responsibilities 001</i>	2.9	1
	2.3.7	Knowledge of the process for preparing a radiation work permit <i>RADWORK PERMIT 001</i>	3.3	1
	Subtotal			2
4. Emergency Procedures / Plan 24 25	2.4.4	Ability to recognize abnormal indications for system operating parameters which are entry level conditions for emergency and abnormal operating procedures <i>EMER PRO 001</i>	4.3	1
	2.4.18	Knowledge of the specific bases for EOPs specific bases for EOPs <i>SRO-201-3-1-28 028</i>	3.8	1
	Subtotal			2
Tier 3 Point Total				7

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 1 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K	K	K	A	A	G	Number	K/A Topics	Imp.	RO #
	1	2	3	1	2					
000007/E02 Reactor Trip – Recovery /1				x			EA1.06	Verification that the control and safety rods are in after the trip <i>SRO-201-2-05 005</i>	4.4	1
000008 Pzr Vapor Space Accident /3					x		AA2.01	RCS pressure and temperature indicators and alarms <i>VAPOR SPACE ACC 001</i>	3.9	1
000009 Small Break LOCA /3				x			EA1.07	Ability to operate and monitor the Containment Cooling System <i>CONTAINMENT COOLING 001</i>	3.7	1
000011 Large Break LOCA /3		x					EK2.02	Knowledge of the interrelations between Pumps and the Large Break LOCA <i>SRO-201-5-1-286 006</i>	3.6	006
000015/17 RCP Malfunctions /4	x						AK1.04	Basic steady state thermodynamic relationship between RCS loops and S/Gs resulting from unbalanced RCS flow <i>RCP Malfunctions 001</i>	2.9	1
000022 Loss of Rx Coolant Makeup /2						x	2.4.21	Knowledge of parameters and logic used to assess the status of safety functions <i>LOSS OF RX COOLANT 001</i>	3.7	1
000025 Loss of RHR System /4								NOT SELECTED		
000026 Loss of Comp. Cooling Water /8			x				AK3.02	Automatic actions within the CCWS resulting from ESFAS actuation <i>CCWS-113-5-5-25 035</i>	3.6	1
000027 Pzr Press. Ctrl. Sys. Malf. /3			x				AK3.03	Actions contained in EOP for PZR PCS malfunction <i>PZR PRESS MALF 001</i>	3.7	1
000029 ATWS /1	x						EK1.03	Effects of boron on reactivity, as it relates to an ATWS <i>ATWS-201-0-3-29 029</i>	3.6	1
000038 SG Tube Rupture/3			x				EK3.01	Equalizing pressure on primary and secondary sides of ruptured S/G <i>SRO-201-6-1-30 030</i>	3.4	1
000040CE05 Steam Line Rupture /4	x						AK1.07	Effects of feedwater introduction on dry S/G <i>STEAM LINE RUPTURE 001</i>	3.4	1
000054CE06 Loss of Feedwater /4	x						AK1.01	MFW line break depressurizes the S/G (similar to steam line break) <i>LOSS OF FEEDWATER 001</i>	4.1	1
000055 Station Blackout /6				x			EA1.06	Restoration of power with one ED/G <i>STATION BLACKOUT 001</i>	4.1	1
000056 /Loss of Off Site Power /6					x		AA2.43	Occurrence of a turbine trip <i>LOSS OF OFFSITE</i>	3.9	1
000057 Loss of Vital AC Instrument Bus /6					x		AA2.17	System and component status, using local or remote controls <i>LOSS OF VITAL AC 001</i>	3.1	1
000058 Loss of DC Power /6						x	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status <i>LOSS OF DC POWER 001</i>	3.0	1
000062 Loss of Nuclear Service Water /4			x				AK3.01	The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the nuclear service water coolers <i>LOSS OF SWS 001</i>	3.2	1
000065 Loss of Instrument Air /8				x			AA1.04	Ability to operate and/or monitor Emergency air compressors as applicable to loss of instrument air <i>APP-7D-05 008</i>	3.5	1
K/A Category Totals	4	1	4	4	3	2				18

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18

NEW

BANK

MODIFIED

Cognitive level 2013

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 2 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K			A		G	Number	K/A Topics	Imp.	RO #
	1	2	3	1	2					
000001 Continuous Rod Withdrawal /1										
19 000003 Dropped Control Rod /1					x		AA2.01	Ability to determine and interpret—Rod position indication to actual rod position <i>Dropped CEA 001</i>	3.7	1
000005 Inoperable/Stuck Control Rod /1										
000024 Emergency Boration /1										
000028 /Pzr Level Malfunction /2										
20 000032 Loss of Source Range NI /7						x	2.2.22	Knowledge of limiting conditions for operation and safety limits <i>Loss of WRNI 001</i>	3.4	1
000033 Loss of Intermediate Range NI /7										
21 000036 /Fuel Handling Accident /8					x		AA2.02	Ability to determine and interpret—occurrence of a fuel handling incident <i>FUEL HANDLING ACCIDENT 001</i>	3.4	1
000037 SG Tube Leak /3										
000051 Loss of Condenser vacuum /4										
000059 Accidental Liquid RadWaste Rel. /9										
000060 Accidental Gaseous Radwaste Rel./9										
22 000061 ARM System Alarms /7						x	2.1.1	Knowledge of conduct of operations requirements <i>AREA RAD MON 001</i>	3.7	1
23 000067 Plant Fire on Site /8			x				AK3.04	Actions contained in EOP for plant fire on site <i>CRD-202-9A-2-49 049</i>	3.3	1
000068 Control Room Evac. /8										
000069 Loss of CTMT Integrity /5										
24 000074 Inadequate Core Cooling /4				x			EA1.16	Ability to operate and monitor RCS in-core thermocouple indicators <i>LDR-114-1-03 054</i>	4.4	008
25 000076 High Reactor Coolant Activity /9		x					AK2.01	Knowledge of interrelations between the High Reactor Coolant Activity and the process radiation monitors <i>CRD-107-1-3-55 055</i>	2.6	1
CE/A11 RCS Overcooling/PTS /4										
CE/A13 Natural Circulation /4										
26 CE/A16 /Excessive RCS Leakage /2				x			AA1.1	Ability to operate/monitor components, functions of control and safety systems including instrumentation, signals, interlocks failure modes, auto/man features <i>EXCESS RCS LEAKAGE 001</i>	3.4	1
27 CE/E09 /Functional Recovery			x				EK3.4	Knowledge for the reasons of RO or SRO function within the control room team in such a way that procedures are adhered to and limits are not violated <i>SRO-201-8-1-158 018</i>	3.3	1
K/A Category Totals	0	1	2	2	2	2		Group Point Total		9

