KEY VERIFY RESCORE ⊏R⊐

	(T)	(F)			
1	⊏A⊐	⊏B⊐	■	⊏D⊐	C
2	⊏A⊐	■	⊏C⊐	⊏D⊐	B
3	⊏A⊐	⊏B⊐	⊏C⊐	■	D
4	⊏A⊐	⊏B⊐	⊏C⊐	■	D
5	■	⊏B⊐	⊏C⊐	⊏D⊐	A
6	⊏A⊐	■	⊏C⊐	⊏D⊐	B
7	⊏A⊐	⊏B⊐	■	⊏D⊐	C
8	⊏A⊐	⊏B⊐	⊏C⊐	■	D
9	⊏A⊐	⊏B⊐	■	⊏D⊐	C
10	⊏A⊐	⊏B⊐	⊏C⊐	■	D
11	⊏A⊐	■	⊏C⊐	⊏D⊐	B
12	⊏A⊐	⊏B⊐	⊏C⊐	■	D
13	■	⊏B⊐	⊏C⊐	⊏D⊐	A
14	⊏A⊐	■	⊏C⊐	⊏D⊐	B
15	⊏A⊐	⊏B⊐	■	⊏D⊐	C
16	⊏A⊐	⊏B⊐	⊏C⊐	■	D
17	⊏A⊐	■	⊏C⊐	⊏D⊐	B
18	⊏A⊐	■	⊏C⊐	⊏D⊐	B
19	⊏A⊐	⊏B⊐	■	⊏D⊐	C
20	⊏A⊐	■	⊏C⊐	⊏D⊐	B
21	⊏A⊐	■	⊏C⊐	⊏D⊐	B
22	⊏A⊐	■	⊏C⊐	⊏D⊐	B
23	⊏A⊐	■	⊏C⊐	⊏D⊐	B
24	■	⊏B⊐	⊏C⊐	⊏D⊐	A
25	⊏A⊐	⊏B⊐	■	⊏D⊐	C
26	⊏A⊐	■	⊏C⊐	⊏D⊐	B
27	⊏A⊐	■	⊏C⊐	⊏D⊐	B
28	⊏A⊐	⊏B⊐	⊏C⊐	■	D
29	⊏A⊐	⊏B⊐	■	⊏D⊐	C
30	⊏A⊐	■	⊏C⊐	⊏D⊐	B
31	⊏A⊐	⊏B⊐	■	⊏D⊐	C
32	■	⊏B⊐	⊏C⊐	⊏D⊐	A
33	⊏A⊐	■	⊏C⊐	⊏D⊐	B
34	⊏A⊐	⊏B⊐	■	⊏D⊐	C
35	⊏A⊐	⊏B⊐	⊏C⊐	■	D
36	⊏A⊐	⊏B⊐	■	⊏D⊐	C
37	⊏A⊐	⊏B⊐	■	⊏D⊐	C
38	■	⊏B⊐	⊏C⊐	⊏D⊐	A
39	⊏A⊐	⊏B⊐	■	⊏D⊐	C
40	⊏A⊐	⊏B⊐	■	⊏D⊐	C
41	⊏A⊐	⊏B⊐	■	⊏D⊐	C
42	⊏A⊐	⊏B⊐	⊏C⊐	■	D
43	■	⊏B⊐	⊏C⊐	⊏D⊐	A
44	⊏A⊐	⊏B⊐	■	⊏D⊐	C
45	■	⊏B⊐	⊏C⊐	⊏D⊐	A
46	⊏A⊐	■	⊏C⊐	⊏D⊐	B
47	⊏A⊐	⊏B⊐	■	⊏D⊐	C
48	⊏A⊐	⊏B⊐	⊏C⊐	■	D
49	■	⊏B⊐	⊏C⊐	⊏D⊐	A
50	■	⊏B⊐	⊏C⊐	⊏D⊐	A

	(T)	(F)			
51	⊏A⊐	⊏B⊐	■	⊏D⊐	C
52	⊏A⊐	⊏B⊐	⊏C⊐	■	D
53	⊏A⊐	⊏B⊐	■	⊏D⊐	C
54	■	⊏B⊐	⊏C⊐	⊏D⊐	A
55	■	⊏B⊐	⊏C⊐	⊏D⊐	A
56	⊏A⊐	⊏B⊐	⊏C⊐	■	D
57	■	⊏B⊐	⊏C⊐	⊏D⊐	A
58	■	⊏B⊐	⊏C⊐	⊏D⊐	A
59	⊏A⊐	■	⊏C⊐	⊏D⊐	B
60	⊏A⊐	■	⊏C⊐	⊏D⊐	B
61	■	⊏B⊐	⊏C⊐	⊏D⊐	A
62	⊏A⊐	■	⊏C⊐	⊏D⊐	B
63	⊏A⊐	⊏B⊐	■	⊏D⊐	C
64	⊏A⊐	■	⊏C⊐	⊏D⊐	B
65	⊏A⊐	⊏B⊐	⊏C⊐	■	D
66	⊏A⊐	■	⊏C⊐	⊏D⊐	B
67	⊏A⊐	⊏B⊐	■	⊏D⊐	C
68	■	⊏B⊐	⊏C⊐	⊏D⊐	A
69	⊏A⊐	⊏B⊐	⊏C⊐	■	D
70	⊏A⊐	⊏B⊐	⊏C⊐	■	D
71	■	⊏B⊐	⊏C⊐	⊏D⊐	A
72	⊏A⊐	⊏B⊐	■	⊏D⊐	C
73	■	⊏B⊐	⊏C⊐	⊏D⊐	A
74	⊏A⊐	⊏B⊐	⊏C⊐	■	D
75	■	⊏B⊐	⊏C⊐	⊏D⊐	A
76	⊏A⊐	■	⊏C⊐	⊏D⊐	B
77	■	⊏B⊐	⊏C⊐	⊏D⊐	A
78	⊏A⊐	■	⊏C⊐	⊏D⊐	B
79	⊏A⊐	⊏B⊐	■	⊏D⊐	C
80	⊏A⊐	⊏B⊐	■	⊏D⊐	C
81	⊏A⊐	⊏B⊐	■	⊏D⊐	C
82	⊏A⊐	■	⊏C⊐	⊏D⊐	B
83	■	⊏B⊐	⊏C⊐	⊏D⊐	A
84	⊏A⊐	■	⊏C⊐	⊏D⊐	B
85	⊏A⊐	⊏B⊐	■	⊏D⊐	C
86	■	⊏B⊐	⊏C⊐	⊏D⊐	A
87	⊏A⊐	⊏B⊐	■	⊏D⊐	C
88	■	⊏B⊐	⊏C⊐	⊏D⊐	A
89	⊏A⊐	■	⊏C⊐	⊏D⊐	B
90	■	⊏B⊐	⊏C⊐	⊏D⊐	A
91	⊏A⊐	⊏B⊐	⊏C⊐	■	D
92	⊏A⊐	⊏B⊐	⊏C⊐	■	D
93	⊏A⊐	⊏B⊐	⊏C⊐	■	D
94	⊏A⊐	■	⊏C⊐	⊏D⊐	B
95	⊏A⊐	■	⊏C⊐	⊏D⊐	B
96	⊏A⊐	■	⊏C⊐	⊏D⊐	B
97	■	⊏B⊐	⊏C⊐	⊏D⊐	A
98	■	⊏B⊐	⊏C⊐	⊏D⊐	A
99	⊏A⊐	⊏B⊐	⊏C⊐	■	D
100	⊏A⊐	⊏B⊐	■	⊏D⊐	C

RESCORE

KEY 100

SCORE

IMPORTANT

USE NO. 2 PENCIL ONLY

- EXAMPLE: ⊏A⊐ ⊏B⊐ ■ ⊏D⊐ ⊏E⊐
- MAKE ***DARK*** MARKS
- ERASE ***COMPLETELY*** TO CHANGE
- MAKE NO STRAY MARKS

ID NUMBER

⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐
⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐
⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐
⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐
⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐
⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐
⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐
⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐
⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐
⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐

KEY VERIFY RESCORE ⊏R⊐

	(T)	(F)			
1	⊏A⊐	⊏B⊐	■	⊏D⊐	C
2	⊏A⊐	■	⊏C⊐	⊏D⊐	B
3	⊏A⊐	⊏B⊐	⊏C⊐	■	D
4	⊏A⊐	⊏B⊐	⊏C⊐	■	D
5	■	⊏B⊐	⊏C⊐	⊏D⊐	A
6	⊏A⊐	■	⊏C⊐	⊏D⊐	B
7	⊏A⊐	⊏B⊐	■	⊏D⊐	C
8	⊏A⊐	⊏B⊐	⊏C⊐	■	D
9	⊏A⊐	⊏B⊐	■	⊏D⊐	C
10	⊏A⊐	⊏B⊐	⊏C⊐	■	D
11	⊏A⊐	■	⊏C⊐	⊏D⊐	B
12	⊏A⊐	⊏B⊐	⊏C⊐	■	D
13	■	⊏B⊐	⊏C⊐	⊏D⊐	A
14	⊏A⊐	■	⊏C⊐	⊏D⊐	B
15	⊏A⊐	⊏B⊐	■	⊏D⊐	C
16	⊏A⊐	⊏B⊐	⊏C⊐	■	D
17	⊏A⊐	■	⊏C⊐	⊏D⊐	B
18	⊏A⊐	■	⊏C⊐	⊏D⊐	B
19	⊏A⊐	⊏B⊐	■	⊏D⊐	C
20	⊏A⊐	■	⊏C⊐	⊏D⊐	B
21	⊏A⊐	■	⊏C⊐	⊏D⊐	B
22	⊏A⊐	■	⊏C⊐	⊏D⊐	B
23	⊏A⊐	■	⊏C⊐	⊏D⊐	B
24	■	⊏B⊐	⊏C⊐	⊏D⊐	A
25	⊏A⊐	⊏B⊐	■	⊏D⊐	C
26	⊏A⊐	■	⊏C⊐	⊏D⊐	B
27	⊏A⊐	■	⊏C⊐	⊏D⊐	B
28	⊏A⊐	⊏B⊐	⊏C⊐	■	D
29	⊏A⊐	⊏B⊐	■	⊏D⊐	C
30	⊏A⊐	■	⊏C⊐	⊏D⊐	B
31	⊏A⊐	⊏B⊐	■	⊏D⊐	C
32	■	⊏B⊐	⊏C⊐	⊏D⊐	A
33	⊏A⊐	■	⊏C⊐	⊏D⊐	B
34	⊏A⊐	⊏B⊐	■	⊏D⊐	C
35	⊏A⊐	⊏B⊐	⊏C⊐	■	D
36	⊏A⊐	⊏B⊐	■	⊏D⊐	C
37	⊏A⊐	⊏B⊐	■	⊏D⊐	C
38	■	⊏B⊐	⊏C⊐	⊏D⊐	A
39	⊏A⊐	⊏B⊐	■	⊏D⊐	C
40	⊏A⊐	⊏B⊐	■	⊏D⊐	C
41	⊏A⊐	⊏B⊐	■	⊏D⊐	C
42	⊏A⊐	⊏B⊐	⊏C⊐	■	D
43	■	⊏B⊐	⊏C⊐	⊏D⊐	A
44	⊏A⊐	⊏B⊐	■	⊏D⊐	C
45	■	⊏B⊐	⊏C⊐	⊏D⊐	A
46	⊏A⊐	■	⊏C⊐	⊏D⊐	B
47	⊏A⊐	⊏B⊐	■	⊏D⊐	C
48	⊏A⊐	⊏B⊐	⊏C⊐	■	D
49	■	⊏B⊐	⊏C⊐	⊏D⊐	A
50	■	⊏B⊐	⊏C⊐	⊏D⊐	A

	(T)	(F)			
51	⊏A⊐	⊏B⊐	■	⊏D⊐	C
52	⊏A⊐	⊏B⊐	⊏C⊐	■	D
53	⊏A⊐	⊏B⊐	■	⊏D⊐	C
54	■	⊏B⊐	⊏C⊐	⊏D⊐	A
55	■	⊏B⊐	⊏C⊐	⊏D⊐	A
56	⊏A⊐	⊏B⊐	⊏C⊐	■	D
57	■	⊏B⊐	⊏C⊐	⊏D⊐	A
58	■	⊏B⊐	⊏C⊐	⊏D⊐	A
59	⊏A⊐	■	⊏C⊐	⊏D⊐	B
60	⊏A⊐	■	⊏C⊐	⊏D⊐	B
61	■	⊏B⊐	⊏C⊐	⊏D⊐	A
62	⊏A⊐	■	⊏C⊐	⊏D⊐	B
63	⊏A⊐	⊏B⊐	■	⊏D⊐	C
64	⊏A⊐	■	⊏C⊐	⊏D⊐	B
65	⊏A⊐	⊏B⊐	⊏C⊐	■	D
66	⊏A⊐	■	⊏C⊐	⊏D⊐	B
67	⊏A⊐	⊏B⊐	■	⊏D⊐	C
68	■	⊏B⊐	⊏C⊐	⊏D⊐	A
69	⊏A⊐	⊏B⊐	⊏C⊐	■	D
70	⊏A⊐	⊏B⊐	⊏C⊐	■	D
71	■	⊏B⊐	⊏C⊐	⊏D⊐	A
72	⊏A⊐	⊏B⊐	■	⊏D⊐	C
73	■	⊏B⊐	⊏C⊐	⊏D⊐	A
74	⊏A⊐	⊏B⊐	⊏C⊐	■	D
75	■	⊏B⊐	⊏C⊐	⊏D⊐	A
76	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
77	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
78	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
79	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
80	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
81	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
82	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
83	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
84	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
85	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
86	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
87	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
88	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
89	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
90	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
91	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
92	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
93	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
94	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
95	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
96	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
97	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
98	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
99	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	
100	⊏A⊐	⊏B⊐	⊏C⊐	⊏D⊐	

IMPORTANT

USE NO. 2 PENCIL ONLY

- EXAMPLE: ⊏A⊐ ⊏B⊐ ■ ⊏D⊐ ⊏E⊐
- MAKE ***DARK*** MARKS
- ERASE ***COMPLETELY*** TO CHANGE
- MAKE NO STRAY MARKS

ID NUMBER

⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐	⊏0⊐
⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐	⊏1⊐
⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐	⊏2⊐
⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐	⊏3⊐
⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐	⊏4⊐
⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐	⊏5⊐
⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐	⊏6⊐
⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐	⊏7⊐
⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐	⊏8⊐
⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐	⊏9⊐

RESCORE

KEY 75

SCORE

Both SRO and RO exams were clarified with the following two pieces of information. All students were still in the room at the time of clarification.

Question #4 clarified by providing;

- OTSG "B" pressure 850 psig and steady.
- OTSG "B" level 25 inches and steady.

Question # 48 modified choice "B" to 85 inches vice 85 psig.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	4	
	K/A #	G4 2.4.17	
	Importance Rating	3.9	

Emergency Procedures / Plan: Knowledge of EOP terms and definitions.

Proposed Question: RO Question # 1

The plant has just experienced a major transient and you, as the Control Room Operator, have been handed an Abnormal Operating Procedure (AOP).

You reach an IF AT ANY TIME/THEN (IAAT) step in the AOP.

Which ONE (1) of the following describes the correct treatment of this step?

A. This step remains applicable throughout the remainder of AOPs. If you GO TO another AOP this step still applies.

B. This step remains applicable throughout the remainder of the AOP that it is contained within. However, once the step is used, it is no longer applicable.

C. This step remains applicable throughout the remainder of the AOP that it is contained within. If you GO TO another AOP, the step is no longer applicable.

D. This step remains applicable throughout the remainder of the AOP that it is contained within. If you REFER TO another procedure, the step is no longer applicable.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because this would be correct if the branching statement said "Perform" another procedure, rather than "Go To." According to OS-24 (p10; Rev 18) the term "Perform" means to temporarily stop current procedure use, and complete the referenced enclosure or procedure; then return to the controlling procedure step when the referenced action is completed and continue with the next step. While actions are being PERFORMED in another procedure, the Carryover IAAT Steps of the controlling procedure continue to apply.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that there are limits placed on the number of times that the IAAT/Then Step may be performed. This

would be true of an If/Then statement which applies that the time it is being implemented.

C. **Correct.** According to OS-24 (p9; Rev 18) IAAT, Then logic statements are to be applied as follows: if the condition is true, then take the action specified and proceed to the next step. If the condition is not true, then the step remains OPEN, and becomes a Carryover Step. If the condition becomes true later, while performing the same procedure, return to the step and take the action. After completion of the action, return to the step previously in progress unless the Carryover Step directs performance of another step or procedure. According to OS-24 (p10; Rev 18) in EOPs or AOPS, continuous action steps or Carryover Steps (IAATs) are performed after the step is reached until the step no longer identified in the Carryover Page or the procedure is complete. Therefore, once the procedure is complete the IAAT/Then action no longer applies. According to OS-24 (p10; Rev 18) the term "Go To" means to leave the current step or procedure and transfer to the referenced step or procedure. The procedure that was exited is considered complete.

D. **Incorrect.** This is plausible because the operator may incorrectly believe that the Term "Refer" implies that Carryover IAAT Steps are no longer applicable. According to OS-24 (p10; Rev 18) the term "Refer" means to identify another procedure which may have applicable actions or necessary information for actions in the controlling procedure. The referenced procedure identifies if action is required and any action taken in parallel. The term "Refer" has no bearing on the performance of the controlling procedure.

Technical Reference(s): OS-24 (p9-10; Rev 18) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-OS-24-C002 (PCO-1) (As available)

Question Source: Bank # TMI: IR-COO-PTO-044-Q01

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of EOP terms and definitions; specifically the meaning of the Term "If At Any Time, Then." It should be noted that the KA specifically states EOP, and the question refers to AOP. This should be acceptable because OS-24 uses the same terms and definitions for AOPs as it does for EOPS. An AOP was used to make it at the RO level, an SRO would maintain an EOP but could hand off an AOP if it is not the controlling procedure.

The question is at the Memory cognitive level because the operator must recall the definitions and the meaning of the term "If At Any Time, Then," to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	061 K1.04	
	Importance Rating	3.9	

Knowledge of the physical connections and/or cause-effect relationships between the AFW and the following systems: RCS

Proposed Question: RO Question # 2

Which ONE (1) of the following correctly completes the statement below regarding the design of the Emergency Feedwater (EFW) System?

The EFW nozzle ring directs flow ____(1)____ in each OTSG in order to ____(2)____.

A. (1) directly onto the tube bundle
(2) prevent thermal shock of the Upper Tube Sheet

B. (1) directly onto the tube bundle
(2) promote the establishment of natural circulation in the RCS

C. (1) between the OTSG shell and cylindrical baffle
(2) prevent thermal shock of the Upper Tube Sheet

D. (1) between the OTSG shell and cylindrical baffle
(2) promote the establishment of natural circulation in the RCS

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to Lesson Plan TQ-TM-104-424-C001 (p11; Rev 8), the design of the EFW System in part prevents thermal shock of the lower tube sheet. The operator may misunderstand the concept.

B. **Correct.** 1st part correct, 2nd part correct. According to Lesson Plan TQ-TM-104-424-C001 (p11; Rev 8) the EFW nozzle ring is located on the outside of upper half of each OTSG. There are seven nozzle connections on the ring header, which supply flow to the upper tube sheet through spray nozzles. This is done for two reasons: (1) Elevates the thermal center of the OTSGs to promote the establishment of Natural Circulation and (2) Prevents thermal shock of the lower tube sheet. According to Lesson Plan TQ-

TM-104-411-C001 (p44-45; Rev 5), Emergency Feedwater enters the OTSG (near the upper tube sheet) through seven emergency feedwater nozzles. These nozzles direct the emergency feedwater flow directly at the tube bundle. This is done to remove heat from the tubes at a higher elevation to increase the thermal center of the OTSG for natural circulation.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because according to Lesson Plan TQ-TM-104-411-C001 (p42; Rev 5) In the secondary side of the OTSG, feedwater enters through nozzles (32) between the OTSG shell and cylindrical baffle (about midway up generator). The operator may confuse the design of EFW System entry with that of the MFW System.

Technical Reference(s): TQ-TM-104-424-C001 (p11; Rev 8)
TQ-TM-104-411-C001 (p44-45; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 424-GLO-2
411-GLO-2 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:
The KA is matched because the operator must demonstrate knowledge demonstrate knowledge of the physical connections of AFW (flow directly onto tubes vs. in between OTSG Sheet and Baffle), and cause and effect relationships between the AFW and the RCS (the design is chosen based on its effect in the RCS (i.e. promote the establishment of NC) during an emergency).

The question is at the Memory cognitive level because the operator must recall facts concerning the design basis of the EFW System to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	035 A4.05	
	Importance Rating	3.8	

Ability to manually operate and/or monitor in the control room: Level Control to enhance natural circulation

Proposed Question: RO Question # 3

Plant conditions:

- The plant has tripped from 100% power.
- A loss of Off-Site Power has occurred.
- The crew has entered OP-TM-EOP-001, "Reactor Trip."
- Both Motor Driven EFW Pumps (EF-P-2A and EF-P-2B) are RUNNING.
- The Turbine Driven EFW Pump (EF-P-1) has tripped on overspeed.
- OTSG A Level is 10% in the Operating Range.
- OTSG B level is 8% in the Operating Range.
- Incore temperature is slowly rising.
- SCM is 37°F.
- The crew has just initiated Rule 4, "Feedwater Control."

Which ONE (1) of the following identifies how the operator should adjust EFW flow to the OTSGs?

A. Limit EFW flow to each OTSG to < 215 gpm.

B. Limit total EFW flow to < 435 gpm.

C. Limit total EFW flow to < 515 gpm.

D. Feed both OTSGs at maximum EFW flow.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because according to OP-TM-EOP-010 (p8; Rev 11) Step 2, this would be the flow limitation if SCM was too low, or if the OTSG level was too high.

B. **Incorrect.** This is plausible because according to OP-TM-EOP-010 (p8; Rev 11) Step 3, this would be the flow limitation if an RCP were on and OTSG level was too low.

C. **Incorrect.** This is plausible because according to OP-TM-EOP-010 (p8; Rev 11) Step 1, this would be the flow limitation if there was insufficient EFW Pump capability.

D. **Correct.** According to OP-TM-EOP-001 (p5; Rev 10) the operator will complete the IMAs and then implement the Vital Systems Status Verification (VSSV) in EOP-001. At Step 3.6 the operator will be directed to verify OTSG levels > setpoint (50%). Since levels are low, the operator will be directed to Initiate Rule 4. According to OP-TM-EOP-0101 (p20; Rev 3) one of the purposes of Rule 4 is to prepare the OTSGs for Natural Circulation during a loss of Forced flow in the RCS. According to OP-TM-EOP-010 (p8; Rev 11) Steps 1-3, contingencies are provided for insufficient EFW flow capability, loss of SCM, high OTSG level, and low OTSG level, none of which exist under the stated condition. According to OP-TM-EOP-010 (p9; Rev 11) Step 4, the operator is directed to check for the need to control feedwater flow to enhance NC. Since there are no RCPs running, and neither OTSG is > 50%, the operator must implement the RNO. The RNO directs the operator to feed the OTSGs at maximum permitted EFW flow if incore temperatures are rising. According to OP-TM-EOP-0101 (p21; Rev 3) if an RCP is NOT available, and incore temperatures are rising, the EFW should NOT be throttled. Once NC is established and incore temperature stabilizes. EFW flow may be throttled if level setpoint has not yet been reached.

Technical Reference(s): OP-TM-EOP-001 (p5; Rev 10)
OP-TM-EOP-0101 (p20-21; Rev 3)
OP-TM-EOP-010 (p8-9; Rev 11) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP010-PCO-3 and 5 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the ability to manually operate and/or monitor the OTSG levels in the control room, and adjust EFW to enhance natural circulation(i.e. identify what limits, if any, to feed at).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate the plant conditions and determine that it is most important to feed the OTSGs to enhance the establishment of NC in the RCS, and THEN choose a feeding rate by applying the requirements of Rule 4.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	E05	EK2.2
	Importance Rating	4.2	

Knowledge of the interrelations between the (Excessive Heat Transfer) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.

Proposed Question: RO Question # 4

Plant conditions:

- Major steam leak in Turbine Building.
- Reactor Trip on low pressure.

Observed parameters during Vital Safety System Verification:

- OTSG "A" pressure 500 psig and lowering.
- OTSG "A" level 6 inches and lowering.
- OTSG "B" PRESSURE 850 PSIG and STEADY | Per telecom 9/7/11 JSK
- OTSG "B" LEVEL 25" & STEADY

Which of the following describes the AUTOMATIC system response with respect to EF-V-30 Emergency Feedwater Flow Control valves, FW-V-5A and FW-V-92A Main Feedwater block valves, to the above condition?

A. EF-V-30A, B, C and D open.
FW-V-5A and 92A close.

B. EF-V-30A, B, C and D open.
FW-V-5A and 92A remain open.

C. EF-V-30A and D open.
FW-V-5A and 92A remain open.

D. EF-V-30A and D open.
FW-V-5A and 92A close.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because EF-V-30 valves get the signal to open on the affected generator only, Block and regulating valves get a signal to close at less than 600 psig. EF-V-30B and C would not open in this case because only the affected

generator gets a level control signal from HSPS low level, all three other HSPS EFW signals are applied to both generators.

B. **Incorrect.** This is plausible for misunderstanding of Main feedwater response, EFW response incorrect. This EFW response could be correct for steam leak in the Reactor Building (4 psig).

C. **Incorrect.** This is plausible for knowing the response of the EFW system but not the MFW system. HSPS will send a signal to close FW-V-5A and 92A, as well as FW-V-16A and 17A on low pressure in the OTSG < 600psig.
HSPS will also send a signal to open EF-V-30A and D on low level < 10 inches.

D. **Incorrect.** This is plausible because of the EFW response correct MFW response incorrect, could be chosen if power supply loss missed.

Technical Reference(s): MAP J-1-7 rev 9
MAP J-2-3 rev 17 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP-004-PCO-2 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10
55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:
The KA is matched because the operator must demonstrate Knowledge of the interrelations between the Excessive Heat Transfer and the operation of the facility's heat removal systems, specifically Secondary Heat Transfer (i.e. Steam/Feedwater) excessive heat transfer results in isolation of main feed water and initiation of emergency feedwater through low pressure and

low level respectively..

The question is at the Comprehensive/Analysis cognitive level because the operator must evaluate plant conditions and recognize the conditions that exist (XHT), and then determine actions that should have occurred the fact that the steam leak is outside containment must be factored into which EFW valve would be expected to respond.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	059 K3.03	
	Importance Rating	3.5	

Knowledge of the effect that a loss or malfunction of the MFW will have on the following: S/GS

Proposed Question: RO Question # 5

Plant conditions:

- Reactor is operating at 100% power, with ICS in manual.
- Troubleshooting activities in progress associated with recent ICS control system instability.
- ICS is in TRACKING mode.
- The following ICS control stations are in HAND control mode:
  - Steam Generator/Reactor Master.
  - Main Turbine.
  - Loop A and Loop B FW Demand.
  - Delta T-C.
  - FW-P-1A and FW-P-1B.
  - FW-V-16A and FW-V-16B.
  - FW-V-17A and FW-V-17B.
  - Reactor Master.
  - Diamond Control Panel.

