INITIAL SUBMITTAL

ST. LUCIE EXAM
50-335, 389/2001-301

MAY 14 - 18 & 21 - 25, 2001

INITIAL SUBMITTAL
RO/SRO WRITTEN EXAMINATION

Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws					4. Job Content Flaws				5. U/E/S	6. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job-Link	Minutia	#/ units	Back-ward		
1	H											S	
2	H											S	Clarify that no operator action is taken
3	F											E	Justify this Q under 55.41. Language in Q not the same as ONP.
4	F											S	
5	H											S	
6	H											S	
7	H											S	Is applicant to determine that Hot Leg is covered based on subcooling? No data given for RVLS to satisfy EOP-03 step 25D.
8	H											E	Show tie to 55.41
9	F											U	Loss of Nuc Svc Water (K/A) refers to ICW, NOT CCW (Q). Loss of CCW is covered under 000026, NOT 000062. Change Q.

Instructions

[Refer to Appendix B for additional information regarding each of the following concepts.]

1. Enter the level of knowledge (LOK) of each question as either (F)undamental or (H)igher cognitive level.
2. Enter the level of difficulty (LOD) of each question using a 1 - 5 (easy - difficult) rating scale (questions in the 2 - 4 range are acceptable).
3. Check the appropriate box if a psychometric flaw is identified:
   - The stem lacks sufficient focus to elicit the correct answer (e.g., unclear intent, more information is needed, or too much needless information).
   - The stem or distractors contain cues (i.e., clues, specific determiners, phrasing, length, etc).
   - The answer choices are a collection of unrelated true/false statements.
   - More than one distractor is not credible.
   - One or more distractors is (are) partially correct (e.g., if the applicant can make unstated assumptions that are not contradicted by stem).
4. Check the appropriate box if a job content error is identified:
   - The question is not linked to the job requirements (i.e., the question has a valid K/A but, as written, is not operational in content).
   - The question requires the recall of knowledge that is too specific for the closed reference test mode (i.e., it is not required to be known from memory).
   - The question contains data with an unrealistic level of accuracy or inconsistent units (e.g., panel meter in percent with question in gallons).
   - The question requires reverse logic or application compared to the job requirements.
5. Based on the reviewer's judgment, is the question as written (U)nacceptable (requiring repair or replacement), in need of (E)ditorial enhancement, or (S)atisfactory?
6. For any "U" ratings, at a minimum, explain how the Appendix B psychometric attributes are not being met.

Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws					4. Job Content Flaws				5. U/E/S	6. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job-Link	Minutia	#/ units	Back-ward		
10	H											E	Show connection to 55.43 or demonstrate tie to SRO L.O.
11	F											U	Does not address KA (Operational implications of some aspect of Rad Theory).
12	H											S	
13	F											E	Q Sat. Distractor D implausible - thermal overloads don't relate to thermal conditions
14	F											U	Change "Failed" to Fails." Q doesn't satisfy K/A. K/A calls for predicting impact on pzr level control system. Question tests impact on pzr pressure control system.
15	H											S	
16	H											U	Q doesn't agree with K/A, which calls for effect of malf on RCS, not RPS.
17	H											E	Explain why this isn't trivially simple - what might lead someone to pick OTHER than C?
18	F											S	
19	H											S	Make statement making it clear that CCW is in a normal full power lineup - both trains operable and cross-connected through N hdr.
20	H											S	Verify solenoid valve closure is not off a trip relay no associated with CS pump brkr. LP says it closes if pump stops, it doesn't say valve won't open if pump doesn't start.
21	H											S	
22	H											S	
23	H											S	
24	F											S	
25	F											E	Too Simplistic and C&D are implausible.
26	H					x						U	Distractors not effective. Q really asks "can you read figure 9?"
27	H											E	Supporting info doesn't make it clear that answer is correct. Need something that shows one "A" side ADV powered from "B" side modutronic. Ref mat'l talks about valves being able to be closed - not controlled.
28	H											E	"D" doesn't have supporting info that talks to going to "reset" then to "auto." Also, specify which 4160 breaker.

Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws					4. Job Content Flaws				5. U/E/S	6. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job-Link	Minutia	#/ units	Back-ward		
29	H											S	
30	H											E	These are not ALL the actions necessary that must be taken to cooldown to SDC entry conditions. Better to ask "which one of the following describes the actions necessary to commence a cooldown..."
31	H											S	
32	F											S	
33	F											S	
34	F											U	Show tie to 55.41. C is not correct - EOP-03 req's "all available operating..." Stem says no equip OOS. So, C should specify 2 in service.
35	H											S	
36	H											S	
37	H											E	How does CBO T>200 compare with Table 1 max of 180? Change "normal" in D to "acceptable" or "sat"
38	H											S	
39	H											S	
40	F											S	
41	H											S	
42	F											E	Show link to 55.41
43	H											E	Show link to 55.41
44	H											S	
45	H											S	
46	H											S	
47	F											S	
48	F											S	
49	F											E	make it clear in the stem that 1A is being lost.
50	F											E	Make link to 55.41.
51	H											E	Make link to 55.41.
52	H											S	

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Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws					4. Job Content Flaws				5. U/E/S	6. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job-Link	Minutia	#/ units	Back-ward		
53	F											S	
54	H											S	
55	H											S	
56	F											S	
57	H											S	
58	H											E	Can't find a reference to "Group Motion Inhibit alarm." Can this Q be written without stating that Rx power decreases? That statement tends to make distractors C & D implausible.
59	F											S	
60	H											E	Change K/A ref on Q to 2.2 from 2.1. Show tie to 55.41.
61	F											E	Does not explicitly satisfy the K/A (Knowledge of reason for manipulation of controls to obtain desired operating results). Reference to instrument air in stem diminishes value of distractor A.
62	F											U	Q doesn't satisfy KA (Knowledge of the effect of a loss or malfunction of SG level detectors will have on SGS)
63	F											E	Show tie to 55.41
64	F											E	Show tie to 55.41. Also, distractor A does not appear to have any discriminatory value. Why would an applicant choose this?
65	H											E	Show tie to 55.41. Also, add statement that SG blowdown is in alarm to make it clear that the only steam plant activity success path is to isolate SGs.
66	F											S	
67	H											E	Suggestion - use 25 gpm as the makeup flow rate for distractors A and C - allows for error in reading the units of the x axis for this curve.
68	F											U	Q doesn't satisfy K/A - K/A calls for knowledge of the basis for the power limit for rod misalignment. Q calls for basis of time limit.
69	H											S	
70	F											S	
71	H											S	
72	F											S	

St. Lucie Written Exam Comments

Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws: Stem Focus	Cues	T/F	Cred. Dist.	Partial	4. Job Content Flaws: Job-Link	Minutia	#/ units	Back-ward	5. U/E/S	6. Explanation
73	H											U	Q doesn't satisfy K/A - reason for T/S limits on operability
74	H											U	"correct answer" is incorrect. Should be 55 minutes. Make distractor C 50 minutes and D 55 minutes.
75	F											S	
76	F											S	
77	F											S	
78	H											E	Q states that this is a "both" question, but it only appears on the RO exam outline
79	F											S	
80	H											S	
81	F											E	Unclear what the distractor analysis for "C" has to do with "C" itself
82	F											E	Add "Unit 1" in distractor D - otherwise, C looks like a specific determiner
83	H											E	Show link to 55.41.
84	H											S	
85	H											S	
86	H											S	
87	F											S	
88	H											S	
89	H											E	Specify whether leakage is identified or unidentified.
90	H											S	
91	F											U	Show tie to 55.41 If audible count rate selected to "A," won't loss of A CIS monitor result in a loss of audible counts to containment? If so, "A" may seem like right answer - at least until another channel is selected. Distractor analysis for A - shouldn't it be 2 req'd, vice 3? Distractor analysis for B - what's the difference between a wide range detector and a wide range flux monitor? Does "refueling operations" = "Core alterations?"
92	F											S	

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Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws					4. Job Content Flaws				5. U/E/S	6. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job-Link	Minutia	#/ units	Back-ward		
93	F											S	
94	H											E	Show tie to 55.41
95	H											S	
96	F											S	
97	F											S	
98	F											S	
99	H											S	
100	H											U	This does not appear to test the K/A ("knowledge of bases for prioritizing safety functions during abnormal/emergency operations"). Recommend either changing this to a "what is the basis of..." question, or modifying conditions so that one additional (minimum) distractor's safety function is not met, forcing the applicant to demonstrate a knowledge of the basis by truly prioritizing.
101	H											E	Verify that 0702830-11 is an SRO-level LO
102	F											S	
103	H											E	Verify that 0702812-06 is an SRO-level LO
104	H											S	
105	F											S	
106	F											S	
107	F											S	
108	F											S	
109	F											S	
110	F											S	
111	H											E	Change "the required" to "required" in the question in stem - the choices do not list ALL of the required action, just some.
112	H											S	
113	H											E	Distractor C seems implausible. Try "Heat added by RCP operation" Change Cog Level to 2
114	H											S	

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Q#	1. LOK (F/H)	2. LOD (1-5)	3. Psychometric Flaws					4. Job Content Flaws				5. U/E/S	6. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job-Link	Minutia	#/ units	Back-ward		
115	F												
116	F												
117	H												
118	F											E	Is "header throttle valve" synonymous with "flow control valve?"
119	F												
120	F												
121	F												
122	H												
123	F												
124	H												
125	H											E	Appears to be level 2. Clarify the electrical source of the gravity feed valves.

St. Lucie Plant
May 2001 NRC Exam

Q Num	K/A	Source	Level	Key	Exam	RO Q NUM	SRO Q NUM
1	061.A2.03	Bank	2	D	Both	1	1
2	026.AK3.02	New	2	C	Both	2	2
3	051.AA2.02	New	1	C	Both	3	3
4	068.AA1.01	New	1	A	Both	4	4
5	13.AK1.2	Bank 00 ANO NRC	2	D	Both	5	5
6	028.AK1.01	99 PSL NRC	2	B	Both	6	6
7	074.EK2.05	New	2	B	Both	7	7
8	055.EA2.06	New	2	C	Both	8	8
9	062.AK3.03	New	1	A	Both	9	9
10	069.AK2.03	Mod. 00 NRC	2	C	SRO		10
11	072.K5.01	New	1	C	RO	10	
12	022.A2.03	New	2	D	RO	11	
13	022.K1.01	New	1	A	Both	12	11
14	011.A2.11	New	1	C	Both	13	12
15	056.K1.03	Mod. 00 NRC	2	C	RO	14	
16	039.K3.05	New	2	B	RO	15	
17	059.A2.12	New	2	C	RO	16	
18	064.K4.02	New	1	B	Both	17	13
19	008.A2.02	New	2	B	RO	18	
20	027.K1.01	Bank	2	D	Both	19	14
21	078.K3.02	New	2	A	Both	20	15
22	063.K2.01	New	2	C	Both	21	16
23	045.A3.07	New	2	C	Both	22	17
24	005.K4.03	New	1	D	RO	23	
25	062.K2.01	New	1	B	Both	24	18
26	026.A1.03	New	2	B	Both	25	19
27	057.AA1.06	New	2	D	Both	26	20
28	027.G.2.2.3	New	2	D	RO	27	
29	010.K5.01	New	2	A	Both	28	21
30	041.A4.08	New	2	C	RO	29	
31	004.A3.03	New	2	C	RO	30	
32	076.AA1.04	New	1	A	Both	31	22
33	065.AA2.06	New	1	D	Both	32	23
34	028.G2.4.21	New	1	C	RO	33	
35	002.A1.04	New	2	C	Both	34	24
36	006.G2.1.20	New	2	B	Both	35	25
37	15/17.G2.1.28	Mod. 99 NRC	2	C	Both	36	26
38	004.A1.07	New	2	A	Both	37	27
39	09.EK2.03	New	2	B	Both	38	28
40	068.A3.02	New	1	C	Both	39	29
41	058.AK3.02	New	2	A	Both	40	30
42	08.AA2.03	New	1	B	Both	41	31
43	03.AA2.02	New	2	B	Both	42	32
44	013.K6.01	New	2	D	Both	43	33
45	013.K2.01	Bank	2	C	RO	44	
46	015.K5.15	New	2	B	Both	45	34
47	017.A4.01	New	1	A	Both	46	35
48	2.2.11	New	1	C	Both	47	36
49	079.K1.01	New	1	B	RO	48	

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Q Num	K/A	Source	Level	Key	Exam	RO Q NUM	SRO Q NUM
50	037.AA2.13	New	1	B	Both	49	37
51	054.G2.4.45	New	2	A	Both	50	38
52	033.K3.03	New	2	A	Both	51	39
53	071.K4.04	New	1	D	Both	52	40
54	061.K4.02	New	2	B	Both	53	41
55	003.G2.4.18	New	2	C	Both	54	42
56	072.A4.02	New	1	A	Both	55	43
57	012.K4.01	New	2	A	RO	56	
58	014.K4.06	New	2	B	RO	57	
59	029.A3.01	Modified Bank	1	B	Both	58	44
60	040.EA2.1	New	2	A	Both	59	45
61	CE/A11.AK3.3	New	1	B	Both	60	46
62	035.K6.03	New	1	D	Both	61	47
63	2.3.1	New	1	D	Both	62	48
64	2.1.11	New	1	C	Both	63	49
65	2.4.21	New	2	D	Both	64	50
66	2.1.20	Mod. 00 NRC	1	C	Both	65	51
67	025.AK1.01	Mod. 00 NRC	2	D	Both	66	52
68	005.AK1.06	New	1	B	Both	67	53
69	024.AK2.03	New	2	C	Both	68	54
70	086.A4.02	New	1	A	Both	69	55
71	015.K4.02	New	2	B	RO	70	
72	059.K3.02	New	1	A	Both	71	56
73	001.AK3.02	New	2	A	Both	72	57
74	2.3.4	New	2	C	Both	73	58
75	007.EA1.1	New	1	C	Both	74	59
76	001.K6.11	New	1	B	RO	75	
77	001.G2.2.12	New	1	D	Both	76	60
78	003.K3.04	New	2	B	Both	77	61
79	071.G2.1.32	New	1	A	RO	78	
80	026.G2.4.21	New	2	B	SRO		62
81	2.4.49	New	1	B	RO	79	
82	2.1.1	New	1	C	Both	80	63
83	2.1.7	New	2	B	Both	81	64
84	006.A3.08	New	2	A	Both	82	65
85	00011.G2.4.14	New	2	C	Both	83	66
86	00067.G2.4.25	New	2	C	RO	84	
87	075.K1.02	New	1	A	Both	85	67
88	055.K3.01	New	2	B	Both	86	68
89	CE/A16.AK2.1	New	2	D	Both	87	69
90	CE/EO9.G2.4.16	Bank	2	C	Both	88	70
91	2.2.30	New	1	D	RO	89	
92	0000038.EA1.11	New	1	C	Both	90	71
93	2.3.2	New	1	B	RO	91	
94	2.2.1	New	2	B	Both	92	72
95	2.4.6	Mod.99 NRC	2	A	Both	93	73
96	000029.EK1.05	New	1	D	Both	94	74
97	059.AK3.01	New	1	C	RO	95	
98	000022.AA1.08	New	1	A	Both	96	75

St. Lucie Plant
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Q Num	K/A	Source	Level	Key	Exam	RO Q NUM	SRO Q NUM
99	CE/A13.G2.4.11	New	2	B	SRO		76
100	CE/A11.G2.4.22	New	2	D	SRO		77
101	000055.EA1.06	New	2	B	SRO		78
102	000057.AA2.13	New	1	A	SRO		79
103	000068.AK.2.07	New	2	D	SRO		80
104	003.A2.02	Bank	2	A	SRO		81
105	060.AK2.02	New	1	A	Both	97	82
106	061.AK3.02	New	1	B	Both	98	83
107	073.G2.1.32	New	1	B	RO	99	
108	103.A1.01	New	1	A	RO	100	
109	012.G2.1.33	New	1	D	SRO		84
110	028.A2.02	New	1	A	SRO		85
111	064.G2.2.23	New	2	A	SRO		86
112	005.G2.4.2	New	2	D	SRO		87
113	007.A2.03	New	1	A	SRO		88
114	2.4.40	New	2	C	SRO		89
115	000027.G2.4.48	New	1	D	SRO		90
116	000032.G2.2.3	New	1	C	SRO		91
117	000058.AA2.03	New	2	A	SRO		92
118	000056.AA2.20	New	1	C	SRO		93
119	2.2.29	New	1	C	SRO		94
120	2.2.18	New	1	C	SRO		95
121	2.3.10	New	1	C	SRO		96
122	2.1.12	New	2	A	SRO		97
123	2.4.9	New	1	B	SRO		98
124	015.A2.05	New	2	C	SRO		99
125	2.2.24	New	1	A	SRO		100

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Cell: A28
Comment: Que. 26
Reference required:
1-EOP-99 Fig. 9

Cell: A39
Comment: Que. 37
Reference required:
1-NOP-01.02 RCP seal flow vs. pressure

Cell: A72
Comment: Que. 67
Reference required:
SDC ONP-1-0440030
Fig. 1 & 2

Cell: A90
Comment: Que. 85
Reference required:
1-EOP-99 Fig. 2

Cell: A107
Comment: Que. 99
Reference required:
2-0120039 Nat. Circ.
Cooldown Fig. 3

Cell: A122
Comment: Que. 114
Reference required:
EPIP-01 classifications of emergencies

Question 1

Given the following conditions:

- Unit 1 has just tripped from 100% power due to loss of the 1A 125 VDC bus
- Normal AC electrical lineup prior to trip
- AB DC electrical lineup is to the B side
- Operators are performing 1-EOP-01, 'Standard post trip actions'
- No Contingency Actions have been performed.

Which of the following describes the configuration of the AFW system immediately following AFAS actuation?

A. All AFW pumps running and feeding both Steam Generators.

B. Only the 1C AFW pump running and feeding both Steam Generators.

C. Only the 1B AFW pump running and feeding the 1B Steam Generator.

D. 1C AFW pump running feeding both Steam Generators and 1B AFW pump running feeding 1B Steam Generator.

A. Incorrect, loss of A DC bus results in loss of AC power on the A side

B. Incorrect, the B side AFW system is available

C. Incorrect, because the AB DC bus is alligned to the B side the the C AFW system is available

D. **Correct**

Question level: 2
Question source: Bank
Exam: Both
K/A: 061.A2.03
Importance: 3.1/3.4
References: Text 0711412, LP 0702412-05

UNIT 1 - AUXILIARY FEEDWATER SYSTEM

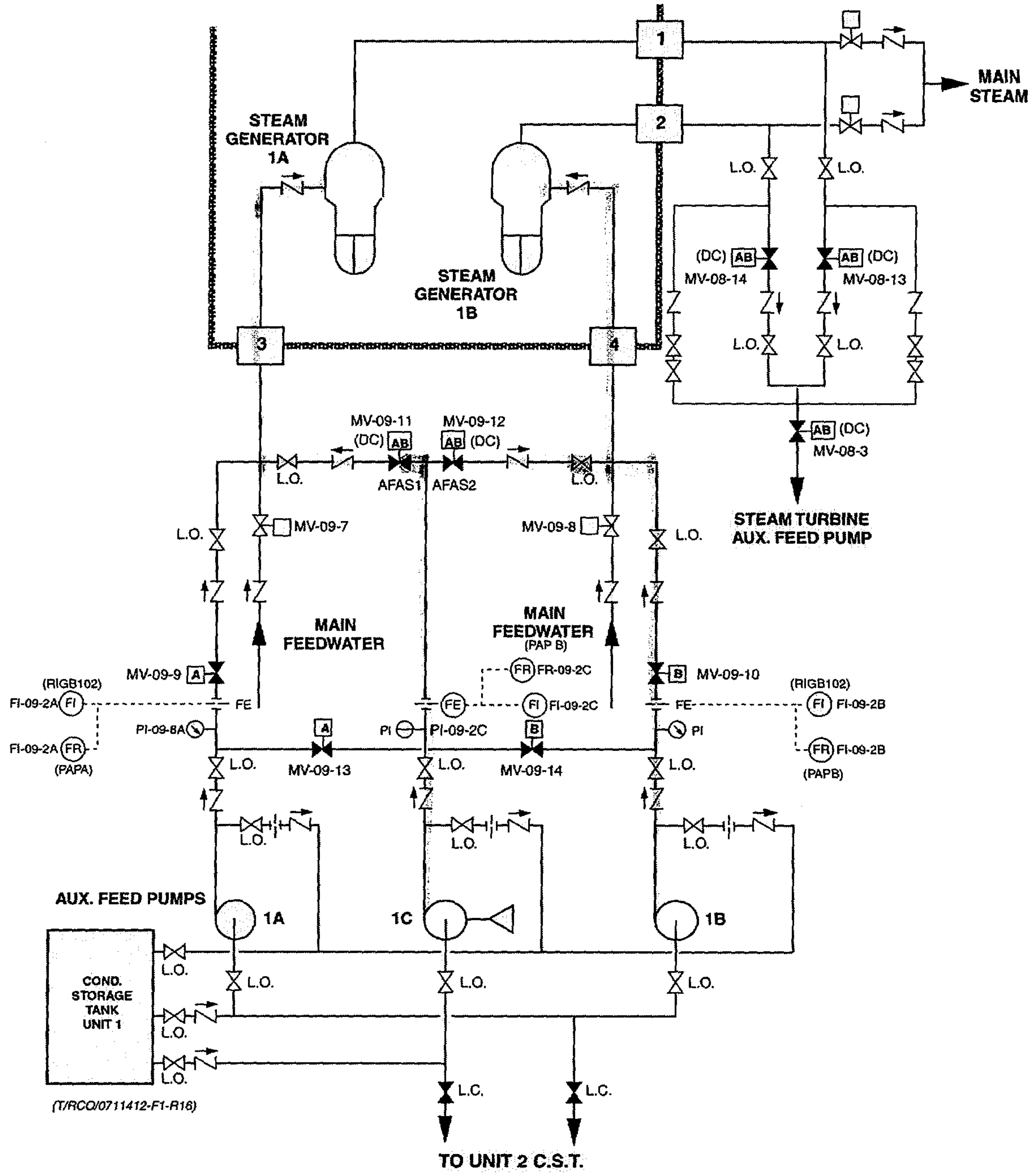

FIGURE 1

7.0 OPERATOR ACTIONS:

7.1 Immediate Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS

> **NOTE**
> Loss of a Safety Related DC Bus will cause PORV (V1402 or V1404) to open.

INSTRUCTIONS	CONTINGENCY ACTIONS
1. If pressurizer pressure is less than 2300 psia, Then ensure the PORVs, V1402 and V1404 are closed.	1. Close the PORV by placing the Override/Normal Range/Low Range switch to the OVERRIDE position or close V1403 or V1405, "PORV Block Valves" if power is available to the PORV block valves.

7.2 Subsequent Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
1. If in Mode 1 through 3, and SIAS is NOT blocked, Then go to step 2.	1. If in Mode 3 through Mode 6, and SIAS is blocked, Then go to step 3.
2. ACTIONS WHEN IN MODE 1 THROUGH MODE 3 (SIAS NOT BLOCKED)	
A. Implement E-Plan as necessary.	

> **NOTE**
> Due to the loss of DC control power, all breakers on the affected side will require manual operation.

INSTRUCTIONS	CONTINGENCY ACTIONS
B. If CCW to the RCPs has been lost for ten minutes, Then trip the RCPs.	

Question 2

Unit 1 has experienced a LOOP followed by a LOCA. The 1B CCW pump failed to start following the LOOP. Which of the following describes the configuration of the CCW system?

(assume all 'AB' lineup to the 'B' side)

A. The 1A and 1C CCW pumps running with the 1C CCW pump supplying both the 'A' and 'B' CCW headers.

B. The 1A and 1C CCW pumps running with the 1C CCW pump supplying only the 1B CCW header.

C. The 1A CCW pump running supplying only the 1A CCW header.

D. The 1A CCW pump running supplying the 1A and 1B CCW headers.

A. Incorrect, 1C CCW pump remains in pull to lock until manually removed

B. Incorrect, 1C CCW pump remains in pull to lock until manually removed

C. **Correct**

D. Incorrect, the 'N' header valves close on SIAS which isolates the A and B headers

Question level: 2
Question source: New
Exam: Both
K/A: 026.AK3.02
Importance: 3.6/3.9
References: Text 0711209, LP 0702209-08

- **START** which starts the pump
- **STOP** which stops the pump
- **PULL TO LOCK**

  The **standby** CCW pump (normally 'C') controls at RTGB 106 [206] is maintained in **the PULL TO LOCK** position. **This configuration prevents the standby pump from AUTO starting for a SIAS and/or LOOP condition, thereby ensuring that only one CCW pump would be loaded to one EDG and preventing an overload condition.** The time that a standby pump is not in PULL TO LOCK is minimized to the time just prior to starting it. The standby pump would be taken from PULL TO LOCK to AUTO GREEN FLAG for a very short time prior to starting the standby pump. Once the running pump is stopped, its control switch would be taken to PULL TO LOCK.

- **Green Flag after STOP**

  This position enables the control circuit to enable certain AUTO start conditions. For example, if the 'A' CCW pump was stopped and the 'C' pump was in PULL TO LOCK and a SIAS were to occur, the 'A' pump would AUTO START.

- **Red Flag after START**

  This position enables the control circuit to enable certain AUTO start conditions. For example, if the 'A' and 'B' pumps were running and the 'C' pump was in PULL TO LOCK, and a LOOP and/or a LOOP/SIAS occurred, the 'A' and 'B' pumps would restart once the load sequencing time delays met the start conditions.

• **LOCAL** operation at the pump breaker would occur for control room inaccessibility conditions when the NORMAL/ISOLATE switches are taken to the ISOLATE position for the 'A' and 'B' pump controls, with the exception being the 'C' pump, which has a three position switch:

  - NORMAL-AUTO, which is the normal position of the switch
  - NORMAL-MAN [NORMAL-MANUAL], which is not used
  - ISOLATE, which is used during control room inaccessibility conditions

Alarms associated with the CCW pumps:

Question 3

Unit 1 Turbine load is 350 MWE and increasing at 2 MWE per minute. Which of the following requires the Unit to be manually tripped?

A. Condenser A reads 3.6" Hg absolute, Condenser B reads 2" Hg absolute.

B. Condenser A reads 4" Hg absolute, Condenser B reads 2" Hg absolute.

C. Condenser A reads 5.2" Hg absolute, Condenser B reads 2.6" Hg absolute.

D. Condenser A reads 5.4 Hg absolute, Condenser B reads 3" Hg absolute.

A. Incorrect, Condenser ΔP is < 2.5" Hg and because power is > 30%, trip limit is 5.5" Hg backpressure

B. Incorrect, Condenser ΔP is < 2.5" Hg and because power is > 30%, trip limit is 5.5" Hg backpressure

C. Correct, Condenser ΔP >2.5" Hg

D. Incorrect, 5.5" Hg > 30% power and 2.5" Hg Condenser ΔP trip criteria.

Question level: 1
Question source: New
Exam: Both
K/A: 051.AA2.02
Importance: 3.9/4.1
References: Loss of Condenser Vacuum ONP-1-0610031, LP 0702812-38

7.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
¶1 **5.** If Unit load is greater than 30% of rated, Then VERIFY backpressure less than or equal to 5.5 inches Hg absolute.	**5.** If backpressure is greater than 5.5 inches Hg absolute, Then PERFORM the following: **A.** TRIP the Unit. **B. GO TO 1-EOP-01, Standard Post Trip Actions.**
6. VERIFY differential pressure between the following indicators is less than 2.5 inches Hg: • PI-10-7, 1A Condenser Back Pressure. • PI-10-6, 1B Cndsr Vac Press Manometer.	**6.** If greater than or equal to 2.5 inches Hg differential, Then PERFORM the following: **A.** TRIP the Unit. **B. GO TO 1-EOP-01, Standard Post Trip Actions.**
7. VERIFY reactor NOT tripped.	**7. If reactor is tripped, Then GO TO 1-EOP-01, Standard Post Trip Actions.**
8. VERIFY PI-22-21, Gland Stm HP Press, between 115 and 140 psig.	**8.** If pressure is NOT between 115 and 140 psig, Then ADJUST MV-08-878, PCV-08-879 Gland Seal Bypass, to maintain desired pressure. /R1A

7.0 OPERATOR ACTIONS

INSTRUCTIONS	**CONTINGENCY ACTIONS**
1. VERIFY proper SJAE operation.	
2. If vacuum continues to decrease, Then PERFORM Appendix A, Placing Hogging Ejectors in Service.	
3. VERIFY vacuum is being maintained.	**3. If vacuum cannot be maintained, Then GO TO NOP-1-0030125, Turbine Shutdown, Full Load to Zero Load to initiate a turbine shutdown in a controlled manner (approximately 5%/minute).**

CAUTION

Exceeding backpressure limits at low load conditions can cause cracking of low pressure turbine last row blades and rotor (disc) attachment areas due to harmful vibratory stress levels.

¶1 **4.** If Unit load is less than or equal to 30% of rated, Then VERIFY backpressure less than or equal to 3.5 inches Hg absolute.	**4.** If backpressure is greater than 3.5 inches Hg absolute, Then PERFORM the following: **A.** TRIP the Unit. **B. GO TO 1-EOP-01, Standard Post Trip Actions.**

Question 4

Unit 1 was manually tripped from 100% power due to a fire in the control room. All control room actions from 1-ONP-100.02 'Control Room Inaccessibility' have been performed and the control room was evacuated.

Which of the following describes how RCS temperature is normally controlled when the remote Shutdown panel is declared operational.

A. ADV's in auto control from the remote shutdown panel

B. ADV's in manual control, locally at the valve

C. SBCS in automatic control

D. SBCS in manual control

A. **Correct**

B. Incorrect, manual control only if loss of Instrument air

C. MSIV's are closed upon leaving the control room

D. MSIV's are closed upon leaving the control room

Question level: 1
Question source: New
Exam: Both
K/A: 068.AA1.01
Importance: 4.3/4.5
References: Control Room Inaccessibility 1-ONP-100.02, LP 0702812-07

6.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
14. If RCPs are OFF, Then MONITOR **ALL** of the following parameters to verify natural circulation is being maintained:	**14.** (continued)
• T-cold constant or lowering	
• Auxiliary Feedwater available and supplying water to at least **ONE** S/G	
• ADVs available and controlling S/G pressure	• LOCALLY CONTROL the ADVs in accordance with Appendix J, Local Operation of Unit 1 Atmospheric Dump Valves

15. ENSURE the following components are positioned as indicated:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
V23113	1A-1 CBHX Isol	CLOSED	
V23138	1B-1 CBHX Isol	CLOSED	
V23112	1A-1/1C-1 CBHX Inlet Cross-Tie Isol	CLOSED	
V23137	1B-1/1C-1 CBHX Inlet Cross-Tie Isol	CLOSED	

Question 5

Given the following conditions on Unit 1:

- LOOP has occurred
- Reactor is in Mode 3
- RCS pressure is 1800 psia and slowly rising
- Tcold is 540ºF and constant
- Rep. CET temperature is 587ºF
- Steam Generator (S/G) A and B levels are 15% NR and slowly rising
- Thot is 565ºF and constant

All of the following conditions meet the criteria for single phase natural circulation in accordance with 1-EOP-09 Loss of Offsite Power with the **EXCEPTION OF**:

A. Tcold Temperature trend

B. Subcooled Margin

C. Thot – Tcold differential temperature

D. Thot – CET differential temperature

A. Incorrect, Tcold required to be constant or decreasing

B. incorrect, < 50ºF

C. Incorrect, subcooled margin >20ºF (currently 34ºF)

D. Correct (>20ºF differential)

Question level: 2
Question source: ANO 2000 NRC RCO exam
Exam: Both
K/A: 13.AK1.2
Importance: 3.2/3.5
References:1-EOP-09, LP 0702835-05

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

It takes about 15 minutes for natural circulation flow to fully develop.

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 13. VERIFY natural circulation flow in at least one loop by **ALL** of the following: A. Loop ΔT (T-hot minus T-cold) is less than full power ΔT (50°F). B. T-cold constant or decreasing. C. T-hot constant or decreasing. D. No abnormal differences (greater than 20°F) between T-hot and Representative Core Exit Thermocouple (CET) temperature. E. Representative CET temperature indicates at least 20°F subcooling.	13. If natural circulation flow is NOT observed, Then ENSURE proper control of S/G feeding and steaming, and RCS inventory and pressure.
[*] 14. Periodically CHECK fuel oil levels in the diesel generator day tanks to confirm proper operation of the Fuel Oil Transfer System and to ensure uninterrupted diesel generator operation.	

Question 6

Unit 2 is at 100% power, steady state. A leak has developed in the common reference leg for Pressurizer pressure transmitter PT-1100X and Pressurizer level transmitter LT-1110X.

Which of the following describes the indications that will be observed in the control room due to this condition?

	PT-1100X	LT-1110X
A.	Lowers	Lowers
B.	Lowers	Raises
C.	Raises	Lowers
D.	Raises	Raises

A. 1110X fails high

B. **Correct**

C. Reverse logic

E. 1100X fails low

Question level: 2
Question Source: 1999 PSL NRC Exam
Exam: Both
KA 000028.AK1.01
Importance 2.8 / 3.1
References: 0711190-

MECHANICAL FAILURES AND EFFECTS

- Bourdon Tube, bellows, or diaphragm failure causes the sensed pressure to decrease. Indication then reads lower than actual pressure, possibly zero.

- Over-ranging the detector could have a couple of effects depending on how much excess pressure is applied and whether or not the detector is equipped with over-range protection. In all cases when the over-pressure is applied, indication will increase. If the detector is equipped with over-range protection, the indication will go to full scale but no higher. If the detector does not have the over-range protection, the indication will go to the top peg. Once the over-pressure is removed the instrument may or may not return to indicate properly. If no permanent deformation of the sensing element has occurred, then the instrument should indicate normally. If permanent deformation has occurred, the instrument will no longer read correctly. Usually from that time on, the instrument will read high due to the deformation.

- Under-ranging the detector has the same effect as over-ranging only in the opposite direction. Normally there is no permanent deformation to an under-ranged detector.

- For a sensing line rupture or leak, the pressure sensed by the detector decreases. The instrument reads lower than actual pressure.

ELECTRICAL FAILURES AND EFFECTS

Electrical failures and the resulting effects are hard to predict. The results depend heavily on exactly where in the instrument the failure occurs. In general, an open circuit or ground will cause the indicated pressure to be less than actual pressure.

MECHANICAL FAILURES AND EFFECTS

Mechanical failures can be analyzed by their effect on the sensed ΔP. If the failure increases the sensed ΔP, indicated level decreases as compared to actual level. If the failure causes a decreased sensed ΔP, the indicated level will increase. Remember that the ΔP of interest in level measurement is P_{REF} - P_{VAR}. If the two pressures are equal, ΔP is zero and the level instrument will indicate full scale. As the tank (or PZR) actual level and P_{VAR} decrease, the sensed ΔP will increase. A maximum ΔP indicates an empty tank.

- Loss of reference leg level - P_{REF} will decrease. ΔP sensed will decrease with no change in P_{VAR}. The level instrument will read high.

- Opening a ΔP cell equalizing valve - ΔP cell senses the same pressure on both sides of the sensing element. Sensed ΔP equals zero and the level instrument will read high.

- Rupture of a ΔP cell element - pressure is equalized on both sides. The level instrument will read high.

REFERENCES:

- Westinghouse Applied Instrumentation Control Technology for Power Plant Operators, 1986, Chapter 2.
- Westinghouse Electrical Sciences Lesson Text, 1983, Chapter 15.
- Westinghouse Mitigating Core Damage, 1983, Chapter 7.

Question 7

Unit 1 has entered 1-EOP-03 LOCA with a LOOP and the following conditions:

- RCS pressure 280 psia stable
- Thot 390ºF
- Rep. CET 398ºF
- Pressurizer level 35% and stable
- 1A S/G level 18% wide range with 155 gpm AFW flow
- 1B S/G level 14% wide range 200 gpm AFW flow

Which of the following prohibits stopping the LPSI pumps?

A. Pressurizer level

B. Subcooling

C. RCS pressure

D. S/G level

A. Incorrect, pressurizer level >30% and stable

B. Correct, Rep CET <20ºF subcooled (even though Thot >20ºF subcooled)

C. Incorrect, RCS pressure >200 psia and controlled (stable)

D. Incorrect, only 1 S/G >15% wide range with feed needed

Question level: 2
Question Source: New
Exam: Both
KA074.EK2.2.05
Importance 3.9 / 4.1
References: 1-EOP-03. LP 0702824-02

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

In order to avoid any unfavorable pressure excursions, water solid operation of the RCS should be avoided unless necessary to maintain 20°F subcooling. Actions to maintain subcooling take precedence over maintaining Pressurizer level. If the RCS is solid, closely monitor any makeup or draining, and any system heatup or cooldown to avoid any unfavorable rapid pressure excursions. Subcooling indication should be used according to RCS flow conditions:

- During Natural Circulation, use Representative CET (Page 213, QSPDS)
- During Forced Circulation, use RCS (Page 211, QSPDS)

[*] 19. ENSURE RCS pressure is being maintained within the limits of Figure 1, RCS Pressure Temperature curve. 20°F to 50°F subcooling is recommended (during Natural Circulation use Representative CET, page 213, or during Forced Circ. use RCS Page 211, QSPDS), using **ANY** of the following:

- Pressurizer heaters and main or auxiliary spray
- Charging and Letdown (if available)
- Throttling HPSI (if HPSI throttling criteria is met)

(Continued on Next Page)

19. If RCS subcooling is NOT being maintained, Then PERFORM **ANY** of the following as appropriate:

A. If RCS subcooling is less than 20°F, Then ESTABLISH 20°F subcooling by reducing RCS temperature.

B. If RCS subcooling is greater than 200°F or cooldown rate is greater than 100°F/hr, Then PERFORM the following steps as appropriate:

1. STOP any cooldown in progress.

(Continued on Next Page)

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS

CONTINGENCY ACTIONS

[*] 24. If no RCPs are running and single-phase natural circulation can NOT be maintained, Then break flow and two-phase natural circulation can maintain the heat removal process. ENSURE the following:

A. Safety injection flow per Figure 2, Safety Injection Flow vs. RCS Pressure.

B. **ALL** available charging pumps operating.

C. S/G steaming and feeding available.

D. Core exit thermocouple temperatures (highest per quadrant) indicate less than 22°F superheated, (page 213, QSPDS).

[*] 25. If the HPSI pumps are operating, Then DETERMINE if all the following throttling criteria are met:

A. RCS subcooling is greater than or equal to 20°F by **ONE** of the following:

1. During Forced Circulation, QSPDS RCS

2. During Natural Circulation, QSPDS REP CET

(Continued on Next Page)

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
25. (continued)	
B. Pressurizer level is greater than or equal to 30% and NOT decreasing.	
C. At least **ONE** S/G greater than or equal to 15% (wide range) level with feedwater available for removing heat.	
D. The Reactor vessel level indicates hot leg covered (sensors 4 through 8 covered, page 212, QSPDS).	
[*] 26. If HPSI throttling criteria are met, Then pumps may be THROTTLED or STOPPED. **REFER TO** Appendix S, Safety Injection Throttling and Restoration.	26. If HPSI throttling criteria can NOT be maintained, Then REINITIATE HPSI flow. **REFER TO** Appendix S, Safety Injection Throttling and Restoration.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 27. If the following criteria are met: A. RCS pressure greater than 200 psia and controlled. B. HPSI Throttling Criteria are met. Then the LPSI pumps may be stopped as follows: 1. CLOSE LPSI Header Loop Isolation Valves: HCV-3615 HCV-3625 HCV-3635 HCV-3645 2. STOP 1A and 1B LPSI Pumps. 3. RETURN 1A and 1B LPSI Pump control switches to AUTO.	27. If LPSI termination criteria can NOT be maintained and RAS has NOT occurred, Then RESTART LPSI pumps and OPEN header isolation valves.

Question 8

Unit 2 is in a station blackout. The 2B Diesel was out of service prior to the event and the 2A Diesel did not load on the bus. Below are some of the alarms received on RTGB 201:

- B-14 4.16 KV 2A3 Δ current trip
- B-6 2A Emer. D/G Brk. Failure
- B-35 480V LC 2A5 UV/UV test/ground
- B-46 4.16 KV Emerg. SWGR. 2A3 UV/UV test
- B-28 480 V LC 2A2 UV/UV test ground
- B-48 4.16 KV SWGR./480V LC/MCC 2AB UV
- B-39 480V MCC 2A5/2A6/2A8 Non-Ess. Sect. Lockout

When conditions permit, which of the following actions will re-energize the 2A3 4.16 KV bus from the 2A Diesel generator?

A. Manually close the 2A Diesel Generator output breaker from RTGB 201

B. Reset the 4.16 KV Undervoltage relays

C. Reset the differential current relay

D. Reset the Non-Essential section lockout

A. Incorrect, the Diesel breaker will immediately reopen due to the Δ current relay trip.

B. Incorrect, relays will not reset and energize the bus

C. **Correct, Diesel breaker will immediately close**

D. Incorrect, Non-Essential section cannot be reset until voltage back on bus

Question level: 2
Question Source: New
Exam: Both
KA: 055.EA2.06
Importance 3.7 / 4.1
References: 2-0910054, 0702502-07

APPENDIX A

RESTORATION OF 2A3 (2B3) 4160V BUS

(Page 2 of 6)

1. (continued)

> **CAUTION**
>
> Resetting the differential current lockout relay will immediately result in the diesel output breaker closing and the diesel loading onto the bus.

E. If no apparent damage exists, one attempt may be made to reset the lockout.

F. Attempt to energize the bus from the 2A (2B) diesel generator, as follows:

1. Ensure the 2A (2B) diesel generator is up to full speed and voltage. Attempt a manual start of the engine if necessary.
2. When the diesel generator is ready to synchronize, insert the synchronize plug and make only one attempt to close in the 2A (2B) diesel output breaker 2-20211 (2-20401).
3. If the diesel generator did NOT start, or is NOT running correctly, send an operator to the diesel building to investigate.
4. Refer to applicable appendices to repower load centers.

G. If the bus has NOT been reenergized, Then attempt to cross tie the bus to the 2A2 (2B2) 4160V bus as follows:

1. Ensure breakers to be closed are first "greenflagged."
2. Make one attempt to close the 2A2/2A3 (2B2/2B3) tie breaker 2-20109 (2-20309).
3. Insert the synchronize plug and make only one attempt to close the 2A3/2A2 (2B3/2B2) tie breaker 2-20209 (2-20411).

H. Call the Electrical Department for assistance, if breaker(s) will NOT close.

excellent arc quenching capability as well as exceptionally good electrical insulating characteristics. The moving electrical stab, which is moved from outside the sealed gas enclosure by a connecting cylinder rod, makes or breaks a contact in each phase simultaneously. The arc is quenched by SF_6 gas blasted against the closing and opening contacts by a puffer cylinder riding with the moving contact. The electrical current flow is transported into and out of the gas enclosure by gas filled bushing assemblies, six total or two per phase.

Air Circuit Breakers (ACB){tc \l2 "Air Circuit Breakers (ACB)}

Air circuit breakers are used in most other system applications, including some high voltage applications where large ACBs are necessary. ACBs use forced air as the medium that removes main contact heat and prevents arcing. The breaker is shut and tripped open by individual shutting and trip springs, each actuated by an electric coil.

Breaker Trip Conditions{tc \l2 "Breaker Trip Conditions}

In order to protect the breaker itself or its associated supply component or load, most breakers are protected by relays that will trip the breaker. The following are general definitions of some of the more common trip conditions:

- **Differential Current** - Phase currents into and out of a differential zone are compared. Too great a differential will cause a breaker trip.

- **Fault/Overload Current** - Excessive current will cause a breaker trip.

- **Fault Pressure** - Sudden pressure change in a transformer. For the startup and auxiliary transformers this fault pressure actuates a relay causing the main generator to trip. A fault pressure as sensed in the main transformers only results in an alarm being generated.

Breaker Numbering{tc \l1 "Breaker Numbering}

The switchyard numbering system uses the Florida Power and Light Switch Numbering Code. The plant uses individual unit numbering systems in each Unit.

closed simultaneously.

- An annunciator is actuated in each Control Room if the respective unit's AB 4.16 kV Bus is not aligned properly.

Emergency buses A3 and B3 are protected against an undervoltage (loss of voltage or degraded voltage) condition by fixed time undervoltage relays. Refer to subsequent sections of this text for the description of 4160V and 480V undervoltage protection. When actuated, these relays automatically initiate:

- starting of the Emergency Diesel Generator (EDG)
- bus load shedding
- open the emergency bus main feeder breaker

This isolates the emergency buses from the rest of the main power distribution system. Each EDG set is automatically started and loaded by controls and circuitry that are independent of those used to start the other EDG. To prevent EDG overloading, all but a few selected load breakers open (load shedding). These loads are referred to as the first load block and are energized as soon as the EDG breaker closes (0.0-0.2 seconds). The following three ESFAS actuated pumps are included in the first load block of the EDG loading sequence on both units:

- High Pressure Safety Injection (HPSI) Pumps
- Charging Pumps (From LC A2 / B2)
- Boric Acid Makeup (BAM) Pumps

Following this initial loading of the diesels, load sequencing relays sequentially load major safety-related loads back on their respective buses at a fixed timed sequence. Load sequencing differs slightly depending on whether there is just a loss of off-site power or a loss of off-site power with an ESFAS actuation. Refer to Unit 1 and Unit 2 UFSAR table 8.3-2 for the complete EDG loading sequence.

Each 4.16 kV bus is provided with the following protection:

- A bus lockout relay, mounted on the front of each 4.16 kV bus, is actuated by the bus differential current relay and causes all possible power sources to the bus to

Question 9

Unit 1 has experienced a LOCA and LOOP. Instrument air has been re-established 38 minutes after the LOOP.

Which of the following explains the required lineup of CCW upon restoration of Instrument air pressure?

A. Isolate CCW to the RCP's by closing Containment Isolation valves, HCV14-1, HCV14-2, HCV14-6, HCV14-7.

B. Isolate CCW to the RCP's by closing 'N' header isolation valves HCV-8A, HCV-8B, HCV-9, HCV-10.

C. Open CCW to the RCP's by opening Containment Isolation valves, HCV14-1, HCV14-2, HCV14-6, HCV14-7.

D. Open CCW to the RCP's by opening 'N' header isolation valves HCV-8A, HCV-8B, HCV-9, HCV-10.

A. Correct (required with new N-9000 seals)

B. Incorrect, this will isolate CCW to sample coolers. S/G and Primary sample will not be obtainable

C. Incorrect, If CCW lost $\geq$30 minutes, RCP seals are to be 'bottled up'. This step is performed if CCW lost <10 minutes.

D. Incorrect, This step is performed if CCW lost <10 minutes.

Question level: 1
Question Source: New
Exam: Both
KA: 062.AK3.03
Importance 4.0 / 4.2
References: 1-EOP-03, 0702824

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
	8. (continued) D. If CCW is lost to the RCPs for greater than or equal to 30 minutes, Then PERFORM **ALL** of the following: 1. ENSURE **ALL** RCPs are STOPPED. 2. ISOLATE CCW to the RCPs by performing **ALL** of the following: • PLACE HCV-14-1, CCW To RC Pump, to CLOSE. • PLACE HCV-14-2, CCW From RC Pump, to CLOSE. • PLACE HCV-14-6, CCW From RC Pump, to CLOSE. • PLACE HCV-14-7, CCW To RC Pump, to CLOSE.

(Continued on Next Page)

Question 10

Given the following:

- Unit 2 is in Mode 5 on SDC preparing to heatup the RCS.
- One Personnel airlock door is closed and one currently open.
- Equipment and escape hatch are closed.
- A loss of shutdown cooling occurs and the RCS temperature rises to 207ºF

Which of the below statements describes the current status of containment integrity?

Containment Integrity is:

A. not required for the current conditions.

B. not required if, within 1 hour, RCS temperature is lowered to 190ºF.

C. met with one airlock door closed

D. not met. Both airlock doors must be maintained closed

A. Incorrect, containment integrity required in Mode 4

B. incorrect, containment integrity must be restored within 1 hour

C. **Correct**

D. incorrect, one door required to be closed

Question level: 2
Question source: Modified from 2000 PSL NRC exam
Exam: SRO
K/A: 000069.AK2.03
Importance: 2.9
Reference: Loss of Containment Integrity/Air Locks ONP 1-1300030, LP 0902723-02

YEAR 2000 NRC EXAM

Given the following:

- Unit 2 is in Mode 5 on SDC preparing to heatup the RCS
- Both Personnel airlock doors are open
- A loss of shutdown cooling occurs and the Unit inadvertently enters Mode 4

Which one of the below statements describes the status of containment integrity?

A. not met, at least one airlock door must be maintained closed

B. not met, both airlock doors must be maintained closed

C. not required in Mode 4

D. not required as long as the Unit re-enters Mode 5 within one hour

---

A. not met, at least one airlock door must be maintained closed (correct)

B. not met, both airlock doors must be maintained closed (incorrect, only one airlock required to be closed)

C. not required in Mode 4 (incorrect, containment integrity required in Mode 4)

D. not required as long as the Unit re-enters Mode 5 within one hour (incorrect, containment integrity must be restored within 1 hour)

Question level: 1
Question source: New
Exam: Both
K/A: 000069.AK2.03
Importance: 2.8
Reference: Loss of Containment Integrity/Air Locks ONP 1-1300030

7.0 OPERATOR ACTIONS:

7.1 Immediate Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
1. If both doors on one containment air lock are open (except in Modes 5 or 6), Then close at least one door.	1. If at least one door will NOT close and seal, Then contact Maintenance Dept. for assistance.

7.2 Subsequent Operator Actions:

§1

NOTE

If the inner airlock door is inoperable, passage through the operable outer airlock door is permitted to effect repairs to the inoperable inner door. No more than one airlock door shall be open at any time.

INSTRUCTIONS	CONTINGENCY ACTIONS
§1 1. If one containment air lock door is inoperable, Then:	1. If at least one door will NOT close and seal, Then:
A. Maintain at least the operable airlock door CLOSED.	A. Contact Maintenance Dept. for assistance.
B. Restore the inoperable door to operable status within 24 hours or lock the operable airlock door CLOSED.	B. Refer to Technical Specifications Section 3.6.1.3 to ensure compliance with all required actions.

/R6

CONTAINMENT SYSTEMS

CONTAINMENT AIR LOCKS

LIMITING CONDITION FOR OPERATION

3.6.1.3 Each containment air lock shall be OPERABLE with:

a. Both doors closed except when the air lock is being used for normal transit entry and exit through the containment, then at least one air lock door shall be closed, and

b. An overall air lock leakage rate in accordance with the Containment Leakage Rate Testing Program.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one containment air lock door inoperable*:

1. Maintain at least the OPERABLE air lock door closed and either restore the inoperable air lock door to OPERABLE status within 24 hours or lock the OPERABLE air lock door closed.

2. Operation may then continue until performance of the next required overall air lock leakage test provided that the OPERABLE air lock door is verified to be closed at least once per 31 days.

3. Otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

4. The provisions of Specification 3.0.4 are not applicable.

b. With the containment air lock inoperable, except as the result of an inoperable air lock door, maintain at least one air lock door closed; restore the inoperable air lock to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.1.3 Each containment air lock shall be demonstrated OPERABLE:

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* If the inner air lock door is inoperable, passage through the OPERABLE outer air lock door is permitted to effect repairs to the inoperable inner air lock door. No more than one airlock door shall be open at any time.

Question 11

What type of radiation detector is used in the Unit 1 & 2 Spent Fuel Pool Area Radiation Monitors.

A. Ion Chambers

B. Proportional Counters

C. Geiger Mueller Tubes

D. Scintillation Detectors

A. Incorrect, Ion Chambers are used in post LOCA and CHRRMs area.

B. Incorrect, Proportional Counters are used for dose rate measurements.

C. **Correct**

D. Incorrect, Scintillation Detectors are used for process radiation monitors.

Question level: 1
Question source: New
Exam: RO
K/A: 000072 K5.01
Importance: 2.7
References: 0711410-12, Unit 1 Radiation Monitoring

SYSTEM DATA

TABLE 1 - AREA RADIATION MONITORS

CHANNEL NO.	MONITORED AREA	RANGE	TYPE DETECTOR
1	Control Room	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
2	Fuel Pool Filter Area	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
*3	CIS	10^{-1} to 10^{5} mR/hr	Geiger-Mueller
*4	CIS	10^{-1} to 10^{5} mR/hr	Geiger-Mueller
*5	CIS	10^{-1} to 10^{5} mR/hr	Geiger-Mueller
*6	CIS	10^{-1} to 10^{5} mR/hr	Geiger-Mueller
*7	Fuel Pool	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
**8	Refueling Canal	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
9	Fuel Pool Pump (Fuel Handling Bldg)	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
10	Boric Acid Preconcentrator Filter	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
11	Waste Filter	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
12	Laundry Filter	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
13	Waste Gas Compressor	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
14	Charging Pump	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
15	Holdup Drain Pump	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
16	Sample Room	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
17	Ion Exchanger Valve	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
18	Ion Exchanger Valve	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
19	Drumming Station	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
20	Purification Filter	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
21	Spent Resin Tank	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
22	ECCS Equipment	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
23	Decontamination	10^{-1} to 10^{4} mR/hr	Geiger-Mueller
24	HVAC Room	10^{-1} to 10^{4} mR/hr	Geiger-Mueller

TABLE 3

AREA MONITORS - SAFETY-RELATED

MONITOR	DETECTOR TYPE		LOCATION
*CIAS A	Geiger-Mueller	RAB el 25'	Containment el 90'
*CIAS B	Geiger-Mueller	RAB el 25'	Containment el 90'
*CIAS C	Geiger-Mueller	RAB el 25'	Containment el 90'
*CIAS D	Geiger-Mueller	RAB el 25'	Containment el 90'
*Spent Fuel Pool A	Geiger-Mueller	FHB el 68'	FHB el 61'
*Spent Fuel Pool B	Geiger-Mueller	FHB el 68'	FHB el 61'
*Spent Fuel Pool C	Geiger-Mueller	FHB el 68'	FHB el 61'
*Spent Fuel Pool D	Geiger-Mueller	FHB el 68'	FHB el 61'
*Spent Fuel Pool E	Geiger-Mueller	FHB el 68'	FHB el 61'
*Spent Fuel Pool F	Geiger-Mueller	FHB el 68'	FHB el 61'
Containment Post Accident A	Ion Chamber	RAB el 64.5	Below FHB roof at el 85'
Containment Post Accident B	Ion Chamber	RAB el 67.5	Above RAB roof at el 85'
*Containment High Range	Ion Chamber	RAB el 65'	RCB el 90'
*Containment High Range	Ion Chamber	RAB el 65'	RCB el 90'
*Control Room OAI	βγ Scintillation	Cable Spreading Room	Intake Ventilation Duct
*Control Room OAI	βγScintillation	Cable Spreading Room	Intake Ventilation Duct
*Control Room OAI	βγ Scintillation	Cable Spreading Room	Intake Ventilation Duct
*Control Room OAI	βγ Scintillation	Cable Spreading Room	Intake Ventilation Duct

* **Tech. Spec. Monitors**

Question 12

Unit 2 has experienced a LOCA with the following conditions:

- RCS pressure is 1640 psia
- Containment pressure is 2.2 psig

Which of the following explains the configuration of the Containment cooling fans?

A. Three Containment Cooling fans running in fast speed

B. Three Containment Cooling fans running in slow speed

C. Four Containment Cooling fans running in fast speed

D. Four Containment Cooling fans running in slow speed

A. Incorrect, four coolers start in fast speed (this is normal configuration, not SIAS)

B. Incorrect, four coolers start in slow speed

C. Incorrect, four coolers start in slow speed

D. Correct

Question level: 2
Question source: New
Exam: RO
K/A: 022.A2.03
Importance: 2.6
References: Containment cooling lesson text 0711207, ECCS and Containment cooling lesson plan 0702207

Unit 2:

Use vane axial flow fans that consist of a multi-bladed rotor assembly mounted directly to the motor shaft. The fan-rotor is of the adjustable pitch type so air flow can be mechanically adjusted. The two-speed fan motors are not cooled by CCW. The fan motors are cooled by air that has been through the cooling coils.

Each fan has a **STOP/AUTO/START/TEST** control switch and off/fast/slow indication lights on HVAC control board. The fan motors are powered from 480 VAC buses; fans 2HVS-1A/1B from MCC 2A9 and 2HVS-1C/1D from MCC 2B9. Control power is supplied from the 480V fan breaker through a step down transformer. There is a **FAST/REMOTE/SLOW** local control switch on each MCC for maintenance. During normal operation three of the four fan-cooler units operate in fast speed to supply the containment with an air flow of 60,000 cfm each.

Upon receipt of an SIAS, all four fan-cooler units start in slow speed to supply approximately 39,600 cfm air flow each for post-accident heat removal system. Following a loss of power to the MCC or an individual fan breaker is cycled the respective fan will start in fast if the control switch is in Auto. There is a 3 second time delay before auto starting. This places these fans in the three second load block following a loop.

The fan can be placed in slow speed by taking the control switch to TEST. To return the fan to fast, the control switch is first taken to STOP, then placed in START. Time should be allowed for the fan to coast down before restarting.

Fan problems are indicated by any of these annunciators:

- CONTAINMENT FAN CLR HVS-1A (B, C, D) OVRLD/TRIP
- CONTAINMENT FAN CLR HVS-1A (B, C, D) FLOW LOW/VIBRATION HIGH
- CONTAINMENT FAN CLV HVS-1A (B, C, D) SIAS OVRD/SS ISOL.

Question 13

Unit 1 is in Mode 5 when the CCW valve (MV-14-6) to the 1A and 1B Containment fan coolers failed closed.

Which of the following states the impact of this CCW valve closure on the 1A and 1B Containment fan coolers?

The Containment fan coolers will:

A. continue to run with no CCW flow to the motors and cooling coils.

B. continue to run with only the cooling coils losing CCW flow.

C. trip on low CCW flow.

D. trip on thermal overload.

A. Correct

B. Incorrect, would be correct on Unit 2 only

C. Incorrect, no low flow trip, only annunciator associated with loss of CCW

D. Incorrect, no high temperature associated with loss of CCW. There is a high containment temperature alarm from the outlet of the CCW coolers.

Question level: 1
Question source: New
Exam: Both
K/A: 022.K1.01
Importance: 3.5 / 3.7
References: Containment cooling lesson text 0711207, ECCS and Containment Cooling Lesson plan 0702209-07

The vibration alarm can be reset by depressing the reset button on the vertical section of RTGB-106 [HVCB]. Refer to the System Data Section of this text for more information on these and other annunciators.

Containment Cooling Coils

Each fan cooling unit contains two banks of cooling coils for normal and post-accident operation. The coils are mechanically and uniformly expanded into finned collars. Each fan cooler is in an enclosure designed to withstand any seismic loads and pressure differentials that could be encountered. The fan coolers are provided with a gravity damper to limit reverse flow while the fan is idle. The fan coolers are located in different quadrants within containment as illustrated in Figures 9 and 10. Three fan coolers are on floor elevation, 45', and the fourth is on the operating floor, 62'.

[sjw1]The fan coolers are designed for **1200 gpm** CCW flow. **1200 gpm** is also the minimum required by Tech Specs. Unit 1 uses 50 gpm of this flow for fan motor cooling. CCW temperature can be monitored on the Speedomax temp-indicator on the back of RTGB 101 [201]. Manual control **OPEN/CLOSE** switches for CCW isolation valves to each fan cooler unit are found on RTGB 106 [HVAC panel]. Temperature recorder 25-1 on RTGB 106 [TR-25-1A, TR-25-1B on HVAC panel] monitors air temperature drop across the fan cooler unit cooling coils. Should CCW flow decrease to **1250 gpm** through a cooler, a CONTAINMENT FAN CLR HVS-1A (B, C, D) CCW FLOW LOW alarm will annunciate (one for each cooler).

Containment Cooling Distribution Ducting

The distribution ducting is arranged to promote mixing of the containment air and includes a common ring header to ensure continuity of design air flows at all air outlets. Ducts are welded, reinforced, and equipped with pressure relief dampers to withstand LOCA induced pressure transients. The containment ring header has blowout panels in the ductwork with the Steam Generator areas and Cavity Cooling System to prevent the overpressurization of the duct. There are also gravity dampers rated at 2[1.5] psi differential at the point of juncture between the ring header and the ducts. The dampers are designed for a differential

Question 14

Unit 2 is at 100% power when the selected Pressurizer Level Control Channel 1110-X failed low. Pressurizer Level Control Channel 1110-Y has been selected for control.

Which of the following describes the actions that must be taken to regain use of the pressurizer heaters?

Position the:

A. low-level cutoff switch to the 'Y' channel and reset proportional and back-up pressurizer heaters controlled by the 'Y' channel.

B. low-level cutoff switch to the 'Y' channel and reset all proportional and back-up pressurizer heaters.

C. backup interlock bypass keyswitch to the LEVEL position and reset proportional and backup pressurizer heaters controlled by the 'Y' channel.

D. backup interlock bypass keyswitch to the LEVEL position and reset all proportional and backup pressurizer heaters.

A. Incorrect, would be correct on Unit 1

B. Incorrect, only operable side heaters can be restored.

C. **Correct**

D. Incorrect, only operable side heaters can be restored.

Question level: 1
Question source: New
Exam: Both
KA: 011 A2.11
Importance: 3.4/3.6
Reference: LP 0702206-13, PPLCS, ONP1-0120035 & ONP 2-0120035, Pressurizer Pressure and Level

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	**CONTINGENCY ACTIONS**
2. (continued)	2. (continued)

NOTE

With less than 27% level on Channel X, the "A" pressurizer heater transformer feeder breaker (2-20204) trips and the "B" side 480V power supplies deenergize. With less than 27% level on Channel Y, the "B" pressurizer heater transformer feeder breaker (2-20403) trips and the "A" side 480V power supplies deenergize. The backup interlock bypass keyswitch selected to the level position, allows the 480V heater power supplies to be reset.

G. Verify pressurizer level indicating controllers (selected and non-selected) are operating properly and power is available to pressurizer heaters.

G. If pressurizer heaters are deenergized or level indicating controller(s) failed, Then perform the following:

1. If either level control channel has failed, Then shift to the operable channel and reset heaters as follows:

   a. Place the backup interlock bypass keyswitch (RTGB-203) to the LEVEL position. (This regains power to the proportional and backup heater banks controlled by the selected channel.)

   b. Reset pressurizer heater banks as needed.

   OR

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
2. (continued)	2. (continued)
	G. (continued)
	2. If actual pressurizer level had decreased below 27% and has been restored, Then reset pressurizer heaters by:
	a. Resetting 4160KV feeder breakers 2-20204 and 2-20403, and Then resetting pressurizer heater control switches.
H. Verify that pressurizer PORV's/Safeties are NOT leaking or actuated as indicated by:	H. If leakage is indicated, Then close PORV block valve(s) V-1476 and/or V-1477 as required, and refer to 2-0120036, "Pressurizer Relief/Safety Valve Off-Normal Operating Procedure."
1. PORV/Safety Valve acoustic flow monitors.	
2. Downstream tailpipe temperatures.	
3. Quench tank level, temperature, and pressure.	

The following scenarios explain the current use of HS-124:

SCENARIO 1: Pressurizer level control channel X is selected and fails low:

Result: LA-1110X trips 'A' 4160V heater breaker (2A3) to P1, B1, B2, B3.
LC-1110XL trips 'B' 480V heater contactors to P2, B4, B5, B6.

Recovery: Select operable level channel for level control (Y).
Turn key switch to "LEVEL" (overrides LC-1110XL trip).
Reset 480V heater controls on 'B' side to restore P2, B4, B5, B6. (Take switch to "off" then back to "on" or "auto".)

NOTE: Only 1 side of pressurizer heaters available while level control channel is failed low (side opposite failed level channel).

(If level channel 'Y' failed low, the other heater banks would be affected:

- 'B' 4160V breaker and P1, B1, B2, B3 480V contactors open.
- 'A' side 480V heater bank controls to P1, B1, B2, B3 could be reset.)

SCENARIO 2: Loss of off-site power: NO repositioning of HS-124 is necessary.

Result: Both 4160V heater supply breakers and all eight 480V contactors open.
D/Gs start and carry emergency loads on 2A3 and 2B3 4160V buses.

Recovery: When pressurizer level >27%, close 'A' and 'B' 4160V breakers,
Reset 480V heaters on RTGB-203 to restore backup heaters B1 and B4.
{All other Unit 2 heaters are interlocked out (for DG loading concerns) by 3 to 2 4160 VAC bus tie breaker open interlock.}

NOTE: Pressurizer Pressure Controllers fail high on a loss of power. Their normal power supply is non-essential.

SCENARIO 3: Pressurizer pressure control channel X is selected and fails high:
NO repositioning of HS-124 is necessary.

Result: All 480V heater contactors open.