System #/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	Number	K/A Topics	Imp.	RO #
38 003 Reactor Coolant Pump											x	2.1.32	Ability to explain and apply all system limits and precautions <i>AOP-7F-06 006</i>	3.4	1
39 004 Chemical and Volume Control						x						K6.04	Knowledge of the effects of loss of CVCS pumps <i>CRD-107-1-9-28 001</i>	3.0	1
30 005 Residual Heat Removal		x										K2.01	Knowledge of the bus power supplies to the RHR pumps <i>CRD-063-1-3-18 018</i>	3.0	1
31 006 Emergency Core Cooling												K4.11	Knowledge of ECCS design features/interlocks which provide for resetting SIAS <i>CRD-063-1-3-18 018</i>	3.9	1
32 008 Component Cooling Water System			x									K3.01	Knowledge of the effect that a loss or malfunction of the CCWS will have on loads cooled by CCWS <i>CRD-113-5-5-19 019</i>	3.4	1
33 007 Pressurizer Relief/Quench Tank								x				A2.02	Ability to predict the impacts of and correct, control or mitigate abnormal pressure in the PRT <i>CRD-113-5-5-19 019</i>	2.6	1
34 008 Component Cooling Water				x								K4.09	The standby feature of the CCW pumps <i>COMPONENT C/W 2.7.00 1</i>	2.7	1
35 010 Pressurizer Pressure Control						x						K6.03	Knowledge of the effect of a loss or malfunction of PZR sprays and heaters will have on RCS PCS <i>LOSS OF PCS 001</i>	3.2	1
36 012 Reactor Protection			x									K3.02	Knowledge that a loss or malfunction of the RPS will have on the Turbine/Generator <i>RPS MALF 001</i>	3.2	1
37 012 Reactor Protection											x	2.4.47	Ability to diagnose and recognize trends in an accurate and timely matter using reference material <i>RPS POWER SUPPLY 001</i>	3.4	1
38 013 ESFAS												A1.01	Ability to predict/monitor changes in RCS pressure and temperature associated with operating ESFAS <i>ESFAS 001</i>	4.0	1
39 022 Containment Cooling	x											K1.01	Knowledge of connections, cause effect relationship between CCS and SWS cooling system <i>CONTAINMENT COOLING 003</i>	3.5	1
40 026 Containment Spray												K2.01	Knowledge of the bus power supplies to CS pumps <i>CONTAINMENT SPRAY 001</i>	3.4	1
41 026 Containment Spray								x				A2.07	Ability to predict impacts of and correct, loss of spray pump suction when in recirc due to clogged screen, cavitation <i>CONTAINMENT SPRAY 002</i>	3.6	1
42 039 Main and Reheat Steam							x					A1.09	Ability to predict/monitor changes in Main Steam line RMS <i>MAIN STEAM 1 RMS 001</i>	2.5	1
43 039 Main and Reheat Steam										x		A4.01	Ability to manually operate/monitor MS supply valves <i>CRD-103-2-16-016</i>	2.16	1
44 056 Condensate								x				A2.04	Ability to predict impacts of loss of condensate pumps <i>CRD 103-2-4-82 082</i>	2.4	1
45 059 Main Feedwater				x								K4.08	FRV operation on basis of feed/steam flow mismatch <i>MAIN FEED 001</i>	2.5	1
46 059 Main Feedwater										x		A3.06	Ability to monitor MFW isolation <i>MFW ISOL 001</i>	3.2	1
47 061 Auxiliary Feedwater					x							K5.01	Knowledge of the relationship between AFW flow and RCS heat transfer <i>AFW 04 001</i>	3.6	1
48 061 Auxiliary Feedwater							x					A1.03	Ability to predict/monitor interactions when units cross tied <i>AFW XCONV 001</i>	3.0	1
49 062 AC Electrical Distribution								x				A2.01	Ability to predict impacts, correct, de-energized loads that degrade or hinder operation <i>AC DISTRIBUTION 001</i>	3.4	1
50 063 DC Electrical Distribution										x		A4.01	Ability to operate or monitor breakers, fuses in the CR <i>DC 001</i>	2.8	1

CCNPP NRC License Examination
 March 2004 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	Number	K/A Topics	Imp.	RO #
064 Emergency Diesel Generator	x											K1.04	Knowledge of the connection, cause/effect between ED/G and DC distribution system <i>EDG SYS 001</i>	3.6	1
073 Process Radiation Monitoring					x							K5.01	Knowledge of Radiation theory as applies to PRM <i>CRD-12-25-35 07 009</i>	2.5	1
076 Service Water							x					A1.02	Ability to predict/monitor changes in reactor and turbine building closed cooling water temperatures <i>CRD-113-2-5-24 024</i>	2.6	1
078 Instrument Air				x								K4.02	Knowledge of design features/interlocks which provide for cross-over to other air systems <i>Instrument Air 04 002</i>	3.2	1
103 Containment								x				A2.05	Ability to predicts impacts of Emergency containment entry and control or mitigate consequences <i>CONTAINMENT</i>	2.9	1
K/A Category Point totals	2	2	2	4	2	2	4	5	1	2	2		Group Point Total		28

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Plant Systems - Tier 2 Group 2 (RO/SRO)

Form ES-401-2

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System #/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	Number	K/A Topics	Imp.	RO #
001 Control Rod Drive											X	A4.08	Ability to manually operate the mode select for CRDS, operation of MG sets and control panel <i>CRD-60-1-04 004</i>	3.7	1
002 Reactor Coolant							X					A1.06	Ability to predict/monitor reactor power associated with RCS controls <i>CRD-52-10-06 00</i>		
011 Pressurizer Level Control															
014 Rod Position Indication												K5.01	Knowledge of operational implications of differences between RPIS and step counter <i>CRD-60-1-45 045</i>	2.7	1
015 Nuclear Instrumentation									X			A3.05	Ability to monitor recognition of audio output expected for a given plant condition <i>NUCLEAR INSTRUMENTS 001</i>	2.6	1
016 Non-Nuclear Instrumentation															
017 In-Core Temperature Monitor															
027 Containment Iodine Removal															
028 H2 Recombiner and Purge Control										X		A4.03	Ability to manually operate/monitor H2 sampling and analysis of cntmt atmosphere including alarms and indications <i>H2 Analyzer 001</i>	3.1	1
029 Containment Purge				X								K4.03	Knowledge of the design feature/interlock providing auto isolation <i>CONTAINMENT PURGE 001</i>		
033 Spent Fuel Pool Cooling			X									K3.03	Knowledge that the effect of loss of cooling has on spent fuel temperature <i>CRD-13-4-3-06 001</i>	3.0	1
034 Fuel Handling Equipment															
035 Steam Generator															
041 Steam Dump/Turbine Bypass Control															
045 Main Turbine Generator															
055 Condenser Air Removal															
068 Liquid Radwaste					X							K5.04	Knowledge of operational implications of biological hazards of radiation and resulting goal of ALARA <i>LIQUID RADWASTE 001</i>	3.2	1
071 Waste Gas Disposal															
072 Area Radiation Monitoring		X										K1.04	Knowledge of connections and cause/effect between ARM and Control Room ventilation <i>CRD-134-1-5-45 045</i>	3.3	1
075 Circulating Water															
079 Station Air															
086 Fire Protection									X			A3.01	Ability to manually operate/monitor starting mechanisms of fire pumps <i>FIRE SYSTEM 04 001</i>	2.9	1
K/A Category Point totals	1	0	1	1	2	0	1	0	2	2	0		Group Point Total		10

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Generic Knowledge and Abilities Outline (Tier 3)

Form ES-401-3

Category	K/A #	Topic	RO	
			Imp.	#
1. Conduct of Operations	66 2.1.3	Knowledge of shift turnover practices <i>SHIFT TURNOVER OI</i>	3.0	1
	67 2.1.10	Knowledge of conditions and limitations in the facility license <i>COND/LIMITS OOI</i>	2.7	1
	68 2.1.14	Knowledge of system status criteria which require the notification of plant personnel <i>SYSTEM STATUS COMM</i>	2.5	1
	Subtotal			3
2. Equipment Control	69 2.2.28	Knowledge of new and spent fuel movement procedures <i>FUEL MOVES OOI</i>	2.6	1
	70 2.2.33	Knowledge of control rod programming <i>CR PROGRAM OOI</i>	2.5	1
	71 2.2.34	Knowledge of the process for determining the internal and external effects on core reactivity <i>CORE REACTIVITY OOI</i>	2.8	1
	Subtotal			3
3. Radiation Control	72 2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure <i>RAD CONTROL OOI</i>	2.9	1
	73 2.3.11	Ability to control radiation releases <i>RADIATION RELEASE OOI</i>	2.7	1
	Subtotal			2
4. Emergency Procedures / Plan	74 2.4.17	Knowledge of EOP terms and definitions <i>EOP DEFINITIONS OOI</i>	3.1	1
	75 2.4.46	Ability to verify that alarms are consistent with plant conditions <i>VERIFY ALARMS OOI</i>	3.5	1
	Subtotal			2
Tier 3 Point Total				10

2/04 NRC Exam Outline Random Selection Method

Overview:

The Written Exam Outlines were developed per NUREG 1021 Draft Revision 9, ES-401 D.1 and Attachment 1.

Numbered tokens were used as described in the attachment 1 to develop both the RO and SRO Written Test Outlines.

Specific steps:

The RO and SRO Written Exam outlines were made site-specific before any random selection was performed. For Tier 1 categories, the Westinghouse and B&W specific E/APEs were removed from the outlines. For Tier 2, Ice Condenser was removed from the outline.

For the SRO exam, only Categories A2, AA2, EA2 and G were maintained in the pool of available K/A statements for selection in Tiers 1 and 2.

Rejected K/A statements were replaced with randomly selected K/A statements in the basic method specified in Attachment 1.