Event:

- Automatic reactor trip due to Main Turbine trip.
- Operators do NOT manipulate any ICS controls prior to initiating the EOP for reactor trip.

Which ONE (1) of the following describes how Main Feedwater flows would be reduced, AND identifies the procedure that would mitigate the consequences of this event if the automatic actions fail?

A. FW-V-16A/B and FW-V-17A/B will automatically close on respective OTSG high levels; OP-TM-EOP-010 Rule 3, Excessive Heat Transfer.

B. FW-V-16A/B and FW-V-17A/B will automatically close on respective OTSG high levels; OP-TM-EOP-010 Guide 11, Cooldown Rate (CDR) Limits.

C. Loop A and Loop B BTU Limit circuits will automatically reduce FW flow to both OTSGs to achieve low level limits;
OP-TM-EOP-010 Rule 3, Excessive Heat Transfer.

D. Loop A and Loop B BTU Limit circuits will automatically reduce FW flow to both OTSGs to achieve low level limits;
OP-TM-EOP-010 Guide 11, Cooldown Rate (CDR) Limits.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-401-C001 (p8-9; Rev 4) Both the startup flow control and block valves and the Main FW Flow Control and Block Valves will automatically close from an HSPS signal for MFW Isolation on Hi Hi SG level (setpoint 97.5% Op. Range OTSG level) or Lo-Lo pressure (setpoint 600 psig OTSG Press). Therefore, FW-V-16A/B and FW-V-17A/B will close due to High OTSG Level FW Isolation, and this signal seals in to prevent valves from automatically re-opening at Low Level Limits. When OTSG levels reduce to less than 10 inches HSPS will actuate EFW to maintain (minimum OTSG levels at 25 inches) the steam generators as a heat sink. According to OP-TM-EOP-001 (p5; Rev 10) the operator will be directed to GO TO EOP-003 if the symptoms are met. According to OS-24 (p3; Rev 18) XHT is undesired heat removal by one or both OTSGs, which will be occurring under the stated conditions if the automatic actions failed to occur as designed. According to OP-TM-EOP-003 (p1; Rev 7) the performance of Rule 3 is an Immediate Action. Consequently, the operator would Reference OP-TM-EOP-010 Rule 3, Excessive Heat Transfer, for guidance to trip both FW Pumps if either OTSG level is not less than 97.5%.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because Guide 11 addresses the excessive cooldown rate that would be experienced under these conditions.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because there are some conditions that will automatically position the FW control valves even though the ICS is in HAND; and the operator may incorrectly believe that the BTU Limit circuit is one of them. The BTU Limit circuits would reduce FW flows if FW valves, pumps were in automatic.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): TQ-TM-104-401-C001 (p8-9; Rev 4)
OP-TM-EOP-001 (p5; Rev 10)
OS-24 (p3; Rev 18)
OP-TM-EOP-003 (p1; Rev 7)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 401-GLO-2 and 10 (As available)

Question Source: Bank # TMI: IR-401-GLO-5-Q05

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge (i.e. what will limit MFW flow to the OTSGs) of the effect that several plant/MFW controllers (i.e. ICS in HAND) will have on the OTSGs (i.e. high level).

The question is at the Comprehension/Analysis cognitive level because the operator must determine the effect on the plant of a plant trip with several controllers in HAND to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	059	A1.07
	Importance Rating	2.5	

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MFW controls including: Feed Pump speed, including normal control speed for ICS

Proposed Question: RO Question # 6

Which ONE (1) of the following describes how Feedwater Pump Turbine speed is controlled?

____(1)_____ controls speed during start-up to ____(2)_____; AND

_____(3)____ is then used under ICS control.

A. (1) The Air Motor
(2) approximately 2600 RPM
(3) the Motor Speed Changer

B. (1) The Motor Speed Changer
(2) approximately 2600 RPM
(3) the Air Motor

C. (1) The Motor Speed Changer
(2) the high speed stop
(3) the Air Motor

D. (1) The Air Motor
(2) the high speed stop
(3) the Motor Speed Changer

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because there are two different speed control mechanisms, at two different ranges of speed; and the operator may reverse the mechanisms with the associated ranges of speed. Note that according to TQ-TM-104-401-C001 (p57-58; Rev 4) it is possible to control the FPT speed across the entire speed range with either

the MSC or the Air Motor.

B. **Correct.** According to TQ-TM-104-401-C001 (p57-58; Rev 4), during normal system operation (remote operation of the MSC) the motor speed changer will control turbine speed between 0 and 2600 rpm. When the MSC gets to approximately 2600 rpm, turbine speed is automatically transferred to control by the air motor. Once this transfer has taken place the MSC is run up to its HSS position. During normal system operation the air motor is operated by a pneumatic signal from the plant Integrated Control System (ICS) that positions the air motor for proper turbine speed. The normal control range of the air motor is 2600 to 5500 rpm. This is reflected in the Operating Procedures. According to OP-TM-401-103 (p3; Rev 7) Step 4.2.9, when the 1A FPT is started the operator raise Turbine Speed demand and then observes the MSC handwheel responds to the signal to raise speed. According to OP-TM-401-103 (p5; Rev 7) Step 4.2.13.6, When at any time no further speed change is observed (2500-3000) then position 1A FPT Governor Control Switch to Fast Raise until at HSS. A note is then provided to the operator indicating that the FPT speed is now controlled by the ICS FP A Turbine Speed Demand control station in HAND control (Air Loader).

C. **Incorrect.** This is plausible because the operator may believe that the motor speed changer controls all the way up to the high speed stop (as it would if we operated with the full range switch on). During startup the full speed control switch is operated in "slow raise" until the speed stops increasing approximately 2600 RPM, then either slow or fast speed raise is used until the high speed stop light comes on. The air speed motor is holding speed down at 2600 RPM at this point. When the Motor speed changer is all the way out of the way (HSS) the air motor is then used from the ICS controller.

D. **Incorrect.** This is plausible because of the conditions mentioned in "C" with the function of the motors reversed as they were twice in validation of the original question.

Technical Reference(s): TQ-TM-104-401-C001 (p57-58; Rev 4)
OP-TM-401-103 (p3 and 5; Rev 7) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 401-GLO-6, 10 (As available)

Question Source: Bank # WTSI 60200
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 2005 Oconee

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 4

55.43

Secondary coolant and auxiliary systems that affect the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to predict and/or monitor changes in parameters (i.e. when speed control mechanisms change) associated with operating the MFW controls including Feed Pump speed, including normal control speed for ICS (i.e. ranges of speed control associated with mechanisms).

The question is at the Memory cognitive level because the operator must recall facts regarding the mechanisms for speed control, and their associated ranges.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	1	
	K/A #	G1 2.1.43	
	Importance Rating	4.1	

Conduct of Operations: Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc.

Proposed Question: RO Question # 7

Plant conditions:

- The plant is at 100% power entering the End of Cycle Tave Reduction and Coast Down IAW 1102-4, Power Operation.
- Tave is 579°F and steady.
- Control Rod Index is 291%.
- RCS Boron concentration is 3 ppmB.
- The specified minimum REMA temperature is 572.5°F.
- The STA has just raised the Feedwater Flow Correction Factor from 0.92 to 1.000 IAW 1102-4.

Which ONE (1) of the following identifies the affect of the change in the Feedwater Flow Correction Factor?

A. Diamond is required to be in Manual.

B. Heat Balance Power will indicate low.

C. Heat Balance Power will indicate high.

D. NI indication will read higher than actual power.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the change in the Correction factor does NOT affect the Heat balance calculation, and that the coast down conditions requires the Diamond to be in Manual. However, the prerequisite for EOL Coastdown is to VERIFY ICS Reactor Demand and Diamond Stations are in AUTO.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that the change in the Correction factor causes the Heat Balance calculation to read low.

C. **Correct.** The feedwater flow correction factors are computer compensations made in the plant process computer to allow for feedwater flow venturi "fouling". These correction factors are to allow the calculated heat balance to more closely resemble actual power. The factors are only allowed to be applied during 100% power operations. When they are removed for power reduction, the heat balance indicates more conservative (higher) than it really is therefore as stated above the actual power will have to be lowered to match the more conservative number indicated as power. According to 1102-4 (p24; Rev 119) "Resetting the Feedwater Flow Correction Factor will cause the calculated Heat Balance Power to indicate HIGH. A Reactor Power reduction will be required to maintain Calculated Thermal power ≤ 2568 MWT."

D. **Incorrect.** This is plausible because the operator may incorrectly believe that the change in the Correction Factor does NOT affect the Heat Balance calculation, but that it does affect the NI readings. In actuality, according to 1102-4 (p25; Rev 119) NI indication will read lower than actual reactor power when Tave is lowered; however Tave is steady in the stem.

Technical Reference(s): 1102-4 (p24-25; Rev 120) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-104-NOP-DBIG PCO-4 (As available)

Question Source: Bank # TMI: IR-GOP-004-PCO-5-Q1

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 6

55.43

Design, components, and function of reactivity control mechanisms and instrumentation.

Comments:

The KA is matched because the operator must demonstrate the Ability to use procedures to determine the effects on reactivity of plant changes, such as RCS temperature, secondary plant, fuel depletion, etc. (i.e. Coast down procedures at EOL, where Feedwater Venturi Correction Factor is changed).

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of if, and if so, how lowering the Feedwater Correction factor affects the Heat Balance.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	E10 EK1.3	
	Importance Rating	4.0	

Knowledge of the operational implications of the following concepts as they apply to the (Post-Trip Stabilization) Annunciators and conditions indicating signals, and remedial actions associated with the (Post -Trip Stabilization).

Proposed Question: RO Question # 8

Plant Conditions:

- The plant has tripped from 100% power.
- OTSG 1B has a tube rupture requiring HPI.
- Four (4) RCP's are running.
- RCS pressure is 1400 psig and lowering.
- OTSG pressure is being controlled by the TBV's.
- OTSG 1B level is 80% on the Operating Range and rising.

The CRS has evaluated 10CFR50.54x and ordered the cooldown rate to be raised to 200°F.

Which ONE (1) of the following identifies the reason(s) for this action?

A. To prevent flooding the aspirating ports of OTSG 1B.

B. To reduce the tube to shell differential temperature on OTSG 1B.

C. To reduce the amount of radioactivity carried over to the Main Steam Lines.

D. To permit isolation of OTSG 1B when level reaches 85% on the Operate Range.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** According to OP-TM-EOP-0051 (p14; Rev 2) if an OTSG cannot be maintained < 85% in the Operating Range carryover or MS line flooding may occur. This is plausible because this is one of the purposes of the OTSG Isolation criteria, but that is not what the question is asking. The higher cooldown rate is to prevent exceeding the OTSG isolation criteria in a plant condition where the OTSG cannot be isolated (i.e. RCS pressure > 1000 psig).

B. **Incorrect.** According to OP-TM-EOP-0101 (p56; Rev 3) OTSG Tube stress is controlled by maintaining Tube to Shell ΔT between -70°F and 50°F under the present plant conditions. A rapid cooldown of a magnitude greater than that allowed by TS will cause the Tube to Shell ΔT to be larger, not smaller. This is plausible because the operator may misunderstand the concept of Tube to Shell ΔT.

C. **Incorrect.** According to OP-TM-EOP-0051 (p14; Rev 2) if an OTSG cannot be maintained < 85% in the Operating Range carryover or MS line flooding may occur. This is plausible because this is one of the purposes of the OTSG Isolation criteria, but that is not what the question is asking. The higher cooldown rate is to prevent exceeding the OTSG isolation criteria in a plant condition where the OTSG cannot be isolated (i.e. RCS pressure > 1000 psig).

D. **Correct.** According to OP-TM-EOP-001 (p5; Rev 10) after the immediate actions are complete, the operator will transition to EOP-005 at Step 3.1. According to OP-TM-EOP-005 (p15; Rev 7), a NOTE prior to Step 3.31 is provided to direct the operator to consider entry into 10CFR50.54(x) if the cooldown rate must exceed the TS Limits in order to permit isolation of an OTSG. According to Technical Specification 3.1.2 (p3-3 and 3-5a; Amendment 234) the RCS/Pzr Cooldown rates at these temperatures are limited to 100°F/hour. According to OP-TM-EOP-0051 (p13; Rev 2) in Tube Leakage events where OTSG isolation is NOT challenged (i.e. OTSG level > 85%), RCS temperature is held constant until SCM is reduced and then a more orderly cooldown is initiated. However, in a situation where OTSG Isolation is or is predicted to be challenged (as in the stated conditions), then a rapid cooldown is initiated (in order to permit OTSG isolation). According to OP-TM-EOP-0051 (p14; Rev 2) an OTSG will NOT be isolated until RCs pressure is less than 1000 psig to prevent the possibility of lifting an MSSV. A rapid cooldown and depressurization should be continued until this condition is satisfied.

Technical Reference(s): OP-TM-EOP-001 (p5; Rev 10)
OP-TM-EOP-005 (p15; Rev 7)
TS 3.1.2 (p3-3 and 3-5a; Amendment 234)
OP-TM-EOP-0051 (p13; Rev 2)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP005-PCO-3 (As available)

Question Source: Bank # TMI: QR-411-GLO-12-Q03

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

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Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the operational implications (i.e. why the need to cooldown > TS limit) of annunciators, conditions, indicating signals, and remedial actions associated with the Post -Trip Stabilization.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of why a specific action is taken under specific plant conditions within the EOPS.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	038 2.1.28	
	Importance Rating	4.1	

Evolution Steam Generator Tube Rupture - Conduct of Operations: Knowledge of the purpose and function of major system components and controls.

Proposed Question: RO Question # 9

Plant conditions:

- OP-TM-EOP-005, OTSG Tube Leakage, has been entered due to a Tube Rupture in the "B" OTSG.
- The reactor has been tripped.
- "B" OTSG level is 25% in the Operating range and steady.
- Subcooling Margin (SCM) has been minimized IAW Guide 8, RCS Pressure Control.
- Reactor Coolant Pumps RC-P-1C and RC-P-1D have been shutdown.

Which ONE (1) of the following identifies the reason for shutting down RC-P-1C and RC-P-1D?

A. To minimize the amount of tube leakage by securing forced primary flow to the affected OTSG.

B. To prevent excessive Reactor Coolant Pump vibrations in the primary loop associated with the affected OTSG.

C. To ensure less than 3 Reactor Coolant Pumps are operating when RCS temperature cools down below 465°F, thereby minimizing core lift concerns.

D. To minimize the amount of flow through RC-V-1, Pressurizer Spray Control Valve, to ensure adequate subcooling margin is maintained after Guide 8 actions are complete.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** The amount of tube leakage is primarily affected by Primary Pressure. The plant is shut down and cooled down to minimize pressure, thereby minimizing the amount of leakage into the OTSG.

B. **Incorrect.** Plausible because this is a concern when securing 1 reactor coolant pump

in a loop. OP-TM-EOP-005 Step 3.42, however, has 2 RCP's secured in the same loop. And the Pumps are the same (RC-P-1C and RC-P-1D) regardless of which OTSG has the tube leak.

C. **Correct.** According to OP-TM-EOP-005 (p41; Rev 21), If RC-P-1A nd RC-P-1B are operating, then ensure RC-P-1C and RC-P-1D are shutdown. OP-TM-EOP-0051, OTSG Tube Leakage Basis Document, states that this action ensures 3 or fewer RC pumps will be operating when RCS temperature is <465°F (core lift concern). RC-P-1A and RC-P-1B are left operating to provide sufficient pressurizer spray capability to continue to minimize SCM. If either RC-P-1A or RC-P-1B was previously secured, no additional pumps are required to be secured for the core lift concern.

D. **Incorrect.** This is plausible because SCM has been minimized and is addressed in the basis document, but the step states that RC-P-1A and RC-P-1B are left operating to provide sufficient pressurizer spray capability to continue to minimize SCM.

Technical Reference(s): OP-TM-EOP-005 (p41; Rev 7)
Attachment 2, Step F
OP-TM-EOP-0051 (p8; Rev 2) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 431-GLO-1
423-GLO-1 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

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Mechanical components and design features of the reactor primary system.

Comments:

The KA is matched because the operator must demonstrate knowledge of the purpose and function of major system components/controls of the Reactor Coolant Pumps (i.e. Why certain ones are secured and certain ones are left running)
The question is at the Memory cognitive level because the operator must recall the purposes of components/systems to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	039 2.4.46	
	Importance Rating	4.2	

System Main and Reheat Steam - Emergency Procedures / Plan: Ability to verify that the alarms are consistent with the plant conditions.

Proposed Question: RO Question # 10

Initial conditions:

- Reactor was tripped due to rupture of B OTSG inside RB.
- Rule 3 has just been completed.
- Auxiliary Boilers have not yet been fired.

Which ONE of the following alarms is consistent with the above conditions?

A. MAP M-1-7, FW-P-1B TRIP

B. MAP M-2-3, FWP A/B ZERO SPEED

C. MAP K-1-5 GLAND STM EXHAUSTER TRIP

D. MAP K-2-5, MN TURB GLAND STM PRESS LO

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** Plausible if the student believes that the alarm will be in due to the lack of steam tripping the feedwater pump. Incorrect because while the pump will not pump without steam the pump will not trip.

B. **Incorrect.** Plausible if the student believes that the alarm will be in due to the FW pump stopping due to no steam, however the pump will take a long time to slow and eventually the turning gear engages to prevent zero speed.

C. **Incorrect.** Plausible because B OTSG supplies steam to the gland seal system, if the student believes that gland steam exhausters GS-E-1A or GS-E-1B have tripped on loss of sealing steam then this would be in. However, the running exhauster will continue to run and draw air instead of steam. The alarm only actuates if the running

exhauster trips on thermal overload.

D. **Correct.** OP-TM-K0205 is correct because aux steam is not yet available, with MS-V-1C and 1D closed as part of Rule 3, and the Main Turbine tripped (therefore the stop valves are closed and no Main Steam can be "cross-connected" in the Main Turbine chest) main steam gland pressure is low.

Technical Reference(s): OP-TM-MAP-K0205 (Rev 1) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 411-GLO-5 and 10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

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Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate the Ability to verify that the MS System alarms are consistent with the plant conditions (This is a unique and temporary condition) while in the Emergency Procedures (i.e. EOP-001 requiring a review of Alarms).

The question is at the Comprehension/Analysis cognitive level because the operator must combine the knowledges of Rule 3 actions (isolate generator by closing MS-V-1C and 1D) the unique steam supply (only B OTSG) and the lack of the other supplies no extraction steam with turbine tripped, no auxiliary steam boilers not yet available.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	054 AK1.01	
	Importance Rating	4.1	

Knowledge of the operational implications of the following concepts as they apply to Loss of Main Feedwater (MFW): MFW line break depressurizes the S/G (similar to a steam line break)

Proposed Question: RO Question # 11

The plant is operating at 100% power.

Which ONE (1) of the following correctly completes the statement below?

A large rupture in the 1A Main Feedwater Line inside the Reactor Building but outside the D-Ring ____(1)___ cause the 1A OTSG to depressurize. For this event the Reactor Operator will be expected to trip the reactor on ____(2)____ RCS pressure.

A. (1) will
(2) low

B. (1) will
(2) high

C. (1) will NOT
(2) low

D. (1) will NOT
(2) high

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible if the operator incorrectly believed that there is sufficient inventory in the OTSG to cause an RCS cooldown as the water in the OTSG depressurized into the RB, resulting in an uncontrolled lowering of RCS pressure.

B. **Correct.** 1st part correct, 2nd part correct. According to TMI-1 UFSAR (p14.2-47/48; Rev 20) a FWLB is a piping rupture in the MFW System where Feedwater is lost abruptly, as opposed to the flow coastdown that can occur for a loss of Feedwater. A

FWLB causes a loss of Heat Sink, a primary system heatup, increased Pzr level and pressure, and a reactor trip on high RCS pressure. The break inside the RB causes one OTSG to depressurize creating a harsh environment inside the RB, as well as a high building pressure.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because if the break is outside of the RB, the FW Check Valve prevents the blowdown of the OTSG, and the affected OTSG behaves as it would for a rapid loss of feedwater flow candidate may not be aware of check valve location believing it to be outside "D" ring at containment wall.

Technical Reference(s): TMI-1 UFSAR (p14.2-47/48; Rev 20) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

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Principles of heat transfer, thermodynamics and fluid mechanics.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the operational implications (i.e Tavg will rise) of the MFW line break inside the RB (i.e. depressurizes the OTSG).

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of cause and effect relationships regarding location of a MFW

break and effect on the RCS temperature of a MFW break.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	A04 2.4.8	
	Importance Rating	3.8	

Evolution Turbine Trip - Emergency Procedures / Plan: Knowledge of how abnormal operating procedures are used in conjunction with EOP's.

Proposed Question: RO Question # 12

Plant conditions:

- 90% power.
- A steam leak has been reported in the Turbine Building near the Main Turbine.
- The crew has implemented OP-TM-AOP-051, Secondary Side High Energy Leak.

Subsequently, the Main Turbine trips from current power level 90%.

Assuming no Excessive Heat Transfer (XHT) exists, which ONE (1) of the following describes how the crew should proceed?

A. Exit AOP-051, Enter OP-TM-EOP-001, Reactor Trip.

B. Enter OP-TM-EOP-001, Reactor Trip, and perform concurrently with AOP-051 as directed by the CRS.

C. Enter OP-TM-EOP-001, Reactor Trip, and complete this procedure; THEN Perform the remaining portions of AOP-051.

D. Enter OP-TM-EOP-001, Reactor Trip, and complete the Immediate Actions and Initial Symptom Check of this procedure; THEN
Perform EOP-001 and AOP-051 in parallel as directed by the CRS.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe parallel procedure usage is NOT allowed, and that the performance of EOP-001 encompasses any and all actions that would have been taken by AOP-051.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that the procedures are performed in parallel from the point of the reactor trip. Incorrect

because EOP-001 IMA's supersede AOP-051 actions.

C. **Incorrect.** This is plausible because the operator may incorrectly believe parallel procedure usage is NOT allowed, and that EOP-001 must be completed prior to returning to AOP-051.

D. **Correct.** Since the plant is at 90% power, when the Turbine trips the reactor will trip as well. According to OS-24 (p8; Rev 18) the process for performing parallel procedures requires that any other procedure actions should be interrupted to perform Reactor Trip Immediate Actions and the Initial Symptom Check. Once these actions are completed, the CRS will determine the sequence of actions between parallel procedures, based on the action most significant to the overall event mitigation. The CRS will base their decision on protecting the public health and safety, site personnel and plant equipment.

Technical Reference(s): OS-24 (p8; Rev 18) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-OS-24-C002 (Obj 1a and 6) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

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Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of how abnormal operating procedures are used in conjunction with EOP's on a Turbine Trip (i.e. by identifying the usage of parallel path procedures with an AOP previously in use at the time of entry into EOP-001).

The question is at the Memory cognitive level because the operator must recall the rules of usage of parallel path AOP/EOPs to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	076 A1.02	
	Importance Rating	2.6	

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SWS controls including: Reactor and turbine building closed cooling water temperatures.

Proposed Question: RO Question # 13

Plant conditions:

- 100% power.
- The Secondary Service River Water (SR) pumps have failed.
- Attempts to start the Standby SR Pump has failed.
- The Secondary Closed Cooling System temperature is rising.
- The operator observes Stator Coolant return temperature (A0192) to be 70°C, and rising at about 2°C per minute.

Assuming no additional operator action and that conditions do not change, which ONE (1) of the following identifies the approximate time before a Main Turbine protective action occurs, AND the protective action that is expected?

A. 5 minutes;
The Main Turbine will runback to a final power of 32%.

B. 5 minutes;
The Main Turbine will runback to a final power of 95%.

C. 15 minutes;
The Main Turbine will runback to a final power of 32%.

D. 15 minutes;
The Main Turbine will runback to a final power of 95%.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-322-C001 (p66-67; Rev 5) a loss of Secondary Services Closed Cooling Water will result in high Main

Generator stator and power rectifier temperatures. A Digital Turbine Control System runback to 32% will occur if Stator Coolant return temperature, (A0192) exceeds 80°C as sensed by GSC-TS-1003A/B/C in 2 out of 3 logic. According to TQ-TM-104-322-C001 (p83-84; Rev 5), High temperature □80°C (176°F) on 2 out of 3 sensors with a 5 second time delay will result in Turbine runs back to approximately 32% power (<8,554 Generator Amps). If NOT <95% power (25,262 Generator Amps) in two minutes the Main Turbine will Trip. Additionally, If NOT <32% Power (8,554 Generator Amps) in 3.5 minutes the Main Turbine will Trip. According to OP-TM-MAP-L0107 (p1; Rev 4) this has been proceduralized.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the circuit includes a 95% permissive and the operator may not understand the operation of the runback circuit.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may get the math wrong, or may incorrectly believe that the runback occurs at a higher temperature.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): TQ-TM-104-322-C001 (p66-67 and 83-84; Rev 5)
TQ-TM-104-322-C001 (p66-67 and 83-84; Rev 5)
OP-TM-MAP-L0107 (p1; Rev 4) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 322-GLO-6 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

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Secondary coolant and auxiliary systems that affect the facility.

Comments:

The KA is matched because the operator must demonstrate the ability to predict changes in parameters to prevent exceeding design limits (i.e. given a heat up rate predict when the protective function will occur and identify the protective function) associated with the Turbine Building Closed Cooling Water temperatures when operating the SWS (i.e. Loss of River Water to SSCCW).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate the system heat up rate, and knowing the protective function threshold, predict when the protective function will occur.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	039 K4.04	
	Importance Rating	2.9	

Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Utilization of steam pressure program control when steam dumping through atmospheric relief/dump valves, including T-ave. limits

Proposed Question: RO Question # 14

A plant startup is in progress with the following conditions:

- Reactor Power 25% and rising, controlled at the ULD.
- All other ICS stations are in AUTO.

The following sequence of events occur:

- Annunciator N-1-6, MN COND VACUUM LO is received.
- PPC Point A0033 indicates Condenser Backpressure is stable at 5.0" HgA.
- The operator determines that only the C Circulating Water Pump (CW-P-1C) is operating.

Which ONE (1) of the following identifies the LOWEST setpoint at which the Atmospheric Dump Valves (MS-V-4A and 4B) will start to automatically OPEN under the present plant conditions?

A. 895 psig

B. 960 psig

C. 1026 psig

D. 1040 psig

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because 895 psig is a setpoint that the TBVs would normally OPEN at when ULD is < 15%.