Recovery: Select operable pressure control channel (Y),
Reset and close 480V heater contactors.

Question 15

Unit 1 is at 48% power increasing at 4 MWE/Min. with the following:

- Both Main Feedwater pumps are running
- Both Condensate pumps are running

If the 1A Condensate pump trips and the power increase is allowed to continue, which of the following will occur first?

A. The 1A Main Feedwater pump trips on low suction pressure.

B. The 1A Main Feedwater pump trips on low suction flow.

C. The 1A Main Feedwater pump trips as a direct result of 2A Condensate pump trip.

D. The plant trips on low S/G level.

A. Incorrect, suction pressure will be low, but the electrical interlock to trip the 1A MFP will be first

B. Incorrect, suction flow will not be at the setpoint of <2500 GPM

C. Correct will occur at >50% power

D. Incorrect, at >50% power 1A Feedwater pump will trip one Condensate pump will handle 55% power.

Question Level: 2
Question Source: Modified from 2000 PSL NRC Exam
Exam: RO
K/A: 056.K1.03
Importance: 2.6
References: 0711301 'Condensate, Feedwater, and Heater Vents and Drains' Lesson Text. 0702301-08 Lesson plan

2000 PSL NRC EXAM

Unit 2 is performing a unit up power and is currently at 54% power increasing at 2 MWE/Min. Both Main Feedwater pumps and Condensate pumps are in service, when the 2B condensate pump trips.

Which of the following will be the initial plant response as the result of 2B Condensate pump tripping?

A. Both Main Feedwater pumps trip on low suction pressure.

B. Both Main Feedwater pumps trip on low suction flow.

C. Alarms only, capacity of one condensate pump is 55% power

D. The 2B Main Feedwater pump trips as a direct result of 2B Condensate pump trip.

A. Both Main Feedwater pumps trip on low suction pressure. (incorrect, suction pressure will be low, but the electrical interlock to trip the 2B MFP will be first)

B. Both Main Feedwater pumps trip on low suction flow. (incorrect, suction flow will not be at the setpoint of <3000 GPM)

C. Alarms only, capacity of one condensate pump is 55% power. (incorrect, electrical interlock will trip the 2B MFP)

D. The 2B Main Feedwater pump trips as a direct result of 2B Condensate pump trip. (correct)

Question Level: 1
Question Source: New
Exam: RO
K/A: 056.K1.03
Importance: 2.6
References: 0711301 'Condensate, Feedwater, and Heater Vents and Drains' Lesson Text.

Only one MFW pump is normally running when plant power is less than 45%. The second MFW pump will automatically start if the running feedwater pump trips and the control for the idle pump is in the AUTO/RECIRC, provided the pump start interlocks are met.
To start a MFW pump, the following conditions must be met: (Refer to Figure 20.)

- Lube oil pressure **>8 psig**.
- Feedwater pump suction valve is open.
- Feedwater pump suction pressure **>275 psig**.
- Two Condensate pumps are running, or
  total feedwater flow is less than 50% and one Condensate pump is running.

The MFW pump discharge valve will open after the pump starts. The auxiliary oil pump must be manually stopped locally. The auxiliary oil pump will automatically start if lube oil pressure on the running feedwater pump drops to **6 psig.**

The MFW pumps will trip under the following conditions: (Refer to Figure 21.)

- Lube oil pressure **<4 psig.**
- Operating pump suction pressure **<275 psig.**
- Electrical fault.
- Both running Condensate pumps are stopped.
- Feedwater pump suction flow **≤2500 gpm**.
- Hi-Hi steam generator level **≥90% [≥88%].**
- 6.9 KV undervoltage
- Loss of one Condensate pump with total feed flow >50% and both feedwater pumps running. (Loss of Condensate pump trips its respective side feedwater pump)
- MSIS (Unit 1 only)

Each MFW pump motor has a thrust bearing and two radial journal bearings, which are lubricated and cooled by oil from the feedwater pump oil system. Each feedwater pump's oil system has a shell-and-tube heat exchanger for oil cooling. The heat exchanger is supplied with cooling water from the turbine cooling water system.

Question 16

Unit 2 is in Mode 3 preparing to perform a Reactor startup with the following conditions:

- Both MSIV's are closed
- RCS Tave is 532ºF
- RCS pressure 2250 psia

2B MSIV was inadvertently opened and the following indications were observed:

- 2B S/G pressure initially decreased to 740 psia and has stabilized.
- 2A S/G pressure 900 psia and stable.

Which of the following describes the plant response
(assume secondary system intact)

A. S/G pressure differential generated a MSIS and has closed both MSIV's.

B. S/G pressure differential generated a Reactor trip signal.

C. A cooldown resulted in low Pressurizer pressure and a SIAS.

D. 2B S/G pressure generated a MSIS and has closed both MSIV's.

A. Incorrect, S/G pressure differential does not generate a MSIS

B. Correct

C. Incorrect, pressure will not decrease to SIAS setpoint

D. Incorrect, MSIS setpoint is 600 psia

Question Level: 2
Question Source: New
Exam: RO
K/A: 039.K3.05
Importance: 3.6
References: 0711304 Main, Reheat, and Auxiliary Steam System, 0702304-6 Main Steam Lesson plan

- MSIVs must also be operable to fulfill the containment isolation function.

- In order to be considered operable, the MSIVs must be capable of shutting within 6.0 [6.75] seconds after receiving a manual or automatic shut initiation signal. If inoperable MSIVs cannot be shut or made operable, the plant must be placed in hot shutdown within 12 hours.

[Section 3/4.7.1.7{tc \l2 "Section 3/4.7.1.7}]

- Addresses operation of the Unit 2 ADVs and their associated block valves. All valves must be operable in Mode 1. All Unit 2 ADVs must be in a manual above 15% power.

- With Reactor power greater than or equal to 5% but less than 15%, NO more than one ADV per S/G shall be in automatic control.

- Unit 1 ADVs are not controlled by Tech Specifications. However, they are procedurally controlled to be in manual above 15%.

Section 3/4.7.2.1

- Addresses S/G pressure/temperature limitations.

OPERATING EXPERIENCE

SCRD 99-0889, Opening of 2B Main Steam Isolation Valve (MSIV) with Main Steam Header Depressurized Results in Reactor Trip Signal

On 6/6/99 with St Lucie Unit 2 in Mode 3, during the release of an Equipment Clearance Order (ECO), the 2B MSIV was inadvertently opened while the Main Steam Header was depressurized. At the time of the event, both S/Gs were at normal no-load pressure of 900 psia, with heat removal being accomplished using the ADVs.

The ECO was implemented on 6/5/99 to maintain the MSIVs closed and the Main Steam Header vented for personnel safety during an inspection inside the Main

Generator. Following completion of the Generator inspection, the ECO was signed off and was being released on the afternoon of 6/6/99. During the ECO release, the 2B MSIV (HCV-08-1B) unexpectedly opened to approximately 90% of full open, immediately pressurizing the Main Steam Header from the 2B S/G. Pressure in the 2B S/G dropped rapidly to approximately 740 psia before slowly recovering toward 840 psia as pressures between the 2B S/G and Main Steam Header equalized.

Due to the resulting pressure differential between the 2A and 2B S/Gs, a reactor trip signal was generated on Asymmetric Steam Generator Transient. The Reactor Protection System (RPS) trip logic was made up and all Trip Circuit Breakers opened, although no rod motion occurred as all CEAs were fully inserted previous to the trip. Due to the reactor trip signal, the operating crew entered EOP-1, "Standard Post Trip Actions". Attempts to close the 2B MSIV from the Control Room were unsuccessful, and the crew entered EOP-5, "Excess Steam Demand", shortly thereafter. It should be noted that as the Main Steam Header was intact at the time of the event, the steam demand effectively ceased once pressures between the 2B S/G and Main Steam Header equalized. Initial attempts to locally close the 2B MSIV were unsuccessful, but the 2B MSIV was finally closed about an hour after going open.

The root cause of the event was failure to utilize the Main Steam System Initial Valve Alignment procedure during the release of the ECO. The Unit 2 MSIVs have a complex hydraulic and pneumatic control system and are designed to fail open on a loss of DC control power. Because of this, a specific sequence must be followed to restore air and power in order to prevent inadvertent opening of the valve. The basic sequence, as discussed in the procedure, is to restore DC control power to the valve first, and then hold the control switch in the CLOSE position while a total of eight air isolation valves are opened. During the release of the ECO, air was being restored to the valve prior to the control power fuses being re-installed, and the control switch was not being held in the CLOSE position.

The intermediate configuration of the MSIV power and air systems at the time of the opening of 2B MSIV hampered attempts to close the valve. As the control power had not been restored, attempts to close the valve from the Control Room were unsuccessful. Initially attempts to locally close the MSIV by disconnecting pressure switch fittings in accordance with EOP-99, "Appendixes/Figures/Tables", to allow the air

Question 17

Unit 2 is performing a Turbine startup with the 15% Main Feedwater bypass valves in automatic utilizing the Low Power Feedwater Control System (LPFWCS). Both Main Feedwater block valves are closed.

Which of the following conditions will terminate Main Feedwater flow to the 2B S/G?

A. Feed flow transmitter FT 9021 fails high.

B. Steam flow transmitter FT 8021 fails low.

C. LPFWCS loss of power.

D. LPFWCS CPU failure (red light on in a flashing mode).

A. Incorrect, feed flow an input to MFW control system.

B. Incorrect, steam flow an input to MFW control system.

C. Correct

D. Incorrect, valve fails as is.

Question Level: 2
Question Source: New
Exam: RO
K/A: 059.A2.12
Importance: 3.1
References: 2-GOP-502, Data sheets required for heatup, S/G Level control text 0711408, LP 0702408-09

All input signals to LPFWCS are buffered to prevent any interactions between LPFWCS and the Main Feedwater Control System.

LIC-9005 (9006) Manual to Automatic Transfer

- The 15% bypass valve is being used to maintain S/G level in manual, and S/G level is stable at the level setpoint.
- The M/A station CPU failure indicator red light is not lit, and the uMAC 5000 output is equal to the horizontal bar graph indicating that the microprocessor is operating and is tracking the M/A station output.
- Main feedwater block valves are closed, to prevent leakage through the MFRVs. (The main feedwater block valves should not be opened while the LPFWCS is in automatic, except during the transfer between LPFWCS and MFWCS.)
- [Unit 2 MFRV LIC-9011 (9012) output set at zero, to allow proper NI signal comparison with S/G level.]

{PRIVATE }uMAC 5000 CPU Failure

{tc \l 2 "UMAC 5000 CPU Failure Indication"}
If operating **in AUTO**, the M/A station alarm indicating red light goes **"on" in a flashing mode** upon a CPU failure, and the 15% bypass valve **fails AS-IS.** The Manual control mode must be selected at the M/A station. **When Manual** control is selected, the flashing red light changes to a **steady red light.** This indicates the uMAC 5000 CPU is not tracking the M/A station.

To restore the uMAC 5000 CPU to active control:

- The reset button, located within the uMAC 5000 cabinet, must be reset, and
- The RUN instruction must be given to the uMAC 5000 through the Termiflex terminal, which is accomplished by I&C.

If a LPFWCS power failure occurs, the uMAC 5000 output signal will drop to zero, causing the 15% bypass valve to **fail CLOSE**. The uMAC 5000 must be reactivated through the Termiflex terminal, and the reset button must be reset in the uMAC 5000 cabinet. **A loss of LPFWCS power does not result in the loss of its CPU program data. The software is retained by means of a backup battery, which should be replaced each outage.**

Question 18

Unit 1 was in a loss of off-site power (LOOP) when the 1A Emergency Diesel Generator tripped. Which of the following conditions caused the 1A EDG to trip?

Engine:

A. oil pressure is 15 psig.

B. speed of 1050 rpm.

C. water temperature is 215°F.

D. crankcase pressure is 2" H_2O.

A. Incorrect, trip disabled during LOOP.

B. **Correct**

C. Incorrect, trip disabled during LOOP.

D. Incorrect, trip disabled during LOOP.

Question level: 1
Question source: New
Exam: Both
K/A: 064.K4.02
Importance: 3.9 / 4.2
References: 0711501, Emergency diesel Generators, 0702501-18

ABNORMAL OPERATION{tc \l1 "ABNORMAL OPERATION}

ONP 1[2]-0910054, Loss of a Safety Related AC Bus, provides direction for attempting to recover from loss of 4.16 KV safety-related power.

EDG Lockout [and Shutdown] Relay
If the diesel is operating in the normal (surveillance) mode and one of the eight following conditions occurs, the EDG lockout relay will energize to give a lockout (the acronym "COREWOOD" may help in memorizing this list):

- Crankcase pressure high at **>1" H_2O**
- Oil pressure low at **<17 [20] psig** (Engine oil pressure)
- Reverse power (Generator motoring)
- Excitation low (Loss of generator field)
- Water temperature high at **>205°F**
- Overcurrent
- Overspeed at **1040 [1035] rpm*****
- Differential current*** (Current imbalance between the generator and load side of the output breaker)

*** Still enabled following Emergency Start

Note –The Fail-To-Start relay will actuate the lockout relay [Shutdown Relay] of the EDG, even in the emergency mode.

The "Lockout" relay trips the EDG to prevent further operation, even in emergency mode, and alarms on the local EDG control panel and in the control room.

- To clear a lockout under normal operation, the condition that caused it must be cleared AND the "Lockout" relay on the local EDG control panel must be reset.

- If lockout has already actuated and an emergency start is present, lockout must still be reset to run the EDG. Emergency operation will remove most input signals as previously discussed, but does NOT block the Fail-To-Start relay.

Question 19

Unit 2 is at 100% power when a 'B' side CCW leak, greater than capacity of the makeup occurs.

Which of the following describes the configuration of the CCW system in response to the leak? (assume no Operator action)

A. All running CCW pumps will lose suction.

B. All the 'N' header valves will close separating the 'A' CCW header from the 'B' CCW header.

C. Only the 'N' header valves from the 'B' side will close separating the 'A' CCW header from the 'B' side CCW header.

D. Only the 'N' header valves from the 'A' side will close separating the 'A' CCW header from the 'B' side CCW header.

A. Incorrect, would be correct if Unit 1 (N header valves don't close)

B. Correct

C. Incorrect, surge tank will lower on both headers, closing all 'N' header valves.

D. Incorrect, surge tank will lower on both headers, closing all 'N' header valves.

Question Level: 2
Question Source: New
Exam: RO
K/A: 008.A2.02
Importance: 3.2
References: CCW Lesson Text 0711209, CCW LP 0702209-08

- **Low at 29"** as sensed by LS-14-1B (COMPARTMENT B LEVEL LOW). This alarm can alert the operator to an off-normal condition such as a failure of the makeup system to begin makeup flow and/or a leak or rupture in the CCW system. The off-normal procedure cautions the operator that the fire water system should be used as a makeup source as a last resort.

- Each side of the surge tank has a water level sight glass for local indication.

- Unit 2 has two additional level switches associated with the CCW surge tank:
  - **at 29"** LS-14-6A causes the following 'A' side 'N' header valves to **CLOSE**:
    - HCV-14-8A, 'A' side supply
    - HCV-14-9, 'A' side return
  - **at 29"** LS-14-6B causes the following 'B' side 'N' header valves to **CLOSE**:
    - HCV-14-8B, 'B' side supply
    - HCV-14-10, 'B' side return

    A **leak** in one of the **essential** headers would affect the level in both compartments of the surge tank due to their being cross-connected via the 'N' header. After both sides 'N' header valves close, the side without the leak would have its low level alarm clear. The 'N' header supply and return valves for that "good" side could then be re-opened.

    A **leak** in the '**N**' header would also affect the level in both compartments of the surge tank. After both sides 'N' headers valves close, both low level alarms would clear, indicating that the leak was in the 'N' header.

- Overflow or draining from the CCW surge tank is collected by the Reactor Auxiliary Building drain system and is routed to the Chemical Drain Tank.

- The CCW surge tank is vented:
  - Normally to atmosphere via RCV-14-1
  - CCW Surge Tank Vent RCV-41-1 diverts from atmosphere to the Chemical Drain Tank on high radioactivity in the CCW system as detected by at least one in line process radiation monitor.

<u>{PRIVATE }CCW Surge Tank High Level Off-Normal Condition{tc \l 5 "CCW Surge Tank High Level Off-Normal Condition"}</u>

Two conditions could cause a high level in the CCW Surge Tank, radioactive leakage into the CCW system or failure of the demineralized makeup water system to function

Question 20

Unit 2 has experienced a Large Break LOCA with the following conditions:

- Containment pressure is 11 psig
- RCS pressure is 210 psia
- 2A Containment spray pump failed to start
- All other ECCS equipment running as designed

Which of the following describes the status of the Iodine removal system?

A. A and B hydrazine pumps running with their associated injection valves open.

B. The B hydrazine pump running and associated injection valve open, the A hydrazine pump running with its injection valve closed.

C The B hydrazine pump running and associated injection valve open, the A hydrazine pump is off with its injection valve open.

D. The B hydrazine pump running and associated injection valve open, the A hydrazine pump is off with its injection valve closed.

A. Incorrect, B iodine removal system not actuated due to 2B CS pp fail to start.

B. Incorrect, A hydrazine pump not running

C. Incorrect, A hydrazine pump not running, injection valve not open

D. Correct

Question Level: 2
Question Source: Bank
Exam: Both
K/A: 027.K1.01
Importance: 3.4 / 3.7
References: 0711207 ECC and Containment heat removal systems, 0702207-10

EMERGENCY OPERATION

The CS System is actuated automatically when containment pressure indicates a LOCA or ESD within containment. Initiation of the CS System on a CSAS ensures that containment pressure and temperature do not exceed design values.

The CSAS actuates the CS System when the CSAS circuitry receives 2 out of the 4 High-High containment pressure signals **10 psig [5.4]** and an SIAS simultaneously. Should the CSAS occur along with a Loss of Offsite Power (LOOP), the CS System would receive power from the EDGs after 12 seconds. The operator should ensure that containment spray is actuated should containment pressure exceed **10 [5.4] psig**. This is done manually if necessary.

The CS System can also be manually actuated from RTGB 106 [206] in the control room. Two CSAS manual initiation switches, Train A and B, with **RESET/AUTO/INITIATE** positions provide manual system control. A **"THINK"** pushbutton must be depressed simultaneously while positioning the switch to INITIATE, thus avoiding accidental system actuation.

Upon receipt of the CSAS, the CS pumps will start and isolation valves FCV-07-1A, and FCV-07-1B will open. See Figures 7 and 8. CSAS actuation opens SE-07-1A, SE-07-1B, SE-07-2A, and SE-07-2B allowing NaOH to be educted into the containment spray water. See Figure 7. These solenoid valves are energize to open.

[On Unit 2, the CS pump breaker closure directly starts the associated hydrazine metering pumps and the hydrazine pump plus an CSAS opens the solenoid-operated hydrazine isolation valves. See Figure 8. The hydrazine metering pumps stop when the hydrazine tank reaches the Low-Low level setpoint of 2 inches. Any one of the following will close the solenoid-operated hydrazine isolation valves:

- Hydrazine tank level Low-Low
- Associated hydrazine metering pump stops
- CSAS is reset

The solenoid-operated hydrazine isolation valves are energize to CLOSE. If DC control power is lost the valves open and can NOT be closed.]

The CS pumps and all IRS components are manually secured after CSAS is reset when containment pressure decreases below **5 [3.4] psig**. To reset CSAS, first verify the tables, reset the signal, and stop/reset and/or close the valves.

Question 21

Unit 2 is in Mode 5, Pressurizer solid, with the following:

- Charging and letdown in service
- Letdown level control valves in manual fully open
- Letdown backpressure control valves in auto set at 250 psia

Which of the following will cause RCS pressure to increase?

A. Loss of Instrument air to Containment.

B. Selected Pressurizer level channel X fails low.

C. Selected Pressurizer pressure channel X fails high.

D. Delta P instrument (PDIS 2216) across the Regenerative heat exchanger fails low.

A. Correct, closes letdown isolation valve

B. Incorrect, level control valves in manual

C. Incorrect, no affect

D. Incorrect, failing high would cause letdown valve to close

Question Level: 2
Question Source: New
Exam: Both
K/A: 078.K3.02
Importance: 3.4 / 3.6
References: ONP 2-1010030 Loss of Inst. Air,
Inst. Air lesson plan 0702413-05

APPENDIX B
AIR ACTUATED COMPONENTS
(Page 1 of 8)

1. **Reactor Coolant System**

COMPONENT	DESCRIPTION	FAIL POSITION
PCV-1100E	Pzr. Spray	Closed
PCV-1100F	Pzr. Spray	Closed

2. **Chemical Volume Control System**

COMPONENT	DESCRIPTION	FAIL POSITION
LCV-2110P	Pzr. Level Control	Closed
LCV-2110Q	Pzr. Level Control	Closed
PCV-2201P	LTDN HX Pressure Control	Closed
PCV-2201Q	LTDN HX Pressure Control	Closed
V2468	Boronometer Flow Control	Closed
V2500	Divert Valve	To VCT
V2505	RCP Seal Bleedoff to VCT	Closed
V2507	RCP Seal Bleedoff to Quench Tank	Closed
V2515	Letdown Isolation (Inside RCB)	Closed
V2516	Letdown Isolation (Inside RCB)	Closed
V2520	Letdown IX Bypass	Bypass IX
V2522	Letdown Isol. (Outside RCB)	Closed
V2524	RCP Seal Bleed Off to VCT	Closed
V2650	2A BAM Tank Recirc.	Closed
V2651	2B BAM Tank Recirc.	Closed

Question 22

Given the following conditions at Unit 1:

- Mode 4, conducting RCS Heatup.
- RCS Tave is 300°F.
- Pressurizer Pressure is 450 psia.

Which of the following will occur on a loss of the 1A 125 volt DC bus prior to immediate operator actions being taken?

A. Total Loss of Feedwater

B. Excess Steam Demand Event

C. Loss of Coolant Accident

D. Loss of Off-Site Power

A. Incorrect, Auxiliary feedwater is available upon AFAS.

B. Incorrect, MSIS would occur. ADV's closed during heatup.

C. **Correct, LOCA would occur through open PORV . Both PORVs required to be in service due to LTOP conditions.**

D. Incorrect, power is still available from off-site.

Question level: 2
Question source: New
Exam: Both
K/A: 063.K2.01
Importance: 2.9 / 3.0
Reference: 0702503-5, 1-0030136, Loss of a Safety Related D.C. Bus

7.0 <u>OPERATOR ACTIONS</u>:

7.1 Immediate Operator Actions:

INSTRUCTIONS	**CONTINGENCY ACTIONS**

> <u>NOTE</u>
> Loss of a Safety Related D.C. Bus will cause PORV (V1474 or V1475) to open.

1. <u>If</u> pressurizer pressure is less than 2300 psia, <u>Then</u> ensure the PORVs, V1474 and V1475, are closed.	1. Close the PORV by placing the OFF/OVERRIDE/TEST switch to the OVERRIDE position or close V1476 or V1477, PORV Block Valves, if power is available to the PORV block valves.

7.2 Subsequent Actions:

1. <u>If</u> in Mode 1 through 3, and SIAS is <u>NOT</u> blocked, <u>Then</u> go to step 7.2.2.	**1. <u>If</u> in Mode 3 through 6, and SIAS is blocked, <u>Then</u> go to step 7.2.3.**
2. Actions when in Mode 1 through 3 (SIAS NOT Blocked).	
A. Implement E-Plan as necessary.	

> <u>NOTE</u>
> Due to the loss of D.C. control power, all breakers on the affected side will require manual operation.

B. <u>If</u> CCW to the RCPs has been lost for ten minutes, <u>Then</u> trip the RCPs.

Question 23

While performing 1-EOP-01 Standard Post Trip Actions, the following indications are observed:

- RCS temperature 538ºF lowering
- Turbine Throttle valve additive position: 100% with position indicating lights red
- Turbine Governor valve additive position: 80% with position indicating lights on valves 1-3 red, valve 4 red and green

Which of the following describes the required Operator actions?

A. Open the Generator OCB's 8W30 and 8W26

B. Open the Exciter supply breaker CB FB 1

C. Close the Main Steam isolation valves

D. Stop the DEH pumps

A. Incorrect, required after the turbine is tripped

B. Incorrect, required after the turbine is tripped

C. Correct

D. Incorrect, this will eventually result in the TV's and GV's closing but not addressed in procedure and result in a slow closure of valves.

Question Level: 2
Question Source: New
Exam: Both
K/A: 045.A3.07
Importance: 3.5 / 3.6
References: 1-EOP-01 Standard post trip actions, LP 0702822-05

5.0 OPERATOR ACTIONS: (continued)

MAINTENANCE OF VITAL AUXILIARIES
(AC & DC POWER)

INSTRUCTIONS	CONTINGENCY ACTIONS
☐ 2. VERIFY plant electrical power requirements are satisfied by **ALL** of the following:	
A. Turbine tripped (GVs and TVs CLOSED).	A. If the Turbine does NOT trip automatically, Then PERFORM the following: 1. Manually TRIP the Turbine and ENSURE GVs and TVs CLOSE. 2. If GVs and TVs do NOT close, Then PERFORM **ALL** of the following in order: a. CLOSE **BOTH** MSIVs. b. DISPATCH an operator to locally TRIP the Turbine (at front standard). c. When the Turbine is tripped, Then ENSURE **ALL** of the following: • 8W26, Generator No. 1 East Breaker, is OPEN

(Continued on Next Page) **(Continued on Next Page)**

Question 24

Unit 2 is on Shutdown Cooling with both trains of SDC in service.

Which of the following explains the SDC system response to an inadvertent SIAS on 'A' train:

A' SDC heat exchanger outlet flow control valve HCV-3657 will:

A. open and 'A' SDC heat exchanger bypass valve HCV-3306 will close.

B. close and 'A' SDC heat exchanger bypass valve HCV-3306 will open.

C. open and 'A' SDC heat exchanger bypass valve HCV-3306 will open.

D. not change position and 'A' SDC heat exchanger bypass valve HCV-3306 will not change position.

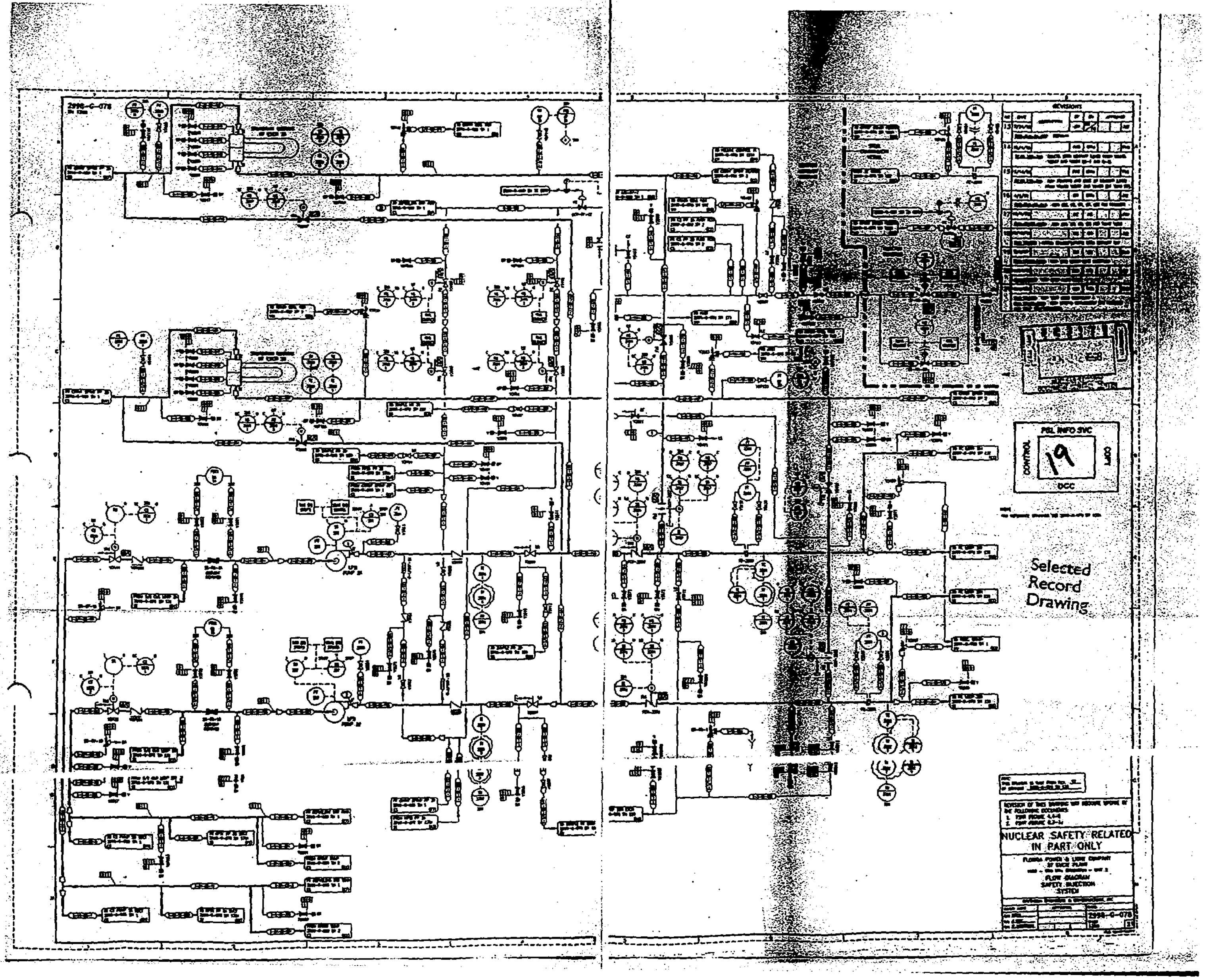
A. Incorrect, HCV-3657 and HCV-3306 do not receive a SIAS signal

B. Incorrect, HCV-3657 and HCV-3306 do not receive a SIAS signal

C. Incorrect, HCV-3657 and HCV-3306 do not receive a SIAS signal

D. Correct

Question Level: 1
Question Source: New
Exam: RO
K/A: 005.K4.03
Importance: 2.9
References: P&ID 2998-G-078 Sheet 130B, LP 0702207-05



2998-G-078
CONTROL
19
COPY
DCC
Selected
Record
Drawing
NUCLEAR SAFETY RELATED
IN PART ONLY
FLOW DIAGRAM
SAFETY INJECTION
SYSTEM
2998-G-078

Question 25

Unit 2 is experiencing a transient with the following conditions:

- 1 ESFAS channel de-energized
- 1 AFAS channel de-energized
- 1 RPS channel de-energized

Which of the below electrical malfunctions has resulted in the above transient?

Loss of 120V:

A. Vital AC bus

B. Instrument AC bus

C. Vital Fire and Security bus

D. QSPDS bus

A. Incorrect, 120V Vital AC bus has only non-safety related loads.

B. **Correct**

C. Incorrect, 120V Vital Fire and Security bus has fire detection and Security non-safety related loads.

D. Incorrect, 120V QSPDS bus has safety-related inputs to Control Room Instrumentation.

Question level:1
Question source: New
Exam: Both
K/A: 062.K2.01
Importance: 3.3/3.4
Reference: 0702503-5, 1-0970030, 120V Instrument and Vital AC Systems

7.0 OPERATOR ACTIONS:

7.1 Immediate Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
1. If a reactor trip occurs, Then carry out 1-EOP-01, "Standard Post Trip Actions."	

7.2 Subsequent Operator Actions:

1. Loss of an Instrument Bus:

> **NOTE**
>
> RPS, ESFAS and AFAS will be in a 1 out of 3 logic on loss of one instrument bus and 4 TCBs will be tripped. Table 1 contains a listing of additional instrumentation supplied by the instrument buses.

INSTRUCTIONS	CONTINGENCY ACTIONS
A. Ensure plant operating parameters are stable by comparing redundant, non-affected instrumentation.	
B. Determine which instrument bus has been lost by checking annunciators A-43, B-43, A-53, B-53 and RPS cabinets MA, MB, MC or MD.	
§$_1$ C. If the affected instrument bus was being supplied by its inverter, Then, within 2 hours, place the affected instrument bus onto its respective maintenance bypass bus as follows:	§$_1$ C. If instrument bus cannot be energized, within 2 hours, Then:

Question 26

Unit 1 is in 1-EOP-03 'Loss of Coolant Accident' with the following conditions:

- Containment pressure is 15 psig
- Pre LOCA RWT level was 33 feet
- Current RWT level is 9 feet

Assuming all break flow remains in the Containment, what is the current Containment sump level?

A. 21 Feet

B. 22 Feet

C. 23 Feet

D. 23.5 Feet

References required: 1-EOP-99 Figure 9

A. Incorrect

B. Correct

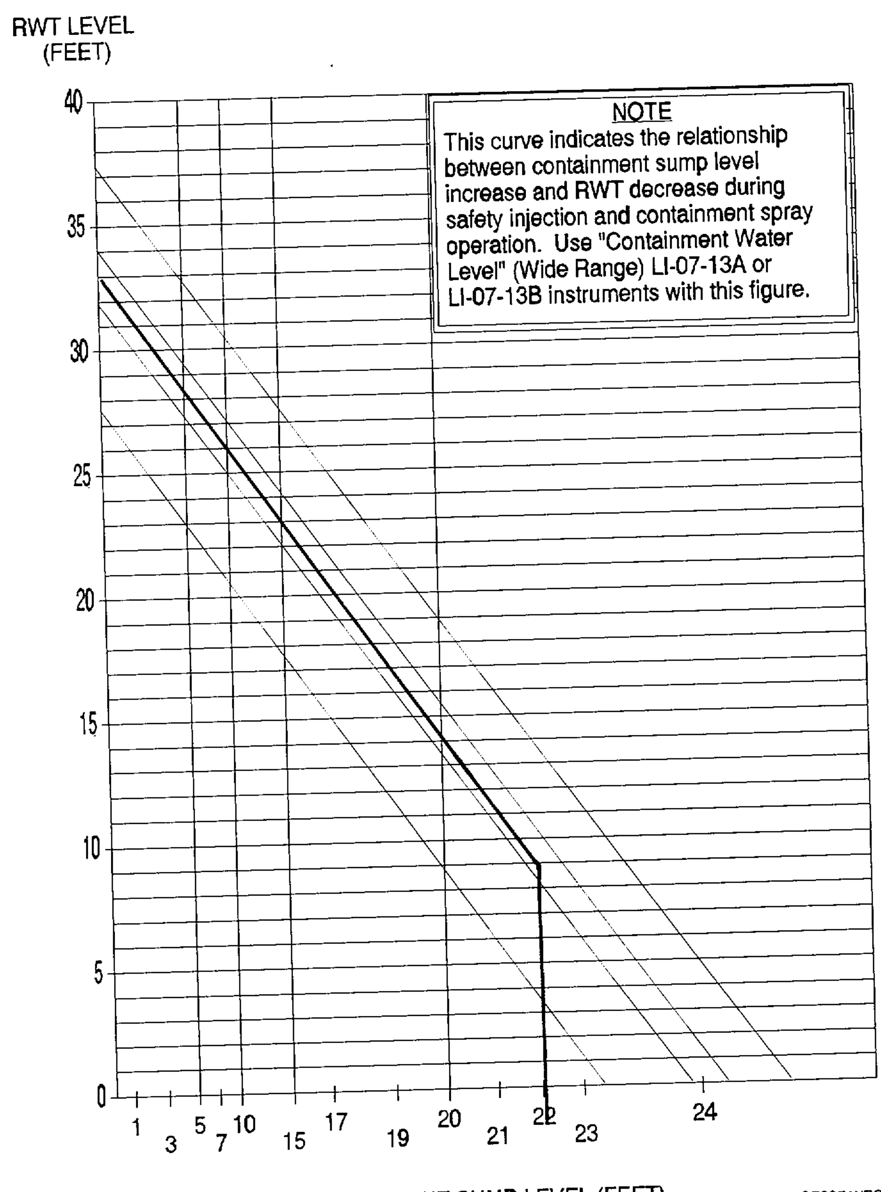
C. Incorrect

D. Incorrect

Question Level: 2
Question Source: New
Exam: Both
K/A: 026.A1.03
Importance: 3.5/3.5
References: 1-EOP-99 Fig. 9,
0711207 ECCS lesson text, 0702401-02 ESFAS Lesson plan

FIGURE 9

RWT LEVEL VS. CONTAINMENT SUMP LEVEL



(1EOP99F.WPG)

33'-9'

Question 27

Unit 2 is in a Loss of offsite power (LOOP) with the following conditions:

- 2A3 4.16 KV bus is energized from the 2A Diesel Generator
- 2B3 4.16 KV bus is de-energized

Which of the following explains the operation of the Atmospheric dump valves (ADV's)?

A. Two ADV's from the 'A' steam header can only be operated in the Auto/Manual mode

B. Two ADV's from the 'A' steam header can only be operated in Manual/Manual mode.

C. Four ADV's are capable of being operated in Auto/Auto mode.

D. One ADV from the 'A' steam header can be operated in Auto/Auto, the other ADV from the 'A' steam header can only be operated in Manual/Manual mode.

A. Incorrect, loss of the 2B Diesel precludes using one of the two 'A' side controllers.

B. Incorrect, one 'A' side ADV can be operated in Auto/Auto

C. Incorrect, two of four ADV's can only be operated in Manual/Manual

D. Correct

Question Level: 2
Question Source: New
Exam: Both
K/A: 057.AA1.06
Importance: 3.5 / 3.5
References: 0711304 Main Steam Lesson Text, 0702304-07 Main steam Lesson plan

NOTE: *These NORMAL/ISOLATE selector switches are located in the transfer panels in the Electrical SWGR rooms and determine which PIC controls the ADVs. Refer to Figure 9.

NOTE: The NORMAL/ISOLATE selector switches located in the Auxiliary Feed Area determine whether the HSCP or control room AUTO/MAN selector switch is in service. Refer to Figure 9.

NOTE: Annunciator G-41 on RTGB-202 or LA-12/LB-12 on the PACB actuates when control is transferred to the HSCP.

Modes of Operation

The ADVs can be operated in either automatic or manual. As shown in Figure 9, the mode of operation is determined by the position of the ADV AUTO/MAN selector switches, PICs and CLOSE/OPEN control switches located on RTGB-202, PACB and the HSCP. The modes of control are MAN-MAN, AUTO-MAN, and AUTO-AUTO.

When operating an ADV electrically:

- The field winding of the DC motor is always supplied by Safety-Related 125 VDC. The valve cannot be operated electrically if DC power to the field is lost.
  - PP-254 (Train A) supplies the Train A ADVs (MV-08-18A/B).
  - PP-255 (Train B) supplies the Train B ADVs (MV-08-19A/B).
- DC power to the motor armature is supplied from either the:
  - same DC panels as the field winding when operating in the MAN-MAN mode, or
  - the modutronic unit in AUTO-MAN or AUTO-AUTO modes.
- The modutronic units receive power from 120 VAC panels PP-201A (Train A) and PP-202 (Train B) for the Train A and Train B ADVs respectively. The modutronic unit converts the AC power to DC power for the MOV armature with an output based on the signal from the PIC. The PIC receives power from the same AC source as the modutronic unit.

The power supplies to the Unit 2 atmospheric dump and isolation valve motors are arranged such that loss of any single bus will not prevent any of the ADVs from either being closed or isolated. That is, if a Train A powered ADV cannot be closed, the Train B powered isolation valve can still be closed; and, if a Train A powered isolation valve cannot be closed, the Train B powered ADV can be closed. Likewise, this power scheme ensures at least one flow path should be available for steaming the S/G.

The following table provides an overview of the control modes.

MODE	SELECTOR SWITCH	PIC CONTROLLER	ARMATURE POWER SOURCE
MAN-MAN	MAN	N/A	D.C.
AUTO-MAN	AUTO	Manual	A.C.→D.C.
AUTO-AUTO	AUTO	Auto	A.C.→D.C.

- **MAN-MAN Mode** - With the AUTO/MAN selector switch in MAN (manual), the respective ADV's position is determined by its CLOSE/OPEN switch.
  - For example, at RTGB-202 with the SG 2A ADV AUTO/MAN selector switch in MAN and the SG 2A ADV CLOSE/OPEN switch positioned to OPEN, MV-08-18A strokes open while the control switch is held in the OPEN position. Refer to Figure 9.
  - During operation above 15% power, the ADVs are maintained in the MAN-MAN (manual) mode to meet Technical Specification requirements.
- **AUTO-MAN and AUTO-AUTO Modes** - With the AUTO/MAN selector switch in AUTO, ADV position is controlled from the respective PIC that sends an electrical signal to the modutronic unit (see Figure 9). A rheostat monitoring ADV position provides a feedback signal that stops valve movement when actual position matches desired position based on the input signal to the modutronic unit. Normally the PICs are maintained in manual control with the automatic actuation pressure setpoint at 900 psia.
  - AUTO-MAN Mode – With the PIC set to manual operation, the ADV can be positioned by pushing the up-arrow or down-arrow pushbuttons on the PIC.

- AUTO-AUTO Mode - With the PIC in the automatic mode, valve control is based on the setpoint on the PIC. For example, as S/G pressure increases above setpoint, the controller output increases to the modutronic unit, which in turn repositions the ADV to open it more, limiting S/G pressure.

On the PACB in the Unit 2 Control Room, controls are provided for MV-08-19A for S/G 2A and MV-08-18B for S/G 2B, as illustrated on Figure 8. Note that S/G 2A ADV isolation valve, MV-08-15, control switch is next to S/G 2B ADV control switches, and the S/G 2B ADV isolation valve, MV-08-16, control switch is next to the S/G 2A ADV switches. Steam trains are color coded to aid in train identification. Control is functionally the same as at RTGB-202, except the power supply trains are reversed. The arrangement of the switches is a function of control power considerations.

If DC power is lost to the ADV, the valve cannot be repositioned electrically in any mode of control due to loss of power to the DC motor field.

Response of an ADV following restoration of electrical power (e.g., EDG loading following a LOOP) is determined by the mode of control.

- If DC power is lost and then regained while in the MAN-MAN mode, the valve will not move because there is no signal being generated to move it.

- If AC power is lost to the modutronic unit and ADV controller and then regained while in the AUTO-MAN mode, the ADV will remain at the current valve position. The controller output is restored to its previous value, which is the input to the modutronic unit. Since the ADV fails as-is, the feedback signal from the rheostat should still match the demand position.

- Note that if the ADV controller fails to zero with AC power still available to the modutronic unit, the ADV will close (if open) to match the input signal.

- If AC power is lost to the modutronic unit and/or ADV controller and then regained while in the AUTO-AUTO mode, the ADV will go to the position dictated by the pressure setpoint on the PIC.

  - As actual pressure deviates from setpoint, the valve will open or close to control S/G pressure at the setpoint.

Modes of Operation

The ADVs can be operated in either automatic or manual. As shown in Figure 9, the mode of operation is determined by the position of the ADV AUTO/MAN selector switches, PICs and CLOSE/OPEN control switches located on RTGB-202, PACB and the HSCP. The modes of control are MAN-MAN, AUTO-MAN, and AUTO-AUTO.

When operating an ADV electrically:

- The field winding of the DC motor is always supplied by Safety-Related 125 VDC. The valve cannot be operated electrically if DC power to the field is lost.
  - PP-254 (Train A) supplies the Train A ADVs (MV-08-18A/B).
  - PP-255 (Train B) supplies the Train B ADVs (MV-08-19A/B).
- DC power to the motor armature is supplied from either the:
  - same DC panels as the field winding when operating in the MAN-MAN mode, or
  - the modutronic unit in AUTO-MAN or AUTO-AUTO modes.
- The modutronic units receive power from 120 VAC panels PP-201A (Train A) and PP-202 (Train B) for the Train A and Train B ADVs respectively. The modutronic unit converts the AC power to DC power for the MOV armature with an output based on the signal from the PIC. The PIC receives power from the same AC source as the modutronic unit.

The power supplies to the Unit 2 atmospheric dump and isolation valve motors are arranged such that loss of any single bus will not prevent any of the ADVs from either being closed or isolated. That is, if a Train A powered ADV cannot be closed, the Train B powered isolation valve can still be closed; and, if a Train A powered isolation valve cannot be closed, the Train B powered ADV can be closed. Likewise, this power scheme ensures at least one flow path should be available for steaming the S/G.

The following table provides an overview of the control modes.

MODE	SELECTOR	PIC	ARMATURE

S/G 2A ADVs

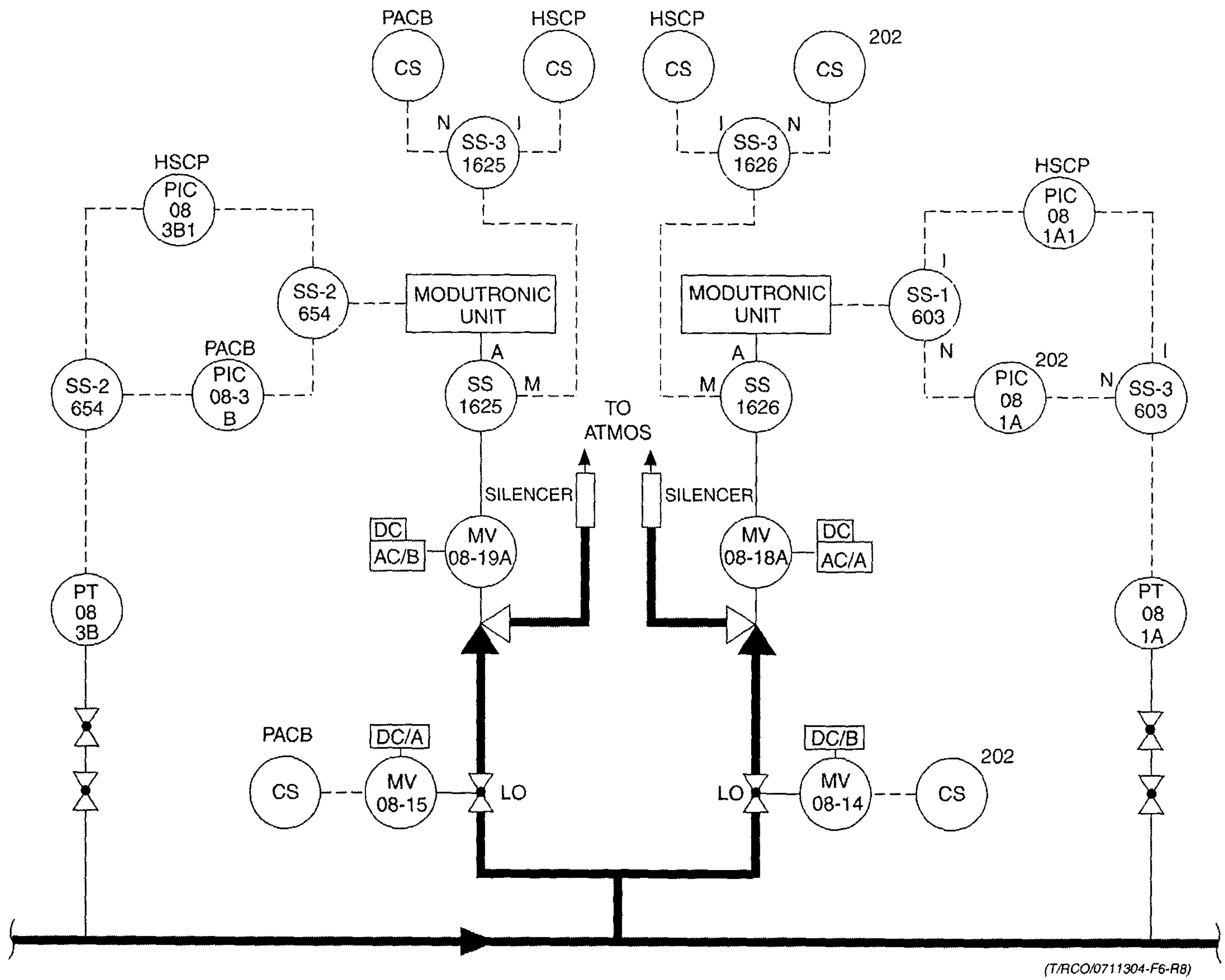


FIGURE 6

ADV (PACB) UNIT 2

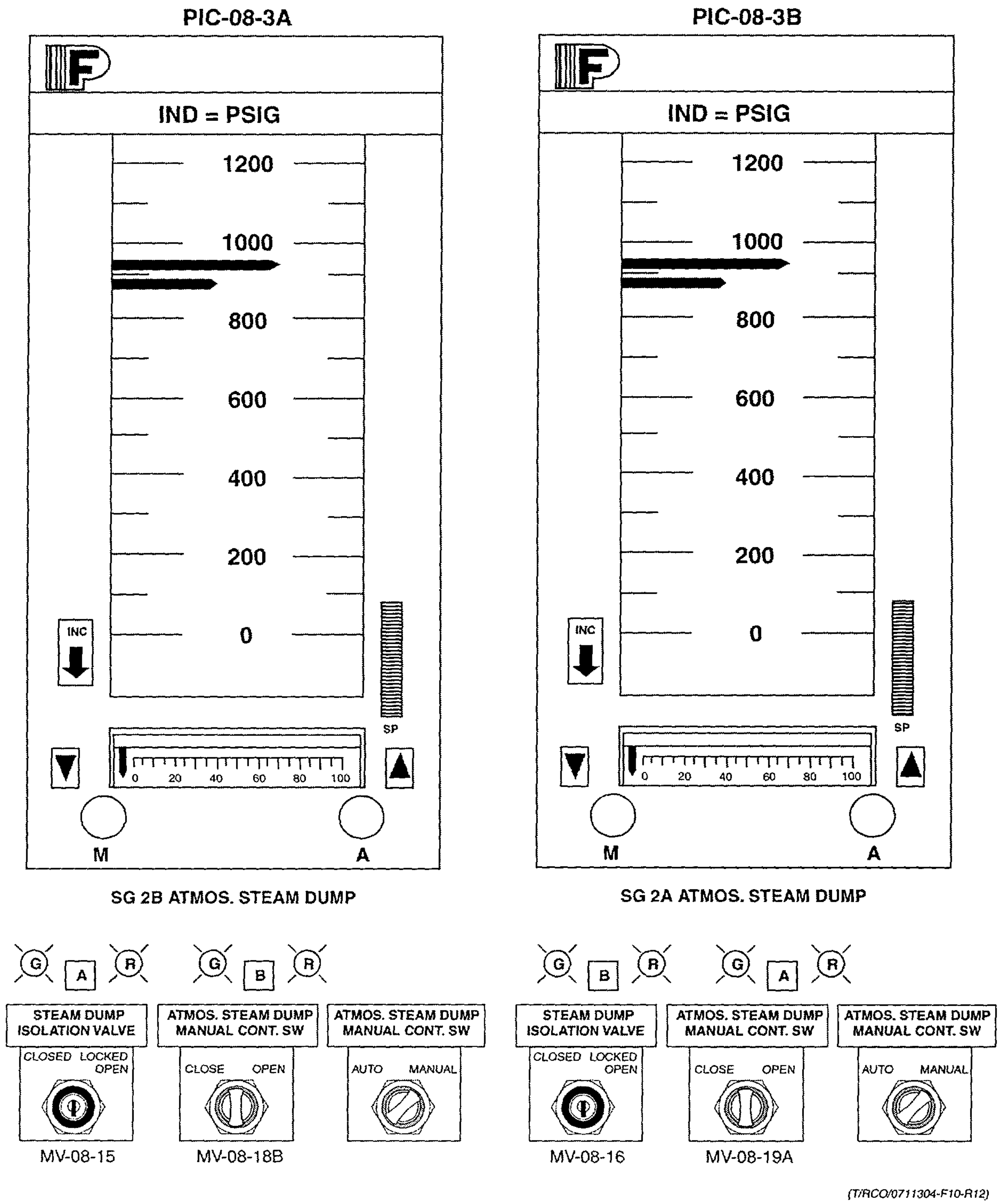
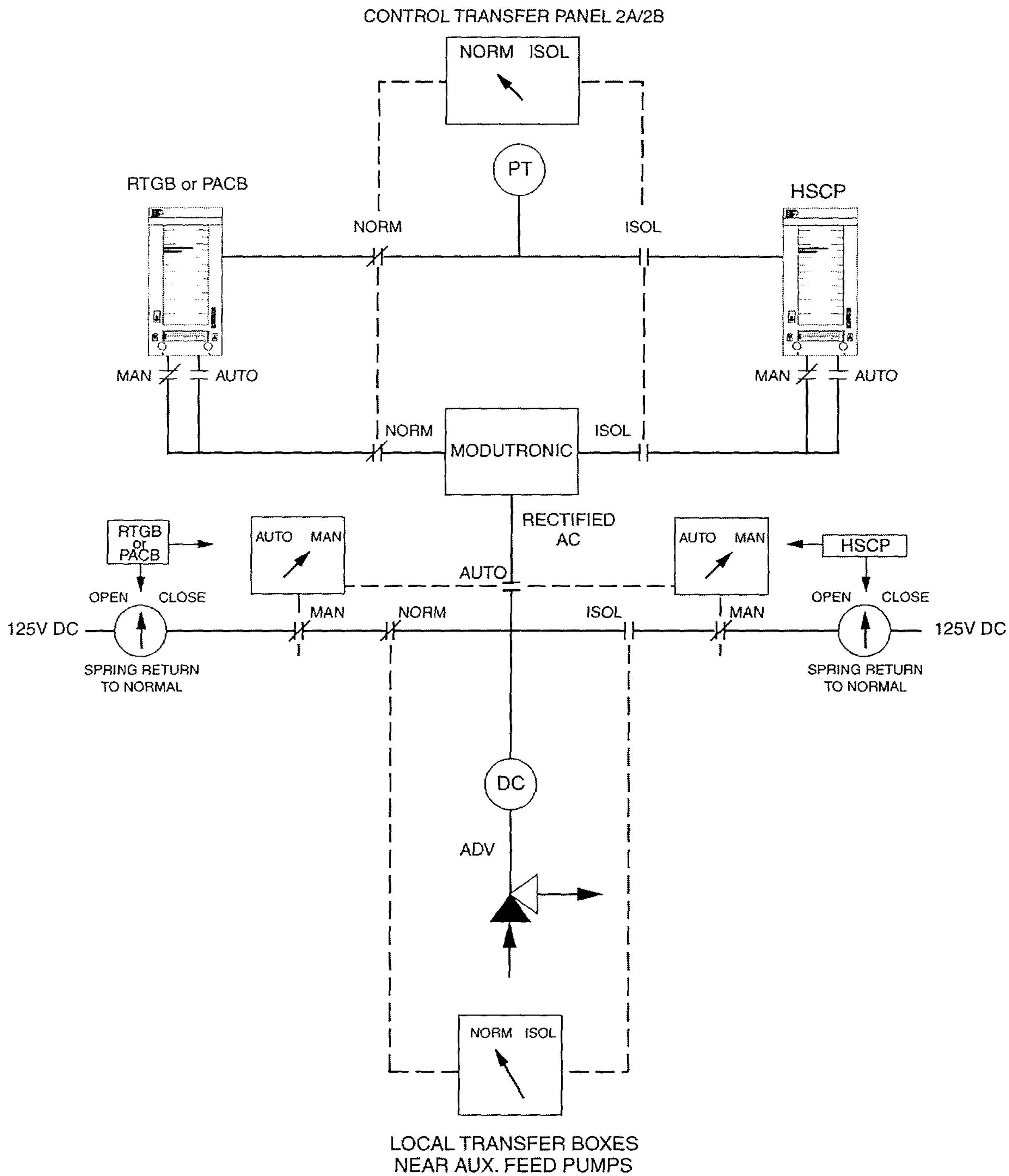


FIGURE 8

ATMOSPHERIC DUMP VALVE (UNIT 2)



NOTE: DIAGRAM DISPLAYS ARMATURE SIGNAL TO ADV MOTOR.
ADV MOTOR FIELD ENERGIZED CONTINUOUSLY BY 125 VDC

(T/RCO/0711304-F11-R12)

FIGURE 9

	SWITCH	CONTROLLER	POWER SOURCE
MAN-MAN	MAN	N/A	D.C.
AUTO-MAN	AUTO	Manual	A.C.→D.C.
AUTO-AUTO	AUTO	Auto	A.C.→D.C.

- **MAN-MAN Mode** - With the AUTO/MAN selector switch in MAN (manual), the respective ADV's position is determined by its CLOSE/OPEN switch.
  - For example, at RTGB-202 with the SG 2A ADV AUTO/MAN selector switch in MAN and the SG 2A ADV CLOSE/OPEN switch positioned to OPEN, MV-08-18A strokes open while the control switch is held in the OPEN position. Refer to Figure 9.
  - During operation above 15% power, the ADVs are maintained in the MAN-MAN (manual) mode to meet Technical Specification requirements.

AUTO-MAN and AUTO-AUTO Modes - With the AUTO/MAN selector switch in AUTO, ADV position is controlled from the respective PIC that sends an electrical signal to the modutronic unit (see Figure 9). A rheostat monitoring ADV position provides a feedback signal that stops valve movement when actual position matches desired position based on the input signal to the modutronic unit. Normally the PICs are maintained in manual control with the automatic actuation pressure setpoint at 900 psia.

AUTO-MAN Mode – With the PIC set to manual operation, the ADV can be positioned by pushing the up-arrow or down-arrow pushbuttons on the PIC.

AUTO-AUTO Mode - With the PIC in the automatic mode, valve control is based on the setpoint on the PIC. For example, as S/G pressure increases above setpoint, the controller output increases to the modutronic unit, which in turn repositions the ADV to open it more, limiting S/G pressure.
On the PACB in the Unit 2 Control Room, controls are provided for MV-08-19A for S/G 2A and MV-08-18B for S/G 2B, as illustrated on Figure 8. Note that S/G 2A ADV isolation valve, MV-08-15, control switch is next to S/G 2B ADV control switches, and the S/G 2B ADV isolation valve, MV-08-16, control switch is next to the S/G 2A ADV switches. Steam trains are color coded to aid in train identification. Control is functionally the same as at RTGB-202, except the power supply trains are reversed. The arrangement of the switches is a function of control power considerations.

If DC power is lost to the ADV, the valve cannot be repositioned electrically in any mode of control due to loss of power to the DC motor field.

- AUTO-AUTO Mode - With the PIC in the automatic mode, valve control is based on the setpoint on the PIC. For example, as S/G pressure increases above setpoint, the controller output increases to the modutronic unit, which in turn repositions the ADV to open it more, limiting S/G pressure.

On the PACB in the Unit 2 Control Room, controls are provided for MV-08-19A for S/G 2A and MV-08-18B for S/G 2B, as illustrated on Figure 8. Note that S/G 2A ADV isolation valve, MV-08-15, control switch is next to S/G 2B ADV control switches, and the S/G 2B ADV isolation valve, MV-08-16, control switch is next to the S/G 2A ADV switches. Steam trains are color coded to aid in train identification. Control is functionally the same as at RTGB-202, except the power supply trains are reversed. The arrangement of the switches is a function of control power considerations.

If DC power is lost to the ADV, the valve cannot be repositioned electrically in any mode of control due to loss of power to the DC motor field.

Response of an ADV following restoration of electrical power (e.g., EDG loading following a LOOP) is determined by the mode of control.

- If DC power is lost and then regained while in the MAN-MAN mode, the valve will not move because there is no signal being generated to move it.

- If AC power is lost to the modutronic unit and ADV controller and then regained while in the AUTO-MAN mode, the ADV will remain at the current valve position. The controller output is restored to its previous value, which is the input to the modutronic unit. Since the ADV fails as-is, the feedback signal from the rheostat should still match the demand position.

- Note that if the ADV controller fails to zero with AC power still available to the modutronic unit, the ADV will close (if open) to match the input signal.

- If AC power is lost to the modutronic unit and/or ADV controller and then regained while in the AUTO-AUTO mode, the ADV will go to the position dictated by the pressure setpoint on the PIC.

  - As actual pressure deviates from setpoint, the valve will open or close to control S/G pressure at the setpoint.

Question 28

A small break LOCA has occurred on Unit 2. SIAS and CIAS have actuated, pressurizer level initially dropped to 10% and now has recovered to 29%.

Which of the following describes the minimum actions necessary to restore operation of the pressurizer heaters?

A. Place the heater control switches for all proportional and back-up heaters to the RESET position, then back to AUTO.

B. Place the backup interlock bypass keyswitch to the LEVEL position then place the heater control switches to the RESET position, then back to AUTO.

C. Reset SIAS, then place the heater control switches to the RESET position, then back to AUTO.

D. Reset SIAS, close the 4160V feeder breaker, then place the heater control switches to the RESET position, then back in AUTO.

A. Incorrect, would be correct on Unit 1

B. Incorrect, SIAS and 4160V breaker required to be reset

C. Incorrect, must reset 4.16V breaker also

D. **Correct**

Question level: 2
Question source: New
Exam: RO
K/A: 027.G2.2.3
Importance: 3.1
Reference: ONP 1-0120035, Pressurizer Pressure and Level, 0702206-13

TABLE 5 - Unit 2 Heater Interlocks and Actions for Restoring Heaters

Note: See Figure 9

NOTE: Use of any position other than OFF or LEVEL is not procedurally addressed.

CONDITION:

SIAS (Opens associated PZR htr xfmr 4160 VAC, gives close inhibit, and all associated 480V htr bkrs de-energize.)

RESTORATION: No heaters available on that side until SIAS is reset. If SIAS is reset then restore by closing 4160 VAC pzr htr xfmr hi side. Condition 2.

CONDITION:

LOOP: Loss of Offsite Power.

RESTORATION: If diesel has re-energized 2A3/2B3 bus:

a. Reset and reclose PZR htr xfmr Hi-side bkr.
b. Reset and energize B1/B4 480V contactors.

If 2A3/2B3 re-energized by 2A2/2B2 bus.

a. Reset and reclose PZR htr xfmr 4160V bkr.
b. Reset and reclose all associated 480V htr bkrs.

CONDITION:

PZR Low-level (<27%) (Opens associated PZR htr xfmr 4160 bkr, all associated 480V htr bkrs de-energize, and all opposite side 480V htr bkrs open.)

RESTORATION: HS-124 Positions:

a. "Level" allows all 480V heaters opposite channel to be reset and reclosed.
b. "Pressure/Level" allows B1/B4 480V htr bkrs opposite channel to be reset and reclosed.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

[*] 63. If the RCS is water solid, Then ESTABLISH a bubble in the Pressurizer by performing **ALL** of the following:

A. ENERGIZE **ALL** available Pressurizer Heaters by performing **BOTH** of the following:

1. ENERGIZE Pressurizer Heaters Buses 1A3 and 1B3.

2. RESET **ALL** available Pressurizer Heaters.

B. If **ANY** of the following conditions exist:

- BOTH S/G pressures can be maintained less than RCS pressure

- At least **ONE** RCP is RUNNING

Then PERFORM **ALL** of the following to REDUCE RCS pressure:

1. COOL DOWN the RCS to reduce pressure to saturation conditions in the Pressurizer.

(Continued on Next Page)

Question 29

Unit 1 RCS is solid, preparing to draw a bubble in the Pressurizer with the following conditions:

- RCS pressure is 240 psia controlled by PIC-2201 in auto
- All Pressurizer heaters have been energized

PIC-2201 is now adjusted to obtain 132 GPM letdown flow. Pressure is now 230 psia and stable, with level stable at 33%.

What is the current temperature of the Pressurizer fluid?

A. 394ºF

B. 397ºF

C. 402ºF

D. 406ºF

A. Correct, Tsat for 230 psia

B. Incorrect, Tsat for 240 psia

C. Incorrect, Tsat for 250 psia

D. Incorrect, Tsat for 260 psia

Question Level: 2
Question Source: New
Exam: Both
K/A: 010.K5.01
Importance: 3.5 / 4.0
References:1-GOP-502 Data Sheets Required for Heatup Appendix B Establishing a bubble in the Pressurizer, 0711205 CVCS Lesson text, 0702205 CVCS Lesson Plan

SYSTEM OPERATION{tc \l1 " III. SYSTEM OPERATION}

NORMAL OPERATION{tc \l1 "A. NORMAL OPERATION}

During normal operation, which includes hot standby and power generation when the Reactor Coolant System is at normal operating temperature and pressure, one charging pump is running and provides the required balance to letdown flow and RCP bleedoff. Although only one pump is normally required, two or three pump operation can be selected to obtain a greater purification flow or to respond to large pressurizer level transients. Proper pressurizer level can normally be maintained by modulation of the on-line letdown control valve in response to control signals from the pressurizer level control system. Large level transients due to power changes or abnormal operations can result in automatic operation of the standby charging pump, again determined by the pressurizer level control system.

During conditions of normal operation VCT level will be controlled by automatic diversion of letdown to the waste management system upon high levels and by automatic or manual operation of the makeup system.