CCNPP NRC License Examination
 March 2004 PWR Written examination outline

Form ES-401-2

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	K	A	A 2	G *	Total	
1. Emergency & Abnormal Plant Evolutions	1	4	1	4				4	3				2	18			4	3	7
	2	0	1	2				2	2				2	9			2	3	5
	Tier Totals	4	2	6				6	5				4	27			6	6	12
2. Plant Systems	1	2	2	2	4	2	2	4	5	1	2	2	28			2	2	4	
	2	1	0	1	1	2	0	1	0	2	2	0	10			1	1	2	
	Tier Totals	3	2	3	5	4	2	5	5	3	4	2	38			3	3	6	
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4	7	
				3		3		2		2				2	1	2	2		

- Note:
1. Ensure that at least two topics from every K/A category are sampled within each tier of the RO outline (i.e. the "Tier Totals" in each K/A category shall not be less than two). Refer to Section D.1.c for additional guidance regarding SRO sampling.
 2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ± 1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
 3. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system or evolution unless they are related to plant specific priorities.
 4. Systems/evolutions within each group are identified on the associated outline.
 5. The shaded areas are not applicable to the category/tier.
 6. * 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. The SRO K/As must also be linked to 10 CFR 55.43 or an SRO-level learning objective.
 7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IR) 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; summarize all the SRO-only knowledge and non-A2 ability categories in the columns labeled "K" and "A". Use duplicate pages for RO and SRO-only exams.
 8. For Tier 3, enter the K/A numbers, descriptions, importance ratings, and point totals on Form ES-401-3.
 9. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 1 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K	K	K	A	A	G	Number	K/A Topics	Imp.	RO #
	1	2	3	1	2					
000007/E02 Reactor Trip – Recovery /1				x			EA1.06	Verification that the control and safety rods are in after the trip	4.4	1
000008 Pzr Vapor Space Accident /3					x		AA2.01	RCS pressure and temperature indicators and alarms	3.9	1
000009 Small Break LOCA /3				x			EA1.07	Ability to operate and monitor the Containment Cooling System	3.7	1
000011 Large Break LOCA /3		x					EK2.02	Knowledge of the interrelations between Pumps and the Large Break LOCA	2.6	1
000015/17 RCP Malfunctions /4	x						AK1.04	Basic steady state thermodynamic relationship between RCS loops and S/Gs resulting from unbalanced RCS flow	2.9	1
000022 Loss of Rx Coolant Makeup /2						x	2.4.21	Knowledge of parameters and logic used to assess the status of safety functions	3.7	1
000025 Loss of RHR System /4								NOT SELECTED		
000026 Loss of Comp. Cooling Water /8			x				AK3.02	Automatic actions within the CCWS resulting from ESFAS actuation	3.6	1
000027 Pzr Press. Ctrl. Sys. Malf. /3			x				AK3.03	Actions contained in EOP for PZR PCS malfunction	3.7	1
000029 ATWS /1	x						EK1.03	Effects of boron on reactivity, as it relates to an ATWS	3.6	1
000038 SG Tube Rupture/3			x				EK3.01	Equalizing pressure on primary and secondary sides of ruptured S/G	4.1	1
000040CE05 Steam Line Rupture /4	x						AK1.07	Effects of feedwater introduction on dry S/G	3.4	1
000054CE06 Loss of Feedwater /4	x						AK1.01	MFW line break depressurizes the S/G (similar to steam line break)	4.1	1
000055 Station Blackout /6				x			EA1.06	Restoration of power with one ED/G	4.1	1
000056 /Loss of Off Site Power /6					x		AA2.43	Occurrence of a turbine trip	3.9	1
000057 Loss of Vital AC Instrument Bus /6					x		AA2.17	System and component status, using local or remote controls	3.1	1
000058 Loss of DC Power /6						x	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status	3.0	1
000062 Loss of Nuclear Service Water /4			x				AK3.01	The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the nuclear service water coolers	3.2	1
000065 Loss of Instrument Air /8				x			AA1.04	Ability to operate and/or monitor Emergency air compressors as applicable to loss of instrument air	3.5	1
K/A Category Totals	4	1	4	4	3	2				18

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 2 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	Number	K/A Topics	Imp.	RO #
000001 Continuous Rod Withdrawal /1										
000003 Dropped Control Rod /1					x		AA2.01	Ability to determine and interpret—Rod position indication to actual rod position	3.7	1
000005 Inoperable/Stuck Control Rod /1										
000024 Emergency Boration /1										
000028 /Pzr Level Malfunction /2										
000032 Loss of Source Range NI /7						x	2.2.22	Knowledge of limiting conditions for operation and safety limits	3.4	1
000033 Loss of Intermediate Range NI /7										
000036 /Fuel Handling Accident /8					x		AA2.02	Ability to determine and interpret—occurrence of a fuel handling incident	3.4	1
000037 SG Tube Leak /3										
000051 Loss of Condenser vacuum /4										
000059 Accidental Liquid RadWaste Rel. /9										
000060 Accidental Gaseous Radwaste Rel./9										
000061 ARM System Alarms /7						x	2.1.1	Knowledge of conduct of operations requirements	3.7	1
000067 Plant Fire on Site /8			x				AK3.04	Actions contained in EOP for plant fire on site	3.3	1
000068 Control Room Evac. /8										
000069 Loss of CTMT Integrity /5										
000074 Inadequate Core Cooling /4				x			EA1.16	Ability to operate and monitor RCS in-core thermocouple indicators	4.4	1
000076 High Reactor Coolant Activity /9		x					AK2.01	Knowledge of interrelations between the High Reactor Coolant Activity and the process radiation monitors	2.6	1
CE/A11 RCS Overcooling/PTS /4										
CE/A13 Natural Circulation /4										
CE/A16 /Excessive RCS Leakage /2				x			AA1.1	Ability to operate/monitor components, functions of control and safety systems including instrumentation, signals, interlocks failure modes, auto/man features	3.4	1
CE/E09 /Functional Recovery			x				EK3.4	Knowledge for the reasons of RO or SRO function within the control room team in such a way that procedures are adhered to and limits are not violated	3.3	1
K/A Category Totals	0	1	2	2	2	2		Group Point Total		9

CCNPP NRC License Examination
 March 2004 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	Number	K/A Topics	Imp.	RO #
003 Reactor Coolant Pump											x	2.1.32	Ability to explain and apply all system limits and precautions	3.4	1
004 Chemical and Volume Control						x						K6.04	Knowledge of the effects of loss of CVCS pumps	2.8	1
005 Residual Heat Removal		x										K2.01	Knowledge of the bus power supplies to the RHR pumps	3.0	1
006 Emergency Core Cooling				x								K4.11	Knowledge of ECCS design features/interlocks which provide for resetting SIAS	3.9	1
008 Component Cooling Water System			x									K3.01	Knowledge of the effect that a loss or malfunction of the CCWS will have on loads cooled by CCWS	3.4	1
007 Pressurizer Relief/Quench Tank								x				A2.02	Ability to predict the impacts of and correct, control or mitigate abnormal pressure in the PRT	2.6	1
008 Component Cooling Water				x								K4.09	The standby feature of the CCW pumps	2.7	1
010 Pressurizer Pressure Control						x						K6.03	Knowledge of the effect of a loss or malfunction of PZR sprays and heaters will have on RCS PCS	3.2	1
012 Reactor Protection			x									K3.02	Knowledge that a loss or malfunction of the RPS will have on the Turbine/Generator	3.2	1
012 Reactor Protection											x	2.4.47	Ability to diagnose and recognize trends in an accurate and timely matter using reference material	3.4	1
013 ESFAS							x					A1.01	Ability to predict/monitor changes in RCS pressure and temperature associated with operating ESFAS	4.0	1
022 Containment Cooling	x											K1.01	Knowledge of connections, cause effect relationship between CCS and SWS cooling system	3.5	1
026 Containment Spray		x										K2.01	Knowledge of the bus power supplies to CS pumps	3.4	1
026 Containment Spray								x				A2.07	Ability to predict impacts of and correct, loss of spray pump suction when in recirc due to clogged screen, cavitation	3.6	1
039 Main and Reheat Steam							x					A1.09	Ability to predict/monitor changes in Main Steam line RMS	2.5	1
039 Main and Reheat Steam										x		A4.01	Ability to manually operate/monitor MS supply valves	2.9	1
056 Condensate								x				A2.04	Ability to predict impacts of loss of condensate pumps...	2.6	1
059 Main Feedwater				x								K4.08	FRV operation on basis of feed/steam flow mismatch	2.5	1
059 Main Feedwater									x			A3.06	Ability to monitor MFW isolation	3.2	1
061 Auxiliary Feedwater					x							K5.01	Knowledge of the relationship between AFW flow and RCS heat transfer	3.6	1
061 Auxiliary Feedwater							x					A1.03	Ability to predict/monitor interactions when units cross tied	3.1	1
062 AC Electrical Distribution								x				A2.01	Ability to predict impacts, correct, de-energized loads that degrade or hinder operation	3.4	1
063 DC Electrical Distribution											x	A4.01	Ability to operate or monitor breakers, fuses in the CR	2.8	1