B. **Correct.** According to TQ-TM-104-411-C001 (p29-31; Rev 5), the Automatic TBV/ADV

Pressure Control Schemes (MS-V-3A/B/C/D/E/F and MS-V-4A/B) use OTSG pressure signals. The Adjustable Automatic Control Setpoint is 885 psig during normal operation with an applied Setpoint bias by the ICS of 10, 75 and 125, resulting in normal automatic adjustable control setpoints of 895, 960 and 1010 psig. There are also Fixed ICS Automatic Control Setpoints. Fixed ICS setpoints of 1040 psig and 1026 psig can be applied (depending on plant conditions) in order to limit high OTSG pressures. Of the adjustable setpoints, the 895 psig setpoint provides a 10 psi control band allowance to prevent Turbine Bypass Valves and Turbine Control Valves from fighting each other during Turbine startup and low load operation when both flow paths are in operation at the same time. Additionally, the 960 psig setpoint, which is in effect when ICS ULD > 15%, is intended to prevent inadvertent Turbine Bypass Valve operation during normal plant transients. Finally, the 1010 psig setpoint is to prevent excessive Pressurizer Level decrease on reactor trip. There are two fixed setpoints used during Auto control. The first, 1040 psig, applies to all of the TBV/ADVs, and the second, modulate open proportionally to control steam flow as a function of pressure in the range 1026 to 1052 psig, applies only to the ADVs. In Auto operation, the OTSG pressure control will automatically transfer from the TBVs to the ADVs on loss of vacuum, (23" Hg) or less than two Circulating Water Pumps operating, as sensed by the CVI relay. When this occurs, ICS sends the TBVs a 0% demand signal. Under either of these two conditions, MS-V-4A/4B (if in automatic) will control pressure at the operator controlled ICS setpoint (normally 885 psig) + bias, or at 1040 psig (fixed setpoint), whichever error signal is greater. According to OP-TM-411-000 (p9; Rev 13) when a Loss of Condenser Vacuum occurs as indicated by < 2 CW Pumps (which is the case in the stated conditions) or < 23" Hg Vac, the ADVs are operated in AUTO (which is NORMAL) at Turbine Header Pressure setpoint plus the appropriate ICS Bias (960 psig) or open at 1040 psig, whichever demand is greater. Also according to OP-TM-MAP-N0106 (p2; Rev 8) under the stated conditions the ADVs assume pressure control from the TBVs under the stated conditions. Furthermore, according to OP-TM-MAP-N0106 (p1; Rev 8) an automatic Turbine Trip has not occurred, and even if one does, a Reactor trip will NOT occur at this power level. Because of that, the LOWEST setpoint that the ADVs will OPEN at under these conditions in the 885 psig plus 75 psig bias, or 960 psig.

C. **Incorrect.** This is plausible because 1026 psig is a fixed setpoint that the ADVs would normally OPEN at under normal conditions when the TBVs have control. The operator may incorrectly believe that the stated events have had no effect on the ADVs, and as such, would open at 1026 psig.

D. **Incorrect.** This is plausible because 1040 psig is a fixed setpoint that the ADVs would normally OPEN at under normal conditions when the TBVs have control. The operator may correctly believe that the stated events have blocked the ADVs from opening at 1026 psig, but incorrectly believe that the ADVs will NOT assume Steam Pressure Control from the TBVs and conclude that the lowest pressure is 1040 psig.

	TQ-TM-104-411-C001 (p29-31; Rev 5)	
Technical Reference(s):	OP-TM-411-000 (p9; Rev 13) OP-TM-MAP-N0106 (p2; Rev 8)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 411-GLO-6, 8 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

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Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

NOTE: According to TQ-TM-104-411-C001 (p60; Rev 5) the ICS maintains constant reactor coolant average temperature and constant steam throttle pressure at the turbine during steady state operation between 15 and 100% of generated megawatts. It does by utilizing OTSG pressure as the controlling program, and therefore, OTSG program control will be considered equivalent to Tave control when writing a question to match this KA.

The KA is matched because the operator must demonstrate knowledge of an interlock (i.e. CVI Relay) which will cause the ADVs to control OTSG Steam Pressure (equivalent of Tave program for TMI), and the limit (i.e. setpoint) for OTSG pressure.

The question is at the Comprehension/Analysis cognitive level because the operator must recall control system operating characteristics (i.e. adjustable and fixed setpoints) and apply them to operation of the system given a specific failure, and predict how the system will operate.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	045 A1.05	
	Importance Rating	3.8	

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MT/G system controls including: Expected response of primary plant parameters (temperature and pressure) following T/G trip

Proposed Question: RO Question # 15

Plant conditions:

- 100% power.
- ICS is in AUTO.

The Main Turbine Trips on Low Lube Oil pressure.

Which ONE (1) of the following describes how RCS Tavg and RCS Pressure will respond during the transient?

A. RCS Tavg will drop rapidly at first, then gradually lower and approach 532°F; AND RCS pressure will drop to approximately 2000 psig before turning around.

B. RCS Tavg will drop rapidly at first, then gradually lower and approach 532°F; AND RCS pressure will drop to approximately 1800 psig before turning around.

C. RCS Tavg will drop rapidly at first, then gradually lower and approach 545°F; AND RCS pressure will drop to approximately 1800 psig before turning around.

D. RCS Tavg will drop rapidly at first, then gradually lower and approach 545°F; AND RCS pressure will drop to approximately 2000 psig before turning around.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** 1st part wrong, 2nd part wrong. See B and D.

B. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly that the TBVs will control at the 895 psig bias, rather than the 1010 psig bias. If so, Tavg will gradually approach 532°F rather than 545°F.

C. **Correct.** 1st part correct, 2nd part correct. According to OS-24 (p29; Rev 18) an automatic reactor trip will occur if the Turbine Trips and Reactor power is > 45%. According to TQ-TM-104-621-C001 (p140,141; Rev 3) With the ICS in automatic, a reactor trip will result in a plant runback at 20% per minute. Feedwater flow will ultimately be controlled by OTSG low level limits. Steam header pressure will be controlled by the Turbine Bypass Valves at 1010 psig, this limits the cooldown of the reactor coolant system and limits the pressurizer level drop to approximately 80 inches. Specifically, when the reactor trips, the Turbine-Generator trips, the Reactor Diamond Station trips to manual, the Integrated Control System goes into "track". Thus, ULD is driven from 100% down to 0% at 20% per minute. However, through nuclear instrumentation a 100% neutron error is developed and the neutron cross limit with feedwater is initiated. This neutron cross limit becomes a 95% reduction signal to feedwater which drives down feedwater demand instantaneously. Also, due to Feedwater Temperature lowering, OTSG Pressure rising, and T hot lowering, BTU limits are lowering. The BTU limit drop follows the feedwater demand drop and at times during the transient will be the most limiting to feedwater flow control. Ultimately, feedwater flow will become limited due to OTSG level of 30 inches on the Startup Range. Immediately following the reactor trip, the turbine header pressure setpoint will shift to 125 psig bias. Header pressure will be controlled by Turbine Bypass Valves at 1010 psig after the initial surge to approximately 1100 psig, where the Turbine Bypass Atmospheric and Main Steam Relief Valves will respond. The Turbine Bypass Atmospheric Valves begin opening at 1026 psig and will be full open at 1052 psig. Steam Header pressure rises just after the trip to approximately 1100 psig and then stabilizes at approximately 1050 psig until enough energy is removed allowing the Turbine Bypass Valves to take control and lower pressure to 1010 psig. RCS average temperature lowers to approximately 555°F within one minute and then gradually approaches saturation temperature of 545°F for 1010 psig, controlled by the Turbine Bypass Valves. During the T_{avg} drop ^{E}T lowers, and T hot and T cold approach each other (T hot lowering and T cold rising). The drop in T_{avg} results in: pressurizer level drop to approximately 80 inches and RCS pressure drop to approximately 1800 psig before turning around.

D. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may incorrectly believe that the RCS pressure will only drop to 1950 psig on a Turbine Trip resulting in a reactor trip from 100% power.

Technical Reference(s): OS-24 (p29; Rev 18)
TQ-TM-104-621-C001 (p140-141; Rev 3) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 621-GLO-11 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 5

55.43

Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes, and operating limitations and reasons for these operating characteristics.

Comments:

The KA is matched because the operator must demonstrate the ability to predict changes in RCS Tavg and pressure following T/G trip following a trip from 100% power, with ICS in AUTO.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of how Tavg is controlled in a post-trip setting, specifically that the TBVs will switch to 125 psig bias, and drive Tavg to near saturation for an OTSG pressure of 1010 psig.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	075 A2.03	
	Importance Rating	2.5	

Ability to (a) predict the impacts of the following malfunctions or operations on the circulating water system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Safety features and relationship between condenser vacuum, turbine trip, and steam dump

Proposed Question: RO Question # 16

Plant conditions:

- 100% power.
- Outside Air Temperature is 40°F.
- Condenser vacuum is degrading rapidly due to a boot seal failure.
- Annunciator N-1-6, MN COND VACUUM LO, alarm is illuminated.
- The crew manually trips the Reactor and enters EOP-001, Reactor Trip.
- Atmospheric Dump Valves (MS-V-4A/4B) assume pressure control from the Turbine Bypass Valves (MS-V-3A-F).

With respect to the Circulating Water System what action listed below will be taken first by the crew?

A. Close "B" NDCT Riser Valves CW-V-14E-H IAW OP-TM-511-161, SHUTDOWN CIRCULATING WATER LOOP A THEN LOOP B.

B. Open "A" and "B" NDCT Bypass Valves CW-V-13A, CW-V-13C, and CW-V-13D IAW OP-TM-511-415, COLD WEATHER OPERATION.

C. Secure Circulating Water Pumps CW-P-1A and CW-P-1B IAW OP-TM-511-431, SHUTDOWN CW-P-1A, and OP-TM-511-432, SHUTDOWN CW-P-1B.

D. Secure Circulating Water Pumps CW-P-1C and CW-P-1D IAW OP-TM-511-433, SHUTDOWN CW-P-1C, and OP-TM-511-434, SHUTDOWN CW-P-1D.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because the candidate may think that closing CW-V-

14E/F/G/H is required prior to opening CW-V-13A/C/D. This, however, will block all flow to the six operating Circulating Water pumps. This would violate a system precaution to prevent pump damage.

B. **Incorrect.** This is plausible if the candidate does not recognize that all six Circulating Water pumps are operating. The bypass piping is not designed for that much flow/pressure, and therefore one CW pump in each loop must be secured prior to opening the associated CW-V-13's. This would violate a system precaution to prevent piping damage.

C. **Incorrect.** This is plausible if the candidate does not recognize that CW-P-1A and 1B are in the same CW loop. With them both being in the same loop, CW-P-1A and CW-P-1B do not satisfy the requirement of OP-TM-EOP-001, step 5.11.

D. **Correct.** CW-P-1C and CW-P-1D satisfy the requirement of OP-TM-EOP-001, step 5.11, which states:

If more than 4 Circulating Water pumps are operating, then INITIATE appropriate procedures (OP-TM-511-431, "Shutdown of CW-P-1A" through OP-TM-511-436, "Shutdown of CW-P-1F") to reduce to 2 CW pumps per loop.

Technical Reference(s): OP-TM-EOP-001 (p 15; Rev 10) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 511-GLO-10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to (a) predict the impacts of the safety features and relationship between condenser vacuum, turbine trip, and steam dump in relation to the operation of the circulating water system; and (b) based on these predictions, use procedures (i.e. MAP-N0106) to correct, control, or mitigate the consequences of those operations.

The question is at the memory cognitive level because the operator must recall procedure steps associated with the Circulating Water system.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	055 EA1.02	
	Importance Rating	4.3	

Ability to operate and monitor the following as they apply to a Station Blackout: Manual ED/G start

Proposed Question: RO Question # 17

Plant conditions:

- 100% power.
- EG-Y-1B is OOS.

Subsequently:

- A loss of off-site power occurs.
- EG-Y-1A trips on overspeed.
- The crew is attempting to manually start the SBO Diesel (EG-Y-4).
- FS-P-2 is the only OPERABLE Fire Pump, however it is NOT running.

Which ONE (1) of the following describes the operating limitations on EG-Y-4?

A. EG-Y-4 can be started and loaded onto Bus 1D or 1E;
Electrical loading is limited to 2.25 MWe.

B. EG-Y-4 can be started and loaded onto Bus 1D or 1E;
Electrical loading is limited to 3 MWe.

C. EG-Y-4 can be started and loaded onto Bus 1D, ONLY;
Electrical loading is limited to 2.25 MWe.

D. EG-Y-4 can be started and loaded onto Bus 1D, ONLY;
Electrical loading is limited to 3 MWe.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to OP-TM-864-901 (p1; Rev 9) the SBO DG steady state load must be maintained < 3 MWe,

and the reactive load must be maintained between 0-2.25 MVAR reactive load. The operator may confuse the two numbers.

B. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-AOP-020 (p3; Rev 13) under the stated conditions the operator will be directed to Section 4.0 (Station Blackout) by the Step 3.3 RNO. According to OP-TM-AOP-020 (p15; Rev 13) the operator will be directed to initiate OP-TM-864-901 to energize the 1D or 1E 4160V Bus from the SBO Diesel. According to TQ-TM-104-861-C001 (p92; Rev 8), SBO utilizes Fire Protection Pumps (FS-P-1/3) to supply cooling water. If these pumps are NOT available, Pump FS-F-2 can be manually started and used to supply cooling water once the SBO is running. According to OP-TM-864-901 (p2 and 3; Rev 9), FS-P-2 can be used to operate the SBO Diesel when it is being loaded onto Bus 1D/1E. According to OP-TM-864-901 (p5; Rev 9) FS-P-2 is started once power is available to Bus 1D/1E, and EG-Y-4 must be loaded to < 3 MW.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because according to OP-TM-864-901 (p3; Rev 9) FS-P-2 cannot be used to provide cooling to the SBO if it is being loaded onto Bus 1C. The operator may incorrectly believe that FS-P-2 cannot be used if the SBO is being loaded onto Bus 1E. Additionally, according to TQ-TM-104-810-C001, FS-P-2 is powered from 1R Screen House Engineered Safeguards 480V Switchgear, which is normally powered from Bus 1D.

Technical Reference(s): OP-TM-AOP-020 (p3 and 15; Rev 13)
TQ-TM-104-861-C001 (p92; Rev 8)
OP-TM-864-901 (p1-2, and 5; Rev 9)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 861-GLO-2 and 10
TQ-AA-223-F070 (PCO-3) (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History:		Last NRC Exam:	N/A
Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	10	
	55.43		

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate ability to operate and monitor the Manual ED/G start to a Station Blackout by identifying what bus it can be aligned to and the loading limits under a specific set of conditions.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate a set of plant conditions and determine how the SBO Diesel can be aligned, which will vary based on the conditions.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	062 A2.15	
	Importance Rating	2.8	

Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Consequence of paralleling out-of-phase/mismatch in volts

Proposed Question: RO Question # 18

Plant Conditions:

EG-Y-1A is being prepared for a two hour run IAW 1107-3, Diesel Generator.
EG-Y-1A Exciter control is in manual.

Event:

As the operator prepares to close G1-02, Generator Output Breaker, voltage on the 1D 4KV bus suddenly drops to 4050 volts and remains steady.

The procedural action to take at this time and the reason for the action are…

Adjust Generator voltage from the ___(1)___ until within 0 to +.05KV of Grid voltage.
If the breaker is closed with the voltage listed above, damage to EG-Y-1A will occur due to the ___(2)___

A. Control Room
Generator "motoring".

B. Control Room
high current created.

C. EG-Y-1A Local Alarm Panel
Generator "motoring".

D. EG-Y-1A Local Alarm Panel
high current created.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. See B and C.

B. **Correct.** With the exciter in manual the voltage is adjusted from the Control Room. Closing the breaker with the exciter in manual at significantly greater terminal voltage than the bus will cause a large reactive current flow.

C. **Incorrect.** 1st part wrong, 2nd part wrong. This is plausible because the operator may incorrectly believe that the manual voltage control is at the alarm panel. This is where both automatic voltage regulator settings are. 2nd part is plausible for a misunderstanding of which way reactive current would be going, our while "motoring" is normally a function of speed past station experience has been to have reverse power trips on negative VARS.

D. **Incorrect.** 1st part wrong, 2nd part correct.

Technical Reference(s): 1107-3 (p29 and 30; Rev 129) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 861-GLO-2, 9 and 10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to (a) predict the impacts of paralleling mismatch voltage on the ac distribution system (i.e. what consequence would be); and (b) based on those predictions, use procedures (i.e. how to adjust voltage to bring back into band) to control the consequences of those operations.

The question is at the memory cognitive level because the operator is given that the action taken will or may cause the two AC sources to be paralleled out of voltage range. In this manner the operator simply must recall that the system uses a rheostat in the control room to adjust voltage when in manual and recall the damage that would be caused by machine voltage significantly above bus voltage.

This is a replacement question for original.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	1	
	K/A #	G1 2.1.31	
	Importance Rating	4.6	

Conduct of Operations: Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.

Proposed Question: RO Question # 19

Current plant conditions are:

- Plant has experienced a reactor trip and a loss of offsite power.
- EG-Y-1B failed to automatically START.

Which ONE (1) of the following conditions will prevent automatic startup of EG-Y-1B?

A. The Unit/Parallel switch is in the PARALLEL position.

B. The Exciter Auto Manual switch in the control room is in the MANUAL position.

C. The Auto-Standby/Manual Exercise switch in the control room is in the MANUAL EXERCISE position.

D. The Emergency Bypass selector switch for breaker control at the EDG breaker cubicle is in the EMERGENCY position.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because according to TQ-TM-104-861 (p10; Rev 8) the Unit/Parallel Switch selects the voltage droop mode. Although it is not an input to the start circuit, a common misconception is that the diesel must be in unit to start and load without parallel source.

B. **Incorrect.** This is plausible because according to OP-TM-861-902 (p7; Rev 11) when EG-Y-1B is in the ES standby position the Exciter Voltage Control is in AUTO. However, the position of the Exciter Auto/Manual Switch does not affect the EG-Y-1B start circuit.

C. **Correct.** According to TQ-TM-104-861 (p47; Rev 8) the EDGs have a 2 position EDG STARTING switch; AUTO (standby) and Manual (exercise). In AUTO, the diesel can be

manually started from the Control Room, or Auto Start on UV or ES. In Manual, the diesel can be started manually from the Control Room or at engine (with the local at engine switch thrown). Therefore, if this switch is in MANUAL EXERCISE, the EGD will NOT start on a UV/ESAS.

D. **Incorrect.** This is plausible because according to TQ-TM-104-614-C001 (p9; Rev 2) in the Emergency position normal control room and relay room component control circuits are bypassed, including ES signals. However, this switch does NOT affect the start circuit of the EDG, but the operator of the EDG Output Breaker.

Technical Reference(s): TQ-TM-104-861-C001 (p67; Rev 8)
TQ-TM-104-614-C001 (p9; Rev 2) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 861-GLO-2 and 10 (As available)

Question Source: Bank # TMI: QR-861-GLO-8-Q05
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 1998 TMI

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must given a set of off-normal conditions, and several mis-positioned switches identify which switch mis-positioning has led to the off-normal conditions; thereby demonstrating the ability to identify plant/control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.

The question is at the Memory cognitive level because the operator must recall the functions of several switches.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	064 K6.07	
	Importance Rating	2.7	

Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system: Air receivers

Proposed Question: RO Question # 20

Plant conditions:

- The plant is at 100% power.
- MAP Annunciator A-1-2 DIESEL GEN 1A TROUBLE is in alarm.
- Diesel Gen 1A Local Alarm B-3-1 STARTING AIR PRESSURE LOW is in alarm.
- Starting air pressure reads 180 psig and stable locally.
- The Air compressor will run but NOT raise pressure higher than 180 psig.

In the event of a Loss of Offsite Power, EG-Y-1A:

A. Will not roll and will not start.

B. Will start and will load within 10 seconds.

C. Will start, but will NOT load within 10 seconds.

D. Will roll for approximately 20 seconds, but will not start.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because this may be true if the Air Receiver pressure was <100 psig. However, the Starting Air pressure is greater than 100 psig.

B. **Correct.** According to 1107-3 (p236; Rev 129), Table 3-5 the starting Air Pressure low pressure alarm EG-Y-1A and 1B will alarm at 185 psig. Therefore, at 180 psig, the alarm is in. According to 1107-3 (p236; Rev 129), Table 3-5 the starting Air Pressure for EG-Y-1A and 1B must be 225-255 psig. According to 1107-3 (p14; Rev 129) Alarm DGA/B-3-1 for starting air pressure provides indication that a problem exists in the starting Air System. If Receiver air pressure drops below 175# and the Diesel is NOT running, then declare EG-Y-1A INOPERABLE per Technical Specifications. Since the

Starting Air pressure is > 175 psig, EG-Y-1A is OPERABLE, and it will start and load within 10 seconds.

C. **Incorrect.** This is plausible if for pressures of between 100 and 180 psig.

D. **Incorrect.** This is plausible because the diesel has a start failure circuit that under non-ES conditions it would block the start if it did not come up to speed in 20 seconds.

Technical Reference(s): 1107-3 (p236; Rev 129), Table 3-5
1107-3 (p14; Rev 129)
1107-3 (p229; Rev 129) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 861-GLO-5 (As available)

Question Source: Bank #
Modified Bank # WTS 69018/ IR-861-GLO-5-Q03 (Note changes or attach parent)
New

Question History: Last NRC Exam: 2008

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.
Comments:
The KA is matched because the operator must demonstrate Knowledge of the effect of a loss or malfunction (i.e. lower than normal air pressure (180 psig) and loss of ability to raise pressure higher) of the EDG air receiver will have on the EDG system:

The question is at the Comprehension/Analysis cognitive level because the operator must relate the current air pressure to procedural operability requirements, and precautions/limitations for reduced availability of the EDG to arrive at the correct conclusion of

the EDG status.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	058 AK3.02	
	Importance Rating	4.0	

Knowledge of the reasons for the following responses as they apply to the Loss of DC Power: Actions contained in EOP for loss of dc power

Proposed Question: RO Question # 21

Plant conditions:

- 50% power.
- 4160V Bus 1D has de-energized.
- During the recovery the crew enters OP-TM-AOP-023, A DC System Failure, due to lowering voltage on DC Bus A.
- The reactor is tripped when the C Battery Voltage drops to less than 110 Volts.

Which ONE (1) of the following identifies a reason for this action?

A. This allows A and B DC busses to be cross-tied before DC Bus A is de-energized.

B. This allows 480V Buses 1P and 1S to be cross-tied before DC Bus A is de-energized.

C. This will prevent a situation where the reactor is critical and cannot be tripped from the Control Room.

D. This is necessary because Technical Specifications does not permit the reactor to be critical with Battery voltage less than 110 volts.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because OP-TM-734-901 allows the cross tie of these busses, however only for a Mitigation of a fire in the 1P bus step 3.4.4 requires that this procedure be entered from the Fire AOP. This is incorrect because 1P 480 volt bus is still available to provide the battery chargers and this is not an authorized path in AOP-023.

B. **Correct.** According to OP-TM-AOP-023 (p5; Rev 2) Step 3.5, IAAT A or C Battery Voltage is < 110 VDC, then perform the following: (1) trip the reactor, and (2) dispatch

the operator to close EG-V-15A. Immediately following this, at Step 3.6, direction is given such that IAAT the reactor is shutdown, and the 1D 4160V ES Bus is de-energized (Which is the case in the stated conditions following the trip), then initiate OP-TM-732-901 to cross-connect 1P from 1S. According to OP-TM-AOP-0231 (p7; Rev 1) Step 3.5, the step is taken at this voltage so that time is allowed for the crew to respond to the reactor trip and cross-tie the 480V buses prior to voltage degrading to < 105 volts, at which point the A DC Bus will be de-energized.

C. **Incorrect.** According to OP-TM-AOP-023 (p37; Rev 2) one of the effects of a loss of DC A is that a remote trip of 1G-02 is not possible. The operator may incorrectly believe that this factors into the decision to trip the reactor before the DC Bus is de-energized to ensure that Reactor Trip from the control room, even under ATWS conditions, is still available.

D. **Incorrect.** According to Technical Specification 3.7.2 (p3-42/43; Amendment 224) the reactor shall not remain critical under certain situations, and some circumstances involve the DC Distribution System. Therefore, the operator may incorrectly believe that the plant must be tripped under the present situation because it is required by the Technical Specification. According to OP-TM-AOP-023 (p11; Rev 2) Step 3.17, the operator is directed to notify the EDM and determine Battery operability within 8 hours, and if NOT, initiate a reactor shutdown. The plant is allowed to have one battery out of service for not more than eight hours per T.S. 3.7.2. 1107-2C L&P I defines battery operable as between 129 and 131 voltages on float charge, therefore the operator may believe the action to get out of the Tech Spec is to trip the reactor.

Technical Reference(s):	OP-TM-AOP-023 (p3, 5 and 37; Rev 2) OP-TM-AOP-0231 (p7; Rev 1) TS 3.7.2 (p3-42/43; Amendment 224)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-AA-223-F070 PCO-4 (As available)

Question Source:	Bank #		
	Modified Bank #		(Note changes or attach parent)
	New	X	

Question History: Last NRC Exam: NA

Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	10	
	55.43		

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

NOTE 1: TMI does not use an EOP for loss of a DC Bus, but an AOP. Because of this, the question focused on the reason behind the action during a loss of a DC Bus that would lead the crew into an EOP.

The KA is matched because the operator must demonstrate Knowledge of the reasons for the actions contained in EOP (AOP - See NOTE 1 above) for loss of dc power (i.e why does the operator trip the plant when Battery voltage is 110 VDC) as they apply to the Loss of DC Power.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of why a specific action is taken during a loss of DC power.

The question is NOT SRO-ONLY. It is assumed that the RO must know all TS Action Statements that are required to be implemented in < one hour. Therefore if the operator knows that 480VAC Bus 1P, which powers the A Train battery chargers, cannot be cross-connected with 480VAC Bus 1S with the reactor critical (TS), the operator can arrive at the correct answer. For instance, if Bus 1D is de-energized, 480VAC Bus 1P is also de-energized which will de-energize the Train A Battery Chargers, causing the A battery to discharge. The operator must know that the AOP directs the operator to cross connect 480VAC Bus 1P with 480VAC Bus 1S, and if this action is taken with the reactor critical, immediate action (< 1 hour) will be needed (i.e. Reactor Trip) to comply with the Technical Specification. Consequently the procedure directs the reactor trip action to be taken with sufficient time to avoid violation of the technical specification and de-energization of the DC Bus. Similarly, the operator can rule distracter D out by knowing that a Battery at less than 110VDC with the reactor critical is NOT a condition specifically prohibited by Technical Specifications (i.e. does not require ACTION in less than one hour).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	063 A3.01	
	Importance Rating	2.7	

Ability to monitor automatic operation of the dc electrical system, including: Meters, annunciators, dials, recorders, and indicating lights

Proposed Question: RO Question # 22

Plant conditions:

- The plant is at 100% power.
- The Station 1B Battery is placed on an Equalizing Charge.

During the performance of operator rounds of the station batteries, which ONE (1) of the following would require immediate notification to the CRS?

A. Equalizing charge current is 2 amps.

B. Battery 1B terminal voltage 130 VDC.

C. Battery 1B room temperature is 78° F.

D. Battery Charger 1F is tagged out of service.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because according to 1107-2C (p4; Rev 10), P&L I, a station battery is OPERABLE when the float charging current is < 2 amps. However, during the equalizing charge, this would be a normal and expected indication.