Plant Startup

{tc \l2 "1. Plant Startup}
Initially, the RCS is solid with pressure controlled by the letdown backpressure regulator. First, a steam bubble is drawn in the pressurizer. RCS pressure is raised to approximately 250 psia and the pressurizer heaters are energized. Pressurizer temperature is stabilized saturation temperature corresponding to 250 psia. The bubble is formed by increasing letdown flow to 132 gpm and draining the pressurizer to its no-load level of approximately 33%. Pressurizer level is maintained by automatic control of letdown flow. Cycling of pressurizer heaters is the preferred method of pressure control at this point, although auxiliary spray (from the charging system) can be used if necessary.

Prior to exceeding an RCS temperature of 350°F, adjust the setpoint of the letdown backpressure regulator to 430 psig. This is the backpressure required to prevent

APPENDIX B
ESTABLISHING A BUBBLE IN THE PRESSURIZER
(Page 5 of 8)

INITIAL

4. LOCK CLOSED SE-02-3, Pressurizer Auxiliary Spray. ______

5. LOCK CLOSED SE-02-4, Pressurizer Auxiliary Spray. ______

6. ADJUST PIC-2201, Ltdn Pressure, to maintain RCS pressure between 230 and 250 psia. ______

7. PLACE the Pressurizer Heater breaker cooling fan switches in AUTO. ______

8. PLACE the selected PIC-1100X or PIC-1100Y, Pressurizer Pressure, in AUTO. ______

9. ADJUST the set point (right hand vertical scale) on the selected PIC-1100X or PIC-1100Y, Pressurizer Pressure, to greater than 1525 psia to obtain maximum Proportional Heater output. ______

CAUTION
Pressurizer heatup rate exceeding 100°F in any one hour period is a violation of Technical Specifications.

10. OPERATE Pressurizer Heaters as required to establish and MAINTAIN a heatup rate as directed by the SRO. ______

11. RECORD and PLOT Pressurizer heatup at 30 minutes intervals on Appendix C of 1-GOP-502, Data Sheets Required For Heatup. ______

NOTE
397°F is the saturation temperature for 240 psia.

12. REMOVE Pressurizer Heaters from service as necessary to stabilize temperature between 395 and 400°F. ______

13. PLACE the selected LIC-1110X or LIC-1110Y, Pressurizer Level, in automatic control. ______

14. PLACE HIC-1110, Pzr Level Ltdn Cntl Vlv, in automatic control. ______

APPENDIX B
ESTABLISHING A BUBBLE IN THE PRESSURIZER
(Page 6 of 8)

INITIAL

CAUTION
Reducing the set point of PIC-2201, Letdown Pressure, below saturation pressure for the letdown temperature downstream of the Regenerative heat exchanger will cause flashing in the letdown piping and possible water hammer damage to the system components.

15. ADJUST PIC-2201, Ltdn Pressure, to obtain maximum Letdown flow available, NOT to exceed 132 GPM. ______

16. VERIFY Pressurizer level instruments indicate a change in level within 30 minutes. ______

- **A.** If no change is seen, Then BALANCE Charging and Letdown flows and INVESTIGATE the problem. ______

17. When Pressurizer level has decreased to between 33 and 35%, Then ENSURE the Pressurizer Level Control System maintains the Pressurizer level stable. ______

18. After a bubble is established, Then functionally TEST the Pressurizer Auxiliary Spray Valves as follows:

- **A.** RECORD current Pressurizer pressure. ______psia. ______
- **B.** PLACE the key switch for SE-02-3, Pressurizer Auxiliary Spray, to OPEN. ______
- **C.** CLOSE SE-02-1, 1B1 Loop Charging Isol. ______
- **D.** CLOSE SE-02-2, 1A2 Loop Charging Isol. ______
- **E.** OBSERVE a Pressurizer pressure decrease of at least 5 psia. ______
- **F.** OPEN SE-02-2, 1A2 Loop Charging Isol. ______ /R5
- **G.** OPEN SE-02-1, 1B1 Loop Charging Isol. ______ /R5

Question 30

Unit 2 tripped due to a loss of condenser vacuum. Condenser vacuum lowered to 15" Hg backpressure before recovering. The following post-trip conditions now exist:

- Tave is 532°F
- 2A and 2B S/G pressure is 900 psia
- Condenser backpressure is 5.5" Hg
- SBCS PCV-8801 is in MANUAL

Which of the following describes all of the actions that must be taken to cooldown to SDC entry conditions using the SBCS?

A. Place the SBCS permissive switch in MANUAL and manually control the cooldown using PCV-8801.

B. Place the SBCS permissive switch in AUTO, the SBCS valves will automatically modulate as needed.

C. Depress the vacuum interlock reset pushbutton and place the permissive switch in MANUAL to manually control the cooldown using PCV-8801.

D. Depress the vacuum interlock reset pushbutton and place the permissive switch in AUTO, the SBCS valves will automatically modulate as needed.

A. Incorrect, vacuum interlock has not been reset.

B. Incorrect, vacuum interlock has not been reset.

C. **Correct**

D. Incorrect, PCV-8801 in manual, none of the valves will automatically reopen.

Question level: 2
Question source: New
Exam: RO
K/A: 041.A4.08
Importance: 3.0
Reference: 0702406-6.c, 0711406, Steam Bypass Control System

INTERLOCKS

The SBCS valve interlocks are:

- SBCS permissive switch
- Condenser vacuum
- Emergency off switch

SBCS {PRIVATE }Permissive Switch{tc \l 2 "Permissive Switch"}

The permissive switch is part of the circuitry that controls the operation of the permissive solenoid valves that allow pressure to be applied to the diaphragm of the bypass valves. The SBCS permissive switch mounted on the RTGB-102 [202] apron, enables the operator to select MANUAL, AUTO, or OFF modes. Refer to Figures 17 and 18.

- MANUAL: The permissive solenoids are energized, enabling remote control of the bypass valves provided the low condenser vacuum and emergency off interlocks are met.

- AUTO (normal mode): The permissive relays are energized by any demand signal from the permissive circuitry.

- OFF: Operation of the turbine bypass valves is blocked, as the permissive solenoid valves are maintained de-energized.

When these solenoid valves are de-energized and vented to atmosphere, the bypass valves spring close and cannot be opened except by the local valve hand jack.

{PRIVATE }Condenser Vacuum{tc \l 2 "Condenser Vacuum Interlock"}

When condenser backpressure, as detected by PS-10-9 (located on mezzanine deck of turbine building), is insufficient (**setpoint of 12" Hg absolute increasing**), the opening of the bypass valves is blocked in order to prevent damage to the turbine or the condenser.

- If **all** the M/A stations are in AUTO when condenser vacuum is regained, the block is automatically removed without operator action and the valves will reopen as required.

- If any one of the M/A control stations is in MANUAL when condenser vacuum is regained, none of the bypass valves will reopen without additional operator action, to prevent flow from unattended preset controllers.
  - In this case, the operator can reset the system by depressing the Emergency Off/Vacuum Interlock reset pushbutton. The valves will then re-open to the preset MANUAL M/A control station settings.
- If the SBCS is de-energized, the bypass valves are still subject to the blocking action of the condenser vacuum interlock and emergency off relay.

{PRIVATE }Emergency Off Switch{tc \l 2 "Emergency Off"}

Depressing the Emergency Off pushbutton on the SBCS test panel closes all bypass valves, regardless of whether the system is in the AUTO or MANUAL mode. This is useful if the system malfunctions while conducting periodic tests at the SBCS Test Panel. Once this pushbutton is depressed, the bypass valves cannot be operated until the system is reset using the Emergency Off/Condenser Vacuum Interlock Reset Pushbutton also located on the Test Panel.

{PRIVATE }MASTER CONTROLLER (PIC-8010){tc \l 1 "MASTER INTEGRATED CONTROLLER (MASTER CONTROLLER)"}

The master controller (PIC-8010), located on RTGB-102 [202], is a standard Proportional-Integral-Derivative (PID) controller. The controller, in addition to acting as a regulating unit, incorporates MANUAL/AUTO switching and indication of both the setpoint and the process signals. The controller is shown in Figure 19. The movable pointer indicates the steam header pressure (P_{sec1} supplied by PT-8010). The setpoint (P_{sp1}) is remotely derived using the calculator, therefore, the local setpoint thumbwheel adjustment is never used.

- Normally the Master Controller (PIC-8010) is maintained in Automatic, and controls all pressure related modulation.
- If PIC-8010 is in Manual, the steam pressure interlock is met (886 psia), and HICs are in automatic, the PIC-8010 output will be sent to all bypass valves. If the pressure

Question 31

Unit 1 is operating at 100% power when the CCW TCV on the Letdown Heat exchanger fails closed.

Which of the following describes the initial response of the CVCS system?

Letdown:

A. isolation valve V2515 closes on high temperature

B. isolates on high VCT temperature

C. diverts around the Purification ion exchangers on high temperature.

D. diverts to the Waste management system on high temperature

A. Incorrect, V2515 closes at 470ºF outlet of Regen Heat exchanger

B. Incorrect, only annunciator associated with VCT high temperature.

C. **Correct, (135ºF**)

D. Incorrect, Letdown diverts on high VCT level, not temperature

Question Level: 2
Question Source: New
Exam: RO
K/A: 004.A3.03
Importance: 2.9
References:0711205 CVCS Lesson text, 0702205-09 CVCS Lesson plan

In addition the controlling the LCVs from RTGB 105 [205], the 'P' letdown valve has the capability of being controlled from the HSCP via HIC-2110, although this feature is not used administratively. In cases where the control room is evacuated, the letdown system is isolated prior to evacuation.

Intermediate Pressure Letdown Relief Valve, V2345

The relief valve downstream of the letdown control valves protects the intermediate pressure letdown piping and letdown heat exchanger from overpressure. The relief valve set pressure is 600 [650] psig. It discharges to the relief valve collection header. On Unit 2 only, V2345 has a temperature sensor, TIA-6660, on the downstream relief line. TIA-6660 will actuate annunciator LC-15 on PACB #2 on high temperature.

Letdown Heat Exchanger{tc \l2 "4. Letdown Heat Exchanger}

The letdown heat exchanger, located in the RAB, is a shell and tube type heat exchanger with letdown flowing through the tubes. The cooling media is Component Cooling Water and flows through the shell. This heat exchanger is sized to maintain outlet temperature < 145°F with minimum charging flow to protect the resins in the purification ion exchangers. Letdown heat exchanger outlet temperature is measured by TE-2223 to control component cooling water outlet flow. The system data section lists the design parameters, instruments and controls associated with the letdown heat exchanger.

The outlet temperature is normally ~100°F. At 135 [140]°F an alarm is actuated on RTGB-105 annunciator M-10. If the temperature increases to 140 [145]°F, the purification ion exchangers are bypassed via the air operated 3-way valve V2520. Additionally, flow to the Boronometer and Radiation Monitor is isolated by valve V2521. [On Unit 2, only the Boronometer is isolated when V2468 is closed.]

Letdown Pressure Control Valves{tc \l2 "5. Letdown pressure Control Valves} - PCV2201P/Q

The Letdown Pressure Control valves provide the final means of letdown pressure reduction prior to the purification subsystem. The purpose of these valves is to maintain sufficient pressure in the letdown heat exchanger to prevent flashing of the letdown flow. Under conditions of maximum letdown flow with minimum charging flow, the inlet temperature of the letdown heat exchanger may approach 450°F. This high temperature water would readily flash to steam if pressure was low. Therefore the selected pressure control valve will modulate to maintain the letdown heat exchanger outlet pressure at the setpoint (normally 430 psig). Under conditions of maximum letdown flow, the letdown heat exchanger inlet pressure will be approximately 50 psi greater than the outlet pressure. The inlet pressure will therefore be sufficient to prevent flashing at the inlet.

Normally, only one of the two backpressure control valves is required. The desired valve is selected by a handswitch HS-2201 located on RTGB-105 and then controlled by a pressure controller PIC-2201.

Letdown heat exchanger outlet pressure, as sensed by PT-2201, is transformed into an electrical signal and then sent to PIC-2201 where it is compared to a setpoint determined by the operator.

Any imbalance between the pressure signal and the pressure setpoint will generate a valve position control signal that is sent to the appropriate backpressure control valve via selector switch HS-2201. The output of the pressure transmitter is also sent to an alarm bistable and will annunciate both high and low pressure conditions on annunciator M-5. The high pressure condition alarms at 500 [510] psig and low pressure is annunciated at 390 [395] psig. A hand indicator controller (HIC-2201) is

Question 32

Unit 1 has been at 100% power for 130 days when the letdown monitor trend chart shows:

- Channel 41, Iodine activity, increased significantly above alarm levels and is remaining at these levels.

- Channel 40, gross activity has not changed

These trends are indicative of:

A. fuel failure

B. high D/P across the purification filter.

C. a purification ion exchanger resin failure.

D. a CRUD burst

A. **Correct**

B. Incorrect, any changes in activity would not be significant, Iodine levels would not remain elevated.

C. Incorrect, activity levels would remain elevated until ion exchanger isolated, Iodine levels would not remain elevated.

D. Incorrect, gross activity would have increased and Iodine levels would return to previous levels.

Question level: 1
Question source: New
Exam: Both
K/A: 076.AA1.04
Importance: 3.2/3.4
Reference: 0702410-7.e, 0711410, Unit 1 Radiation Monitoring, 1-ONP-26.01, Process Radiation Monitors

4.4 Letdown Monitor (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

- Iodine increase that remains significantly above prior levels during steady state operation is indicative of fuel failure.
- Iodine increase concurrent with a Gross Activity increase during a plant load change is indicative of a crud burst.

3. If the affected monitor is functioning properly and indicates high activity, Then GO TO 1-ONP-01.06, Excessive RCS Activity.

END OF SECTION 4.4

Question 33

Unit 2 is at 100% power when a loss of Instrument Air occurs. Instrument air pressure is currently 55 psig and lowering.

Which of the following is the required operator action.

A. Open the Service Air to Instrument Air cross-tie valve.

B. Close the Unit 1 to Unit 2 Instrument Air cross-tie valve.

C. Commence a controlled unit downpower.

D. Trip the Reactor and Turbine.

A. Incorrect, this valve should have already been opened

B. Incorrect, valve closes automatically at 85 psig

C. Incorrect, at 75 psig a downpower should be considered

D. **Correct**

Question level: 1
Question source: New
Exam: Both
K/A: 065.AA2.06
Importance: 3.6/4.2
Reference: 2-1010030, Loss of Instrument Air, 0702413-5

7.0 OPERATOR ACTIONS: (continued)

7.1 Immediate Operator Actions: (continued)

3. (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
B. OPEN SH18718, Service Air Cross-tie to Instrument Air Isol.	
C. If the Instrument Air header is fed from the Service Air header for greater than 1 hour, Then BLOW DOWN the Instrument Air header low point drains hourly to remove oil, water and crud build-up.	
4. If the Instrument Air header pressure indicates less than 60 psig and is still lowering, Then PERFORM the following:	
A. TRIP the Reactor and Turbine.	
B. GO TO 2-EOP-01, Standard Post Trip Actions.	

Question 34

Unit 1 is implementing 1-EOP-03 due to a large break LOCA with the following:

- Containment Hydrogen Concentration is 1.0%

Which of the following is the **minimum** equipment lineup that will satisfy the Containment Combustible Gas Control safety function?
(assume no equipment out of service at start of event)

	Hydrogen Recombiners	**Hydrogen purge**
A.	None	None
B.	None	Two in service
C.	One in service	None
D.	Two in service	One is service

A. incorrect, would be correct is H2 < 0.5%

B. incorrect, H2 Recombiners always placed in service before H2 purge system

C. Correct

D. H2 purge not put in service at 1% H2

Question Level: 1
Question Source: New
Exam: RO
K/A: 028.G2.4.21
Importance: 3.7
References:1-EOP-03 Appendix A, 0702824-09 Lesson plan LOCA event and procedure

APPENDIX A
SAFETY FUNCTION STATUS CHECK SHEET
(Page 11 of 12)

9. CONTAINMENT COMBUSTIBLE GAS CONTROL

> NOTE
>
> If power is interrupted and then restored to a Hydrogen Analyzer while in service, such as after ESFAS or Undervoltage Relay actuation, then the remote control selector push button must be depressed to allow for continued operation of the analyzer from the control room.

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Hydrogen Concentration	Less than 0.5%.	☐☐☐☐☐☐

B. Hydrogen Concentration Greater Than or Equal to 0.5% and Less Than 3.5%

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
Hydrogen Recombiners	All available operating.	☐☐☐☐☐☐

⇓

(Continued on Next Page)

Question 35

Unit 1 is performing a natural circulation cooldown with the following conditions:

- RCS pressure 1250 psia
- CET: 565ºF
- Reactor Vessel Head temperature (QSPDS Pg. 211): 572ºF
- Reactor Vessel Level indicates 2 segments voided.

If each of the following were initiated for 5 minutes, which would result in Pressurizer level going up?

A. Start an additional Charging pump and continue charging to the loops.

B. Operate additional Pressurizer heaters to increase RCS pressure

C. Open Auxiliary Spray valves

D. Isolate Letdown

A. Incorrect, level will go down as void is collapsed

B. Incorrect, increasing pressure will collapse the void, level will go down

C. Correct, Reactor head void will increase causing level to go up

D. Incorrect, same effect as starting additional charging pumps

Question Level: 2
Question Source: New
Exam: Both
K/A: 002.A1.04
Importance: 3.9 / 4.1
References: 1-0120039 Natural Circulation Cooldown,

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

Voiding can be determined by reactor vessel level indication (Page 212, QSPDS) or pressurizer level increasing when spraying and decreasing when charging.

INSTRUCTIONS	CONTINGENCY ACTIONS
14. During cooldown, verify Reactor Vessel level indicates 100% (pg. 212, QSPDS).	14. If Reactor Vessel level is less than 100%, Then take actions to eliminate or reduce voids: A. Ensure Letdown is isolated. B. Stop depressurization, and if necessary, repressurize the RCS (within the limits of Fig. 1) by operating heaters and sprays (preferred) or HPSI and charging pumps. C. Monitor Pressurizer level and Reactor Vessel level (page 212, QSPDS).
15. When RCS pressure reaches 1700 psia, annunciator R-6, SIAS Channel actuation block permiss, will alarm. Perform the following: A. Block channels A and B of SIAS with key switches on RTGB 106.	

APPENDIX B
RCS FILL AND DRAIN METHOD OF VOID ELIMINATION
(Page 1 of 1)

> **NOTE**
> This method of RCS cooldown should only be employed in the event that a rapid depressurization of the RCS is required, or condensate storage tank level approaches minimum required technical specifications with makeup NOT available.

> **CAUTION**
> While performing this evolution, pressurizer level is not a valid indicator of RCS inventory. Care should be exercised to observe other parameters which would indicate any loss of RCS inventory.

1. Take manual control of the charging and letdown system.
2. Lower RCS pressure by using auxiliary spray into the pressurizer.
3. As voiding occurs in the upper reactor vessel head, a surge of water from the RCS will cause pressurizer level to increase rapidly. Terminate auxiliary spray prior to pressurizer level reaching 70% indicated level.
4. Cool the upper reactor vessel head region by charging with a charging pump to the RCS loop(s). Continue charging until either of the following conditions occur.

   A. Pressurizer level decreases to 30% indicated level.

   OR

   B. The upper reactor vessel head is charged solid.

> **NOTE**
> A solid upper head condition will be evident by an increasing pressurizer level as charging to the loops is continued.

5. Repeat steps 1 through 4 above until SDC entry conditions are established.

END OF APPENDIX B

Question 36

Unit 1 has been in a LOCA (EOP-03) for 10 hours. Shutdown cooling can not be established and the following line-up is being performed:

- A Containment spray pump running
- A SDC Hx outlet valve V3456 open, FCV-3306 SDC return closed
- Both LPSI pumps off with A LPSI suction and discharge valves closed.
- SDC warm-up valve MV-03-1A open
- HCV-3480 and HCV-3481 SDC Loop 1A open
- LPSI Injection valves on 1A2, 1A1, 1B1, and 1B2 closed
- SDC HCV-3657 Temp Control throttled to 280 gpm flow
- Aux. HPSI Hdr 1A1, 1A2, 1B1, 1B2, throttled to 500 total flow

Which of the following explains the above line-up?

A. Primary line-up for Hot and Cold Leg Injection.

B. Second alternate line-up for Hot and Cold Leg Injection.

C. Line-up for cooling ECCS water post RAS.

D. Line-up to reduce Containment temperature and pressure.

A. Incorrect, second alternate line-up.

B. Correct.

C. Incorrect, plausible due to RAS water cooled by SDC Hx.

D. Incorrect, Containment spray flow going to core.

Question Level: 2
Question Source: New
Exam: Both
K/A: 006.G2.1.20
Importance: 4.3/4.2
References:1-EOP-15 Functional Recovery, 1-EOP-99, Appendix O,
LP 0702207-9A

INSTRUCTIONS	CONTINGENCY ACTIONS
18. (continued)	
C. ISOLATE the 1B1 SIT as follows:	
1. PLACE Bkr 1-42113 in ON.	
2. CLOSE V3634.	
3. PLACE Bkr 1-42113 in OFF.	
D. ISOLATE the 1B2 Sit as follows:	
1. PLACE Bkr 1-41222 in ON.	
2. CLOSE V3644.	
3. PLACE Bkr 1-41222 in OFF.	
☐ 19. <u>If</u> a LOCA has occurred, and SDC can NOT be established within 10 hours, <u>Then</u> ALIGN the RCS for simultaneous hot and cold leg injection 6 to 10 hours after SIAS. **REFER TO** Appendix O, Hot and Cold Leg Injection.	

APPENDIX O

HOT AND COLD LEG INJECTION

(Page 1 of 16)

INITIAL

> NOTE
>
> This appendix contains 5 sections:
>
> - Section 1: Aligning 1A LPSI Pump for Hot Leg Injection
> - Section 2: Aligning 1B LPSI Pump for Hot Leg Injection
> - Section 3: Aligning HPSI Pump for Hot/Cold Leg Injection
> - Section 4: Aligning 1A CS Pump for Hot/Cold Leg Injection
> - Section 5: Aligning 1B CS Pump for Hot/Cold Leg Injection
>
> Select the method to be used by RCS conditions present and equipment availability. The sections are listed in design preferred order, from the "Primary Method", using LPSI, to the "First Alternate" method (HPSI) and "Second Alternate" method (CS).

1. Aligning 1A LPSI Pump for Hot Leg Injection

> CAUTION
>
> Radiological conditions in the RAB could be significantly higher than normal dose rates during LOCA conditions, depending on the extent of fuel damage.

A. VERIFY ALL the following conditions exist:

- RCS Pressure is less than 250 psia ______
- RCS Pressure: Containment Pressure differential is less than 150 psid ______
- BOTH LPSI Pumps are OFF. ______
- ALL available HPSI Pumps are RUNNING and ALL associated HPSI Header Injection valves are fully OPEN unless this configuration conflicts with HPSI run-out considerations (640 gpm maximum per pump). ______

(Continued On Next Page)

APPENDIX O

HOT AND COLD LEG INJECTION

(Page 9 of 16)

INITIAL

4. Aligning 1A CS Pump for Hot and Cold Leg Injection

A. VERIFY ALL of the following conditions exist:

- 1A Containment Spray Pump is RUNNING. ______
- RCS Pressure is less than 250 psia. ______
- RCS Pressure:Containment Pressure differential pressure is less than 150 psid. ______
- ENSURE ALL available HPSI Pumps are RUNNING AND ALL associated HPSI Header Injection valves are fully OPEN unless this configuration conflicts with HPSI run-out considerations (640 gpm maximum per pump). ______

B. PERFORM ALL of the following:

1. ENSURE V3456, A SDC Hx Outlet Isol Va, is OPEN (CRAC). ______

2. ENSURE BOTH LPSI Pumps are STOPPED. ______

3. PLACE FCV-3306, SDC Return Flow, keyswitch to AUTO. ______

4. CLOSE FCV-3306 using FIC-3306, SDC Return Flow. ______

(Continued On Next Page)

APPENDIX O
HOT AND COLD LEG INJECTION
(Page 10 of 16)

4. (continued)

C. If 1A LPSI injection flow path is to be used,
Then ALIGN the A LPSI Train by performing **ALL** of the following:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
V3206	LPSI Pump Disch Isol Va (CRAC)	CLOSE	
V3444	LPSI Pump Suct Isol Va (CRAC)	CLOSE	
MV-03-1A	A SDC Warm-up Va (CRAC)	OPEN	
HCV-3480	SDC Loop 1A	OPEN	
HCV-3481	SDC Loop 1A	OPEN	

D. If 1B LPSI injection flow path is to be used,
Then ALIGN **ALL** of the following valves as indicated:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
V3207	LPSI Pump Disch Isol Va (CRAC)	CLOSE	
V3432	LPSI Pump Suct Isol Va (CRAC)	CLOSE	
MV-03-1B	B SDC Warm-up Va (CRAC)	OPEN	
HCV-3651	SDC Loop 1B	OPEN	
HCV-3652	SDC Loop 1B	OPEN	

(Continued On Next Page)

APPENDIX O

HOT AND COLD LEG INJECTION

(Page 11 of 16)

4. (continued) INITIAL

E. CLOSE **ALL** of the following LPSI Header Isolation Valves:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
HCV-3615	LPSI Header to Loop 1A2 Valve	CLOSED	
HCV-3625	LPSI Header to Loop 1A1 Valve	CLOSED	
HCV-3635	LPSI Header to Loop 1B1 Valve	CLOSED	
HCV-3645	LPSI Header to Loop 1B2 Valve	CLOSED	

NOTE

1A Containment Spray Pump is still supplying cooled water to 1A HPSI Pump and is now aligned to the LPSI Header, except for opening HCV-3657.

F. PLACE HCV-3657, SDC Temp Control, keyswitch to MAN. ______

G. SLOWLY OPEN HCV-3657 using HIC-3657, SDC Temp Control, to maintain a minimum of 250 gpm on FIC-3306. ______

(Continued On Next Page)

APPENDIX O
HOT AND COLD LEG INJECTION
(Page 12 of 16)

4. (continued)

> NOTE
> Total SI flow should be equally divided between hot and cold legs.

H. If the 1A LPSI injection flow path was used,
Then ADJUST the A HPSI Header Isolation Valves to maintain total hot and cold leg injection between 250 and 1500 gpm:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
HCV-3627	Aux HPSI Hdr to Loop 1A1 Valve	THROTTLED	
HCV-3617	Aux HPSI Hdr to Loop 1A2 Valve	THROTTLED	
HCV-3637	Aux HPSI Hdr to Loop 1B1 Valve	THROTTLED	
HCV-3647	Aux HPSI Hdr to Loop 1B2 Valve	THROTTLED	

I. If the 1B LPSI injection flow path was used,
Then ADJUST the B HPSI Header Isolation Valves to maintain total hot and cold leg injection between 250 and 1500 gpm:

COMPONENT ID	COMPONENT NAME	POSITION	PERF INITIAL
HCV-3626	HPSI Hdr B to Loop 1A1 Valve	THROTTLED	
HCV-3616	HPSI Hdr B to Loop 1A2 Valve	THROTTLED	
HCV-3636	HPSI Hdr B to Loop 1B1 Valve	THROTTLED	
HCV-3646	HPSI Hdr B to Loop 1B2 Valve	THROTTLED	

(Continued On Next Page)

Question 37

Unit 1 is heating up the RCS with the following conditions:

- RCS pressure 1800 psia
- RCS temperature 515° F

	RCP 1A1	RCP 1A2	RCP 1B1	RCP 1B2
	Running	Running	Running	Running
RCP controlled bleedoff flow	0.85 GPM	0.95 GPM	0.9 GPM	1.1 GPM
Middle cavity pressure	1100 psia	1120 psia	1070 psia	950 psia
Upper cavity pressure	610 psia	610 psia	600 psia	615 psia
Controlled Bleedoff pressure	80 psia	75 psia	80 psia	90 psia
Controlled Bleedoff Temperature	230°F	200°F	205°F	220°F

Which of the below statements describes the status of the RCP's?

A. 1A1 bleedoff temperature is higher than allowable limit.

B. 1A2 is indicating failed seal.

C. 1B2 has excessive controlled bleedoff flow

D. All RCP's, parameters are normal.

References required

A. Incorrect, 250°F for >10 minutes or 300°F upper limit

B. Incorrect, seal pressures within normal band

C. Correct, 1.075 gpm upper limit

D. Incorrect 1B2 not normal

Question Level: 2
Question Source: Modified from 1999 PSL NRC Exam
Exam: Both

K/A 0000015/17.G2.1.28
Importance 3.2/3.3
Reference 1-NOP-01.02 RCP Operation, RCP LP 0702202-7C

1999 PSL NRC EXAM

Unit 1 is heating up the RCS with the following conditions:

- RCS pressure 1500 psia
- RCS temperature 505° F

RCP status:

	RCP 1A1	RCP 1A2	RCP 1B1	RCP 1B2
Status	Off	Running	Running	Running
RCP controlled bleedoff flow	.8 GPM	.68 GPM	.9 GPM	.65 GPM
Middle cavity pressure	1000 psia	1020 psia	970 psia	950 psia
Upper cavity pressure	510 psia	490 psia	500 psia	515 psia
Controlled Bleedoff pressure	80 psia	75 psia	80 psia	85 psia
Controlled Bleedoff Temperature	220°F	195°F	205°F	230°F

Which of the below statements describes how the RCPs will be configured to continue the heat-up?
(References provided)

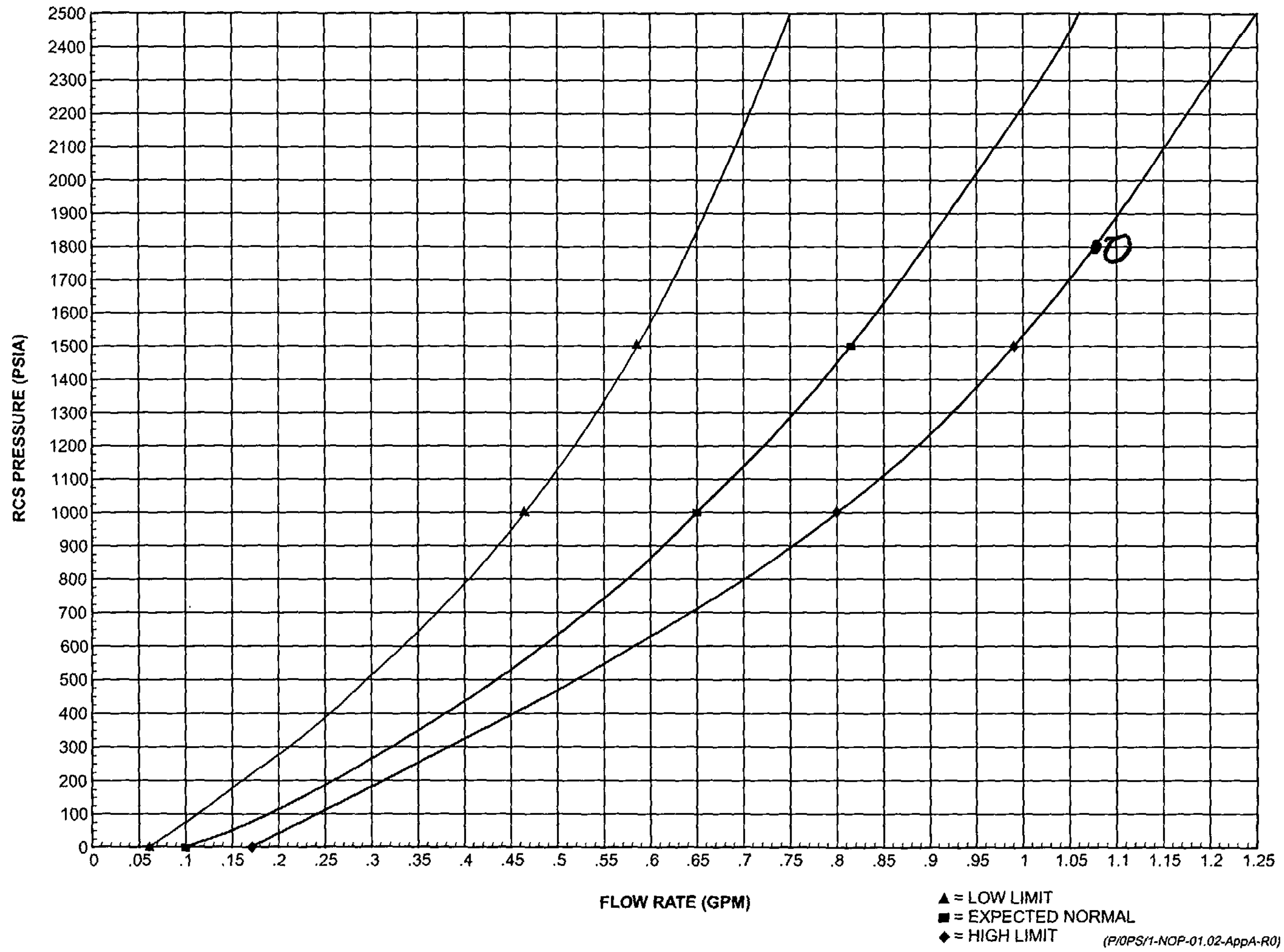
A. Parameters are normal, the fourth RCP may be started

B. Stop the 1A2 RCP due to indications of seal failure.

C. Stop the 1B1 due to high controlled bleedoff flow

D. Stop the 1B2 within 10 minutes due to high Bleedoff temperature

APPENDIX A
RCP SEAL LEAKOFF FLOW RATE VS RCS PRESSURE
(Page 1 of 1)



Note: Flow rate instrumentation may be unreliable below 0.7 GPM

END OF APPENDIX A

4.12 Reactor Coolant Pump Operating Limits (continued)

TABLE 1

PARAMETER	NORMAL	MIN	MAX	INDICATOR	ARP
RCS press	400 – 2250 psia	Refer to App B			
Upper Oil Reservoir lvl	+2" to –2"	-2"	+2"	LIA-1156	ARP J10, J14, J26, J30
Lower Oil Reservoir lvl	+2" to –2"	-2"	+2"	LIA-1157	ARP J10, J14, J26, J30
Upper Guide Bearing temp	110 -130° F		185° F	TI-1156	
Upper Thrust Bearing temp	135 -155°F		200° F	TIA-1158	ARP J3, J6, J21, J24
Down Thrust Bearing temp	115 -135° F		200° F	TIA-1159	ARP J3, J6, J21, J24
Lower Guide Bearing temp	120 -140° F		185° F	TI-1157	
Stator temp	170 -190° F		311° F	TI-1155	
CBO Outlet temp	135 -165° F		180° F 1	TI-1154	
Lower Seal Cavity temp	105 -135° F		< 250° F 2	TIA-1151	ARP J2, J5, J20, J23
CBO Cavity press	65 – 150 psia	25 psia 3	150 psia	PIA-1153	ARP J2, J5, J20, J23
Upper Seal Cavity press	615 – 815 psia	560 psia 4	960 to 1315 psia 5	PIA-1152	ARP J2, J5, J20, J23
Middle Seal Cavity press	1365 –1565 psia	1215 psia 6	1615 psia	PI-1151	
CBO Flow	0.9 – 1.1 gpm	0.75 gpm 7	1.2 – 1.5 gpm[5]	FIA-1150	ARP J2, J5, J20, J23
CCW Flow		200 gpm		FIA-1158	ARP J9, J12, J21, J24

---

1 If CBO outlet temperature is greater than or equal to 250 °F for 10 minutes, the RCP should be tripped.
2 During start of idle RCP when RCS temp is greater than 450° F, temp may be between 250 and 300°F.
3 When CBO is aligned to floor drains during initial pump runs for fill and vent, CBO pressure will be atmospheric (0 psig).
4 When the RCS is NOT at normal operating pressure, the Upper Seal Cavity pressure should be approximately 1/3 of RCS pressure.
5 Alarm is normally set at lower end of range. If middle seal fails, alarm may be reset to higher end of range.
6 When the RCS is NOT at normal operating pressure, the Middle Seal Cavity pressure should be approximately 2/3 of RCS pressure.
7 When RCS is NOT at normal operating pressure, Refer to Appendix A, RCP Seal Leak-Off Flow Rate vs RCS Pressure.

Question 38

Unit 1 is performing a reactor startup when Thot input to the selected Reactor Regulating system fails to 615ºF.

Which of the following describes the plant response?

A. Backup Charging pump starts.

B. CEA low power auto motion prohibit.

C. Steam Bypass control system valve PCV 8801 opens.

D. Letdown flow increases to maximum flow.

A. Correct

B. Incorrect, comes from RRS but NI's not RTD's

C. Incorrect, RRS is input to SBCS as Tave, but must have other permissive to open SBCS valves

D. Incorrect, would be correct if Thot failed low

Question Level: 2
Question Source: New
Exam: Both
K/A: 004.A1.07
Importance: 2.7 / 3.1
References: 0711402 Reactor Regulating System, 1-0120035 Pressurizer Pressure and level, 0702402-07 RRS Lesson plan

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
1. (continued)	1. (continued)
E. Verify pressure anomaly is NOT caused by a large rate of change of T-avg.	E. Slow the rate of change of T-avg or stabilize until pressure anomaly is controlled.
2. **ABNORMAL PRESSURIZER LEVEL CONDITION**	2.

> NOTE
>
> Appendix "B" contains a listing of pressurizer levels which are associated with automatic actions.

A. Verify selected RRS channel is operating properly.	A. If the selected RRS channel has failed, Then shift to the operable channel.
B. Ensure backup charging pump starts and letdown flow is decreasing, or the backup charging pump stops and letdown flow is increasing, whichever is applicable. (Appendix "B" contains expected automatic responses.)	B. If automatic actions have NOT occurred, Then manually control charging and letdown flow as required.
C. Verify level anomaly is NOT caused by a large rate of change in T-avg.	C. Slow the rate of change of T-avg or stabilize until level anomaly is controlled.
D. Verify V-2515 and V-2516, "Letdown Isol. Valves", are open.	D. If letdown has isolated, Then secure charging and refer to 1-ONP-02.03, "Charging and Letdown."

- Provides heater low level trip protection; with ability to cutout a defective channel,
- Provides level indication on two level indicator controllers and a level recorder.

Except for the low-low level pressurizer heater cutoff and low-low level alarm features, all automatic level control functions operate on deviation from level setpoint.

The level setpoint signal applied to the pressurizer level control system originates in the reactor regulating system (RRS).

- Comprised of two redundant channels, each of which generates a level setpoint according to a program based on T_{AVG}.
- T_{AVG} is used as the setpoint for programmed level, as opposed to first stage turbine pressure or T_{REF}, because it is the change in average temperature which directly causes the change in coolant specific volume, and therefore in pressurizer level.

One RRS channel is selected to provide the setpoint signals to the level control system by means of a selector switch located on RTGB-103 [203].

- The pressurizer level program is depicted in Figure 35.
- The range of T_{AVG} traversed from no load to full load is **532°F to 572°F**.
- Level is programmed to be higher at increased values of T_{AVG}, which is another way of saying that pressurizer level is controlled higher at higher power levels.
- Level program has a **minimum level of 33%** and a **maximum level of 66% [63%]**.
- The program between these two extremes is linear with respect to T_{AVG}.
- Letdown level control valves (LCVs) are throttled to maintain letdown flow rate equal to charging flow according to the analog level control signal
- Standby charging pump(s) automatically cycle through a pair of level bistables, starting

RRS SIMPLIFIED BLOCK DIAGRAM

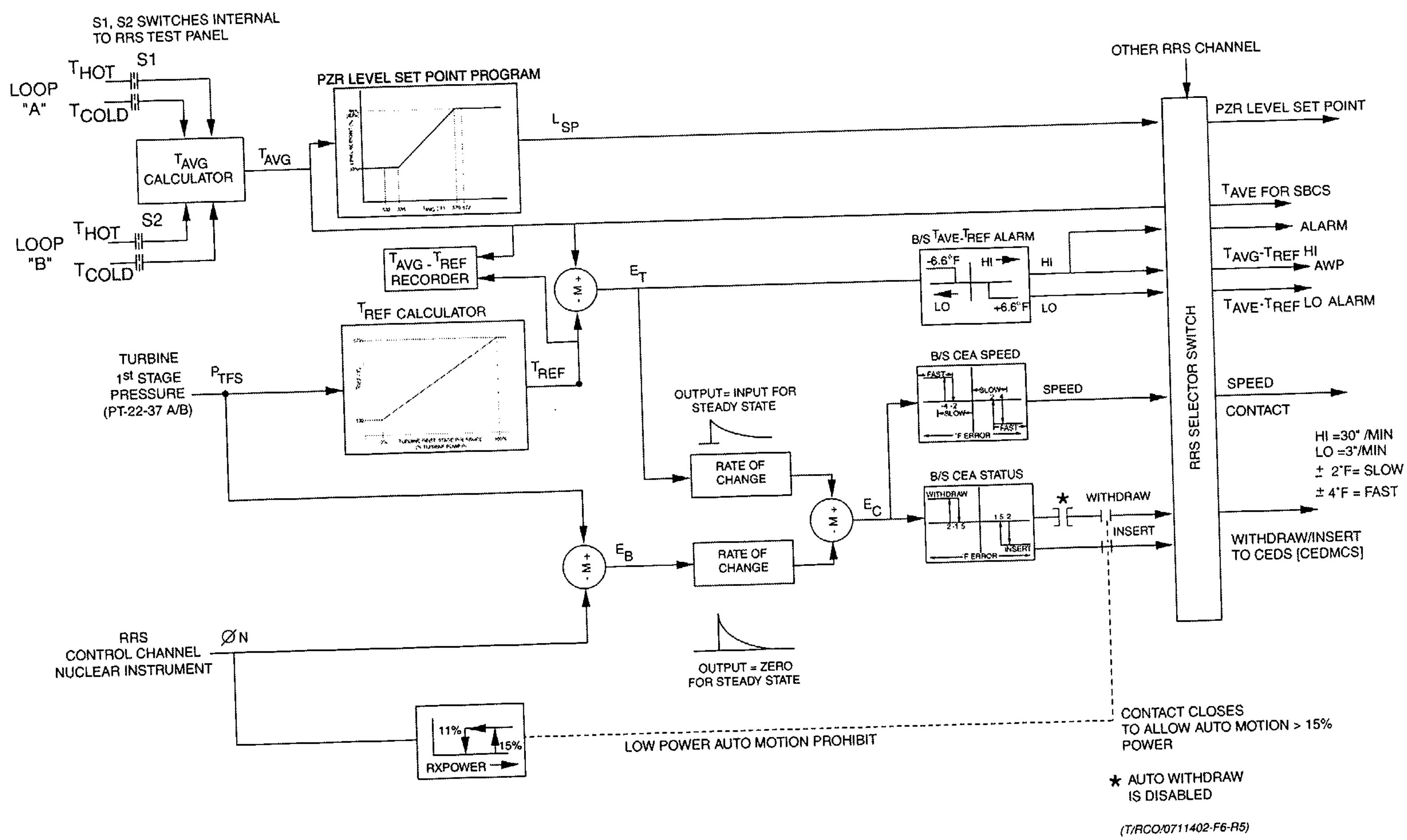


FIGURE 6

DETAILED DESCRIPTION

{PRIVATE }REACTOR PROGRAM UNIT CALCULATOR (RPUC){tc \l 2 "1. Reactor Program Unit Calculator"}

The RPUC performs the majority of calculations required by the RRS. It does so by means of internal calculators, alarm/inhibit bistables, and comparative/summing circuitry. The parameters generated by the calculators are used as inputs to the bistables, comparative circuitry, and to other units of the RRS. Refer to Figure 6.

There are four functions provided by the RPUC:

- T_{AVG} calculator
- Pzr level setpoint (L_{SP}) calculator
- T_{REF} calculator
- A signal to prohibit automatic CEA movement at low power levels.

{PRIVATE } T_{AVG} Calculator{tc \l 3 "a. T_{AVG} Calculation"}

The T_{AVG} calculator uses 4-20 mA current inputs of (T_{HOT} and T_{COLD}) to determine T_{AVG}. The 4-20 mA (1-5 volt) output signal corresponds to 515°F – 615°F.

$$T_{AVG} = \frac{T_{HOT} + T_{COLD}}{2}$$

Refer to Figures 7 and 8. While there is only one T_{HOT} RTD per loop, on Unit 1 the operator may select either of two RTDs in each of the loop cold legs [only one cold leg RTD]. This feature allows switching to the alternate temperature input in the event of an RTD failure, permitting the continued use of the same RRS cabinet. The selector switches for these RTDs are located on RTGB 103.

- [There is only one RTD per cold leg.]
- [The operator must switch RRS cabinets if the T_{COLD} RTD fails].

UNIT 1 SUMMARY OF PRESSURIZER LEVEL CONTROL ACTIONS

PZR. LEVEL (ROUNDED)	AUTOMATIC ACTION
+10% DEVIATION	HIGH PRESSURIZER LEVEL ALARM (INCREASING)
+9% DEVIATION	MAXIMUM LETDOWN (128 GPM) (INCREASING)
+4% DEVIATION	• ALL HEATERS ON • BOTH BACKUP CHARGING PUMPS RECEIVE STOP SIGNAL
0% DEVIATION	NORMAL LEVEL (SETPOINT FROM RRS)
-1% DEVIATION	• MINIMUM LETDOWN (29 GPM) (DECREASING) • FIRST B/U CHG. PUMP "STOP" SIGNAL (INCREASING)
-2% DEVIATION	• SECOND B/U CHG. PUMP "STOP" SIGNAL (INCREASING)
-3% DEVIATION	FIRST B/U CHG. PUMP "START" SIGNAL (DECREASING)
-4% DEVIATION	SECOND B/U CHG. PUMP "START" SIGNAL (DECREASING)
-5% DEVIATION	LOW PRESSURIZER LEVEL ALARM, ALL CHG. PUMPS GET BACKUP "START" SIGNAL (DECREASING)
28 % INDICATED LEVEL	ALL PRESSURIZER HEATERS OFF (DECREASING)

UNIT 2 SUMMARY OF PRESSURIZER LEVEL CONTROL ACTIONS

PZR. LEVEL (ROUNDED)	AUTOMATIC ACTION
67% INDICATED LEVEL	HIGH PRESSURIZER LEVEL ALARM (INCREASING)
+9% DEVIATION	MAXIMUM LETDOWN (128 GPM) (INCREASING)
+4% DEVIATION	• ALL HEATERS "ON" SIGNAL • B/U CHG. "STOP" SIGNAL (INCREASING)
0% DEVIATION	NORMAL LEVEL (SETPOINT FROM RRS)
-1% DEVIATION	• MINIMUM LETDOWN (29 GPM) (DECREASING) • B/U CHG. PUMP "STOP" SIGNAL (INCREASING)
-3% DEVIATION	• B/U CHG. PUMP "START" SIGNAL (DECREASING)
-5% DEVIATION	LOW PRESSURIZER LEVEL ALARM, B/U CHG. PUMP GETS BACKUP "START" SIGNAL (DECREASING)
27 % INDICATED LEVEL	WITH CHANNEL X <27%; 2A3 4160V HEATER XFMR BREAKER TRIPS AND "B" SIDE 480V BREAKERS TRIP. WITH CHANNEL Y <27%; 2B3 4160V HEATER XFMR BREAKER TRIPS AND "A" SIDE 480V BREAKERS TRIP.

Question 39

Unit 2 is experiencing a loss of coolant accident (LOCA). RCS Pressure initially lowered to 1090 psia and is now stable at 1180 psia, with:

- Containment pressure at 5.8 psig
- RCS Thot 556ºF

Which of the following Operator actions will maximize the RCS heat removal process?

A. Feed and steam both Steam Generators using Auxiliary Feedwater and Steam Bypass Control system.

B. Feed and steam both Steam Generators using Auxiliary Feedwater and Atmospheric dump valves.

C. Lower RCS pressure using Auxiliary Spray valves to increase High Pressure Safety Injection flow.

D. Lower RCS pressure using Main Spray valves to increase High Pressure Safety Injection flow.

A. Incorrect, SBCS unavailable due to MSIS on high containment pressure

B. Correct

C. Incorrect, RCS subcooling is less than 20ºF

D. Incorrect, RCS subcooling is less than 20ºF, main spray not available due to RCP's manually tripped from lack of subcooling.

Question Level: 2
Question Source: New
Exam: Both
K/A: 09.EK.2.03
Importance: 3.0 / 3.3
References: 0711824 LOCA event and procedure, 2-EOP-03 LOCA, 0702824-02 LOCA Lesson plan

Another distinction between small and large break LOCAs is the ability to reach and maintain Shutdown Cooling System (SDC) entry conditions. For a large break LOCA, the RCS pressure will normally decrease to well below that required for SDC, thus the plant may be maintained on simultaneous hot/cold leg injection. For a small break LOCA, the RCS pressure normally stabilizes above that required for SDC, thus the plant can be cooled down, depressurized and placed on SDC.

{PRIVATE }1.3.1 Small Break LOCA{tc \l 3 "1.3.1 Small Break LOCA"}

Following a rupture in the RCS the pressurizer pressure and level decrease due to the loss of inventory through the break. However, for breaks at the top of the pressurizer, the pressurizer level may increase or exhibit erratic behavior. The rate of pressure decrease depends primarily upon the size of the break. A reactor trip and SIAS will occur when the pressurizer pressure falls below the low pressure setpoint.

An illustration of the variation of pressure decrease for different break sizes is shown in Figure 1. In general, the pressurizer liquid inventory will empty very rapidly. For larger size small breaks the rate of pressure drop is moderated by the saturation pressure of the hottest fluid in the RCS (e.g., the reactor vessel upper head). Early in the transient a rapid depressurization is followed by a pressure plateau. The pressure plateau occurs because the energy loss through the break has decreased with the decreasing pressure and has become less than the energy added to the RCS from core decay heat. In order for the heat transfer process to proceed, the RCS temperature and saturation pressure must be higher than that on the secondary side. The pressure plateau will continue until the level of the two-phase (steam-water) mixture in the RCS falls below the level of the break. Then, pure steam discharges from the break and the pressure proceeds to fall more rapidly.

For small break LOCAs, the smaller the break size, the more important the S/G's are as a heat sink for RCS and Core Heat Removal. If feedwater is interrupted for a period, the RCS would repressurize and pressurized/thermal shock considerations would become a concern.

As the RCS pressure continues to decrease below the shutoff head of the higher pressure safety injection (HPSI) pumps, an increase in HPSI flow will occur due to reduced backpressure. This causes the RCS inventory to increase and the pressurizer level to be regained. For very small break sizes (less than 0.05 ft^2, 3.0" ID pipe) the pressure can fall to a value where the HPSI flow rate exceeds the loss of inventory through the break. As the RCS pressure continues to fall, the mass of fluid will rise due to increased HPSI flow. If the entire RCS should refill with water, the pressure will undergo a sudden jump. The resultant rise in pressure will cause more fluid to discharge through the break and a reduction in HPSI flow. These competing conditions will cause the pressure to equalize at a value determined by the HPSI pump delivery characteristics and the size of the break.

For the very small breaks, uncovering the core is not expected. The core decay heat is almost entirely removed by the S/G's.

An exception to the small break depressurization behavior described above is for breaks located at the top of the pressurizer [e.g., stuck open PORV or safety valve]. A break in this region will result in flashing of the reactor coolant and steam production in the reactor vessel and hot legs. This is commonly referred to as voiding and is monitored by the Reactor Vessel Level indication on QSPDS. The expansion of the reactor coolant into steam causes fluid to flow towards the break through the pressurizer surge line and oppose the draining of the pressurizer liquid. Thus, the liquid level in the pressurizer may increase or exhibit erratic behavior due to the competing counter flow condition.

During normal operation the Reactor Coolant Pumps (RCPs) provide forced convection fluid flow. Following a LOCA, if RCS pressure is <1300 psia and subcooling is >20° F, one RCP in each loop is stopped. If RCS subcooling is <20° F, all four RCPs are stopped.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

For small breaks in the RCS where the steam generators are important for heat removal, at least one steam generator must be used even if primary to secondary leaks are detected. If both steam generators have primary to secondary leaks, the least affected steam generator should be used for RCS heat removal.

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 17. COMMENCE an RCS cool down to less than 325°F, within the limits of Figure 1, RCS Pressure Temperature, at a rate NOT to exceed 100°F per hour, using SBCS.	17. OPERATE **ANY** of the following to cooldown the RCS to less than 325°F, within the limits of Figure 1, RCS Pressure Temperature, at a rate NOT to exceed 100°F per hour: • ADVs. • 2C AFW Pump • Steam systems vent, drain, and trap valves. **REFER TO** Table 12, Alternate S/G Heat Removal Flow Paths.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

In order to avoid any unfavorable pressure excursions, water solid operation of the RCS should be avoided unless necessary to maintain 20°F subcooling. Actions to maintain subcooling take precedence over maintaining Pressurizer level. If the RCS is solid, closely monitor any makeup or draining, and any system heatup or cooldown to avoid any unfavorable rapid pressure excursions.
Subcooling indication should be used according to RCS flow conditions:

- During Natural Circulation, use Representative CET (Page 213, QSPDS)
- During Forced Circulation, use T_{HOT} (Page 211, QSPDS)

$\boxed{*}$ 18. ENSURE RCS pressure is being maintained within the limits of Figure 1, RCS Pressure Temperature curve. 20°F to 50°F subcooling is recommended (during Natural Circulation use Representative CET, page 213, or during Forced Circ. use T-hot page 211, QSPDS) using **ANY** of the following:

- Pressurizer heaters and main or auxiliary spray.
- Charging and Letdown (if available).
- Throttling HPSI (if HPSI throttling criteria is met)

18. If RCS subcooling is NOT being maintained, Then PERFORM **ANY** of the following as appropriate:

A. If RCS subcooling is less than 20°F, Then ESTABLISH 20°F subcooling by reducing RCS temperature.

B. If RCS subcooling is greater than 200°F or cooldown rate is greater than 100°F/HR, Then PERFORM the following steps as appropriate:

1. STOP any cooldown in progress.

(Continued on Next Page)

Question 40

A liquid release is in progress at Unit 1. A high radiation alarm is received on the liquid release radiation monitor channel 43.

Which of the following are the immediate operator actions?

A. Compare the radiation levels on channel 43 to the limits on the liquid release permit. If channel 43 higher than permit, call Chemistry.

B. Ensure the waste monitor pump being used for the liquid release automatically stopped upon the high radiation alarm.

C. Ensure FCV-6627X, the final effluent flow control valve, closed automatically upon the high radiation alarm.

D. Close and lock V21462, the final effluent discharge valve, to terminate the liquid release to the discharge canal.

A. Incorrect, the radiation monitor alarm setpoint will terminate the release before the limits are exceeded.

B. Incorrect, the waste monitor pump will not automatically stop.

C. **Correct**

D. Incorrect, this valve must be closed when the release is terminated.

Question level: 1
Question source: New
Exam: Both
K/A: 068.A3.02
Importance: 3.6/3.6
Reference: 1-0510030, Uncontrolled Release of Radioactive Liquids, 0702410-9

5.0 INSTRUCTIONS:

5.1 Excessive release through liquid release discharge header:

1. Symptoms:

   A. High radiation alarm on liquid release monitor channel #43.

   B. Closure of Flow Control Valve FCV-6627X during release.

   C. Liquid Radwaste Local Annunciator

2. Automatic actions:

   A. FCV-6627X closes if HI-RATE alarm is received on channel #43.

3. Immediate operator action:

   A. Ensure FCV-6627X, final effluent discharge flow control valve, is closed.

4. Subsequent operator action:

   A. Stop waste monitor pump associated with liquid release.

   B. Close and lock V21462 final effluent discharge valve to discharge canal.

   C. Complete appropriate sections of liquid release permit.

   D. Inform the control room of action taken.

   E. Implement the Emergency Plan as necessary in accordance with EPIP-01, Classification of Emergencies.

   F. Notify the Health Physics Supervisor and Chemistry Supervisor.

Question 41

During the performance of Standard Post trip actions a loss of the DC bus that feeds the AB DC bus occurs. The AB DC bus is now being realigned to an operable DC bus.

Which of the following defines which Unit this is being performed on and the reason why?

A. Unit 1, to ensure the availability of the 1C Auxiliary Feedwater pump because all 1C AFW pump steam and feed valves are AB DC powered.

B. Unit 1, to ensure the availability of the 1C Auxiliary Feedwater pump because only the Trip and Throttle valve MV-08-03 is AB DC powered and is normally closed.

C. Unit 2, to ensure the availability of the 1C Auxiliary Feedwater pump because all 1C AFW pump steam and feed valves are AB DC powered.

D. Unit 2, to ensure the availability of the 1C Auxiliary Feedwater pump because only the Trip and Throttle valve MV-08-03 is AB DC powered and is normally closed.

A. **Correct**

B. Incorrect, all Unit 1 valves are DC powered

C. Incorrect, Verification of AB DC aligned to operable DC bus not performed on Unit 2, also only MV-08-03 is AB DC powered on Unit 2.

D. Incorrect, Verification of AB DC aligned to operable DC bus not performed on Unit 2, also MV-08-03 is normally open on Unit 2.

Question Level: 2
Question Source: New
Exam: Both
K/A: 000058.AK3.02
Importance: 4.0 / 4.2
References: 1-EOP-01 Standard Post trip Actions, 0711412 Auxiliary Feedwater system lesson text, 0702412-05 Auxiliary Feedwater Lesson plan

{PRIVATE }POWER SUPPLIES{tc \l 1 "POWER SUPPLIES"}

Diverse power sources assure that the AFW systems can perform their design safety function in the event of a Loss of Offsite Power Event or a Total Loss of AC Power Event:

1. The 'A' and 'B' motor-driven AFW pumps are each powered from separate Emergency Diesel Generator 4.16 KV safety-related buses. Their flow control MOVs [SOVs are powered from 120V AC] are powered from corresponding 480VAC MCCs.

2. The turbine-driven 'C' AFW pumps are powered from their respective units' steam generators. Their steam flow control valves, T&T valves, turbine controls, and AFW flow control valves [and SOVs] are powered from safety-related 125V DC buses.

The 125V DC power supplies for Unit 1 AFW 'C' pump and valves are on the 'AB' DC bus, located in the northwest corner of the Cable Spreading Room. This electrical arrangement allows the 'C' AFW pump and associated controls to be powered off of either vital DC bus. Following a unit trip, procedural guidance ascertains that the DC AB bus is energized in the event that the 'C' pump might be required for feedwater addition.

The 125V DC power supplies for Unit 2 AFW 'C' pump and valves are located on two levels of the RAB. The 'A' DC bus supplies steam inlet valves from the 'B' steam generator and AFW flow control valves to the 'B' steam generator.

The 'B' DC bus supplies steam inlet valves from the 'A' steam generator and AFW flow control valves to the 'A' steam generator. The '2C' T&T valves is supplied from the 'AB' DC bus. This electrical arrangement ensures that a total loss of power to one train will not prevent automatic feed to either S/G. To ensure this MV-08-3 is maintained open. For example: If all AC and DC is lost on the 'A' side, 'B' side motor driven AFW pump and valves would provide feedwater to the 'B' S/G and 'C' AFW pump and valves would provide feedwater to the 'A' S/G.

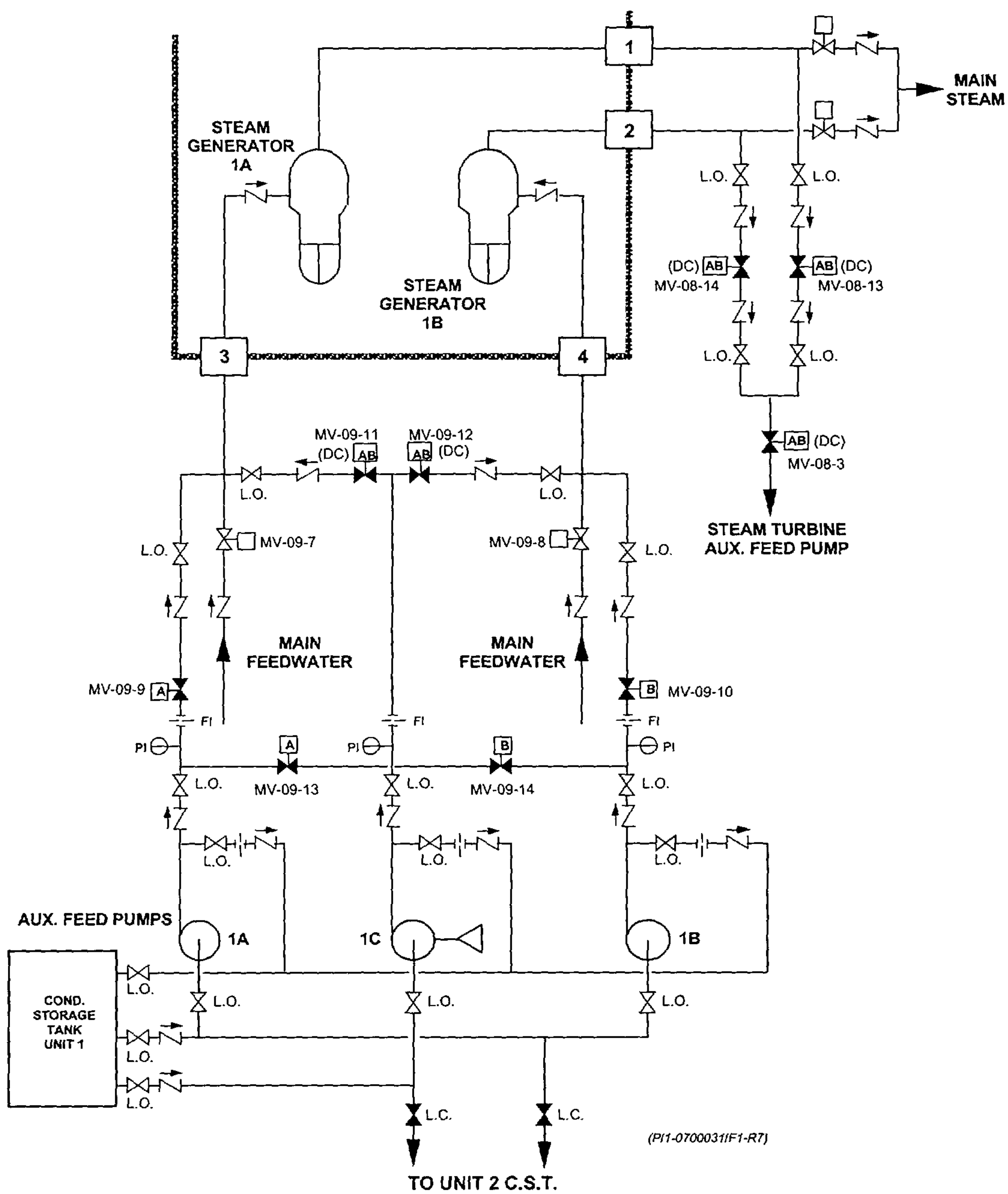
5.0 OPERATOR ACTIONS: (continued)

MAINTENANCE OF VITAL AUXILIARIES
(AC & DC POWER)

INSTRUCTIONS	CONTINGENCY ACTIONS
2. (continued)	2. (continued)
D. At least **ONE** vital DC bus (1A or 1B) is ENERGIZED.	
E. 1AB DC bus is aligned to an energized vital DC bus.	E. REALIGN 1AB DC bus to an energized DC bus using the RTGB-101 key lock switches as follows: 1. If 1A DC bus is energized, Then PERFORM the following: a. PLACE key lock switch for Bkr 1-60316, TIE 1AB-1B, to OPEN/RESET. b. PLACE key lock switch for Bkr 1-60230, TIE 1B-1AB, to OPEN/RESET. c. CLOSE Bkr 1-60130, TIE 1A-1AB. d. CLOSE Bkr 1-60315, TIE 1AB-1A.
(Continued on Next Page)	**(Continued on Next Page)**

/R16

FIGURE 1
UNIT 1 AUXILIARY FEEDWATER SYSTEM



Question 42

Which of the following constitutes positive indication that a PORV is open on Unit 1?

A. Red position indicating light on the RTGB.

B. PORV acoustic monitor LED's lit.

C. Tailpipe temperature on TIA-1106 on RTGB 103.

D. Quench Tank parameters, temperature, pressure, and level increasing.

A. Incorrect, position indicating lights show solenoid position, not valve stem position.

B. **Correct**

C. Incorrect, TIA-1106 is combined PORV/Safety Valve tailpipe temperature and may remain elevated even when the PORV is re-closed.

D. Incorrect, Quench Tank parameters increase for PORV, Safety Valve, or certain valve packing leakoff

Question level: 1
Question source: New
Exam: Both
K/A: 08.AA2.03
Importance: 3.9/3.9
Reference: 0711206, Pressurizer Level and Pressure Control, 0702206-8

- Similar to the control switches on the RTGB, momentary contact of either local pushbutton strokes the block valve through its full travel in the direction selected.

Green/Red RTGB indication is not affected by a thermal overload condition for either unit, the lamps remain energized.

A block valve thermal overload condition does NOT cause an alarm for either unit. Only **Unit 1** PORV block valves **fail as-is if the thermal overload trips**.

[A two position "NORM/BYPASS - MAINT/TEST" switch is also used for block valve testing.