CCNPP NRC License Examination
 March 2004 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	Number	K/A Topics	Imp.	RO #
064 Emergency Diesel Generator	x											K1.04	Knowledge of the connection, cause/effect between ED/G and DC distribution system	3.6	1
073 Process Radiation Monitoring					x							K5.01	Knowledge of Radiation theory as applies to PRM	2.5	1
076 Service Water							x					A1.02	Ability to predict/monitor changes in reactor and turbine building closed cooling water temperatures	2.6	1
078 Instrument Air				x								K4.02	Knowledge of design features/interlocks which provide for cross-over to other air systems	3.2	1
103 Containment								x				A2.05	Ability to predicts impacts of Emergency containment entry and control or mitigate consequences	2.9	1
K/A Category Point totals	2	2	2	4	2	2	4	5	1	2	2		Group Point Total		28

System #/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	Number	K/A Topics	Imp.	RO #
001 Control Rod Drive										X		A4.08	Ability to manually operate the mode select for CRDS, operation of MG sets and control panel	3.7	1
002 Reactor Coolant							x					A1.06	Ability to predict/monitor reactor power associated with RCS controls	4.0	1
011 Pressurizer Level Control															
014 Rod Position Indication					x							K5.01	Knowledge of operational implications of differences between RPIS and step counter	2.7	1
015 Nuclear Instrumentation									x			A3.05	Ability to monitor recognition of audio output expected for a given plant condition	2.6	1
016 Non-Nuclear Instrumentation															
017 In-Core Temperature Monitor															
027 Containment Iodine Removal															
028 H2 Recombiner and Purge Control										x		A4.03	Ability to manually operate/monitor H2 sampling and analysis of cntmt atmosphere including alarms and indications	3.1	1
029 Containment Purge				x								K4.03	Knowledge of the design feature/interlock providing auto isolation	3.2	1
033 Spent Fuel Pool Cooling			x									K3.03	Knowledge that the effect of loss of cooling has on spent fuel temperature	3.0	1
034 Fuel Handling Equipment															
035 Steam Generator															
041 Steam Dump/Turbine Bypass Control															
045 Main Turbine Generator															
055 Condenser Air Removal															
068 Liquid Radwaste					x							K5.04	Knowledge of operational implications of biological hazards of radiation and resulting goal of ALARA	3.2	1
071 Waste Gas Disposal															
072 Area Radiation Monitoring	x											K1.04	Knowledge of connections and cause/effect between ARM and Control Room ventilation	3.3	1
075 Circulating Water															
079 Station Air															
086 Fire Protection									x			A3.01	Ability to manually operate/monitor starting mechanisms of fire pumps	2.9	1
K/A Category Point totals	1	0	1	1	2	0	1	0	2	2	0		Group Point Total		10

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Generic Knowledge and Abilities Outline (Tier 3)

RO

Form ES-401-3

Category	K/A #	Topic	RO	
			Imp.	#
1. Conduct of Operations	2.1.3	Knowledge of shift turnover practices	3.0	1
	2.1.10	Knowledge of conditions and limitations in the facility license	2.7	1
	2.1.14	Knowledge of system status criteria which require the notification of plant personnel	2.5	1
	Subtotal			3
2. Equipment Control	2.2.28	Knowledge of new and spent fuel movement procedures	2.6	1
	2.2.33	Knowledge of control rod programming	2.5	1
	2.2.34	Knowledge of the process for determining the internal and external effects on core reactivity	2.8	1
	Subtotal			3
3. Radiation Control	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure	2.9	1
	2.3.11	Ability to control radiation releases	2.7	1
	Subtotal			2
4. Emergency Procedures / Plan	2.4.17	Knowledge of EOP terms and definitions	3.1	1
	2.4.46	Ability to verify that alarms are consistent with plant conditions	3.5	1
	Subtotal			2
Tier 3 Point Total				10

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 1 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K	K	K	A	A	G	Number	K/A Topics	Imp.	SRO #
	1	2	3	1	2					
000007/E02 Reactor Trip – Recovery /1										
000008 Pzr Vapor Space Accident /3										
000009 Small Break LOCA /3										
000011 Large Break LOCA /3										
000015/17 RCP Malfunctions /4					x		AA2.10	When to secure RCPs on loss of cooling or seal injection	3.7	1
000022 Loss of Rx Coolant Makeup /2										
000025 Loss of RHR System /4						x	2.1.12	Ability to apply Technical Specifications for a system	4.0	1
000026 Loss of Comp. Cooling Water /8										
000027 Pzr Press. Ctrl. Sys. Malf. /3						x	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm	3.6	1
000029 ATWS /1					x		EA2.01	Ability to determine or interpret reactor nuclear instrumentation as it applies to a ATWS	4.7	1
000038 SG Tube Rupture/3										
000040CE05 Steam Line Rupture /4										
000054CE06 Loss of Feedwater /4					x		AA2.08	Ability to determine and interpret Steam flow-feed trend recorder	3.3	1
000055 Station Blackout /6						x	2.1.20	Ability to execute procedure steps	4.2	1
000056 /Loss of Off Site Power /6										
000057 Loss of Vital AC Instrument Bus /6										
000058 Loss of DC Power /6					x		AA2.01	Ability to determine and interpret that a loss of dc power has occurred: verification that substitute power power sources have come on line	4.1	1
000062 Loss of Nuclear Service Water /4										
000065 Loss of Instrument Air /8										
K/A Category Totals					4	3				7

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Emergency and Abnormal Plant evolutions – Tier 1 Group 2 (RO/SRO)

Form ES-401-2

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	Number	K/A Topics	Imp.	SRO #
000001 Continuous Rod Withdrawal /1										
000003 Dropped Control Rod /1										
000005 Inoperable/Stuck Control Rod /1										
000024 Emergency Boration /1						x	2.2.22	Knowledge of limiting conditions for operations and safety limits	4.1	1
000028 /Pzr Level Malfunction /2										
000032 Loss of Source Range NI /7										
000033 Loss of Intermediate Range NI /7										
000036 /Fuel Handling Accident /8										
000037 SG Tube Leak /3						x	2.1.33	Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications	4.0	1
000051 Loss of Condenser vacuum /4										
000059 Accidental Liquid RadWaste Rel. /9										
000060 Accidental Gaseous Radwaste Rel./9										
000061 ARM System Alarms /7										
000067 Plant Fire on Site /8										
000068 Control Room Evac. /8						x	2.2.25	Knowledge of bases in technical specifications for limiting conditions and safety limits	3.7	1
000069 Loss of CTMT Integrity /5										
000074 Inadequate Core Cooling /4										
000076 High Reactor Coolant Activity /9										
CE/A11 RCS Overcooling/PTS /4										
CE/A13 Natural Circulation /4										
CE/A16 /Excessive RCS Leakage /2					x		AA2.1	Facility conditions and selection of appropriate procedures during abnormal and emergency conditions	3.5	1
CE/E09 /Functional Recovery					x		EA2.1	Facility conditions and selection of appropriate procedures during abnormal or emergency operations	4.4	1
K/A Category Totals					2	3		Group Point Total		5