B. **Correct.** According to 1107-2C (p4; Rev 10), P&L I, the normal terminal voltage for a station battery is between 129.0 and 131.0 (or 134 or136 VDC if it is on an equalizing charge). A battery terminal voltage of 130 VDC during an equalizing charge is abnormally low. This condition would require immediate notification of the CRS. According to OP-AA-102-102 (p11; Rev 8) Step 4.3.7, the operator is required to highlight (e.g., circle or electronically flag) out-of-tolerance readings and bring them to the attention of the Field Supervisor; and if an out-of-tolerance reading is associated with or could affect the operability of safety-related equipment, then NOTIFY the control room and the Field Supervisor immediately. Since the terminal voltage during the

equalizing charge is abnormally low, Battery 1B could be inoperable, and therefore, this condition should be reported to the CRS immediately.

C. **Incorrect.** This is plausible because, according to 1104-19 (p8; Rev 76), the B & D Battery Room temperature must be maintained at 75±5°F. Therefore, this is a normal condition.

D. **Incorrect.** This is plausible because according to Technical Specification 3.7 (p3-42; Amendment 224) two Battery Chargers must be operable; however the spare does not have to be one of the two.

Technical Reference(s): 1107-2C (p4; Rev 10)
OP-AA-102-102 (p11; Rev 8)
1104-19 (p8; Rev 76)
Technical Specification 3.7 (p3-42; Amendment 224) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 734-GLO-6 and 9 (As available)

Question Source: Bank #
Modified Bank # WTSI 58754 (Note changes or attach parent)
New

Question History: Last NRC Exam: 2007 TMI Q#21

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate the Ability to monitor automatic operation of the dc electrical system, specifically the Station battery Terminal Voltage required for OPERABILITY.

The question is at the Comprehensive/Analysis cognitive level because the operator must recall OPERABILTY requirements for the station battery during an equalizing charge, and then relate these to CRS immediate notification requirements to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	004 K2.01	
	Importance Rating	2.9	

Knowledge of bus power supplies to the following: Boric acid makeup pumps

Proposed Question: RO Question # 23

Which ONE (1) of the following describes the bus power supply and the means of control power to the Boric Acid Pump Breakers (CA-P-1A and CA-P-1B)?

A. Safety Related (Class 1E) 480V MCC;
External source used to supply 125VDC for control power.

B. Safety Related (Class 1E) 480V MCC;
Internal transformer used to supply 120VAC for control power.

C. Non-Safety Related (Non-Class 1E) 480V MCC;
External source used to supply 125VDC for control power.

D. Non-Safety Related (Non Class 1E) 480V MCC;
Internal transformer used to supply 120VAC for control power.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may incorrectly believe that the Boric Acid Pump motors are of such size that they warrant a larger breaker, similar to that of the MU Pumps.

B. **Correct.** 1st part correct, 2nd part correct. According to 1107-5 (p22; Rev 138), the power supply to CA-P-1A is 1A ES MCC, a Safety Related (Class 1E) 480VAC Motor Control Center and the power supply to CA-P-1B is 1B ES MCC, a Safety Related (Class 1E) 480VAC Motor Control Center. According to TQ-TM-104-740-C001 (p18; Rev 5) the 480VAC Bus has an external DC control power is available to operate the breaker. On the other hand, according to OPM A-1 (p21; Rev 17) the MCC Breaker receives its control power through an internal transformer (480VAC to 120VAC) internal to the breaker itself. Since these pumps are powered from the ES 480VAC MCC, they have an internal transformer used to supply 120VAC for control power.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. According to 1107-5 (p103; Rev 138)), the power supply to WDL-P-13A is 1AR.W, a Non-Safety Related (Non-Class 1E) 480VAC Motor Control Center and the power supply to WDL-P-13B is 1BR.W, a Non-Safety Related (Non-Class 1E) 480VAC Motor Control Center. Since both pumps can be used to Emergency Borate, the operator may incorrectly believe that the pumps are powered from a Non-Safety Related MCC.

Technical Reference(s): 1107-5 (p22 and 103; Rev 138)
TQ-TM-104-740-C001 (p18; Rev 5)
OPM A-1 (p21; Rev 17)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 211-GLO-4 (As available)

Question Source: Bank # WTSI 62558
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 2007 Farley

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 6
55.43

Design, components, and function of reactivity control mechanisms and instrumentation.

Comments:
The KA is matched because the operator must demonstrate knowledge of the classification of the electrical bus that provides power to the BA Pumps (Safety Related vs. Non-Safety Related; and 480V Bus vs. 480V MCC which is indicative of the control power used (Facility objectives state that for loads < 4KV the operator must know voltage, control power, and class)).

The question is at the Memory cognitive level because the operator must recall bits of information that are characteristic of the power supply to correctly answer the question (Classification of Switchgear and Control Power of breaker).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	026 K3.01	
	Importance Rating	3.9	

Knowledge of the effect that a loss or malfunction of the CSS will have on the following: CCS

Proposed Question: RO Question # 24

Plant conditions:

- The plant has tripped from 100% power due to a Large break LOCA.
- Reactor Building Spray Pump BS-P-1A has tripped on overcurrent.

Which ONE (1) of the following Reactor Building Emergency Cooler/Fan speed combinations meets the MINIMUM accident analysis assumptions for post-accident Reactor Building emergency cooling under these conditions?

A. 1 Cooler with its fan in SLOW speed.

B. 1 Cooler with its fan in FAST speed.

C. 2 Coolers with their fans in SLOW speed.

D. 2 Coolers with their fans in FAST speed.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to TQ-TM-104-214-C001 (p70; Rev 6) and TQ-TM-824-C001 (p 46, Rev 4), Post-accident Reactor Building Emergency Cooling may be accomplished by three emergency cooling units, two spray systems, or by a combination of one emergency cooling unit and one spray system. Also, according to Technical Specification 3.3 Basis (p3-24; Amendment 263), the post-accident RB emergency cooling may be accomplished by emergency cooling units, by two spray systems, or by a combination of one emergency cooling unit, and one spray system. According to OP-TM-534-901 (p1; Rev 10), to prevent RB fan overload, operate RB fans in SLOW speed when RB pressure is greater than 2 psig (as would be the case in the event of a LB LOCA). Additionally, according to TQ-TM-104-824-C001 (p10; Rev 4), the RB Cooling Fans are 50% capacity and during an Emergency operation is in SLOW speed.

B. **Incorrect.** This is plausible because according to TQ-TM-104-824-C001 (p10; Rev 4) there are two speeds associated with each fan. It is reasonable for the operator to incorrectly believe that during an emergency FAST speed is required.

C. **Incorrect.** This is plausible because according to TQ-TM-104-824-C001 (p10; Rev 4) there are three fans. It is reasonable for the operator to incorrectly believe that two of the three must be operating under the stated conditions.

D. **Incorrect.** This is plausible because it combines the errors of B and C.

Technical Reference(s): TQ-TM-104-214-C001 (p70; Rev 6)
Technical Specification 3.3 Basis (p3-24; Amendment 263)
OP-TM-534-901 (p1; Rev 10)
TQ-TM-104-824-C001 (p10, 46; Rev 4)
UFSAR 6.3.1
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 824-GLO-6
214-GLO-14 (As available)

Question Source: Bank #
Modified Bank # WTSI 58795 (Note changes or attach parent)
New

Question History: Last NRC Exam: 2007 TMI Q#15 (mod)

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

Modified Q15 from TMI 0701 NRC exam

The KA is matched because the operator must demonstrate knowledge (i.e. that one Cooling Unit with its fan in SLOW Speed is required to ensure Safety Analysis requirements are met) of the effect that a loss or malfunction of the CSS (i.e. failure of one BS Pump) will have on the Containment Cooling System.

The question is at the Memory cognitive level because the operator must recall two bits (TS Basis regarding number of units required under potential conditions, speed of operation in an emergency) of information regarding the design and characteristics to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	009 EA1.05	
	Importance Rating	3.4	

Ability to operate and monitor the following as they apply to a small break LOCA: CCWS

Proposed Question: RO Question # 25

Plant conditions:

- The reactor has tripped from 100% power.
- A small break LOCA has caused Reactor Building (RB) pressure to rise to 5 psig.

Which ONE (1) of the following describes the status of cooling water flow to the RB Recirculation Fans (AH-E-1 units), AND the Reactor Compartment Cooling Fans (AH-E-2 Units)?

A. The RB Recirculation Fans and the Reactor Compartment Cooling Fans will remain aligned to the Industrial Coolers.

B. The RB Recirculation Fans and the Reactor Compartment Cooling Fans will realign to the RB River Water System (RR).

C. The RB Recirculation Fans will realign to the RB River Water System (RR); AND
The Reactor Compartment Cooling Fans will be isolated.

D. The Reactor Compartment Cooling Fans will realign to the RB River Water System (RR); AND
The RB Recirculation Fans will be isolated.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because both sets of fans are normally supplied with cooling water during normal operation.

B. **Incorrect.** This is plausible because the RB Recirculation Fans are realigned to be supplied by the RR System during an ESAS actuation; and the operator may incorrectly believe that both sets of fans have a similar design.

C. **Correct.** According to TQ-TM-104-824-C001 (p10; Rev 4) the RB Recirculation Fans are normally cooled by Industrial Cooling and cooled by RB River Water during an emergency. According to TQ-TM-104-824-C001 (p11; Rev 4) the Reactor Compartment Cooling Fans are normally cooled by Industrial Cooling. According to OPM D-04 (p5-6; Rev 12) the RR system is placed in operation when RB pressure rises to > 4 psig (Which may occur on a small break LOCA in the RB). When the RR system actuates the pumps will auto start and the inlet and outlet valves will automatically open to supply RR to the emergency coils of the RB Recirculation Fans. Simultaneously, according to OPM L-02 (p9; Rev 10), when RB pressure rises to > 4 psig, both RB-V-7 and 2A will automatically close isolating normal cooling to both the RB Recirculation Fans and the Reactor Compartment Cooling Fans. This will leave the RB Recirculation Fans supplied with cooling water by RR, and the Reactor Compartment Cooling Fans isolated from any cooling water.

D. **Incorrect.** This is plausible because this is the exact opposite of what will actually occur; and the operator may confuse the two system responses.

Technical Reference(s): TQ-TM-104-824-C001 (p10-11; Rev 4)
OPM D-04 (p5-6; Rev 12)
OPM L-02 (p9; Rev 10)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 824-GLO-2 and 12 (As available)

Question Source: Bank # WTSI 68408
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 2007 Crystal River

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation,

signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Ability to operate and monitor the IC (Closed Cooling System) during a small break LOCA (as indicated by RB pressure rising to > 4 psig).

The question is at the Comprehension/Analysis cognitive level because the operator must consider the normal and emergency operation of two different sets of fans/cooling units are determine how they would respond during a small break LOCA to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	013 K5.02	
	Importance Rating	2.9	

Knowledge of the operational implications of the following concepts as they apply to the ESFAS: Safety system logic and reliability

Proposed Question: RO Question # 26

The plant is operating at 100% power.

Which ONE (1) of the following correctly completes the statement below regarding the automatic starting of the Reactor Building Spray Pumps (BS-P-1A and 1B)?

The auto start circuit for each BS Pump utilizes a ____1____ logic scheme, which ____2____ automatically start the BS Pumps if two 120VAC Vital Buses lose power simultaneously.

A. (1) 2 of 3
(2) will

B. (1) 2 of 3
(2) will NOT

C. (1) 2 of 4
(2) will

D. (1) 2 of 4
(2) will NOT

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to TQ-TM-104-642-C001 (p80-81; Rev 5) the loss of two of the three 120 VAC AC buses used by the ESAS, will actuate all engineered safeguards except the Reactor Building Spray Systems ; and the operator may incorrectly believe that such an event will start the BS Pumps as well.

B. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-642-C001 (p20; Rev 5) the start circuit of each BS Pump utilizes a 2 of 3 logic circuit for actuation

(Coupled with Block 4 actuation). However, according to TQ-TM-104-642-C001 (p47-48; Rev 5), the BS Pump start circuitry is distinguished from other applications of Pressure Switch schemes such as the similar, yet different, 30 psig RB Isolation scheme. For instance, while the 30 psig Hi-Hi Reactor Building Isolation signal is processed by the Engineered Safeguards Actuation System, the 30 psig Reactor Building Spray pressure switches input directly to the associated pump's start circuitry. Consequently, according to TQ-TM-104-642-C001 (p80-81; Rev 5) the loss of two of the three 120 VAC AC buses used by the ESAS, will actuate all engineered safeguards except the Reactor Building Spray Systems (i.e. the system utilizes an energize-to-function scheme, rather than a de-energize to function scheme to improve reliability, preventing an inadvertent actuation of the BS Pumps).

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. According to TQ-TM-104-641-C001 (p9; Rev 1) the reactor trip modules located in the NI/RPS cabinets utilize a 2-out-of-4 trip logic; and the operator may incorrectly believe that the ESAS does as well.

Technical Reference(s): TQ-TM-104-642-C001 (p20, 47-48 and 80-81; Rev 5)
TQ-TM-104-641-C001 (p9; Rev 1) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 642-GLO-6, 8 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate knowledge of the operational implications (i.e. start logic of BS Pumps and whether the start circuit is energize or de-energize to function) of the ESFAS Safety system logic and reliability (i.e if the operator can identify the difference between the BS Pump start circuit and the other ESAS actuations, the operator knows that the difference is done for reliability).

The question is at the Comprehension cognitive level because the operator must demonstrate an understanding that the BS Pump start actuation is unique (i.e. Energize to function) for overall reliability of the ESAS (i.e. inadvertent actuation of RB Spray could damage equipment unnecessarily).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	029 K4.03	
	Importance Rating	3.2	

Knowledge of design feature(s) and/or interlock(s) which provide for the following: Automatic purge isolation

Proposed Question: RO Question # 27

Plant Conditions:

- Reactor Shutdown in progress.
- RB Purge is in progress in preparation for the start of a Refueling Outage.

Event Occurrence:

- An inadvertent actuation of the "A" Train 4# RB Pressure has occurred.

Which ONE (1) of the following identifies the RB equipment realignment and RB purge status?

A. Purge Exhaust valve AH-V-1B closes;
Purge Supply valve AH-V-1D closes;
RB Purge Exhaust Fan, AH-E-7A, automatically trips.

B. Purge Exhaust valve AH-V-1B closes;
Purge Supply valve AH-V-1D closes;
RB Purge Exhaust Fans, AH-E-7A and AH-E-7B, continue to run.

C. Purge Exhaust valves AH-V-1A and 1B closes;
Purge Supply valves AH-V-1C and 1D closes;
RB Purge Exhaust Fan, AH-E-7A, automatically trips.

D. Purge Exhaust valves AH-V-1A and 1B closes;
Purge Supply valves AH-V-1C and 1D closes;
RB Purge Exhaust Fans, AH-E-7A and AH-E-7B, continue to run.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part (Valves) correct, 2nd part (Exhaust Fan status) wrong. This is

plausible because the operator may incorrectly believe that the ESAS signal, or the valve position changes will result in the Exhaust Fan tripping.

B. **Correct.** 1st part (Valves) correct, 2nd part (Exhaust Fan status) correct. According to 1105-3, Attachment 1 (p14; Rev 51), both AH-V-1B and AH-V-1D will close on the Train A 4 psig RB Pressure Actuation. Each Train closes one inside and one outside supply and exhaust valve. According to TQ-TM-104-824-C001 (p37-38; Rev 4) the RB Purge Supply and Exhaust Fans (AH-E-6 and 7 A&B) can run with no Purge Valves OPEN. Both sets of Fans will trip on AH-F-1 Fire Detection. Additionally, AH-E-6 trips on high duct temperature and AH-E-7 trip. Therefore, under the stated conditions, there is no signal that will automatically trip the Purge Supply and Exhaust fans.

C. **Incorrect.** 1st part (Valves) wrong, 2nd part (Exhaust Fan status) wrong. See A and D.

D. **Incorrect.** 1st part (Valves) wrong, 2nd part (Exhaust Fan status) correct. This is plausible because the operator may incorrectly believe that one train of ESAS closes ALL the RB Purge isolation valves, as is the case if RM-A-9 were to alarm.

Technical Reference(s): 1105-3, Attachment 1 (p14; Rev 51)
TQ-TM-104-824-C001 (p37-38; Rev 4) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 824-GLO-2 and 8 (As available)

Question Source: Bank # QR-824-GLO-10-Q02
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge of design feature(s) and/or interlock(s) (i.e. how does system respond to one train of ESAS actuating, and how does this affect Exhaust fan operation) which provide for Automatic purge isolation.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and determine how the RB Purge System isolation valves have responded to these conditions, and then based on these conditions determine how the system exhaust fans will be affected.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	073 A4.02	
	Importance Rating	3.7	

Ability to manually operate and/or monitor in the control room Radiation monitoring system control panel

Proposed Question: RO Question # 28

Plant conditions:

- 100% power.
- Condenser Vacuum Pump Exhaust Radiation Monitors RM-A-5 and RM-A-15 suddenly show rising trends and activate the C-1-1 MAP Alarm.

Assuming that the rising trends are due to increased RCS activity, which ONE (1) of the following identifies how RM-L-1, Letdown Monitor, would be expected to respond?

A. RM-L-1 will trend upward immediately.

B. RM-L-1 will trend upward with a lag time of 30-60 seconds.

C. RM-L-1 will trend upward with a lag time of 3-6 minutes.

D. RM-L-1 will trend upward with a lag time of 30-60 minutes.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may not know that there is a time delay associated with RM-L-1.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that the time delay associated with RM-L-1 is 30-60 seconds rather than minutes.

C. **Incorrect.** This is plausible because according to TQ-TM-104-661-C001 (p37; Rev 44), the instrument uses a 3 minute delay coil to compensate for N16 gammas, and the operator may incorrectly believe that this is the only factor affecting the delay of the instrument. If so, 3-6 minutes is reasonable.

D. **Correct.** According to OP-TM-MAP-C0101 (p8; Rev 1) Note prior to Step 4.3, a change in RCS activity may not be observed on RM-L-1 until 30-60 minutes later due to the transport time to the monitor. According to TQ-TM-104-661-C001 (p37-39; Rev 44), RM-L-1 uses a delay coil for N16 gammas and a lower flowrate than the other RM-Ls, which would result in a delayed indication.

Technical Reference(s):	OP-TM-MAP-C0101 (p8; Rev 1) Note prior to Step 4.3 TQ-TM-104-661-C001 (p37-39; Rev 44)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 661-GLO-2 and 6 (As available)

Question Source:	Bank #		
	Modified Bank #	WTS 65106/TMI: IR-XXX-GLO-X-Q24	(Note changes or attach parent)
	New		

Question History: Last NRC Exam: None

Question Cognitive Level:	Memory or Fundamental Knowledge	X
	Comprehension or Analysis	

10 CFR Part 55 Content:	55.41	11
	55.43	

Purpose and operation of radiation monitoring systems, including alarms and survey equipment.

Comments:

The KA is matched because the operator must demonstrate the Ability to monitor in the control room Radiation monitoring system control panel and predict trends under a given set of conditions.

The question is at the Memory cognitive level because the operator is given that one RM monitor is trending upward, and the reason for the trend. The operator simply needs to recall the time delayed response associated with a separate, yet associated, instrument to answer

the question correctly.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	072 A3.01	
	Importance Rating	2.9	

Ability to monitor automatic operation of the ARM system, including: Changes in ventilation alignment

Proposed Question: RO Question # 29

Plant conditions:

- The plant is shutdown.
- The core is offloaded into the Spent Fuel Pool.
- Spent Fuel operations are on-going within the Spent Fuel Pool.

Subsequently:

- RM-G-9, Fuel Handling Building (FHB) Fuel Handling Bridge, goes into HIGH ALARM.

Which ONE (1) of the following describes the AUTOMATIC response to this condition?

A. The FHB Exhaust Isolation Damper AH-D-122 will CLOSE ONLY; AND
The FHB Exhaust Fans AH-E-14A/C (B/D) will trip, ONLY.

B. The FHB Supply Isolation Dampers AH-D-120 and 121 will CLOSE ONLY; AND
The FHB Supply Fan AH-E-10 will trip, ONLY.

C. The FHB Supply & Exhaust Isolation Dampers AH-D-120, 121 and 122 will CLOSE; AND
The FHB Supply Fan AH-E-10 will trip, ONLY.

D. The FHB Supply & Exhaust Isolation Dampers AH-D-120, 121 and 122 will CLOSE; AND
The FHB Supply Fan AH-E-10 and FHB Exhaust Fans AH-E-14A/C (B/D) will trip.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that only the Exhaust system is automatically shutdown in order to keep a positive pressure in the

building.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that only the Supply system is automatically shutdown in order to keep a negative pressure in the building.

C. **Correct.** According to TQ-TM-104-661-C001 (p52; Rev 4), RM-G-9 HIGH ALARM closes dampers, AH-D-120, 121, 122. (between Fuel Handing Building Spent Fuel Pools isolating Unit I from Unit II) and trips AH-E-10.

D. **Incorrect.** This is plausible because according to TQ-TM-104-829-C001 (p57; Rev 2) and OP-TM-MAP-C0101 (p7; Rev 1) the RO will trip exhaust fans AH-E-14A/C (B/D), and the operator may incorrectly believe that this is done automatically.

Technical Reference(s): TQ-TM-104-661-C001 (p55; Rev 4)
TQ-TM-104-829-C001 (p57; Rev 2)
OP-TM-MAP-C0101 (p7; Rev 1) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 661-GLO-5
829-GLO-5 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:
The KA is matched because the operator must demonstrate the Ability to monitor automatic operation of the ARM system by identifying the expected changes in the FHB Ventilation System based on the fact that the RM-G-9 Hi Radiation Alarm has occurred.

The question is at the Memory cognitive level because the operator must simply recall how the RM-G-9 Hi radiation Alarm affects the FHB Ventilation System.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	059 2.2.38	
	Importance Rating	3.6	

Evolution Accidental Liquid Radwaste Release - Equipment Control: Knowledge of conditions and limitations in the facility license.

Proposed Question: RO Question # 30

The crew is preparing to conduct a liquid release of "B" Waste Evaporator Condensate Storage Tank (WECST) in accordance with OP-TM-232-554, Liquid Release of the "B" WECST With WDL-P-14B.

Which ONE (1) of the following identifies the Radiation Monitoring Instrument(s) that is/are required to be OPERABLE per the Offsite Dose Calculation Manual (ODCM) to commence the release?

A. RM-L-7, Plant Water Discharge, **ONLY**, must be OPERABLE.

B. RM-L-6, Liquid Radioactive Waste Discharge, **ONLY**, must be OPERABLE.

C. EITHER RM-L-7, Plant Water Discharge; **OR**
RM-L-6, Liquid Radioactive Waste Discharge must be OPERABLE.

D. BOTH RM-L-7, Plant Water Discharge; **AND**
RM-L-6, Liquid Radioactive Waste Discharge must be OPERABLE.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because there is only one RM Instrument required to be OPERABLE, although two are used by the procedure; and the operator may incorrectly believe that it is RM-L-7, rather than RM-L-6.

B. **Correct.** According to TQ-TM-104-232-C001 (p122-3; Rev 3), RM-L-6 is required by the ODCM, while RM-L-7 is NOT. This is reflected in the ODCM. According to the ODCM, Table 2.1.1 (p22; Rev 2) the radioactive liquid effluent monitoring instrumentation channels shown in Table 2.2-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Control 2.2.1.1 are not exceeded. According to the ODCM, Table 2.1.1 (p22; Rev 2) the Minimum Channels Required for Gross Radioactivity Monitors Providing Automatic Termination of Release, includes RM-L-6,

but NOT RM-L-7. If RM-L-6 is inoperable, the release may only continue by relying on an ODCM ACTION Statement.

C. **Incorrect.** This is plausible because there is only one RM Instrument required to be OPERABLE, although two are used by the procedure; and the operator may incorrectly believe that the ODCM allows either RM-L-7 or RM-L-6 to be OPERABLE to perform releases without relying on an ACTION Statement.

D. **Incorrect.** This is plausible because according to OP-TM-232-554 (p1; Rev 2) both instruments are used during the release; and the operator may incorrectly believe that the ODCM requires both.

Technical Reference(s): TQ-TM-104-232-C001 (p122-3; Rev 3)
ODCM, Table 2.1.1 (p22; Rev 2) (Attach if not previously provided)
OP-TM-232-554 (p1; Rev 2)

Proposed References to be provided to applicants during examination: None

Learning Objective: 232-GLO-14 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10
55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

What MUST be known:

1. RM-L-6 is required by the ODCM to be OPERABLE when conducting radioactive liquid releases via this pathway.
2. RM-L-7 is NOT required by the ODCM to be OPERABLE when conducting radioactive

liquid releases via this pathway.

The KA is matched because the operator must demonstrate Knowledge of conditions and limitations in the facility license (i.e. ODCM).

The question is at the Memory cognitive level because the operator must recall the ODCM requirements for Operability of Waste Liquid Release Instrumentation.

This is NOT an SRO-ONLY Question because it can be answered solely by knowing the TS/ODCM LCO information considered to be "Above the line (i.e. LCO proper, applicability)." See TQ-TM-104-232-C001 Objective GLO-14 for ROs: Demonstrate the ability to recognize and comply with Liquid Waste Disposal System limiting conditions for operation and action statements.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	2	
	K/A #	G2 2.2.14	
	Importance Rating	3.9	

Equipment Control: Knowledge of the process for controlling equipment configuration or status.

Proposed Question: RO Question # 31

Plant conditions:

- 100% power, with ICS in full automatic.
- Steam Generator Sample Line monitor, RM-G-17, detector power supply fails, however, the amplifier and digital ratemeter are still energized.
- Attempts to reset the ratemeter are unsuccessful.
- The RM-G-17 High Rad Interlock Defeat Switch has been placed in DEFEAT, IAW 1105-8 Radiation Monitoring System.

Which ONE (1) of the following describes actions that will be taken to ensure configuration control of RM-G-17 is maintained per OP-AA-108-101 Control of Equipment and System Status?

(1) An EST would be applied to RM-G-17 DEFEAT switch to ___(1)___.
(2) Configuration control is maintained per ____(2)____.

A. (1) allow I&C to replace the detector power supply, used in lieu of a Clearance order
(2) 1105-8 Radiation Monitoring System

B. (1) allow I&C to replace the detector power supply, used in lieu of a Clearance order
(2) Abnormal Component Positioning Sheet (ACPS)

C. (1) highlight the temporary position of the component
(2) 1105-8 Radiation Monitoring System

D. (1) highlight the temporary position of the component
(2) Abnormal Component Positioning Sheet (ACPS)

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because OP-AA-108-101 step 4.1.1.2 states that ESTs may

be used without ACPS in certain cases including clearance orders In these cases use the EST to highlight configuration. If it is believed that the EST replaces the info tag that would be used for a clearance order this could be chosen. 2nd part correct.

B. **Incorrect.** First part plausible but incorrect see (A) 2nd part incorrect for belief that the ACPS must be filled out.

C. **Correct.** According to OP-AA-108-101 (p3; Rev 8) an EST Tag is used to (1) identify the temporary status of equipment position to ensure configuration control, (2) identify temporary abnormal positioning in conjunction. (3) direct attention to any special condition of an operating system such as outstanding post-maintenance test or non-preferred equipment use. Because the RM-G-17 High Rad Interlock Defeat Switch has been placed in DEFEAT, an EST is required to be placed on the switch. The configuration control is maintained by use of the appropriate steps of 1105-8 to place the monitor in defeat, therefore the ACPS is not needed.