- "NORM/BYPASS" position bypasses the motor thermal overloads.

- "MAINT/TEST" allows thermal protection during maintenance testing/adjustment of the valve motor operator. Valve is TS inoperable while the switch is in "MAINT/TEST".]

Safety Valve/PORV Acoustic Monitor (Figure 22)

Safety valves do NOT have positive position switches operated by the valve stem. While the Unit 1 PORVs have position indication, it is not positive because their indication is actuated by energizing the PORV operating solenoid. The PORV may not open if a mechanical failure occurs, even though the solenoid is energized. Therefore one piezoelectric accelerometer is clamped to the outside of each code safety valve and PORV tailpipe.

Flow through the tailpipe, which constitutes positive indication that the valve is open, causes acoustical accelerations (flow noise and pipe vibrations) producing a piezoelectric charge proportional to acceleration (g's). This charge is then converted to voltage by a remote charge converter mounted inside the containment. This voltage is then applied to the valve flow monitor module, located in the control room on the post-accident panel (PAP).

The flow module contains a signal processing channel and display for each monitored valve. The module processes the voltage signal and indicates a flow value on light emitting diodes (LEDs) calibrated in % increments of full flow. The discrete flow value LEDs are: 0.01, 0.04, 0.09, 0.16, 0.25, 0.36, 0.49, 0.64, 0.81, and 1.0 (full flow).

Question 43

Unit 2 is in Mode 2, 1 x 10^{-5} % power. CEA's are in manual sequential being withdrawn with CEA group 5 at 62 inches withdrawn. CEA #59 drops fully into the core.

Which of the following interlock will prevent continued CEA motion in manual sequential?

CEA:

A. withdrawal prohibit

B. motion inhibit

C. auto withdraw prohibit

D. PDIL

A. Incorrect, comes from RPS, not position CEA deviation

B. Correct, due to CEA deviation from other CEA's

C. Incorrect, auto withdraw has been defeated at PSL, but annunciator still active

D. Incorrect, PDIL not active until 10^{-4}% power

Question Level: 2
Question Source: New
Exam: Both
K/A: 03.AA2.02
Importance: 2.7 / 2.8
References:0711405 Control Element Drive system, 0702405-10 Control Element Drive system Lesson plan

{PRIVATE }CEA Motion Inhibit Circuitry{tc \l 4 "• CEA Motion Inhibit Circuitry"}

A Motion Inhibit signal shall be generated based on the information from the following **Alarms**:

- CEA Deviation (Shutdown and Regulating Groups)
- CEA Regulating Group Out-Of-Sequence
- CEA Regulating Group Overlap
- CEA Regulating Group Insertion to the Power Dependent Insertion Limit
- CEA Regulating CEA greater than IRG
- CEA Shutdown CEA is less than ISH

~~When the Reactor Power is less than 10^{-4}% rated power, the motion inhibit signals are bypassed via a low power cutout signal (external digital input).~~

Other Control Interlocks

Several other control interlocks are provided and are detailed in the following list.

- **UPPER GROUP STOP** - Stops group CEA withdrawal at 133" withdrawal. This interlock is generated by **DDPS** based on the pulse-count position indication.

- **LOWER GROUP STOP** - Stops group CEA insertion at 4.5" from bottom of insertion. This interlock is also generated by **DDPS** based on the pulse-count position indication.

- **UPPER CEA LIMIT** - **RSPT** interlock that stops the withdrawal of each individual CEA at 136" of withdrawal.

- **LOWER CEA LIMIT** - **RSPT** interlock that stops the insertion of each individual CEA at approximately 1" from the bottom.

SEQUENCE PERMISSIVE (DDPS) - A group out of sequence condition prohibiting regulating group motion in the manual sequential (MS) and automatic sequential (AS) modes. This permissive is lost if there is greater than a 54" overlap between groups.

{PRIVATE }Equipment Protective Interlocks{tc \l 1 "Equipment Protective Interlocks"}

Two equipment protective interlocks are provided and are detailed in the following list:

AUTOMATIC WITHDRAWAL PROHIBIT (AWP) - Prevents regulating groups from being withdrawn in the automatic sequential (AS) mode if any of the following conditions exist:

- Any CEA is dropped as sensed by the reed switches at the zero inch position. Energizes DROPPED CEA (CEDS) annunciator.
- T_{AVG}-T_{REF} deviation as sensed by the reactor regulating system exceeds 6.6°F.
- Cold leg temperature (T_c) is greater than 552°F.
- A demand signal is generated by the Steam Bypass Control System.

An AWP condition will also energize the AUTO WITHDRAWAL PROHIBIT annunciator, K-14 [18].

NOTE: Although the auto withdrawal in the AS mode has been defeated in both Units, the annunciator still exists.

CEA WITHDRAWAL PROHIBIT (CWP) - Prevents the withdrawal of the CEAs in any mode. On Unit 1 this interlock cannot be bypassed. This interlock is generated by the following RPS pre-trips on 2/4 logic:

- TM/LP (Thermal margin/low pressure)
- LPD (Local power density)
- High SUR
- Variable High Power

A CWP condition will also energize the CEA Withdrawal Prohibit annunciator.

Question 44

Unit 1 is at 100% power with PT-07-2A, Containment pressure transmitter failed high and has yet to be bypassed. A loss of the MD instrument bus occurs.

Which of the following Engineered Safety Features Actuation signals will actuate?

A. SIAS, CSAS, MSIS and CIAS

B. CSAS and SIAS

C. SIAS, MSIS and CIAS

D. SIAS and CIAS

A. Incorrect, CSAS energized to actuate

B. Incorrect, CSAS energized to actuate

C. Incorrect, MSIS does not actuate on high Containment pressure on Unit 1, only on Unit 2

D. Correct

Question Level: 2
Question Source: New
Exam: Both
K/A: 013.K6.01
Importance: 2.7 / 3.1
References: 0711401 ESFAS Lesson Text, 0702401-08 ESFAS Lesson plan

ENGINEERED SAFEGUARDS ATI FAULT alarm on RTGB 106 [206], as well as the ATI failure lamp on the ATI test panel.

On each of the measurement channels, there is a manual test panel. See Figure 5 [Figure 6]. The manual test panel is provided for I&C to set, and periodically verify, the bistable trip setpoints.

- Taking the spring-return calibration test switch out of the "operate" position removes that respective measurement channel's input resulting in a 2-out-of-3 logic for that trip.

As shown on Figure 3, the train B isolation modules are located just below the manual test panel [above the analog indicators]. There are nine ESFAS modules and one ATWS module labeled 1M110 - 1M118 and ATWS. Like the train A isolation modules, there are no isolation modules for S/G 1A [2A].

The power supply fuse panel is located just below the train B isolation modules [bistable bypass key switches]. Refer to Figure 7. Indicator lights for various power supplies are located on this panel.

{PRIVATE }Actuation Cabinets{tc \l 2 "Actuation Cabinets"}

As shown on Figure 3, the two double actuation cabinets are located on both ends of the measurement cabinets. When facing the ESFAS cabinets, train SA is located on the left end and train SB is located on the right end. These cabinets house all the actuation modules, 3-out-of-4 block matrix modules, [ATI Panel] and the output relays. Some of the ESFAS power supplies are also housed in these cabinets. Refer to Figure 8. There are also switches provided for the manual testing of these modules.

Power to the ESFAS is supplied from the four instrument AC buses: MA, MB, MC, and MD, in the cable spreading room. Refer to Figure 9. The four channels of instrument AC are completely separate to eliminate interconnection between redundant elements and to ensure that a loss of electrical power or electric fault on one circuit cannot affect another circuit. Actuation trains SA and SB require redundant power sources (115 VAC) to ensure reliable operation of the output relays. If there were not redundant power sources, the "de-

- CIS [CIAS] is a **de-energize to actuate** signal.

There are four independent cntmt pressure transmitters (PT-07-2A, B, C, and D) and four independent cntmt radiation monitors (RD-26-3, 4, 5, and 6).

The operation of the measuring channels, actuation channels, isolation modules, manual and automatic testing, and output relays of the CIS [CIAS] is similar to the operation of the SIAS. Refer to Figure 14. The CIS [CIAS] is also divided into groups for testing purposes.

- CIS [CIAS] is not provided with blocking modules. If auto SIAS is blocked, CIS [CIAS] can only be automatically actuated as a result of high cntmt pressure or radiation.

Separate control switches for manual initiation of each actuation train (SA and SB) of the CIS [CIAS] are provided on RTGB 106 [206]. As with the SIAS, these switches have RESET/AUTO/CIS [CIAS] ON positions and are provided with a "Think" Pushbutton to prevent accidental actuation. SIAS must be reset prior to the reset of CIS[CIAS]. This may require RTGB 106[206] keyswitch blocking of the SIAS signal if Pzr. pressurizer is below the SIAS actuation setpoint.

Several annunciators associated with CIS [CIAS] actuation on RTGB 106 [206] are:

- Q-15 [P-13], CNTMT PRESS HIGH CIS CHANNEL TRIP
- Q-16 [P-5], CNTMT RAD HIGH CIS CHANNEL TRIP
- Q-5 [P-3], CIS CHANNEL A/B ACTUATION
- Q-25 [P-23], CNTMT Press Hi CIS PRETRIP
- Q-26 [P-15], CNTMT Rad Hi CIS PRETRIP

{PRIVATE }Containment Spray Actuation Signal (CSAS){tc \l 1 "CONTAINMENT SPRAY ACTUATION SIGNAL (CSAS)"}

A CSAS automatically actuates the Containment Spray System and supporting systems as listed in EOP-99.

- A CSAS is actuated by 2-out-of-4 HI-HI cntmt pressure (**10 psig [5.4 psig]**) signals AND a coincident SIAS signal.

- CSAS is an **energize to actuate** signal.

There are four independent cntmt pressure transmitters (PT- 07-2A, B, C, and D). Note that these are the same transmitters used for the SIAS and CIS [CIAS] signals.

The operation of the measuring channels, actuation channels, manual and automatic testing, and isolation modules of the CSAS is similar to the operation of the SIAS. Like the SIAS and CIS [CIAS], the CSAS is divided into groups for testing purposes.

- The CSAS output relays are designed to be energized to actuate in order to prevent spurious spray system operation on a loss of power to one of the two 125V DC buses.

- CSAS is NOT provided with blocking modules.

Separate control switches for manual initiation of each train of the CSAS are provided on RTGB 106 [206]. These switches have the similar positions and are operated in the same way as those previously described.

Several annunciators associated with CSAS actuation on RTGB 106 [206] are:

- R-11 [S-17], CNTMT PRESS HIGH CSAS CHANNEL TRIP
- R-1 [S-7], CSAS CHANNEL A/B ACTUATION

{PRIVATE }Recirculation Actuation Signal (RAS){tc \l 1 "RECIRCULATION ACTUATION SIGNAL (RAS)"}

An RAS automatically transfers the suction of the Safety Injection Pumps and the Containment Spray Pumps from the RWT to the cntmt sump. This is accomplished by opening the two sump outlet valves while simultaneously closing the RWT outlet valves and closing the pump miniflow recirculation valves to the tank. Unit 1 has a key switch to allow auto action to close the miniflow recirculation valves

- The cntmt sump outlet valves open within 30 seconds.
- The RWT outlet isolation valves close within 90 seconds.

- MSIS is actuated by 2-out-of-4 low S/G pressure **(600 psia)** signals [and/or 2-out-of-4 high cntmt pressure **(3.5 psig)** signals.]
- MSIS is a **de-energize to actuate** signal.

There are four independent channels of S/G pressure transmitters for each S/G (PT-8013A, B, C, and D and PT-8023 A, B, C, and D). **[On Unit 2, the cntmt pressure trips for MSIS come from a common cntmt pressure bistable used for SIAS.]**

As shown in Figure 17, an initiation signal, generated by either channel, will actuate the isolation of both S/Gs. It should be noted, however, that the ESFAS system does not "auctioneer" S/G A & B pressures. The 'A' actuation channel looks only at 'A' S/G pressure and actuates 'A' train MSIS on 'A' S/G low pressure only. The same is true for B actuation channel. This means that it requires 2 of 4 low S/G pressure signals from the same S/G to actuate an A or B MSIS signal.

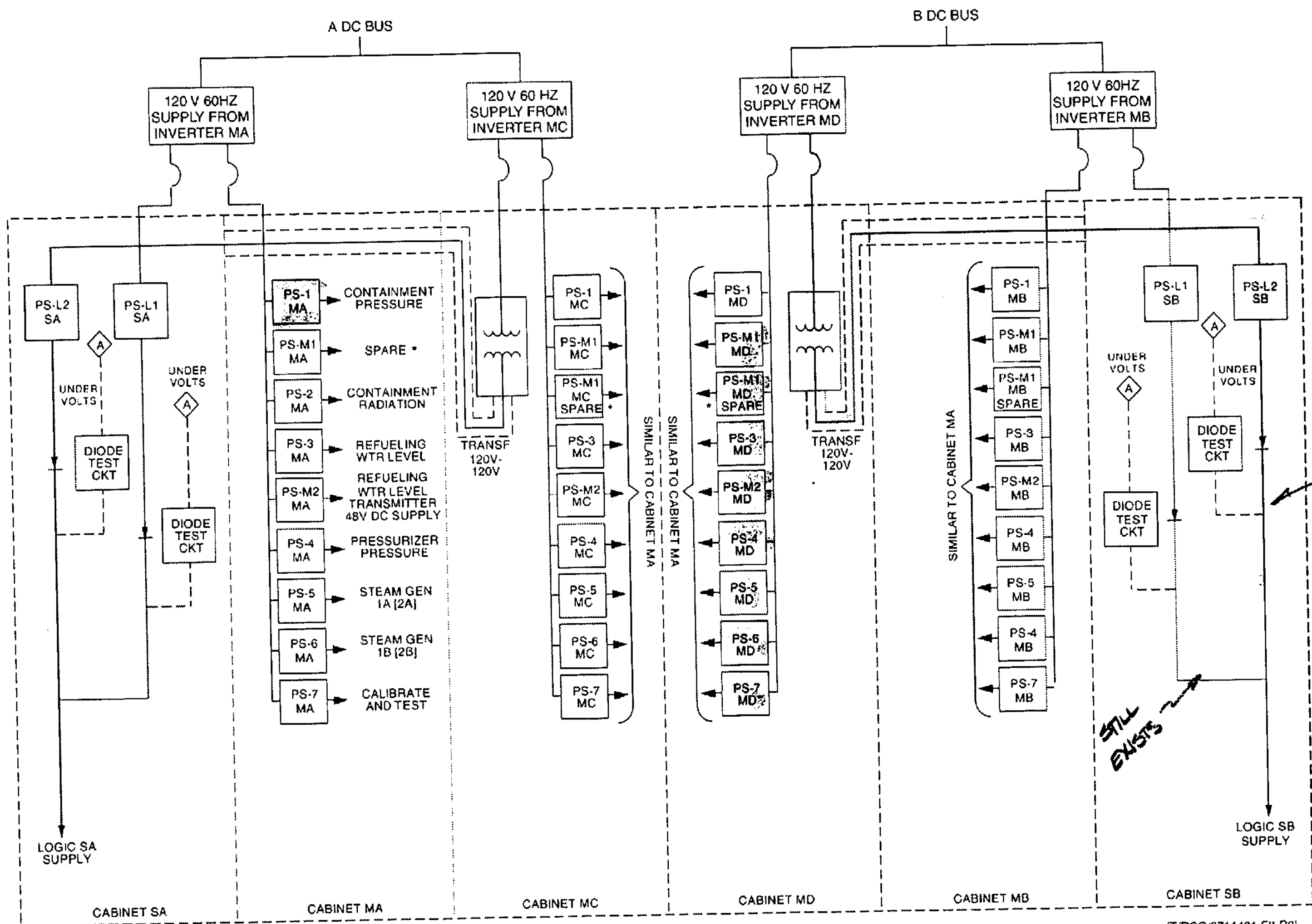
The operation of the measuring channels, actuation channels, isolation modules, output relays, and manual and automatic testing of the MSIS is similar to the operation of the SIAS. It is also divided into groups for testing purposes.

- MSIS is provided with a manual block for low S/G pressure actuation to permit shutdown depressurization of the Main Steam System without initiating MSIS. The block is a manual operator action performed by a NORM/BLOCK spring-return key switch on RTGB 106 [206].
- The block can only be initiated when 3-out-of-4 S/G pressure channels reach **700 psia** decreasing.
- When 2-out-of-4 S/G pressure channels exceed **700 psia**, the block is automatically removed.

The following annunciators are associated with blocking MSIS on RTGB 106 [206]:

- Q-18 (Q-20) [P-18 (P-20)], MSIS CHANNEL A (B) ACTUATION BLOCK PERMISSIVE
- Q-8 (Q- 10) [P-8 (P-10)], MSIS CHANNEL A (B) ACTUATION BLOCKED

ESFAS SYSTEM POWER SUPPLY



(T/RCO/0711401-F8-R8)

PS-L1/SA, PS-L2/SA, PS-L1/SB, PS-L2/SB } ACTUATION LOGIC POWER SUPPLIES

PS-1 THRU PS-6 } BISTABLE POWER SUPPLIES

* [UNIT 2 ONLY]

FIGURE 9

Question 45

Unit 2 is in Mode 3 when a loss of the 2B DC bus occurs. A and B S/G narrow range levels are 65%.

Which of the following explains the response of the AFAS system?

A. Only AFAS 2 will actuate

B. AFAS 1 and 2 will actuate

C. AFAS channel B goes to bypass, channel D goes to trip

D. AFAS channel B goes to trip, channel D goes to bypass.

A. Incorrect, battery fail bypass prevents AFAS actuation upon loss of DC bus.

B. Incorrect, battery fail bypass prevents AFAS actuation upon loss of DC bus.

C. Correct

D. Incorrect, backwards logic

Question level: 2
Question source: Bank
Exam: RO
K/A: 013.K2.01
Importance: 3.6
Reference: 0711412 AFAS Lesson text 0702412-01 AFAS Lesson plan

{PRIVATE }BYPASSES{tc \l 1 "BYPASSES"}

Trip Channel Bypass

Refer to Figure 26. Each channel has a Trip Channel Bypass feature that can defeat the AFAS Bistable trip contact in each associated matrix. Each channel has two Bypass pushbuttons located behind the keylocked flip down door on the control panel front (Figure 29) labeled AFAS-1 and AFAS-2, respectively. One channel may be bypassed for maintenance/testing or when required by the Technical Specifications. The Channel Bypass is interlocked and prioritized with the other three channels such that only one channel may be bypassed at a time and in a descending order (i.e., 'A' has priority, then 'B', etc). For example, if Ch. C AFAS-1 is bypassed, pressing the Ch. B AFAS-1 Bypass push-button will remove Ch. C from bypass and bypass Ch. B. It is possible to have AFAS-1 bypassed in one channel and AFAS-2 bypassed in another channel. Pressing the AFAS-1(2) Bypass push-button energizes the corresponding Bypass Relay whose contacts are in parallel with the AFAS Bistable contacts in the associated Logic Matrices. This closes the Bypass Relay contacts in all three of the associated Logic Matrices (i.e., if Ch. A AFAS-1 Bypass is depressed, the AFAS-1 AB, AC, AD Logic Matrices are affected). This action also lights the appropriate "TRIP CHAN BYPASS" indicator on the Channel Control Panel and gives annunciator "AFW PP AUTO START BYPASSED" ["AFAS-1/ AFAS-2 BYPASS"] on RTGB-102[202]. The Channel Bypass relays are powered from auctioneered power supplies.

{PRIVATE }Battery Failure Bypass {tc \l 2 "Battery Failure Bypass"}

AC power for each channel is provided via an instrument inverter which is powered from one of the two safety battery buses. Instrument Inverters A and C are powered from Battery Bus A and Instrument Inverters B and D are powered from Battery Bus B. The internal power supply auctioneering scheme for AFAS is such that the Bistable, Matrices, Initiation, Actuation, and Trip Bypass circuits for each channel should remain energized in the event one safety battery bus is lost. However, power would be lost to the corresponding process instruments (e.g., S/G Level, pressure) resulting in an actuation of AFAS-1 and AFAS-2. The Battery Failure Bypass was built to preclude the unneeded actuation.

Both of the Battery Buses are monitored for voltage and in the event one of them loses power the Battery Failure Bypass is invoked in affected Ch. A or B. The two affected

channels will trip, but in Ch. A(B) the battery bus monitoring relay causes the AFAS-1 and AFAS-2 Channel Bypass Relays in the affected Channel A or B to energize, placing that channel in Trip Channel Bypass. This causes the same annunciation and indication as the CHANNEL BYPASS, plus illuminates the BATTERY FAILURE BYPASS indicator on the Ch. A or B Control Panel front and additional annunciators on RTGB-102(202). The additional annunciators are:

UNIT 1	**UNIT 2**
AFAS Bistable Pretrip	AFAS Cabinet Trouble
AFAS Stm Gen Faulted Channel Trip	
AFAS Stm Gen Low Level Channel Trip	
AFAS Trouble/Test	

The end result is one of the two affected channels is bypassed (Ch. A or B), the other is in a tripped condition (Ch. C or D) and the AFAS coincidence logic is reduced to 1 out of 2. If a low level or loss of power subsequently occurs in one of the two operable channels, an AFAS-1(2) would occur.

Question 46

Unit 2 is performing a load reduction to 60% power. It has been determined that the Axial Shape Index (ASI) will need to be controlled during this power maneuver. Current ASI is +0.2 RPS units which is on the Equilibrium Shape Index (ESI) value.

Which of the following describes the method to control ASI at the 100% power level during the power reduction?

(Assume CEA's are currently at 129" withdrawn)

A. CEA withdrawal for ASI control, Boric acid addition for power reduction

B. CEA insertion for ASI control, Boric acid addition for power reduction

C. No CEA motion for ASI control, Boric acid addition for power reduction

D. Only CEA insertion for ASI control and power reduction

A. Incorrect, will cause rapid shift of ASI outside transient band

B. Correct

C. Incorrect, ASI will shift toward top of core, and result in ASI outside transient band

D. Incorrect, to much CEA insertion will shift ASI to bottom of core and result in ASI outside transient band.

Question level: 2
Question source: New
Exam: Both
K/A: 015.K5.15
Importance: 3.3 / 3.7
Reference: 0-NOP-100.02 Axial Shape index Control

6.3 Planned Load Reductions

CAUTION
Simultaneous power reduction / CEA withdrawal or power escalation / CEA insertion should not be carried out since both actions tend to accelerate the axial power shape shift in the same direction and thus induce xenon oscillations. These actions could also result in a rapid shift of the ASI outside the transient band.

1. If a planned load reduction is required, Then FOLLOW the transient control band of Limit and Precaution Steps 4.3 and 4.4 of this procedure.

   A. Control outside this transient band is undesirable but not prohibited.

   B. Reactor Engineering will provide direct assistance to the Control Room Operators when operation outside the transient band is needed.

   C. ¶1 If reducing load, Then REDUCE the variance from the ESI to $\pm$ 0.2 by CEA motion.

      1. This will reduce the effect of oscillations caused by the power reduction.

      2. This should be considered up to 28 hours in advance of a known planned load change.

   D. REDUCE turbine and reactor power and REPOSITION lead group CEAs to control ASI to the full power ESI unless otherwise directed by Reactor Engineering.

   E. INCREASE turbine and reactor power and REPOSITION lead group CEAs to control ASI to the full power ESI.

END OF SECTION 6.3

Question 47

The Unit 1 ‘A’ QSPDS has displayed one of the Core Exit Thermocouples (CET) as ‘suspicious’.

A ‘suspicious’ CET is displayed on the QSPDS plasma screen as:
(assume no other CET abnormalities)

A. a question mark in front of the value, and discarded from the calculation.

B. parameter value field filled with question marks in the inverse mode, but still used in the calculation

C. system error, and discarded from the calculation

D. setpoint error, but still used in the calculation

A. Correct

B. Incorrect, correct if valid CET inputs <9.

C. Incorrect, this is hardware or software error

D. Incorrect, this is multi-input calculated value out of range/bad data.

Question level: 1
Question source: New
Exam: Both
K/A: 017.A4.01
Importance: 3.8 / 4.1
Reference: 1-1150020 Qualified Safety Parameter Display System Operation 0711407 ICIC and QSPDS Lesson Text, 0702407-09 ICIC and QSPDS Lesson plan

The QSPDS displays individual core exit temperatures with a core map, the highest and next highest core exit temperature in each quadrant, and a representative core exit temperature. Refer to Figures 32 and 41.

The representative core exit temperature is calculated based on a statistical analysis with practice checks from the inputs:

- The out-of-range CET temperature inputs are discarded.
- The mean CET temperature is calculated from the remaining inputs.
- The CET temperature inputs are checked within a statistical band around the mean CET temperature. Those inputs falling outside the bands are flagged as suspicious inputs and discarded from the calculation.
- The mean CET temperature is then recalculated using the remaining inputs.

The process continues until there are no more flagged or discarded inputs. At this point, the CET inputs are considered stable and valid, and the representative CET temperature is calculated.

The mean CET temperature is constrained to be ± 30°F of the maximum Hot Leg Temperature. Those CET(s) with outputs that are more than ± 30°F from the mean CET temperature are flagged "suspicious" (denoted by a '?') and not used until their values return to less than ± 30°F from the mean CET temperature. Both the out-of-range and suspect inputs are considered invalid, with the out-of-range inputs displayed as all question marks and the suspect inputs displayed as a question mark in front of the displayed value.

When saturation margin alarm occurs, either RCS or upper head, the process of identifying suspicious CET temperatures stops. At this point all CET inputs are considered valid except those previously flagged and those out-of-range. Any remaining suspect CET input will be reconsidered in the calculation if it falls within a specified band around the mean CET temperature. If the number of valid CET inputs is less than nine [eight], the representative CET temperature and the other CET calculated variables will be displayed as all question marks.

8.0 INSTRUCTIONS: (continued)

8.2 (continued)

2. (continued)

C. (continued)

¶2

NOTE

The representative core exit temperature is calculated based on a statistical analysis with practice checks from the input. The out-of-range CET temperature inputs are discarded, the mean CET temperature is calculated from the remaining inputs, the CET temperature inputs are checked within a statistical band around the mean CET temperature. Those inputs falling outside the bands are flagged as suspicious inputs and discarded from the calculation. The mean CET temperature is then recalculated using the remaining inputs.

The process continues until there are no more flagged or discarded inputs. At this point, the CET inputs are considered stable and valid, and the representative CET temperature is calculated. The mean CET temperature is constrained to be plus or minus 30 degrees F of the maximum Hot Leg temperature. Those CET(s) with outputs that are more than plus or minus 30 degrees F from the mean CET temperature are flagged "suspicious" (with ?) and not used until their values return to less than plus or minus 30 degrees F from the mean CET temperature. Both the out-of-range and suspect inputs are considered invalid, with the out-of-range inputs displayed as all question marks and the suspect inputs displayed as a question mark in front of the displayed value.

When saturation margin alarms occurs, either RCS or upper head, the process of identifying suspicious CET temperatures stops. At this point all CET input are considered valid except those previously flagged and those out-of-range. Any remaining suspect CET input will be reconsidered in the calculation if it falls within a specific band around the mean CET temperature.

If the number of valid CET inputs is less than nine, the representative CET temperature and the other CET calculated variables will be displayed as all question marks. If the number of CETs operable becomes less than 2 in any one quadrant, a "CET Below Tech Spec Minimum Requirement" alarm message is displayed.

The aforementioned description only holds true for the Core Exit Thermocouple (QSPDS Display Page 213). The above description does not apply to the Subcooled Margin (QSPDS Display Pages 211 and 311). The Subcooled Margin display annotates the CET temperature with a question mark when the CET input data is outside a calculated statistical acceptance/rejection band. This particular statistical acceptance/rejection band is derived by calculating the average value of all valid CETs in the specified range between 40°F and 2295°F, calculating the standard deviation by taking the square root of the sum of the squares. The standard deviation is multiplied by a given ration of 2.33, if the value inputs is greater than 30°F, the CET temperature on the Subcooled Margin is marked as suspect by display a question mark.

The increase is suspect CET inputs can be attributed to the core loading. The new fuel assemblies are loaded into the center of the core and the partially burned fuel assemblies are relocated to the outer core perimeter. The center of the core has a higher temperature than the outer perimeter. Per discussion with Reactor Engineering, the expected range of assembly outlet temperature is approximately from 615°F to 562°F. Therefore, the QSPDS will mark CETs as suspect due to the wide delta temperature experienced as a result of the core loading. I&C Department or Engineering will have to determine if CET is inoperable if a determination is required and can not be determined by OP-1-0010125A Data Sheet 26. /R13

2. Bad Data Alarm - parameter values are replaced with question marks.

Question 48

Unit 2 is in a refueling outage and is currently in Mode 5. The temporary containment cooler chiller units are being installed.

Which of the following is **NOT** an acceptable method to control this temporary system alteration?

A. Equipment clearance order.

B. Nuclear Plant Work Order (NPWO).

C. Station an operator at the equipment.

D. Declaring the Containment Coolers out of service.

A. Incorrect

B. Incorrect

C. Correct

D. Incorrect

Question Level: 1
Question Source: New
Exam: Both
K/A: 2.2.11
Importance: 2.5 / 3.0
References: Temporary System Alteration Control 0010124, LP 0702841-19

8.0 INSTRUCTIONS:

8.1 Applicability

1. The purpose of this procedure is to evaluate the impact on safety and maintain control of the actual plant configuration for temporary system alterations whose implementation and removal are not controlled and tracked by other plant processes described below.

2. This procedure **SHALL NOT BE USED** if the change to the system or component is covered by one of the following:

   A. Controlled by Approved Plant Procedure/Guideline/LOI

      1. The implementation and restoration of the temporary system alteration is controlled by a plant procedure/guideline/LOI approved by the Plant General Manager where that procedure/guideline/LOI provides for post-implementation and post-restoration independent verification (if applicable) and testing (if appropriate).

      2. Approved Procedure Not Requiring a TSA

         For controlling alterations and thus qualifying as exempt from the guidelines of this procedure, an approved procedure shall include the following:

         a. Clearly identify the placement and removal of the alteration.

         b. Independent verification of the alteration, if applicable.

         c. Guidelines for post-installation and post-restoration testing, if applicable.

         d. If a TSA must remain in place after completion of the approved procedure, the alteration shall be made in accordance with this procedure.

8.0 INSTRUCTIONS: (continued)

8.1 (continued)

2. (continued)

B. Controlled by NPWO:

Provisions for system alterations associated with troubleshooting/maintenance on equipment not taken out of service on a Plant Clearance Order have been made for within the NPWO procedure (ADM-0010432, Section 6.5.5).

C. Disabled Equipment Controlled by Plant Clearance Order

System alterations performed on disabled equipment where the alteration is controlled by an active clearance order and the components affected are declared out-of-service. Clearance tags should be hung directly on the alteration (e.g. on the jumper, tubing, lifted lead or gagging device) to ensure the affected equipment is verified to be restored to its normal configuration during the releasing of the clearance.

D. Temporary modifications to be installed on components that are out of service may be excluded from the requirements of this procedure. This exclusion does not apply if temporary modifications affect interfacing systems or components which are in service. If the temporary modifications must remain installed after the equipment is returned to service, this exclusion will not apply.

E. TSAs shall not replace In-Plant Equipment Clearance Orders. If a clearance is required, refer to ADM-09.04, "In-Plant Equipment Clearance Orders."

F. Control Not Required

1. Installation of electrical or electronic test equipment where the test connections are permanent jacks designed specifically for their installation.

2. Installation of temporary process monitoring equipment at locations specifically designed for their installation and shown on permanent plant drawings. For example, a pressure gage installed at PX 21-1A would not fall within the scope of this procedure.

Question 49

The Unit 2 Instrument Air System has been cross-tied with the Station Air System.

In accordance with ONP-2-1010030, Loss of Instrument Air, what actions must be taken within 1 hour?

A. Install a diesel driven air compressor to augment the Station Air supply.

B. Blow down the Instrument Air header drains to remove oil, water, and crud build-up.

C. Isolate the Station Air cross-tie and open the Unit 1 cross-tie to the Unit 2 Instrument Air System.

D. Perform a controlled downpower and take the Unit off the line.

A. Incorrect, not necessary, the Station Air System can supply Instrument Air.

B. **Correct**

C. Incorrect, Unit 1 cross-tie opens automatically when Instrument Air pressure is decreasing.

D. Incorrect, not necessary, the Station Air System can supply Instrument Air.

Question level: 1
Question source: New
Exam: RO
K/A: 079.K1.01
Importance: 3.0
Reference: 2-1010030, Loss of Instrument Air, 0702812-2

7.0 OPERATOR ACTIONS: (continued)

7.1 Immediate Operator Actions: (continued)

3. (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
B. OPEN SH18718, Service Air Cross-tie to Instrument Air Isol.	
C. If the Instrument Air header is fed from the Service Air header for greater than 1 hour, Then BLOW DOWN the Instrument Air header low point drains hourly to remove oil, water and crud build-up.	
4. If the Instrument Air header pressure indicates less than 60 psig and is still lowering, Then PERFORM the following:	
A. TRIP the Reactor and Turbine.	
B. GO TO 2-EOP-01, Standard Post Trip Actions.	

Question 50

During the performance of Standard Post trip actions on Unit 2, you observe the 2A Steam Generator (S/G) blowdown radiation monitor on the PC-11 as 'Magenta' and the 2B Steam Generator (S/G) blowdown radiation monitor as 'Yellow'.

Which of the following conditions does this indicate?

2A S/G has a:

A. monitor communication failure, 2B S/G is in 'high' alarm on radiation.

B. monitor communication failure, 2B S/G is in 'alert' alarm on radiation.

C. loss of process flow, 2B S/G is in 'high' alarm on radiation.

D. loss of process flow, 2B S/G is in 'alert' alarm on radiation.

A. Incorrect, 2B S/G in alert

B. Correct

C. Incorrect, 2A S/G loss of communication, 2B S/G in alert

D. Incorrect, 2A S/G loss of communication

Question Level: 1
Question Source: New
Exam: Both
K/A: 037.AA2.13
Importance: 4.1 / 4.3
References: 0711411 Unit 2 Radiation Monitoring system lesson text, 0702411-07 Unit 2 Radiation Monitoring system lesson plan

TABLE 7

PC-11 DISPLAY STATUS AND ASSOCIATED COLOR/INTENSITY CUES

Monitor Line Status	
Monitor Offline	White
PC-11 Communications	
Channel not Responding to Poll	Magenta
Monitor Communications Failure	Magenta
System Failure	
Monitor Status Unknown	Dark Blue
Channel Out of Service	Dark Blue
Monitor Loss of Sample Flow	Dark Blue
Channel Filter not Moving	Dark Blue
No Pulses Received on Channel	Dark Blue
Checksource Test Failed	Dark Blue
Checksource Test Failed Assc. Channel	Dark Blue
No Pulses Received by Assc. Channel	Dark Blue
Channel High Alarm	
Channel in High Alarm	Red
Channel Alert Alarm	
Channel in Alert Alarm	Yellow
Equipment Failure	
Monitor Loss of Process Flow	Light Blue (Cyan)
Monitor in Scan Overload	Light Blue (Cyan)
Channel Filter Clogged	Light Blue (Cyan)
Channel Excessive Negative Deltas	Light Blue (Cyan)
Monitor Loss of Flow Control	Light Blue (Cyan)
Monitor Loss of Isokinetic Controls	Light Blue (Cyan)
Monitor Loss of RM-23 Communications	Light Blue (Cyan)
Monitor Instrument Failure	Light Blue (Cyan)
Monitor Low Vacuum Alarm	Light Blue (Cyan)
Monitor High Vacuum Alarm	Light Blue (Cyan)
Monitor Functions	
Channel Checksource Energized	Half Intensity Cyan
Monitor Purging	Half Intensity Cyan
Channel Filter Advancing	Half Intensity Cyan
Normal Operations	
Normal Operating Condition	Green

PRIORITY BY COLOR (highest to lowest)

1. Blink/Red
2. Blink/Yellow
3. Blink/Light Blue
4. Grey
5. Blink/Dark Blue
6. No-Blink/Red
7. No-Blink/Yellow
8. No-Blink/Light Blue
9. No-Blink/Half Intensity Light Blue
10. No-Blink/Dark Blue
11. No-Blink/Green

Question 51

During a Unit 2 rapid downpower the following annunciators were received:

- G-9 2B S/G Level High/Low
- G-15 'FW Reg. Valve supply Air Press Low

Instrument air has been lost to the 2B Main Feedwater Regulating Valve (MFRV)

Which of the following explains the 2B S/G level response as the downpower continues? (assume no Operator actions)

2B S/G level is trending:

A. high due the MFRV failing as is

B. high due to the MFRV failing open

C. low due to the MFRV failing closed

D. low due to the MFRV failing as is

A. **correct, feed flow will exceed steam flow during the downpower and level will increase.**

C. incorrect, MFRV fails as is

D. incorrect, MFRV fails as is

E. Incorrect, level will be high

Question Level: 2
Question Source: New
Exam: Both
K/A: 054.G2.4.45
Importance: 3.3 / 3.6
References: 0711408 Steam Generators and Feedwater control system Lesson Text
0702408-06 Steam Generators and Feedwater control system Lesson Plan

{PRIVATE }MSR Quench Water{tc \l 3 "MSR Quench Water"}

Feedwater is supplied to the tube side drain of the MSRs as they enter the #5 Heater, see Figure 23, to prevent flashing of the cascading drain to FW Heaters 5A and 5B. The feedwater is supplied from the feedwater system downstream of the feedwater pump discharge off a drain connection on the tube side of feedwater heaters 5A and 5B.

{PRIVATE }Feedwater Flow Control{tc \l 3 "Feedwater Flow Control"}

The MFW pumps supply water to the S/Gs at high pressure. Flow control, consisting of the feedwater regulating valve and S/G level control system, feedwater regulating valve bypass valves, and feedwater isolation valves, is maintained by operation of these valves under varying plant conditions. Refer to S/G and FWCS text, 0711408 for more detail.

{PRIVATE }Main Feedwater Regulating Valves{tc \l 3 "Main Feedwater Regulating Valves"}

The main feedwater regulating valves (MFRV), FCV-9011 and FCV-9021, are air piston-operated balanced plug globe valves. Refer to Figure 24. The cage assembly has slotted openings of varying widths around its circumference. As the piston moves upward to open the valve, less and less movement is required to increase flow. This type of valve gives accurate control at relatively large flow rates.

- Loss of air fails the valve **As-Is.**
- Loss of power fails the valve **CLOSED**.

The feedwater regulating valve can be operated in three ways. Local manual operation can be accomplished with the actuator handwheel. Pneumatic operation is accomplished by means of a signal from the feedwater regulating system in automatic, or by manual control on RTGB-102. Feedwater regulating valve signal generation and operation is discussed in detail in Steam Generator and Feedwater Control System text, 0711408.

Bypass flow control around the feedwater regulating valves is available by assuming manual control of either the 15% or 100% bypass valves, and shutting the feedwater regulating valve inlet block valves, MV-09-5 and MV-09-6.

The 100% bypass valves, MV-09-3 and MV-09-4, are motor-operated globe valves that will allow 100% of the flow necessary for full-power operation of the affected steam generator. They are not normally used for plant operation. **The Unit 1 100% bypass valves receive an**

REVISION: 1	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: G
PROCEDURE NO: 1-ARP-01-G9	ST. LUCIE UNIT 1	WINDOW: 9

ANNUNCIATOR PANEL G

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48

1B S/G
LEVEL
HIGH/LOW
G-9

DEVICE:
LIA-9006

LOCATION:
RTGB-102

SETPOINT:
HIGH 70%
LOW 60%

/R1/R1

ALARM CONFIRMATION:
1. LIC-9023A through LIC -9023D, 1B SG Level , indicate high or low Steam Generator level.
2. LI-9022, 1B SG Level Wide Range indicates high or low Steam Generator level.
3. LR 9011/9021, SG Level Recorder indicates high or low Steam Generator level
4. FR 8021/9021, SG 1B STM FLOW /FEEDWATER FLOW Recorder indicates high or low steam/ feedwater flow rates.

OPERATOR ACTIONS:
1. CHECK the four Safety Level channels (LIC-9023A through 9023D) for either high or low level in the 1B Steam Generator.
2. IMPLEMENT ONOP 1-0700030, Main Feedwater.
3. If 1B S/G Level continues to rise, Then ENSURE FCV-9021, 1B Steam Generator Flow Control closes at 82.2% SG level on 2/4 safety channels (LIC-9023A through LIC-9023D)
4. If 1B S/G Level still continues to rise, Then ENSURE Automatic Turbine Generator/ Main Feedwater pump trips at 90% SG level on 2/4 safety channels (LIC-9023A through LIC-9023D)

CAUSES: Either a High or Low level in the 1B Steam Generator due to a loss of a Main Feedwater pump, loss of a Condensate pump, loss of a Heater Drain pump, or a Feed Reg valve malfunction.

REFERENCES
1. CWD 8770-B-327 SH 624, 377, 709, 710
2. TEDB

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: G
PROCEDURE NO: 2-ARP-01-G15	ST. LUCIE UNIT 2	WINDOW: 15

ANNUNCIATOR PANEL G

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48

FW REG VALVE
SUPPLY AIR
PRESS
LOW
G-15

DEVICE:
PS-9011
PS-9021

LOCATION:
TGB/62/S-26/W-A
TGB/62/N-29/W-A

SETPOINT:
LOW 70 psig
LOW 70 psig

ALARM CONFIRMATION:
1. Annunciator F-5, INSTR AIR PRESS HIGH/LOW .
2. PI-18-9, Instrument Air Pressure, indicates less than expected .

OPERATOR ACTIONS:
1. VERIFY FIC-9011 and FIC-9021 are controlling Steam Generator level properly.
2. DISPATCH an operator to PERFORM the following:
   A. CHECK Instrument air pressure at the Main Feedwater regulating valves.
   B. CHECK for air leaks on the Main Feedwater regulating valves and instrument racks.
   C. ENSURE V18424, Instr Air to FCV-9021 Isol, and V18433, Instr Air to FCV-9011 Isol, are open.
3. **GO TO ONOP 2-0700030 Main Feedwater.**

CAUSES: This alarm is caused by low instrument air pressure due to an instrument air system problem, an instrument air valve being closed, or an air leak on the Main Feedwater Instrument Racks.

REFERENCES
1. CWD 2998-B-327 SH 627
2. TEDB

Question 52

Which of the following will have the greatest impact on Spent Fuel Pool temperature?
(assume no Operator actions)

A. SIAS

B. Fuel Pool Heat Exchanger tube leak

C. Loss of 1 of 2 running Fuel Pool Cooling Pumps

D. Loss of 1 of 2 running CCW Pumps

A. Correct, isolates CCW to the Fuel Pool Heat Exch.

B. Incorrect, CCW will leak into the fuel pool, raising level.

C. Incorrect, one Fuel Pool Cooling Pump capable of maintaining temp.

D. Incorrect, one CCW Pump maintains cooling water flow.

Question level: 2
Question source: New
Exam: Both
K/A: 033.K3.03
Importance: 3.0/3.3
Reference: 1-0350030, Fuel Pool Cooling System, 0702812-4

7.0 OPERATOR ACTIONS: (continued)

7.2 (continued)

INSTRUCTIONS	**CONTINGENCY ACTIONS**
3.	3. (continued) B. CONTACT EM for troubleshooting and repairs. **C. GO TO STEP 7.2.4.**

NOTE

The Fuel Pool Cooling System is designed to limit fuel pool temperature to 150°F with 3 1/3 cores stored in the pool. During normal operations, the fuel pool temperature is maintained less than 120°F with one cooling pump in operation; however, due to the enlarged capacity of the fuel racks and possible shorter unloading times for the annual refuelings, it may be necessary to operate both spent fuel cooling pumps for a short period of time after a refueling offload to maintain pool water temperature less than 125°F .

NOTE

If CCW has been lost due to SIAS, conditions required to reset the safeguards signal should be met before restoring CCW.

4. If Fuel Pool cooling is degraded, Then locally verify Fuel Pool temperature to be less than 125°F. (TIA-4420, west side of Fuel Pool 62' elev.).	4. If Fuel Pool temperature is greater than 125°F, Then: A. Manually isolate Fuel Pool Ion Exchangers. B. Ensure proper CCW alignment to the Fuel Pool Hx. Refer to 1-NOP-14.01, Component Cooling Water System Initial Alignment.

Question 53

A waste gas release is being performed from the 1A Gas Decay Tank at Unit 1. Which of the following will automatically terminate the release?

A. An unexpected drop in the 1A Gas Decay Tank pressure.

B. Gas decay tank oxygen concentration > 4% by volume.

C. High radiation alarm on the Plant Vent process radiation monitor.

D. Neither RAB Exhaust fan HVE-10A or HVE-10B are running.

A. Incorrect, must be manually terminated, will not automatically stop release.

B. Incorrect, must be manually terminated, will not automatically stop release.

C. Incorrect, high rad. on waste gas process monitor will automatically stop release.

D. **Correct, one RAB exhaust fan must be running during release.**

Question level: 1
Question source: New
Exam: Both
K/A: 071.K4.04
Importance: 2.9/3.4
Reference: ONP-1-25.02, Ventilation Systems, 0702410-9

6.0 OPERATOR ACTIONS

6.1 RAB Ventilation

INSTRUCTIONS | **CONTINGENCY ACTIONS**

> **CAUTION**
> Operating HVE-10A and HVE-10B simultaneously may result in fatigue damage to duct work.

1. If both HVE-10A and HVE-10B, RAB Main Exhaust Fans are TRIPPED, Then PERFORM the following:

   A. ENSURE V6565, Waste Gas Stop Valve, is CLOSED.

   B. MONITOR RAB area temperatures.

   C. REFER TO Tech Spec 3.7.8.1, ECCS Area Ventilation System.

> **NOTE**
> With both RAB Main Exhaust fans stopped, the RAB Main Supply Fans should be stopped or an ECCS Emergency Exhaust Fan should be started.

   D. If an ECCS Emergency Exhaust Fan is to be started, Then START **ONE** of the following:

   - HVE-9A
   - HVE-9B

   E. If RAB ventilation is to be shut down, Then PLACE RAB Main Supply Fan control switches to STOP:

   - HVS-4A
   - HVS-4B

isotopic analysis of the gaseous waste to be discharged. The monitor will then alarm if the discharge activity exceeds this predetermined value. When the alarm is activated, valve V-6565 will shut and terminate the release. (Both RAB main exhaust fans 10A and 10B not running will also shut V6565.)

Control Room Outside Air Intake (OAI) Monitors (Channels 46 and 47)

The Control Room OAI monitors (Channels 46 and 47) are designed to monitor intake air for the protection of Control Room personnel. A high radiation alarm from either of these monitors will close the Control Room Ventilation Outside Air Intake valves and place the Control Room Ventilation System on recirculation.

These monitors are Victoreen monitors similar to those already discussed but equipped with sample pumps and solenoid valves for obtaining a sample stream. Each monitor is capable of sampling the North or South Control Room OAI ducts. Only one monitor is in service at a time. Each monitor unit is equipped with its own detector and sample pump system. Controls and indication for each monitor unit are provided on the Radiation Monitoring Panel in the Control Room and also locally at the monitor unit itself (Figures 14 and 15).

The detectors are gamma scintillation detectors with photomultipliers. Output is supplied to a Log Ratemeter and is recorded on the multi-point process radiation recorder.

The pumping system motor can be started from the pump or locally. The pumping system air flow rate is adjustable via a bleed air valve located at the pump inlet.

The Control Room controls consists of an OAI Inlet Panel, OAI System Select Control Panel, 'A' OAI Pump Control Panel, 'A' Outside Air Intake Log Ratemeter, 'B' OAI Pump Control Panel, and 'B' Outside Air Intake Log Ratemeter. Refer to Figure 15.

These panels are used to select the operating mode of this system. For example, the operator can choose to use the 'A' OAI Radiation Monitor (which requires the 'A' OAI

Question 54

Unit 2 was operating at 100% power with the following conditions:

- 2C AFW pump out of service
- Reactor trip occurred due to a Loss of Off-Site Power.
- 2A Emergency Diesel Generator automatically loaded on the bus
- 2B Emergency Diesel Generator started but its breaker didn't close and was manually closed two minutes later.
- 2-EOP-09 LOOP has been entered
- AFAS has actuated

Assuming no Operator actions, which of the following explains the AFW lineup?

A. The 2A and 2B AFW pumps are running feeding their respective S/G's

B. The 2A AFW pump is running feeding only the 2A S/G. The 2B AFW pump is running but not feeding the 2B S/G.

C. The 2A and 2B AFW pumps are running but not feeding either S/G

D. The 2A AFW pump is feeding both S/G's

A. Incorrect, 2B AFW will not be feeding 2B S/G due to the delay in energizing the 2B3 bus and subsequent AFAS lockout on the B side

B. Correct, FW header ΔP would be significant due to the 2B EDG delay.

C. Incorrect, 2A will be feeding the 2A S/G

D. Incorrect, this would require manual operation

Question level: 2
Question source: New
Exam: Both
K/A: 061.K4.02
Importance: 4.5/4.6
Reference: 0711412-7, AFW System and AFAS

delay device will start when the respective AFAS signal is present, the bus is energized and the EDG Breaker is closed.

As an example, assume a trip occurs with a Loss of Off-Site Power to both buses. The Emergency Diesels will start and power up the Safety Buses. This would occur before the AFAS timers time out. When the AFAS signal is received at the pump control circuit, its' diesel loading timer starts. At the end of 15 [30] seconds, the AFW pump will start. In the meantime, AFW Pump C should have started on the AFAS signal and the appropriate valves stroked open supplying AFW to the S/Gs.

For another example, assume a trip occurs, AFAS initiated, the operator secured AFW Pump C and throttled flow to the S/Gs on pumps A and B when a Loss of Off-Site Power occurs. Both electric pumps are load shed, so AFW flow is lost (remember the C pump is secured). When the EDG reenergizes the bus, the timer starts. At the end of the delay the electric Pumps would sequence back on. As an alternative, flow can be restored immediately by using the C pump.

Both of these examples are potential scenarios for an AFAS-1(2) d/p lockout to one of the S/Gs. A feedwater header d/p lockout can occur due to one header being pressurized before the other one. This can result from differences in equipment response times (i.e., valve stroke), differences in the sequence of events (i.e., AFAS-1 occurs before AFAS-2), loss of one offsite source vs. both, etc.

OPERATION OF REMOTE-MANUAL INITIATION SWITCHES (RTGB-202)

Each Remote-Manual Initiation Switch at RTGB-202 immediately de-energizes the Initiation, Interposing, Lockout, and both the cycling and latching Actuation Relays for its respective channel. Thus, all four switches associated with AFAS-1(2) should be positioned to MANUAL for complete actuation and AFW flow will commence without delay. After the flow control valves have traveled to their full-open position, they can then be throttled to establish manual S/G level control. Since the switches de-energize the Initiation Relays directly (Figure 27), both the Fault/Rupture Identification and the Automatic Level Control features associated with that S/G will be defeated.

AFAS System behavior upon returning the RTGB-202 switches to AUTO will depend upon the status of S/G level and the Initiation Time Delay timer:

Question 55

A Loss of Coolant Accident has occurred with the following conditions:

- RCS Thot is 512ºF
- Pressurizer pressure 1120 psia

Which of the following describes the RCP operating strategy and the reason for such?

A. Trip all RCP's to conserve RCS inventory.

B. Trip all RCP's due to loss of RCP NPSH.

C. Run one RCP in each loop, to enhance the RCS heat removal process.

D. Run three RCP's, continuing to run four RCP's may result in fuel uplift.

A. Incorrect, subcooling >20ºF. two RCP's are left running

B. Incorrect, subcooling >20ºF. two RCP's are left running

C. Correct

D. Incorrect, fuel uplift consideration at <500ºF

Question Level: 2
Question Source: New
Exam: Both
K/A: 003.G2.4.18
Importance: 2.7 / 3.6
References:EOP-03 LOCA, 0711824 Lesson Text Loss of Coolant Accident
0702824-06 Lesson Plan Loss of Coolant Accident

{PRIVATE }1.5.4 Reactor Coolant Pump {tc \l 3 "1.5.4 Reactor Coolant Pump "}Trip Strategy

The LOCA operational strategy directs the operator to trip two RCPs (in opposite loops) if pressurizer pressure is less than 1300 psia (maximum pressure plateau for a SBLOCA). This action may have already taken place in the SPTAs, in which case the operator would simply verify that two RCPs in opposite loops have been tripped. If RCS subcooling is less than 20° F., the operational strategy directs the operator to trip all four RCPs.

If minimum RCS subcooling (>20°F) is satisfied, the other two RCPs remain in operation unless one or more of the RCP operating requirements (e.g. temperatures, oil pressure, motor amps) are not satisfied. In such cases, any pump which does not satisfy these requirements would be tripped. If the operator cannot confirm that a LOCA has occurred, and EOP-15 is entered, the RCP trip strategy in EOP-15 is identical to EOP-3.

The Trip 2/Leave 2 strategy has two goals. First, it maintains forced RCS circulation for non-LOCA depressurization events, and for LOCA events in which the rate of RCS inventory loss is not duly exacerbated by leaving two RCPs in service. Second, it ensures that all four RCPs are tripped for LOCAs in which the RCS leak rate may challenge RCS heat removal capability if forced circulation is continued.

If the LOCA procedure is implemented when no charging pumps are available and no significant RCS leak exists, stopping all four RCPs at 1300 psia. would severely inhibit the operator's ability to reduce RCS pressure to the point where HPSI pumps could restore RCS inventory, since neither main or aux spray would be available. Conversely, continuing to run two RCPs for LOCAs in which the RCS inventory loss is great enough to challenge the subcooling margin acceptance criteria carries a separate risk. Under these conditions, forced circulation tends to increase the total inventory loss. Shortly after NPSH is lost, it is likely that the remaining RCPs will have to be tripped due to loss of subcooled margin. In this scenario, RCS inventory will be much less than it would have been if the RCPs were tripped earlier in the event.

Question 56

The Unit 2 Fuel Handling Bldg has experienced a high radiation condition on the Spent Fuel Pool Radiation Monitors.

When the high radiation condition has cleared, what operator action is initially required to restore the ventilation systems to their normal configuration?

A. Depress the Fuel Pool HVAC high radiation reset pushbuttons.

B. Stop the operating Shield Building Exhaust fans.

C. Start a Fuel Pool Exhaust fan.

D. Start the Fuel Handling Building Exhaust fans.

A. Correct, reset pushbuttons must be pushed first.

B. Incorrect, Shield Bldg Exhaust fans will not stop till reset pushbuttons depressed.

C. Incorrect, reset pushbuttons must be depressed first.

D. Incorrect, FHB Exhaust fans will not start till reset pushbuttons depressed.

Question level: 1
Question source: New
Exam: Both
K/A: 072.A4.02
Importance: 2.5/2.5
Reference: 2-ONP-26.02, Area Radiation Monitors, 0702411-9

APPENDIX B
FUEL POOL VENTILATION RESTORATION
(Page 1 of 2)

1. RESET the Fuel Pool High Radiation interlocks as follows (HVAC Panel):

   A. PRESS the Fuel Pool HVAC HI RAD A Reset pushbutton.

   B. PRESS the Fuel Pool HVAC HI RAD B Reset pushbutton.

2. STOP the operating Shield Building Exhaust Fan(s):

   - HVE-6A, SBVS Exhaust Fan
   - HVE-6B, SBVS Exhaust Fan

3. ENSURE the following components are positioned as indicated:

COMPONENT ID	COMPONENT NAME	POSITION
FCV-25-32	SBVS Isolation Valve	OPEN
FCV-25-30	Fuel Handling Emerg Vent Vlv	CLOSED
FCV-25-11	Outside Cooling Air to SBVS	CLOSED
D-29	Fuel Pool Inlet Damper	OPEN
D-31	Fuel Pool Outside Damper	OPEN
D-33	Fuel Hdlg Bldg Inlet Damper	OPEN
D-35	Fuel Hdlg Bldg Outlet Damper	OPEN
FCV-25-33	SBVS Isolation Valve	OPEN
FCV-25-31	Fuel Handling Emerg Vent Vlv	CLOSED
FCV-25-12	Outside Cooling Air to SBVS	CLOSED
D-30	Fuel Pool Inlet Damper	OPEN
D-32	Fuel Pool Outlet Damper	OPEN
D-34	Fuel Hdlg Bldg Inlet Damper	OPEN
D-36	Fuel Hdlg Bldg Outlet Damper	OPEN

4. PLACE Fuel Pool Ventilation in service as follows:

   A. START a Fuel Pool Exhaust Fan:

      - HVE-16A, Fuel Pool Exhaust Fan
      - HVE-16B, Fuel Pool Exhaust Fan

   B. VERIFY HVS-6, Fuel Pool Supply Fan, starts.

Question 57

Unit 1 channel 'A' Pressurizer pressure safety channel has failed low and has yet to be bypassed. Shortly thereafter, safety channel 'B' Steam Generator pressure on the 1B Steam Generator failed high.

Which of the following describes the plant response?
(assume no Operator action)

The plant will:

A. trip due to RPS channel 'A' TMLP and RPS channel 'B' TMLP in trip.

B. trip due to RPS channel 'A' Pressurizer pressure and RPS channel 'B' TMLP in trip.

C. not trip, but RPS channel 'A' TMLP and RPS channel 'B' Steam Generator pressure will be in trip.

D. not trip, but RPS channel 'A' Pressurizer pressure and RPS channel 'B' Steam Generator pressure will be in trip.

A. **Correct, TMLP trip on channel 'A' due to low Pressurizer pressure and channel 'B' TMLP due to Asymmetrical S/G.**

B. Incorrect, Pressurizer pressure trip on RPS is high pressure not low pressure.

C. Incorrect, S/G pressure trip on RPS is low not high.

D. Incorrect, both RPS trips incorrect

Question Level: 2
Question Source: New
Exam: RO
K/A: 012.K4.01
Importance: 3.7
References:0711404 RPS Lesson Text, 0702404-07 RPS Lesson Plan

TM/LP TRIP

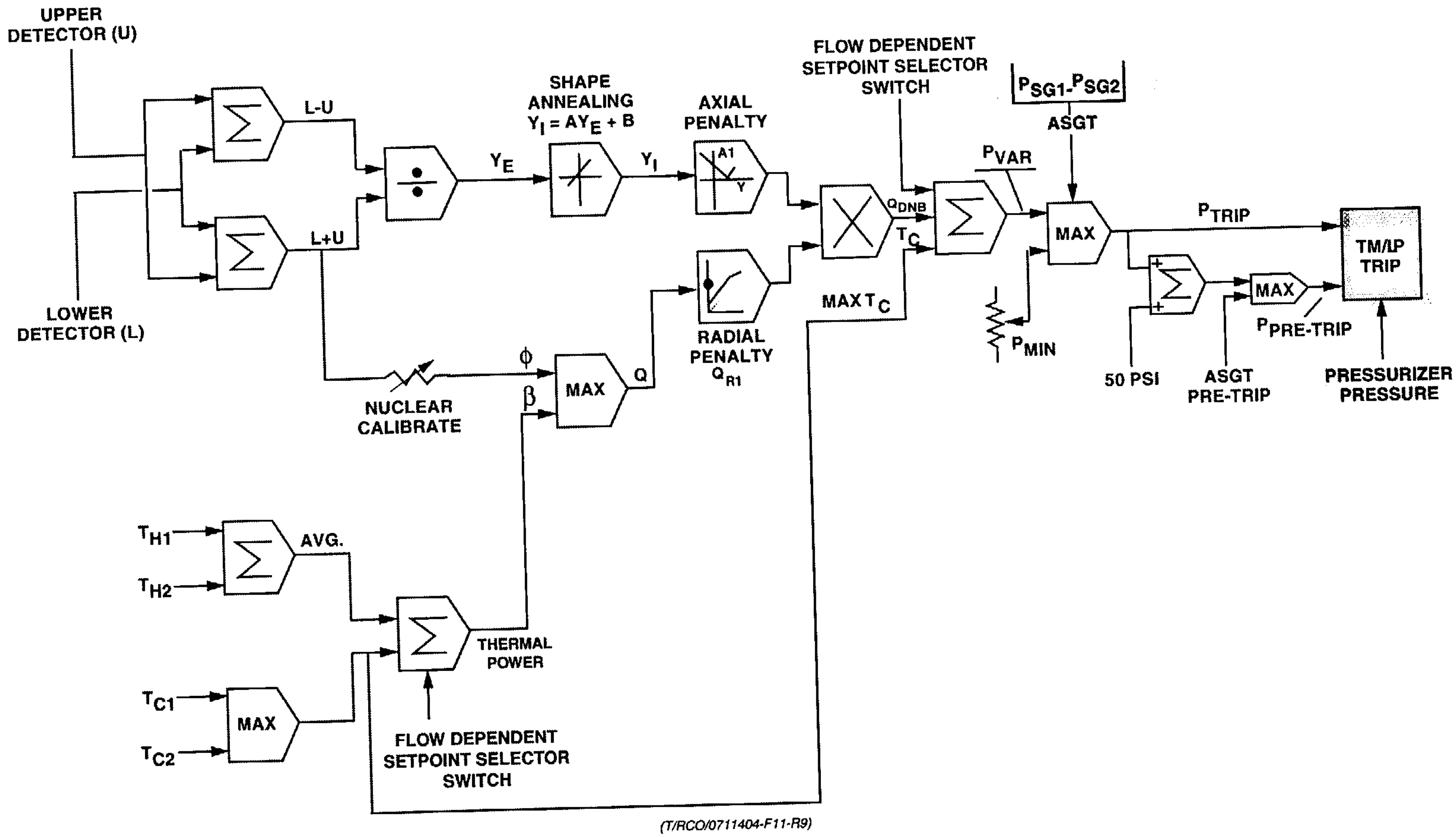


FIGURE 10

A channel pretrip annunciator, common to all four channels, is triggered by a pretrip condition on any one of the four channels.

- When the trip unit is key bypassed, relay K-29 is energized and prevents that channel from contributing a signal that would open the PORVs.

Thermal Margin/Low Pressure (TM/LP){tc \l2 "Thermal Margin/Low Pressure (TM/LP)}

- The TM/LP trip is provided to prevent operation when DNBR is less than **1.22 [1.28]**.
- A reactor trip is initiated whenever the RCS pressure signal drops below a minimum setpoint value of **1887 [1900] psia** or a continuously calculated setpoint (described below), whichever is higher. A TM/LP pre-trip occurs **50 psi** greater than the trip setpoint.
- 2-out-of-4 pretrips will generate a CWP.

RPS calculates inside CPCs the computed setpoint as a function of the higher of ΔT power or neutron power, reactor inlet temperature, the number of coolant pumps operating and the axial shape index. Consistent with Technical Specifications, the minimum value of reactor coolant flow rate, the maximum azimuthal tilt, and the maximum CEA deviation permitted for continuous operation are assumed in the generation of this computed trip setpoint. CEA group sequencing is also assumed to be in accordance with Technical Specifications.

A channel trip annunciator and/or channel pretrip annunciator, each common to all four channels, is triggered by a trip/pretrip condition on any one of the four channels. The TM/LP setpoint calculation is accomplished by the setpoint calculator shown in Figure 10. Included on Figure 10 is the functional location of the T_{COLD} calibrate potentiometer and flow dependent setpoint selector (FDSS) switch. Origin of the input signals is displayed as is the interface with the ASGT protective trip function.

Asymmetrical Steam Generator Transient (ASGT) Part of TM/LP

- The ASGT is designed to protect against AOOs, associated with secondary system malfunctions, that create asymmetric RCS cold leg temperatures, resulting in significant radial peaking.

- The most limiting event is the loss of load to one S/G caused by a single Main Steam Isolation Valve (MSIV) slow closure.

For this case, the ASGT results in a trip, sooner than the low steam generator level trip, providing a smaller degradation in the margin to maximum kw/ft limits and allowable DNBR.

The CPC TM/LP calculator, TM/LP bistable trip unit and steam generator pressure signals available in the RPS are utilized to provide a Rx trip for these events. Refer to Figure 11. The S/G pressure signals are the absolute value of the pressure difference between the two steam generators $|P_{SG1}-P_{SG2}|$. This value is utilized by the ASGT calculator to determine if asymmetric trip conditions are reached. See Figure 12.

- If the difference exceeds **135 [120] psid**, a signal is input to the TM/LP calculation which results in a reactor trip. The additional input sets the TM/LP low pressure trip value to 2500 psia ensuring a trip. A **70 psid** difference causes a 2500 psia signal to be applied to the pretrip setpoint yielding a TM/LP pretrip.

To test the ASGT, depress the test pushbutton located inside CPC-2. Test power is supplied from the logic matrix test power supply. The P_{SG1} and P_{SG2} test signals are set by potentiometers located in CPC-2. To verify that the unit works when S/G1 pressure is greater than S/G2 pressure and vice versa, the settings of the test potentiometers must be reversed and the test button pushed again.