CCNPP NRC License Examination
 March 2004 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	Number	K/A Topics	Imp.	SRO #
003 Reactor Coolant Pump															
004 Chemical and Volume Control															
005 Residual Heat Removal															
006 Emergency Core Cooling															
007 Pressurizer Relief/Quench Tank															
008 Component Cooling Water								x				A2.07	Consequences of high or low flow rate and temperature: the flow rate at which the CCW standby pump will start	2.8	1
010 Pressurizer Pressure Control															
012 Reactor Protection															
013 ESFAS															
022 Containment Cooling								x				A2.04	Ability to predict impacts of and correct or control-Loss of service water	3.2	1
026 Containment Spray															
039 Main and Reheat Steam															
056 Condensate															
059 Main Feedwater															
061 Auxiliary Feedwater															
062 AC Electrical Distribution															
063 DC Electrical Distribution											x	2.1.32	Ability to explain and apply all system limits and precautions	3.8	1
064 Emergency Diesel Generator															
073 Process Radiation Monitoring															
076 Service Water															
078 Instrument Air															
103 Containment											x	2.1.14	Knowledge of system status criteria which require the notification of plant personnel	3.3	1
K/A Category Point totals								2				2	Group Point Total		4

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Plant Systems -- Tier 2 Group 2 (RO/SRO)

Form ES-401-2

System #/Name	K	K	K	K	K	K	A	A	A	A	G	Number	K/A Topics	Imp.	SRO #
	1	2	3	4	5	6	1	2	3	4					
001 Control Rod Drive															
002 Reactor Coolant															
011 Pressurizer Level Control								x				A2.05	Ability to predict the impacts of and correct or control-Loss of pressurizer heaters	3.7	1
014 Rod Position Indication															
015 Nuclear Instrumentation															
016 Non-Nuclear Instrumentation															
017 In-Core Temperature Monitor															
027 Containment Iodine Removal															
028 H2 Recombiner and Purge Control															
029 Containment Purge															
033 Spent Fuel Pool Cooling															
034 Fuel Handling Equipment											x	2.4.49	Ability to perform w/o reference to procedures actions that require immediate operation	4.0	1
035 Steam Generator															
041 Steam Dump/Turbine Bypass Control															
045 Main Turbine Generator															
055 Condenser Air Removal															
068 Liquid Radwaste															
071 Waste Gas Disposal															
072 Area Radiation Monitoring															
075 Circulating Water															
079 Station Air															
086 Fire Protection															
K/A Category Point totals							1				1		Group Point Total		2

CCNPP NRC License Examination
 March 2004 PWR Examination outline
 Generic Knowledge and Abilities Outline (Tier 3)

SRO

Form ES-401-3

Category	K/A #	Topic	SRO-Only	
			Imp.	#
1. Conduct of Operations	2.1.2	Knowledge of operator responsibilities during all modes of plant operation	3.8	1
	2.1.15	Ability to manage short-term information such as night and standing orders	3.0	1
	Subtotal			2
2. Equipment Control	2.2.22	Knowledge of limiting conditions for operation and safety limits	4.1	1
	Subtotal			1
3. Radiation Control	2.3.3	Knowledge of SRO responsibilities for auxiliary systems which are outside the control room	2.9	1
	2.3.7	Knowledge of the process for preparing a radiation work permit	3.3	1
	Subtotal			2
4. Emergency Procedures / Plan	2.4.4	Ability to recognize abnormal indications for system operating parameters which are entry level conditions for emergency and abnormal operating procedures	4.3	1
	2.4.18	Knowledge of the specific bases for EOPs	3.6	1
	Subtotal			2
Tier 3 Point Total				7

Tier / Group	Randomly Selected K/A	Reason for Rejection
		RO EXAM
1/1	026AK1.	None listed, selected 026AK3.01
1/1	056AK2.07	Low RO importance, selected 056AA2.43
1/1	057AK1.	None listed, selected 057AA2.17
1/1	065AA1.05	RPS unaffected by loss of IA, selected 065AA1.04
1/1	027AK3.04	Routine Rx trip pressure restores at the same time or before level, due to high heater capacity—selected 027K3.03
1/1	026AK3.01	SWS valves to CCWS coolers receive no automatic signals, selected 3.02
2/1	026K5.	None > 2.5, selected 026A2.07
2/1	039K2.	None > 2.5, selected 039A1.09
2/1	076K6	None > 2.5, selected 076A1.02
2/1	078K6	None > 2.5, selected 078K4.02
2/1	004K4.14	Over sampled K4, selected 004K6.04
2/1	007K3.01	Same K/A selected last exam, minimal questions to match K/A, replaced w/008K3.01 to preserve K/A number distribution
2/2	014A3.	None listed, selected 014K5.01
2/2	027A2.01	IRU high temps not addressed in procedures, spray retired in place, selected 002A1.06
2/2	029K6.	None listed, selected 029K4.03
2/2	001A4.12	Not applicable, no limit to prevent coil burnout, selected 001A4.08
		SRO EXAM
1/1	055 2.1.6	Not applicable to SRO during SBO, selected 2.1.20
1/1	026 2.1.12	Over sampled CC system, selected APE 025
2/1	059 2.1.14	Over sampled Main Feed, selected 103 (Containment)

Facility: **CCNPP** Date of Examination: **03/01/2004**
 Exam Level (circle one): **(RO)** / SRO(I) / SRO(U) Operating Test No.:

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System/JPM Title	Type Code*	Safety Function
a. CVCS/Shift Charging Pumps per OI-2A (Discharge relief lifts on started pump) 004A2.22 3.2/3.1	N, A, S	2
b. ECCS/Test LPSI check valves per STP-O-65-1 006A4.02 4.0/3.8	N,S	3
c. RHR/Initiate SDC (An RCS leak develops when suction MOVs are opened) 005A1.05 3.3/3.3	N,A,L,S	4-primary
d. Emergency Diesel Generators/Transfer 4 KV bus from an EDG to Offsite Power 064A4.06 3.9/3.9	D,S	6
e. Control Rod Drive System/Realign a CEA (CEA drops when moved) 003AA1.02 3.6/3.4	D,A,S	1
f. Verify the Containment Environment Safety Function 022A4.01,4.04 3.9/3.8 and 3.1/3.2	D,A,S	5
g. Process RMS/Test Containment Atmosphere Rad. Mon. per STP-O-33-1 073A4.03 3.1/3.2	N,S	7
h. Secure a Circulating Water Pump per OI-14A 075A2.02 2.5/2.7	N,S	8

In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)		
i. Align AFW pump speed/flow control to 1(2)C43 068AA1.12 4.4/4.4	D	4 secondary
j. ESFAS/Re-energize ESFAS cabinet per OI-34 013K2.01 3.6/3.8	D	2
k. Liquid RadWaste/Perform flush of Rad. Monitor per OI-17C. (Discharge valve shuts during flush) 068A3.02 3.6/3.6	N,R,A	9
*Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA		

Facility: **CCNPP**Date of Examination: **03/01/2004**Exam Level (circle one): RO / **SRO(I)** / SRO(U) Operating Test No.:Control Room Systems (8 for RO; **7 for SRO-I**; 2 or 3 for SRO-U)

System/JPM Title	Type Code*	Safety Function
a. CVCS/Shift Charging Pumps per OI-2A (Discharge relief lifts on started pump) 004A2.22 3.2/3.1	N, A, S	2
b. ECCS/Test LPSI check valves per STP-O-65-1 006A4.02 4.0/3.8	N,S	3
c. RHR/Initiate SDC (An RCS leak develops when suction MOVs are opened) 005A1.05 3.3/3.3	N,A,L,S	4-primary
d. Emergency Diesel Generators/Transfer 4KV loads from an EDG to Offsite Power 064A4.06 3.9/3.9	D,S	6
e. Control Rod Drive System/Realign a CEA (CEA drops when moved) 003AA1.02 3.6/3.4	D,A,S	1
f. Verify the Containment Environment Safety Function 022A4.01,4.04 3.9/3.8 and 3.1/3.2	D,A,S	5
g. Process RMS/Test Containment Atmosphere Rad. Mon. per STP-O-33-1 073A4.03 3.1/3.2	N, S	7
h.		

In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)		
i. Align AFW pump speed/flow control to 1(2)C43 068AA1.12 4.4/4.4	D	4 secondary
j. ESFAS/Re-energize ESFAS cabinet per OI-34 013K2.01 3.6/3.8	D	2
k. Liquid RadWaste/Perform flush of Rad. Monitor per OI-17C. (Discharge valve shuts during flush) 068A3.02 3.6/3.6	N,R,A	9
*Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA		

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Facility: **CCNPP** Date of Examination: **03/01/2004**
 Exam Level (circle one): RO / SRO(I) / **SRO(U)** Operating Test No.:

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System/JPM Title	Type Code*	Safety Function
a. CVCS/Shift Charging Pumps per OI-2A (Discharge relief lifts on started pump) 004A2.22 3.2/3.1	N, A, S	2
b. Emergency Diesel Generators/Transfer 4 KV bus from an EDG to Offsite Power 064A4.06 3.9/3.9	D,S	6
c. RHR/Initiate SDC (An RCS leak develops when suction MOVs are opened) 005A1.05 3.3/3.3	N,A,L,S	4-primary
d.		
e.		
f.		
g.		
h.		