D. **Incorrect.** This is plausible because OP-AA-108-101 4.1.1.1 "utilize an ACPS for aligning equipment outside of routine operations…. " and the second part is correct. The power supply failure is obviously not normal, however the use of the defeat switch is in a normal procedure, making this plausible for misunderstanding of the intent of the procedure step.

Technical Reference(s): OP-AA-108-101 (p3; Rev 8) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-104-NOP-DBIG (PCO-2 & 3) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the process for controlling equipment configuration or status (i.e. use of the EST for identification of out of position equipment and the correct process to implement to operate the control ACPS or a portion of a procedure).

The question is at the Memory cognitive level because the operator must know the purpose of the 2 memory level pieces of information and apply their use appropriately to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	3	
	K/A #	G3 2.3.7	
	Importance Rating	3.5	

Radiation Control: Ability to comply with radiation work permit requirements during normal or abnormal conditions.

Proposed Question: RO Question # 32

Plant conditions:

- 100% power.
- Due to high RCS activity, portions of the Aux Building are in the process of being posted as a High Radiation Area.
- The entire area has not been completely surveyed since the high activity condition was detected, but surveys are on-going.
- An operator is required to enter this area for approximately five minutes for non-emergency valve operations.

Which ONE (1) of the following would meet the MINIMUM requirement for the operator to enter into the High Radiation Area per Technical Specifications, Section 6.12, High Radiation Area?

The individual is entered on a valid Radiation Work Permit and...

A. has a monitoring device which continuously displays area radiation dose rate.

B. is escorted by a Radiation Protection Technician equipped with a neutron dose rate monitoring instrument.

C. has a monitoring device set to alarm at 75% of the MAXIMUM allowable total dose for the task being performed.

D. is under direct surveillance by a Radiation Protection Technician who is using closed circuit TV, and a means to communicate with the individual.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to Technical Specification 6.12.1.a (p6-22; Amendment 213) Each High Radiation Area in which the intensity of radiation at 30 cm is > 100 mrem/hour

deep dose but < 1000 mrem/hour shall be barricaded and conspicuously posted as a High Radiation Area, and personnel desiring entrance shall use a RWP. Any individual entering an HRA shall (a) use a continuously indicating dose rate monitoring device, or (b) use a radiation dose rate integrating device which alarms at a pre-set dose level (entry into such areas can only be made after the dose rate levels in the area has been established and personnel have been made knowledgeable of them), or (c) assure that a RPT provides positive control over activities within the area and periodic radiation surveillance with a dose rate monitoring instrument.

B. **Incorrect.** This is plausible because a Radiation Protection Technician can monitor an individual in a High Radiation Area, however, the RP Tech must provide positive control over activities within the area and perform periodic radiation surveillance with a dose rate monitoring instrument. The neutron monitoring instrument is inappropriate for the Aux Building, although the operator may incorrectly believe this to be appropriate with high RCS activity.

C. **Incorrect.** This is plausible because the operator may use a radiation dose rate integrating device which alarms at a pre-set dose level. However, this can only be used after the dose rate levels in the area has been established and the individual has been made knowledgeable of them (which is still in progress).

D. **Incorrect.** This is plausible because a Radiation Protection Technician can monitor an individual in a High Radiation Area, however, the RP Tech must provide positive control over activities within the area and perform periodic radiation surveillance with a dose rate monitoring instrument. Additionally, according to RP-AA-460 (p8; Rev 19) this process is allowed at Limerick, Peach Bottom and Lasalle.

Technical Reference(s): Technical Specification 6.12.1.a (p6-22; Amendment 213)
RP-AA-460 (p8; Rev 20) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: N-TM-TQ-104-NOP-DBIG (PCO-3) (As available)

Question Source: Bank # WTSI 69340
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 2010 Ginna

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 12

55.43

Radiological safety principles and procedures.

Comments:

What MUST be known:

1. TS 6.12 requires that an individual, other than an RP Tech on routine assessment duties, upon entering an HRA, use one of three means to assure exposure to the individual is controlled.
2. The use of a radiation dose rate integrating device which alarms at a pre-set dose level is NOT permitted until dose rate levels in the area has been established and personnel have been made knowledgeable of them.
3. The use of neutron dose rate monitoring instrument upon entry by either the individual, or an RP Tech maintaining positive control is inappropriate.
4. The use of positive control over the individual by an RP tech monitoring the closed circuit TV is NOT permitted at TMI.

The KA is matched because the operator must demonstrate ability to comply with radiation work permit requirements during normal or abnormal conditions (by identifying what additional requirements must be met, other than using the RWP, to enter an HRA in accordance with TS).

The question is at the Memory cognitive level because the operator must recall the TS requirements for entry into a HRA.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	3	
	K/A #	G3 2.3.4	
	Importance Rating	3.2	

Radiation Control: Knowledge of radiation exposure limits under normal or emergency conditions.

Proposed Question: RO Question # 33

An Exelon employee has 1880 mrem TEDE exposure for this calendar year.

He is assigned to a task that will result in approximately 1200 mrem additional TEDE exposure. His work group supervisor has authorized his participation in the work.

In addition to the Work Group Supervisor, which ONE (1) of the following is the MINIMUM additional authorization required for this exposure in accordance with RP-AA-203, Exposure Limits and Controls?

A. RP Manager.

B. RP Manager <u>and</u> Plant Manager.

C. RP Manager <u>and</u> Site Vice President.

D. Plant Manager <u>and</u> Site Vice President.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because if the exposure was < 3000 mrem, it would be correct. According to Step 4.2.6 to raise the Administrative Dose Control level (ADCL) up to 3000 mrem in a calendar year, written approval is required by the RP manager and the Work Group Supervisor.

B. **Correct.** According to RP-AA-203 (p4; Rev 3) Step 4.2.1, exposures in excess of 2000 mrem/year TEDE must be approved. According to Step 4.2.7 to raise the Administrative Dose Control level (ADCL) from 3001 to 4000 mrem in a calendar year, written approval is required by the RP Manager, a Work Group Supervisor, and the Plant Manager.

C. **Incorrect.** This is plausible because there is an occasion when the Site VP must approve the allowable exposure and the operator may incorrectly believe that it applies here. According to Step 4.2.8 to raise the Administrative Dose Control level (ADCL) up to > 4000 mrem in a calendar year, written approval is required by the Site Vice President.

D. **Incorrect.** This is plausible because there is an occasion when the Plant Manager and the Site VP must approve the allowable exposure limits (See B and C); and the operator may incorrectly believe that it applies here.

Technical Reference(s): RP-AA-203 (p4; Rev 3) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-104-NOP-DBIG (PCO-1) (As available)

Question Source: Bank # TMI: IS-OP-AA-RPT-Q03

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 12

55.43

Radiological safety principles and procedures.

Comments:

The KA is matched because the operator must demonstrate Knowledge (i.e. authority for approval beyond ADCL) of radiation exposure limits under normal or emergency conditions.

The question is at the memory cognitive level because the operator must recall who must approve an exposure limit extension between 3000-4000 mrem per calendar year.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	3	
	K/A #	G3 2.3.12	
	Importance Rating	3.2	

Radiation Control: Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.

Proposed Question: RO Question # 34

Plant conditions:

- 50% power.
- There is a steam leak inside the RB.
- An urgent unplanned entrance into the RB is in progress.

Which ONE (1) of the following identifies the MINIMUM required compliment of personnel required to make this entry?

A. One Operator.

B. Two Operators.

C. One Operator and one RP Technician.

D. Two Operators and one RP Technician.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because based on the urgent nature of the entry and ALARA considerations, the Operator may incorrectly believe that only one Operator can make this entry.

B. **Incorrect.** This is plausible because based on the urgent nature of the entry, Safety considerations and the need to have qualified operators in the Containment, the Operator may incorrectly believe that two Operators, without an RP Technician, can make this entry.

C. **Correct.** According to RP-TM-460-1007 (p6; Rev 5) an Urgent Unplanned Entrance into the RB may be made without RWP, air and radiation surveys, or atmospheric

testing on direction of the SM. However, a minimum of two persons, at least one of whom is an RP Technician, the necessity to wear protective clothing and a respirator, have appropriate neutron/gamma dosimetry and rate meters cannot be waived.

D. **Incorrect.** This is plausible because the Operator may incorrectly believe that the minimum number of personnel required by procedure is three rather than two.

Technical Reference(s): RP-TM-460-1007 (p6; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 11.2.01.465DBIG Objective 1 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 12

55.43

Radiological safety principles and procedures.

Comments:

What MUST be known:

1. The need to have a minimum of two persons, at least one of whom is an RP Technician to make an urgent entry

Although the KA for this question, and that of Q70 are closely related, what must be known to answer the two questions are different, and do NOT present an overlap concern.

The KA is matched because the operator must demonstrate Knowledge of Radiological Safety Principles pertaining to licensed operator duties, such as containment entry requirements.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	067 AK3.02	
	Importance Rating	2.5	

Knowledge of the reasons for the following responses as they apply to the Plant Fire on Site Steps called out in the site fire protection plan, FPS manual, and fire zone manual

Proposed Question: RO Question # 35

AOP-001 step 3.11 directs entry into Fire Zone Specific procedures or attachments. This is done __(1)__ for the purpose of __(2)__ .

A. (1) from all plant conditions
(2) to direct fire fighting actions

B. (1) from all plant conditions
(2) to protect 1 train of safe shut down equipment

C. (1) from RCS > 200F ONLY
(2) to direct fire fighting actions

D. (1) from RCS > 200F ONLY
(2) to protect 1 train of safe shut down equipment

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** Both parts incorrect. Plausible for lack of knowledge of the reason for the zone manual steps and when they are applicable.

B. **Incorrect.** 1st part incorrect, 2nd part correct. This is plausible for a lack of understanding of the reason for the zone protection procedures, while understanding they are to protect equipment for safe shutdown the candidate may believe that the procedures are intended to protect the cold shutdown function as well.

C. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible for a knowledge of the words of the specific step (> 200F) but a lack of understanding of the reasons for the zone protection procedures. It is plausible to believe they deal with fire fighting methods (ie foam vs: water spray or other specifics to each area) rather than the equipment protected by actions contained in each section.

D. **Correct.** OP-TM-AOP-001 rev 8 step 3.11 States If RCS temperature > 200F then INITIATE referenced procedure for the affected fire area/zone as specified in Attachment 1. Basis document OP-TM-AOP-0011 rev 8 page 18 States these procedures are not applicable when the plant is in cold shut down since the plant the plant is already in the end state the safe shutdown procedures are designed to achieve.

Technical Reference(s): OP-TM-AOP-001 rev 8 pg 5
OP-TM-AOP-0011 rev 8 pg 18 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: AOP-001-PCO-1 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10
55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the reasons for the Fire AOPs as they apply to the Plant Fire on Site (i.e. knowledge of the overall mitigation process of the AOP-001 enclosures and sub-procedures).

The question is at the Memory cognitive level because the operator must recall why a specific action with reference to the overall mitigation strategy.

Question is at the RO level because it only tests the overall mitigation strategy.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	4	
	K/A #	G4 2.4.43	
	Importance Rating	3.2	

Emergency Procedures / Plan: Knowledge of emergency communications systems and techniques.

Proposed Question: RO Question # 36

Plant conditions:

- 09:22 - An Unusual Event (UE) was declared
- 09:26 - The Shift Communicator was provided the State/Local Event Notification Form EP-MA-114-100-F-01
- 09:27 - The initial role call is complete except for Dauphin County who did not answer
- 09:28 - A Site Area Emergency (SAE) was declared

With the above conditions the Shift Communicator is required to ____(1)____ and the Site Area Emergency notification ____(2)____.

A. (1) hold the notification until the Dauphin County is contacted via alternate means
(2) can be made in place of the Unusual Event if accomplished before 09:37

B. (1) hold the notification until the Dauphin County is contacted via alternate means
(2) can only be made after the Unusual Event notification and before 09:43

C. (1) notify the Shift ED so Dauphin County can be notified by 09:37 by an alternate means
(2) can be made in place of the Unusual Event if accomplished before 09:37

D. (1) notify the Shift ED so Dauphin County can be notified by 09:37 by an alternate means
(2) can only be made after the Unusual Event notification and before 09:43

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** Plausible since the SAE notification can be made instead of the UE if made by 09:37; however the notification to the answering parties will not be held up while Dauphin County is contacted via alternate means.

B. **Incorrect.** Plausible since the SAE notification must be made by 09:43; however it can be made instead of the UE if made by 09:37 and the notification to the answering parties will not be held up while Dauphin County is contacted via alternate means.

C. **Correct.** The Shift ED must be notified after the role call if a county or PEMA does not answer so they can be notified within 15 minutes by an alternate means IAW EP-MA-114-100. The SAE can be made instead of the UE if made within 15 minutes of the UE declaration IAW EP-AA-112-100-F-01.

D. **Incorrect.** Plausible since the Shift ED must be notified; however the SAE can be made instead of the UE if made by 09:37.

Technical Reference(s): EP-MA-114-100, Rev 15 (Page 9)
EP-AA-112-100-F-01, Rev L (Page 3) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EP101007 (As available)

Question Source: Bank # IR-EP101007-Q03
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 2008 TMI Q#75

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10
55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:
The KA is matched because the operator must demonstrate Knowledge of the communications systems and techniques, if one county fails to answer how is that county contacted and when.

The question is at the Comprehension/Analysis cognitive level because the operator must do math to determine time remaining.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	065 2.4.31	
	Importance Rating	4.2	

Evolution Loss of Instrument Air - Emergency Procedures / Plan: Knowledge of annunciator alarms, indications, or response procedures.

Proposed Question: RO Question # 37

Plant Conditions:

- IA-P-4, Instrument Air Compressor, tripped.
- Instrument Air pressure is 74 psig and slowly lowering.
- The crew has initiated OP-TM-AOP-028, Loss of Instrument Air.
- Instrument Air header pressure upstream of the pre-filters has dropped to 80 psig.
- Standby Instrument Air Compressors IA-P-1A and IA-P-1B, failed to load.
- Neither IA-P-1A nor IA-P-1B are responding to their control switches in the Control Room.

Which ONE (1) of the following identifies the action to be taken NEXT in accordance with OP-TM-AOP-028?

A. Ensure the Reactor is tripped.

B. Block open RB IC Outlet and Inlet Valves IC-V-3 **and** IC-V-4.

C. Ensure Service Air Compressor SA-P-1A **or** SA-P-1B is running.

D. Locally start Standby Instrument Air Compressors IA-P-1A **and** IA-P-1B.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because according to OP-TM-AOP-028 (p3; Rev 5) Step 3.2, the operator is directed to ensure the reactor is tripped IAAT IA pressure is < 60 psig.

B. **Incorrect.** This is plausible because according to OP-TM-AOP-028 (p3; Rev 5) Step 3.2, the operator is directed to Block open IC-V-3 and IC-V-4 IAAT IA pressure is < 60 psig, and ICCW flow is > 550 gpm.

C. **Correct.** According to OP-TM-AOP-028 (p3; Rev 5) Step 3.3, the operator is directed to check if IA-PI-491 is < 85 psig, and IA-P-1A or IA-P-1B is NOT loaded from the Control Room (As stated in the conditions). Since this is the case, the RNO must be implemented which directs the operator to ensure that SA-P-1A or 1B is running.

D. **Incorrect.** This is plausible because on at least two occasions, AOP-028 directs that actions be taken locally; and the operator may incorrectly believe that this action is also directed locally.

Technical Reference(s): OP-TM-AOP-028 (p3; Rev 5) Step 3.3 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-AA-223-F070 (PCO-2 and 5) (As available)

Question Source: Bank # TMI: IR-AOP-028-PCO-4-Q05

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate knowledge of the response procedure associated with a loss of Instrument Air.

The question is at the Memory cognitive level because the operator must recall major actions based on specific conditions to answer the question correctly.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	078 A3.01	
	Importance Rating	3.1	

Ability to monitor automatic operation of the IAS, including: Air pressure

Proposed Question: RO Question # 38

The following plant conditions exist:

- A rupture occurs in the 1 1/2 to 3/4 inch reducer on the air header supplying Turbine Bypass Valve MS-V- 3D.
- Instrument Air Compressor, IA-P-4 trips on overload.
- Standby Instrument Air Compressors, IA-P-1A/B, and Service Air Compressors,SA-P-1A/B, are started successfully.
- Instrument air primary (PI-222) and secondary (PI-1403) pressure indicators on Panel PL are tracking together and continue to lower.

Which ONE (1) of the following indications would be observed on Panel PL when IA-V-26 closes?

When header pressure drops below.....

A. 60 psig, PI-222 starts to RISE and PI-1403 continues to LOWER.

B. 60 psig, PI-1403 starts to RISE and PI-222 continues to LOWER.

C. 80 psig, PI-222 starts to RISE and PI-1403 continues to LOWER.

D. 80 psig, PI-1403 starts to RISE and PI-222 continues to LOWER.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to TQ-TM-104-850-C001 (p12; Rev 2), Secondary Plant Instrument Air Supply IA-V-26 Automatically isolates secondary plant Instrument Air header from primary plant Instrument Air header if secondary plant header pressure lowers to 60 psig. MS-V-3D is in the Turbine Building, which will be isolated by the closing of IA-V-26 and therefore isolating the leak from the primary side. According to TQ-TM-104-850-C001 (p36; Rev 2), the Control Room has two IA pressure indications; PT-222,

which monitors the Primary Instrument Air Header, and PT-1403, which monitors the Secondary Instrument Air Header. Therefore, PI-1403 continues to LOWER as secondary side pressure bleeds off and the primary side pressure will recover. See Drawings 302-271 & 302-268.

B. **Incorrect.** This is plausible if the operator confuses the IA pressure instruments with the headers that they monitor, is unaware of the leak location, or unaware of the function of IA-V-26. For instance, if the operator incorrectly believed that the leak is on the primary header and that IA-V-26 auto closes at 60 psig to isolate the primary and secondary headers, this could be viewed as correct.

C. **Incorrect.** This is plausible because according to OP-TM-AOP-028 (p1; Rev 5) the AOP is entered if either Primary IA header pressure is < 80 psig on psig and lowering, as well as if secondary IA header pressure is < 80 psig on PI-1403; and the operator may incorrectly believe that IA-V-26 auto closes at 80 psig rather than 60 psig.

D. **Incorrect.** This is plausible because according to OP-TM-AOP-028 (p1; Rev 5) the AOP is entered if either Primary IA header pressure is < 80 psig on psig and lowering, as well as if secondary IA header pressure is < 80 psig on PI-1403; and the operator may incorrectly believe that IA-V-26 auto closes at 80 psig rather than 60 psig. Additionally, this is plausible if the operator confuses the IA pressure instruments with the headers that they monitor, is unaware of the leak location, or unaware of the function of IA-V-26 (See B above).

Technical Reference(s): TQ-TM-104-850-C001 (p12; Rev 2)
TQ-TM-104-850-C001 (p36; Rev 2)
OP-TM-AOP-028 (p1; Rev 5)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 850-GLO-2, 6, 8 and 10 (As available)

Question Source: Bank # WTSI 62729/TMI: QR-AOP028-PCO-5-Q01

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2008 TMI Q#53

Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	4	
	55.43		

Secondary coolant and auxiliary systems that affect the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to monitor automatic operation of the IAS (i.e. IA-V-26 auto operation),including air pressure in both the primary and secondary headers by predicting how they will trend upon automatic system isolation.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of the automatic operation of the IA system under conditions with a leak in the system; and then predict how this automatic action affects at least two important IA headers.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	003 A3.03	
	Importance Rating	3.2	

Ability to monitor automatic operation of the RCPS, including: Seal D/P

Proposed Question: RO Question # 39

In accordance with OP-TM-226-000, and as measured on MU-13-DPI-1/ 2/ 3/ 4 RC-P-1 Seal No. 1 Delta Pressure Indicator, which one of the choices below indicate the Reactor Coolant Pump #1 Seal differential pressure: (1) required to start a Reactor Coolant Pump, and (2) during normal power operations?

A. (1) > 10 psid
(2) 50 to 60 psid

B. (1) 27 to 90 psid
(2) 40 to 60 psid

C. (1) > 210 psid
(2) > 400 psid

D. (1) > 275 psid
(2) 275 to 400 psid

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible if the operator mistakes the labyrinth seal D/P; 1st number is the top of the "red" band the second is the normal operating pressure.

B. **Incorrect.** This is plausible if the operator mistakes the normal back pressure setting that is used to accomplish seal flow. At low RCS pressures the band of 27 to 90 psig is used at normal operating pressures 40 to 60 psig is used.

C. **Correct.** > 210 is a starting interlock for all Reactor Coolant pumps and a limit in OP-TM-226-000 Rev 3A step 2.2.4 and 2.2.5 along with attachment 7.2. Normal differential pressure is greater than the 400 psid range of the gage (2250 psid).

D. **Incorrect.** This is plausible 275 psid is the bottom end of the green band on the gage,

and 400 is the top of the gage plausible for candidate that does not know the normal reading exceeds the range of the gage.

Technical Reference(s): OP-TM-226-000 (p3 Rev 3A Step 2.2.4
OP-TM-226-000 (p3; Rev 3A, Attachment 7.2 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 226-GLO-6 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10
55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:
The KA is matched because the operator must demonstrate Ability to monitor automatic operation of the RCPS, specifically the #1Seal D/P (i.e. what is the minimum acceptable D/P for starting and normal displayed value.

The question is at the Memory cognitive level because the operator must recall two bits of information to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	077 AK2.05	
	Importance Rating	3.1	

Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Pumps

Proposed Question: RO Question # 40

Plant conditions:

- The plant is operating at 100% power.
- The Electrical Grid Voltage dropped to 223.8 KV about one hour ago.
- The crew has responded in accordance with 1107-11, "TMI Grid Operations," and adjusted the Main Generator reactive load within the allowable limits of the Generator Capability Curve.
- The Electrical Grid Voltage has stabilized at 224.6 KV.

Which ONE (1) of the following identifies the pumps whose operating voltage is most affected by the above conditions?

A. Makeup.

B. Condensate.

C. Reactor Coolant.

D. Circulating Water.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because the operating MU pump is powered from the 4.16 KV ES Bus, and no other selection is. The operator may misunderstand how station Electrical Bus voltage is controlled and/or how Grid voltage affects in-house electrical loads. However, according to TQ-TM-104-701-C001 (p44; Rev 3), the LTC automatically controls 4KV voltage at or near the required setpoint (4162-4218) under the stated conditions, and the MU Pump will be relatively unaffected.

B. **Incorrect.** This is plausible because the operating Condensate pumps are powered

from the 4.16 KV BOP Buses, and no other selection is. The operator may misunderstand how station Electrical Bus voltage is controlled and/or how Grid voltage affects in-house electrical loads. However, according to TQ-TM-104-701-C001 (p44; Rev 3), the LTC automatically controls 4KV voltage at or near the required setpoint (4162-4218) under the stated conditions, both ES and BOP buses, and the CO Pumps will be relatively unaffected.

C. **Correct.** According to TQ-TM-104-701-C001 (p5; Rev 3), the 230KV Substation supplies power to the Auxiliary Transformers at all times. According to TQ-TM-104-701-C001 (p23; Rev 3) the 1A and 1B Auxiliary Transformers step down the voltage from 230KV to the 7KV buses through a fixed Tap, and to the 4.16KV buses through a Load Changer Tap. According to TQ-TM-104-701-C001 (p44; Rev 3), the LTC automatically controls 4KV voltage at or near the required setpoint (4162-4218). On the other hand, the 7KV Bus voltage is controlled by the fixed Tap from the Aux Transformers, rendering the voltage control of the 7KV buses subject to Voltage swings on the Grid. If the Grid Voltage is abnormally low, as is the case in the stated conditions, so will the voltage on the 7KV Buses be abnormally low. If so, the RCP motors will be most affected. This is reflected in station ARPs. According to MAP-AA-2-2 (p1; Rev 6) the 7KV BUS UV annunciator will alarm when the 7KV Bus voltage is 88% below rated voltage (6100≈) for either the 1A or the 1B 7KV Bus; and it is noted that this condition could result in a trip of the RCPs. According to TQ-TM-104-226-C001 (p34; Rev 4), the RCPs will trip on Bus running undervoltage of 6.15 KV for 5.18 seconds.

D. **Incorrect.** This is plausible because the operating Circulating Water pumps are powered from the 4kV Bus., However, according to TQ-TM-104-701-C001 (p44; Rev 3), the LTC automatically controls 4KV voltage at or near the required setpoint (4162-4218) under the stated conditions, both ES and BOP buses, and the CO Pumps will be relatively unaffected.

Technical Reference(s):	TQ-TM-104-701-C001 (p5, 23 and 44; Rev 3) MAP-AA-2-2 (p1; Rev 6) TQ-TM-104-226-C001 (p34; Rev 4)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective:	701-GLO-2 226-GLO-6	(As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

	New	X	
Question History:		Last NRC Exam:	N/A
Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	4	
	55.43		

Secondary coolant and auxiliary systems that affect the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances (i.e. Low Grid Voltage adjusted as much as able by TMI Generator) and various plant pumps (i.e. RCPs, MU Pump, Condensate Pumps, Circ Water Pump).

The question is at the Comprehension/Analysis cognitive level because the operator must identify the affect of low Electrical Grid voltage on the plant 7KV and 4.16KV buses, and then evaluate the consequence of this to the operation of several pumps, predicting which will be affected.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	003 K1.13	
	Importance Rating	2.5	

Knowledge of the physical connections and/or cause-effect relationships between the RCPS and the following systems: RCP bearing lift oil pump

Proposed Question: RO Question # 41

Which ONE (1) of the following identifies a requirement that must be satisfied, for any Reactor Coolant Pump, before it can be started?

A. Reactor Power < 35%.

B. RCS temperature > 403°F.

C. Lift oil pressure > 1000 psig for the pump.

D. ICCW Flow ≥ 550 gpm OR Seal Injection Flow ≥ 22 gpm.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because 30% power is a starting interlock for RCPs. This is incorrect as the setpoint listed is above the allowable setpoint.

B. **Incorrect.** In actuality 403°F is a previously used setpoint. According to OP-TM-226-000 (p12; Rev 3A), RCS temperature of > 465°F forms Starting Interlock #1 for each RCP. According to Lesson Plan TQ-TM-104-226-C001 (p30; Rev 4), ECR 09-00373, implemented during T1R18 Refueling Outage, resulted in a change in the interlock setpoint from 403°F to 465°F.

C. **Correct.** According to OP-TM-226-000 (p12; Rev 3A), a Motor Oil Lift System Pressure of > 1000 psig is one of ten interlocks associated with Starting Interlock #2 for each RCP.

D. **Incorrect.** This is plausible because ICCW Flow ≥ 550 gpm AND Seal Injection Flow ≥ 22 gpm are required to start a pump, only one of the two are required to continue to run the pump, this is incorrect because an OR is listed.

Technical Reference(s):	OP-TM-226-000 (p12; Rev 3A) OP-TM-226-000 (p2; Rev 3) OP-TM-AOP-040 (p1; Rev 0) Lesson Plan TQ-TM-104-226-C001 (p30; Rev 4) May modify this.	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 226-GLO-10 (a) (As available)

Question Source: Bank #

Modified Bank # WTSI 58492 (Note changes or attach parent)

New

Question History: Last NRC Exam: 2005 Davis Beese

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 3

55.43

Mechanical components and design features of reactor primary system.