Loss of Load{tc \l2 "Loss of Load}

- Although no credit is taken in the Safety Analysis, this trip provides turbine protection, reduces the severity of the ensuing transient, and helps avoid lifting the main steam line safety valves. This trip also precedes the high pzr pressure trip helping to limit RCS pressure.

The trip is initiated at **1000 psig** (T.S. 800 psig) as sensed by 2-out-of-4 low DEH oil pressure switches from the DEH Emergency Trip Header. The trip signal is automatically inhibited below **15%** power by contacts from the Linear Power Range Safety Channel Linear 1 (Lin 1) bistable. Refer to Figure 6.

- A turbine trip causes a loss of load reactor trip when operating above **15%** power.
- The Tech Spec value for Loss of Load is ≥ 800 psig.

Question 58

On Unit 2 Group 5 CEA's have just been withdrawn to 100 inches when the following alarms and indications occur:

- Reactor power decrease
- Group motion inhibit alarm
- Group out of sequence alarm
- Pulse counter indicates Group 5 and CEA #9 at 100 inches
- CEA #9 rod bottom light on the core mimic is not illuminated
- CEA #9 lower electrical limit (LEL) on the CEDMCS panel is illuminated

CEA #9 has:

A. dropped/slipped and actual position cannot be determined

B. dropped/slipped to 1 inch from the bottom

C. not dropped/slipped however LEL Reed Switch Position Transmitter (RSPT) has failed closed.

D. not dropped/slipped however LEL Reed Switch Position Transmitter (RSPT) has failed closed and Rod Bottom RSPT failed open.

A. Incorrect, reed switches available to determine position

B. Correct

C. Incorrect, power level decrease and alarms indicate CEA out of position

D. Incorrect, power level decrease and alarms indicate CEA out of position

Question Level: 2
Question Source: Palo Verde 1 1997 NRC exam
Exam: RO
K/A: 014.K4.06
Importance: 3.4
References: 0711405 Control Element Drive System lesson text, 0702405-07 Control Element Drive System Lesson plan

DIGITAL DATA PROCESSING SYSTEM (DDPS) POSITION INDICATION, ALARMS AND CONTROL

Component Description

One of the two position indicating trains, as shown on Figure 15, consists of the CPP ACTM and the data processor. This position indicating system infers each CEA position by maintaining a record of the raise and lower control pulses sent from the CPP ACTM to the CEDMs. The system is incorporated in the data processor. Position information for each CEA is available via the DDPS line printer. The position of each CEA is periodically printed out for a permanent record. A printout is available, on operator demand, of the position of all CEAs or of all CEAs within a given group.

The data processor also provides deviation information. If the deviation in position between the highest and the lowest CEA in any group exceeds a preset amount, an annunciator sounds, and a printout of actual positions of all CEAs within that group is initiated.

The data processor also provides position indication information for regulating groups out of sequence, and power and pre-power dependent insertion annunciators. The following details the annunciators associated with DDPS. These are alarms only and provide no control function.

- **CEA GROUP OUT OF SEQUENCE**
  - indicates that at least one group is out of overlap alignment. There are three setpoints depending on whether rods are stationary, being withdrawn, or being inserted. Refer to annunciator response procedure for K-15.

- **CEA PRE-POWER DEPENDENT INSERTION**
  - indicates that at least one CEA is about to exceed acceptable insertion limits for existing power. This annunciator is set approximately 5" above power dependent insertion limit (PDIL).

- **CEA POWER DEPENDENT INSERTION**
  - indicates that one or more CEAs is at or below the PDIL.

- **CEA PRE-POWER DEPENDENT INSERTION** - indicates that one or more CEAs is about to exceed acceptable insertion limits for existing power. This annunciator is set approximately 5" above power dependent insertion limit.

- **CEA POWER DEPENDENT INSERTION** - indicates that one or more CEAs is at or below acceptable insertion limits for the existing power.

- **CEA POSITION DEVIATION WARNING** - indicates that a deviation greater than or equal to 3.75" exists between CEAs within a group.

- **CEA POSITION DEVIATION LIMIT** - indicates that a deviation greater than or equal to 7.5" exists between CEAs within a group.

{PRIVATE }REED SWITCH POSITION INDICATION, ALARMS, INHIBITS AND INTERLOCKS{tc \l 1 "REED SWITCH POSITION INDICATION, ALARMS, INHIBITS AND INTERLOCKS"}

As shown on Figure 15, the Position Indicating Train B consists of the RSPTs, the CEDMCS Logic Cabinets, ADS, the Core Mimic Display, and the CEA Group Status Lights.

{PRIVATE }Reed Switch Position Transmitter (RSPT){tc \l 2 "Reed Switch Position Transmitters (RSPT)"}

The RSPTs are located in the CEDMs and are provided to furnish CEA position information to the CEDMCS and ADS. It contains a group of reed switches and resistors in a voltage divider network mounted within a stainless steel tube. The reed switches are spaced at 1.5 inch intervals along the length of the RSPT. They are actuated by a magnet that is positioned by the CEA extension shaft. The output of the RSPT is proportional to the CEA position. In addition to the voltage divider, one pair of reed switches is positioned at the CEA drop position, the LEL position, and the UEL position. Refer to Figure 16.

Question 59

Unit 1 is in Mode 6. Which of the following will cause an actuation that will stop a running Containment Purge fan (HVE 8A or 8B)?

Containment:

A. Atmosphere Radiation Monitor in high alarm.

B. Containment Radiation Monitors (CIAS) increase to 1 R/Hr.

C. Containment pressure transmitter for PIS-07-1B fails high.

D. Containment High Range Radiation Monitors increase to 1 R/Hr.

A. Incorrect, Containment Atmosphere high rad. has no automatic functions.

B. **Correct, CIAS monitors have reduced CIAS setpoint (90 mr/hr) in Mode 6.**

C. Incorrect, CIAS on Containment pressure 2/4 logic.

D. Incorrect, high rad. on CHRRMS has no automatic functions.

Question level: 1
Question source: Modified from bank
Exam: Both
K/A: 029.A3.01
Importance: 3.8/4.0
Reference: 0711410, Unit 1 Radiation Monitoring, LP 0702602-1C, 0702410-9

Unit 1 is in Mode 1. Which of the following will cause an actuation that will stop a running Containment purge fan (HVE 8A or 8B)?

A. Plant stack P.I.G monitor in high alarm.

B. Containment High range radiation monitor fails high.

C. Containment pressure increases to 5.5 PSIG

D. Containment Radiation monitors (CIAS) increases to 1 R/Hr.

A. Plant stack P.I.G monitor in high alarm. (incorrect, P.I.G monitor in alarm has no auto actions)

B. Containment High range radiation monitor fails high. (incorrect, CHRRM failing high has no auto actions)

C. **Containment pressure increases to 5.5 PSIG (correct, 5 PSIG containment pressure on Unit 1 gives CIAS, which stops HVE 8A and 8B)**

D. Containment Radiation monitors (CIAS) increases to 1 R/Hr. (incorrect, 10R/Hr. gives CIAS)

Question level: 2
Question source: New
Exam: Both
K/A: 029.K1.03
Importance: 3.6
References: EOP-99 Appendixes/Figures/Tables

ORIGINAL QUESTION FROM PREVIOUS EXAM

TABLE 2

CONTAINMENT ISOLATION ACTUATION SIGNAL

(Page 1 of 3)

RTGB-106, Left to Right	**REQUIRED STATUS**	**A TRAIN √**	**D/C √**	**B TRAIN √**
Two (2) SIT Sample Isol. Valve (FCV-03-1E, FCV-03-1F)	CLOSED	XXXXX	______	XXXXX
Three (3) Containment Purge Isol. Valves (FCV-25-1, FCV-25-3, FCV-25-5)	CLOSED	XXXXX	______	XXXXX
One (1) Containment Purge Exhaust Fan (HVE-8A)	OFF	______	XXXXX	XXXXX
One (1) Shield Bldg. Exhaust Fan (HVE-6A)	START	______	XXXXX	XXXXX
Two (2) S/G Blowdown and Two (2) S/G Sample Isol. Valves (Blowdown: FCV-23-3,-5) (Sample: FCV-23-7,-9) (One Switch)	CLOSED	XXXXX	______	XXXXX
Three (3) Containment Sample Isol. Valves (FCV-26-2, FCV-26-4, FCV-26-6) (one switch)	CLOSED	XXXXX	______	XXXXX
One (1) Instrument Air to Containment Isol. (MV-18-1)	CLOSED	______	XXXXX	XXXXX
Three (3) RCS and Pressurizer Sample Isol. Valves (V5200, V5201, V5202)	CLOSED	XXXXX	______	XXXXX
Three (3) Containment Purge Isol. Valves (FCV-25-2, FCV-25-4, FCV-25-6)	CLOSED	XXXXX	______	XXXXX
One (1) Containment Purge Exhaust Fan (HVE-8B)	OFF	XXXXX	XXXXX	______
One (1) Shield Bldg. Exhaust Fan (HVE-6B)	START	XXXXX	XXXXX	______

(Continued on Next Page)

2) Interlocks

a) Auto start on low flow after 10 sec

b) Fan stops on CIS[CIAS] and delta pressure of –4.0" wg between RCB and atmosphere.

If during startup or operation the delta pressure goes lower than –1.0" wg and the outside air intakes are closed then secure the fan and call I&C.

3) Unit difference –

a) Unit 2 has a vortex damper to control air flow.

b) Also Unit 2 purge valves do not have spring side jack screws.

b. Containment purge suction isolation valves

1) Three valves in series. One inside containment, one in the annulus and one outside containment

2) Interlocks –

Figure 7

a) Open when fan Start/Stop switch taken to start.

b) Auto close on a CIAS and when the fans are stopped

EO-2C

c. Containment Purge Outside Makeup Air Isolation Valves. One inside containment, one in the annulus and one outside containment.

1) Interlocks

Figure 9,10, 11, &12

EO-3

a) Auto open with the purge fan running and a delta pressure of –0.5" wg between the RCB and atmosphere

b) Auto close on an CIAS, purge fans stop, and <-0.5" wg RCB vacuum

d. Filters – debris screen, prefilter for dust removal and a carbon HEPA filter for removal of particulates and iodine,

Figure 8

logging system.

The readout module has two solid-state trip circuits that can be adjusted over the complete meter range. It has a self-checking failure trip that is actuated upon loss of power, high voltage, or loss of signal from the detector. Each readout module includes low-voltage regulators and a regulated high-voltage power supply.

Front panel controls include three alarm lights with reset pushbuttons and a three-position spring-loaded function switch. The function switch allows for normal operation, trip level adjustments, and internal check signal actuation. In the CHECK position, an electric current is generated in the module to produce a mid-scale indication. Test points and adjustment potentiometers are accessible from the front panel. The test points and adjustments are recessed to prevent accidental adjustment.

<u>They are used as a backup source of information for calculating off-site dose during an accident.</u>

<u>Containment Isolation Signal Radiation Monitors (Channels 3-6)</u>

Four Containment Isolation Signal (CIS) Radiation Monitors, spaced 90 degrees apart, provide continuous radiation monitoring in containment. If 2 of the 4 CIS monitors reach their preset high alarm setpoint, they will activate Containment Isolation. If a 1-out-of-4 condition is met, this pretrip alarm setpoint will cause the containment evacuation alarm to sound.

The output signals from these monitors feed the engineered safety features logic to make up the CIS. The monitors are located within the containment at 90 degree intervals along the containment vessel wall.

The radiation monitors level alarm is set at less than <u>10 R/hr (Modes 1-4)</u>, 90 mR/hr (mode 6). A setpoint of 10 R/hr was selected based on response time for the high containment pressure setpoint of 5 psig since both signals feed the CIS circuitry.

Question 60

1-EOP-05 Excess Steam Demand is being implemented with the following:

- A S/G pressure is 880 psia and steady
- B S/G pressure is 230 psia and steady
- RCS pressure is 1050 psia
- RCS Thot is 485ºF
- One RCP in each Loop is Operating
- Pressurizer level 100%
- Reactor Vessel level 100%

Which of the following actions should be performed?

A. cooldown the RCS, establish a bubble in the pressuirzer.

B. cooldown the RCS, stop the running RCP's

C. depressurize the RCS, maintain temperature constant.

D. depressurize the RCS, stop the running RCP's

A. **Correct**

B. Incorrect, RCP operating criteria met for two RCP's

C. Incorrect, maintaining temperature constant would be correct if RCS was not solid.

D. Incorrect, RCS is to be depressurized by cooling down and removal of inventory

Question Level: 2
Question Source: New
Exam: Both
K/A: 040.EA2.1 2.2
Importance: 3.4 / 4.2
References: 1-EOP-5 Excess Steam Demand, 0702826-09 Excess Steam Demand Lesson plan

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 25. If the RCS is water solid, Then ESTABLISH a bubble in the Pressurizer by performing **ALL** of the following: A. ENERGIZE **ALL** available Pressurizer Heaters by performing **BOTH** of the following: 1. ENERGIZE Pressurizer Heaters Buses 1A3 and 1B3. 2. RESET **ALL** available Pressurizer Heaters. B. If **ANY** of the following conditions exist: • Both S/G pressures can be maintained less than RCS pressure • At least one RCP is RUNNING Then PERFORM **ALL** of the following to REDUCE RCS pressure: 1. COOL DOWN the RCS to reduce pressure to saturation conditions in the Pressurizer.	

(Continued on Next Page)

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
25. (continued) B. (continued) 2. CONTROL RCS pressure within the limits of Figure 1, RCS Pressure Temperature, using **ANY** of the following: • ADJUST the cooldown rate • CONTROL Letdown • CONTROL Charging and SI flow to maintain HPSI throttling criteria C. If indication of a void in the Reactor Vessel Upper Head exists, Then PERFORM **BOTH** of the following: 1. MAINTAIN Reactor Vessel level above the top of the hot legs (sensors 4 through 8 covered) by performing **ANY** of the following: • THROTTLE SI flow • CONTROL Charging • CONTROL Letdown	

(Continued on Next Page)

5.0 <u>OPERATOR ACTIONS</u>: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
27. <u>If</u> HPSI Throttling Criteria is met, <u>Then</u> OPERATE the Charging pumps as required to maintain Pressurizer level between 30% and 70%.	

<u>NOTE</u>

In order to avoid any unfavorable pressure excursions, water solid operation of the RCS should be avoided unless necessary to maintain 20°F subcooling. Actions to maintain subcooling take precedence over maintaining Pressurizer level. If the RCS is solid, closely monitor any makeup or draining, and any system heatup or cooldown to avoid any unfavorable rapid pressure excursions. Subcooling indication should be used according to RCS flow conditions:

- During Natural Circulation, use Representative CET (Page 213, QSPDS)
- During Forced Circulation, use RCS (Page 211, QSPDS)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 28. STABILIZE and MAINTAIN RCS pressure within the limits of Figure 1, RCS Pressure Temperature curve by **ANY** of the following: A. Pressurizer heaters and Main or Auxiliary spray. B. Charging and Letdown (if available). C. Throttling of HPSI (if HPSI throttling criteria is met).	28. <u>If</u> RCS subcooling is NOT being maintained, <u>Then</u> PERFORM **ALL** of the following as appropriate: A. <u>If</u> RCS subcooling is less than 20°F, <u>Then</u> PERFORM **ANY** of the following: 1. ESTABLISH 20°F subcooling by reducing RCS temperature. 2. OPERATE Pressurizer heaters to establish 20°F subcooling. **(Continued on Next Page)**

Question 61

Unit 1 has a LOOP and an ESD on the 1A Steam Generator. 1-EOP-05 'Excess Steam Demand' has been implemented with the following conditions:

- 1A Steam Generator blown dry and isolated

Which of the following method is used in attempt to stabilize RCS temperature prior to Instrument air being restored?

A. Control the 1B Steam Generator ADV from the control room.

B. Operate the 1C AFW pump from the 1B Steam Generator.

C. Establish maximum Steam Generator blowdown and feed the 1B Steam Generator with AFW.

D. Open the Turbine main steam drains from the RTGB.

A. Incorrect, ADV not available on Unit 1 with loss of Instrument air, only on Unit 2

B. Correct

C. Incorrect, not referenced in procedure, no instrument air, no override capability with safeguards actuated.

D. Incorrect, MSIV's will be closed. Drains referenced in procedure are upstream of MSIV's

Question Level: 1
Question Source: New
Exam: Both
K/A: CE/A11.AK3.3
Importance: 3.1 / 3.5
References:1-EOP-05 Excess Steam Demand, 0702826-09 Excess Steam Demand Lesson Plan

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
19. (continued) C. When Appendix H is completed, Then locally START **ONE** Instrument Air Compressor as follows: 1. RESET local handswitch. 2. PLACE local control switch in AUTO. 3. VERIFY Instrument Air pressure being restored.	
[*] 20. STABILIZE RCS temperature by steaming the unisolated S/G using SBCS or ADVs:	20. If SBCS or ADVs are NOT available, Then USE **ANY** of the following on the unisolated S/G: • 1C AFW Pump • Steam system vent, drain and trap valves. **REFER TO** Table 12, Alternate S/G Heat Removal Flow Paths.

TABLE 12
ALTERNATE S/G HEAT REMOVAL PATHS
(Page 1 of 2)

FLOW PATH	COMPONENTS AVAILABLE
1C AFW Pump Turbine Operation	A. MV-08-13, S/G 1A Stm to AFW PP 1C OR B. MV-08-14, S/G 1B Stm to AFW PP 1C
1A MS Header Drains and Vents	A. 1A MS Header drain: V08603, V08116 A MS Hdr Drain Dwnstrm Drain B. 1A MS Header Supply to 1C AFW Pump Turbine vent: • V08450, V08113 A MS To AFW Pump Dwnstrm Vent • V08533, V08113 A MS To AFW Pump Dwnstrm Vent
1B MS Header Drains and Vents	A. 1B MS Header drain: V08600, V08147 B MS Hdr Drain Dwnstrm Drain B. 1B MS Header Supply to 1C AFW Pump Turbine vent: • V08471, V08144 B MS to AFW Pump Dwnstrm Vent • V08470, V08144 B MS to AFW Pump Dwnstrm Vent

TABLE 12

ALTERNATE S/G HEAT REMOVAL PATHS

(Page 2 of 2)

FLOW PATH	COMPONENTS AVAILABLE
Common MS Header Paths on the 1C AFW Pump Turbine	A. ST-08-1, 1C AFW Pump Turbine supply header trap: 1. Trap upstream drain: • V08168, ST-08-1 Drain • V08437, ST-08-1 Drain 2. Trap Bypass to floor drain: • V08169, ST-08-1 Bypass • V08438, ST-08-1 Bypass B. PX-08-11, 1C AFW Pump Turbine supply header pressure tap: • V08173, PX-08-11 Root Isol • V08174, PX-08-11 Isol C. Common Supply Steam Header drains: • V08165, 1C AFW Pump MS Drain Pot Drain • V08166, 1C AFW Pump MS Drain Pot Drain

END OF TABLE 12

Question 62

The following conditions are observed on Unit 2 at 100% power:

- LT 9013A, 9013B, 9013C, 9013D, 2A Steam Generator level safety channels indicate 70% and rising.

With Feedwater control in automatic and no Operator actions, which of the following describes the plant response when the 2A S/G level reaches 80%?

A. Main Feedwater regulating and 100% bypass valves receive a close signal.

B. Both Main Feedwater pumps will trip.

C. Unit will trip on high S/G water level.

D. The 2A Main Feedwater regulating valve receives a close signal.

A. Incorrect, 100% bypass valves only receive a close signal on Unit 1

B. Incorrect, this occurs at 88% S/G level

C. Incorrect, this occurs at 88% S/G level

D. Correct

Question Level: 1
Question Source: New
Exam: Both
K/A: 035.K6.03
Importance: 2.6 / 3.0
References: 0711408 S/G level control Lesson Text, 0702408-08 S/G level control Lesson Plan

Above 15% power, steam generator level is maintained by the three element main feedwater control system (MFWCS), as illustrated by Figures 14, 15, and 16. MFWCS compares the normal level setpoint of 65% with three process inputs, and generates an electrical signal that is converted into an air signal in the electro-pneumatic (E/P) converter. This air signal controls the position of the main feedwater control valve, which adjusts its feed flow and associated steam generator water level.

The three process inputs to the MFWCS are:

- Steam Generator Level (LT-9011 & LT-9021)
- Main Steam Flow (FT-8011 & FT-8021)
- Main Feedwater Flow (FT-9011 & FT-9021)

Steam Generator Level

Steam generator level is monitored by level transmitter LT-9011 ('A' S/G) and LT-9021 ('B' S/G). The output of the level transmitter is applied to the MFWCS controller level comparator and level recorder LR-9011/9021. The level recorder, a two-pen recorder located on RTGB 102 [202], provides an indication of level trend in both steam generators.

Steam Flow

Steam flow is another process parameter monitored by the three element control system. The steam flow signal is generated by flow transmitter FT-8011 ('A' S/G) and FT-8021 ('B' S/G). The flow transmitter senses steam flow across flow venturi FE-8011 (FE-8021). Since the output of the flow transmitter is proportional to the square of the steam flow, the transmitter cannot provide a linear flow signal.

To adjust this, the output of the steam flow transmitter is fed to a square root extractor FY-8011 (FY-8021). The extractor output is a linear steam flow signal, and is fed to the steam/feed flow comparator and a steam/feed flow recorder. Each flow recorder is a two-pen recorder located on RTGB 102 [202]. Flow recorders FR-8011/9011 ('A' S/G) and FR-8021/9021 ('B' S/G) provide the steam and feed flow trends for each S/G.

The feedwater controller power supply is designed to handle input voltage fluctuations of 10 percent, and maintain an output of 24 volts. During subsequent testing, however, it was found that the power supply had become degraded, and was producing output voltages as low as 20.6 volts, or approximately 17 percent degraded. The drop in voltage to the controller resulted in a loss of control signal to the MFRV supplying feedwater to the 1B Steam Generator. This resulted in the partial closure of the valve.

LER 389-95-02, St. Lucie Unit 2 Automatic Reactor Trip on Low Steam Generator Water Level due to Failed Level Transmitter

On February 21, 1995, at 1317 hours, St. Lucie Unit 2 automatically tripped from 100% power, due to low water level in the 2A Steam Generator. The event was initiated when LT-9011 failed high.

- This level transmitter sends an input signal to the Feedwater Control System, which then sends an output signal to LR-9011 and FIC-9011. When the transmitter failed high, indicating 100% level in the 2A S/G, it sent a signal to close the MFRV. When the MFRV closed, all feedwater to the 2A S/G was stopped.

The level in the 2A S/G decreased rapidly, initiating annunciator G1 "2A SG HI/LO". By the time annunciator G1 had alarmed, water level in the 2A S/G was already decreasing rapidly. The reactor tripped automatically, as required, at 20.5% level. Just prior to the reactor trip, a Reactor Operator (RCO) observed the annunciator alarming. Upon acknowledgement of the annunciator, the RCO observed S/G level indications:

- The wide range level indication indicated that level in the 2A S/G was rapidly decreasing,
- In contrast the narrow range S/G level indication indicated that the 2A S/G level was at 100%.
- The RCO then observed the four narrow range safety channels: The narrow range safety channels indicated that level in the 2A S/G was rapidly decreasing.

('B' S/G). They provide input signals to their respective level indicator controller (LIC) located on RTGB 102 [202], which provides indication of level span, from 0 to 100%.

The LIC also provides a level input to the feedwater high level override and turbine trip protection circuitry, to the Reactor Protection System (RPS) for low S/G level trip, and to the Auxiliary Feedwater Actuation System (AFAS) for AFW initiation.

Individual level channel output signals may be blocked with [key] switches on the front [back] of RTGB 102 [202].

High level override (HLO) occurs when 2/4 level channels for a particular S/G exceed **82% [80%]**. High level override **shuts the affected main feed regulating valve (and the Unit 1 100% bypass valve for 35 seconds, if open).** The two high level override channels are located behind RTGB 102 [202].

A high level override cancel pushbutton, located at the high level override channel, allows overridding the high level override signal and restores control of the main feed regulating valve to the MFWCS. This button has no effect on the turbine trip signal to the main feed regulating valve (and the Unit 1 100% bypass).

The high S/G level turbine trip provides protection against possible water slugging of the turbine due to excessive water level transients. The inputs feed a 2/4 coincidence logic matrix, one for each steam generator. At a Hi-Hi level of **90% [88%]** in 2/4 indicators for a particular S/G, the **turbine is tripped, and both FW pumps are tripped**.

As illustrated in <u>Figures 20, 21 and 22</u>, on a turbine trip, the feedwater control system will shunt its signal to ground via relay K-2. Grounding the signal forces the E/P converter to close the main feed regulating valve; this prevents overfeeding and overcooling the S/G. A turbine trip signal (or High Level Override) also closes the Unit 1 100% bypass valve for 35 seconds, via relay K-2, to limit overfeeding the S/Gs.

At the same time, relay K-3 initiates a 5% flow bias signal that maintains the 15% bypass valve in the 5% flow position, to limit overfeeding the S/Gs. K-3 also fails open the FW pump recirc valve, to prevent the FW pump from tripping on low flow. Following a turbine trip, the K-3 relay can be reset to restore LIC output control of the 15% bypass

7.0 OPERATOR ACTIONS:

INSTRUCTIONS	CONTINGENCY ACTIONS
7.1 Immediate Operator Actions:	
¶ 1. **If 2 of 4 Steam Generator Narrow Range Level Channels on either Steam Generator (1A SG - LIC-9013A, B, C and D or 1B SG - LIC-9023A, B, C and D indicate less than or equal to 40% and decreasing, Then Trip the Rx and the Turbine and implement 1-EOP-01, "Standard Post Trip Actions."**	
¶ 2. **If either of the following conditions exist, Then TRIP the Reactor and Turbine and IMPLEMENT 1-EOP-01, Standard Post Trip Actions:** **A. Reactor power is ≥15% AND at least 2 of 4 SG narrow range level safety channels (LIC-9013A-D OR LIC-9023A-D) for either SG indicate ≥85% AND rising,** **OR**	2. If Reactor power is <15% power AND Loss of Load Trip is NOT enabled (L-35 is in ALARM) AND at least 2 of 4 SG narrow range level safety channels (LIC-9013A-D OR LIC-9023A-D) for either SG indicate ≥85% AND rising, Then TRIP the Main Turbine Generator.

Question 63

Which of the following is the annual regulatory dose limit (NRC) for total dose equivalent (TEDE)

A. 1000 mrem

B. 2500 mrem

C. 4500 mrem

D. 5000 mrem

A. Incorrect, FPL guidline without extension

B. Incorrect, FPL guidline with extension

C. incorrect, All FPL sites

D. Correct

Question Level: 1
Question Source: New
Exam: Both
K/A: 2.3.1
Importance: 2.6 / 3.0
References:HP-2 FP&L Health Physics Manual

TABLE 4.1

OCCUPATIONAL REGULATORY DOSE LIMITS AND FPL GUIDELINES

QUANTITY	REGULATORY LIMIT	FPL GUIDELINE FPL Plants (total per plant)*	FPL GUIDELINE All Sites (total for all sites)
1. Total Effective Dose Equivalent (TEDE)	5 rems/yr**	2.5 rems/yr	4.5 rems/yr
2. Shallow Dose Equivalent to the skin or to any extremity	50 rems/yr	25 rems/yr	45 rems/yr
3. Lens Dose Equivalent	15 rems/yr	7.5 rems/yr	13.5 rems/yr
4. Total Organ Dose Equivalent (TODE)	50 rems/yr	25 rems/yr	45 rems/yr
5. Dose to embryo/fetus of a declared pregnant woman	0.5 rems during entire pregnancy (avoid substantial variation above a uniform monthly dose rate)	N/A	0.450 rems during entire pregnancy (50 mrems/month)
6. Dose limits for minors	10% of annual dose limits specified for adult workers	Minors are restricted from entering the RCA.	N/A

*For FPL employees, 2.5 rems/yr represent the total of the dose received at each FPL plant not to exceed 4.5 rems/yr. The guideline is applicable for FPL employees whose lifetime dose is less than 1XN; where N is the person's age in years. For FPL employees, the annual dose should be limited so that his/her lifetime dose does not exceed 1XN. If an individual's lifetime dose is greater than 1XN, then Plant Management approval is needed to exceed one rem (TEDE) for the year. For contractor employees, the 2.5 rems/yr represent the dose allowed at each of the FPL plants.

**The annual limit is the more limiting of the TEDE being equal to 5 rems or the sum of the deep dose equivalent to any individual organ or tissue other than the lens of the eye and the CDE being equal to 50 rems. It is expected that the value will be the TEDE of 4.5 rems for most exposure conditions encountered in the nuclear power plants.

Question 64

A reactor start-up is being performed at Unit 2.

- Mode 2 was entered at 40 inches on CEA Group 3.
- The reactor was critical at 60 inches on CEA Group 5.
- CEAs are being withdrawn to raise power to the POAH.
- A steam bypass control valve stuck open.
- Tave is currently 512°F.

What operator actions are required to be taken?

A. Insert CEAs to 60 inches on Group 5.

B. Insert CEAs to maintain power constant.

C. Restore Tave to $\geq$ 515°F within 15 minutes.

D. Restore Tave to $\geq$ 525°F within 30 minutes.

A. Incorrect, the reactor was critical at 60 inches on Group 5.

B. Incorrect, the reactor is still critical with Tave < 515°F.

C. Correct, T.S. minimum temperature for criticality.

D. Incorrect, T.S. surveillance requirements.

Question level: 1
Question source: New
Exam: Both
K/A: 2.1.11
Importance: 3.0/3.8
Reference: Unit 2 Tech Spec 3.1.1.5, 0702842-7

MINIMUM TEMPERATURE FOR CRITICALITY

LIMITING CONDITION FOR OPERATION

3.1.1.5 The Reactor Coolant System lowest operating loop temperature (T_{avg}) shall be greater than or equal to 515°F.

APPLICABILITY: MODES 1 and 2#.

ACTION:

With a Reactor Coolant System operating loop temperature (T_{avg}) less than 515°F , restore T_{avg} to within its limit within 15 minutes or be in HOT STANDBY within the next 15 minutes.

SURVEILLANCE REQUIREMENTS

4.1.1.5 The Reactor Coolant System temperature (T_{avg}) shall be determined to be greater than or equal to 515°F:

a. Within 15 minutes prior to achieving reactor criticality, and

b. At least once per 30 minutes when the reactor is critical and the Reactor Coolant System T_{avg} is less than 525°F.

With K_{eff} greater than or equal to 1.0.

Question 65

Unit 2 has a Loss of Offsite Power with a Steam Generator tube rupture. Due to AFW problems the crew has entered 2-EOP-15 'Functional Recovery' with the following conditions:

- RCS Thot 520ºF
- RCS pressure 1650 psia
- Local surveys indicate secondary activity
- CIAS monitors indicate no alarms or increasing trends

Which of the following is the status of Containment Isolation Safety function?

Containment Isolation Safety function:

A. is currently met due to CIAS actuated

B. is currently met due to CIAS monitors indicate no alarms or increasing trends

C. will be met when offsite power restored and the faulted S/G is no longer steaming by ADV's.

D. will be met when the faulted Steam Generator is isolated per Appendix R from EOP-99.

A. Incorrect, faulted S/G must be isolated (<515ºF Thot)

B. Incorrect, faulted S/G must be isolated (<515ºF Thot)

C. Incorrect, faulted S/G must be isolated (<515ºF Thot)

D. Correct, faulted S/G required to be isolated to meet safety function.

Question Level: 2
Question Source: New
Exam: Both
K/A: 2.4.21
Importance: 3.7 / 4.3
References: 2-EOP-15 'Functional Recovery' 0702828-06 Functional Recovery Lesson Plan

APPENDIX A
SAFETY FUNCTION STATUS CHECK SHEET
CONTAINMENT ISOLATION - SECTION 5.7

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
		SUCCESS PATH IN SERVICE
2. CIAS		
Steam Plant Activity	No Condenser Air Ejector, Main Steam line and Steam Generator Blowdown Radiation Monitors in alarm or increasing trends	
		OR
	Local Surveys being performed indicate no secondary plant radiation	
		OR
	The most affected S/G with tube leakage is isolated by Appendix R	
		AND
Containment Pressure	Less than 3.5 psig	
		OR
	CIAS Actuated	

END OF SECTION 5.7 CONTAINMENT ISOLATION

Question 66

A step in an EOP is preceded by an asterisk (*). Which of the following describes the meaning of this asterisk (*)?

The step:

A. indicates a management directive.

B. indicates a regulatory commitment.

C. may be performed out of sequence.

D. is required to be performed in sequence.

A. incorrect, this is indicated by: ¶

B. incorrect, this is indicated by: §

C. Correct

D. Incorrect, backwards

Question Level: 1
Question Source: Modified from 2000 PSL NRC exam
Exam: Both
K/A: 2.1.20
Importance: 4.3 / 4.2
References: ADM 0010120 Conduct of Operations

Question 71

Which of the following describes the significance of an asterisk (*) when used in an Emergency Operating Procedure?

An asterisk indicates a:

A. step that may be performed out of sequence.

B. step that requires a sign off or data sheet.

C. management directive or vendor recommendation.

D. regulatory commitment made by Technical Specifications.

A. **step that may be performed out of sequence.**
(Correct)

B. step that requires a sign off or data sheet.
(incorrect, another symbol used for this)

C. management directive or vendor recommendation.
(incorrect, another symbol used for this)

D. regulatory commitment made by Technical Specifications.
(incorrect, another symbol used for this)

Question level: 1
Question Source: New
Exam: both
KA G2.4.19
Importance 2.7 / 3.7
References: St. Lucie EOPs, AP 0010120 Conduct of Operations

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 2 of 15)

Emergency Operating Procedure Implementation: (continued)

1. (continued)

D. Compliance with EOP Steps

1. Steps which are preceded by an asterisk (*) are to be performed continuously. In this context, continuously is defined as one or more of the following:

   a. The step may be performed out-of-sequence.

   b. The step has initiating conditions that occur independently of any specific time frame.

   c. The step is a recurring step.

2. When restoring a Safety Function, take actions that are appropriate. For example, it is NOT necessary to wait for procedural guidance to throttle HPSI, if throttling criteria is met. Good judgement is needed to maintain/restore safety functions.

3. The steps in the EOPs shall be addressed in the sequence they are written, NOT randomly. If the step is NOT applicable to the present plant condition, proceed to the next step. An effective method should be utilized of tracking a step that has NOT been implemented and needs to be re-evaluated for applicability.

E. Recovering Safety Functions

1. If the safety function status check acceptance criteria is NOT met for a particular safety function, the operating crew should take appropriate contingency actions necessary to restore the safety function. If the safety function can NOT be restored, the EOP in use is NOT working. The operating crew should then re-diagnose the event and exit to the appropriate EOP or the Functional Recovery Procedure (EOP-15) within 15 minutes.

6.0 REFERENCES:

> **NOTE**
>
> One or more of the following may be used in this procedure.
>
> § indicates a Regulatory commitment made by Technical Specifications, condition of license, audit, LER, bulletin, etc. and should NOT be revised without Facility Review Group approval.
>
> ¶ indicates a management directive, vendor recommendation, plant practice or other non-regulatory commitment that should NOT be revised without consultation with the plant staff.
>
> Ψ indicates a step that requires a sign off of a data sheet.

$\S_1$ 6.1 Technical Specifications, St. Lucie Units 1 and 2.

6.2 10 CFR 50.54.

6.3 Reg. Guide 1.33, Rev. 2, 1978.

6.4 INPO 84-021 Good Practice, Conduct of Operations.

6.5 INPO 84-001 Good Practice, Operations Narrative Log Books.

6.6 INPO 84-008 Good Practice, Shift Relief and Turnover.

6.7 INPO 85-017, Guidelines for the Conduct of Operations at Nuclear Power Stations.

6.8 QI 1-PR/PSL-2.

6.9 Memorandum (SSINS #0208) dated August 22, 1980, from E. L. Jordan, Assistant Director for Technical Programs Division of Reactor Operations Inspection, I.E. to Regional Chiefs.

$\S_2$ 6.10 LER 1999-007-00

$¶_1$ 6.11 JPN-PSL-SENP-95-110, Rev 1, Evaluation of Loops Filled for Mode 5 operation.

$¶_2$ 6.12 PMAI 96-11-212, Containment Vacuum Relief Valves.

Question 67

Unit 1 is drained down to Mid-Loop with the following conditions:

- The Unit has been shutdown for 4 days.
- RCS temperature is 120°F.
- Shutdown Cooling has been lost.

Which of the following is the time to boil and the makeup flow rate for Boil off?

A. 11 minutes, 45 gpm

B. 11 minutes, 65 gpm

C. 14 minutes, 45 gpm

D. 14 minutes, 65 gpm

Reference Required: ONP-1-0440030, FIGURE 1 AND 2.

A. Incorrect, 11 minutes is 2 days shutdown, 45 gpm is 10 days shutdown.

B. Incorrect, 11 minutes is 2 days shutdown, 65 gpm is correct.

C. Incorrect, 14 minutes is correct, 45 gpm is 10 days shutdown.

D. **Correct**

Question level: 2
Question source: Modified from 2000 PSL NRC exam
Exam: Both
K/A: 025.AK1.01
Importance: 3.9/4.3
Reference: ONP-1-0440030, Shutdown Cooling Off-Normal

2000

St. Lucie USNRC RO/SRO Initial License Exam

Question 118

Unit 2 Reactor Vessel Level is at Mid Loop with the following conditions:

- The Unit has been shutdown 4 days
- SDC cooling temperature from RCS: 130° F
- SDC cooling temperature to RCS: 116° F

Both SDC cooling trains are lost

Which of the following is the time to boil and the required makeup rate for boil off?

(REFERENCES PROVIDED)

A. 11 minutes to boil, 60 GPM makeup rate

B. 11 minutes to boil, 75 GPM makeup rate

C. 14 minutes to boil, 60 GPM makeup rate

D. 14 minutes to boil, 75 GPM makeup rate

A. 11 minutes to boil, 60 GPM makeup rate (correct)

B. 11 minutes to boil, 75 GPM makeup rate (incorrect, makeup rate wrong)

C. 14 minutes to boil, 60 GPM makeup rate (incorrect, time to boil based on temperature return to RCS)

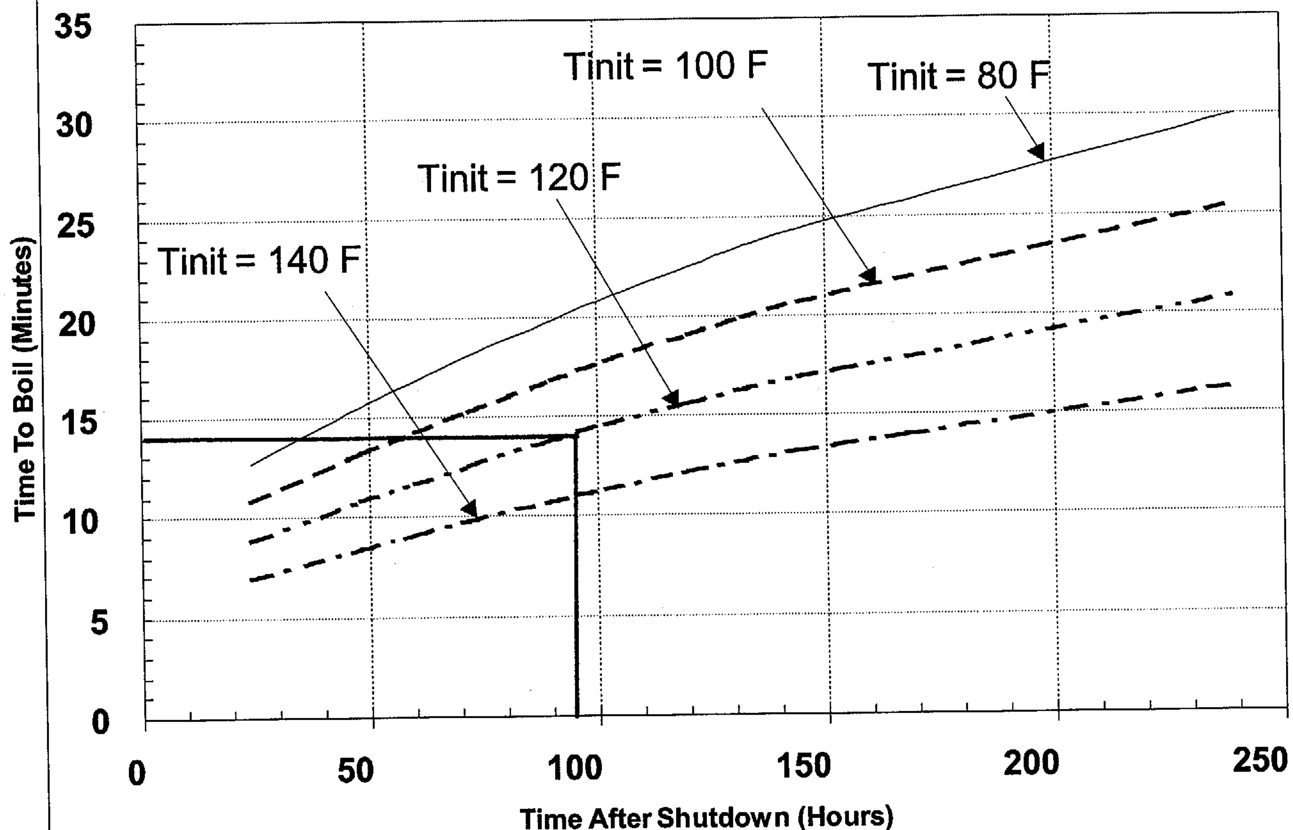
D. 14 minutes to boil, 40 GPM makeup rate (incorrect, time to boil based on temperature return to RCS and makeup rate wrong)

Question Level: 3
Question Source: Bank
Exam: Both
K/A: 0000025.AK2.02
Importance: 3.2 / 3.2
References: 2-ONP-01.04 Plant Condition 4 Shutdown Cooling in Operation – Reduced Inventory Operation

FIGURE 1
TIME TO CORE BOILING
(Page 1 of 2)

π_4 **Figure 1**

PSL1 Time to Boil from Mid-Loop (16000 EFPH)

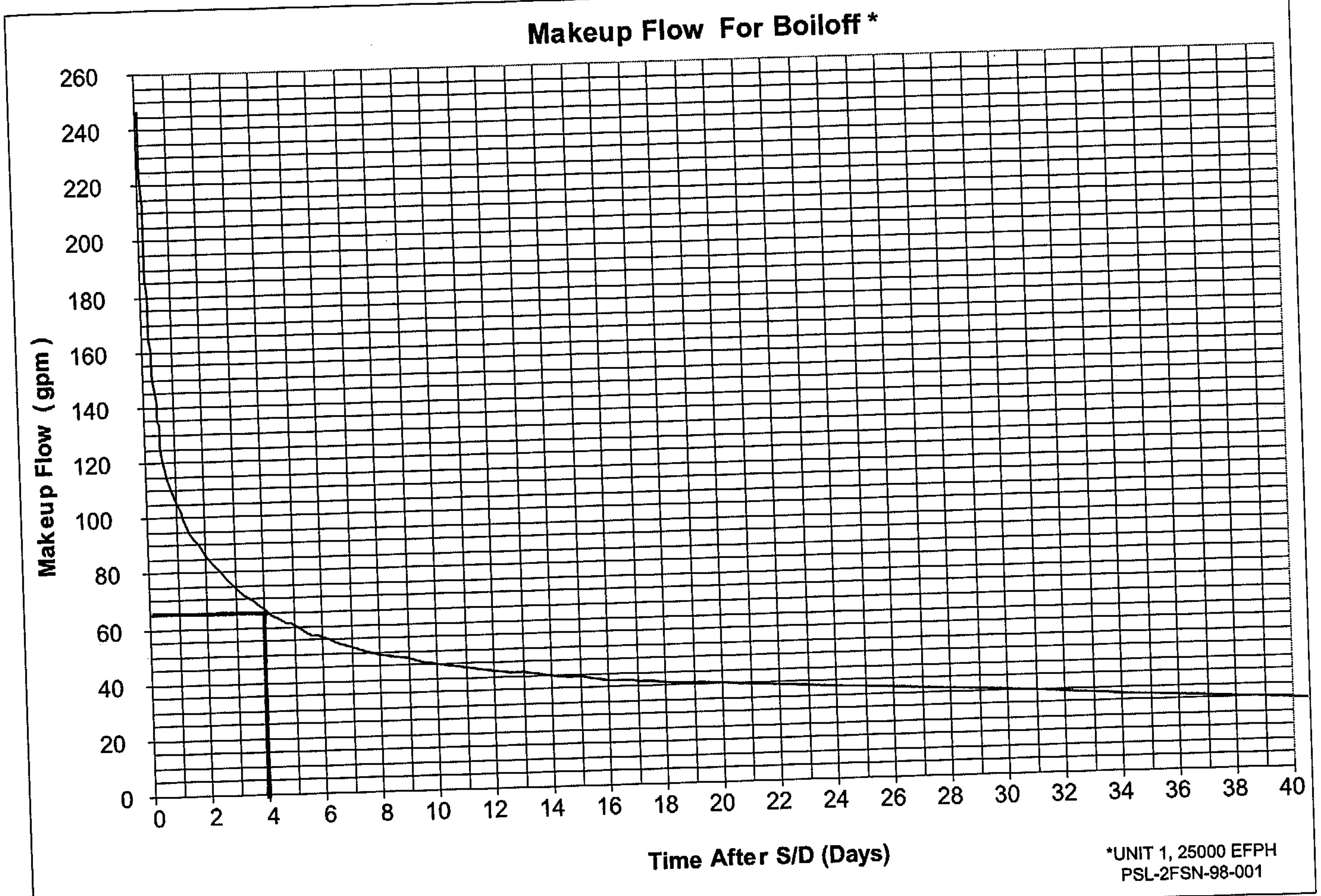


PSL-IFJF-99-055

(P/OPS/1-0440030-F1-R0)

FIGURE 2

FLOW TO MAKEUP FOR BOIL-OFF



Question 68

Which of the following is referenced to determine the length of time when a dropped CEA must be re-aligned to within 7.5" of other CEA's within its group?

(assume 100% power and CEA is operable)

A. Shutdown margin

B. Total Unrodded Integrated Radial Peaking Factor ($F_r^{\,t}$)

C. Unrodded Planar Radial Peaking Factor (F_{xy})

D. Azimuthal Power Tilt (T_q)

A. Incorrect, required for inoperable CEA

B. **Correct**

C. Incorrect, total peaking factor required

D. Incorrect, core quadrant power, not peak pin power

Question Level: 1
Question Source: New
Exam: Both
K/A: 005.AK1.06
Importance: 2.9/3.8
References:T.S. 3.1.3.1 LCO for Movable Control Assemblies.
1-0110030 CEA Off-normal operation and realignment

APPENDIX F
ONE DROPPED CEA
(Page 1 of 3)

1. Ensure the following:

   A. CEDS panel in OFF.

   B. Turbine power adjusted to equal reactor power.

   C. CEA motion inhibit.

> **NOTE**
> If in the previous 8 hours a dropped or slipped CEA has been successfully retrieved, upper plant management will make the decision to retrieve the CEA and continue operation.

¶2 2. Maintain reactor power at or below, but NOT to exceed the power level which resulted from the CEA insertion.

3. Determine from symptoms and CEA position indications, the operability of the CEA in accordance with Appendix A.

¶2 4. During determination of the cause of the misaligned CEA, maintain reactor power at or below, but NOT to exceed the power level which resulted from the CEA insertion.

5. If CEA is determined to be inoperable for any reason, Then refer to Appendix B.

> **NOTE**
> If difficulty is experienced in CEA realignment, a power reduction to less than or equal to 70% rated thermal power should be initiated.

6. If in Mode 3, recover the dropped CEA in accordance with Appendix I Then proceed to Step 8.

§1 7. If in Modes 1 and 2, Then refer to plant curve book and obtain the most recent F_R^T value. This value, when interpreted on COLR Figure 3.1-1a in Appendix E of the Plant Physics Curve Book, will indicate the amount of time to restore the CEA within 7.5 inches of all other CEAs in its group.

Question 69

At 100% power a loss of the 1A2 480 Volt Load Center has occurred and cannot be immediately recovered. A short time later, the plant trips and RCS temperature indicates 502ºF and lowering.

Which of the following Operator actions should be taken?

A. Start both Boric acid makup pumps, close both Boric acid pump recirc valves and open emergency borate valve V 2514.

B. Start both Boric acid makup pumps, close both Boric acid pump recirc valves and open Boron load control valve V 2525.

C. Open Gravity feed valves V 2508 and V 2509, close and hold closed VCT outlet valve V 2501.

D. Open Gravity feed valves V 2508 and V 2509, and emergency borate valve V 2514.

A. Incorrect, 1A2 480 Volt load center powers both Boric acid makeup pumps.

B. MV 2525 required to be closed.

C. **Correct**

D. Without Boric Acid pumps running, emergency borate valve opening does no good.

Question Level: 2
Question Source: New
Exam: Both
K/A: 024.AK2.03
Importance: 2.6/2.5
References: 1-ONP-02.02 Emergency Boration, CVCS Lesson text 0711205, CVCS Lesson plan 0702205-04

Emergency Boration

Emergency boration (Figure 20) injects concentrated boric acid into the suction of the charging pumps. Emergency boration is used for the following conditions:

1. An unanticipated or uncontrolled RCS cooldown following a reactor trip,
2. An unexplained or uncontrolled reactivity increase, or
3. A loss of shutdown margin due to excessive Control Element Assembly insertion below the PDIL.
4. More than one CEA not fully inserted following a reactor trip.

The emergency boration flowpath is also used in the performance of a rapid downpower.

Emergency boration is achieved by directing flow from the selected BAM pump, through the motor operated emergency borate valve MV-2514, and into the charging pumps common suction header. Emergency boration, although normally an operator controlled evolution, is also initiated automatically by a Safety Injection Actuation Signal. MV-2514 is powered from MCC-A5.

These boration flowpaths discussed require BAM pump operation. Since the safe shutdown of the plant can depend on the injection of concentrated boric acid into the RCS, allowances must be made for the remote possibility that both BAM pumps may fail. For instance, when the 'A' 480 VAC bus goes off line, both BAM pumps will be disabled. In this situation, boration is assured by gravity feed from the BAM tanks into the charging pump suction (Figure 21).

Gravity feed is automatically initiated by SIAS by opening the motor-operated gravity feed line isolation valves V2508 and V2509 and by closing V2501. The combined flow then enters the charging pump suction via a portion of the emergency boration header.

The BAM pumps are powered from MCC-1A6. The gravity feed isolation valves (V2508, V2509) are powered from MCC-1B6.

6.0 OPERATOR ACTIONS

INSTRUCTIONS	CONTINGENCY ACTIONS
1. ¶1 PLACE the Makeup Mode Selector switch in MANUAL.	
2. ENSURE V2525, Boron Load Control Valve, is CLOSED.	
3. START 1A or 1B Boric Acid Pump.	
4. CLOSE V2510, BA Tank 1A Recirc.	
5. CLOSE V2511, BA Tank 1B Recirc.	
6. OPEN V2514, Emergency Borate.	6. A. If V2514 fails to open, Then PERFORM the following: 1. OPEN V2508, BA Gravity 1B. 2. OPEN V2509, BA Gravity 1A. 3. CLOSE V2501 VCT Outlet Valve. 4. If VCT level is greater than 5%, Then PLACE and hold V2501 in the CLOSE position. 5. OPEN Bkr 1-42018, V2501, at MCC-1B5.

Question 70

The Fire Computer Console on Unit 2 has failed. Cross-connecting to the Unit 1 Fire Computer has not been successful.

Which of the following states the actions to be taken?

A. Station an individual at the Master Local Fire Alarm Panel at Unit 2 to monitor and report fire alarms to the Control Room.

B. Notify Security to commence continuous roving fire watch to all vital areas at Unit 2.

C. Assign additional operators to monitor the local fire panels and report fire alarms to the Control Room.

D. Suspend all maintenance involving Hot Work Permit jobs until the Fire Computer is operable.

A. **Correct**

B. Incorrect, no procedural guidance for roving fire watch.

C. Incorrect, plausable but no procedural guidance.

D. Incorrect, no procedural guidance to suspend any work.

Question level: 1
Question source: New
Exam: Both
K/A: 086.A4.02
Importance: 3.5/3.5
Reference: 0-NOP-79.01, Fire Protection Program

INITIAL

6.2 Fire Computer Failure

NOTE

Performing the following action will allow the operable Fire Computer to monitor both units for fire alarms.

1. PERFORM the following to switch fire alarm monitoring to the operable Fire Computer:

   A. PLACE the selector switch inside the **INOPERABLE** Fire Computer console to OFF. ______

   B. PLACE the selector switch inside the **OPERABLE** Fire Computer console to BOTH. ______

2. If the Unit 1 Fire Computer is failed, Then PERFORM the following:

   A. ENSURE Power Panel 137 circuit 9, Main Fire Alarm Panel A and Remote Mult. Panel (A and D), is ON. ______

   B. ENSURE Power Panel 137 circuit 11, Main Fire Alarm Panel B and Remote Mult. Panel (B and E), is ON. ______

3. If the Unit 2 Fire Computer is failed, Then PERFORM the following:

   A. ENSURE Power Panel 237 circuit 19, Main Fire Alarm Panel A & DGP is ON. ______

   B. ENSURE Power Panel 237 circuit 21, Main Fire Alarm Panel B & DGP is ON. ______

4. ENSURE the Security & Fire Detection inverter is energized with its output breaker closed. ______

5. If the Fire Computer console is still failed, Then NOTIFY I&C of the Fire Computer failure. ______

6. If **BOTH** of the following conditions exist:

   - The Fire Computer is failed
   - Cross connecting to the operable Fire Computer console can NOT be performed

   Then STATION an operator at the Master Local Fire Alarm Panel on the affected unit (RAB B switchgear room) to monitor and report fire alarms to the Control Room. ______

Question 71

Unit 1 is performing a Reactor startup and received a CEA Withdrawal Prohibit.

Which of the following caused the condition?

RPS Channel:

	A Power/SUR	B Power/SUR	C Power/SUR	D Power/SUR
A.	$10^{-5\%}$ /1.3 DPM	$10^{-5\%}$ /1.4 DPM	$10^{-4\%}$ /1.3 DPM	$10^{-4\%}$ /1.2 DPM
B.	$10^{-4\%}$ /1.4 DPM	$10^{-4\%}$ /1.4 DPM	$10^{-5\%}$ /1.4 DPM	$10^{-5\%}$ /1.3 DPM
C.	$10^{-3\%}$ /1.2 DPM	$10^{-4\%}$ /1.2 DPM	$10^{-4\%}$ /1.3 DPM	$10^{-4\%}$ /1.2 DPM
D.	$10^{-4\%}$ /1.4 DPM	$10^{-5\%}$ /1.4 DPM	$10^{-5\%}$ /1.3 DPM	$10^{-5\%}$ /1.4 DPM

A. Incorrect, power level low on A & B, start-up rate low on C & D

B. **Correct**

C. Incorrect, SUR low on all

D. Incorrect, power level low on B, C, D

Question Level: 2
Question Source: New
Exam: RO
K/A: 015.K4.02
Importance: 3.7
References: Lesson Text 0711405 Control Element Drive System, Lesson Plan 0702405-10

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: K
PROCEDURE NO: 1-ARP-01-K20	ST. LUCIE UNIT 1	WINDOW: 20

ANNUNCIATOR PANEL K

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	**20**	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

CEA WITHDRAWAL PROHIBIT

K-20

DEVICE:	LOCATION:	SETPOINT:
CEDS	CEDS Logic Cabinet	Multiple Inputs
LPD (Low Power Density)	RPS Cabinet	Variable (2 out of 4 logic)
Power Level - High	RPS Cabinet	Maximum = 105% (2 out of 4 logic) Minimum = 7% above last reset (2 out of 4 logic)
SUR High	RPS Cabinet	1.4 dpm (2 out of 4 logic)
TM/LP (Thermal Margin/Low Power)	RPS Cabinet	50 psia above TRIP (2 out of 4 logic)

ALARM CONFIRMATION:

1. Annunciator L-18, LOCAL POWER DENSITY CHNL PRE TRIP, is ALARMED.
2. Annunciator L-13, REACTOR HIGH PWR LVL CHNL PRE TRIP, is ALARMED.
3. Annunciator L-25, REACTOR START UP RATE HIGH CHNL PRE TRIP, is ALARMED.
4. Annunciator L-28, TM/LP CHNL PRE TRIP, is ALARMED.
5. RPS Cabinet PRE-TRIP alarms on 2 out of 4 of the following channels:
   - LOC PWR DEN
   - HIGH POWER
   - HIGH RATE
   - TM/LO PRESS

OPERATOR ACTIONS:

> NOTE
>
> CEA insertion remains available.

1. If the annunciator is caused by the variable High Power setpoint, Then PERFORM **ONE** of the following:
   A. DEPRESS the RESET pushbuttons on RTGB 104.
   B. REDUCE Reactor power.
2. If the annunciator is caused by the 105% setpoint, Then REDUCE Reactor power using **ONE** of the following:
   - NOP-1-0030123, Reactor Operating Guidelines During Steady State and Scheduled Load Changes.
   - 1-ONP-22.01, Rapid Downpower.
3. If the Reactor Trip Setpoints are being approached and corrective actions are ineffective, Then PERFORM the following:
   A. TRIP the Reactor and Turbine.
   B. GO TO 1-EOP-01, Standard Post Trip Actions.

CAUSES: This annunciator is activated by **ANY** of the following PRE TRIP alarms on the RPS Bistable Trip Units using a 2 out of 4 logic.

- LOC PWR DEN
- HIGH POWER
- HIGH RATE
- TM/LO PRESS

REFERENCES: 1. CWD 8770-B-327 sheets 399 and 406

- When the pushbutton is lit, power is within 4% of the trip setpoint and should be reset. All four pushbuttons must be depressed.

Once the pushbutton is depressed, Q_{TR} is reset to the current value of $Q + Q_b$. The system is capable of holding the setpoint Q_{TR} at the previous minimum indefinitely. A pretrip occurs when Q rises to within **2%** of Q_{TR}.

- The Q_{TR} signal has lower and upper limits of **15%** and **107%** respectively.

A similar circuit generates a pretrip limit for the BTU, as well as an annunciator to warn the operator that Q_{TR} may have to be reset to avoid a trip. The pretrip output provides annunciation in addition to CEA withdrawal prohibit (CWP) signals.

Hi Rate of Change of Power{tc \l2 "Rate of Change of Power}

- The high rate (SUR) trip is provided to protect the core during startup operations, and serves as a backup to the administrative startup rate limits. This trip is not credited in any design basis accident; however, this trip is considered in the safety analysis in that it precludes the need for specific analyses of other events initiated from subcritical conditions.

- A high SUR trip is initiated at **2.49 decades per minute (DPM)**, as sensed on 2-out-of-4 wide-range logarithmic channels, over the range of 10^{-4}% to 15% power.

- The SUR signal is automatically grounded below **10^{-4}%** and bypassed above **15%** power. Refer to Figure 6. Annunciation alerts the operator when the SUR trip is enabled.

- A common pretrip alarm is generated by any one of the four channels when its trip unit senses a SUR in excess of **1.3 DPM** over the range of 10^{-4}% to full power. In conjunction with the pretrip alarm, a CWP signal is also generated (2-out-of-4 coincidence logic) which prevents further withdrawal of regulating group CEAs, but does not affect insertion capability.

Low Reactor Coolant Flow{tc \l2 "Reactor Coolant Flow}

- The reactor coolant low flow trip provides core protection against Departure from Nucleate Boiling (DNB) in the event of a sudden significant decrease in RCS flow.

Question 72

Which of the following explains the response of the Auxiliary Feedwater system following a Unit 1 trip from 100% power?

The Auxiliary Feedwater Actuation System (AFAS) will:

A. actuate at 19.5% NR S/G level and augment the Main Feedwater system to feed the S/G's.

B. actuate at 19.5% NR S/G level and will be the only source of Feedwater to the S/G's.

C. not actuate, the Main Feedwater system will maintain S/G levels through the 15% bypass valves.

D. not actuate, the Main Feedwater system will maintain S/G levels through the Main Feedwater regulating valve.

A. **Correct (but only on Unit 1, Unit 2 MFIV's close on AFAS)**

B. Incorrect, would be correct on Unit 2

C. Incorrect, trip from this power will shrink the S/G's enough to actuate AFAS

D. Incorrect, trip from this power will shrink the S/G's enough to actuate AFAS

Question Level: 1
Question Source: New
Exam: Both
K/A: 059.K3.02
Importance: 3.6/3.7
References: Lesson Text 0711412 AFW and AFAS,
Lesson plan 0702412-10 AFW and AFAS

SYSTEM OPERATION

UNCOMPLICATED TRIP

Following a reactor trip from high power, it is expected that the level in both S/Gs will decrease to below the AFAS setpoint. If level is not recovered before the time delay times out, a full actuation of the AFAS-1 and 2 would be expected.

With no intervening actions, the S/Gs would be receiving feedwater from the main feedwater system via the biased 15% Bypass Valves [Unit 2 isolates MFW on AFAS] and all three AFW pumps, with excessive RCS cooling a likely result. Post trip actions allow cutting back on AFW flow once proper S/G levels have been established thereby preventing unnecessary RCS cooldown.

As S/G levels are increased to above the AFAS reset point (29%), the cycling AFW flow control valves go closed. If level decreased again to the AFAS setpoint, the flow control valves would reopen following the initiation time delay and this cycle would continue to repeat until interrupted by an operator.

Manual S/G Level control during the presence of an AFAS-1(2) can be accomplished by throttling the motor operated valves (MV-09-09 through -12) **after** they have traveled to their full open position. If level is allowed to go above the AFAS-1(2) reset point, you must wait until the valves have closed and press the four (4) ACTUATION RESET PUSHBUTTONS before throttling capability is restored.

To review the indications provided by the AFAS Cabinet Status Lights for automatic actuation, refer to Figure 29.

The normally-off **BISTABLE RELAY STATUS** indicators should be **ON** when that channel's AFAS-1 or AFAS-2 bistables have tripped. The corresponding matrices should be in the tripped state and their normally-on **MATRIX RELAY STATUS** indicators should be **OFF**. The normally-on **SYSTEM STATUS** indicators will extinguish in the following order: **INT** indicator should be **OFF** when any matrix is in the tripped state; the **1-3, 2-4** and **ACT** indicators should extinguish upon completion of the Initiation Time Delay [or immediately if AFAS initiated from RTGB-202 Manual Initiation switches]. The normally-off **AFAS LOCKOUT RELAY STATUS** will indicate **ON**.

The Bistable Units compare the inputs to a predetermined setpoint to cause or prevent generation of the AFAS-1/AFAS-2 signals. Each bistable unit is comprised of two parts - a bistable comparator card and a bistable relay card. The bistable comparator performs the input-setpoint comparison. The bistable relay card contains the relays to "relay" signals to the associated circuits (i.e., indicators, Rupture ID ckt., etc.). The relays are energized during normal conditions and de-energize as conditions dictate.

Each AFAS Channel contains six Bistable Units grouped into two groups to generate the AFAS-1 and AFAS-2 demand signals. The grouping is:

{PRIVATE }**AFAS-1**	**AFAS-2**
LO $LVL_{S/G-A}$	LO $LVL_{S/G-B}$
$P_{S/G-A} < P_{S/G-B}$	$P_{S/G-B} < P_{S/G-A}$
$P_{FWH-1} < P_{FWH-2}$	$P_{FWH-2} < P_{FWH-1}$

The two Level Bistable Units (Figure 21) are of the single input, fixed setpoint type. Their Trip setpoint is 19.5% NR on decreasing level and resets at approximately 10% above the trip setpoint. At the Lo Level Trip setpoint, the bistable trips causing the Lo S/G-1(2) 'T' indicator and a pair of contacts in the Rupture Identification Logic to actuate. One contact opens to de-energize the AFAS Bistable Relay and the second contact closes to enable the Rupture ID Logic. Unless blocked by the Rupture Identification Logic, a channel AFAS-1(2) signal is generated. When the Pre-Trip and Trip setpoints are reached an indicator light under the channel label plate of the front panel will light (Figure 29). This is a split window indicator labeled 'PT' and 'T'. The indicators are latch on and can be reset by depressing the pushbutton labeled "RESET" when level has recovered above the setpoint.

The Pressure Bistable Units (Figure 22) are of the dual input, fixed differential setpoint type and work similar to the Level Bistable Units including Pre-Trip and Trip indicating lights on the channel front panel. The two S/G Pressure Bistable Units have a Trip setpoint of 275 psid while the two Feedwater Header Pressure Bistable Units have a Trip setpoint of 150 psid. When the 'A' input decreases to the setpoint d/p below the 'B' input, the bistable trips. This causes the bistable relays to de-energize, closing a contact in the Rupture ID circuit and lighting the appropriate 'T' light on the AFAS Cabinet.