In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)

i. Align AFW pump speed/flow control to 1(2)C43 068AA1.12 4.4/4.4	D	4 secondary
j. Liquid RadWaste/Perform flush of Rad. Monitor per OI-17C. (Discharge valve shuts during flush) 068A3.02 3.6/3.6	N,R,A	9

*Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA

Facility: CCNPP		Date of Examination: 03/01/2004	
Examination Level (circle one): (RO) / SRO Operating Test Number:			
Administrative Topic (see Note)		Describe activity to be performed	
A.1.a Conduct of Operations		2.1.19 3.0 Ability to use plant computer to obtain and evaluate parametric information on plant system or component status Enter feed flow correction factors into the plant computer per OI-50A, verifying NI calibration.	
A.1.b Conduct of Operations		2.1.25 2.8 Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data Verify shutdown margin in mode 3 with one stuck CEA	
A.2 Equipment Control		2.2.13 3.6 Knowledge of tagging and clearance procedures Verify tagout boundaries per NO-1-112	
A.3 Radiation Control			
A.4 Emergency Plan		2.4.43 2.8 Knowledge of emergency communications and techniques Recall station personnel due to a hurricane warning per ERPIP 3.0 Att. 20, D.5.0	
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.			

Facility: CCNPP		Date of Examination: 03/01/2004	
Examination Level (circle one): RO / SRO Operating Test Number:			
Administrative Topic (see Note)		Describe activity to be performed	
A.1.a Conduct of Operations		A.1.124.0 Ability to apply technical specifications to a system Review /Approve an IR for Operability determination	
A.1.b Conduct of Operations		2.1.25 3.1 Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data Verify an ECC	
A.2 Equipment Control		2.2.13 3.8 Knowledge of tagging and clearance procedures Approve a clearance or restoration per NO-1-112	
A.3 Radiation Control		2.3.6 3.1 Knowledge of the requirements for reviewing and approving release permits Review an RCWMT discharge permit	
A.4 Emergency Plan		2.4.44 4.0 Knowledge of emergency plan protective action recommendations Classify an EAL and provide protective action recommendations per the ERPIP	
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.			

Simulation Facility Calvert Cliffs Scenario No.: 1 Op Test No.: 1

Examiners: _____ Operators: _____ SRO
_____ RO
_____ CRO

Objectives: To evaluate the applicant's ability to conduct a unit power decrease and implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including failure of a VCT level Transmitter with an intermediate indication on suction switchover, erratic operation of a FW controller, and a dropped CEA. After the unit is stabilized, the System Operator directs power be reduced 100 MWe in the next 10 minutes. Once power is stabilized, a high SGFP vibration alarm occurs followed shortly thereafter by a SGFP trip. After it is determined the SGFP cannot be reset, the unit is tripped and EOP-0 entered. The feed system perturbation causes a feed rupture. A blockage in the AFW suction line prevents AFW flow from being established requiring EOP-3 be implemented. The crew will attempt to restore feed and then initiate OTCC. Upon initiation of OTCC, one PORV will not open.

Initial Conditions: The plant is at 100% Power, MOC

500KV Bkr., 552-23 tripped open 2 hours ago.

13 HPSI Pp is OOS.

13 SRW Pp is OOS

12A Travelling Screen – flow switch is jumpered

12 4KV Bus is on the Alternate Feeder

Turnover: Present plant conditions: 100% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 100% power for previous 68 days.

- Equipment out of service:**
- 1) 500KV Bkr., 552-23 tripped open 2 hours ago. Investigating.
 - 2) 13 HPSI Pp motor bearing failure during STP two (2) days ago. It is nearly reassembled, expected to be returned to service in 3 hours. T.S. 3.5.2 Action Statement entered 49 hours ago.
 - 3) 13 SRW Pp has a broken shaft, expected return - tomorrow.
 - 4) 12A Travelling Screen – flow switch is jumpered – will be worked tomorrow.
 - 5) 12 4KV Bus is on Alternate Feeder, 152-1209 – the Normal Feeder, 152-1201, has a loudly buzzing relay, electricians will be investigating later this shift.

Surveillances due: None

- Instructions for shift:**
- 1) Maintain 100% power.
 - 2) Perform PMT on 13 HPSI when returned to service.

Event No.	Malf. No.	Event Type*	Event Description
Preload	RF-rackout RF-rackout PNL OVR PNL OVR PNL OVR (CD-161) RF-161		13 HPSI Pp OOS. 13 SRW Pp OOS. RWT Outlet 1-SI-504-MOV – GREEN light ON, PWR ON light ON. PORV-402 switch in Auto. AFW pump suction blockage - (12 CST suction valve shut and indicating open.)
1	CVCS009 (LO)	I RO	Several minutes after the crew takes the watch, VCT Level transmitter LT-227 fails low. This causes Chg. Pp suction to shift to the RWT. The RO informs the CRS. After verifying it is an instrument failure, the CRS directs the RO to shift Chg. Pp suction back to the VCT. RO should note the failure of RWT Outlet (504-MOV) to go fully open. The CRS directs MOV-501 be reopened and MOV-504 to be shut. The ABO should be dispatched to check VCT level and MOV-504 position locally. The OWC is contacted for assistance.
2	FW007_01	I CRO	FRV Controller 1111 begins to operate erratically. The CRO should notice oscillating SGFP RPM, MWe, and SG level. The CRS should direct the Controller be shifted to manual and AOP-3G implemented. The PDI Control Switch is placed in MAIN FAIL and level controlled on the PDI. The CRS should then direct the controller be placed in bypass override. The CRS contacts the OWC for assistance.
3	CEDS012_01	C RO	After the 1111 failure, CEA 01 drops. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The CRS should implement AOP-1B and address T.S. 3.1.4. The primary will be stabilized and realignment time determined. After notifying maintenance and correcting the cause, realignment will be commenced.
4	Load reduction	R RO N CRO	Next, the System Operator calls the Control Room and reports a transformer cooling problem at Waugh Chapel and requests they reduce unit load by 100 MWe within the next 10 minutes. The CRS should brief the crew and commence a rapid downpower to ~90%.
5	PNL OVR on C-69 and Status Panel (Supervisory Inst.)	C CRO	After power has been stabilized, a SGFP supervisory alarm is received on 11 SGFP. The alarm is determined to be a valid vibration alarm in the danger range at about 7 mils. The TBO or PPO and the System Engineer are dispatched to the pump. After a course of action is determined, (reduce load on the SGFP), 11 SGFP trips. The CRS may direct an attempted reset of 11 SGFP pump. The SGFP will not reset. The CRS will direct the RO to trip the unit and EOP-0 be implemented.
6	CD008 – 20% no ramp	M All	After the reactor trip, an unisolable rupture occurs on the feed pump suction (upstream of 1-FW-101). The feed and condensate headers will have to be isolated. When the CRO attempts to initiate AFW flow, flow will not be able to be established due to the common AFW Pump suction being blocked. The CRS should evaluate the EOP-0 flowchart and determine EOP-3 should be implemented.
7	OTCC	M All	Prior to EOP-3 entry blowdown will be isolated and the RCPs tripped. A rapid cooldown to less than 465°F will be commenced. When both SG levels are less than –350”, OTCC will be initiated. When the RO attempts to open PORV-402, it will not open. The crew should evaluate Attachment 17 and determine the potential success of OTCC. After this assessment, the scenario can be terminated.

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

SCENARIO 1 OVERVIEW

The candidates will take the shift at 100% power with instructions to maintain power.

Several minutes after the crew takes the watch, VCT Level transmitter LT-227 fails low. This causes Chg. Pp suction to shift to the RWT. The RO informs the CRS. After verifying it is an instrument failure, the CRS directs the RO to shift Chg. Pp suction back to the VCT. RO should note the failure of RWT Outlet (504-MOV) to go fully open. The CRS directs MOV-501 be reopened and MOV-504 to be shut. The ABO should be dispatched to check VCT level and MOV-504 position locally. The OWC is contacted for assistance.