Comments:

The KA is matched because the operator must demonstrate knowledge of the RCPS starting interlocks, specifically that an RCP will not start unless Bearing Lift Oil pressure is greater than 1000 psig (A direct result of operating the Bearing Oil Lift Pump).

The question is at the Memory cognitive level because the operator must recall specific bits of information (Starting Interlocks and their setpoints) necessary to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	027 AA2.13	
	Importance Rating	2.8	

Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions: Seal return flow

Proposed Question: RO Question # 42

Plant conditions:

- 100% power.
- MU-V-32, Seal Injection Control Valve, is in HAND supplying 38 gpm total RCP Seal Injection flow.

Subsequently:

- The controlling RCS Pressure instrument fails HIGH.
- The SASS function for this instrument fails to operate.

Which ONE (1) of the following describes how the RCP Seals are affected?

A. Total Seal Supply flow will LOWER.

B. RCP # 2 Seal Leakoff flow will RISE.

C. RCP Seal Inlet temperature will RISE.

D. RCP # 1 Seal Leakoff flow will LOWER.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because Total Seal Supply flow is an observable parameter associated with this system; and the operator may mis-understand how the system operates.

B. **Incorrect.** This is plausible because leakage through the #2 Seal is an indirectly observable parameter associated with this system; and the operator may mis-understand how the system operates. According to TQ-TM-104-226-C001 (p11; Rev

4), the #2 seal is a rubbing-face type. Leakage from the #1 seal (about 3 gpm) flows upward along the shaft to the #2 seal area. At this point, most of this water exits through #1 seal leakoff to be returned to Makeup Tank. Leakage through the #2 seal is dependent upon the condition of the seal itself, which has not been affected by this transient.

C. **Incorrect.** This is plausible because RCP Seal Inlet temperature is an observable parameter associated with this system; and the operator may mis-understand how the system operates.

D. **Correct.** According to TQ-TM-104-220-C001 (p10; Rev 5), Spray flow is controlled by a motor operated globe valve (RC-V-1) that has the capability of automatic or manual operation. In the automatic control mode, the valve will open at a 2205 psig setpoint to a maximum of 40% open until the pressure is reduced to 2155 psig. According to OP-TM-MAP-G0308 (p1; Rev 3) failure of the controlling RCS Pressure instrument RC3-PR or RC3-PIS (CC) (in which SASS fails to operate) could result in system LO Pressure alarm at 2105 psig. This would occur when the controlling channel failed HIGH causing the Spray valve to open to 40% and spraying relatively cold water into the Pzr Steam Space. When this occurs, RCS pressure will lower. According to TQ-TM-104-211-C001 (p28; Rev 4) and OPM B-05 (p6; Rev 18), Reactor Coolant Pump seal injection flow is routed from the Makeup Pump through the Seal Injection Control Valve, MU-V-32, and Reactor Coolant Pump seal supply of approximately 32 gpm (8 gpm per pump) is regulated to provide sealing water to each seal at a pressure slightly higher than primary coolant pressure. A portion of the water supplied to the RCPs leaks off through the #1 seal (3 gpm), and the remainder is injected into the RCS. Since MU-V-32 is in HAND the seal injection flow will NOT change. If the controlling RCS Pressure instrument fails HIGH, the spray valve will open lowering RCS pressure. When RCS pressure lowers more seal injection flow will flow downward along the RCP shaft and into the RCS, and less flow will be provided to the #1 RCP seal for each pump. According to TQ-TM-104-226-C001 (p9; Rev 4), the #1 seal is a controlled leakage, film-riding face seal. The seal consists of two elements; a runner which rotates with shaft and a non-rotating seal ring attached to seal housing. The two faces are slightly beveled from each other. As injection water flows upward along shaft, it exerts equal pressure on top and face of seal ring. Since the seal ring face is beveled, the area on which pressure is exerted is larger than the area on top of the seal ring to ensure that upward force slightly overcomes downward forces of water pressure and weight of seal ring assembly. Thus, high-pressure water is able to keep the two faces of the seal slightly apart (film riding face) while a controlled amount of water at a much lower pressure (due to restrictive passage of approximately 0.0045-inch face separation) flows between the two faces (controlled leakage). Therefore, since the entire seal injection system is in an equilibrium balance, when more seal injection flow is injected into the RCS because of the lower RCS pressure, and seal injection flow/pressure is constant, less flow is routed to the #1 seal, and the differential pressure across the seal will lower, lowering the #1 RCP Seal Return flow.

Technical Reference(s):	TQ-TM-104-220-C001 (p10; Rev 5) OP-TM-MAP-G0308 (p1; Rev 3) TQ-TM-104-211-C001 (p28; Rev 4)	(Attach if not previously provided)

OPM B-05 (p6; Rev 18)
TQ-TM-104-226-C001 (p9; Rev 4)

Proposed References to be provided to applicants during examination: None

Learning Objective: 220-GLO-2, 5 and 8
226-GLO-2 and 8 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 3
55.43

Mechanical components and design features of reactor primary system.

Comments:
The KA is matched because the operator must demonstrate the ability to determine trend direction of the Seal return flow when a Pressurizer Pressure Control Malfunctions occurs causing a lower than normal RCS pressure.

The question is at the Comprehension/Analysis cognitive level because the operator must determine how the plant responds to a failure of an RCS pressure instrument (lower pressure); and then use that outcome to determine how the RCP Seal Return flow is affected.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	010 K6.03	
	Importance Rating	3.2	

Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR sprays and heaters

Proposed Question: RO Question # 43

Plant is operating at 100% power.

Event:

- A plant transient has resulted in RCS pressure rising to 2210 then lowering to the point at which all Pressurizer Heater Banks energized.

Subsequently:

- The plant stabilized.
- RCS pressure rose to normal operating pressure.
- The Bank 5 Pressurizer Heater Bistable failed causing the heaters to remain energized.
- RCS pressure is 2165 and rising slowly.

Which ONE (1) of the following describes the status of the remaining Pressurizer Heater Banks, AND the operation of the Spray Valve, RC-V-1?

A. Pressurizer Heater Bank 1 is energized and full ON;
All other Heater Banks are either full OFF or de-energized;
Spray Valve RC-V-1 is CLOSED.

B. Pressurizer Heater Banks 1 and 4 are energized and full ON;
Pressurizer Heater Banks 2 and 3 are de-energized;
Spray Valve RC-V-1 is CLOSED.

C. Pressurizer Heater Banks 1 and 4 are energized and full ON;
Pressurizer Heater Banks 2 and 3 are de-energized;
Spray Valve RC-V-1 is OPEN.

D. Pressurizer Heater Bank 1 is energized and full ON;
All other Heater Banks are either full OFF or de-energized;
Spray Valve RC-V-1 is OPEN.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct, 3rd part correct. According to OP-TM-104-220-C001 (p8-9; Rev 5), the control of the Pressurizer heaters is by "banks" of switches on Console Right. Bank one contains Group 1 (SCR controlled - bias and gain adjusted to maintain heaters full on). Bank two contains Group 2 (SCR controlled - full on at 2135 psig/full off at 2155 psig). Bank three contains Groups 3,4,5,6 (SCR controlled - full on at 2135 psig/full off at 2147 psig). Bank four contains Groups 7,8,9 (Bistable controlled - on at 2120/off at 2140). Bank five contains Groups 10,11,12,13 (Bistable controlled - on at 2105/off at 2155). Additionally, according to OP-TM-104-220-C001 (p109; Rev 5), Spray Valve RC-V-1, in the automatic control mode, will open at a 2205 psig setpoint and remain open until the pressure is reduced to 2155 psig. Consequently, when the transient lowered RCS pressure to the point at which all Pressurizer Heaters were energized (i.e. 2105 psig for Bank 5), RC-V-1 would have been closed. It will remain CLOSED until RCS pressure rises to 2205 psig, which it has NOT reached. Therefore, the Spray Valve is CLOSED. Since the Bank 5 Heater Bistable has failed, these heaters are still energized and causing RCS pressure to rise. If all other components worked as designed, the Bank 1 Pressurizer Heaters, which are SCR controlled, will still be energized and full ON, the Banks 2 and 3 Pressurizer Heaters, which are also SCR controlled, will be energized but full OFF because their full OFF setpoint has been exceeded, and the Bank 4 Pressurizer Heaters would have de-energized these heaters when RCS pressure rose to 2140 psig.

B. **Incorrect.** 1st part wrong, 2nd part wrong, 3rd part correct. This is plausible because the operator may not know the operation of the Bank 4 heaters. If the operator incorrectly believed that these heaters de-energized at a higher pressure, this would be correct.

C. **Incorrect.** 1st part wrong, 2nd part wrong, 3rd part wrong. This is plausible because the operator may not know the operation of the Bank 4 heaters; or the proper operational band of the Spray Valve in AUTO. If the operator incorrectly believed that the Bank 4 heaters de-energized at a higher pressure, AND that the Spray Valve opened in AUTO at a lower pressure, this would be correct.

D. **Incorrect.** 1st part correct, 2nd part correct, 3rd part wrong. This is plausible because the operator may not know the operation of the Spray Valve in AUTO. If the operator incorrectly believed that the Spray Valve opened in AUTO at a lower pressure, this would be correct.

Technical Reference(s): OP-TM-104-220-C001 (p8-10; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 220-GLO-5, 7 and 8 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge of how the Pressurizer Heaters and Sprays Valve will respond in Auto given that the RCCS PPCS has experienced a failure that will result in a pressure adjustment.

The question is at the Comprehension/Analysis cognitive level because the operator will have to analyze the given conditions to determine what automatic actions will occur, to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	A06 AK2.1	
	Importance Rating	3.8	

Knowledge of the interrelations between the (Shutdown Outside Control Room) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Proposed Question: RO Question # 44

Plant conditions:

- A Loss of Offsite power has occurred, and the crew has entered OP-TM-AOP-020, Loss of Station Power.
- Pressurizer heater control has been established for Group 9 heaters on 1S 480V Bus in accordance with OP-TM-220-901, Emergency Power Supply for Pressurizer Heaters.
- A fire in the Relay Room occurs and plant control is established at the Remote Shutdown Panels.
- Per CRS direction, the "PRESS HTR GROUP 9" 69 Transfer Switch has been placed to EMERG on the 1S 480V Bus.

Subsequently:

- Pressurizer level drops to 75 inches.
- RCS pressure drops to 1600 psig, and the ESAS actuates.

Which ONE (1) of the following describes the operation of the Group 9 Pressurizer Heaters?

The Group 9 heater breaker on the 1S 480V Bus will.....

A. trip and lockout.

B. trip but NOT lockout.

C. remain closed, and the heaters will remain energized.

D. remain closed, but the heaters will de-energize due to low Pressurizer level.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because many plant breakers trip and lockout on an ESAS actuation.

B. **Incorrect.** This is plausible because this is what would occur if the Group 8 Heaters were aligned rather than the Group 9 heaters (aligned as stated). This would also be the plant response if the "PRESS HTR GROUP 9" 69 Transfer Switch were in the NORMAL position on the 1S 480V Bus.

C. **Correct.** According to TQ-TM-104-220-C001 (p8-9; Rev 5), Pressurizer Heater MCC 1B provides power to Heater Group 8 and Heater Group 9. During Emergencies, if normal power is lost, Group #8 can be powered from 480V "P" bus or Group #9 from 480V "S" bus, IAW OP-TM-220-901. According to OP-TM-220-901 (p1; Rev 5) an ES Signal will trip the pressurizer heaters off the bus but will not lock them out. The group 9 ES signal may be bypassed using the "PRESS HTR GROUP 9" 69 Transfer Switch on the 1S 480v Bus Relay Panel. According to OP-TM-220-901 (p4; Rev 5) if ESAS is unreliable (i.e. fire in the ESAS Room, Relay Room, or Control Room), place the "PRESS HTR GROUP 9" 69 Transfer Switch on 1S 480v Bus Relay Panel in EMERG to bypass the ES load shed interlock. Under this configuration, if an ESAS were to occur, the Group 9 heaters emergency breaker will remain closed, and the heaters will remain energized.

D. **Incorrect.** This is plausible because the operator may know that the 69 Transfer switch prevents the trip but incorrectly believe that the Pressurizer low level will affect the control circuit. According to OP-TM-220-901 (p1; Rev 5) there is no heater automatic cut off on low level while powered from ES bus, therefore, low Pressurizer level will not affect the operation of either Group 8 or 9 heaters when on the emergency bus.

Technical Reference(s): TQ-TM-104-220-C001 (p8-9; Rev 5)
OP-TM-220-901 (p1 and 4; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 220-GLO-2 and 10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History:		Last NRC Exam:	N/A
Question Cognitive Level:	Memory or Fundamental Knowledge		X
	Comprehension or Analysis		
10 CFR Part 55 Content:	55.41	7	
	55.43		

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the interrelations between the process of Shutdown Outside Control Room and Components, and functions of control and safety systems such as Pressurizer heaters, including signals, interlocks, failure modes, and automatic and manual features (i.e. How do the Group 8 & 9 Pressurizer heaters operate from the RSD during ESAS).

The question is at the Memory cognitive level because the operator must recall design features associated with both Pressurizer Heaters Groups 8 and 9 to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	024 AA1.22	
	Importance Rating	3.2	

Ability to operate and / or monitor the following as they apply to the Emergency Boration: Safety injection valves, switches, flow meters, and indicators

Proposed Question: RO Question # 45

Plant conditions:

- Reactor is tripped from 100% power.
- CRD Group 1 Rod 1 and Rod 2 are stuck (fully withdrawn).
- Pressurizer level control valve MU-V-17 is closed in automatic.
- Pressurizer level is above the current automatic control setpoint.
- RCS Makeup Flow is 0 gpm.
- HPI Valves MU-V-16A-D are all closed.
- RCS letdown flow is 0 gpm.
- Total RCP Seal Injection Flow is 38 gpm, steady.
- Total RCP Seal #1 Leak-off flow is 10 gpm, steady.

Which ONE (1) of the following identifies the MINIMUM actions required to initiate emergency boration of the RCS in accordance with Rule 5, Emergency Boration?

A. Open MU-V-14A or MU-V-14B;
Restore RCS letdown flow to raise RCS makeup flow to 13 gpm.

B. Open MU-V-14A or MU-V-14B;
Restore RCS letdown flow to raise RCS makeup flow to 23 gpm.

C. Open (BOTH) MU-V-14A and MU-V-14B;
Restore RCS letdown flow to raise RCS makeup flow to 13 gpm.

D. Open (BOTH) MU-V-14A and MU-V-14B;
Restore RCS letdown flow to raise RCS makeup flow to 23 gpm.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-EOP-0101 (p24; Rev

3) Step 3, when borating from the BWST either MU-V-14A or 14B must to be opened. According to OP-TM-EOP-010 (p11; Rev 11) Step 4, after the operator has opened MU-V-14A or 14B, the operator is directed to verify total injection flow is > 50 gpm. The total injection flow is a combination of MU, SI and HPI. If there is not > 50 gpm, the operator must implement the RNO which allows initiating or increasing RCS Letdown flow. Since under the stated conditions there is no letdown flow, the operator will place letdown in service and MU-V-17 will respond by automatically opening to maintain Pzr level setpoint. Once MU flow has increased to 13 gpm, a total injection flow of > 50 gpm will exist.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may incorrectly believe that the 10 gpm of RCS inventory must be compensated for in the process of Emergency Boration.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that both valves must be opened. A similar action is the case in alternate emergency boration while one pump would work both CA-P-1A and CA-P-1B are specified.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): OP-TM-EOP-0101 (p24; Rev 3) Step 3
OP-TM-EOP-010 (p11; Rev 11) Step 4 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP010-PCO-1 and 2 (As available)

Question Source: Bank #
Modified Bank # TMI: IR-EOPR5-PCO-4-Q01 (Note changes or attach parent)
New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content:	55.41	10
	55.43	

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to operate and/or monitor the Safety injection valves, switches, flow meters, and indicators as they apply to Emergency Boration (i.e. Rule 5).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate a set of plant conditions (i.e. involving total injection flow) and apply the criteria of Rule 5, emergency boration, correctly to answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	029 EK3.03	
	Importance Rating	3.7	

Knowledge of the reasons for the following responses as they apply to the ATWS: Opening BIT inlet and outlet valves

Proposed Question: RO Question # 46

With the plant at 100% power, the following events occur:

- A loss of both Main Feed Water pumps occurs.
- The RO presses both reactor trip and DSS pushbuttons.
- The control rods do NOT trip and remain out of the core.
- The crew trips BOTH 1L-02 and 1G-02.
- Several control rods remain out of the core at their original position.
- Reactor shutdown can NOT be verified.
- Reactor Coolant System pressure rises to 2550 psig.

Subsequently:

- The Main Turbine is verified to be tripped.
- Emergency Feedwater has been initiated in accordance with OP-TM-424-901.
- Primary-to-Secondary Heat Transfer (PSHT) is being maintained.
- RCS pressure is 2475 psig and lowering rapidly.

Which ONE (1) of the following identifies the next required action, AND the reason for this action?

A. Open MU-V-51, Emergency Boric Acid Addition to Makeup Tank, IAW Guide 1;
To ensure inventory control during the subsequent recovery.

B. Initiate High Pressure Injection IAW OP-TM-211-901, Emergency Injection HPI/LPI;
To maintain the reactor shutdown.

C. Maximize the Batch Size and Select Run on the totalizer batch controller;
To ensure inventory control during the subsequent recovery.

D. Open MU-V-14A **and** 14B, Makeup Pump Suction from Borated Water Storage Tank, IAW Rule 5;
To maintain the reactor shutdown.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because according to OP-TM-EOP-001 (p5; Rev 10) Step 3.3, the operator will be directed to verify the control rods groups are fully inserted, and if NOT, initiate Rule 5. However, the crew will be obligated to initiate HPI per Step 2.2 RNO, prior to taking this action. If the operator incorrectly believed that the next correct action is to initiate Rule 5, the operator will be directed to either open MU-V-14A, open MU-V-14B, or initiate Guide 1. According to OP-TM-EOP-010 Guide 1 (p13; Rev 11), MU-V-51 would be opened if using the BAMT as the Emergency Boration source. However, the operator may incorrectly believe that the initiation is accomplished to control RCS inventory.

B. **Correct.** According to OP-TM-EOP-001 (p1; Rev 10) Step 2.2, upon entry into the EOP the operator will be directed to press both reactor trip and DSS pushbuttons, and verify REACTOR SHUTDOWN. Since this cannot be accomplished, the RNO actions must be taken. If so, the operator is next directed to Trip both 1L-02 and 1G-02 and then again verify the reactor is shutdown. If so, the operator will proceed to Step 2.3, and skip over the step to inject borated water into the RCS. Since the crew is preparing to inject boron into the core, the attempt to de-energize the CRDMs by opening the AC Power Breakers was unsuccessful, and the operator must continue on in the Step 2.2 RNO. The operator will eventually be directed to INITIATE OP-TM-211-901, Emergency Injection HPI/LPI, after verifying that RCS pressure is less than 2500 psig. According to OP-TM-EOP-0011 (p6; Rev 1) if sufficient rod insertion has not occurred to terminate the fission process (when the AC Power Breakers are tripped) rising fuel and moderator temperature will shutdown the fission process. Therefore, boron addition is NOT needed to shutdown the reactor. However, raising boron concentration of the RCS will maintain the reactor shutdown without relying on these inherent core characteristics. The step to inject boron directs the operator to align for emergency injection only if RCS pressure is < 2500 psi. This is done so that the low HPI flow conditions associated with high RCS pressure conditions will not damage the pumps. Therefore, it can be seen that the step is taken because it offers the advantage of NOT having to rely on fuel/core operating characteristics. However, it the actions comes at too high a price, potential damage to the HPI pumps, then the action is NOT taken, and the core will inherently shut itself down.

C. **Incorrect.** This is plausible because HPI inventory control can be aided through the use of the batch controller and these steps would be taken as part of either a normal batch add of as part of guide 1 alternate boration steps.

D. **Incorrect.** This is plausible because according to OP-TM-EOP-001 (p5; Rev 10) Step 3.3, the operator will be directed to verify the control rods groups are fully inserted, and if NOT, initiate Rule 5. However, the crew will be obligated to initiate HPI per Step 2.2 RNO, prior to taking this action. If the operator incorrectly believed that the next correct action is to initiate Rule 5, according to OP-TM-EOP-010 Guide 1 (p11; Rev 11), the operator will be directed to open MU-V-14A or MU-V-14B. The operator may incorrectly believe that opening both valves are required to be opened.

Technical Reference(s): OP-TM-EOP-001 (p1; Rev 10)
OP-TM-EOP-0011 (p6; Rev 1)
OP-TM-EOP-001 (p5; Rev 10) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP001-PCO-4 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 6

55.43

Design, components, and function of reactivity control mechanisms and instrumentation.

Comments:

NOTE: During an ATWS, TMI will initiate boration of the RCS by manually initiating Emergency Injection (HPI/LPI) by aligning the BWST to the suction of MU Pumps and injecting the strong BA solution of the BWST directly into the Cold Legs. The question will be framed using this approach.

The KA is matched because the operator must demonstrate knowledge (i.e. how accomplished (initiate HPI vs. Rule 5)) of the reason for opening the BWST to MU Pump isolation valves and the reason for the this action.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of what actions are required to maintain the reactor shutdown in an ATWS situation.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	056 2.2.44	
	Importance Rating	3.7	

Evolution Loss of Off-site Power - Equipment Control: Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.

Proposed Question: RO Question # 47

Initial Conditions:

- 100% Power.
- Emergency Diesel Generator EG-Y-1A is tagged OOS for a 3-day planned maintenance outage.

Event:

- A Loss Of Offsite Power occurs.
- Emergency Diesel Generator EG-Y-1B fails to start and all attempts to restart have failed.
- The 1E 4160V bus has been re-energized from the Station Blackout Emergency Diesel Generator (EG-Y-4) IAW OP-TM-864-901.
- An Engineered Safeguards (ES) actuation occurs.
- The URO attempts to start Makeup Pump MU-P-1C to restore seal injection and finds the pump will not start.

Which ONE (1) of the following identifies why MU-P-1C has failed to start?

A. MU-P-1C 43-selector switch is not selected to an energized bus.

B. MU-P-1C was deenergized when the Loss of Offsite Power occurred.

C. MU-P-1C was in Pull-To-Lock when the Engineered Safeguards actuation occurred.

D. MU-P-1C was in Normal-After-Stop when the Engineered Safeguards actuation occurred.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is a plausible distractor because the examinee may be confused as to the purpose of the 43 Selector Switch, which selects the MU pump to be ES selected on a particular bus, and not which bus MU-P-1C is powered from.

B. **Incorrect.** This is a plausible distractor because the examinee may not recall that MU-P-1C is placed in Pull-To-Lock in preparation of placing the SBO on the 1E 4160V bus IAW OP-TM-864-901.

C. **Correct.** MU-P-1C is placed in Pull-To-Lock in preparation of placing the SBO on the 1E 4160V bus IAW OP-TM-864-901. To start a MU pump, the breaker anti-pump logic must be cleared. If a MU pump is placed in PTL with an ES signal present, the breaker will open, but the breaker anti-pump start logic will be actuated. The pump cannot be started again without first removing all start signals.
Normal plant alignment is to have "A" and "C" MU-P's ES selected on their respective busses, with "B" pump running for normal makeup and seal injection. The "C" MU-P must be placed in 'PTL' as part OP-TM-864-901 therefore when the ES occurs MU-P-1C breaker will close and immediately trip placing the pump in "anti-pump".

D. **Incorrect.** This is a plausible distractor because MU-P-1C is normally in the Normal-After-Stop position and the examinee may not recall that MU-P-1C is placed in Pull-To-Lock in preparation of placing the SBO on the 1E 4160V bus IAW OP-TM-864-901.

Technical Reference(s): OP-TM-864-901 (p3 and 5; Rev 10) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-A20-C001-PCO-4 (As available)

Question Source: Bank # QR-AOP020-PCO-4-Q03

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate the ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions during a loss of Offsite power.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, and apply knowledge of the Makeup Pump ES start logic.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	004 K5.26	
	Importance Rating	3.1	

Knowledge of the operational implications of the following concepts as they apply to the CVCS: Relationship between VCT pressure and NPSH for charging pumps

Proposed Question: RO Question # 48

Plant conditions:

- 100% power.
- There is a leak in the Makeup Tank (MU-T-1) gas space.
- The following MU-T-1 parameters are observed:
  - Level – 90 inches
  - Pressure – 13 psig.

Which ONE (1) of the following is correct for the above conditions?

A. Any running Makeup Pump must be stopped immediately.

B. MU-T-1 level must be lowered to at least 85 ~~psig~~ INCHES within 1 hour. Typo per telecom JAC 9/7/11

C. MU-T-1 pressure must be raised to at least 22 psig within 1 hour.

D. A Large Break LOCA could cause any running Makeup Pump to cavitate.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because according to OP-TM-211-000 (p14; Rev 20) if the MU Tank level/pressure relationship is in the Low NPSH Region of Attachment 7.3, immediate action shall be taken to restore it to the Unrestricted Region. The operator may incorrectly believe that the immediate action is to stop the running MU Pump.

B. **Incorrect.** This is plausible because the operator may incorrectly determine that this would return the operation to the unrestricted region however lowering the level would also reduce the pressure and the unrestricted region would not be entered by this action

alone. Additionally this action would not be required to be taken within one hour.

C. **Incorrect.** According to OP-TM-211-000 (p7; rev 20) during steady state operation the MU tank should be maintained between 22-34 psig. The operator may incorrectly believe that if the MU Tank pressure is NOT within this range operation is prohibited. Additionally, according to OP-TM-211-000 (p14; Rev 20) if the MU Tank level/pressure relationship is in the Prohibited Region of Attachment 7.3, TS 3.0.1 applies. The operator may incorrectly apply this TS and believe that such action is required within 1 hour.

D. **Correct.** According to OP-TM-211-000 (p5; Rev 20) to avoid MU Pump damage due to a loss of NPSH during an HPI Actuation, do NOT allow MU Tank level/pressure to enter the Low NPSH Region of Attachment 7.3. Under the stated conditions, with MU-T-1 pressure abnormally low, the plant is being operated in the Low NPSH Region. Therefore, a LB LOCA, which will result in an HPI Actuation will cause NPSH to be lost to the MU Pumps and the running pumps will cavitate.

Technical Reference(s): OP-TM-211-000 (p5, 7 and 14; Rev 20) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: OP-TM-211-000 Attachment 7.3

Learning Objective: 211-GLO-7 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:
The KA is matched because the operator must demonstrate Knowledge of the operational implications of the relationship between MU Tank pressure and NPSH for the MU pumps, as they apply the CVCS.

The question is at the Comprehensive/Analysis cognitive level because the operator consider the MU-T-1 parameters, and determine the operating point, and then based on this, determine the operational implications, one of which is no concern at all.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	006 K4.20	
	Importance Rating	3.2	

Knowledge of ECCS design feature(s) and/or interlock(s) which provide for the following: Automatic closure of common drain line and fill valves to accumulator.