Rupture Identification and AFAS-1(2) Bistable Relays

Question 73

Unit 1 is in Mode 2 with CEA's being withdrawn for a Reactor Startup. When Group 7 rods are stepped out to 70" withdrawn, CEA #41 continues to withdraw with the CEDMCS panel in off.

Which of the following describes the required CEA Off-Normal procedure Operator actions and at what CEA position will the CEA Technical Specification action statement be entered?

	Procedure required actions	**CEA position T.S. Entered**
A.	Trip Reactor	78 inches
B.	Trip Reactor	73 inches
C.	Manually insert CEA #41	78 inches
D.	Manually insert CEA #41	73 inches

A. **Correct**

B. Incorrect, CEA required to be aligned within 7.5 inches of other CEA's

C. Incorrect, Reactor required to be tripped

D. Incorrect, incorrect actions and T.S.

Question Level: 2
Question Source: New
Exam: Both
K/A: 001.AK3.02
Importance: 3.2/4.3
References: 1-0110030 CEA Off-Normal operation and realignment, Tech. Spec. 3.1.3.1, LP 0702405-12 CEDMCS Lesson Plan

7.0 OPERATOR ACTIONS:

7.1 Immediate Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS
1. Place CEDS panel in OFF.	
2. If continuous CEA withdrawal is indicated, while CEDS panel is OFF, Then manually trip the reactor and turbine and carry out 1-EOP-01, "Standard Post Trip Actions."	
3. If a mismatch between reactor power and turbine power (T-avg and T-ref) exists, Then adjust turbine power to equal reactor power.	
4. If 2 or more CEAs are misaligned from any other CEA in their group by greater than 15 inches and/or dropped, Then manually trip the reactor and turbine and carry out 1-EOP-01, "Standard Post Trip Actions."	

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

FULL LENGTH CEA POSITION

LIMITING CONDITION FOR OPERATION

3.1.3.1 The CEA Block Circuit and all full length (shutdown and regulating) CEAs shall be OPERABLE with each CEA of a given group positioned within 7.5 inches (indicated position) of all other CEAs in its group.

APPLICABILITY: MODES 1* and 2*.

ACTION:

a. With one or more full length CEAs inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With the CEA Block Circuit inoperable, within 6 hours either:

   1. With one CEA position indicator per group inoperable, take action per Specification 3.1.3.3, or

   2. With the group overlap and/or sequencing interlocks inoperable, maintain CEAs in groups 3, 4, 5 and 6 fully withdrawn and withdraw the CEAs in group 7 to less than 5% insertion and place and maintain the CEA drive system mode switch in either the "Manual" or "Off" position, or

   3. Be in at least HOT STANDBY.

c. With one full length CEA inoperable due to causes other than addressed by Action a above, but within its above specified alignment requirements and either fully withdrawn or within the long term steady state insertion limits if in CEA group 7, operation in MODES 1 and 2 may continue.

d. With one or more full length CEAs misaligned from any other CEAs in its group by more than 7.5 inches but less than 15 inches, operation in MODES 1 and 2 may continue, provided that within one hour the misaligned CEA(s) is either:

   1. Restored to OPERABLE status within its above specified alignment requirements, or

---

* See Special Test Exceptions 3.10.2 and 3.10.5.

LIMITING CONDITION FOR OPERATION (continued)

2. Declared inoperable and satisfy SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 for up to 7 days per occurrence with a total accumulated time of ≤ 14 days per calendar year provided all of the following conditions are met:

   a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

   b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be at least HOT STANDBY within the next 6 hours.

e. With one full length CEA misaligned from any other CEA in its group by 15 or more inches, operation in MODES 1 and 2 may continue provided that the misaligned CEA is positioned within 7.5 inches of other CEAs in its group in accordance with the time constraints shown in COLR Figure 3.1-1a.

f. With one full length CEA misaligned from any other CEA in its group by 15 or more inches beyond the time constraints shown in COLR Figure 3.1-1a, reduce power to ≤ 70% of RATED THERMAL POWER prior to completing ACTION f.1 or f.2.

   1. Restored the CEA to OPERABLE status within its specified alignment requirements, or

   2. Declare the CEA inoperable and satisfy the SHUTDOWN MARGIN requirements of Specification 3.1.1.1. After declaring the CEA inoperable, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6 provided:

      a) Within 1 hour, the remainder of the CEAs in the group with the inoperable CEA shall be aligned to within 7.5 inches of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown on COLR Figure 3.1-2; the THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.6 during subsequent operation.

LIMITING CONDITION FOR OPERATION (continued)

b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

Otherwise, be at least HOT STANDBY within the next 6 hours.

g. With more than one full length CEA inoperable or misaligned from any other CEA in its group by 15 inches (indicated position) or more, be in HOT STANDBY within 6 hours.

h. With one full length CEA inoperable due to causes other than addressed by ACTION a above, and inserted beyond the long term steady state insertion limits but within its above specified alignment requirements, operation in MODES 1 and 2 may continue pursuant to the requirements of Specification 3.1.3.6.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full-length CEA shall be determined to be within 7.5 inches (indicated position) of all other CEAs in its group at least once per 12 hours except during time intervals when the Deviation Circuit and/or CEA Block Circuit are inoperable, then verify the individual CEA positions at least once per 4 hours.

4.1.3.1.2 Each full length CEA not fully inserted shall be determined to be OPERABLE by inserting it at least 7.5 inches at least once per 92 days.

4.1.3.1.3 The CEA Block Circuit shall be demonstrated OPERABLE at least once per 92 days by a functional test which verifies that the circuit prevents any CEA from being misaligned from all other CEAs in its group by more than 7.5 inches (indicated position).

4.1.3.14 The CEA Block Circuit shall be demonstrated OPERABLE by a functional test which verifies that the circuit maintains the CEA group overlap and sequencing requirements of Specification 3.1.3.6 and that the circuit prevents the regulating CEAs from being inserted beyond the Power Dependent Insertion Limit of COLR Figure 3.1-2:

*a. Prior to each entry into MODE 2 from MODE 3, except that such verification need not be performed more often than once per 92 days, and

b. At least once per 6 months.

* The licensee shall be excepted from compliance during the startup test program for an entry into MODE 2 from MODE 3 made in association with a measurement of power defect.

Question 74

A St. Lucie non-licensed operator is being sent to perform a valve alignment in the RAB. The dose rate in the area of the job is 120 mr/hr. The operator's exposure record to date for the year is 890 mrem.

What is the maximum time the Operator can stay in this area without exceeding his FPL annual limit?

A. 40 minutes

B. 45 minutes

C. 50 minutes

D. 60 minutes

A. Incorrect, can stay 55 minutes.

B. Incorrect, can stay 55 minutes.

C. Correct

D. Incorrect, will exceed limits

Question level: 2
Question source: New
Exam: Both
K/A: 2.3.4
Importance: 2.5/3.1
Reference: HP-2, FPL Health Physics Manual

NOTE
Guideline extensions normally apply to administrative guidelines established for the quantity Total Effective Dose Equivalent. It is unlikely that the lens dose equivalent or shallow dose equivalent limits for the skin or to any extremity would ever be exceeded, and would not be the dose limiting factor.

4. The approval process for allowing a worker to receive occupational dose, provided that all current year exposure has been documented, is as follows:

NOTE
Sections a and b apply to site annual TEDE doses.

a. At the beginning of each calendar year, each worker is allowed to receive up to 1000 mrem TEDE without a dose extension.

b. Greater than 1000 mrem/year TEDE site exposure requires review from the Health Physics Supervisor and approval from the Plant General Manager.

   (1) Greater than 2500 mrem/year TEDE site exposure requires review from the Health Physics Supervisor and approval from the Plant General Manager, and the Site Vice President.

c. Greater than 3000 mrem/year TEDE from all sites requires review from the Health Physics Supervisor and approval from the Plant General Manager.

   (1) Greater than 4500 mrem/year TEDE from all sites requires review from the Health Physics Supervisor and approval from the Plant General Manager, and the Site Vice President.

Question 75

Unit 1 has manually tripped the Reactor and Turbine due to an oil leak on the 1B1 Reactor Coolant pump. 1B1 Reactor Coolant pump has been stopped and 1-EOP-02 has been entered.

Which of the following states the required action as a direct result of stopping the 1B1 Reactor Coolant pump (RCP)?

A. Cooldown the RCS to less than 545ºF

B. Isolate controlled bleedoff from the 1B1 RCP

C. Depressurize the RCS to 1850 psia.

D. Open V2507 RCP Bleedoff Relief Stop valve.

A. Incorrect, this applies if all RCP's stopped

B. Incorrect, this applies if CCW lost to RCP's >30 minutes

C. **Correct**

D. Incorrect, this applies if SIAS/CIAS, CCW restored, RCP bleedoff lost for <30 minutes.

Question Level: 1
Question Source: New
Exam: Both
K/A: 007.EA1.1
Importance: 3.7/3.7
References:1-EOP-02 Reactor Trip Recovery
Lesson Plan 0702822-05 Reactor Trip event and Recovery

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS		CONTINGENCY ACTIONS

CAUTION

Pressurizer level should be closely monitored since it normally approaches the Pressurizer heater low level cutout (28%) following an uncomplicated trip.

	INSTRUCTIONS	CONTINGENCY ACTIONS
☐	5. VERIFY that the Pressurizer level controls are automatically maintaining or restoring Pressurizer level 28% to 35%.	5. If Pressurizer level is NOT recovering, Then manually OPERATE Charging and Letdown to maintain or restore Pressurizer level 28% to 35%.
☐	6. VERIFY that the Pressurizer Pressure Control System is automatically maintaining or restoring pressure 2225 to 2275 psia and is within the limits of Figure 1, RCS Pressure Temperature curve.	6. If Pressurizer pressure is NOT being automatically controlled, Then manually OPERATE Pressurizer heaters and sprays to control pressure.
☐	7. If an RCP has been stopped, Then DEPRESSURIZE the RCS to approximately 1850 psia to maintain RCP Lower Cavity temperature less than 300°F on the idle pump(s).	

Question 76

At 100% power, Unit 1 has received the following annunciator:

- 'K-26 CEDS Trouble/Continuous Gripper Voltage High'

It has been determined that CEA #26 has a high voltage condition.

Which of the following must be performed within 10 minutes?

A. Transfer CEA #26 to Upper Gripper.

B. Transfer CEA #26 on the Hold Bus.

C. Actuate the Reset Toggle Switch for CEA #26 timer module.

D. Contact I&C Maintenance to investigate CEA #26 for operability.

A. Incorrect, this is performed when removing CEA from the hold bus

B. Correct

C. Incorrect, this is for CEA timer module malfunction

D. Incorrect, this is performed after CEA is placed on hold bus.

Question Level: 1
Question Source: New
Exam: RO
K/A: 001.K6.11
Importance: 2.9
References: 1-ARP-01-K27 Annunciator response procedure, 1-01100340 CEA Off-Normal Operation and Realigment.

REVISION: 0	PROCEDURE TITLE: ANNUNCIATOR RESPONSE PROCEDURE	PANEL: K
PROCEDURE NO: 1-ARP-01-K26	ST. LUCIE UNIT 1	WINDOW: 26

ANNUNCIATOR PANEL K

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

CEDS TROUBLE/ CONTINUOUS GRIPPER VOLTAGE HIGH
K-26

DEVICE:
ACTM Module
TFA
HVA

LOCATION:
CEDS Logic Cabinets
ACTM Module
ACTM Module

SETPOINT:
Multiple
Timer Failure Alarm
Uncontrollable High Voltage

ALARM CONFIRMATION:
1. ACTM local indication.

OPERATOR ACTIONS:

> CAUTION
> Actions of ONOP 1-0110030, CEA Off-Normal Operation and Realignment, must be performed within 10 minutes of receiving this annunciator to prevent damage to upper gripper coils

1. NOTIFY I&C.
2. **GO TO ONOP 1-0110030, CEA Off-Normal Operation and Realignment.**

CAUSES: This annunciator is caused by either of the following, indicating an ACTM Module malfunction:
- Timer Failure Alarm (TFA) indicating neither a high nor low pulse is available during an insert or withdraw demand to the UG or LG coil for a specified time period.
- High Voltage Alarm (HVA) provided for an uncontrollable high voltage condition.

REFERENCES: 1. CWD 8770-B-327 sheets 397, 430 and 1074

¶1

APPENDIX J
CEDS TROUBLE/CONTINUOUS GRIPPER VOLTAGE HIGH (K-26)
(Page 1 of 7)

> **CAUTION**
> If this Appendix is being performed due to a LOCKED IN Annunciator (K-26) alarm, Then Section 2, Placing CEAs On The Hold Bus, must be completed within 10 minutes to prevent possible Gripper Coil damage.

1. Diagnosing Alarm Indications

> **NOTE**
> The ACTM has two trouble indications: Current Trouble & Historical Trouble
>
> - For Current Trouble, the LED flashes continuously.
> - For historical Trouble, the LED flashes for 4 seconds, then off for 4 seconds.
> - When K-26 is LOCKED IN, the alarm is NOT from an ACTM with Historical Trouble.

A. DETERMINE the affected CEA(s) by observing the timer module LEDs for each CEA.

1. If only **one** CEA timer module has the following LEDs lit:

   - ABNORMAL VOLTAGE
   - TROUBLE (flashing continuously)

   Then PLACE the CEA on the Hold Bus in accordance with Section 2, Placing CEAs On The Hold Bus.

Question 77

During a reactor startup, which of the following CEA surveillances is performed to ensure shutdown margin will be maintained?

Verifying:

A. Reed switch position indication and pulse counting position indication agree within 3 inches.

B. CEA motion stops if deviation of ≥ 4 inches occurs.

C. Regulating group overlap is < 58 inches.

D. Regulating groups will not withdraw if the Shutdown groups are inserted.

A. Incorrect, position indication verification

B. Incorrect, limit is 6 inches

C. Incorrect, overlap limit 54 inches

D. Correct

Question Level: 1
Question Source: New
Exam: Both
K/A: 001.G2.2.12
Importance: 3.0/3.4
References: NOP-1-0030122 Reactor Startup, 0702405-09 CEA Drive System Lesson plan

{PRIVATE }Core Mimic Display{tc \l 2 "Core Mimic Display"}

The core mimic display is a group of multi-segmented lights located on RTGB-104 that are laid out the same as the CEA positions in the reactor core (Refer to Figure 23). Separate segments of these lights are actuated by interface relays operated by the limit switches in the RSPT (Refer to Figure 15). The color varies based on the following:

Amber - Dropped rod
Green - Lower Electrical Limit (LEL)
White - Operating band
Red - Upper electrical limit (UEL)
Blue - Shutdown CEA below exercise limit (128" from DDPS)

{PRIVATE }CEA Motion Interlocks{tc \l 2 "CEA Motion Interlocks"}

There are various motion interlocks associated with the CEAs. These interlocks are used to ensure appropriate reactor core reactivity status, and protect against equipment damage.

{PRIVATE }Permissives{tc \l 1 "Permissives"}

Two permissives are provided for the maintenance of minimum shutdown margin and are detailed in the following list:

REGULATING GROUP WITHDRAWAL PERMISSIVE (ISH) - All shutdown CEAs must be at the upper electrical limit (UEL) to allow regulating group withdrawal. This interlock can be bypassed by depressing the REG GROUP W/D PROHIBIT BYPASS pushbutton on RTGB-104. When not met, this condition energizes the CEA REG GRP WITHDRAWAL PROHIBIT Yellow Indicating Light.

SHUTDOWN GROUP INSERTION PERMISSIVE (IRG) - All regulating CEAs must be at the lower electrical limit (LEL) to allow shutdown group insertion. When met, this condition energizes the CEA S/D GRP. INSERT. PERMITS Yellow Indicating Light.

{PRIVATE }CEA Motion Inhibit Circuitry{tc \l 4 "• CEA Motion Inhibit Circuitry"}

A Motion Inhibit signal shall be generated based on the information from the following **Alarms**:

- CEA Deviation (Shutdown and Regulating Groups)
- CEA Regulating Group Out-Of-Sequence
- CEA Regulating Group Overlap
- CEA Regulating Group Insertion to the Power Dependent Insertion Limit
- CEA Regulating CEA greater than IRG
- CEA Shutdown CEA is less than ISH

When the Reactor Power is less than 10^{-4}% rated power, the motion inhibit signals are bypassed via a low power cutout signal (external digital input).

Other Control Interlocks

Several other control interlocks are provided and are detailed in the following list.

- **UPPER GROUP STOP** - Stops group CEA withdrawal at 133" withdrawal. This interlock is generated by **DDPS** based on the pulse-count position indication.

- **LOWER GROUP STOP** - Stops group CEA insertion at 4.5" from bottom of insertion. This interlock is also generated by **DDPS** based on the pulse-count position indication.

- **UPPER CEA LIMIT - RSPT** interlock that stops the withdrawal of each individual CEA at 136" of withdrawal.

- **LOWER CEA LIMIT - RSPT** interlock that stops the insertion of each individual CEA at approximately 1" from the bottom.

SEQUENCE PERMISSIVE (DDPS) - A group out of sequence condition prohibiting regulating group motion in the manual sequential (MS) and automatic sequential (AS) modes. This permissive is lost if there is greater than a 54" overlap between groups.

INITIAL

7.0 INSTRUCTIONS: (continued)

> **NOTE**
> Following the boration/dilution to achieve the estimated critical boron concentration, the present boron concentration should be determined by chemical analysis. There should be at least a 20 minute wait between the completion of boration/dilution and RCS sampling.

> **NOTE**
> Step 7.7 does NOT need to be completed to continue, but shall be completed prior to commencing Step 7.11.

7.7 The measured RCS boron concentration should be within 15 PPM of the estimated critical boron concentration determined in Appendix C, "Estimated Critical Conditions and Inverse Count Rate Ratio," ECC Calculation Worksheet. If this must be exceeded, refer to Appendix E, Steps 3.E and F. ______

7.8 Shutdown Group Withdrawal

¶1
> **NOTE**
> The CEA Circuit Breaker for each CEA is located inside the front of the CEA Control Panel.

1. ENSURE all CEA Circuit Breakers are OPEN. ______
2. Ensure CLOSED TCB-1 through TCB-9. ______
3. ¶1 Ensure CLOSED all CEA Circuit Breakers located inside the front of the CEA Control Panel. ______
4. Ensure all CEA Disconnect Circuit Breaker closed red lights are lit at the Coil Power Programmer cabinets. ______
5. §1 Verify the Regulating Group interlock as follows:
   A. Attempt to WITHDRAW the Regulating Group 1 CEAs using Manual Group. ______
   B. Verify no CEA motion occurs. ______
   C. Verify that the "CEA Reg Grp Wthdrl Prohibit" amber light on RTGB-104 is lit. ______

Question 78

Unit 1 is performing a startup with the following conditions:

- 0.3% power
- 1B Main Feedwater pump in service

A loss 2B1 6.9 KV bus occurs.

Which of the following explains the initial plant response?

Unit will:

A. trip on low S/G level

B. trip on low RCS flow

C. not trip due to Zero Power Mode bypass in service

D. not trip due to Loss of Load bypass in service.

A. Incorrect, although loss of the 1B Feedwater pump will occur, a low S/G level will take many minutes to generate a reactor trip.

B. Correct

C. Incorrect, ZPMB is automatically removed on Unit 1 at 0.1% power,0.5% on Unit 2.

D. Incorrect, Loss of Load bypass applicable <15% power with Turbine trip.

Question Level: 2
Question Source: New
Exam: Both
K/A: 003.K3.04
Importance: 3.9/4.2
References: RPS lesson text 0711404, RPS lesson plan 0702404-01

- When the pushbutton is lit, power is within 4% of the trip setpoint and should be reset. All four pushbuttons must be depressed.

Once the pushbutton is depressed, Q_{TR} is reset to the current value of $Q + Q_b$. The system is capable of holding the setpoint Q_{TR} at the previous minimum indefinitely. A pretrip occurs when Q rises to within **2%** of Q_{TR}.

- The Q_{TR} signal has lower and upper limits of **15%** and **107%** respectively.

A similar circuit generates a pretrip limit for the BTU, as well as an annunciator to warn the operator that Q_{TR} may have to be reset to avoid a trip. The pretrip output provides annunciation in addition to CEA withdrawal prohibit (CWP) signals.

Hi Rate of Change of Power{tc \l2 "Rate of Change of Power}

- The high rate (SUR) trip is provided to protect the core during startup operations, and serves as a backup to the administrative startup rate limits. This trip is not credited in any design basis accident; however, this trip is considered in the safety analysis in that it precludes the need for specific analyses of other events initiated from subcritical conditions.
- A high SUR trip is initiated at **2.49 decades per minute (DPM)**, as sensed on 2-out-of-4 wide-range logarithmic channels, over the range of 10^{-4}% to 15% power.
- The SUR signal is automatically grounded below **10^{-4}%** and bypassed above **15%** power. Refer to Figure 6. Annunciation alerts the operator when the SUR trip is enabled.
- A common pretrip alarm is generated by any one of the four channels when its trip unit senses a SUR in excess of **1.3 DPM** over the range of 10^{-4}% to full power. In conjunction with the pretrip alarm, a CWP signal is also generated (2-out-of-4 coincidence logic) which prevents further withdrawal of regulating group CEAs, but does not affect insertion capability.

Low Reactor Coolant Flow{tc \l2 "Reactor Coolant Flow}

- The reactor coolant low flow trip provides core protection against Departure from Nucleate Boiling (DNB) in the event of a sudden significant decrease in RCS flow.

The Differential Pressure (ΔP) across each steam generator (S/G) is monitored by 4 ΔP transmitters. Refer to Figure 7. Each RPS channel is fed by one ΔP transmitter from each S/G. The square root of each ΔP transmitter output signal is electronically extracted to provide a signal directly proportional to flow. The flow signals from both S/Gs are summed to get total RCS flow.

- A reactor trip is initiated when RCS flow falls below **95% [95.4%]** of nominal full flow, as seen by 2-out-of-4 RPS channels. A pretrip is initiated at **97%** flow.
- ZPMB Key block to bypass trip when ≤ .1%[.5%]

Low Steam Generator Water Level{tc \l2 "Steam Generator Water Level}

- A reactor trip is initiated on a low steam generator water level condition to prevent reactor operation with steam generator water level below the minimum volume required for adequate heat removal capability. This trip ensures that the design pressure of the reactor coolant system will not be exceeded due to a loss of the steam generator heat sink. This trip is utilized to prevent exceeding the DNBR.

The setpoint provides an allowance to ensure sufficient water inventory in the S/Gs at the time of the trip to provide a margin of at least 10 minutes before auxiliary feedwater is required; i.e., cooling lost.

Each S/G's downcomer level is monitored by four level transmitters. Refer to Figure 8. Each RPS channel is fed by one level transmitter on each steam generator and auctioneers and passes the lower signal fed to it.

- A reactor trip is initiated when the lower steam generator level drops to **20.5%** of N.R. span, as seen by 2-out-of-4 RPS channels. The pretrip setpoint is **40%**.

A channel trip annunciator and/or channel pretrip annunciator, each common to all four channels, is triggered by a trip/pretrip condition on any one of the four channels.

Low Steam Generator Pressure{tc \l2 "Steam Generator Pressure}

- The steam generator low pressure trip terminates the power excursion associated with an excessive rate of heat extraction from the S/Gs, and limits the subsequent

because it is also used to establish the base line enthalpy condition for the DNB calculation. Figure 20 details the ΔT power calculation.

NI Power (ϕ)

The lower (L) and upper (U) subchannel signals from the Linear Power Range Safety Channel are input to CPC-2. There, the subchannel signals are summed and sent to the RPSCIP where the nuclear calibrate potentiometer is used to adjust it. The result is ϕ, which is directed to CPC-1 and max selected with β to develop Q, and the nuclear PWR-ΔT Pwr (%) meter on the RPSCIP.

Pump Flow{tc \l4 "Pump Flow}

Actual reactor coolant flow is not measured for the CPCs. A flow signal is developed by the FDSS switch on Unit 1 [is hardwired on Unit 2] and sent to numerous places in the CPCs. This signal is always constant since neither unit permits critical operation with less than four RCPs running.

Radial Penalty (QR_2){tc \l4 "Radial Penalty QR2}

QR_2 is similar to QR_1 except that its synthesized radial peaking factor is used in the CPC-1. Presently, the Q input equals the QR_2 output.

Q_{DNB}{tc \l4 "QDNB}

Q_{DNB} is the Q power signal amplified by A_1 and QR_1, and is used in the TM/LP calculation of the variable pressure setpoint, P_{VAR}.

$$P_{VAR} = 2061 \bullet A_1 \bullet QR_1 + 15.85\, T_{COLD} - 8950 \quad \text{(Figure 2.2-3 in Tech Specs)}$$

In the above Unit 1 P_{VAR} formula, the origin of A_1, QR_1, and T_{COLD} were previously discussed. The remaining factors 2061, 15.85, and 8950 are functions of the FDSS switch position.

- Refer to Unit 2 Tech Specs for Unit 2 P_{VAR} factors values.

P_{VAR} is fed into the Max auctioneer along with P_{MIN} (1887 psia [1900 psia]) and ASGT (zero or 2500 psia). While at full power, P_{VAR} is usually the larger signal and is therefore the TM/LP setpoint.

Question 79

Which of the following determines if the Waste Gas system will be lined up directly from the Gas Surge Tank to the Plant Vent or from the Gas Surge Tank to the Gas Decay Tank?

A. Off-site dose calculations as projected by Chemistry

B. Operability of Met Tower

C. Volume of Nitrogen in the Waste Gas system

D. Operability of the Waste Gas Release Radiation Monitor

A. Correct

B. Incorrect, plausible due to Met Tower used for Gas release from GDT.

C. Incorrect, if level of Oxygen is high, directions are to add Nitrogen to reduce levels of Oxygen.

D. Incorrect, plausible, Monitor is used to release Gas Decay Tanks

Question Level: 1
Question Source: New
Exam: RO
K/A: 071.G2.1.32
Importance: 3.9
References:1-0530020 Waste Gas System Operation

ST. LUCIE UNIT 1
OPERATING PROCEDURE NO. 1-0530020, REVISION 36
WASTE GAS SYSTEM OPERATION

8.0 INSTRUCTIONS:

8.1 Initial Alignment of the Waste Gas System

Operational lineup of the Waste gas system is dependent upon projected off-site dose calculations done by the Chemistry Department. There are two lineups that will be used; the first is directly from the Gas Surge Tank to the plant vent and the second is from the Gas Surge Tank to the selected gas Decay Tank and then, after Chemistry sample, to the plant vent.

1. Valves located in Containment.

VALVE NO.	DESCRIPTION	POSITION	INITIAL
V6000	Cntmt Vent Hdr Leaving Cntmt Isol	OPEN	______
V6001	Betwn Penetr 31 & Cntmt Vent Hdr Isol V6000 Drain	CLOSED	______
V6058	Cntmt Vent Hdr Vent	CLOSED	______
V6744	Cntmt Vent Hdr from Exhaust Gas Refueling Equip Isol.	CLOSED	______

2. Valves located in pipe tunnel:

VALVE NO.	DESCRIPTION	POSITION	INITIAL
V6071	1A GST from Various Equip Drain	CLOSED	______
V06156	Gas Analyzer Gas Vent Line to 1A Gas Surge Tank Drain	CLOSED	______
V6586	Gas Analyzer to 1A Gas Surge Tank Isol	OPEN	______
V06109	Waste Gas Comprs Diaphragm Leak Hdr Isol	OPEN	______
V06826	T6911 Equalizing Line Isol	OPEN	______
V6800	Isolation Valve for Gas Surge Tank 1A Drain Trap Discharge	*	______

*Automatic valve controlled by T-6911

Question 80

Unit 1 has experienced an ESD in the Containment with the following conditions:

- Containment pressure is 15 psig
- Containment temperature is 226ºF

Which of the following are the **minimum** Containment Coolers/Containment Spray header combinations that will meet the Containment Temperature and Pressure Safety Function while in 1-EOP-05?

	Containment Coolers	**Containment Spray Headers**
A.	1 operating	One with 2500 gpm flow, one with 2600 gpm
B.	2 operating	One with 2900 gpm flow
C.	3 operating	One with 2600 gpm flow
D.	3 operating	None

A. Incorrect, spray header flow low

B. Correct

C. Incorrect, spray header flow low

D. Incorrect, need four coolers with no spray header flow

Question Level: 2
Question Source: New
Exam: SRO
K/A: 026.G2.4.21
Importance: 4.3
References: 1-EOP-05, 0711600 Containment and Shield Building Lesson text, 0711600-02 Containment and Shield Building Lesson plan.

APPENDIX A
SAFETY FUNCTION STATUS CHECK SHEET
(Page 10 of 12)

8. CONTAINMENT TEMPERATURE AND PRESSURE

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Containment Pressure	Less than 10 psig.	
		AND
Containment Temperature	Less than 240°F.	
B. Four Containment Coolers	Operating.	
C. Two Containment Spray Headers	Each greater than or equal to 2700 gpm flow.	
D. Two Containment Coolers	Operating.	
		AND
One Containment Spray Header	With greater than or equal to 2700 gpm flow.	

END OF SAFETY FUNCTION 8

Question 81

Unit 2 has tripped from 100% power. Which of the following actions are specifically performed in 2-EOP-01 to prevent excessive RCS cooldown?

A. Throttling AFW flow to less than 150 gpm per Steam Generator.

B. Closing MSR block valves.

C. Resetting the Main Feedwater 15% bypass valves.

D. Closing the Steam Spillover Bypass valve MV 08-814

A. Incorrect, 150 gpm based on Feed Ring water hammer damage

B. Correct

C. Incorrect, AFAS is always received from 100% trip and will close the MFRV's.

D. Incorrect, this is performed to prevent losing vacuum

Question Level: 1
Question Source: New
Exam: RO
K/A: 2.4.49
Importance: 4.0
References: 2-EOP-01 Standard Post Trip Actions

1.0 TITLE:

STANDARD POST TRIP ACTIONS

2.0 PURPOSE:

This procedure provides the immediate operator actions that must be accomplished after an automatic or manually initiated Reactor trip. These actions are necessary to ensure the plant is placed in a stable, safe condition or plant is configured to respond to a continuing emergency. This is the entry procedure for the entire EOP system. The plant should be in MODE 3, at the termination of this procedure.

3.0 ENTRY CONDITIONS:

Symptoms of a Reactor trip:

1. ADS Display indicates CEAs inserted.
2. CEA Lower Electrical Limit lights (green) and CEA bottom lights (amber) are on.
3. Rapid decrease in Reactor power.
4. Reactor Trip Swgr breakers open.

4.0 EXIT CONDITIONS:

1. Any of the Standard Post Trip safety functions acceptance criteria are NOT met.

OR

2. A. All of the safety functions are being maintained.

AND

B. RCS conditions are being controlled and maintained in a MODE 3 condition.

5.0 OPERATOR ACTIONS: (continued)

RCS HEAT REMOVAL

INSTRUCTIONS	CONTINGENCY ACTIONS
6. (continued)	6. (continued)
D. Four MSR TCV Block Valves are CLOSED: • MV-08-4 • MV-08-4 • MV-08-6 • MV-08-10	D. If **ALL** four MSR TCV Block Valves did NOT close automatically, Then PERFORM **ANY** of the following: 1. PLACE the affected TCV Block Valve RTGB hand switch in CLOSE. 2. PLACE Reheat Control Valve TCVs in MANUAL and CLOSE the TCVs using Temperature Control Rheostat.
E. If maintaining a vacuum in the Condenser is desired, Then ENSURE MV-08-814, Spillover Bypass Valve, is CLOSED.	

/R16

Question 82

Which of the following do NOT require prior ANPS/NPS (individual with Control Room Command Function duties) concurrence and or approval.

A. Skipping parameter log entries

B. Shift relief during a surveillance that is in a steady state condition

C. Closing Unit 2 MSR block valves during performance of SPTA's

D. Adding 30 gallons of primary water to the RCS to maintain steady state RCS temperature.

A. Incorrect

B. Incorrect

C. Correct

D. Incorrect

Question Level: 1
Question Source: New
Exam: Both
K/A: 2.1.1
Importance: 3.7/3.8
References: Adm. 0010120 Conduct of Operations

ST. LUCIE PLANT
ADMINISTRATIVE PROCEDURE NO. 0010120, REVISION 130
CONDUCT OF OPERATIONS

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 6 of 15)

Emergency Operating Procedure Implementation: (continued)

1. (continued)

G. (continued)

3. Following completion of the Immediate Actions, the Board RCO systematically performs the steps of EOP-01 with procedure in hand. If a Safety Function is not being met or a contingency action must be taken, that information must be communicated to the ANPS. The ANPS should concur with these contingency actions prior to the action being taken. Closing of the MSR TCV Block Valves on Unit 2 is a normal action (i.e., not a contingency) and can be taken by the operators without ANPS specific concurrence. The accomplishment of this action will be second checked by the other RCO as he performs the procedure.

4. Once the Board RCO has completed the SPTAs, he will **formally report, "I have completed SPTAs"** to the ANPS and return to the RTGB to monitor the plant and perform other actions as required (e.g., throttling AFW flow and securing RCPs, should plant conditions require it).

5. Following completion of the Immediate Actions, the ANPS and Desk RCO should spend one to two minutes assessing plant and equipment status. During this time, the Desk RCO should announce on the Gaitronics **"Attention all Plant Personnel, the Unit 1 (2) reactor has tripped."**

6. After approximately two minutes, the ANPS and Desk RCO, with procedure in hand, will then perform the Standard Post Trip Actions together.

   a. The ANPS will ask for the status of each Safety Function in turn.

   b. The Desk RCO will then verbalize each indication and/or trend within that safety function while the ANPS follows along in the procedure. Should contingency actions be required, the **ANPS will direct** the actions using formal three-part communication.

APPENDIX C
CREW RELIEF/SHIFT TURNOVER
(Page 6 of 6)

1. (continued)

B. (continued)

9. (continued)

e. Instructions for Relief/Turnover While Performing a Surveillance

1. Crew Relief/Shift Turnover for Operators or the Assistant Nuclear Plant Supervisor shall NOT take place while performing a surveillance, with the following exception:

(a.) The surveillance evolution is in a steady state or non-transient/transition condition. The Operators shall obtain ANPS approval prior to turnover.

2. Individual Relief/Split-Shift Turnover and Interim or Short Term Relief may take place for an Operator, if at a minimum, one other Operator is responsible for the status of the surveillance in progress. Prior ANPS approval is required.

APPENDIX D
LOG KEEPING
(Page 7 of 8)

3. Parameter Logs:

   A. RCOs, SNPOs/NOs, NPOs/NTOs, and ANPOs shall maintain logs to document plant parameters at pre-determined time intervals.

      1. All required entries on logs must be completed.

      2. Log entries shall be compared with previous entries to detect abnormal trends or conditions.

      3. Log entries shall be verified to be within the minimum and maximum acceptance values for the parameter.

§3   a. An explanation shall be recorded for entries that exceed the minimum or maximum acceptance values.

      4. Parameter log entries at the required time interval shall NOT be skipped without **PRIOR** approval from the NPS.

      5. Under NO circumstances shall midnight parameter log entries be skipped.

4. Shift Record Reviews:

   A. The following logs should be reviewed at least once per 8 hours by the NPS, ANPS, or NWE:

      1. Reactor Control Operator Log Readings.

      2. Senior Nuclear Plant Operator Log Readings and Chronological Log.

      3. Nuclear Plant Operator Log Readings and Chronological Log.

      4. Associate Nuclear Plant Operator Log Readings and Chronological Log.

   B. The intent is that the review of the operator logs be performed by the SROs responsible for that shift. The SRO should review the log sheets after the last set of logs are taken, prior to the end of shift.

APPENDIX A
SHIFT OPERATING PRACTICES
(Page 2 of 10)

1. (continued)

   B. (continued)

      2. (continued)

         b. (continued)

            2. He/She should primarily remain in the immediate vicinity of the RTGBs.

               a) The area between the Control Room Desk/ERDADS console and the RTGS is defined as the "immediate vicinity of the RTGBs.

      3. To the maximum extent possible two licensed Operators should be within the solid lines of Figure 1.

2. Reactivity Manipulations

   A. Reactivity manipulations or manipulations of other control board equipment with the potential for effecting reactivity shall only be performed by licensed operators.

      1. Persons reactivating a license or in a bonafide training role in pursuit of obtaining an operators license may perform reactivity manipulations while under the direction and in the presence of a currently licensed operator.

   B. All reactivity manipulations in the course of normal plant operations shall have prior approval of the SRO with the Control Room Command Function.

      1. When reactivity manipulations are in progress the "Operator at the Controls" shall remain within the immediate vicinity of the RTGBs and remain focused on the primary responsibility of reactivity management.

         a. The commencement and termination of all reactivity manipulations shall be communicated to the SRO with the Control Room Command Function.

Question 83

Unit 1 has experienced a SGTR on the 1A S/G. The ruptured S/G has been isolated. The crew is cooling down on the 1B S/G using SBCS and AFW, with the following conditions:

- 1A S/G pressure: 870 psia
- 1B S/G pressure: 780 psia
- 1A S/G level is 60% narrow range
- 1B S/G level is 20% narrow range

Assuming the 1A S/G remains at 870 psia during the cooldown, which of the following describes when Operator actions would be required to re-establish AFW flow?

Manually initiate AFAS 2:

A. when 1B S/G pressure reaches 750 psia.

B. when 1B S/G pressure reaches 595 psia.

C. now, based on the current 1B S/G pressure.

D. now, based on the current 1B S/G level.

A. Incorrect, this will defeat the rupture ID earlier than allowed by procedure.

B. Correct

C. Incorrect, this will defeat the rupture ID earlier than allowed by procedure

D. Incorrect, current level within allowed safety function band.

Question Level: 2
Question Source: New
Exam: Both
K/A: 2.1.7
Importance: 3.7/4.4
References: ADM. 0010120 Conduct of Operations, Lesson Text 0711412 AFW/AFAS, Lesson Plan 0702412-11, 1-EOP-04 SGTR

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CONDUCT OF OPERATIONS

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 9 of 15)

Emergency Operating Procedure Implementation: (continued)

1. (continued)

   I. ESFAS Actuation:

      1. The blocking or termination of ESFAS actuation is only allowed during normal plant cooldown, as directed by Operating procedure and during emergency recovery, when directed by the EOPs or the Technical Support Center.

      2. Under no circumstances shall the automatic actuation of ESFAS be blocked when the actuation limits are being approached in an uncontrolled plant condition. Operators shall NOT manually terminate the operation of ESFAS actuated components during an emergency, except as allowed by plant procedure.

      3. If a valid ESFAS actuation occurs, then the operating crew should NOT exit EOP-1 to EOP-2. EOP-1 should be exited to one of the optimal recovery EOPs or EOP-15 for the following reasons:

         a. The optimal recovery EOPs contain procedural steps to determine the extent of the damage.

         b. EOP-2 entry conditions assumes an uncomplicated trip has occurred. A valid ESFAS actuation is NOT an uncomplicated trip.

      4. If a spurious invalid ESFAS actuation occurs in any plant mode, Then perform the applicable EOP 99 table prior to restoration of components.

      5. Manual initiation of AFAS is allowable under the following circumstances:

         a. Automatic actuation of the system did NOT occur after the appropriate time delay has elapsed.

         b. When cooling down the RCS using only one Steam Generator, if the operable Steam Generator is affected by the AFAS rupture identification circuit.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS | **CONTINGENCY ACTIONS**

CAUTION

When cooling down and depressurizing using only one steam generator, AFW flow to the operable steam generator may be isolated by the AFAS rupture identification circuitry. Should this occur, manual initiation of AFAS, to the operable steam generator, will be necessary.

NOTE

If cooldown is being performed under natural circulation and one S/G is isolated, then the cooldown rate should be maintained less than or equal to 30°F/hr. This is to ensure adequate natural circulation flow in the the affected loop.

[*] 19. DECREASE and CONTROL RCS pressure by using Auxiliary Spray to maintain Pressurizer pressure within **ALL** of the following criteria:

A. Less than 1000 psia.

B. Within 50 psi of isolated S/G pressure.

C. Within the limits of Figure 1, RCS Pressure Temperature, curve.

19. If Auxiliary Spray can NOT adequately control RCS pressure, Then control pressure by **ONE** of the following:

A. Operation of Main Spray.

B. Operation of Charging and Letdown (if available).

C. Throttling of HPSI (if HPSI throttling criteria are met).

The Bistable Units compare the inputs to a predetermined setpoint to cause or prevent generation of the AFAS-1/AFAS-2 signals. Each bistable unit is comprised of two parts - a bistable comparator card and a bistable relay card. The bistable comparator performs the input-setpoint comparison. The bistable relay card contains the relays to "relay" signals to the associated circuits (i.e., indicators, Rupture ID ckt., etc.). The relays are energized during normal conditions and de-energize as conditions dictate.

Each AFAS Channel contains six Bistable Units grouped into two groups to generate the AFAS-1 and AFAS-2 demand signals. The grouping is:

{PRIVATE }**AFAS-1**	**AFAS-2**
LO $LVL_{S/G-A}$	LO $LVL_{S/G-B}$
$P_{S/G-A} < P_{S/G-B}$	$P_{S/G-B} < P_{S/G-A}$
$P_{FWH-1} < P_{FWH-2}$	$P_{FWH-2} < P_{FWH-1}$

The two Level Bistable Units (Figure 21) are of the single input, fixed setpoint type. Their Trip setpoint is 19.5% NR on decreasing level and resets at approximately 10% above the trip setpoint. At the Lo Level Trip setpoint, the bistable trips causing the Lo S/G-1(2) 'T' indicator and a pair of contacts in the Rupture Identification Logic to actuate. One contact opens to de-energize the AFAS Bistable Relay and the second contact closes to enable the Rupture ID Logic. Unless blocked by the Rupture Identification Logic, a channel AFAS-1(2) signal is generated. When the Pre-Trip and Trip setpoints are reached an indicator light under the channel label plate of the front panel will light (Figure 29). This is a split window indicator labeled 'PT' and 'T'. The indicators are latch on and can be reset by depressing the pushbutton labeled "RESET" when level has recovered above the setpoint.

The Pressure Bistable Units (Figure 22) are of the dual input, fixed differential setpoint type and work similar to the Level Bistable Units including Pre-Trip and Trip indicating lights on the channel front panel. The two S/G Pressure Bistable Units have a Trip setpoint of 275 psid while the two Feedwater Header Pressure Bistable Units have a Trip setpoint of 150 psid. When the 'A' input decreases to the setpoint d/p below the 'B' input, the bistable trips. This causes the bistable relays to de-energize, closing a contact in the Rupture ID circuit and lighting the appropriate 'T' light on the AFAS Cabinet.

Rupture Identification and AFAS-1(2) Bistable Relays

When S/G level is restored to the AFAS reset point, the Bistable, Matrix, Initiation, and Interposing Relays return to the untripped state and: **AFAS LOCKOUT RELAY STATUS** indicators remain **ON; BISTABLE RELAY STATUS** indicators turn **OFF; MATRIX RELAY STATUS, SYSTEM STATUS INT, 1-3 AND 2-4** indicators turn **ON**. The System Status ACT indicator will remain OFF and the AFAS Lockout Relay Status indicators should remain ON until the lockout and latching relays are manually reenergized using the **ACTUATION RESET** Pushbutton(s).

COMPLICATED TRIP (MSLB OR FEED HEADER RUPTURE)

The rupture detection was intended to help mitigate the effects of an unisolable steam line break or feed header rupture. Refer to Figures 23 and 24 for the following example of the rupture circuitry operation:

Assume that S/G A has a main steam line leak that is unisolable. Following the reactor trip and MSIS, both steam generator levels decrease below their AFAS setpoints. The pressure in S/G A will continue to decrease as it blows down, while S/G B will decrease at a slower rate due to cooldown of the RCS. After a short time $P_{S/G\text{-}B}$-$P_{S/G\text{-}A}$ will be >275 psid, the S/G D/P Bistable will trip, and the Rupture Relay will energize to Block AFAS-1. The Rupture Relay will also disable the Fault I.D. feature of AFAS-2. The same AFAS response would occur for a rupture of the feed header to S/G A.

COMPLICATED TRIP (SGTR)

In the event a Steam Generator Tube Rupture occurs, EOP-04 requires isolation of the affected S/G and cooldown of the RCS. During the cooldown process with one S/G isolated, a S/G d/p will develop. This results from the inability to cooldown the isolated S/G at the same rate as the unisolated S/G, known as an asymmetrical cooldown. Consequently, the rupture identification circuit would block AFAS to the unisolated S/G that is being used for the cooldown and prevent it from automatically receiving AFW on an AFAS.

Question 84

Unit 2 has a large break LOCA with the following conditions:

- Current RWT level is 21 feet and decreasing at 1.2 feet per minute.

Based on the above ECCS flow rate and current RWT level, how long before RAS actuates?

A. 12.5 minutes

B. 14.2 minutes

C. 15.3 minutes

D. 16.5 minutes

A. Correct (RAS 6 feet)

B. Incorrect, is correct for Unit 1 (RAS 4 feet)

C. Incorrect, based on approx. 1 ft./minute

D. Incorrect, based on < 1 ft./minute

Question Level: 2
Question Source: New
Exam: Both
K/A: 006.A3.08
Importance: 4.2/4.3
References: 0711207 ECCS lesson text, 0702401-02 ESFAS Lesson plan

On an SIAS with a loss of off-site power, the LPSI pumps are tripped if running and restart 3 seconds after EDG breaker closure (3 second load block). There is no time delay for opening the LPSI header isolation valves and they do NOT receive a load shed signal. Like the HPSI header isolation valves, they stroke open when an SIAS is present and power is available.

LPSI flow may be terminated following automatic actuation if:

- HPSI throttling criteria is met; and
- RCS pressure is greater than **200 psia** and controlled.

A Recirculation Actuation Signal, RAS, will be generated when the RAS two-out-of-four logic matrix is satisfied **(RWT at 4' [6'])**. The receipt of an RAS will cause CNTMT sump isolation valves, MV-07-2A and MV-07-2B, to open within 30 seconds and the RWT outlet valves, MV-07-1A and MV-07-1B to shut within 90 seconds. This ensure constant suction supply during transfer to recirculation. Refer to Figures 1 and 2.

- RAS will stop the LPSI pumps and shut the pump recirculation miniflow valves V3659 and V3660 provided the valves lockout keyswitch has been placed in ON. Once the valves stroke closed, the lockout keyswitch is returned to OFF. [There are no power supply keyswitches to the four miniflow isolations on Unit 2.]

On Unit 1, Hot Leg Injection is initiated 6 to 10 hours after a LOCA. The following methods of establishing Hot Leg Injection on Unit 1 according to availability:

- Primary method: LPSI pump via A or B Hot Leg suction line.
- Alternate method: HPSI pump via pressurizer auxiliary spray line.
- Secondary alternate: Containment Spray pump via A or B Hot Leg suction line.
- Refer to 1-EOP-99, Appendix O for lineups.

[On Unit 2, Hot Leg Injection is initiated 2 to 6 hours after a LOCA and there is a dedicated system for Hot Leg Injection.

- Dedicated Hot and Cold Leg Injection lines provide simultaneous 220 GPM to Hot Leg and 220 GPM to Cold Leg.

- Refer to 2-EOP-99 for hot leg injection system lineup.]

1[2]-EOP-99 provides a figure for Safety Injection Flow vs. RCS Pressure.

Question 85

Unit 1 has been in 1-EOP-03 per the following time frame:

1:52 p.m.	2:02 p.m.
• RCS pressure: 310 psia	RCS pressure: 290 psia
• CET: 440ºF	CET: 440ºF
• ECCS flow: 920 gpm	ECCS flow: 930 gpm
• Pressurizer level: 20%	Pressurizer level: 40%

Which of the following states the proper EOP implementation strategy?

(assume all ECCS equipment operating and contingency actions are being taken as appropriate)

A. Continue with EOP-03 and depressurize the RCS to increase ECCS flow.

B. Continue with EOP-03, throttle HPSI flow per Appendix S.

C. Exit to EOP-15 within 5 minutes and perform SIAS table 1

D. Exit to EOP-15 within 5 minutes and restore letdown.

References required EOP-99 Fig. 2

A. Incorrect, subcooling not met

B. Incorrect, pressurizer level meets criteria but subcooling not met

C. Correct, safety function not met in EOP-03 for 15 minutes

D. Incorrect, pressurizer level rising but criteria not met for letdown restoration.

Question Level: 2
Question Source: New
Exam: Both
K/A: 00011.G2.4.14
Importance: 3.3/3.9
References: ADM 0010120 Conduct of Operations, 1-EOP-15 Functional Recovery, 1-EOP-99 Fig. 2

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 2 of 15)

Emergency Operating Procedure Implementation: (continued)

1. (continued)

   D. Compliance with EOP Steps

      1. Steps which are preceded by an asterisk (*) are to be performed continuously. In this context, continuously is defined as one or more of the following:

         a. The step may be performed out-of-sequence.

         b. The step has initiating conditions that occur independently of any specific time frame.

         c. The step is a recurring step.

      2. When restoring a Safety Function, take actions that are appropriate. For example, it is NOT necessary to wait for procedural guidance to throttle HPSI, if throttling criteria is met. Good judgement is needed to maintain/restore safety functions.

      3. The steps in the EOPs shall be addressed in the sequence they are written, NOT randomly. If the step is NOT applicable to the present plant condition, proceed to the next step. An effective method should be utilized of tracking a step that has NOT been implemented and needs to be re-evaluated for applicability.

   E. Recovering Safety Functions

      1. If the safety function status check acceptance criteria is NOT met for a particular safety function, the operating crew should take appropriate contingency actions necessary to restore the safety function. If the safety function can NOT be restored, the EOP in use is NOT working. The operating crew should then re-diagnose the event and exit to the appropriate EOP or the Functional Recovery Procedure (EOP-15) within 15 minutes.

5.4 RCS INVENTORY CONTROL
(continued)

Success Path 2: SIAS and Charging Pumps

INSTRUCTIONS

[*] 1. If Pressurizer pressure is less than 1600 psia or Containment pressure greater than 5.0 psig, Then VERIFY SIAS is actuated.

[*] 2. ENSURE maximum safety injection and charging flow to the RCS by:

A. Safety injection flow per Figure 2, Safety Injection Flow vs. RCS Pressure.

AND

B. **ALL** available charging pumps operating.

[*] 3. If safety injection flow is inadequate due to high RCS pressure or unavailability of HPSI pumps, Then attempt to COOLDOWN and DEPRESSURIZE to obtain adequate safety injection flow.

[*] 4. If Pressurizer pressure lowers to less than 1300 psia following SIAS, Then PERFORM **ALL** of the following:

A. STOP **ONE** RCP in each loop.

B. If the RCS subcooling is less than 20°F, Then STOP **ALL** RCPs.

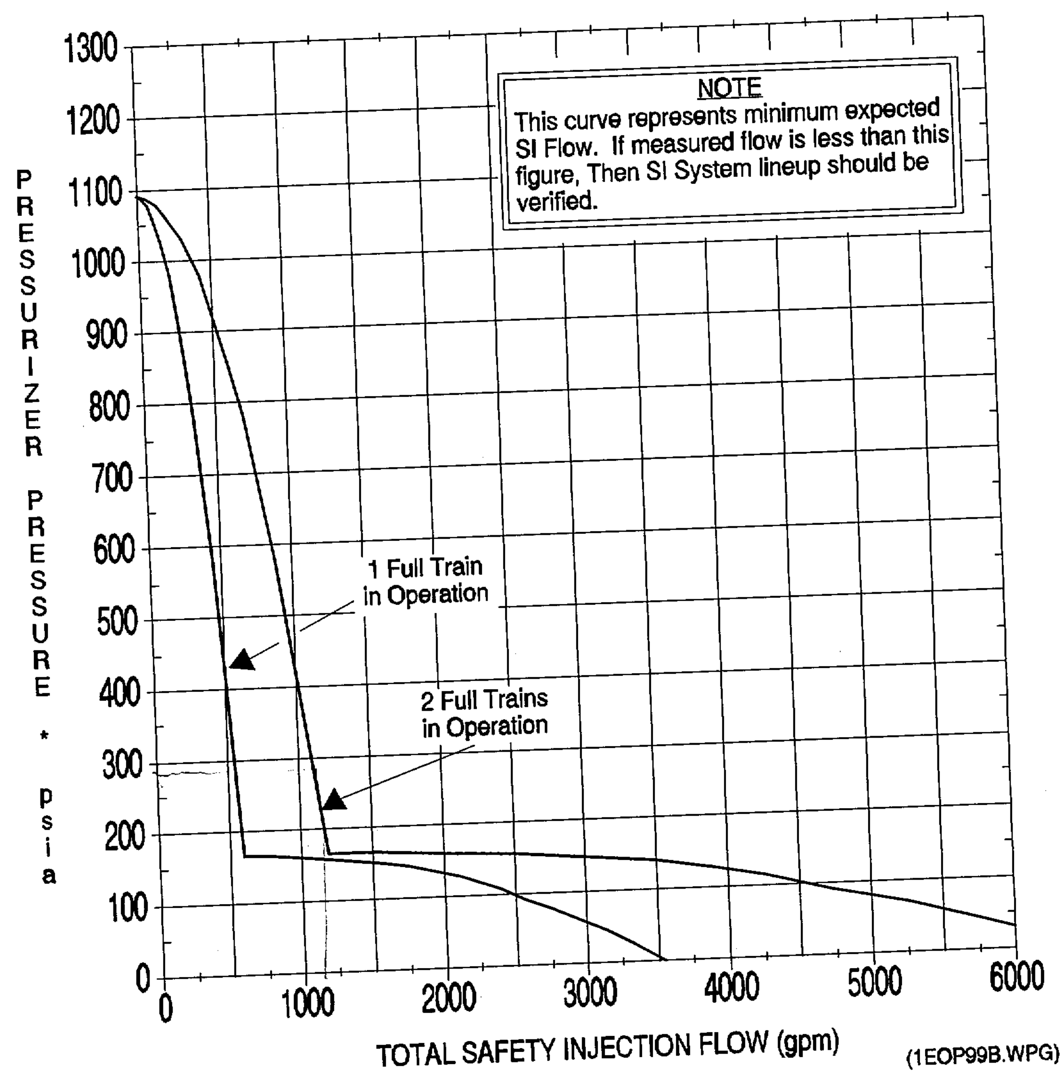
CONTINGENCY ACTIONS

1. If SIAS does NOT occur automatically, Then manually INITIATE SIAS.

2. If safety injection flow is NOT per Figure 2, Safety Injection Flow vs. RCS Pressure, Then VERIFY SIAS per Table 1, Safety Injection Actuation Signal.

FIGURE 2

SAFETY INJECTION FLOW VS. RCS PRESSURE



Question 86

Unit 1 has manually tripped the plant due to excessive RCS leakage with the following conditions:

- 1-EOP-03 has been entered and RCS pressure is 1580 psia.
- A major fire has been reported on the 1A Main Transformer and the Deluge system has actuated.
- The fire pumps were running when a LOOP occurs.
- Both Diesel Generators have loaded on the bus.

Which of the following describes the status of the fire protection system?

The fire pumps will:

A. automatically load on the Diesel Generator and will automatically stop when the deluge system is reset.

B. automatically load on the Diesel Generator and will have to be manually stopped when the deluge system is reset.

C. have to be manually re-started and will have to be manually stopped when the deluge system is reset.

D. have to be manually re-started and will automatically stop when the deluge system is reset.

A. Incorrect, will not automatically load on the Diesel Generator, will not automatically stop when deluge system is reset.

B. Incorrect, will not automatically load on the Diesel Generator.

C. Correct, fire pumps do not sequence on the Diesel Generators

D. Incorrect, will not auto stop.

Question Level: 2
Question Source: New
Exam: RO
K/A: 00067.G2.4.25
Importance: 2.9
References: 0-NOP-15.12 Fire Protection System Operation

INITIAL

3.0 PREREQUISITES

3.1 0-NOP-15.11, Fire Protection System Initial Alignment, is complete. _______ ANPS

3.2 Domestic Water System is in operation in accordance with 0-OI-15-01, Domestic Water System – Normal Operation. _______ ANPS

4.0 PRECAUTIONS / LIMITATIONS

4.1 Both Fire Pumps should be properly aligned and operational at all times.

4.2 §1 Level in the City Water Tanks shall be maintained above 16' 10.5" at all times.

4.3 Fire Pump operation following a SIAS:

- SIAS – Overrides Fire Pump automatic start. Permissive to manually start.
- LOOP coincident with SIAS – Pump receives a TRIP signal. Permissive to manually start after the associated bus is energized.

5.0 RECORDS REQUIRED

5.1 Completed copy of this procedure shall be maintained in the plant files in accordance with QI-17-PSL-1, Quality Assurance Records.

6.2 Automatic Operation Alignment INITIAL

NOTE
Fire Pumps will AUTO START if fire header pressure is below 85 psig when the control power fuses are installed unless the pump control switches are placed in the OFF position.

1. POSITION the following components as indicated:

COMPONENT ID	COMPONENT NAME	POSITION	INITIAL
CS-852-1	Fire Water Pump 1A	OFF	
CS-853-1	Fire Water Pump 1B	OFF	
Bkr 1-40209	Fire Pump 1A	RACKED IN	
Bkr 1-40209	Fire Pump 1A Trip and Close Fuses	INSTALLED	
Bkr 1-40509	Fire Pump 1B	RACKED IN	
Bkr 1-40509	Fire Pump 1B Trip and Close Fuses	INSTALLED	

2. If the Fire Protection system is below 85 psig, Then PERFORM the following:

   A. START a Fire Pump to raise system pressure. ______

   B. When the Fire Protection system pressure is above 85 psig, Then STOP the operating Fire Pump. ______

3. POSITION the following components as indicated:

COMPONENT ID	COMPONENT NAME	POSITION	INITIAL
CS-852-1	Fire Water Pump 1A	AUTO	
CS-853-1	Fire Water Pump 1B	AUTO	

4. PERFORM the following surveillances to demonstrate system operability:

   - 0-OSP-15.11, Fire Protection System Monthly Alignment Verification. ______
   - 0-OSP-15.12, Wet Pipe Sprinkler Systems Surveillance. ______
   - 0-OSP-15.13A, 1A Fire Pump Monthly Operability Test. ______
   - 0-OSP-15.13B, 1B Fire Pump Monthly Operability Test. ______

/R0A

END OF SECTION 6.2

Question 87

A controlled liquid release to the circulating water discharge is in progress.

If a Circulating Water Pump trips, resulting in one less than required on the release permit, which of the following are the required actions?

A. Terminate the release immediately.

B. Terminate the release within 30 minutes of the CWP tripping.

C. The release may continue with a loss of one CWP pump, but is to be terminated upon loss of two CWP's.

D. The release may continue as long as the required pumps were running when the release was initiated.

A. **Correct**

B. Incorrect, termination of release is required immediately

C. Incorrect, termination required for any pump trip

D. Incorrect, termination required for any pump trip

Question Level: 1
Question Source: New
Exam: Both
K/A: 075.K1.02
Importance: 2.9/3.1
References: 2-0510022 Controlled Liquid Release to the Circulating Water Discharge.

8.0 INSTRUCTIONS: (continued)

8.6 (continued)

INITIAL

3. (continued)

B. Take manual control of Flow Instrument Controller FIC-6627 and dial in zero flow rate. ______

C. Select FCV-6627X (10-50 gpm) or FCV-6627Y (0-20 gpm) with the FCV-6627X/Close/FCV-6627Y Selector Switch. ______

> NOTE - RR6627
> 0 --> 60 gpm range.

D. Using FIC-6627, increase flow slowly until an increase is noted on the flow recorder number RR-6627. ______

E. Dial in the desired release rate flow and ensure that this value is less than the maximum release rate specified on Line IIe of the LRP. ______

F. Record the AWST-2 level on Line IVb of the LRP. ______

G. Record the DATE and TIME at the start of the release on Line IVc. ______

H. Observe the liquid waste discharge monitor channel ELP 301 on the PC-11 monitor for normal release initiation conditions to ensure that the count rate is below the HIGH TRIP setpoint during the first few minutes of the release. ______

4.

> NOTE
> If the running CWP/ICWP combination drops below the minimum requirements of the LRP during the release, terminate the release immediately by placing the FCV-6627X/Close/FCV-6627Y Selector Switch to CLOSE. Notify the Chemistry Department. Do not restart the release until the minimum CWP/ICWP requirements are restored.

Question 88

Unit 1 has established a vacuum in preparation for startup with the following equipment is service:

- A and B AFW pumps
- 1A Condensate pump

Which of the following will have the largest impact on Condenser vacuum?

A. PCV-12-29, Steam jet air ejector main steam pressure regulator failing open.

B. FCV-12-1 Condensate Header Recirc to Condenser failing closed.

C. TCV-22-61 Turbine Exhaust Hood sprays fails closed.

D. PCV-12-34 Auxiliary Priming Ejectors main steam pressure regulator failing open.

A. Incorrect, designed to fail open to maintain vacuum

B. Correct, loss of flow to SJAE and Gland Exhaust condenser

C. Incorrect, exhaust hood sprays open at 160 degrees, normally closed

D. Incorrect, will keep water boxes full and improve vacuum if anything

Question Level: 2
Question Source: New
Exam: Both
K/A: 055.K3.01
Importance: 2.5/2.7
References:0711301 Lesson Text: Condenser, Feedwater and Heater Vents and Drains, Lesson Plan: 0702301-01

{PRIVATE }Steam Jet Air Ejector (SJAE) Condenser{tc \l 2 "Steam Jet Air Ejector Condenser"}s

- Consists of two condensers operating in parallel. Refer to Figure 1 and 2.
- Inner condenser condenses exhaust steam from the first stage of the steam jet air ejectors
- After condenser condenses exhaust steam from the second stage of the steam jet air
- Both condensers are single pass, crossflow, shell-and-tube heat exchangers
- A flow orifice around the condensers is sized to create back pressure necessary for adequate flow through the condensers and allows the heat exchangers to be isolated if necessary.

{PRIVATE }Gland Steam (GS) Condenser{tc \l 2 "Gland Steam Condenser"}

The GS Condenser prevents turbine gland sealing steam from leaking into the atmosphere. Gland steam exhaust is drawn into the gland steam condenser by one of two Gland Steam Exhaust fans and is condensed. As the steam condenses, entrained non-condensable gases escape into the shell side of the condenser. Gasses are then exhausted to atmosphere by one of two fans to prevent the decrease in condenser efficiency associated with air blanketing. The condenser is a single-pass, cross-flow, shell-and-tube type heat exchanger.

{PRIVATE }SJAE/GS Condenser Cooling {tc \l 2 "Condensate Piping and Valves"}

FCV-12-1, "Condensate Header Recirc to Condenser", maintains condensate flow through the SJAE and gland steam condensers for proper operation during low flow conditions in the condensate system.

A local control station controls air operated **fail open [fail closed]**, FCV-12-1:

- Locally opened prior to starting a Condensate pump.
- When condensate header flow is > 8000 [10000] gpm, the recirculation valve automatically maintains setpoint.
- "Cond to 1A & 1B Htrs Flow Low" alarms on RTGB 102 when flow is ≤ **8000 gpm.**

Question 89

Unit 2 RCS leakage is currently 3.5 gpm and stable. When the Unit was shutdown a Loss of Offsite Power (LOOP) occurred with the following:

- Reactor Cavity leakage FR-07-3 indicates '0' flow immediately upon entering 2-EOP-03 LOCA procedure
- Annunciator 'Reactor Cavity Leakage High' (N-46) from LS-07-12 is illuminated

Which of the following describes the reason for the current flow indication on FR-07-3 and annunciator (N-46) response?

Loss of:

A. power to FR-07-3 and continued RCS leakage results in N-46 staying illuminated.

B. power to FR-07-3 and LS-07-12

C. instrument air pressure and loss of power to LS-07-12

D. instrument air pressure and continued RCS leakage results in N-46 staying illuminated.

A. Incorrect, FR-07-3 does not lose power on a LOOP

B. Incorrect, FR-07-3 and LS-07-12 do not lose power

C. Incorrect, LS-07-12 does not lose power.

D. Correct

Question Level: 2
Question Source: New
Exam: Both
K/A: CE/A16.AK2.1
Importance: 3.2/3.5
References: 0711600 Containment and Shield Building Lesson Text, 0702600-06,Containment and Shield Building Lesson Plan, 2-EOP-03 LOCA

Reactor Cavity Leakage Detection

Collection of water in the reactor cavity sump indicates possible reactor coolant leakage. Reactor building floor drains and containment fan cooling unit condensate drains are routed to the sump for measurement and collection.

All drains entering the sump are routed to a measurement tank. A triangular notch (weir) is machined into the side of the tank such that inlet flow changes will change tank level and outlet flow. The weir tank level is calibrated to the flow into the tank. Refer to Figure 8, Figure 9, and Figure 10.