FRV Controller 1111 begins to operate erratically. The CRO should notice oscillating SGFP RPM, MWe, and SG level. The CRS should direct the Controller be shifted to manual and AOP-3G implemented. The PDI Control Switch is placed in MAIN FAIL and level controlled on the PDI. The CRS should then direct the controller be placed in bypass override. The CRS contacts the OWC for assistance.

After the 1111 failure, CEA 01 drops. The RO should acknowledge the alarms, inform the CRS and refer to the ARM. The CRS should implement AOP-1B and address T.S. 3.1.4. The primary will be stabilized and realignment time determined. After notifying maintenance and correcting the cause, realignment will be commenced.

Next, the System Operator calls the Control Room and reports a transformer cooling problem at Waugh Chapel and requests they reduce unit load by 100 MWe within the next 10 minutes. The CRS should brief the crew and commence a rapid downpower to $\approx 90\%$.

After power has been stabilized, a SGFP supervisory alarm is received on 11 SGFP. The alarm is determined to be a valid vibration alarm in the danger range at about 7 mils. The TBO or PPO and the System Engineer are dispatched to the pump. After a course of action is determined, (reduce load on the SGFP), 11 SGFP trips. The CRS may direct an attempted reset of 11 SGFP pump. The SGFP will not reset. The CRS will direct the RO to trip the unit and EOP-0 be implemented.

After the reactor trip, an unisolable rupture occurs on the feed pump suction (upstream of 1-FW-101). The feed and condensate headers will have to be isolated. When the CRO attempts to initiate AFW flow, flow will not be able to be established due to the common AFW Pump suction being blocked. The CRS should evaluate the EOP-0 flowchart and determine EOP-3 should be implemented.

Prior to EOP-3 entry blowdown will be isolated and the RCPs tripped. A rapid cooldown to less than 465°F will be commenced. When both SG levels are less than $-350''$, OTCC will be initiated. When the RO attempts to open PORV-402, it will not open. The crew should evaluate Attachment 17 and determine the potential success of OTCC. After this assessment, the scenario can be terminated.

Simulation Facility Calvert Cliffs Scenario No.: 2 Op Test No.: 1

Examiners: _____ Operators: _____ SRO
_____ RO
_____ CRO

Objectives: To evaluate the applicant's ability to conduct a unit power decrease, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including failure of 11 CCW Pp, a PZR spray valve opening, an RCP seal and the ADV controller. After the ADV controller fails the remaining seals fail on the affected RCP resulting in an RCS leak. After EOP-0 is entered, the RCS leak causes a SIAS actuation. SIAS 'A' fails to actuate requiring 11 or 12 HPSI Pump to be started manually to establish HPSI flow. As EOP-0 progresses, a steam leak begins in CNMNT from 12 SG requiring EOP-8 be implemented. The ADV Controller will not operate from the Control Room, the crew will have to operate the ADVs locally.

Initial Conditions: The plant is at 100% Power, MOC
13 HPSI Pp is OOS.
13 CCW Pp is OOS
12A Travelling Screen – flow switch is jumpered
12 4KV Bus is on the Alternate Feeder

Turnover: Present plant conditions: 100% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 100% power for previous 68 days.

Equipment out of service:

- 1) 13 HPSI Pp motor bearing failure during STP two (2) days ago. It is nearly reassembled, expected to be returned to service in 3 hours. T.S. 3.5.2 Action Statement entered 49 hours ago.
- 2) 13 CCW Pp has a bad bearing, expected return on night shift.
- 3) 12A Travelling Screen – flow switch is jumpered – will be worked tomorrow.
- 4) 12 4KV Bus is on Alternate Feeder, 152-1209 – the Normal Feeder, 152-1201, has a loudly buzzing relay, electricians will be investigating later this shift.

Surveillances due: STP-0-29 (CEA Movement Test) due by end of shift. SM will discuss with CRS shortly after turnover.

Instructions for shift:

- 1) Maintain 100% power.

Event No.	Malf. No.	Event Type*	Event Description
Preload	ESFA002_01 ESFA001_01 RF-rackout RF-rackout		SIAS 'A' fails to actuate automatically and manually. 13 HPSI Pp OOS. 13 CCW Pp OOS.
1	CCW002_01	C CRO	About 3 minutes after the crew takes the watch, 11 CCW Pp trips. The CRO will acknowledge the alarms, inform the CRS and refer to the ARM. The crew will check for common mode failure and the CRS will direct the CRO to start 12 CCW Pp. The CRS refers to AOP-7C and T.S. 3.7.5. The CRS contacts the OWC for assistance.
2	RCS016	I RO	PRZR Spray Valve 100E fails open. The RO will note lowering RCS pressure and inform the CRS of the open spray valve. May refer to the PZR pressure ARM. Spray valve control will be shifted from 'both' to '100F'. 100E will be verified to be going shut and RCS pressure restored. The CRS contacts the OWC for assistance.
3	RCS011_01 (0-100% over 3 min)	C RO	Next, the lower seal (first stage) fails on 11A RCP. The RO notes the alarm, informs the CRS and refers to the ARM. The crew should determine the lower seal on 11A RCP has failed. The OWC and system engineer are contacted for assistance.
4	MS015 (high)	I CRO	Two minutes after the notifications have been made the ADV controller fails high causing the ADVs to open. The CRO will inform the CRS. The CRS should direct the CRO to take manual control of the ADVs and shut them. The RO should maintain reactor power less than 100%. The CRS refers to AOP-7K. The CRS contacts the OWC for assistance.
5	RCS012_01 (0-100% over 2 min)	R N RO CRO	After the CRS has referenced AOP-7K, the 11A RCP middle seal fails. The crew should implement ARM guidance and begin an expeditious shutdown. The CRS refers to OP-3 for guidance on for the shutdown.
6	RCS013_01 (over 2 min) RCS003 (50 gpm over 5 min) RCS014_01 (over 4 min)	M All	After power has been reduced at least 5%, the 11A upper seal begins to fail followed shortly thereafter by the failure of the vapor seal. With all the seals failed, RCS leakage begins via the seals. The CRS will trip the unit based on high RCP seal temperature and EOP-0 is implemented. The CRS will direct reactivity be performed then 11A RCP be tripped. When SIAS actuates, train 'A' fails to automatically and manually initiate. To establish HPSI flow 11 or 12 HPSI must be started manually.
7	MS010_02 (0-25% over 3 min) Panel Override ADV's closed & in manual	M All	After the first pass through the safety functions is complete, a steam break in CNMNT begins. The CRS should recognize two events are taking place and implement EOP-8. Success Paths will be selected and implemented. When the crew attempts to operate the ADVs, they will not operate from the Control Room. To establish heat removal via 11 SG, the ADV will have to be operated locally. After 12 SG is isolated, the scenario can be terminated.

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

SCENARIO 2 OVERVIEW

The candidates will take the shift at 100% power with instructions to maintain power.

After the crew has taken the shift, 11 CCW Pp trips. The CRO will acknowledge the alarms, inform the CRS and refer to the ARM. The crew will check for common mode failure and the CRS will direct the CRO to start 12 CCW Pp. The CRS should refer to AOP-7C and T.S. 3.7.5. The CRS contacts the OWC for assistance.

PRZR Spray Valve 100E fails open. The RO will note lowering RCS pressure and inform the CRS of the open spray valve. May refer to the PZR pressure ARM. Spray valve control will be shifted from 'both' to '100F'. 100E will be verified to be going shut and RCS pressure restored. The CRS contacts the OWC for assistance.

Next, the lower seal (first stage) fails on 11A RCP. The RO notes the alarm, informs the CRS and refers to the ARM. The crew should determine the lower seal on 11A RCP has failed. The OWC and system engineer are contacted for assistance.

Two minutes after the notifications have been made the ADV controller fails high causing the ADVs to open. The CRO diagnoses the open ADVs and inform the CRS. The CRS directs the CRO to take manual control of the ADVs and shut them. The RO should maintain reactor power less than 100%. The CRS refers to AOP-7K. The CRS contacts the OWC for assistance.