Proposed Question: RO Question # 49

Plant conditions:

- Reactor operating at 100% power, with ICS in full automatic.
- CF-T-1A level has been raised using OP-TM-213-469, Makeup to CF-T-1A for Batches of Less Than 100 Gallons.
- Fill isolation valve CF-V-19A has not yet been closed.
- Chemistry is initiating sampling of CF-T-1A using N1807, Primary Chemistry Sampling.
- Sample isolation valve CF-V-20A is open to support their sample for final boron concentration verification.

Event:

- Automatic reactor trip due to low RCS pressure.
- RCS leak (LOCA) inside the RB.
- NO ES actuations have occurred yet.

Based on these conditions identify the ONE selection below that describes when to expect automatic closure (assuming no failures) of CF-V-19A and CF-V-20A.

A. CF-V-19A will close when Reactor Trip Isolation occurs;
CF-V-20A will close when Reactor Trip Isolation occurs.

B. CF-V-19A will close when Reactor Trip Isolation occurs;
CF-V-20A will close when 4 psig ES actuation occurs.

C. CF-V-19A will close when 4 psig ES actuation occurs;
CF-V-20A will close when Reactor Trip Isolation occurs.

D. CF-V-19A will close when 4 psig ES actuation occurs;
CF-V-20A will close when 4 psig ES actuation occurs.

Proposed Answer: A.

Explanation (Optional):

A. **Correct.** Both CF-V-19A and CF-V-20A close on Reactor Trip Isolation signals as part of diverse means of containment isolation for accident conditions. Both valves also receive a back-up closure signal from 4# ES actuation.

B. **Incorrect.** Plausible first part correct, second part would already be closed by RTI when ES occurred otherwise would be correct.

C. **Incorrect.** Plausible second part correct, first part would already be closed by RTI when ES occurred otherwise would be correct.

D. **Incorrect.** Plausible for not knowing the valves receive an RTI signal as both valves do receive a 4# ES signal. Incorrect as valves would have already closed on RTI

Technical Reference(s): OP-TM-244-901 Rev 3 pg 12 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 213-GLO-7 (As available)

Question Source: Bank # X

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2005 Q#6

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:
The KA is matched because the operator must demonstrate knowledge of the design feature that uses Reactor Trip Isolation to close valves automatically, associated with Core Flood drain and vent.

The question is at the Memory cognitive level because the operator must recall an interlock and recognize its application to the conditions.

New K/A after submittal, original question not accepted.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	005 A1.03	
	Importance Rating	2.5	

Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: Closed cooling water flow rate and temperature

Proposed Question: RO Question # 50

Plant Conditions:

- Reactor is in Cold Shutdown
- "A" Decay Heat Train is in service
- DC-V-2A, Decay Closed Cooler Inlet valve, is 30% open
- DC-V-65A, Decay Closed Cooler Bypass valve, is 50% open

If Foxboro Controller power to DC-V-2A and DC-V-65A is lost, which of the following explains the flow and temperature affects on the **Decay Closed** Cooling System (DC):

A. DC-V-2A fails full open, DC-V-65A fails full closed, DC system temperature rises.

B. DC-V-2A fails full closed, DC-V-65A fails full open, DC system temperature lowers.

C. DC-V-2A fails full closed, DC-V-65A fails full closed, DC system temperature rises.

D. DC-V-2A fails full open, DC-V-65A fails full open, DC system temperature lowers.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** OP-TM-543-000 2.1.3 DC-V-2A fails open on loss of power DC-V-65 fails closed. The full flow with no bypass will cause additional heat to be picked up and DC system temperature to rise.

B. **Incorrect.** Plausible for a reversal of the fail positions of the inlet and bypass valves.

C. **Incorrect.** Plausible for an incorrect understanding of the inlet valve fail position.

D. **Incorrect.** Plausible for an incorrect understanding of the bypass valve fail position.

Technical Reference(s): OP-TM-542-000 Rev 8 L&P 2.13. (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 533-GLO-10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate the ability to monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls associated (i.e. monitoring the flow through verses around the cooler and the affect on the closed cooling temperature).

The question is at the Comprehension/Analysis cognitive level because the operator must determine the affect on the closed temperature related to the memorized action of the valve on power loss (determine that from the give valve positions they will change to input less heat from DHR into DCCW.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	005 K2.01	
	Importance Rating	3.0	

Knowledge of bus power supplies to the following: RHR pumps

Proposed Question: RO Question # 51

Plant conditions:

- A LOCA resulting in ES actuation occurred ten minutes ago.
- No operator actions have been taken.
- "B" Auxiliary Transformer sudden pressure fault occurs.

With respect to "A" Decay Heat Pump DH-P-1A, which ONE (1) of the following describes operation of DH-P-1A breaker and DH-P-1A, after the Transformer Fault?

A. DH-P-1A is unaffected because it is powered from the opposite train.

B. DH-P-1A is unaffected because its bus power supply is fast transferred to "A" Auxiliary Transformer.

C. The DH-P-1A motor breaker remains closed and the motor is re-powered when "A" diesel breaker closes.

D. The DH-P-1A motor breaker opens and the motor is re-powered after both the diesel and motor breakers are closed.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible as it would be logical to think the "A" train is powered from "A" transformer. Incorrect because "B" transformer powers "A" train in normal plant line-up.

B. **Incorrect.** This is plausible because all BOP busses will fast transfer to the opposite transformer. Incorrect because Class 1E busses do not fast transfer.

C. **Correct.** According to Lesson Plan TQ-TM-104-212-C001 (p28; Rev 8) the A DHR Pump (DH-P-1A) is normally powered from the 1D 4160 VAC ES Bus. The Class 1E

Electrical Distribution System provides the electrical power for components required to (a) safely shutdown the plant and (b) prevent release of radioactive material to the environment. The system is normally powered from the grid through two auxiliary transformers (1A and 1B), with automatic backup from site two Emergency Diesel Generators (EDGs) and manual backup from a Station Blackout Diesel Generator (SBO DG). According to Lesson Plan TQ-TM-104-740-C001 (p4; Rev 5) Slide 18, the 1A Aux Transformer normally supplies the 1E ESF Bus, while the 1B Aux Transformer normally supplies the 1D ESF Bus. According to Lesson Plan TQ-TM-104-740-C001 (p21; Rev 5), there is no automatic fast transfer of Class 1E 4160V buses from normal power sources and manual transfers of the two buses to a single auxiliary transformer are administratively limited. Therefore, during the LOCA the 1A DHR Pump would have started, and then Bus 1D would have lost power when the malfunction of the 1B Aux Transformer occurred. According to OPM F-06 (p39; Rev 8) DH-P-1A is part of ESAS Block 1 Loading. According to Lesson Plan TQ-TM-104-642-C001 (p40-41; Rev 5) when Engineered Safeguards followed by Under Voltage (As would be the case with a 1B Aux Transformer Failure after a LOCA) occurs, the A Diesel Generator starts but its Breaker does not close. Under Voltage (caused by the 1B Aux Transformer Failure) trips all equipment except Block 1 (i.e. DH-P-1A breaker does NOT trip). Following this, all Non-Engineered Safeguards equipment is locked out, Under Voltage starts a 2.5 second timer for Diesel Generator breaker closure. After the 2.5 seconds timer times out, the Diesel Generator breaker closing re-initiates Block Loading. Since the DH-P-1A breaker is still closed, it will re-start when the Diesel Breaker closes.

D. **Incorrect.** Plausible because most major motor breakers on this bus are opened by under-voltage and then block loaded back on.

Technical Reference(s): TQ-TM-104-212-C001 (p28; Rev 8)
TQ-TM-104-740-C001 (p4; Rev 5) Slide 18
TQ-TM-104-740-C001 (p21; Rev 5)
OPM F-06 (p39; Rev 8)
TQ-TM-104-642-C001 (p40-41; Rev 5)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 212-GLO-4 (As available)

Question Source: Bank # WTSI 67899

	Modified Bank #		(Note changes or attach parent)
	New		
Question History:		Last NRC Exam: 2010	TMI Q#28
Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	7	
	55.43		

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate knowledge of bus power supplies to the DHR (RHR) pumps (i.e. associated Train, Pump breaker operation).

The question is at the Comprehension/Analysis cognitive level because the operator must relate several pieces of information to arrive at the correct answer (i.e. power supplies to DHR Pumps, Consequences of loss of 1B Aux Transformer on the power supply in question, and operation of DH-P-1A breaker on LOCA followed by subsequent Undervoltage condition).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	025 AK2.03	
	Importance Rating	2.7	

Knowledge of the interrelations between the Loss of Residual Heat Removal System and the following: Service water or closed cooling water pumps

Proposed Question: RO Question # 52

Plant conditions:

- RCS temperature is 138°F and stable.
- The A DHR Train is in service.

Subsequently:

- MAP C0108, DH CLOSED FLOW LO, alarms.
- The operator observes that Decay Closed Pump DC-P-1A has tripped.
- Attempts to restart it have failed.
- Incore temperature starts to rise.

Which ONE (1) of the following identifies the pump(s) that the operator is required to start?

A. Decay Heat Closed Cooling Pump DC-P-1B, ONLY.

B. Decay Heat Closed Cooling Pump DC-P-1B; AND
Decay Heat River Water Pump DR-P-1B, ONLY.

C. Decay Heat Closed Cooling Pump DC-P-1B; AND
Decay Heat Removal Pump DH-P-1B, ONLY.

D. Decay Heat Closed Cooling Pump DC-P-1B;
Decay Heat River Water Pump DR-P-1B ; AND
Decay Heat Removal Pump DH-P-1B.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the DC System is NOT a Separate and redundant System, and that starting the DC-P-1B, with

DR-P-1A and DH-P-1A already running, will provide cooling to Train A of DHR and stabilize incore temperatures.

B. **Incorrect.** This is plausible because the operator may know that the DC/DR Systems are separate and redundant, but incorrectly believe that the DH System is NOT a Separate and Redundant System, and that starting the DC-P-1B and DR-P-1B, with the DH-P-1A already running, will provide cooling to Train A of DHR and stabilize incore temperatures.

C. **Incorrect.** This is plausible because the operator may know that the DC/DH Systems are separate and redundant, but incorrectly believe that the DR System is NOT a Separate and Redundant System, and that starting the DC-P-1B and DH-P-1B, with the DR-P-1A already running, will provide cooling to Train A of DHR and stabilize incore temperatures.

D. **Correct.** According to OP-TM-MAP-C0108 (p1; Rev 3) if all in-service DC flow has been lost, the operator is directed to switch to standby DHR string IAW OP-TM-212-100 series procedures. According to OP-TM-212-112 (p2; Rev 6) a prerequisite to shifting the DH Train B from DHR Standby to DHR Operating Mode is to verify that the DC Train B is in DHR Operating Mode. According to OP-TM-543-112 (p2; Rev 2) in order to place the DC Train B in operation, the operator will be directed to start DC-P-1B. According to TQ-TM-104-533-C001 (p9; Rev 6) the DR and DC Systems have two (2) separate and redundant trains. Therefore, if the DC Train B is placed in service, the DR Train B must also be placed in service. According to OP-TM-533-102 (p2; Rev 4) in order to shift the B DR Train from ES/DHR Standby to DHR Operating Mode the operator is directed to start DR-P-1B. According to OP-TM-212-112 (p3; Rev 6) once the DC/DR Train B is placed in operation, the operator will be directed to start DH-P-1B. According to OP-TM-212-452 (p2; Rev 5) the operator will be directed to throttle DC-V-2B and 65B to control system temperature.

Technical Reference(s): OP-TM-MAP-C0108 (p1; Rev 3)
OP-TM-212-112 (p2; Rev 6)
OP-TM-543-112 (p2; Rev 2)
TQ-TM-104-533-C001 (p9; Rev 6)
OP-TM-533-102 (p2; Rev 4)
OP-TM-212-112 (p3; Rev 6)
OP-TM-212-452 (p2; Rev 5)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 533-GLO-2 and 10
212-GLO-2 and 10 (As available)

Question Source:	Bank #		
	Modified Bank #		(Note changes or attach parent)
	New	X	

Question History:	Last NRC Exam:	N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	X
	Comprehension or Analysis	

10 CFR Part 55 Content:	55.41	7
	55.43	

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the interrelations between the Loss of Residual Heat Removal System and the DC Closed Cooling Water Pumps (i.e. that if DC-P-1A cannot be started Train B of DHR must be placed in service, which requires that Train B DR, DC and DH all be placed in service).

The question is at the Memory cognitive level because the operator must simply recall that the DHR Trains are separate trains, including 100% capacity DR and DC Systems that are separate and redundant, to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	062 AK3.02	
	Importance Rating	3.6	

Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water The automatic actions (alignments) within the nuclear service water resulting from the actuation of the ESFAS

Proposed Question: RO Question # 53

Plant conditions:

- 100% power.
- Nuclear River pumps NR-P-1A and NR-P-1C are ES selected and running.

Event:

- A Loss of Offsite Power occurs.
- Emergency Diesel Generators, EG-Y-1A and EG-Y-1B, have started and are powering the ES busses.
- After an initial drop, RCS pressure is 1575 psig and rising slowly.

Which ONE (1) of the following identifies Nuclear River Water pump(s) that are running?

A. NR-P-1B, ONLY

B. NR-P-1A and NR-P-1B, ONLY

C. NR-P-1A and NR-P-1C, ONLY

D. NR-P-1A, NR-P-1B, and NR-P-1C

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible if the student fails to recognize that RCS pressure is below the 1600# ESAS actuation setpoint. If only a Loss of off-site power were to occur, NR-P-1B would have started from a standby condition and be the only running NR pump.

B. **Incorrect.** This is plausible if the student thinks that all three pumps would be running

after the ES busses reenergize after the loss of off-site power, and then that NR-P-1C deenergizes if both NR-P-1B and NR-P-1C are running when an ESAS signal occurs. That B and C pump interlock is applicable to Secondary River pumps only.

C. **Correct.** When the loss of offsite power occurs and the ES busses are re-energized, NR-P-1B starts on standby and is the only running NR pump. However, upon the 1600# RCS ESAS signal, NR-P-1B locks out on a 27/86 signal and NR-P-1A and NR-P-1C receive an ES start signal.

D. **Incorrect.** This is plausible if the student fails to recognize the 27/86 lockout of NR-P-1B upon the ESAS actuation signal.

Technical Reference(s): 1105-3 (p19 and 20; Rev 51) (Attach if not previously provided)

Proposed References to be provided to applicants during examination:

Learning Objective: (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 4

55.43

Secondary coolant and auxiliary systems that affect the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: The automatic actions (alignments) within the nuclear service water resulting from the actuation of the ESFAS.

The question is at the Comprehensive/Analysis cognitive level because the operator must analyze conditions and relate a Loss of Nuclear Service Water with a Loss of Offsite Power, failure of a EDG, and an ES signal.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	103 A4.04	
	Importance Rating	3.5	

Ability to manually operate and/or monitor in the control room: Phase A and phase B resets

Proposed Question: RO Question # 54

Plant conditions:

- Reactor tripped.
- RCS LOCA inside the RB caused RB pressure to rise to 35 psig.
- All ES actuations and systems operated as designed.
- Current RB pressure is 15 psig and stable.
- Current RCS pressure is 40 psig and stable.

Based on these conditions, which ONE (1) of the following describes the MINIMUM required actions to enable re-opening NS-V-15, NS cooling to the Reactor Building?

A. Reset 30 psig RB Isolation, ONLY.

B. Defeat 4 psig ES Actuations; AND
Reset 30 psig RB Isolation.

C. Bypass 1600 psig AND 500 psig ES actuations.

D. Bypass 1600 psig AND 500 psig ES actuations; AND
Defeat 4 psig RB Isolations.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to TQ-TM-104-642-C001 (p24-25; Rev 5), the 1600 psig Reactor Coolant System pressure actuation, 500 psig Reactor Coolant System pressure actuation, 4 psig Reactor Building pressure actuation, and the 30 psig Reactor Building pressure actuation are all ESAS signals that provide protection to the reactor plant. According to OP-1105-3 (p13-19; Rev 51), NS-V-15 will automatically close upon the 30 psig RB Pressure Actuation. Additionally, NS-V-15 is unaffected by the 1600 psig Reactor Coolant System pressure actuation, 500 psig Reactor Coolant System pressure actuation, and the 4 psig Reactor Building pressure actuation. Resetting 30

psig actuation will allow control to be restored to NS-V-15.

B. **Incorrect.** This is plausible because 30 psig actuation does close NS-V-15 and will have to be reset to regain control of NS-V-15; and the operator may incorrectly believe that the 4 psig Reactor Building pressure actuation also auto closes the valve (and must be defeated).

C. **Incorrect.** This is plausible because 1600 psig and 500 psig actuations have to be bypassed in order to gain control of other ES components; and the operator may incorrectly believe that it is these actuations that automatically close NS-V-15.

D. **Incorrect.** This is plausible because 1600 psig, 500 psig and 4 psig actuations have to be bypassed/defeated in order to gain control of other ES components; and the operator may incorrectly believe that it is these actuations that automatically close NS-V-15.

Technical Reference(s): TQ-TM-104-642-C001 (p24-25; Rev 5)
OP-1105-3 (p13-19; Rev 51) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 642-GLO-2 and 10 (As available)

Question Source: Bank # TMI: IR-XXX-GLO-XX-Q28

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2005 TMI Q#28

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator is given a set of conditions requiring actuation of all ESAS signals under consideration, and then asked to determine how to regain manual control over an automatically positioned valve; thereby demonstrating the Ability to manually operate Phase A Train and Phase B Train resets.

The question is at the Comprehension/Analysis cognitive level because the operator must recall various ESAS actuations, determine whether or not they are active, determine which of these signals affected a specific valve, and then decide what signals need to be reset to regain manual control of the valve under consideration, to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	063 K4.01	
	Importance Rating	2.7	

Knowledge of dc electrical system design feature(s) and/or interlock(s) which provide for the following: Manual/automatic transfers of control

Proposed Question: RO Question # 55

Plant conditions:

- 100% power.
- The 1M DC Distribution Panel is being powered from DC Panel 1A.

Subsequently:

- An Undervoltage condition occurs on the 4160V Bus 1D.
- Emergency Diesel generator EG-Y-1A starts and repowers 4160V Bus 1D.
- 60 seconds later a 1600 psig ESAS actuation occurs.

Which ONE (1) of the following identifies the status of the 1M DC Distribution Panel, AND its power supply transfer scheme?

A. Powered from DC Panel 1A;
Auto transfer of the 1M DC Distribution Panel power supply is BLOCKED.

B. Powered from DC Panel 1A;
Auto transfer of the 1M DC Distribution Panel power supply is PERMITTED.

C. Powered from DC Panel 1B;
Auto transfer of the 1M DC Distribution Panel power supply is BLOCKED.

D. Powered from DC Panel 1B;
Auto transfer of the 1M DC Distribution Panel power supply is PERMITTED.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to OPM A-03 (p4; Rev 12) the 1M DC Bus has an auto transfer switch to auto swap power supplies on a loss of power

to the selected bus; DC Panel 1A or 1B. According to 1107-2C (p3; Rev 10) PP&L D, when the discharge cross-connect valves between Makeup Pump MU-P-1B and MU-P-1C are closed, as is the normal 100% lineup, the 1M DC Distribution Panel should be powered from DC Distribution Panel 1A. On the Undervoltage condition, power would NOT have been lost to DC Distribution Panel 1A, and therefore the 1M DC Distribution Panel is presently powered by DC Distribution Panel 1A. According to TQ-TM-104-642-C001 (p40-42, 57; Rev 5) the ESAS prevents auto/manual transfer of DC Bus 1M during times when the ESAS is followed by Under Voltage, and Under Voltage is followed by an ESAS, or when the two occur simultaneously.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may incorrectly believe that manual transfer of the 1M DC Distributing Panel is possible under the stated conditions, while only the Auto Transfer is blocked.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that the blocking of the Auto transfer scheme only occurs when the ESAS occurs before, or simultaneously with the Undervoltage condition.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): OPM A-03 (p4; Rev 12)
1107-2C (p3; Rev 10)
(p40-42, 57; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 642-GLO-5 (As available)

Question Source: Bank #
Modified Bank # IR-642-GLO-4-Q01 (Note changes or attach parent)
New

Question History: Last NRC Exam: 2010 TMI Q#31 (mod)

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge of dc electrical system design feature(s) and/or interlock(s) which provide for Manual/automatic transfers of control (specifically to the 1M DC Distribution Panel) .

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and determine how the Bus 1M auto transfer scheme has responded to those conditions, demonstrating an understanding of the operation of the auto transfer scheme, the 1M DC is blocked from transfer after "27/86" actuation. 27/86 is actuated by ES plus undervoltage or ES plus the EDG breaker closed. In this case the diesel has repowered the bus clearing the undervoltage, however the output breaker makes up the logic when the ES occurs blocking the 1M transfer.

This question was modified from Q31 of TMI 2008 NRC Retake Exam.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	012	K4.06
	Importance Rating	3.2	

Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: Automatic or manual enable/disable of RPS trips

Proposed Question: RO Question # 56

Which ONE (1) of the following correctly completes the statement below?

When the RPS Shutdown Bypass switches are in the "BYPASS" position the ____(1)____ reactor trip is blocked, and the setpoint of the ____(2)____ reactor trip is automatically reduced.

A. (1) High RCS Temperature
(2) Nuclear Overpower

B. (1) High RCS Temperature
(2) High RCS Pressure

C. (1) Variable Low RCS Pressure
(2) Nuclear Overpower

D. (1) Variable Low RCS Pressure
(2) High RCS Pressure

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

B. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because according to OS-24 (p29; Rev 18) High RCS Temperature is a Reactor Trip signal (Thot > 618°F), and the operator may incorrectly believe that it, rather than the VLPT is blocked.

C. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to TQ-TM-104-641-C001 (p36-38; Rev 1) the Nuclear Overpower setpoint is reduced, however, it is reduced manually by I&C.

D. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-641-C001 (p36-38; Rev 1) Certain RPS trip functions are allowed to be bypassed during heatup and cooldown. When the RCS pressure is less than 1720 psig (typical) a lock switch in each of the four protective channels can enable the RPS shutdown bypass. The RPS trip functions that are bypassed are the Power-Imbalance-Flow trip, the Power/Pumps trip, the Low RC pressure trip, and the Variable Low RC pressure trip. Two conditions are imposed when the bypass is used. First of all, by administrative control the nuclear overpower trip (high flux) setpoint is manually reduced to a value of < 4.25% of rated power during reactor shutdown. Secondly, a high reactor coolant system pressure trip setpoint of 1720 psig is automatically imposed.

Technical Reference(s): TQ-TM-104-641-C001 (p36-38; Rev 1)
OS-24 (p29; Rev 18) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 641-GLO-2 and 5 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.
Comments:
The KA is matched because the operator must demonstrate knowledge (i.e. what trips are affected and NOT affected in Shutdown Bypass) to correctly answer the question.

The question is at the Memory cognitive level because the operator must recall the four trips that are blocked when the switch is used, and the trips that are still enabled but have setpoints

automatically adjusted, to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	001 K2.02	
	Importance Rating	3.6	

Knowledge of bus power supplies to the following: One-line diagram of power supply to trip breakers

Proposed Question: RO Question # 57

Which ONE (1) of the following correctly completes the statement below?

When the operator presses the Diverse Scram System (DSS) Pushbutton, the Shunt Trip Coils on ____(1)____ will be energized ____(2)____, and these breakers will open.

A. (1) Breakers 1G-2A and 1L-2A
(2) directly

B. (1) Breakers 1G-2A and 1L-2A
(2) via the Reactor Protection System

C. (1) CRD breakers CB-10 and CB-11
(2) directly

D. (1) CRD breakers CB-10 and CB-11
(2) via the Reactor Protection System

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-622-C001 (p32, 99-100; Rev 5) when the DSS pushbutton is pressed, Shunt trip coils installed on 1G-2A and 1L-2A breakers will be energized to these trip breakers. The Power Supply for DSS is directly (120V AC) from CT-3 on Reactor Plant MCC.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to TQ-TM-104-622-C001 (p32, 30-33; Rev 5) the shunt trip coil of CB-10 and CB-11must be energized by 125V DC (i.e. via the RPS) to trip its breaker; and the operator may incorrectly believe that the Shunt Trip Coil associated with 1G-2A and 1L-2A receives power from the same source.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because according to TQ-TM-104-622-C001 (p32, 30-33; Rev 5) these breakers are tripped via both an Undervoltage Coil and a Shunt Trip Coil by manual and/or automatic signals from the RPS; and the operator may incorrectly believe that DSS operates these breakers rather than 1G-2A and 1L-2A.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): TQ-TM-104-622-C001 (p32, 99-100; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 622-GLO-4 (As available)

Question Source: Bank #

Modified Bank # TMI: IR-641-GLO-5-Q04 (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge (i.e. which breakers open, and how they are opened (i.e. power supply of Shunt Coil)) of bus power supplies to the one-line diagram of power supply to the trip breakers.

The question is at the Memory cognitive level because the operator must recall the Control Rod Drive power distribution system and how the DSS functions to interrupt power to the Control Rod Drive System.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	014 K5.01	
	Importance Rating	2.7	

Knowledge of the operational implications of the following concepts as they apply to the RPIS: Reasons for differences between RPIS and step counter

Proposed Question: RO Question # 58

Plant conditions:

- The unit was at 100%.
- A rapid load reduction to 85% was initiated due to a grid disturbance.
- Control rod 7-2 was stuck and failed to move with its' group during the power reduction.

Which ONE (1) of the following correctly completes the statement below?

For the stuck rod, ____(1)_____ will indicate the HIGHEST position because _____(2)____.

A. (1) Absolute Position Indication
(2) no change in reed switch positions occurred

B. (1) Absolute Position Indication
(2) no programmer drive motor motion occurred

C. (1) Relative Position Indication
(2) no change in reed switch positions occurred

D. (1) Relative Position Indication
(2) no programmer drive motor motion occurred

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-622-C001 (p41-42; Rev 5), API uses 45 equally spaced reed switches mounted in a housing strapped to the outside of the CRDM motor tube. A magnet attached to the torque taker closes the reed switches. As the leadscrew moves up and down, this magnet passes by reed switches. A reed switch will be held closed whenever the magnet is within 1.5 inches of it (above or below). These reed switches are connected to a voltage divider network.

As the reed switches open and close (due to the magnet on the leadscrew), the resistance of the network changes. This varying resistance results in a variable current output from the network, which is then translated to position indication. According to TQ-TM-104-622-C001 (p45-46; Rev 5) the RPI system uses a potentiometer, driven by the Rod Stepping Motor, to produce a variable output corresponding to rod position. The system is extremely accurate but only reflects rod position as a function of field rotation. Thus, it will not show correct position if a rod is tripped or dropped, or if it is stuck or binding mechanically. Therefore, API will indicate the Rod is at the height that it was prior to the transient, while RPI will indicate that the rod is with the other rods in the group that moved inward.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may not understand the difference between API/RPI, which finds its basis in the difference between demanded movement and actual movement.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may not understand the difference between API/RPI, which finds its basis in the difference between demanded movement and actual movement.