The weir tank level is determined by a bubbler system and a float switch level sensor. The bubbler level detector uses regulated instrument air bubbled into the bottom of the weir tank. On Unit 1, a recorder, FR-07-3 on RTGB 105 provides flow indication and activates annunciator, "REACTOR CAVITY LEAKAGE HIGH" (N-35), when reactor cavity flow rate reaches 1 gpm. On Unit 2, FR-07-3 on RTGB 205 provides flow indication only. FR-07-3 fails low with loss of instrument air.

Float switch level detector, LS-07-12 also installed in the weir tank, is set for detection of a level, which corresponds to 1 gpm flow. The detector has no associated indication but provides independent and diverse monitoring for the 1 gpm technical specification limit on unidentified leakage through a control room annunciator. Control room annunciator, "REACTOR CAVITY LEAKAGE HIGH" (N-46), alarms when the float switch detects ≥ 1 gpm cavity flow.

Inaccuracies in leakage flow can develop if debris washes into the weir tank and obstructs the V-notch. Flowrate can be compared to cavity sump level changes indicated on LI-07-6, to verify leakage rate.

An alternate method of monitoring RCS leakage uses the containment atmosphere radiation monitors. These instruments are discussed in detail in the Radiation Monitoring Text.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
☐ 28. If continued use of SBCS is desired, Then BLOCK automatic initiation of MSIS. **REFER TO** Appendix P, Restoration of Components Actuated by CIAS, SIAS and MSIS.	28. If MSIS actuates, Then USE **ANY** of the following to control RCS temperature: • ADVs • 2C AFW Pump • Steam systems vent, drain and trap valves. **REFER TO** Table 12, Alternate S/G Heat Removal Flow Paths
☐ 29. If a Loss of Offsite Power (LOOP) has occurred, Then RESTORE instrument air by performing the following: A. ENSURE 2AB 480V Load Center is aligned to an energized bus. B. DISPATCH an operator to align and start emergency cooling water to the instrument air compressors. **REFER TO** Appendix H, Operation of the 2A and 2B Instrument Air Compressors.	

(Continued on Next Page)

Question 90

EOP-15 has been implemented and the following success paths are in service:

- RCS and Core Heat Removal Success Path 3 is not being met
- RCS Inventory Control Success Path 2 is not being met
- RCS Pressure Control by Success Path 3
- Reactivity Control by Success Path 3

Which of the following should be addressed first?

A. Reactivity Control

B. RCS and Core Heat Removal

C. RCS Inventory Control

D. RCS Pressure Control

A. Incorrect, although reactivity is first success path, it is being met, but inventory control is not being met by any success path.

B. Incorrect, inventory control is before RCS and Core heat removal

C. **Correct**

D. Incorrect, RCS pressure control is met by a success path.

Question Level: 2
Question Source: Bank
Exam: Both
K/A: CE/EO9.G2.4.16
Importance: 3.0/4.0
References: EOP-15 (either Unit), Lesson plan Functional Recovery 0702828-04

5.1 FUNCTIONAL OVERVIEW
(continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
☐ 9. PLACE Hydrogen Analyzers in service. **REFER TO** Appendix L, Placing Hydrogen Analyzer in Service.	
[*] 10. ASSESS the status of each safety function using Chart 3, Functional Recovery Success Paths, by identifying success paths currently in use for each Safety function.	
[*] **11. <u>If</u> ALL safety function acceptance criteria are satisfied by Success Path 1, <u>Then</u> EXIT this procedure and GO TO 2-EOP-02, Reactor Trip Recovery.**	11. Perform **ALL** of the following in order: A. <u>If</u> any safety function acceptance criteria are NOT met, <u>Then</u> IMPLEMENT the recovery actions steps for the success paths most likely to meet that safety function. B. IMPLEMENT the recovery action steps for **ALL** success paths in service which are NOT met by Success Path 1 in the order of Chart 3, Functional Recovery Success Paths. C. IMPLEMENT the recovery action steps for **ALL** success paths in service which are met by Success Path 1. D. IMPLEMENT Long Term Action steps, Section 5.10.

Question 91

Unit 1 is refueling with the following:

- All Wide Range Neutron flux monitors operating with audible count rate selected to A.
- All CIS monitors operable

In accordance with Unit 1 Technical Specifications, which of the following requires immediate suspension of refueling operations?

Loss of:

A. channel A CIS monitor

B. channel B and D Wide Range Detectors

C. audible count rate indication in the Control Room.

D. audible count rate indication in the Containment.

A. Incorrect, three of four required operable

B. Incorrect, two Wide Range flux monitors needed

C. Incorrect, would be correct for Unit 2 only

D. Correct

Question Level: 1
Question Source: New
Exam: RO
K/A: 2.2.30
Importance: 3.5
References: Technical Specification 3.9.2 , LP 0702842-07 Technical Specifications for RCO's

REFUELING OPERATIONS

INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 As a minimum, two wide range logarithmic neutron flux monitors shall be operating, each with continuous visual indication in the control room and one with audible indication in the containment.

APPLICABILITY: MODE 6.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.2 Each wide range logarithmic neutron flux monitor shall be demonstrated OPERABLE by performance of:

a. A CHANNEL FUNCTIONAL TEST at least once per 7 days.

b. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the start of CORE ALTERATIONS, and

c. A CHANNEL CHECK at least once per 12 hours during CORE ALTERATIONS.

Question 92

Unit 1 has isolated the 1A S/G due to a SGTR.

In accordance with 1-EOP-04, which of the following is the preferred method of maintaining the isolated S/G level to acceptable limits?

A. Unisolate and Steam the ruptured S/G to the condenser.

B. Align and open S/G blowdown to the Monitor Storage tanks.

C. Depressurize the RCS to less than the ruptured S/G pressure.

D. Align and open S/G blowdown to the Aerated Waste Storage tanks.

A. Incorrect, used only if not desired to backflow to RCS. (not preferred)

B. Incorrect, used only if not desired to backflow to RCS. (not preferred)

C. Correct

D. Incorrect, this lineup not used anymore (pre blowdown building lineup)

Question Level: 1
Question Source: New
Exam: Both
K/A: 000038.EA1.11
Importance: 3.8/3.9
References:1-EOP-04 SGTR

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

When cooling down and depressurizing using only one steam generator, AFW flow to the operable steam generator may be isolated by the AFAS rupture identification circuitry. Should this occur, manual initiation of AFAS, to the operable steam generator, will be necessary.

NOTE

If cooldown is being performed under natural circulation and one S/G is isolated, then the cooldown rate should be maintained less than or equal to 30°F/hr. This is to ensure adequate natural circulation flow in the affected loop.

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 19. DECREASE and CONTROL RCS pressure by using Auxiliary Spray to maintain Pressurizer pressure within **ALL** of the following criteria: A. Less than 1000 psia. B. Within 50 psi of isolated S/G pressure. C. Within the limits of Figure 1, RCS Pressure Temperature, curve.	19. If Auxiliary Spray can NOT adequately control RCS pressure, Then control pressure by **ONE** of the following: A. Operation of Main Spray. B. Operation of Charging and Letdown (if available). C. Throttling of HPSI (if HPSI throttling criteria are met).

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
21. BORATE to maintain adequate SDM throughout the RCS cooldown.	21. If the BAMTs and the RWT are NOT available, Then ALIGN the SITs to the VCT for RCS Make-up. **REFER TO** Appendix AA, Aligning SITs to VCT for RCS Make-up.
[*] 22. MAINTAIN the isolated S/G level less than 100% (wide range) by depressurizing the RCS 0 to 50 psi less than the isolated S/G pressure.	22. If backflow from S/G to the RCS is NOT desired, Then MAINTAIN isolated S/G level by **ONE** of the following methods: A. Operation of the Blowdown System as follows: 1. ENSURE sufficient capacity is available in the Monitor Storage Tanks and Blowdown Cooling System is operable. 2. Locally CLOSE Vacuum Drag Valves on both units (V31189 on Unit 1 and V31190 on Unit 2). 3. CONTACT Unit 2 Control Room to isolate S/G blowdown. 4. ENSURE blowdown is aligned to Demineralizer Trains.

(Continued on Next Page)

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
	22. (continued) A. (continued) 5. If a CIAS or high radiation signal has isolated S/G blowdown containment isolations, Then they may be opened as follows: a. For 1A S/G, PLACE the control switch for FCV-23-3 in the CLOSE/OVERRIDE position, Then PLACE the switch in the OPEN position. b. For 1B S/G, PLACE the control switch for FCV-23-5 in the CLOSE/OVERRIDE position, Then PLACE the switch in the OPEN position. c. OPEN FCV-23-4 (1A S/G) or FCV-23-6 (1B S/G). OR B. Steaming to condenser using SBCS.

Question 93

An operator is required to perform a 30 minute valve lineup inside the Reactor Auxiliary Bldg. in an area posted as follows:

- Radiation Controlled Area
- General area 50 mr/hr
- Surface contamination 20,000 dpm/100 cm^2

Which of the following is required by the St. Lucie Plant ALARA Program?

A. General Entry RWP

B. Job Specific RWP

C. Pre-Job ALARA Review

D. TEDE ALARA Review

A. Incorrect, contamination levels > 10,000 dpm/100 cm^2.

B. **Correct**

C. Incorrect, dose estimate < one manrem.

D. Incorrect, respirator not required.

Question level: 1
Question source: New
Exam: RO
K/A: 2.3.2
Importance: 2.5
Reference: ADM.-05.03, Radiation Work Permits, ADM.-05.01, ALARA Program

NOTE

§2 Health Physics coverage may be substituted for a specific RWP in 6.9.5 and 6.9.6 to provide for inspections or short duration jobs. Individuals being supervised by Health Physics personnel should sign in on their general entry RWP.

6.9 §2 Job specific RWPs are used for a work activity outside the scope of a general or standing RWP where specific radiological concerns need to be addressed. The following are activities that require a specific RWP:

1. §2 Entry into the Reactor Containment Building.
2. §1,2 Work in High Radiation Areas.
3. Work in Locked High Radiation Areas.
4. §2,3 Very High Radiation Areas.
5. §2 Entry into Airborne Radioactivity Areas.
6. §2 Work assignments involving equipment or surfaces contaminated to levels greater than 10,000 dpm / 100 cm^2.
7. §2 Jobs in Hot Particle Areas.
8. §2 Movement of irradiated fuel.
9. §2 When Health Physics Supervision determines that an RWP is necessary to provide proper radiological controls in situations not addressed above.

6.10 Any individual entering the Radiation Controlled Area should be aware of:

1. The existing radiological conditions.
2. The protective clothing and equipment requirements.
3. Special instructions and remarks listed on the RWP.
4. Dosimetry alarm set points.
5. Their margin.

6.11 Entries into areas where high levels of radioactive airborne activity is known to exist but not analyzed shall require the use of SCBA.

7.0 INSTRUCTIONS: (continued)

7.1 (continued)

10. Total Effective Dose Equivalent (TEDE) ALARA Evaluations

TEDE ALARA evaluations are performed when the use of full face air purifying respirators is considered. Air supplied hoods or air line respirators may be used when heat stress or the potential for hot particle ingestion is present. Consideration of setup time and exposure should be given when considering air line respiratory protection equipment.

A. Evaluations shall be performed to maintain doses TEDE ALARA. These evaluations shall be documented under the following circumstances:

1. When respirators are planned to be used and the projected deep dose equivalent from any task is greater than 500 mrem for any individual and greater than 5 manrem collectively,

2. When respirators are planned to be used and the protection factor of the respiratory protection equipment to be used is less than the multiple by which the peak concentrations of airborne radioactive materials in the working areas are expected to exceed the concentrations specified in 10 CFR 20.

3. When respirators are not planned to be used and the projected intake for an individual is greater than 40 DAC-hrs (100 mrem),

B. In some cases, the functional loss of efficiency factor may be higher than the .25 specified on Appendix C of this procedure, and should be evaluated for the specific task or evolution and modified as appropriate.

7.0 INSTRUCTIONS:

7.1 Pre-Job ALARA Reviews

1. An RWP Request is submitted in accordance with HPP-1, "Radiation Work Permits."

2. Upon receipt of the RWP Request, Health Physics shall perform a dose estimate in accordance with approved Health Physics procedures. If the dose estimate is less than one manrem, the RWP may be prepared in accordance with HPP-1.

3. If the estimate is greater than one manrem, the RWP Request shall be routed to ALARA.

4. ALARA shall review the request and review/revise the estimate if appropriate.

5. If the dose estimate is greater than one manrem, complete the Pre-job ALARA Review form.

6. The Pre-job ALARA Review and associated ALARA requirements shall be discussed with the work crew during the Pre-job Briefing if a briefing is required.

7. Jobs that are expected to exceed 10 manrem shall be reviewed in a more detailed manner. This review should include available historical data on effective ALARA methods (i.e., shielding, flushing, ventilation, decontamination, containments, etc.), and any alternative actions that could be taken. This review shall be performed by ALARA personnel and documented on the Pre-job ALARA Review Form (Appendix A).

8. Any job where collective exposure is projected to exceed 5 manrem shall be reviewed by the ALARA Review Board prior to job commencement.

9. Any job involving collective exposures greater than 10 manrem shall be reviewed by corporate Health Physics.

Question 94

Unit 1 is in Mode 3, middle of core life, performing a Reactor startup. Which of the following evolutions could result in entering Mode 2 earlier than expected?

A. Placing the Boric Acid makeup tanks on Recirc.

B. Placing the Hogging Ejectors in service.

C. Starting the first Condensate pump.

D. Removing Steam Generator blowdown from service.

A. Incorrect, could cause addition of boric acid if various valves leaked through.

B. Correct, Main Steam flow to ejectors will cooldown the RCS adding positive reactivity.

C. Incorrect, Condensate pump not sufficient pressure to add feedwater to the Steam Generators.

D. Incorrect, will cause RCS temperature to increase adding negative reactivity.

Question Level: 2
Question Source: New
Exam: Both
K/A: 2.2.1
Importance: 3.7/3.6
References: NOP-1-0030122 Reactor Startup, Reactor Theory Chapter 12, applications and plant response LP 0702112-09.

7.0 INSTRUCTIONS: (continued) INITIAL

NOTE

An additional SRO with an active license (NWE, ANPS, NPS or MGMT Observer) shall remain in the vicinity of RTGB-104 during Regulating Group withdrawal to provide additional monitoring of critical approach in accordance with Appendix E, Reactivity Manager Guidelines.

7.11 Perform a Reactor startup as follows:

CAUTION

Unplanned RCS temperature changes from failures during primary or secondary side work, testing or surveillances may result in unplanned reactivity addition and an inadvertent mode change. Activities which could lead directly to a RCS temperature change shall be deferred until after the reactor is critical and stable.

/R12

NOTE

The time duration of the Shutdown CEAs being fully withdrawn while awaiting Reactor Startup shall be reviewed and found acceptable by the NPS and Plant Management.

1. If the time duration of the Shutdown CEAs being fully withdrawn while awaiting Reactor Startup is **NOT** acceptable, Then PERFORM the following:

   A. INSERT both Shutdown CEA groups fully. ______ ANPS

   B. **When ready to recommence with the Reactor Startup, Then GO TO Step 7.1** ______ ANPS

2. ENSURE the GOPs have been completed **up to and including** the step which reads "The following shall be accomplished prior to entering Startup (Mode 2)." ______ ANPS /R12

7.0 INSTRUCTIONS: (continued) INITIAL

7.11 (continued)

2. (continued)

   A. Ensure work and testing on the primary and secondary, which may lead directly to a RCS temperature change, during the criticality approach are either completed or suspended until after criticality. ______ ANPS /R12

3. The measured RCS boron concentration should be within 15 PPM of the estimated critical boron concentration determined in Appendix C, "Estimated Critical Conditions and Inverse Count Rate Ratio," ECC Calculation Worksheet. If this must be exceeded, refer to Appendix E, Steps 3.E and F. ______

NOTE

The ECC worksheet should be considered valid for a period NOT to exceed 1/2 hour before or 1/2 hour after the time entered in Column 2 of the ECC Calculation Worksheet. The decision to change ECCs during the approach to criticality shall be made by the Reactivity Manager with concurrence of the ANPS or NPS. Refer to Appendix E, Reactivity Manager Guidelines.

4. Start and maintain an Inverse Count Rate Ratio (ICRR) plot in accordance with Appendix C, "Estimated Critical Conditions and Inverse Count Rate Ratio." ______

5. Announce on the Gai-tronics system, "Unit 1 Reactor Startup has Commenced." ______

APPENDIX E
REACTIVITY MANAGER GUIDELINES
(Page 2 of 2)

3. (continued)

   E. Critical boron concentration from the ECC should be within 15 PPM of RCS boron concentration. This number is meant to be a guideline. This helps ensure that the 500 PCM margin for achieving criticality is not compromised. It may become necessary to exceed this guideline. If this occurs the delta between ECC and RCS boron concentration multiplied by the present boron worth should not exceed 200 PCM.

   F. The approach to criticality may proceed if the reactivity difference in E. above exceeds 200 PCM only with the concurrence of the Reactivity Manager and the Reactor Engineer.

NOTE

The approach to criticality is a dynamic process with multiple variables changing. Based on the response of instrumentation and use of the 1/M or inverse count rate plot, the approach to criticality may proceed even though the 30 minute guideline for the ECC may be exceeded. This is to ensure the approach is controlled and the attention of the crew is not distracted at a time when dynamic reactivity changes could cause the Reactor to go critical without operator action (i.e. Xenon decay).

4. Prior to entry into Mode 2, establish control of work activities which could lead directly to a RCS temperature change. Activities that could lead directly to a RCS temperature change shall be deferred until after the reactor is critical and stable. Examples include turbine testing and main feedwater activities. /R12

5. 1/M or Inverse Count Rate Ratio Plot:

   A. The 1/M or Inverse count rate plot is a valuable tool during the approach to criticality and should be used by the Reactivity Manager to provide an estimate of when the Reactor is predicted to achieve criticality.

   B. The 1/M plot should also be used to aid the Reactivity Manager in deciding whether to change ECCs.

END OF APPENDIX E

Question 95

Unit 1 is in Mode 3 performing a controlled cooldown for a refueling outage with the following conditions:

- RCS Tave 505 ºF
- A and B S/G pressure 710 psia
- RCS pressure 1720 psia

Immediately after the above conditions were observed the following occurs:

- RCS pressure, temperature and 1A S/G pressure is falling rapidly

Which of the following describe the correct procedure to implement.

A. EOP-05 'Excess Steam Demand'.

B. EOP-15 'Functional Recovery'.

C. 1-ONP-01.01 'PC-1, 'S/G Heat removal LTOP not in effect'.

D. 1-ONP-01.02 'PC-2, 'S/G Heat removal LTOP in effect'

A. Correct, MSIS and SIAS not at the blocking setpoint, which is the entry conditions for Low Mode ONP's.

B. Incorrect, not indication of duel event

C. Incorrect, this would be correct if on Unit 2 due to SIAS would have been blocked at 1736 psia

D. Incorrect, same as 'C' above and LTOP would not be in effect.

Question Level: 2
Question Source: Modified from 2000 PSL NRC SRO exam (Ques. 32)
Exam: Both
K/A: 2.4.6
Importance: 3.1/4.0
References:1-EOP-05 Excess Steam Demand, 0702826-08 Excess Steam Demand Lesson plan

ORGINAL QUES

Unit 1 ANPS has taken the turnover with the following conditions:

- Unit 1 Mode 3 performing a controlled cooldown
- RCS Tave 450° F.
- S/G pressure 413 psia
- RCS pressure 1280 psia

Fifteen minutes after the turnover the following condition exist:

- RCS pressure, temperature and S/G pressure falling rapidly

What procedure and mitigation strategy should be implemented?

A. ONP-01.01 Plant Condition 1, 'S/G Heat Removal LTOP not in effect' attempt to isolate the affected S/G, maintain RCS subcooling 20-200° F.

B. ONP-01.02 Plant Condition 2, 'S/G Heat Removal LTOP in effect' Manually actuate MSIS and SIAS. Stabilize RCS temperature and pressure after the affected S/G blown dry.

C. EOP-05 Excess Steam Demand, manually actuate MSIS and SIAS. Stabilize RCS temperature and pressure after the affected S/G blown dry.

D. EOP-15 Functional recovery, emergency borate, attempt to isolate the affected S/G, stabilize RCS temperature and pressure after the affected S/G blown dry.

A. **ONP-01.01 Plant Condition 1, 'S/G Heat Removal LTOP not in effect' attempt to isolate the affected S/G, maintain RCS subcooling 20-200° F. (correct)**

B. ONP-01.02 Plant Condition 2, 'S/G Heat Removal LTOP in effect' Manually actuate MSIS and SIAS. Stabilize RCS temperature and pressure after the affected S/G blown dry. (incorrect, wrong procedure implemented)

C. EOP-05 Excess Steam Demand, manually actuate MSIS and SIAS. Stabilize RCS temperature and pressure after the affected S/G blown dry. (incorrect, wrong procedure implemented)

D. EOP-15 Functional recovery, emergency borate, attempt to isolate the affected S/G, stabilize RCS temperature and pressure after the affected S/G blown dry. (incorrect, wrong procedure implemented)

Question Level: 2
Question Source: New
Exam: SRO
K/A: 000040/EO5. G2.4.9
Importance: 3.9
References: 1-ONP.01 Plant Condition 1, 'S/G Heat Removal LTOP not in effect'

1.0 TITLE:

EXCESS STEAM DEMAND (ESD)

2.0 PURPOSE:

1. This procedure provides the operator actions which must be accomplished to mitigate an Excess Steam Demand (ESD). The actions in this procedure are necessary to ensure that the plant is placed in a stable, safe condition. The goal of the procedure is to safely establish the plant in a MODE 3 or 4 condition.

3.0 ENTRY CONDITIONS:

1. 1-EOP-01, Standard Post Trip Actions, have been performed.

OR

All of the following conditions exist:

A. Event initiated from MODE 3.

B. SIAS has NOT been blocked.

AND

2. Plant conditions indicate that an ESD has occurred. Indications of a Loss of Offsite Power (LOOP) may exist concurrently with these conditions. Any of the following may be present:

A. Loud noise indicative of a high energy steam release.

B. Rapidly decreasing RCS T-avg caused by increased heat removal.

C. Increase in feedwater flow until MSIS initiation.

D. Possible increase in containment temperature, pressure and sump level.

E. Rapid decrease in either S/G pressure.

Question 96

A loss of Feedwater has occurred at beginning of core life. Steam Generator levels are 15% Narrow range and all CEA's are fully withdrawn.

As S/G levels continue to lower and CEA's remain fully withdrawn, which of the following explains the initial plant response?
(assume Turbine is tripped)

A. RCS pressure will increase and will be the initial contributor to adding negative reactivity.

B. RCS temperature will increase and will be the initial contributor to adding negative reactivity.

C. RCS void fraction will develop and will be the initial contributor to adding negative reactivity.

D. Fuel temperature will increase and will be the initial contributor to adding negative reactivity.

A. Incorrect, pressure will increase and add slight positive reactivity.

B. Incorrect, fuel heats up first and will be the initial negative feedback response

C. Incorrect, as RCS becomes saturated void fraction will eventually develop but is not the initial plant response and is not the initial contributor.

D. Correct

Question Level: 1
Question Source: New
Exam: Both
K/A: 000029.EK1.05
Importance: 2.8/3.2
References: 0711100-11 Chapter 7 Fundamentals

Core Effective Temperature: Weighted average temperature of the different fuel loads.

Doppler Defect (DD): pcm associated with a change in power: $DD = FTC \times \Delta T$.

Fuel Temperature Defect (FTD): Same as Doppler Defect, the difference is Doppler Defect is usually the term used in reference to power changes and Fuel Temperature Defect when Fuel Temperature is the reference point.

Power ↑ → Fuel Temp ↑: FTC gets smaller in magnitude. DD gets larger in magnitude at a decreasing rate.

Core Ages → Fuel Temp ↓: FTC gets larger in magnitude (Pu-240 and other absorbers build in). DD stays approximately the same $(DD = \uparrow FTC \times \downarrow \Delta T)$.

Power excursion → Fuel Temp ↑: FTC inserts negative reactivity to limit the transient to within the capability of the Safety Systems.

{PRIVATE }5.0 MODERATOR TEMPERATURE{tc \l 1 "5.0 MODERATOR TEMPERATURE"}

The moderator temperature plays an important part in reactor control. This is due mainly to the way in which water density responds to a temperature change.

{PRIVATE }5.1 Moderator Temperature Coefficient (MTC){tc \l 2 "5.1 Moderator Temperature Coefficient (MTC)"}

The moderator temperature coefficient determines the ULTIMATE behavior of a reactor in response to changes in moderator temperature. It also determines the effect on the reactor of changes in the temperature of the coolant entering the core.

Question 97

Unit 2 is in 2-EOP-15 'Functional Recovery'. A lineup is being performed that will pump ECCS area sumps to the Reactor Cavity sump.

Which of the following explains the reason for this lineup?

To:

A. ensure all available water is returned to the Containment for core cooling prior to RAS.

B. limit flooding and possible damage to ECCS equipment in the event of safeguards pump leakage.

C. limit contamination of the liquid waste management system which could result in an uncontrolled liquid release and elevated radiation levels in the RAB.

D. prevent overloading the liquid waste management system, which is no longer able to process large volumes of waste water due to the Boric Acid Concentrators no longer being used.

A. Incorrect, although plausible, also this lineup is performed after RAS.

B. Incorrect, although not the reason as listed in the FSAR.

C. Correct.

D. Incorrect, although the BA Concentrators have been abandoned in place which has limited the amount of water than can be processed.

Question level: 1
Question source: New
Exam: RO
K/A: 000059.AK3.01
Importance: 3.5
Reference:2-EOP-03 LOCA, FSAR section 9.3.5.1 and 9.3.5.2

the control room and is indicative of a charging pump malfunction or charging line break.

f) Reactor Coolant Pump Seal injection Flow

An orifice type flowmeter indicates seal injection flowrate to each of the reactor coolant pumps.

9.3.4.6.5 Boron Measurement instrumentation

The boronometer provides a continuous recording at the Reactor Turbine Generator Board of reactor coolant boron concentration. High and low alarms in the control room warn the operator of deviations from the required boron concentration in the reactor coolant. Adjustable high and low alarm setpoints are available throughout a range of 0-5000 ppm boron and they are set at a value slightly above and below the expected reading. The boronometer is provided to permit data to be available as a backup and to assist in trending the reactor coolant boron concentration. Principal boron monitoring is attained by local and remote wet chemistry samples. The boronometer is nonsafety-related, non-IE and is automatically isolated for post-accident conditions. For more details, see the description in Subsection 9.3.4.2.2, item n.

9.3.4.6.6 Radiation Monitoring Instrumentation

The process radiation monitor provides a continuous recording in the control room of reactor coolant gross gamma radiation and specific fission product gamma activity thus providing a measure of fuel cladding integrity. A high alarm is annunciated in the control room. For more details, see the description in Subsection 9.3.4.2.2, item o.

9.3.5 ESF LEAKAGE COLLECTION AND RETURN SYSTEM

9.3.5.1 <u>Design Basis</u>

The ESF Leakage Collection and Return System is designed to

a) Collect leakage from all ESF system components and return it to the containment, and

b) Eliminate need for liquid waste system during a high activity release accident.

The system is non-safety and non-seismic except for the containment penetrations including the containment isolation valves which are designed to Quality Group B and seismic Category I requirements.

9.3.5.2 System Description

To prevent radioactive contaminants from entering the Liquid Waste Management System (LWMS), the ESF Leakage Collection and Return System (see Figure 9.3-6) isolates the equipment drain tank. In the event of a CIAS as operator from the control room can realign the system to divert radioactive leakage back into containment. This is done by closing valve SE-06-1 opening I-LCV-07-11A and 11B. Should the CIAS/SIAS setpoint not be reached, an operator would be alerted to high radiation in the ECCS room by the area radiation monitors.

Equipment design data is provided in Table 9.3-10.

The valve control switches and indicating lights are mounted in the control room.

9.3.5.3 Safety Evaluation

The ESF Leakage Collection and Return System, except for the containment penetrations, is designed to non-safety and non-seismic requirements, since this system is not required to safely shutdown the reactor or mitigate the consequences of an accident. The containment penetrations and isolation valves which provide containment integrity are designed to Quality Group B and seismic Category I requirements.

The injection phase of ECCS operation lasts for a minimum of 20 minutes, (see Subsection 6.2.2.2.1) during which time the non-radioactive water from the refueling water tank is injected into the Reactor Coolant System and containment. The ECCS room sumps would only collect radioactive water during the recirculation and shutdown cooling phase of ECCS operation. Hence after an accident the operators have at least 20 minutes available to close valve SE-06-1 by manual operation from control room and isolate the equipment drain tank.

9.3.6 POST-ACCIDENT SAMPLING SYSTEM

The Post-Accident Sampling System (PASS) consists of a shielded skid-mounted sample station, a remotely located control panel, and a remote dissolved oxygen indicating panel. The PASS provides a means to obtain and analyze reactor coolant samples and containment building samples.

The Piping and Instrumentation diagrams for the PASS are shown on Figures 9.3-3a, 9.3-3b, and 9.3-6a. Design data are provided in Tables 9.3-10a, 9.3-10b and 9.3-10c.

9.3.6.1 Design Bases

The PASS is designed in accordance with the criteria stated in Section II.B.3 of Enclosure 3 to NUREG-0737. Combustion Engineering Owners Group issued in September 1993 the NRC approved Topical Report (CEN-415 Revision 1-A "Modification of Post Accident Sampling System Requirements" (Reference 7). This report approved by the NRC on April 12, 1993, allows the deletion of sampling requirements for containment sump pH and dissolved oxygen in reactor coolant samples. The report also approved deleting the requirement for heat tracing of sample lines and containment hydrogen analysis. Heat tracing of containment atmosphere sample lines is not required if the Core Damage Assessment procedure bases the assessment on noble gas concentration in lieu of iodines. Some components which are no longer required by the design, including heat tracing and instruments, remain in place, but will not be maintained as required equipment. The quantitative design criteria for the PASS are as follows:

5.4 RCS INVENTORY CONTROL
(continued)

Success Path 2: SIAS and Charging Pumps

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

ECCS area sump pumps are only available when non-vital MCCs (2A2/2B2) are energized.

☐ 14. After RAS, PUMP ECCS leakage and RCS sample water collected in the ECCS area sumps to the reactor cavity sump inside containment by performing the following:

A. OPEN 2-SE-07-4 and CLOSE 2-SE-06-1 by positioning ESF leak collection key switch (located on PACB 2) to SSP TO RC SUMP.

B. OPEN HCV-18-1, Instrument Air to Containment.

C. OPEN LCV-07-11A and LCV-07-11B, Reactor Cavity Sump, by PLACING the switches to CLOSE, Then OPEN/RESET.

D. ENSURE the PACB-2 panel annunciator, Annunciator LC-13, ESF Leakage Coll. Return to Containment, is lit.

Question 98

Unit 1 is in Mode 3. It is desirable to perform a cooldown to SDC entry conditions, however RCS makeup water sources are unavailable and VCT level is low.

In accordance with 1-ONP-02.01 Boron Concentration Control, which of the following can be used for RCS makeup water sources and under what conditions?

A. Safety injection tanks if the RWT and PWT are unavailable due to tornado damage.

B. Safety injection tanks if the RWT and PWT are unavailable due to a seismic event.

C. Demineralized water tank and BAMT's only if the RWT is unavailable due to tornado damage.

D. Demineralized water tank and BAMT's only if the RWT is unavailable due to a seismic event.

A. Correct

B. Incorrect, procedure specifies damage due to tornado only

C. Incorrect, Safety Injection tanks referenced for tornado damage not deminerlized water tanks.

D. Incorrect, although RWT manual isolation valve to the charging pumps is required to be closed in the event of a seismic event.

Question Level: 1
Question Source: New
Exam: Both
K/A: 000022.AA1.08
Importance: 3.4/3.3
References: 1-ONP-02.01 Boron Concentration Control

APPENDIX B
VCT MAKEUP FORM THE SITS
(Page 1 of 2)

If other sources of makeup are NOT available, the SITs maybe used for makeup to the RCS as follows:

> **CAUTION**
> §1 Use only one SIT at a time. RCS pressure must be less than 1750 psia before using this method.

INITIAL

1. VERIFY NO CIAS or SIAS signal is present. If present, they must be reset for operation of certain valves. ______

2. ENSURE V2501, VCT Outlet Valve, is open and V2504, Refueling Water to Charging Pump, is closed, Then open breaker 1-42018 (V2501) and breaker 1-42017 (V2504). ______

3. ALIGN the SIT to RWT / VCT line as follows:

   A. ¶2 ENSURE V2621, VCT Inlet from PMW and BAM Isol. is CLOSED.

   B. CLOSE V3459, SIT Recirc. Line to RWT.

   C. OPEN and LOCK V07009, SIT Test Line to RWT.

   D. OPEN and LOCK V3463, SIT Test Line to RWT.

   E. OPEN V03920, SIT Recirc. to VCT.

   F. ENSURE open V02203, VCT Inlet from SITs.

4. ADD borated water to the VCT from the selected SIT by opening its associated Fill & Drain Valve as needed.

   1A1 SIT: V3621
   1A2 SIT: V3611
   1B1 SIT: V3631
   1B2 SIT: V3641

/R1

6.0 OPERATOR ACTIONS (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
2. Analyze all available indications to determine the plant status and the cause of the VCT low level.	**2.** ¶2 If the VCT low level is due to the loss of the PWT and the RWT due to a tornado, Then PERFORM Appendix B. /R1
3. VERIFY the VCT level is stable or trending to the normal operating band of 45% to 65%.	**3.** If VCT level continues to lower and leakage from the CVCS System is indicated, Then PERFORM the following: **A.** ISOLATE Letdown by CLOSING V2515, Letdown Stop Valve, and V2516, Letdown CNTMT Isolation Valve. **B.** STOP all Charging pumps. **C.** If RCS level is lowering rapidly after isolation of Charging and Letdown, Then IMPLEMENT ONOP 1-0120031, Excessive RCS Leakage.

NOTE

To maintain V2501, VCT Outlet Valve, closed with VCT level greater than 5%, V2501 control switch on RTGB-105 must be held in the CLOSE position.

D. PLACE and hold V2501 in the CLOSE position.

E. OPEN Bkr 1-42018, V2501, at MCC-1B5.

F. Attempt to refill the VCT using a blended make-up flow.

Question 99

Unit 2 is performing a natural circulation cooldown. The unit has been cooling down at 30ºF/hour from hot standby conditions for 5.5 hours. What is the current saturation pressure of the upper head?

A. 650 psia.

B. 775 psia.

C. 850 psia.

D. 900 psia.

References required from 2-0120039 Figure 3 Natural Circulation cooldown.

A. Incorrect, would be correct for 50ºF/hour cooldown.

B. Correct

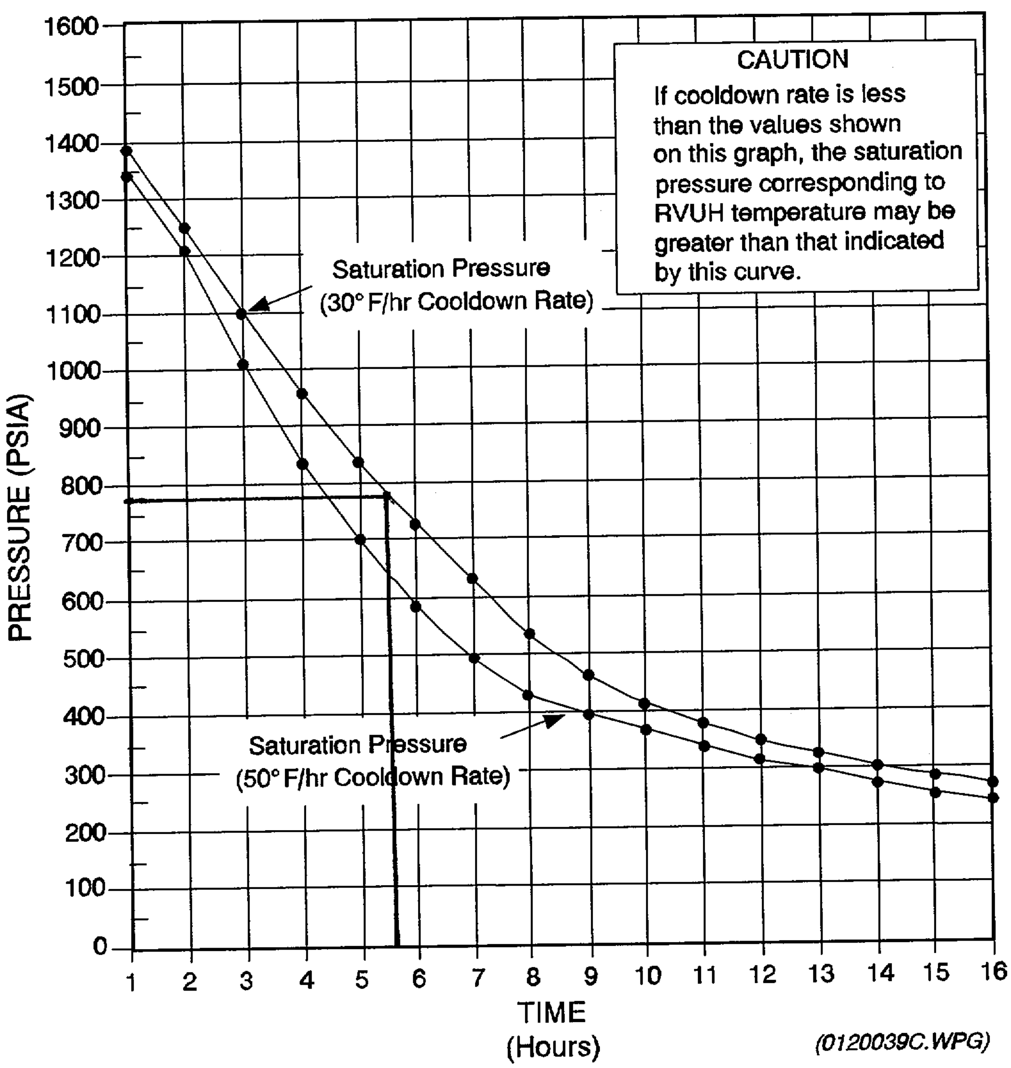
C. Incorrect, would be close for 5 hour cooldown.

D. Incorrect, would be correct for 4 hour cooldown.

Question Level: 2
Question Source: New
Exam: SRO
K/A: CE/A13.G2.4.11
Importance:3.6
References: 2-0120039 Natural Circulation Cooldown

FIGURE 3

UPPER HEAD SATURATION PRESSURE VS. TIME



(0120039C.WPG)

Question 100

Unit 1 has entered 1-EOP-05 Excess Steam Demand, with the following conditions:

- RCS pressure is 1300 psia and constant
- Thot is 352 ºF and constant
- CET 355 ºF and constant
- 1A S/G wide range level is '0' %
- 1B S/G level is 34% wide range and rising feeding at 150 gpm
- Pressurizer level is '0' %
- One RCP in each loop is operating
- Reactor Vessel level sensors 7 and 8 covered

All ECCS equipment is operating as designed.

In the order of Safety Function hierarchy, which of the following safety functions is not being met and should be addressed next?

A. Core Heat Removal

B. RCS Heat Removal

C. RCS Inventory Control

D. RCS Pressure Control

A. Incorrect, Core heat removal is met

B. Incorrect, RCS heat removal met

C. Incorrect, RCS inventory control met

D. Correct, pressure is outside Figure 1 (>200 ºF subcooled)

Question Level: 2
Question Source: New
Exam: SRO
K/A: CE/A11.G2.4.22
Importance: 4.0
References: 1-EOP-05 Excess Steam Demand, 0702821-05 Safety Function Concept and EOP overview Lesson plan

APPENDIX A
SAFETY FUNCTION STATUS CHECK SHEET
(Page 6 of 12)

4. RCS PRESSURE CONTROL

	SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A.	Pressurizer heaters and sprays or charging pumps or safety injection.	Maintaining or restoring pressure within limits of Figure 1, "RCS Pressure Temperature" curve.	☐☐☐☐☐☐
B.	Charging Pumps	All available operating or HPSI throttling criteria met.	☐☐☐☐☐☐
			AND
	Safety Injection Pumps	Injection flow per Figure 2, "Safety Injection Flow vs. RCS Pressure" or HPSI throttling criteria met.	☐☐☐☐☐☐

END OF SAFETY FUNCTION 4

Question 101

A loss of offsite power has occurred with the following conditions:

- Unit 1 has no Diesel Generators operable
- Unit 2 has only the 2B Diesel Generator tied to the 2B3 4.16 KV bus.

Which of the following explains the preferred power lineup to supply power to Unit 1? (assume all equipment available to be energized on Unit 1)

Utilize 2B Diesel Generator through the:

A. Station Blackout crosstie breaker to the 1AB 4.16 KV bus to the 1A3 4.16 KV bus.

B. Station Blackout crosstie breaker to the 1AB 4.16 KV bus to the 1B3 4.16 KV bus.

C. 2B4 switchgear to the Unit 1 1B startup transformer to the 1B2 4.16 KV bus tied to the 1B3 4.16 KV bus.

D. 2B4 switchgear to the Unit 1 1B startup transformer to the 1B2 4.16 KV bus to the 1B3 4.16 KV bus to the 1AB 4.16 KV bus to the 1A3 4.16 KV bus.

A. Incorrect, preferred is to the 1B3 4.16 KV bus due to 10 CFR Appendix R considerations.

B. Correct

C. Incorrect, this is the alternate power source lineup

D. Incorrect, alternate power source lineup to the non preferred 1A3 4.16 KV bus.

Question Level: 2
Question Source: New
Exam: SRO
K/A: 000055.EA1.06
Importance: 4.5
References: 1-EOP-10 Station Blackout, 1-EOP-99 Appendixes/Figures/Tables, LP 0702830-11

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 9. If Unit 1 EDG or Offsite Power is available, Then RESTORE normal power per Appendix E, Power Restoration Station Blackout.	9. If Unit 1 EDG or Offsite Power is NOT available, Then: A. If Unit 2 has at least **ONE** energized 4.16 KV Emergency Bus, Then CROSSTIE AB 4.16 KV buses from Unit 2 to Unit 1 per Appendix V, SBO Crosstie From Unit 2 to Unit 1. B. If SBO crosstie from Unit 2 is NOT available, Then CONSIDER crosstie from Unit 2. **REFER TO** Appendix F, Alternate Method of Crosstying Unit 2 Diesel or Startup Transformer to Unit 1.
[ ] 10. To minimize RCS leakage and cooldown, perform the following: A. Manually CLOSE the Main Steam Isolation Valves (MSIVs). 1. HCV-08-1A - S/G 1A AND 2. HCV-08-1B - S/G 1B	10. If MSIVs do NOT close, Then PERFORM the following as necessary: A. Manually INITIATE MSIS. B. Locally CLOSE MSIVs. **REFER TO** Appendix I, MSIV Local Closure.

(Continued on Next Page)

APPENDIX V

SBO CROSSTIE FROM UNIT 2 TO UNIT 1

(Page 1 of 9)

INITIAL

1. Establish communications with Unit 2 via Gai-Tronics or plant radio (if available). ______

2. To bring AC power from Unit 2 to Unit 1 via the SBO crosstie bus:

> NOTE
>
> Selection should be based on equipment availability necessary to stabilize the RCS, i.e., if the 1A Charging Pump is out of service, the 1B3 4.16 KV Bus should be considered, or the electrical train LEAST likely to be restored by either offsite power or EDG. Due to 10 CFR 50 Appendix R considerations, the 'B' side is preferable.

   A. Select the 4.16 KV vital bus to be energized on Unit 1. Circle selected bus: 1A3 1B3 ______

   B. Place the following pump switches in the PULL TO LOCK position: ______

      1A ICW Pump

      1B ICW Pump

      1C ICW Pump

      1A CCW Pump

      1B CCW Pump

      1C CCW Pump

   C. Perform the following steps:

      1. Ensure Table 7, "Vital Power Breaker Configuration/ Station Blackout" of 1-EOP-99, has been completed. ______

      2. Verify the EDG output breaker on the selected 4.16 KV bus is OPEN 1-20211 (1-20401). ______

(Continued on Next Page)

UNIT 2 - MAIN POWER DISTRIBUTION SYSTEM

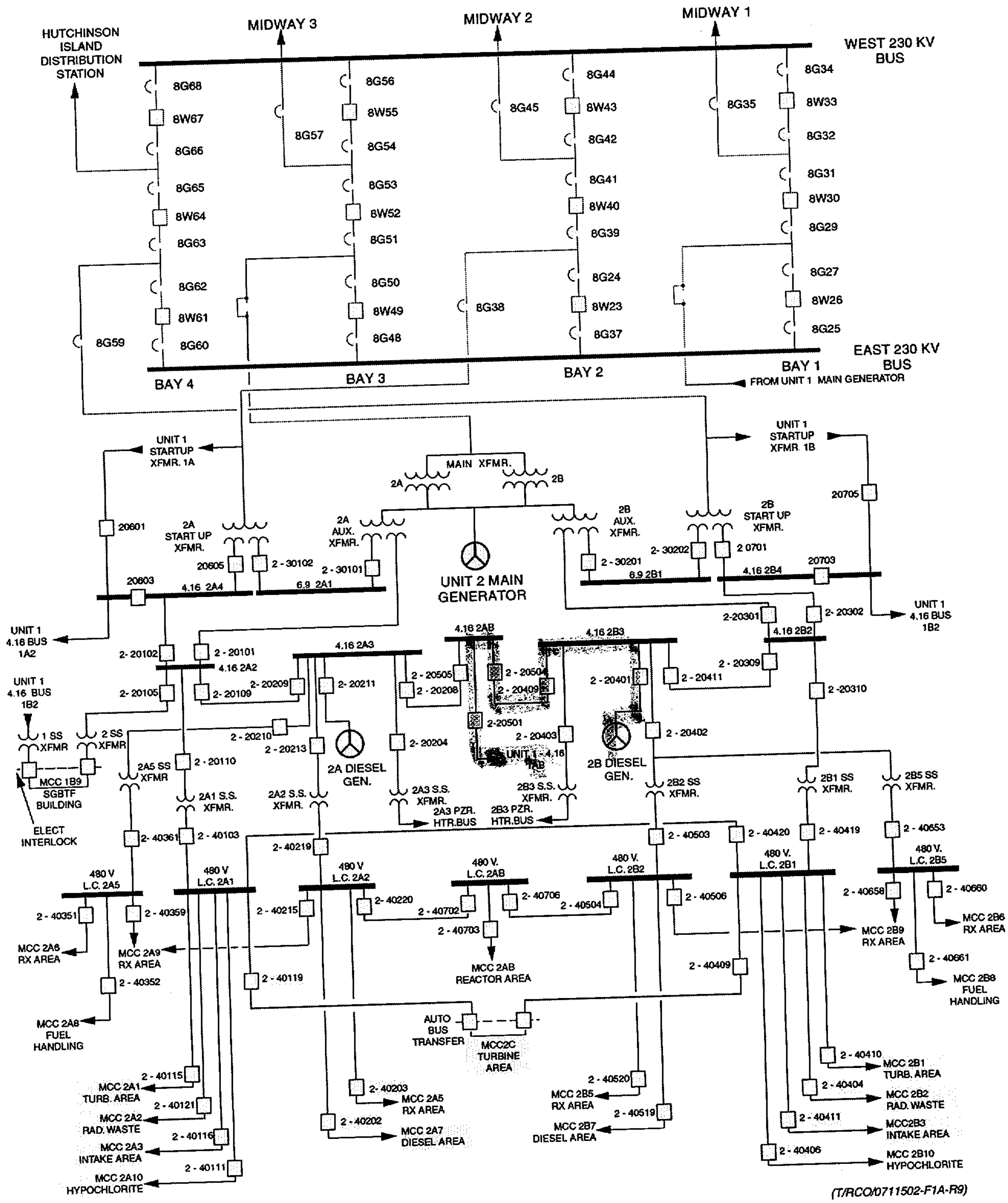


Figure 2

Question 102

Unit 1 is at 100% power when a major fire has been reported to the control room. In accordance with 1-ONP-100.01 Response to Fire, which of the following situations would require the Unit to be shutdown?

The Unit is:

A. being severely affected by spurious operation of equipment and all safe shutdown equipment on the protected train is operable.

B. being severely affected by loss of equipment and various safe shutdown equipment on the protected train is inoperable and unrecoverable.

C. experiencing minor loss of equipment and all safe shutdown equipment on the protected train is operable.

D. experiencing minor spurious operation of equipment and all safe shutdown equipment on the protected train is lost and unrecoverable.

A. Correct

B. Incorrect, do not shutdown if supporting equipment is not available.

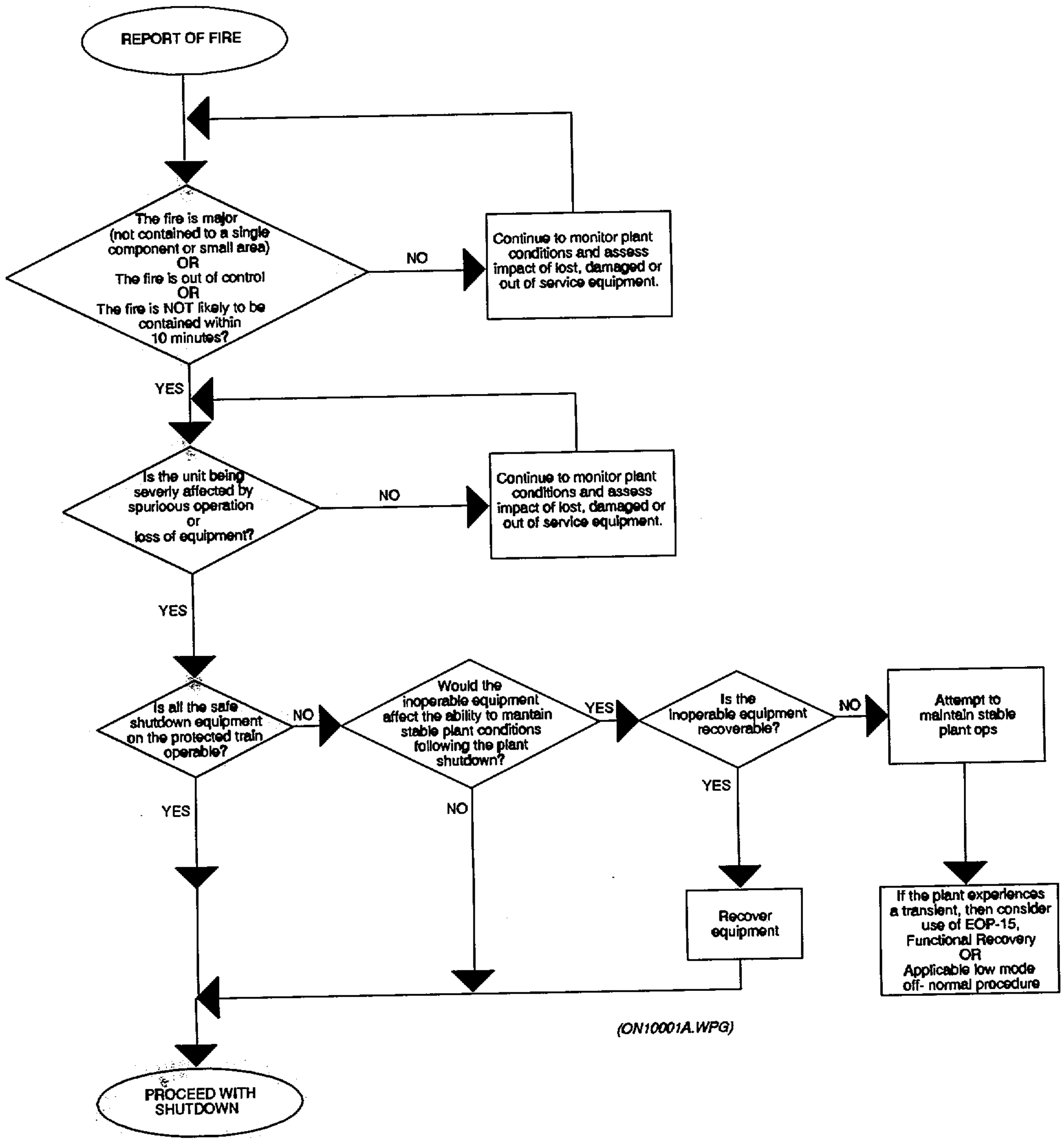
C. Incorrect, must be major loss of equipment

D. Incorrect, shutdown equipment must be available

Question Level: 1
Question Source: New
Exam: SRO
K/A: 000067.AA2.13
Importance: 4.4
References: 1-ONP-100.01 Response to Fire

FIGURE 1

SAFE SHUTDOWN FIRE IMPACT ASSESSMENT



(ON10001A.WPG)

6.0 OPERATOR ACTIONS (continued)

INITIAL

INSTRUCTIONS	CONTINGENCY ACTIONS	INITIAL
4. NPS or ANPS of the affected unit shall PERFORM the following:		
A. If the fire is in the Radiation Controlled Area, Then PERFORM the following:		
• NOTIFY Health Physics		______
• IMPLEMENT EPIP-00, Discovery & Identification of an Emergency Condition (Including Chemical, Fire and Natural Emergencies)		______
B. If evacuation of an area is necessary, Then ANNOUNCE the following:		
• Area to be evacuated		______
• Assembly area		______
• Area(s) to avoid during evacuation		______
C. If off-site assistance is required, Then PERFORM the following:		______
• NOTIFY St. Lucie County - Ft. Pierce Fire District (911 on Ft. Pierce line)		
• NOTIFY Security of their expected arrival.		

6.0 OPERATOR ACTIONS (continued) INITIAL

INSTRUCTIONS	CONTINGENCY ACTIONS	INITIAL
5. (continued)		
C. DETERMINE the fire's impact on continued unit operation in accordance with Figure 1, Safe Shutdown Fire Impact Assessment.		______

> **CAUTION**
> Appendices provide actions which supplement current plant procedures. Actions listed in the Appendices will NOT be performed until directed by this procedure.

INSTRUCTIONS	CONTINGENCY ACTIONS	INITIAL
D. REVIEW the Safe Shutdown Actions required for the affected zone(s) in accordance with the applicable Appendix for availability of equipment required to stabilize the plant.		______

> **NOTE**
> This procedure is written to respond to fires by Fire Zones. Credit for fire control is assumed to be bounded by a three hour fire barrier (Fire Areas). Table 2 provides a cross reference for other potentially affected Fire Zones within affected Fire Areas.

INSTRUCTIONS	CONTINGENCY ACTIONS	INITIAL
E. REFER to Table 2, Fire Area/Zone Cross Reference, to determine other potentially affected zones within the fire area.		______

Question 103

Unit 1 has manned the Hot Shutdown Control Panel due to a fire in the Control Room. All subsequent actions have been performed. If a loss of offsite power were to occur, which of the following explains the expected response of the 1B Diesel Generator?

The Diesel Generator:

A. will not start due to all normal/isolate switches in isolate.

B. will not start due to overspeed trip levers placed in trip.

C. start and load on the vital 4.16 KV bus.

D. start but not load on the vital 4.16 KV bus due to the Diesel output breaker normal/isolate switch in isolate.

A. incorrect, will start even with switches in isolate.

B. incorrect, will start, overspeed levers placed in trip only if fire in cable spreading room.

C. Incorrect, diesel will start but not load due to output breaker switch in isolate.

D. Correct

Question Level: 2
Question Source: New
Exam: SRO
K/A: 000068.AK.2.07
Importance: 3.4
References: 1-ONP-100.02 Control Room Inaccessibility. 0702812-06 ONP Lesson Plan.

APPENDIX G

LOSS OF OFFSITE POWER WITH NORMAL/ISOLATE SWITCHES IN ISOLATE

(Page 1 of 3)

INITIAL

NOTE

Supplemental portable lighting may be obtained for component manipulations outside the Control Room.

- Dedicated portable lanterns are available at the following locations:
  - Storage Locker 1: Walkway to Containment Personnel Hatch
  - Storage Locker 2: RAB Hallway West End (-0.5' elevation)
  - Storage Locker 3: RAB M.G. Set Room (19.5' elevation)
  - Storage Locker 4: RAB HVAC Room West (43.0' elevation)
- Temporary portable lanterns are available at the following locations:
  - Steam Trestle (Inside Mezzanine level door)
  - Field Operator Facility (FOF)
- 1A Emergency Diesel Generator will NOT be available with a fire in the Cable Spreading Room.

1. If a Loss of Offsite Power occurs while the Normal/Isolate switches are in ISOLATE, Then LOCALLY ENSURE EDG is operating 4160V and 60 hertz. (D/G Control Panels):
   - 1B Diesel Generator ______
   - 1A Diesel Generator ______

2. If the EDG is NOT operating, Then PERFORM the following:

   A. INVESTIGATE status of local alarm panel. ______

   B. If there are no alarms, Then VERIFY the overspeed trip lever has NOT tripped. ______

   CAUTION

   If auto-start signal is present and the lockout relay is reset, the EDG will automatically start.

   C. ENSURE the lockout relay is RESET. ______

   D. If the EDG does NOT start, Then PLACE the engine start Control switch to START. ______

Question 104

Given the following conditions and time line on Unit 1:

- A small break LOCA occurred at 10:28 am
- SIAS/CIAS actuated at 10:42 am
- One RCP in each loop is operating
- CCW was restored to the RCP's at 10:50 am
- Current time is 11:14 am

Which of the following describes the required Operator actions?

A. Secure the running RCP's.

B. Isolate CCW to the RCP's.

C. Open SE-01-1 and V2505, RCP bleedoff containment isolation valves.

D. Open V2507, RCP bleedoff relief stop valve.

A. **Correct, bleedoff has been lost for >30 minutes.**

B. incorrect, CCW is not to be isolated.

C. incorrect, this is performed if SIAS/CIAS reset/not actuated and <30 minutes of loss of bleedoff.

D. incorrect, this is done if loss of bleedoff for <30 minutes.

Question Level: 2
Question Source: Bank
Exam: SRO
K/A: 003.A2.02
Importance: 3.9
References: 1-EOP-03 Loss of Coolant Accident, 0702824-06 LOCA Lesson Plan.

5.0 OPERATOR ACTIONS: (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS

CAUTION

RCP seal damage and possible increase RCS leakage can result from restoration of RCP Controlled Bleedoff following a loss of CCW cooling for greater than 30 minutes.

INSTRUCTIONS	CONTINGENCY ACTIONS
[*] 10. If **BOTH** of the following conditions exist: • CCW flow to the RCPs has been restored. • RCP Controlled Bleedoff has been interrupted for less than 30 minutes. Then PERFORM **ONE** of the following: 1. If SIAS/CIAS is actuated, Then OPEN V2507, RCP Bleedoff Relief Stop Vlv. 2. If SIAS/CIAS is RESET/ NOT ACTUATED, Then PERFORM **BOTH** of the following: a. OPEN SE-01-1, RCP Bleed Cntmt Isol. b. OPEN V2505, RCP Bleedoff Cntmt Isol.	10. If RCP Controlled Bleedoff has been interrupted for greater than 30 minutes, Then ENSURE **ALL** RCPs are STOPPED.

Question 105

Unit 2 is experiencing a LOCA with a breach of Containment integrity. Wind direction is from the east/southeast.

Which of the following explains how Unit 1 Control Room Ventilation system will be aligned?

HVE-13A and/or HVE-13B running with:

A. the north outside air makeup throttled open and the south outside air closed, maintaining a slight positive pressure in the control room.

B. the north outside air makeup throttled open and the south outside air throttled open, maintaining a slight positive pressure in the control room.

C. the north outside air makeup throttled closed and the south outside air throttled open, maintaining a slight positive pressure in the control room.

D. the north outside air makeup closed and the south outside air closed.

A. **Correct**

B. Incorrect, south makeup should be closed to prevent intake of radiation from Unit 2.

C. Incorrect, north should be throttled open, south makeup should be closed

D. Incorrect, north should be open to maintain a slight positive pressure.

Question level: 1
Question source: New
Exam: Both
K/A: 060.AK2.02
Importance: 2.7/3.1
Reference: ONP 2-ONP-25.02 Ventilation Systems, LP 0702601-04

APPENDIX B
CIAS AND CONTROL ROOM OAI HIGH RADIATION
(Page 2 of 3)

INITIAL

6. If both Control Room OAI Radiation Monitors on any intake are inoperable, Then REFER TO Tech Spec 3.3.3.1. ______

7. DETERMINE which Control Room OAI has the least amount of radiation:
   - North OAI ______
   - South OAI ______

8. When the OAI with the lowest amount of radiation has been determined, Then PERFORM the following:

   A. THROTTLE the FCVs on the lowest reading side:
      - FCV-25-14, North OAI Isolation Valve ______
      - FCV-25-15, South OAI Isolation Valve ______

   B. ENSURE the FCVs on the lowest reading side throttle:
      - FCV-25-16, North OAI Isolation Valve ______
      - FCV-25-17, South OAI Isolation Valve ______

   C. MAINTAIN parameters:

OAI	FCV	CONTROL ROOM PRESS MIN	FLOW INDICATION	FLOW RATE	INITIAL
NORTH	FCV-25-16	0.125 in. H_2O above Initial CR ΔP	FI-25-18A	≤450 scfm	______
SOUTH	FCV-25-17	0.125 in. H_2O above Initial CR ΔP	FI-25-18B	≤ 450 scfm	______

/R2

9. ¶1 If desired, Then STOP **ONE** of the following Control Room Emerg Filter Fans:
   - HVE-13A ______
   - HVE-13B ______

Unit 2 is equipped with the following annunciators associated with Control Room Ventilation:

- P-40 RAB Temp High/Aux Stm Line TCV-08-06/PCV-16-1 Close
- V-5 Cntl Room to Outside ΔP Low
- V-6 Cntl Room ISOL FCV-25-18/19/24/25 OVRLD
- V-11 Cntl Room Emerg Vent Sys HVE-13A OVRLD/SS ISOL
- V-12 Cntl Room HVA/ACC-3A OVRLD/SS ISOL
- V-16 Cntl Room Isol FCV-25-15/17 OVRLD/OVRD
- V-17 Cntl Room Emerg Vent Sys HVE-13 OVRLD/SS ISOL
- V-18 Cntl Room HVA/ACC-1A/3B/3C Flow Low
- V-22 Cntl Room ISOL FCV-25-14/16 OVRLD/OVRD
- V-23 Cntl Room Emerg Vent Sys HVE0-13A/13B Flow Low
- V-24 Cntl Room HVA/ACC-3A Failure
- W-1 Cntl Room Emerg Vent Sys Adsorber Temp High
- W-2 Cntl Room Emerg Vent Sys HEPA ΔP High
- W-7 Cntl Room HVA/ACC-3B OVRLD/SS ISOL
- W-8 Cntl Room HVA/ACC-3C OVRLD/SS ISOL
- W-19 Cntl Room HVA/ACC-3D Failure
- W-20 Cntl Room HVA/ACC-3C Failure

ABNORMAL OPERATION

Procedural guidance for operation of the Control Room Ventilation System can be found in the following:

- 2-ONP-25.02, Ventilation System

Upon receipt of a CIS from Unit 1 or CIAS from Unit 2, an outside air intake radiation monitor high alarm, or upon receipt of a Rad Monitor power failure, the CREACS fans HVE-13A and B automatically start, the outside air intake flow control valves and the kitchen and toilet exhaust flow control valves automatically close, and both the CREACS fan and inlet dampers automatically open. The operator must manually stop the kitchen and toilet exhaust fans. The operator can secure one of the CREACS fans and open one of the outside air intake lines to pressurize the control room. The system now not only

maintains the control room atmosphere as previously described in the normal operations sections, but also filters the control room air through HEPA filters and charcoal absorbers to minimize any airborne radioactivity they may have resulted from the event.

In the event of a CIAS or high radiation signal followed by a loss of off-site power, the outside air intake isolation valves are designed to fail as is and the CREACS fans stop. Outside air is not drawn into the Control Room because the Control Room is pressurized during normal operation and the coasting down fan is discharging against a positive pressure in addition to overcoming ductwork and damper frictional losses. When sequenced onto the diesel generator, the valves automatically close and the CREACS fan is started.

High OAI Temperature

The NORTH OAI is equipped with temperature switches. On high temperature, the NORTH OAI is isolated due to the auto closure of FCV-25-14/16. This is to protect against an auxiliary steam line rupture.

Smoke in OAI

Two smoke detectors are located in the OAI ducts. The fire computer will alarm to alert the operators, but there is no automatic action.

TECHNICAL SPECIFICATION (Unit 2)

T.S. 3.7.7, Control Room Emergency Air Cleanup System (CREACS)

This specification identifies the requirement for two operable Control Room Emergency Air Cleanup Systems. One objective is to maintain the Control Room habitable without exceeding 5 rem whole body. The other is to ensure that Control Room temperatures do not exceed the continuous duty rating for Control Room instrumentation.