After the CRS has referenced AOP-7K, the 11A RCP middle seal fails. The crew should implement ARM guidance and begin an expeditious shutdown in accordance with OP-3. The CRS refers to OP-3 and directs the unit shutdown at a rate less than 30%/hour. The appropriate notifications should be made.

After power has been reduced at least 5%, the 11A RCP upper seal begins to fail followed shortly thereafter by the failure of the vapor seal. With all the seals failed RCS leakage begins via the seals. The CRS will trip the unit based on high RCP Controlled Bleed Off temperature and EOP-0 implemented. The CRS will direct reactivity be performed then 11A RCP be tripped. When SIAS actuates, train 'A' fails to initiate automatically and manually. To establish HPSI flow 11 or 12 HPSI must be started manually.

After the first pass through the safety functions is complete, a steam break in CNMNT begins. The CRS should recognize two events are taking place and implement EOP-8. Success Paths will be selected and implemented. When the crew attempts to operate the ADVs, they will not operate from the Control Room. To establish heat removal via 11 SG, the ADV will have to be operated locally. After 12 SG is isolated, the scenario can be terminated.

Simulation Facility Calvert Cliffs Scenario No.: 3 (Spare) Op Test No.: 1

Examiners: _____ Operators: _____ SRO
_____ RO
_____ CRO

Objectives: To evaluate the applicant's ability to conduct a unit power increase, to implement the ARMs, OIs, AOPs, as appropriate, for malfunctioning systems and/or controls including a failure of the SRW Controller for the Main Generator H2 Cooler, a failure of a letdown backpressure regulator valve and a PZR pressure control channel and selector switch, then a loss of 14 4KV Bus occurs. The crew will shift charging suction back to the VCT, stabilize the unit and implement AOP-7I. Next, a loss of offsite power occurs and the Main Turbine does not Trip. The crew should determine a reactor trip is required, trip the unit and implement EOP-0. The 1A DG does not start and the 0C DG Tie Bus is faulted resulting in a Station Blackout. The crew will implement EOP-7. As actions for EOP-7 are being performed, 11 AFW Pp will trip. The crew will be able to restore AFW using 12 AFW Pump allowing them to remain in the optimal procedure.

Initial Conditions: The plant is at 75% Power, MOC (IC-18)

13 SRW Pp is OOS

12 Charging Pp is OOS

12 4KV Bus is on the Alternate Feeder

Turnover: Present plant conditions: 75% power, MOC; Unit 2 is in MODE 5 – no CW Pps and 23 AFW Pp unavailable.

Power history: 100% power for previous 190 days. Then reduced to ≈68% 3 days ago for 12 SGFP repairs.

Equipment out of service:

- 1) 13 SRW Pp has a broken shaft, expected repair tomorrow-noon.
- 2) 12 Charging Pp is OOS due to severe packing leakage. The packing is being replaced. Expected to be ready for PMT in about 4 hours.
- 3) 12 4KV Bus is on Alternate Feeder – the Normal Feeder has a loudly buzzing relay, electricians will be investigating later this shift.

Surveillances due: None.

Instructions for shift:

- 1) Unit 1 had been at ≈68% power the previous 3 days to repair a steam leak on 12 SGFP. Both SGFPs are operating in parallel. Continue raising power to 100% per OP-3. Raise power as soon as possible, ESO says needed for grid stability, maximum emergency generation.
- 2) Perform PMT on 12 Charging Pump when returned to service.

Event No.	Malf. No.	Event Type*		Event Description
Preload	DG0C004 DG002_02 RF-rackout TG002 RF-rackout RF- 12 CH. Pp to 14 bus PNL OVR			0C DG tie bus faulted. 1A DG start failure. 13 SRW Pp OOS Turbine fails to trip. 12 Chg Pp OOS Pressurizer Press Controller Selector Switch in channel X.
1	N/A	R N	RO CRO	After the crew takes the watch, the CRS should brief the crew on the power increase to 100% per OP-3 and that the ESO needs the power as quickly as possible. After the brief the RO and CRO coordinate to raise power while maintaining plant parameters within acceptable limits and Tc on program.
2	TG030_01 (closed)	I	CRO	After power has been raised at least 5%, the SRW controller for the Main Generator H ₂ cooler fails the valve shut. When the high temperature alarm is received, the CRO acknowledges the alarm, informs the CRS and refers to the ARM. The CRO should determine TIC-1608 has failed low causing the CV to go shut, take manual control and restore H ₂ temperature. The OWC is contacted for assistance.
3	CVCS004_02	C	RO	Next, Letdown backpressure valve 1-CVC-201Q fails shut. The RO acknowledges the alarm, informs the CRS and refers to the ARM. The CRS should direct the RO to shift to 1-CVC-201P and restore letdown flow. The OWC is contacted for support.
4	RCS023_01 (high)	I	RO	Next, PRZR Press Channel 100X fails high. The RO acknowledges the alarms, informs the CRS and refers to the ARM. The RO should note the lowering RCS pressure and the open spray valves. Pressure control should be shifted to channel Y and the spray valves verified shut. The RO notes the spray valves did not shut. The CRS should direct the spray controller be taken to manual and the spray valves closed. The CRS contacts the OWC for assistance.
5	4KV001_04	C	CRO	After the RCS is stabilized, 14 4KV Bus is lost. The crew should stop any power increase, diagnose the bus loss, shift Charging Pump suction back to the VCT and stabilize the unit. The CRS implements AOP-7I. The CRO will perform APO-7I actions as directed by the CRS. The OWC is contacted for support.
6	SWYD002	M	ALL	About 5 minutes after the bus loss, a loss of offsite power occurs. 1A DG does not start and 14 4KV bus is locked out. The Main Turbine does not trip automatically. The crew should recognize a reactor trip is required and trip the unit manually. The 0C Diesel will not energize the 0C Tie Bus due to a fault. The crew will implement EOP-0 and diagnose a station blackout exists.
7	AFW001_01	C	ALL	In EOP-7, 11 AFW Pp trips but they can restore AFW using 12 AFW Pump. 1A DG will become available and 11 4KV Bus re-energized. After the bus is re-energized the scenario can be terminated.

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

SCENARIO 3 OVERVIEW

The candidates will take the shift at $\approx 75\%$ power with instructions to raise power to 100% per OP-3.

After the crew takes the watch, the CRS should brief the crew on the power increase to 100% per OP-3 and that the ESO needs the power as quickly as possible. After the brief the RO and CRO coordinate to raise power while maintaining plant parameters within acceptable limits and Tc on program.

After power has been raised at least 5%, the SRW controller for the Main Generator H2 cooler fails the SRW valve closed. When the generator H₂ high temperature alarm is received, the CRO should acknowledge the alarm, inform the CRS and refer to the ARM. The CRO should determine TIC-1608 has failed low causing the CV to go shut, take manual control and restore H₂ temperature. The OWC should be contacted for assistance.

Next, Letdown backpressure valve 1-CVC-201Q fails shut. The RO acknowledges the alarm, informs the CRS and refers to the ARM. The CRS should direct the RO to shift to 1-CVC-201P and restore letdown flow. The OWC is contacted for support.

Next, PRZR Press Channel 100X fails high. The RO acknowledges the alarms, informs the CRS and refers to the ARM. The RO should note the lowering RCS pressure and the open spray valves. Pressure control should be shifted to channel Y and the spray valves verified shut. The RO notes the spray valves did not shut. The CRS should direct the spray controller be taken to manual and the spray valves closed. The CRS contacts the OWC for assistance.

After the RCS is stabilized, 14 4KV Bus is lost. The crew should stop any power increase, diagnose the bus loss, shift Charging Pump suction back to the VCT and stabilize the unit. The CRS implements AOP-7I. The CRO will perform APO-7I actions as directed by the CRS. The OWC is contacted for support.

About 5 minutes after the bus loss, a loss of offsite power occurs. 1A DG does not start and 14 4KV Bus is locked out. The 0C Diesel will not energize the 0C Tie Bus due to a fault. The Main Turbine will not trip automatically. The crew should recognize a reactor trip is required and trip the unit manually. The crew will implement EOP-0 and diagnose a station blackout exists.

In EOP-7 11 AFW Pp will trip but they can restore AFW using 12 AFW Pump. 1A DG will become available and the 11 4KV Bus energized. After the bus is energized the scenario can be terminated.