Unit 2 T.S. require verification that the Unit 1 CIS signal will place the Unit 2 Control Room in the recirculation mode. There is NOT a Unit 1 T.S. requirement to verify Unit 2 CIAS places the Unit 1 Control Room in recirc.

Question 106

Given the following Area Radiation Monitors:

- Fuel Storage Pool Area
- Containment Isolation
- Control Room outside air intake monitors
- Containment High Range

All of these Area Radiation Monitors:

A. provide Emergency Safeguards actuation signals.

B. have Technical Specifications required actions.

C. provide automatic control functions.

D. do not have Class 1E power supplies.

A. Incorrect, only the Containment Isolation monitors provide ESFAS signals.

B. **Correct**

C. Incorrect, the Containment High Range monitors have no automatic control functions.

D. Incorrect, all of these Area monitors have a Class 1E power supply.

Question level: 1
Question source: New
Exam: Both
K/A: 061.AK3.02
Importance: 3.4/3.6
Reference: 2-ONP-26.02, Area Radiation Monitors, 0702411-10

APPENDIX A
INOPERABLE MONITOR
(Page 1 of 1)

1. NOTIFY Health Physics to perform the following:

   A. CHECK local operation of the affected monitor (if accessible).

   B. §1 PERFORM surveys of the affected area as required (if accessible).

2. If required, Then NOTIFY I&C to check the affected monitor.

3. REFER TO 2-NOP-26.02, Area Radiation Monitors, for operating instructions.

4. If **ANY** of the following monitors are inoperable:

   - Fuel Storage Pool Area
   - Containment – Isolation
   - Control Room Isolation
   - Containment Area – High Range

   Then REFER TO Technical Specification 3.3.3.1, Radiation Monitoring, for required actions.

END OF APPENDIX A

Question 107

If a valid high radiation alarm is received on the 2B Steam Generator Blowdown Radiation Monitor at Unit 2, which of the following automatic actions will occur?

A. The S/G blowdown isolation valves and the blowdown sample isolation valves for both S/Gs will close.

B. The S/G blowdown isolation valve and the blowdown sample isolation valve for the 2B S/G will close.

C. Only the S/G blowdown isolation valve for the 2B S/G will close, the S/G blowdown sample isolation valves for both S/Gs close.

D. Only the S/G blowdown isolation valve for the 2B S/G will close, the S/G blowdown sample valves remain open.

A. Incorrect, only the blowdown and sample isolations for the affected S/G close.

B. **Correct**

C. Incorrect, the S/G sample isolation valve on the unaffected S/G does not close.

D. Incorrect, the S/G sample isolation valve on the affected S/G will close.

Question level: 1
Question source: New
Exam: RO
K/A: 073.G2.1.32
Importance: 3.4
Reference: 2-ONP-26.01 Process Radiation Monitors, Unit 2 Radiation Monitoring, LP 0702411-9B

4.2 Steam Generator Blowdown Monitors (continued)

INSTRUCTIONS	CONTINGENCY ACTIONS
3. (continued) B. If PLP-122 is alarmed, Then ENSURE the following: • FCV-23-5 is CLOSED • FCV-23-9 is CLOSED C. If Channels PLP-121 and PLP-122 are alarmed, Then CONSIDER the possibility of high background radiation in the vicinity of the detectors. D. CHECK EAG-403, Condenser Air Ejector, to determine extent of leakage into the secondary system. E. ALIGN S/G sample valves: 1. PLACE FCV-23-7-9, Stm Gen Blowdown Sample, in CLOSE / OVERRIDE. 2. PLACE FCV-23-7-9 in OPEN. F. NOTIFY Chemistry to implement COP-06.05, High Activity in a Steam Generator. G. MAINTAIN S/G Blowdown isolated until notified by Chemistry that blowdown may be established. H. **GO TO ONOP 2-0830030,** Steam Generator Tube Leak.	

/R2 /R2

END OF SECTION 4.2

UNIT 1 [UNIT 2] - STEAM GENERATOR BLOWDOWN SCHEMATIC

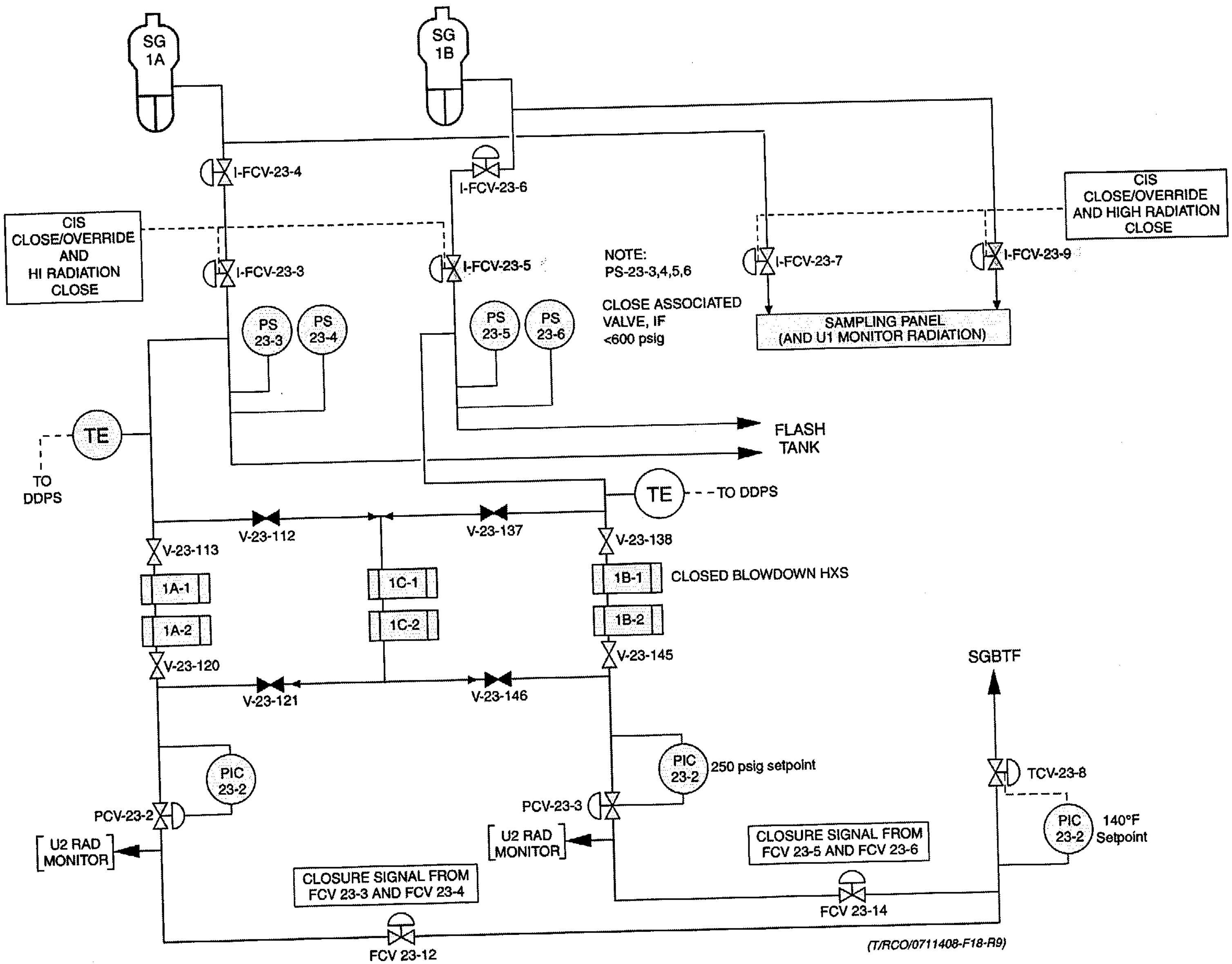


FIGURE 8

Question 108

Unit 1 has experienced a large break LOCA.

Which of the following is the **minimum** equipment required to be operating to prevent exceeding the Containment temperature and pressure design limits?

A. Four Containment coolers

B. Three Containment coolers

C. One Containment spray pump with a flow rate of 3000 gpm and one Containment cooler

D. Two Containment spray pumps each with a flow of 2500 gpm.

A. Correct

B. Incorrect, four coolers or two coolers and one spray pp with $\geq$2700 gpm flow

C. Incorrect, two coolers and one spray pump with flow $\geq$2700 gpm flow.

D. Incorrect, $\geq$2700 gpm

Question Level: 1
Question Source: New
Exam: RO
K/A: 103.A1.01
Importance: 3.7
References: 1-EOP-03 LOCA

APPENDIX A

SAFETY FUNCTION STATUS CHECK SHEET

(Page 10 of 12)

8. CONTAINMENT TEMPERATURE AND PRESSURE

	SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A.	Containment Pressure	Less than 10 psig.	☐☐☐☐☐☐
			AND
	Containment Temperature	Less than 240°F.	☐☐☐☐☐☐
B.	Four Containment Coolers	Operating.	☐☐☐☐☐☐
C.	Two Containment Spray Headers	Each greater than or equal to 2700 gpm flow.	☐☐☐☐☐☐
D.	Two Containment Coolers	Operating.	☐☐☐☐☐☐
			AND
	One Containment Spray Header	With greater than or equal to 2700 gpm flow.	☐☐☐☐☐☐

END OF SAFETY FUNCTION 8

Question 109

Unit 1 is in Mode 3 pulling the Shutdown CEA's in preparation for a Unit restart. The 'A' Safety Channel Steam Generator pressure has just failed low.

Which of the following explains the required actions.
(assume all other channels operable)

Place the failed channel in

A. trip. Shutdown CEA's can be withdrawn but reactor cannot enter Mode 2 until channel is repaired.

B. trip. Terminate CEA withdraw until the channel is repaired.

C. bypass. Terminate CEA withdraw until the channel is repaired.

D. bypass. Reactor startup can continue.

A. Incorrect, channel to be tripped or bypassed, T.S. 3.0.4 (changing modes while in action statement) not applicable. Reactor startup can continue.

B. Incorrect, CEA's can continue to be withdrawn

C. Incorrect, CEA's can continue to be withdrawn

D. Correct

Question Level: 1
Question Source: New
Exam: SRO
K/A: 012.G2.1.33
Importance: 4.0
References: Technical Specifications 3.3.1.1, 0711842 Technical Specification Lesson Plan

3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR PROTECTIVE INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1.1 As a minimum, the reactor protective instrumentation channels and bypasses of Table 3.3-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3-1.

ACTION:

As shown in Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1.1 Each reactor protective instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations during the modes and at the frequencies shown in Table 4.3-1.

4.3.1.1.2 The logic for the bypasses shall be demonstrated OPERABLE during the at power CHANNEL FUNCTIONAL TEST of channels affected by bypass operation. The total bypass function shall be demonstrated OPERABLE at least once per 18 months during CHANNEL CALIBRATION testing of each channel affected bypass operation.

4.3.1.1.3 The REACTOR TRIP SYSTEM RESPONSE TIME of each reactor trip function shall be demonstrated to be within its limit at least once per 18 months. Neutron detectors are exempt from response time testing. Each test shall include at least one channel per function such that all channels are tested at least once every N times 18 months where N is the total number of redundant channels in a specific reactor trip function as shown in the "Total No. of Channels" column of Table 3.3-1.

TABLE 3.3-1

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
1. Manual Reactor Trip	2	1	2	1, 2 and *	1
2. Power Level – High	4	2(a)	3(f)	1, 2	2#
3. Reactor Coolant Flow – Low	4/SG	2(a)/SG	3/SG	1, 2 (e)	2#
4. Pressurizer Pressure – High	4	2	3	1, 2	2#
5. Containment Pressure – High	4	2	3	1, 2	2#
6. Steam Generator Pressure – Low	4/SG	2(b)/SG	3/SG	1, 2	2#
7. Steam Generator Water Level – Low	4/SG	2/SG	3/SG	1, 2	2#
8. Local Power Density – High	4	2(c)	3	1	2#
9. Thermal Margin/Low Pressure	4	2(a)	3	1, 2 (e)	2#
9a. Steam Generator Pressure Difference – High	4	2(a)	3	1, 2 (e)	2#
10. Loss of Turbine – Hydraulic Fluid Pressure - Low	4	2(c)	3	1	2#

TABLE 3.3-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
11. Wide Range Logarithmic Neutron Flux Monitor					
a. Startup and Operating -- Rate of Change of Power – High	4	2(d)	3	1, 2 and *	2#
b. Shutdown	4	0	2	3, 4, 5	3
12. Reactor Protection System Logic	4	2	4	1, 2*	4
13. Reactor Trip Breakers	4	2	4	1, 2*	4

TABLE 3.3-1 (Continued)

ACTION STATEMENTS

b. Within one hour, all functional units receiving an input from the inoperable channel are also placed in the same condition (either bypassed or tripped, as applicable) as that required by a. above for the inoperable channel.

c. The Minimum Channels OPERABLE requirement is met; however, one additional channel may be bypassed for up to 48 hours while performing tests and maintenance on than channel provided the other inoperable channel is placed in the tripped condition.

ACTION 3 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, verify compliance with the SHUTDOWN MARGIN requirements of Specification 3.1.1.1 or 3.1.1.2, as applicable, within 1 hour and at least once per 12 hours thereafter.

ACTION 4 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, be in HOT STANDBY within 6 hours; however, one channel may be bypassed for up to 1 hour for surveillance testing per Specification 4.3.1.1.1.

Question 110

During a LOCA, which of the following describes the mitigation strategy to limit the hydrogen concentration in the Containment?

A. No hydrogen mitigation systems are placed in service until hydrogen in the Containment reaches a predetermined level.

B. Place the Hydrogen purge system and Hydrogen recombiners in service for all conditions requiring entry into EOP-03 LOCA.

C. Place the Hydrogen purge system in service when Containment hydrogen concentration reaches ≥0.5%.

D. Place the Hydrogen purge system and the Hydrogen recombiners in service when Containment hydrogen concentration reaches ≥1.5%.

A. Correct, Hydrogen concentration must be ≥0.5%

B. Incorrect, systems placed in service based on concentration levels.

C. Incorrect, Hydrogen recombiners placed in service at this level

D. Incorrect, purge system not placed in service until ≥3.5%

Question Level: 1
Question Source: New
Exam: SRO
K/A: 028.A2.02
Importance: 3.9
References:1-EOP-03 LOCA

APPENDIX A

SAFETY FUNCTION STATUS CHECK SHEET

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9. CONTAINMENT COMBUSTIBLE GAS CONTROL

> NOTE
>
> If power is interrupted and then restored to a Hydrogen Analyzer while in service, such as after ESFAS or Undervoltage Relay actuation, then the remote control selector push button must be depressed to allow for continued operation of the analyzer from the control room.

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A. Hydrogen Concentration	Less than 0.5%.	☐☐☐☐☐☐
B. Hydrogen Concentration Greater Than or Equal to 0.5% and Less Than 3.5%		
Hydrogen Recombiners	All available operating.	☐☐☐☐☐☐

⇓

(Continued on Next Page)

APPENDIX A
SAFETY FUNCTION STATUS CHECK SHEET
(Page 12 of 12)

9. CONTAINMENT COMBUSTIBLE GAS CONTROL

> NOTE
> If power is interrupted and then restored to a Hydrogen Analyzer while in service, such as after ESFAS or Undervoltage Relay actuation, then the remote control selector push button must be depressed to allow for continued operation of the analyzer from the control room.

SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
C. Hydrogen Concentration Greater Than or Equal to 3.5%		
Hydrogen Recombiners	All available operating.	☐☐☐☐☐☐
		AND
Hydrogen Purge System	As recommended by the Technical Support Center.	☐☐☐☐☐☐

END OF SAFETY FUNCTION 9

INITIALS

RO / SRO / STA ☐☐☐☐☐☐

END OF APPENDIX A

Question 111

Unit 1 Diesel Generator 1A was declared out of service at 0235 on March 5. The diesel was discovered to have a corroded radiator and was leaking coolant. The current time is 0245 March 5.

Which of the following describes the required actions as a result of the 1A diesel being declared out of service?

Demonstrate operability of offsite AC sources no later than:

A. 0335 March 5 and restore the 1A Diesel Generator to operable status by 0235 March 19.

B. 0335 March 5 and restore the 1A Diesel Generator to operable status by 0235 March 8.

C. 1035 March 5 and demonstrate the operability of the 1B Diesel Generator by performing the specified surveillance no later than 0235 March 8.

D. 1035 March 5 and demonstrate the operability of the 1C AFW by performing the specified surveillance no later than 0335 March 5.

A. **Correct**

B. Incorrect, restore Diesel within 14 days

C. Incorrect, offsite power to be verified within one hour

D. Incorrect, 1C AFW pump requires operability check but surveillance does not need to be performed.

Question Level: 2
Question Source: New
Exam: SRO
K/A: 064.G2.2.23
Importance: 3.8
References: Technical Specification 3.8.1.1 0711842 Technical Specification Lesson Plan

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and

b. Two separate and independent diesel generator sets each with:

1. Engine-mounted fuel tanks containing a minimum of 152 gallons of fuel,

2. A separate fuel storage system containing a minimum of 16,450 gallons of fuel, and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one offsite circuit of 3.8.1.1.a inoperable, except as provided in Action f. below, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. Restore the offsite circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

b. With one diesel generator of 3.8.1.1.b inoperable, demonstrate the OPERABILITY of the A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; and if the EDG became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventative maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE EDG by performing Surveillance Requirement 4.8.1.1.2.a.4 within 8 hours, unless it can be confirmed that the cause of the inoperable EDG does not exist on the remaining EDG*; restore the diesel generator to OPERABLE status within 14 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Additionally, verify within 2 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours that:

* If the absence of any common-cause failure cannot be confirmed, this test shall be completed regardless of when the inoperable EDG is restored to OPERABILITY.

ACTION (continued)

1. all required systems, subsystems, trains, components and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE, and

2. when in MODE 1, 2 or 3, the steam-driven auxiliary feed pump is OPERABLE.

c. With one offsite A.C. circuit and one diesel generator inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; and if the EDG became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventative maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE EDG by performing Surveillance Requirement 4.8.1.1.2.a.4 within 8 hours unless it can be confirmed that the cause of the inoperable EDG does not exist on the remaining EDG*. Restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore the other A.C. power source (offsite circuit or diesel generator) to OPERABLE status in accordance with the provisions of Section 3.8.1.1 ACTION Statement a or b, as appropriate, with the time requirement of that ACTION Statement based on the time of the initial loss of the remaining inoperable A.C. power source. Additionally, verify within 2 hours or be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours that:

   1. all required systems, subsystems, trains, components and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE, and

   2. When in Mode 1, 2 or 3, the steam-driven auxiliary feed pump is OPERABLE.

d. With two of the required offsite A.C. circuits inoperable, restore one of the inoperable offsite sources to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours. Following restoration of one offsite source, follow ACTION Statement a. with the time requirement of that ACTION Statement based on the time of the initial loss of the remaining inoperable offsite A.C. circuit.

---

* If the absence of any common-cause failure cannot be confirmed, this test shall be completed regardless of when the inoperable EDG is restored to OPERABILITY.

ACTION (continued)

e. With two of the above required diesel generators inoperable, demonstrate the OPERABILITY of two offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; restore one of the inoperable diesel generators to OPERABLE status within 2 hours or be in the at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Following restoration of one diesel generator unit, follow ACTION Statement b. with the time requirement of that ACTION Statement based on the time of initial loss of the remaining inoperable diesel generator.

f. With one Unit 1 startup transformer (1A or 1B) inoperable and with a Unit 2 startup transformer (2A or 2B) connected to the same A or B offsite power circuit and administratively available to both units, then should Unit 2 require the use of the startup transformer administratively available to both units, Unit 1 shall demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. Restore the inoperable startup transformer to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.8.1.1.1 Each of the above required independent circuits between the offsite transmission network and the onsite Class 1E distribution system shall be:

a. Determined OPERABLE at least once per 7 days by verifying correct breaker alignments, indicated power availability; and

b. Demonstrated OPERABLE at least once per 18 months by transferring (manually and automatically) unit power supply from the auxiliary transformer to the startup transformer.

4.8.1.1.2 Each diesel generator shall be demonstrated OPERABLE:

a. At least once per 31 days on a STAGGERED TEST BASIS by:

1. Verifying fuel level in the engine-mounted fuel tank,
2. Verifying the fuel level in the fuel storage tank,
3. Verifying the fuel transfer pump can be started and transfers fuel from the storage system to the engine-mounted tank,

Question 112

Unit 1 was manually tripped from 60% power due to S/G level problems. Shortly after the trip 'A' train SIAS actuated. The following parameters were observed during implementation of 1-EOP-01:

- RCS pressure lowered to 1890 psia and is currently 2100 psia and rising.
- RCS temperature lowered to 532ºF and is stable at that value.
- All Safety Functions met in EOP-01
- All other parameters are within EOP-01 acceptance criteria.

Which of the following describes the procedure implementation strategy?

A. 1-EOP-03 Loss of Coolant Accident, if all Safety Functions met, perform applicable EOP-99 table, reset 'A' train SIAS then restore ESFAS affected components

B. 1-EOP-15 Functional Recovery, if all Safety Functions met, reset 'A' train SIAS, restore ESFAS affected components then perform applicable EOP-99 table

C. 1-EOP-02 Reactor Trip Recovery, reset 'A' train SIAS, restore ESFAS affected components then perform applicable EOP-99 table.

D. 1-EOP-02 Reactor Trip Recovery, perform applicable EOP-99 table, reset 'A' train SIAS then restore ESFAS affected components.

A. Incorrect, all Safety Functions met in EOP-01 and invalid SIAS actuation

B. Incorrect, all Safety Functions met in EOP-01 and invalid SIAS actuation

C. Incorrect, cannot restore ESFAS affected components prior to performing EOP-99 table

D. Correct

Question Level: 2
Question Source: New
Exam: SRO
K/A: 005.G2.4.2
Importance: 4.1
References: ADM. 0010120 Conduct of Operations, 1-EOP-02 Reactor Trip Recovery, LP 0902704-3

ST. LUCIE PLANT
ADMINISTRATIVE PROCEDURE NO. 0010120, REVISION 130
CONDUCT OF OPERATIONS

APPENDIX E
EOP OPERATING PHILOSOPHY
(Page 9 of 15)

Emergency Operating Procedure Implementation: (continued)

1. (continued)

   I. ESFAS Actuation:

      1. The blocking or termination of ESFAS actuation is only allowed during normal plant cooldown, as directed by Operating procedure and during emergency recovery, when directed by the EOPs or the Technical Support Center.

      2. Under no circumstances shall the automatic actuation of ESFAS be blocked when the actuation limits are being approached in an uncontrolled plant condition. Operators shall NOT manually terminate the operation of ESFAS actuated components during an emergency, except as allowed by plant procedure.

      3. If a valid ESFAS actuation occurs, then the operating crew should NOT exit EOP-1 to EOP-2. EOP-1 should be exited to one of the optimal recovery EOPs or EOP-15 for the following reasons:

         a. The optimal recovery EOPs contain procedural steps to determine the extent of the damage.

         b. EOP-2 entry conditions assumes an uncomplicated trip has occurred. A valid ESFAS actuation is NOT an uncomplicated trip.

      4. If a spurious invalid ESFAS actuation occurs in any plant mode, Then perform the applicable EOP 99 table prior to restoration of components.

      5. Manual initiation of AFAS is allowable under the following circumstances:

         a. Automatic actuation of the system did NOT occur after the appropriate time delay has elapsed.

         b. When cooling down the RCS using only one Steam Generator, if the operable Steam Generator is affected by the AFAS rupture identification circuit.

1.0 TITLE:

REACTOR TRIP RECOVERY

2.0 PURPOSE:

1. This procedure provides the operator actions that must be accomplished subsequent to an uncomplicated Reactor trip. The actions in this procedure are necessary to ensure that the plant is placed in a stable, safe condition. The goal of the procedure is to safely establish the plant in a MODE 3 condition which will allow a return to normal operation, while minimizing any radiological releases to the environment.

3.0 ENTRY CONDITIONS:

1. The 1-EOP-01, Standard Post Trip Actions, have been performed.

AND

2. Plant conditions indicate that an uncomplicated Reactor trip has occurred.

4.0 EXIT CONDITIONS:

1. The diagnosis of an uncomplicated Reactor trip is NOT confirmed.

OR

2. Any of the Reactor Trip Recovery safety functions status check acceptance criteria are NOT met.

OR

3. The steps of this procedure have been completed, all of the safety functions are being maintained and RCS conditions are being controlled and maintained in a MODE 3 condition.

Question 113

Unit 1 RCS is solid at 310 psia preparing to start an RCP on an idle loop during fill and vent. Upon starting the RCP, RCS pressure rapidly increases.

Which of the following caused the pressure excursion?

A. RCS temperature was 40ºF lower than Steam Generator temperature on the idle loop.

B. RCS temperature was 40ºF higher than Steam Generator temperature on the idle loop.

C. Loss of an Instrument bus

D. Loss of the 1D DC bus

A. **Correct**

B. Incorrect, backward logic

C. Incorrect, would cause one channel of RPS to trip

D. Incorrect, possible if loss of safety related DC bus.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 007.A2.03
Importance: 3.9
References:2-EOP-05 Excess Steam Demand

4.0 PRECAUTIONS AND LIMITS: (continued)

¶6,7 4.8 Seal injection is required to be in service when filling RCS from below the Seal Cartridge to above the Seal Cartridge (approx 32.5 to 33.5 ft elev) to prevent contaminants on the surface of the Reactor Vessel water from entering the seals.

¶7 4.9 Continued use of seal injection when filling above the level of Seal Cartridge is not required.

4.10 When RCS temperature is greater than 200°F, both charging header loop isolation valves should remain open when seal injection is aligned to the RCPs to minimize thermal stress on the RCP shafts.

§1 4.11 When the RCS cold leg temperature is less than 304°F, the Reactor Head is on the Reactor Vessel AND the RCS is NOT vented through a hole greater than 1.75 square inches, Then two PORVs shall be operable, in service and selected to LOW RANGE OPERATION.

4.12 When the RCS is in Solid Pressure Control, Then close scrutiny should be given to any action that could result in the de-energization of any portion of the Class 1E 125V DC System. This could cause both the isolation of the RCS while solid and the simultaneous failure of one PORV thereby challenging the LTOP single failure design criteria.

§1 4.13 An RCP shall NOT be started in an idle RCS loop unless the Steam Generator secondary temperature is less than 30°F above each of the RCS cold leg temperatures (T.S. 3.4.14).

¶3 4.14 Routine operation of the RCGVS has resulted in degradation of the solenoid actuated valves in the system. RCS venting from the Reactor Vessel and the Pressurizer shall be accomplished through manually operated valves and attached hoses.

4.15 CEDMs should be vented any time the RCS has been depressurized and vented to the atmosphere.

Question 114

The plant has declared an Unusual event due to hurricane warnings. Both Units are in cold shutdown. Reports are coming in that winds are expected to be 180 MPH. At 0800 the storm surge has resulted in water levels in the Turbine building to be over the Main Feedwater pump auxiliary oil pumps.

As Emergency Coordinator which of the following applies?

A. Maintain the current classification and update the State by 0900 with the new information.

B. Maintain the current classification and update the State by 0815 with the new information.

C. Upgrade the event as Site Area Emergency. Notify the State by 0815.

D. Upgrade the event as an Alert. Notify the State by 0815.

Reference required (EPIP-01 Classification of Emergencies)

A. Incorrect, event classification is Site Area Emergency.

B. Incorrect, event classification is Site Area Emergney

C. **Correct**

D. Incorrect, event classification is Site Area Emergney

Question level: 2
Question source: New
Exam: SRO
K/A: 2.4.40
Importance: 4.0
Reference: EPIP-01, EPIP-08, SRO EPIP LP 0902701-2

5.0 INSTRUCTIONS

5.1 State and County Notification

1. Time Limits

   A. Notification shall be initiated within 15 minutes of any of the following:

      1. Recognition of entry into the Emergency Plan.
      2. Escalation in Emergency Class.
      3. De-escalation of the Emergency Class.
      4. Protective Action Recommendation.
      5. Change in Protective Action Recommendation.

   B. Notification shall be initiated within 60 minutes of any of the following:

      1. At an Alert or higher Emergency Class, the time of the last update (unless a different frequency has been agreed to by the off-site agencies as during a hurricane).
      2. A radiological release has been initiated.
      3. A radiological release has been terminated.
      4. A significant change in plant conditions has occurred (e.g., loss or restoration of off-site power or major plant equipment).
      5. Termination of the emergency.

ATTACHMENT 1
EMERGENCY CLASSIFICATION TABLE
(Page 13 of 20)

EVENT/CLASS	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
5.C. TORNADO	Notification of a tornado sighted in the Owner Controlled Area	§2 Any tornado striking the Power Block.		**NOTE** Refer to Potential Core Melt Event/Class 6.A.
5.D. ABNORMAL WATER LEVEL	Abnormal water level conditions are expected or occurring 1. Low intake canal level of -10.5 ft. MLW for 1 hour or more. OR 2. Visual sightings by station personnel that water levels are approaching storm drain system capacity.	Flood, low water, hurricane surge or other abnormal water level conditions 1. The storm drain capacity is exceeded during hurricane surge or known flood conditions. OR 2. Low intake canal level of -10.5 ft. MLW for 1 hour or more with emergency barrier valves open.	Flood, low water, hurricane surge or other abnormal water level conditions causing failure of vital equipment 1. Flood/surge water level reaching elevation +19.5 ft. (turbine building/RAB ground floor). OR 2. Low intake canal level has caused the loss of all ICW flow.	

5.C. TORNADO

5.D. ABNORMAL WATER LEVEL

AFTER CLASSIFYING, GO TO EPIP-02, DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

ATTACHMENT 1
EMERGENCY CLASSIFICATION TABLE
(Page 12 of 20)

EVENT/CLASS	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
5.A. EARTHQUAKE	§2 A confirmed earthquake has occurred 1. A confirmed earthquake has been experienced within the Owner Controlled Area. OR 2. ¶4 An earthquake is detected by plant seismic monitor instruments or other means.	§2 A confirmed earthquake has occurred. 1. A confirmed earthquake has occurred which registered GREATER THAN 0.05g within the Owner Controlled Area. OR 2. A confirmed earthquake has occurred that could or has caused trip of the turbine generator or reactor.	§2 A confirmed earthquake has occurred. 1. A confirmed earthquake has occurred which registered GREATER THAN 0.1g within the Owner Controlled Area and the plant not in Cold Shutdown. OR 2. A confirmed earthquake has occurred that has caused loss of any safety system function (e.g., both trains inoperable).	**NOTE** Refer to Potential Core Melt Event/Class 6.A.
5.B. HURRICANE	Hurricane Warning 1. Confirmed hurricane warning is in effect.	Hurricane warning with winds near design basis 1. Confirmed hurricane warning is in effect and winds are expected to exceed 175 mph within the Owner Controlled Area. **NOTE** At FPL's request, NOAA will provide an accurate projection of wind speeds onsite 24 hours prior to the onset of hurricane force winds. If that projection is not available within 12 hours of entering into the warning, classify the event using current track and wind speeds to project onsite conditions. For example, projected onsite wind speed would be less than maximum hurricane wind speed if the track is away from PSL.	Hurricane warning with winds GREATER THAN design basis 1. Plant not at cold shutdown. AND 2. Confirmed hurricane warning is in effect and winds are expected to exceed 194 mph within the Owner Controlled Area. **NOTE** At FPL's request, NOAA will provide an accurate projection of wind speeds onsite 24 hours prior to the onset of hurricane force winds. If that projection is not available within 12 hours of entering into the warning, classify the event using current track and wind speeds to project onsite conditions. For example, projected onsite wind speed would be less than maximum hurricane wind speed if the track is away from PSL.	**NOTE** Refer to Potential Core Melt Event/Class 6.A.

AFTER CLASSIFYING, GO TO EPIP-02, DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

Question 115

Unit 1 is on SDC performing a normal plant cooldown. The RCS is solid, cooling the Pressurizer with the following conditions:

- RCS pressure 60 psia
- Both S/G levels are 65% Narrow range

In accordance with NOP-1-0030127 'Reactor Plant Cooldown-Hot Standby to Cold Shutdown' which of the following strategy would be used to meet the Technical Specification criteria for "RCS loops filled" if SDC were lost?

A. Start additional charging pumps to increase RCS pressure.

B. Close letdown isolation valves to increase RCS pressure.

C. Close Auxiliary spray valves to increase RCS pressure.

D. Adjust PIC-2201 Letdown pressure controller to increase RCS pressure.

A. Incorrect, with Pressurizer pressure controls in Auto. RCS pressure would not increase. This is also not proceduralized.

B. Incorrect, this would increase RCS pressure, but not proceduralized.

C. Incorrect, this method is used only if a bubble in the Pressurizer.

D. Correct, use PIC-2201 to close backpressure control valves to increase RCS pressure.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 000027.G2.4.48
Importance: 3.8
References NOP-1-0030127 'Reactor Plant Cooldown-Hot Standby to Cold Shutdown'

APPENDIX F

PRESSURIZER COOLING AND SOLID PRESSURE OPERATION

(Page 2 of 7)

> CAUTION
>
> The conditions for satisfying the Technical Specifications criteria of "RCS loops filled" are met if RCS pressure is below 70 psia provided the ability to repressurize the RCS to greater than 70 psia within the constraints of the "time to boil" criteria of Figure 1 of ONOP 1-0440030, Shutdown Cooling off-normal exists.

5. Prior to reducing RCS pressure below 70 psia, ENSURE **ONE** of the following is satisfied:

   A. Both trains of Shutdown Cooling are operable and at least one train is operating.

   OR

§4 B. If only one train of Shutdown Cooling is operable and in operation, Then ENSURE the following:

   1. Both S/Gs level greater than 10% narrow range.

      AND

   2. Pressurizer level is greater than or equal to 30% as indicated on L1-1103.

      AND

   3. The RCS is capable of being pressurized to greater than 70 psia as indicated by either:

      a. A steam bubble in the Pressurizer

      OR

      b. Solid plant pressure control

APPENDIX F

PRESSURIZER COOLING AND SOLID PRESSURE OPERATION

(Page 3 of 7)

INITIAL

6. If Shutdown Cooling is lost while RCS pressure is less than 70 psia (55 psia), Then RAISE RCS pressure to greater than 70 psia as follows:

   A. If there is a bubble in the Pressurizer, Then PERFORM the following:

      1. CLOSE SE-02-3, Aux Spray Valve

      2. CLOSE SE-02-4, Aux Spray Valve

   B. If the Pressurizer is water solid, Then ADJUST PIC-2201, Letdown Pressure, to establish RCS pressure greater than 70 psia.

NOTE

Letdown flow is re-aligned through the purification ion exchangers following Hydrogen Peroxide shock of the RCS. Verifying this re-alignment prior to commencing Pressurizer cooling will ensure dose rates in the Pressurizer area of the containment are maintained as low as possible.

7. ENSURE letdown flow is aligned through the purification ion exchanger(s). ______

§1

CAUTION

Do NOT exceed a Pressurizer cooldown rate of 200°F in any one hour period.

8. Using Auxiliary Spray, reduce RCS pressure to 50 PSIA over a period of at least 90 minutes. Record times for the start and completion of the pressure reduction.

   ______ Time RCS pressure reduction started.

   ______ Time RCS pressure reaches 50 PSIA

Question 116

In accordance with Technical Specifications, which of the following is the minimum Nuclear Instrumentation channels that must be operable to conduct core alterations?

A. Unit 1, two Wide Range log safety channels, one with audible in the Containment and Control room, each with visual indication in the control room.

B. Unit 1, two Wide Range log safety channels, one with audible in the Containment and one with visual indication in the Control Room

C. Unit 2, two Start-up Range flux monitors, one with audible in the Containment and Control room, each with visual indication in the control room.

D. Unit 2, two Start-up Range flux monitors, one with audible in the Containment and one with visual in the Control room.

A. Incorrect, Unit one does not require audible in the Control room, only Unit 2.

B. Incorrect, both require visual indication in the Control room.

C. Correct

D. Incorrect, both must be audible and visual in Containment and Control room.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 000032.G2.2.3
Importance: 3.3
References Technical Specifications 3.9.2 Refueling Operations

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 As a minimum, two startup range neutron flux monitors shall be OPERABLE and operating, each with continuous visual indication in the control room and one with audible indication in the containment and control room.

APPLICABILITY: MODE 6.

ACTION:

a. With one of the above required monitors inoperable or not operating, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

b. With both of the above required monitors inoperable or not operating, determine the boron concentration of the Reactor Coolant System at least once per 12 hours.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.2 Each startup range neutron flux monitor shall be demonstrated OPERABLE by performance of:

a. A CHANNEL CHECK at least once per 12 hours,

b. A CHANNEL FUNCTIONAL TEST within 8 hours prior to the initial start of CORE ALTERATIONS, and

c. A CHANNEL FUNCTIONAL TEST at least once per 7 days.

Question 117

Unit 1 is in Mode 3 with all CEA's inserted. The Main Steam header is pressurized from Unit 2.

The following alarm is received:

- Q47 Main Steam Isol HCV-08-1A Low Air Press/DC Failure.

The 1A MSIV indicates open and the 1B MSIV indicates closed.

Which of the following describes the reason for the 1A MSIV opening and its operability?

The 1A MSIV has opened on loss of:

A. DC power and must be declared out of service.

B. Instrument air pressure and must be declared out of service.

C. DC power but is operable as long as long as Instrument air is available.

D. Instrument air pressure but is operable as DC power is available.

A. Correct,

B. Incorrect, loss of Instrument air MSIV fails closed.

C. Incorrect, MSIV not operable on loss of DC power

D. Incorrect, loss of Instrument air, MSIV fails closed

Question Level: 2
Question Source: New
Exam: SRO
K/A: 000058.AA2.03
Importance: 3.9
References 1-ONP-50.02 125V DC Bus 1A Ground Isolation, 0702304-10 Main Steam Lesson Plan.

APPENDIX D

DC GROUND ISOLATION FOR BKR 1-60121 LOADS - RTGB-106

(Page 6 of 13)

INITIAL

10. CHECK RTGB-106, TB CCC fuses F19 and F20 for DC grounds, as follows:

> **CAUTION**
> Removing fuses F19 and F20 will render HCV-08-1A, Main Steam Isolation Valve, out of service.

> **NOTE**
> Removing fuses F19 and F20 will result in the following:
> - If supply air is available, HCV-08-1A, Main Steam Isolation Valve, will open.
> - No adverse effects if pulled at power.
> - Annunciator Q47, Main Stm Isol HCV-08-1A Low Air Press/ DC Failure, alarms.

A. REFER TO Tech Spec section 3.7.1.5 for LCO and Action requirements. ______

Removal of fuses F19 and F20 is authorized. ______ ANPS

B. PULL fuses F19 and F20. ______

C. OBSERVE annunciator B-10, 125V DC Bus 1A Ground. ______

D. INSERT fuses F19 and F20. ______

Question 118

A Loss of Offsite power has occurred on Unit 1. The transient has resulted in various breakers tripping. As a result, AFW flow instrumentation on the RTGB is unavailable. Which of the following describes an alternate method of determining approximately 150 gpm AFW flow to each S/G's?

A. Adjust the 1C AFW turbine speed to equal 100 psig above the S/G pressure with the header throttle valves fully open.

B. Locally open the respective header throttle valves to 10 turns open on each AFW header.

C. On each AFW header, open the respective header throttle valve for six seconds from the full closed position.

D. On each AFW header, close the respective header throttle valve for six seconds from the full open position.

A. Incorrect, this method is used in Appendix G 1-EOP-99 for local operation on the 1C AFW pump. This method is not intended to be used for flow control purposes.

B. Incorrect, 10 turns open is for the ICW pump start on a depressurized header.

C. Correct

D. Incorrect, backward from the correct method.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 000056.AA2.20
Importance: 4.2
References 1-ONP-100.02 Control Room Inaccessibility

APPENDIX A

RCO A SUBSEQUENT ACTIONS

(Page 4 of 5)

INITIAL

NOTE

- V1404, Pressurizer Relief Valve, may be used to control pressurizer pressure if auxiliary sprays become unavailable, however V1405, Przr Relief Block Valve must be opened prior to use.
- If Control Room Inaccessibility is NOT due to a fire, Main Spray valves may be available.

8. CONTROL available Pressurizer heaters and Auxiliary Sprays to maintain PI-1100Y-1, Pressurizer Pressure, 1800 to 2300 psia, trending to 2225 to 2275 psia. ______

A TRAIN	B TRAIN
SE-02-3, Pressurizer Auxiliary Spray	SE-02-4, Pressurizer Auxiliary Spray
B-1, Backup Heater Bank	B-4, Backup Heater Bank
B-2, Backup Heater Bank	B-5, Backup Heater Bank
B-3, Backup Heater Bank	B-6, Backup Heater Bank
P-1, Propnl Heater Bank	P-2, Propnl Heater Bank

$\Psi\S_1$ • INITIATE Data Sheet 2, Auxiliary Spray Cycles. ______

9. MAINTAIN S/G pressure between 750 and 950 psia as follows:

- CONTROL PIC-08-1A1, 1A S/G Atmos Dump Valve. ______
- CONTROL PIC-08-1B1, 1B S/G Atmos Dump Valve. ______

NOTE

A six second open stroke of the AFW flow control valves from the fully closed position is equivalent to approximately 150 gpm flow to the S/Gs.

10. CONTROL AFW pumps and flow control valves to maintain at least **ONE** S/G wide range level greater than 40%. ______

Question 119

Unit 1 has been in a refueling outage for 12 days, with a total core offload in progress.

Which of the following requires immediate suspension of refueling operations?

A. Spent fuel pool temperature is reported to be 125 ºF.

B. One of the two running spent fuel pool pumps is temporarily stopped for electrical train swap.

C. Refueling canal level is 22 feet above the top of fuel assemblies that are seated in the reactor.

D. Refueling canal level is 22 feet above the top of the reactor flange.

A. Incorrect, at 145ºF, fuel loading in SFP must stop.

B. Incorrect, one of two conditions one SFP can be temporarily stopped.

C. Correct.

D. Incorrect, would be correct for Unit 2 only.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 2.2.29
Importance: 3.8
References 1-1600023 Refueling Sequencing Guidelines, Technical Specifications 3.9.10.

REFUELING OPERATIONS

WATER LEVEL – REACTOR VESSEL

LIMITING CONDITION FOR OPERATION

3.9.10 At least 23 feet of water shall be maintained over the top of irradiated fuel assemblies seated within the reactor pressure vessel.

APPLICABILITY: During CORE ALTERATIONS.
During movement of irradiated fuel assemblies within containment.

ACTION:

With the requirements of the above specifications not satisfied, immediately suspend CORE ALTERATIONS and movement of irradiated fuel assemblies within containment, and immediately initiate action to restore refueling cavity water level to within limits.

SURVEILLANCE REQUIREMENTS

4.9.10 The water level shall be determined to be at least its minimum required depth within 2 hours prior to the start of and at least once per 24 hours thereafter during CORE ALTERATIONS and during movement of irradiated fuel assemblies within containment.

3/4.9.10 WATER LEVEL – REACTOR VESSEL

LIMITING CONDITION FOR OPERATION

3.9.10 At least 23 feet of water shall be maintained over the top of the reactor pressure vessel flange.

APPLICABILITY: During CORE ALTERATIONS.
During movement of irradiated fuel assemblies within containment.

ACTION:

With the requirements of the above specifications not satisfied, immediately suspend CORE ALTERATIONS and movement of irradiated fuel assemblies within containment, and immediately initiate action to restore refueling cavity water level to within limits.

SURVEILLANCE REQUIREMENTS

4.9.10 The water level shall be determined to be at least its minimum required depth within 2 hours prior to the start of and at least once per 24 hours thereafter during CORE ALTERATIONS and during movement of irradiated fuel assemblies within containment.

ST. LUCIE UNIT 1
OPERATING PROCEDURE NO. 1-1600023, REVISION 93
REFUELING SEQUENCING GUIDELINES

APPENDIX A
SURVEILLANCES PERFORMED DURING REFUELING

CHECK SHEET 3
Surveillances Performed Daily or Weekly While Refueling
(Page 1 of 2)

DATE:____/____/____

NOTE
Refueling Operations start with the movement of the first irradiated fuel assembly within the reactor pressure vessel and continues until the last fuel assembly is seated in the reactor pressure vessel. Surveillance intervals should be maintained as much as possible even through periods of inactivity such as an off-load window or a refueling equipment repair period. Periodic checks should be completed with the first 3 hours of a twelve hour shift to ensure completion within the proper intervals.

INITIAL

1. The following surveillances shall be performed on each midnight shift at the specified frequency:

CAUTION
If refueling cavity level exceeds 60 ft. 5", water may enter into the HVAC ductwork through the openings around the periphery of the refueling cavity.

* A. Daily, verify at least 23 feet of water is over the top of irradiated fuel assemblies seated within the reactor pressure vessel by ensuring refueling cavity water level is greater than or equal to 48 feet 5 inches. ______

Technical Specification: 4.9.10

B. Daily, TEST the Containment Evacuation Alarm. ______

*Satisfactory performance of the above asterisked steps assures conformance with applicable Technical Specifications.

S__OPS
DATE____________
DOCT____________
DOCN____________
SYS____________
COMP____________
ITM____________

Question 120

Unit 1 is in day 15 of a refueling outage and has completed the refueling shuffle. Reduced inventory has just been entered. Maintenance has requested to open the Containment equipment hatch.

Which of the following applies.

The Containment equipment hatch:

A. cannot be opened while in reduced inventory.

B. cannot be opened until the Reactor has been shutdown for at least 20 days.

C. can be opened if Maintenance personnel are on station prepared to close the hatch within 30 minutes upon loss of SDC.

D. can be opened if reduced inventory can be exited within 30 minutes upon loss of SDC.

A. Incorrect, can be opened if refueling complete or time to boil is $\geq$ 30 minutes.

B. Incorrect, reactor must be shutdown for >240 hours.

C. Correct

D. Incorrect, hatch must be closed within 30 minutes.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 2.2.18
Importance: 3.6
References 1-NOP-01.04 RCS Reduced Inventory and Mid-Loop Operation.

APPENDIX G
NPS/ANPS REDUCED INVENTORY AND MID-LOOP CHECKLIST
(Page 3 of 5)

	MIDNIGHT	DAYS	PEAKS
3.0 §17 If the Reactor has been shutdown for less than 240 hours, Then ENSURE the Containment Equipment Hatch is CLOSED unless at least **ONE** of the following conditions is met:	______	______	______
• The refueling shuffle is complete. OR • A condition specific decay heat calculation has determined that the time to core boiling is greater than or equal to 30 minutes.			
4.0. §17 If plant conditions allow the Containment Equipment Hatch to be open, Then PERFORM the following:	______	______	______
4.1. ESTABLISH communications with Maintenance personnel responsible for closing the equipment hatch in accordance with 1-M-0060, Emergency Closure of Containment Penetrations, Personnel Hatch, and Equipment Hatch.	______	______	______
4.2. VERIFY required Maintenance personnel are stationed to close the equipment hatch.	______	______	______
5.0 NOTIFY the System Load Dispatcher of the Reduced Inventory operation.	______	______	______

Question 121

The SNPO at Unit 1 has been asked to enter the pipe tunnel area, in the –.5 ft. elevation of the RAB, to investigate a primary leak. The latest Health Physics survey shows about 1200 mr/hr throughout the room.

Which of the following describes the minimum RWP requirements for entry into this area?

A. General entry RWP

B. RWP or Health Physics escort under general entry RWP

C. Specific RWP with continuous Health Physics coverage

D. Specific RWP approved by RPM and Plant General Manager

A. Incorrect, general entry RWP not used for Locked High Radiation Area

B. Incorrect, requirements for High Radiation Area

C. **Correct, requirements for Locked High Radiation Area**

D. Incorrect, requirements for Very High Radiation Area

Question level: 1
Question source: New
Exam: SRO
K/A: 2.3.10
Importance: 3.3
Reference: HPP-3 High Radiation Areas

APPENDIX A
DEFINITIONS
(Page 3 of 6)

11. Locked High Radiation Area (LHRA) - an area, accessible to individuals, in which radiation levels from the radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 1000 mrem in 1 hour (1000 mrem/hr) at 30 cm (12 in) from the radiation source or 30 cm (12 in) from any surface that the radiation penetrates and the radiation levels are less than the radiation levels qualifying as a Very High Radiation Area. These areas shall be maintained locked to prevent unauthorized entry.

12. Periodic surveillance - Health Physics oversight, on an as-needed-frequency, of work in process in high radiation areas where the radiation levels are less than 1000 mrem/hr.

    A. The frequency of surveillance is based on the radiation levels present and the potential for changes in the radiological condition.

    B. Health Physics shall:

        1. Establish and communicate the dose rates in the work area to the workers. /R9

        2. Communicate the location and radiation levels of any hot spots in the work area to the workers.

        3. Ensure each worker has an electronic alarming dosimeter prior to allowing work to commence.

    C. The RWP shall specify either continuous or periodic coverage for all workers in the high radiation area.

13. Qualified Health Physics Individual - an ANSI 3.1 qualified Health Physics Technician. A Florida Power and Light RPT is a qualified Health Physics Individual. Contract Senior Health Physics Technicians are qualified Health Physics individuals if they meet the ANSI 3.1 qualifications.

14. Radiation Protection Manager (RPM) - The term RPM is used in this procedure to uniquely identify a radiological management position that is contained in Regulatory Guidance documents. The Regulatory Guidance management position of RPM and the Florida Power and Light Company management position of Health Physics Supervisor are equivalent.

7.0 INSTRUCTIONS: (continued)

7.6 (continued)

4. (continued)

C. These individuals do not enter locked high radiation areas.

D. These individuals are aware of the work area dose rates.

5. A worker shall immediately leave the area if their electronic dosimeter alarms and report to Health Physics or the RPT covering the work to have the situation assessed.

7.7 Entry Into Locked High Radiation Areas:

Listed below are the requirements for entry into locked high radiation areas. These requirements also apply to areas that meet the criteria of locked high radiation areas but that have access controlled by a flashing light or are guarded.

§2,6 1. A specific RWP containing the necessary instructions for entry into the area.

2. The RWP shall contain an ALARA dose rate holdpoint.

3. If dose rates are encountered that are in excess of the ALARA holdpoint dose rate, Then the entry shall be terminated and all entry personnel shall exit the area.

§2,6 4. Dose rates in the immediate work area and maximum stay times for individuals entering the area shall be specified, as appropriate, on a:

A. Locked or Very High Radiation Area Authorization form (HPP-3.1), or

B. Multibadge issue form.

§2,6 5. All entries into locked high radiation areas require continuous coverage by a qualified RPT with a dose rate instrument.

Question 122

Unit 2 is in Mode 1 when the 2A Diesel Generator was declared out of service. No other equipment is out of service.

Which of the following describes the operability of the ECCS system as a result of the 2A Diesel Generator out of service?

A. All ECCS equipment is considered operable.

B. The A train ECCS equipment is considered inoperable until surveillance's can be performed to prove operability. The B train ECCS is considered operable.

C. The A train ECCS equipment is considered inoperable until the Diesel is returned to service. The B train ECCS is considered operable.

D. The A train ECCS equipment is considered inoperable until the Diesel is returned to service. The B train ECCS is considered operable but surveillance's are required to be performed to confirm operability.

A. Correct

B. Incorrect, A train ECCS equipment not considered inoperable solely as a result of emergency power source inoperable.

C. Incorrect, A train ECCS equipment not considered inoperable solely as a result of emergency power source inoperable

D. Incorrect, A train ECCS equipment not considered inoperable solely as a result of emergency power source inoperable

Question Level: 2
Question Source: New
Exam: SRO
K/A: 2.1.12
Importance: 4.0
References AP 0010120 Conduct of Operations App. G, Technical Specifications 3.8.1.1.b.1

APPENDIX G
TECHNICAL SPECIFICATION GUIDANCE

9. Electrical Power

A. Station Blackout Cross Tie

1. While not specifically addressed in the Technical Specifications, the Station Blackout Cross tie is a component of the Risk Assessment Matrix. As such it is considered a risk significant component. Management expectation is that the same action as a single Diesel Generator, 72 hour time limit, be applied to any situation where the Station Blackout Cross tie is out-of-service.

B. Redundant Equipment Operability (Action 3.8.1.1.b)

1. When a Diesel Generator is declared inoperable, Then one of the required activities is to verify that all required systems, subsystems, trains, components, and devices that depend on the remaining OPERABLE Diesel Generator as a source of emergency power are also OPERABLE.

   a. This verification must be completed within 2 hours of entering the ACTION statement. If such verification can not be made, then the unit must be in HOT STBY within the next 6 hours.

   b. The construction of this action requirement does NOT provide for starting the 2 hour action completion time from any point other than the initial entry into the action statement.

2. If a LCO for a system, subsystem, train, component, or device does NOT explicitly require the associated Diesel Generator to be operable to satisfy that LCO, Then:

   a. PSL does NOT consider that equipment to be inoperable solely due to Diesel Generator inoperability, when powered from the preferred off-site power source.

   b. Therefore, when only a Diesel Generator is inoperable, it suffices to enter only the action 3.8.1.1.b.

9. (continued)

B. (continued)

3. If at some time subsequent to the completion of the requirements of action 3.8.1.1.b a system, subsystem, train, component, or device dependent on the opposite train Diesel Generator for emergency power becomes inoperable, Then two separate action statements are invoked:

a. The action for the particular opposite unit system, subsystem, train, component, or device inoperability.

b. The compensatory/remedial provisions of action 3.8.1.1.b that require the unit to be in HOT STBY within the next 6 hours.

C. Unit 1 Emergency Diesel Generators

1. An Engineering evaluation (PSL-ENG-SEES-99-016) was completed with justification that the EDG kW recorders are not to be considered as attendant instrumentation for the operability of the Unit 1 Emergency Diesel Generators. The evaluation concluded that the EDG is operable with the watt recorder out of service since there is other instrumentation adequate to assess the status of the EDG.

2. A successful completion of the surveillance assures operability for that month. Conservatively, we should have all of out instrumentation to prove this operability and safely surveil the diesel. Even though we do not have to declare the Unit 1 EDGs out of service when the kW recorders are not available, the surveillance run should not be done without them.

10. Relocated Technical Specifications (T.S.)

A. A Technical Requirements Manual is located in the Unit 1 and Unit 2 ANPS office.

B. Operations Department shall review each T.S. amendment to determine if the changes have deleted/relocated any T.S. to other documents, i.e., UFSAR or other Manual.

C. Operations Support shall add copies of the relocated T.S. to the Technical Requirements Manual to be accessible by Operations Personnel for reference.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and

b. Two separate and independent diesel generators, each with:

1. Two separate engine-mounted fuel tanks containing a minimum volume of 200 gallons of fuel each,

2. A separate fuel storage system containing a minimum volume of 40,000 gallons of fuel, and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With one offsite circuit of 3.8.1.1.a inoperable, except as provided in Action f. below, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. Restore the offsite circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

b. With one diesel generator of 3.8.1.1.b inoperable, demonstrate the OPERABILITY of the A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; and if the EDG became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventative maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE EDG by performing Surveillance Requirement 4.8.1.1.2a.4 within 8 hours, unless it can be confirmed that the cause of the inoperable EDG does not exist on the remaining EDG*; restore the diesel generator to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Additionally, verify within 2 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours that:

* If the absence of any common-cause failure cannot be confirmed, this test shall be completed regardless of when the inoperable EDG is restored to OPERABILITY.

ACTION: (Continued)

1. All required systems, subsystems, trains, components and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE, and

2. When in MODE 1, 2 or 3, the steam-driven auxiliary feed pump is OPERABLE.

c. With one offsite A.C. circuit and one diesel generator inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; and if the EDG became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventative maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE EDG by performing Surveillance Requirement 4.8.1.1.2a.4 within 8 hours, unless it can be confirmed that the cause of the inoperable EDG does not exist on the remaining EDG*. Restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore the other A.C. power source (offsite circuit or diesel generator) to OPERABLE status in accordance with the provisions of Section 3.8.1.1 ACTION Statement a or b, as appropriate, with the time requirement of that ACTION Statement based on the time of the initial loss of the remaining inoperable A.C. power source. Additionally, verify within 2 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours that:

   1. All required systems, subsystems, trains, components and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE, and

   2. When in Mode 1, 2, or 3, the steam-driven auxiliary feed pump is OPERABLE.

---

* If the absence of any common-cause failure cannot be confirmed, this test shall be completed regardless of when the inoperable EDG is restored to OPERABILITY.

Question 123

Unit 2 has entered a refueling outage. The Unit was in Mid loop when an unidentified leak occurs in the RCS and level continues to drop. A loss of SDC occurs.

Which of the following explains the procedure implementation strategy?

Implement:

A. SDC ONOP and 2-ONP-01.04 PC-4 'SDC In Operation-Reduced Inventory'. Continue with both procedures until all exit conditions met.

B. SDC ONOP and 2-ONP-01.04 PC-4 'SDC In Operation-Reduced Inventory'. If any Safety Functions not met in PC-4, exit SDC ONOP within 15 minutes and continue with PC-4.

C. 2-ONP-01.04 PC-4 'SDC In Operation-Reduced Inventory.' If any Safety Functions not met in PC-4, implement SDC ONOP within 15 minutes.

D. 2-ONP-01.04 PC-4 'SDC In Operation-Reduced Inventory.' If all Safety Functions met, exit PC-4 and implement SDC ONOP.

A. Incorrect, exit SDC ONOP within 15 minutes of PC-4 safety functions not met.

B. Correct, inventory control will not be met in PC-4

C. Incorrect, SDC ONOP should be exited for this condition due to not meeting safety functions.

D. Incorrect, backwards logic.

Question Level: 1
Question Source: New
Exam: SRO
K/A: 2.4.9
Importance: 3.9
References 2-0440030 SDC Off-Normal, 2-ONP-01.04 PC-4 'SDC In Operation-Reduced Inventory

7.0 OPERATOR ACTIONS: (continued)

7.2 Subsequent Operator Actions:

INSTRUCTIONS	CONTINGENCY ACTIONS

NOTE

If conditions continue to degrade or this procedure is NOT succeeding in stabilizing plant conditions, the Low Mode Off-Normal Procedure (LMONP) for the current plant condition should be implemented.

1. Perform safety function status check per Low Mode Off-Normal Procedure, Appendix A, for the current plant condition every 15 minutes until exit conditions are met.

2. Record the time SDC was lost and RCS temperature on Data Sheet 1.

CAUTION

- If LPSI pump is lost due to level dropping below 29 ft, 9.7 inches, do NOT attempt to restart the LPSI pump until the cause has been identified and corrected.
- If SDC is lost, it may be necessary to isolate the tygon level hose to prevent overpressurizing the hose.

INSTRUCTIONS	CONTINGENCY ACTIONS
3. Check Core Alterations NOT in progress.	3. Stope Core Alterations.

Question 124

A Large Break Loss of Coolant accident and Loss of Offsite power has occurred on Unit 1. The leak has not been isolated. The 1A LPSI pump has failed to start.

The following indications are observed:

- RCS pressure 280 psia and stable.
- CET temperature 408ºF and slowly going down.
- QSPDS Reactor Vessel level indicates sensors 4 through 8 covered.
- Excore Nuclear Instrumentation indicate 10^{-7}% and stable.
- All CEA's inserted

Which of the following explains the status of Reactor Core?

Reactor Core is:

A. voided as indicated by Excore NI power >10^{-8}%, and lack of 20ºF subcooled.

B. voided as indicated by lack of 20ºF subcooled and sensors 1 through 3 uncovered.

C. not voided as indicated by RCS subcooled conditions and sensors 4 through 8 covered.

D. not voided as indicated by stable Excore NI power of 10^{-7}% and RCS subcooled conditions.

A. Incorrect, Excore NI power <10^{-4}% is criteria for meeting reactivity control.

B. Incorrect, criteria indicated Core covered

C. Correct

D. Incorrect, Excore power not criteria for Core covered although if used with other indications could indicate Core uncovery.

Question Level: 2
Question Source: New
Exam: SRO
K/A: 015.A2.05
Importance: 3.5
References 1-EOP-03 LOCA, Core Melt Lesson plan 0702832-04

under accident conditions instrument errors are increased and this procedure may have an uncertainty > 20°F.

This procedure is illustrated in Figure 8.

{PRIVATE }Incore Neutron Detector Currents{tc \l 2 "2. Incore Neutron Detector Currents"}

Incore neutron detectors can provide the operator with an alternate means of detecting core uncovery. In a review of instrumentation performance during the TMI-2 event, incore neutron detectors were noted to have provided an early indication of core uncovery. This indication apparently arises from the fact that when operating at high temperatures incore neutron detectors produce large negative currents. Several theories currently exist which provide differing mechanisms for this behavior, but at this point none has been completely proven in the laboratory. **Look for "Failed" detector print-outs on the DDPS and track core water level based on failures at the 80%, then 60%, 40%, and 20% elevations.**

{PRIVATE }Ex-Core Detectors{tc \l 2 "3. Ex-Core Detectors"}

A review of existing ex-core detectors suggests that these instruments are not sufficient to provide an unambiguous level indication within the core. While the output of these instruments is not unambiguous, **large increases in ex-core detector signals may be used in conjunction with QSPDS level indications confirm a boil off condition within the core.**

{PRIVATE }Radiation Monitoring{tc \l 2 "4. Radiation Monitoring"}

The containment high range radiation monitors also provide an indication of probable core damage. **When the CHRRM reads ≥ 4.2 E4 R/hr, that represents greater than 100% of fuel gas gap activity in the containment.**

{PRIVATE }Vital Instrumentation{tc \l 2 "5. Vital Instrumentation"}

During events where harsh environment conditions exist, Reg. Guide 1.97 designated instruments should be used for diagnosis of events and confirmation of safety functions. Instrument readings should be verified when one or more confirmatory indications are available. (See LOR Lesson Text 0711834 for more information on accident instrumentation.)

APPENDIX A

SAFETY FUNCTION STATUS CHECK SHEET

(Page 7 of 12)

5. CORE HEAT REMOVAL

	SAFETY FUNCTION	ACCEPTANCE CRITERIA	CHECK √
A.	Representative CET Temperature (page 213, QSPDS)	Not superheated.	☐☐☐☐☐☐
B.	CET Temperature (highest per quadrant, page 213, QSPDS)	Less than 22°F superheated.	☐☐☐☐☐☐ **AND**
	Reactor Vessel Level (page 212, QSPDS)	Indicates core covered (sensors 7 and 8 covered).	☐☐☐☐☐☐

END OF SAFETY FUNCTION 5

Question 125

Unit 1 is operating at 100% power with the 1A Charging Pump out of service. The 1B BAM tank is out of service on low level. Electrical Maintenance has requested a clearance to repair the breaker that supplies the power supply for the gravity feed valves.

If the clearance is granted which of the following will apply?

The Tech Spec LCO for boration flow paths will:

A. be met by two of the three flow paths available.

B. be met by one of the three flow paths available.

C. not be met since two of the three flow paths are unavailable.

D. not be met since none of the flow paths are available.

A. **Correct, one flow path available from BAM tank via BAM pump to charging pump, one flow path from RWT via charging pump.**

B. Incorrect, requires two of the three flow paths available.

C. Incorrect, two of the three flow paths are available.

D. Incorrect, two of the three flow paths are available.

Question level: 1
Question source: New
Exam: SRO
K/A: 2.2.24
Importance: 3.8
Reference: Unit 1 Tech Spec 3.1.2.2

REACTIVITY CONTROL SYSTEMS

FLOW PATHS – OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.2 At least two of the following three boron injection flow paths shall be OPERABLE:

a. One flow path from the boric acid makeup tank(s) with the tank meeting Specification 3.1.2.8 part a) or b), via a boric acid makeup pump through a charging pump to the Reactor Coolant System.

b. One flow path from the boric acid makeup tank(s) with the tank meeting Specification 3.1.2.8 part a) or b), via a gravity feed valve through a charging pump to the Reactor Coolant System.

c. The flow path from the refueling water storage tank via a charging pump to the Reactor Coolant System.

OR

At least two of the following three boron injection flow paths shall be OPERABLE:

a. One flow path from each boric acid makeup tank with the combined tank contents meeting Specification 3.1.2.8 c), via both boric acid makeup pumps through a charging pump to the Reactor Coolant System.

b. One flow path from each boric acid makeup tank with the combined tank contents meeting Specification 3.1.2.8 c), via both gravity feed valves through a charging pump to the Reactor Coolant System.

c. The flow path from the refueling water storage tank, via a charging pump to the Reactor Coolant System.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one of the above required boron injection flow paths to the Reactor Coolant System OPERABLE, restore at least two boron injection flow paths to the Reactor Coolant System to OPERABLE status within 72 hours or make the reactor subcritical within the next 2 hours and borate to a SHUTDOWN MARGIN equivalent to the requirements of Specification 3.1.1.2 at 200°F; restore at least two flow paths to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.