D. **Incorrect.** 1st part wrong, 2nd part wrong. This is plausible because the operator may not understand the difference between API/RPI, which finds its basis in the difference between demanded movement and actual movement.

Technical Reference(s): TQ-TM-104-622-C001 (p41-42 and 45-46; Rev 5) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 622-GLO-11 (As available)

Question Source: Bank # WTSI 65149

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 6

55.43

Design, components, and function of reactivity control mechanisms and instrumentation.

Comments:

NOTE: TMI does not have Step counters, but there is difference between API (Actual Position Indication) and RPI (Relative Position Indication).

The KA is matched because the operator must demonstrate Knowledge of the operational implications of the reasons for differences between API/RPI as they apply to the RPIS (i.e. API uses reed switches to determine actual position while RPI measures demand of CRDM run time).

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of the mechanism of a stuck rod, and the difference between API/RPI to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	008 A2.08	
	Importance Rating	2.5	

Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Effects of shutting (automatically or otherwise) the isolation valves of the letdown cooler

Proposed Question: RO Question # 59

Initial plant conditions:

- Reactor is operating at 100% power, with ICS in full automatic.
- Intermediate Service Cooler IC-C-1A is in service.
- Intermediate Closed Cooling Pump IC-P-1A is operating.
- Susquehanna River Water temperature is 45°F.
- Nuclear Service River Water Pumps NR-P-1A and NR-P-1C are operating.
- Intermediate Closed Cooling Cooler IC-C-1A outlet water temperature is 90°F and steady.
- Intermediate Closed Cooling Cooler IC-C-1A cooling outlet valve NR-V-15A is throttled, partially open.

Event:

- MU-V-1A and MU-V-1B letdown cooler isolation valves closed due to false actuation of an automatic closure interlock.
- ICCW temperature rapidly dropped to 80°F, and is continuing to lower at 1 degree per minute.

Based on these conditions, which ONE (1) of the following describes the operational impact of the malfunction, AND the actions to mitigate the consequences of the event?

A. Severe reduction in RCP radial bearing temperatures;
Stop NR-P-1A or NR-P-1C.

B. Formation of condensate on CRD stator water jackets;
Throttle closed NR-V-15A.

C. Thermal shock to letdown coolers MU-C-1A and MU-C-1B;
Close letdown cooler isolation valves IC-V-1A and IC-V-1B.

D. IC-T-1 surge tank level reduction to below the lower sight glass connection;
Open Surge Tank Makeup Valve IC-V-5 as needed.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** RCP seal injection flow has not been lost. Water being cooled by the thermal barrier heat exchangers (cooled by ICCW) is flowing into the RCS, rather than past the pump radial bearings. This is plausible because this would occur if RCP seal injection flow is lost. The operator is required to know physical relationships between seal injection point, labyrinth seals, thermal barrier heat exchangers, pump radial bearings, etc. associated with RCP seal packages. Additional plausibility is merited since the action stated would reduce heat sink cooling flow through IC-C-1A.

B. **Correct.** According to OP-TM-541-000 (p4; Rev 12) to minimize the possibility of forming condensate in the CRD stator water jacket and provide adequate CRD stator cooling, IC outlet temperature should be maintained between 90°F and 100°F on IC-6TI. According to OP-TM-541-461 (p3; Rev 6) Step 4.1.3, throttle NR-V-15A (IC-C-1A, River Outlet Valve) to maintain IC cooler outlet temperature IC-6TI between 90°F and 100°F.

C. **Incorrect.** These valves are required to be open in order to re-open MU-V-1A/1B (interlocked). This is plausible because ICCW temperature will reduce significantly if left unchecked. Additional plausibility is merited since the action stated is appropriate for thermal shock concerns.

D. **Incorrect.** Although the water density will change, it will result in much less level reduction. This is plausible because reduction in ICCS temperature will result in shrinkage and subsequent surge tank level reduction. Additional plausibility is merited since the action stated is appropriate for low surge tank level.

Technical Reference(s): OP-TM-541-000 (p4; Rev 12)
OP-TM-541-461 (p3; Rev 6) Step 4.1.3 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 531-GLO-6, 8, 9 and 10 (As available)

Question Source: Bank # TMI: IR-531-GLO-9-Q01

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to (a) predict the impacts of shutting (automatically or otherwise) the isolation valves of the letdown cooler on the CCWS (ie. Overcooling leading to the formation of condensation on the CRDMs), and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations (i.e. throttle NR-V-15A).

The question is at the Memory cognitive level because the operator must recall the effect of cooling the ICCW System temperature, and the action to take because of it.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	057 AA1.05	
	Importance Rating	3.2	

Ability to operate and / or monitor the following as they apply to the Loss of Vital AC Instrument Bus: Backup instrument indications

Proposed Question: RO Question # 60

With the plant at 100% power a loss of VBA occurs.

Which ONE (1) of the following identifies the instruments that the Smart Automatic Signal Selector (SASS) will select for the input to the ICS?

A. Power Range channel NI-6; AND
RCS Narrow Range Pressure Channel RC3A-PT2.

B. Power Range channel NI-6; AND
RCS Narrow Range Pressure Channel RC3B-PT1.

C. Power Range channel NI-8; AND
RCS Narrow Range Pressure Channel RC3A-PT2.

D. Power Range channel NI-8; AND
RCS Narrow Range Pressure Channel RC3B-PT1.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because there are two RCS Narrow Range pressure detectors per loop: RC3A-PT1/2 for the "A" loop; and RC3B-PT1/2 for the "B" loop; and the operator may incorrectly believe that SASS selects RC3A-PT2, rather than RC3B-PT1.

B. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-623-C001 (p29; Rev 3) there are four Power Ranger channels; NI-5, 6, 7 and 8. NI-5 and NI-6 provide control input to Integrated Control System and console center recorder via SASS. According to TQ-TM-104-624-C001 (p29; Rev 2) there are two RCS Narrow Range pressure detectors per loop: RC3A-PT1/2 for the "A" loop; and RC3B-PT1/2 for the "B" loop. RC3A-PT2 feeds only the "C" RPS cabinet, and RC3B-PT2 feeds only the "D"

RPS cabinet. RC3A-PT1 feeds the "A" RPS cabinet and RC3B-PT1 feeds the "B" RPS cabinet. According to TQ-TM-104-624-C001 (p6; Rev 2), RC3A-PT1 & RC3B-PT1 are monitored by SASS. According to OP-TM-AOP-0151 (p24; Rev 0) on a loss of VBA, NI-5 and RC3A-PT1 will fail. SASS will automatically select NI-6 and RC3B-PT1 for ICS input.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because there are four Power Ranger Instruments, and the operator may incorrectly believe that SASS will select NI-8 rather than NI-6.

Technical Reference(s): TQ-TM-104-623-C001 (p29; Rev 3)
TQ-TM-104-624-C001 (p29; Rev 2)
OP-TM-AOP-0151 (p24; Rev 0)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 623-GLO-2 and 10
624-GLO-2 and 10
(As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7
55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate the ability to monitor Backup instrument indications inputting to ICS as they apply to the Loss of Vital AC Instrument Bus.

The question is at the Memory cognitive level because the operator must recall which NI Power Ranger instrument provides backup to NI-5 on a loss of VBA, and which RCS Narrow Range Pressure Instrument provides backup to RC3A-PT1 on a loss of VBA.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	032 AA1.01	
	Importance Rating	3.1	

Ability to operate and / or monitor the following as they apply to the Loss of Source Range Nuclear Instrumentation: Manual restoration of power

Proposed Question: RO Question # 61

Plant conditions:

- 20% power and stable.
- Source Range Channel N-11 was removed from service.
- I&C has repaired NI-11 and is restoring the instrument to service.
- Upon re-powering NI-11 the Center Console meter indication for NI-11 indicates 3×10^4 CPS.
- I&C suspects that this is a meter malfunction, and not a failure within the instrument itself.

Which ONE (1) of the following correctly completes the statements below?

The Center Console meter indication for NI-11 is reading too ____(1)____ for present plant conditions. A Channel Check can be performed by comparing the N-11 indication on ____(2)____.

A. (1) low
(2) the Plant Computer, ONLY

B. (1) low
(2) the Plant Computer and/or Panel B of the Remote Shutdown Panel

C. (1) high
(2) the Plant Computer, ONLY

D. (1) high
(2) the Plant Computer and/or Panel B of the Remote Shutdown Panel

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to TQ-TM-104-623-C001 (p28;

Rev 3) the NI-11 reads out at 10^{-1} cps to 10^{6} cps, which is significantly below the power range indication 20%. In other words, at 20% power the Source Range instruments should be reading 10^{6} CPS. Therefore, the meter is presently indicating too low. According to TQ-TM-104-623-C001 (p27; Rev 3), NI-11 has meter/signal indications in CPS on Panel CC and the PPC. NI-12 has meter indications on the Remote Shutdown Panel (Panel B), but NOT NI-11.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to TQ-TM-104-623-C001 (p26-27; Rev 3), NI-11 has meter/signal indications in CPS on Panel CC and the PPC. NI-12 has meter indications on the Remote Shutdown Panel (Panel B), but NOT NI-11.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that at 20% power, the Source Range is reading too high.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): TQ-TM-104-623-C001 (p627-28; Rev 3) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 623-GLO-2 and 10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:
The KA is matched because the operator must demonstrate Ability to monitor the restoration of power to NI-11 as it applies to the Loss of Source Range Nuclear Instrumentation.

The question is at the Memory cognitive level because the operator must recall where the NI-11 meter indications read out to correctly answer the question, and the normal reading of the Source Range instruments when the plant is operating at power.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	2	
	K/A #	G2 2.2.2	
	Importance Rating	4.6	

Equipment Control: Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.

Proposed Question: RO Question # 62

Plant Conditions:

- An approach to criticality is in progress IAW 1103-8, Approach to Criticality.
- The Estimated Critical Position ECP is 75% on Group 6.
- The MAX Rod Withdrawal Limit is 50% on Group 7.
- The MIN Rod Withdrawal Limit is 50% on Group 6.

Which ONE (1) of the following would require inserting the rod group being withdrawn and one additional group?

A. 50% on Group 5 when Group 2, Rod 3 drops to fully inserted.

B. 55% withdrawn on Group 7 and the reactor is NOT critical.

C. 50% withdrawn on Group 5 and criticality is PREDICTED at 30% on Group 6.

D. 75% on Group 6 with SUR at 1.5 DPM with rod motion and the reactor critical.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because this would invalidate the ECP, and it would be necessary to stop and insert rods. AOP-062 step 3.6 states verify reactor power greater than 5%, RNO is to use 1102-4 and 1102-10 to place reactor in hot shutdown. 1102-4 does not apply less than 2% power. 1102-10 has the operator drive rods until groups 5, 6, and 7 are fully inserted. This is incorrect because while group five would be inserted the additional group would not.

B. **Correct.** According to 1103-8 (p7; Rev 52) Step 3.2.16, IAAT maximum Rod Withdraw Limit is exceeded and the rector is NOT critical, then GO to Step 3.3, Missed ECP.

According to 1103-8 (p9; Rev 52) Step 3.3.1 INSERT control rods in sequence, until the rod group which was being withdrawn is fully inserted and one additional group is fully inserted.

C. **Incorrect.** This is plausible because according to 1103-8 (p7; Rev 52) Step 3.2.11, if criticality is predicted to occur ≥30% below the MINIMUM ROD WITHDRAW LIMIT and criticality is within the next 25% rod index increment, then GO to Step 3.3, missed ECP; and the operator may incorrectly believe that this step applies. However it is not >30% below and it is not predicted to occur in the next 25% withdraw increment.

D. **Incorrect.** This is plausible because according to 1103-8 (p3; Rev 52) L&P 2.3 directs the operator to not exceed a transient SUR of 1.5 DPM, and the present SUR is 1.5 DPM. Based on this, the operator may incorrectly believe that the action under consideration is required.

Technical Reference(s): 1103-8 (p3, 7 and 9; Rev 52) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-AA-223-F070 (PCO 2 and 3) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to manipulate the console controls as required to operate the facility during a reactor startup, which is between shutdown and designated power levels.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate a stated set of plant conditions, and apply procedural guidance to identify under what condition specific compensatory actions (i.e. inserting the rod group being withdrawn and one additional group) must be taken.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	E09 EK1.2	
	Importance Rating	3.7	

Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Cooldown) Normal, abnormal and emergency operating procedures associated with (Natural Circulation Cooldown).

Proposed Question: RO Question # 63

Plant conditions:

- The plant has tripped from 100% power due to a loss of Offsite power.
- Natural Circulation has been verified.
- A plant cooldown is in progress in accordance with 1102-11, Plant Cooldown.
- RCS pressure is 1375 psig.
- RCS Thot is 500°F and slowly lowering.

Which ONE (1) of the following identifies the MAXIMUM allowable cooldown rate under the present conditions, AND a symptom that would be indicative of a steam bubble in the Reactor Vessel Head?

A. 30°F/hour;
An increase in Pressurizer level without an increase in RCS pressure.

B. 30°F/hour;
An increase in RCS pressure without an increase in Pressurizer level.

C. 50°F/hour;
An increase in Pressurizer level without an increase in RCS pressure.

D. 50°F/hour;
An increase in RCS pressure without an increase in Pressurizer level.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because it would be correct if the RCS temperature was <255°F.

B. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

C. **Correct.** 1st part correct, 2nd part correct. According to OS-24 (p7; Rev 18) Guides should be implemented when the applicable conditions exists as described in the Rule or Guide; and they are applicable when the EOP has been initiated. Consequently, when the EOP has been initiated on the reactor trip, and all RCPs are off, Guide 10 will be applicable and Natural Circulation will be verified. Likewise, according to OP-TM-EOP-010 (p23; Rev 11), IAAT reactor is shutdown and SCM > 25°F (which it is), the cooldown rate will be determined using Guide 11. If the RCS is < 255°F, then the Cooldown Rate is limited to 30°F. On the other hand if the RCS Tcold is > 255°F, and all RCPs are OFF (i.e. NC exists), then the Cooldown Rate is limited to 50°F. According to 1102-11 (p5; Rev 140) voids may form in the RV Head if the RCPs are OFF, and can result in a loss of Pzr control of RCS Pressure. This condition would be indicated by a change in Pzr level without a corresponding change on Pzr pressure.

D. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may not comprehend the thermodynamics of a steam bubble drawn in the Reactor Vessel Head, and confuse the two parameters.

Technical Reference(s): OS-24 (p7; Rev 18)
EOP-010 (p23; Rev 11)
1102-11 (p5; Rev 140) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP010-PCO-1
TQ-TM-104-A20-C001 (1.b)
TQ-TM-104-GOP-C008 (PCO-4/5) (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the operational implications of the Normal, Abnormal and Emergency operating procedures associated with Natural Circulation Cooldown (i.e. Both the EOP and AOP-020 will ultimately require a plant cooldown via 1102-11, and this NOP provides the symptoms/indication of a Steam Bubble being drawn in the RV Head).

The question is at the Comprehension/Analysis cognitive level because the operator must consider present plant conditions and determine a maximum allowable cooldown rate (which changes based on the stated conditions), and demonstrate an understanding of the thermodynamics of drawing a steam bubble in the RV head during and NC cooldown.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	007 K3.01	
	Importance Rating	3.3	

Knowledge of the effect that a loss or malfunction of the PRTS will have on the following: Containment

Proposed Question: RO Question # 64

Plant conditions:

- Reactor Coolant System fill in progress per 1103-11, RCS Water Level Control.
- The Pressurizer is venting to the Reactor Coolant Drain Tank.
- All Reactor Coolant Drain Tank manual vent valves are closed.
- The Reactor Vessel is venting to the Reactor Building via the CRDM vents.
- Hot Legs are venting to the Reactor Coolant Drain Tank via high point vents.

Event:

- WDG-V-3, RB Vent Header Containment Isolation Valve, fails closed.

Assuming that the fill evolution continues, which ONE (1) of the following identifies when Reactor Building Sump Level will begin to rise?

A. After the Pressurizer has filled, when the RC Drain Tank rupture disk has failed.

B. Before Pressurizer level reaches 400 inches, when flow begins out the CRDM vents.

C. Before Pressurizer level reaches 400 inches, when flow begins out the Hot Leg vents.

D. After the Pressurizer has filled, when the RC Drain Tank overflows through the relief valve.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the system will pressurize as the fill continues; however the Reactor Vessel is vented to the

RB.

B. **Correct.** The Pressurizer and RC Drain Tank will be hydraulically locked which will cause the Reactor Vessel to overflow at a lower indicated pressurizer level than expected. According to OP-TM-220-555 (p1; Rev 4), during the fill operation the operator is directed to monitor RCS water level and limit level in accordance with the maximum per attachment 1 of 1103-11. According to 1103-11 (p45; Rev 68) the lowest level vented to the RB is the top of the CRDM closures at an equivalent Pzr level of 364".

C. **Incorrect.** This is plausible the operator may incorrectly believe that the level of the Hot Leg Vents is below the CRDM vents but does recognize the manometer affect of RCDT isolated.

D. **Incorrect.** This is plausible because the operator may incorrectly believe that the Pressurizer would fill and overflow to the RC Drain Tank causing it to pressurize; however the level of the CRDM vents is below the full point of the Pressurizer.

Technical Reference(s): OP-TM-220-555 (p1; Rev 4)
1103-11 (p45; Rev 68) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: GOP-012-PCO-5 (As available)

Question Source: Bank # WTSI 58796/ TMI Bank: IR-GOP-012-PCO-5-Q03

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2007 TMI Q#5

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 3

55.43

Mechanical components and design features of reactor primary system.

Comments:
TMI Bank Question: IR-GOP-012-PCO-5-Q03 Also on 07-1 NRC Exam)

The KA is matched because the operator must demonstrate knowledge of the consequences (overflow into the Containment) of an inadvertent valve realignment associated with the RCDT (PRTS).

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of system response during a dynamic process (filling the RCS) when an inadvertent valve realignment associated with the RCDT (PRTS) occurs.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	008 AK1.01	
	Importance Rating	3.2	

Knowledge of the operational implications of the following concepts as they apply to a Pressurizer Vapor Space Accident: Thermodynamics and flow characteristics of open or leaking valves

Proposed Question: RO Question # 65

The plant is operating at power.

Which of the following provides the most valid indication that the Power Operated Relief Valve (PORV) is stuck open?

A. RC-RV-2 tailpipe delta temp (A0517) reading 550F.

B. The "red" indicating light on the PORV control switch is illuminated.

C. Pressurizer level is rapidly decreasing with decreasing Tave and decreasing Reactor Coolant System pressure.

D. Reactor Coolant System Pressure is decreasing, Tave is stable or decreasing and Pressurizer level is slowly increasing.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because this would be in for the PORV being open however it can not be used to verify the PORV is stuck open as the temperatures take time to return to normal, and this delta temperature is too high.

B. **Incorrect.** This is plausible because the PORV has a red indicating light (Pilot Valve Demand Position) that will be lit when the valve is OPEN. However, according to OPM B-01 (p18; Rev 13) this is ONLY demanded position and if the valve were to be stuck open would NOT be an accurate indication of actual position).

C. **Incorrect.** This is plausible because the RCS is losing inventory and typically Pzr level is a measure of RCS inventory. However, the RCS is also losing energy faster than it is losing inventory causing an initial insurge into the Pressurizer, and then ultimately, as saturation occurs in the RCS, voiding of the RCS Hot Legs which will rapidly increase

Pressurizer Level. The operator may NOT understand this concept.

D. **Correct.** According to TM1 UFSAR (p14.2-36; Rev 20) the initial rise in Pzr Level will occur due to the RCS pressure reduction, and the insurge of coolant from the RCS into the Pzr. According to OP-TM-MAP-G0105 (p1; Rev 2) the PZR LEVEL HI-HI can be caused by a large Pzr Steam Space Leak. Therefore, Pzr level rising supports the Pzr PORV being stuck open while at power. Step 4.3 of this procedure states that if Pzr Level is > 370" and RCS temperature is stable or lowering, then go to OP-TM-AOP-043. According to OP-TM-AOP-0431 (p7; Rev 2) Step 3.6 the operator is directed to verify that the PORV is NOT leaking, and if it is determined to be leaking, the operator is directed to close the Block Valve. A similar step appears in OP-TM-EOP-002 (p3; Rev 8) which is entered upon loss of SCM. According to Step 3.4, the operator is directed to verify that the PORV is closed, and if not, and the PORV was NOT opened for HPI cooling, the block valve is directed to be closed. From these procedures it can be seen that a stuck open PORV can lead to situations where Pzr Level is high, RCS pressure is low and RCS temperature is stable/or decreasing.

Technical Reference(s): TM1 UFSAR (p14.2-36; Rev 20)
OP-TM-MAP-G0105 (p1; Rev 2)
OP-TM-AOP-0431 (p7; Rev 2)
Step 3.6
OP-TM-EOP-002 (p3; Rev 8)
OPM B-01 (p18; Rev 13)
TQ-TM-104-220-C001 (p14, 29; Rev 5)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: A43-C001 (Obj. 5) (As available)

Question Source: Bank # WTSI 58471
Modified Bank # (Note changes or attach parent)
New

Question History: Last NRC Exam: 2005 Davis Besse

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 14

55.43

Principles of heat transfer, thermodynamics and fluid mechanics.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the operational implications (i.e. what are the indications of a stuck open PORV while at power) of the Thermodynamics and flow characteristics of open valves as they apply to a Pressurizer Vapor Space Accident.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of how Pzr level and RCS temperature will respond if a PORV were to stick open (i.e. recognize that the RCS is also losing energy faster than it is losing inventory and Pzr level will tend to rise rather than lower for this particular type of Small Break LOCA).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	017 K3.01	
	Importance Rating	3.5	

Knowledge of the effect that a loss or malfunction of the ITM system will have on the following: Natural circulation indications

Proposed Question: RO Question # 66

Plant conditions:

- The plant has tripped from 100% power.
- All RCPs are OFF.
- The Plant Process Computer is unavailable.

In order to determine if Natural Circulation exists, which indication is used to determine if adequate SCM exists?

A. SCM Meters TI-977 or TI-978.

B. The highest BIRO thermocouple reading.

C. The average of all the BIRO thermocouple readings.

D. The average of the five highest BIRO thermocouple readings.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may correctly believe that the normal SCM meters are available to determine SCM for Natural circulation, however they are only to be used for forced flow or verified natural circulation OS-24 rev 18 page 21.

B. **Correct.** According to OP-TM-EOP-010, Guide 10 (p22; Rev 11), six criteria are required to exist before the operator can state that NC has been verified. Two of these criteria is that Incore temperature stabilizes and tracks with Thot, and that SCM must be verified to be > 25°F. Consequently, an Incore Thermocouple must be available to verify that NC is established. According to TQ-TM-104-625-C001 (p10; Rev 1), there are 50 Incore thermocouples, and they normally readout on the Plant Computer. However, 16 selected thermocouples feed the Backup Incore Thermocouple Display on

CR Panel F (BIRO). Therefore, since the operator can use the BIRO to monitor the Incore Thermocouples, the operator can verify that NC is established. Secondly, according to OS-24 (p21; Rev 18) when determining SCM if the preferred instruments are NOT available the SCM should be calculated using Attachment J. If TI-977 and TI-978 are < 25°F, and Thot is changing at a high rate (>900°F/hour), then the operator is instructed to use incore Subcooling Margin (C4008 or C4132) to determine SCM. However, neither one of these are available, and the direction to use Attachment J applies. According to OS-24 (p40; Rev 18) if the PPC is NOT available when determining the SCM, use the highest BIRO thermocouple indication.

C. **Incorrect.** This is plausible because according to OS-24 (p40; Rev 18) the preferred method to determine SCM is to use C4008 which is the average of the five highest thermocouples. The operator may incorrectly believe that the 16 BIRO thermocouple temperatures must be recorded, and averaged.

D. **Incorrect.** This is plausible because according to OS-24 (p40; Rev 18) the preferred method to determine SCM is to use C4008 which is the average of the five highest thermocouples. The operator may incorrectly believe that the 16 BIRO thermocouple temperatures must be recorded, and the five highest averaged.

Technical Reference(s): OP-TM-EOP-010, Guide 10 (p22; Rev 11)
TQ-TM-104-625-C001 (p10; Rev 1)
OS-24 (p21 and 40; Rev 18)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 625-GLO-11 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the effect (i.e. 16 T/Cs are available) that a malfunction of the ITM system (i.e. Loss of PPC) will have on Natural circulation indications (i.e. Operator can still verify that NC is established with PPC out).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and predict an outcome based on those conditions to correctly answer the question. Specifically, the operator must relate the impact of a loss of PPC (16 T/Cs available) with the criteria for assessing whether or not NC is established in the NC (IC T/C stabilized and trending with Thot and SCM > 25F), and then predict an the outcome (i.e. Operator can still verify that NC is established with PPC out, but must use Attachment J).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	011 EA2.01	
	Importance Rating	4.2	

Ability to determine or interpret the following as they apply to a Large Break LOCA: Actions to be taken, based on RCS temperature and pressure - saturated and superheated

Proposed Question: RO Question # 67

Plant conditions:

- The plant tripped from 100% power due to a Large Break LOCA in the Reactor Building.
- Guide 22, RB Sump Recirculation, has just been initiated.
- SCM is 21°F and stable.

IAW Guide 22, which ONE (1) of the following identifies an action that will be taken based on the indicated RCS Subcooling Margin?

A. Perform a Rapid RCS Cooldown.

B. Feed at >215 gpm/OTSG to 75 to 85% Operating Range.

C. Initiate Post LOCA Reactor Vessel Boron Concentration Control.

D. Maintain OTSG Pressure more than 100 psig below RCS pressure.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because according to OP-TM-EOP-002, Loss of SubCooling Margin, Step 3.7, the operator is provided direction to verify either SCM >25°F or Adequate HPI exists. This is a step taken based on LSCM, but is in EOP-002, and not the action to take IAW Guide 22.

B. **Incorrect.** This is plausible because according to OP-TM-EOP-010, Rule 4, Feedwater Control (p8; Rev 11) Steps 11 & 12, the operator is provided direction to verify SCM >25°F or OTSG level between 75 to 85% Operating Range Level. The RNO is to feed with EFW Feed at >215 gpm/OTSG to 75 to 85% Operating Range. This is a step taken based on LSCM, but is in RULE 4, and not the action to take IAW Guide 22

C. **Correct.** According to OP-TM-EOP-010, Guide 22 (p31; Rev 11) Step 7, if SCM < 25°F, the operator is directed to initiate OP-TM-212-911, "Post-LOCA Reactor Vessel Boron Concentration Control." According to OP-TM-EOP-0101 (p67; Rev 3), if the core has not been restored to subcooled conditions when on recirculation, then the steam leaving the core does not carry over boron, causing the boron concentration in the core region to slowly rise. The concern is that if this is not addressed, boron crystal will eventually form in the core area, and the unknown structures could adversely affect core cooling. This condition can occur in events where there is a large break in the Cold Leg. To prevent this, a forced circulation path is established. According to OP-TM-212-911 (p1; Rev 1) the purpose of the procedure is to ensure that there is forced flow through the reactor vessel during a situation when RCS subcooling cannot be recovered after a LOCA. After a Large Break LOCA, precipitation of Boric Acid is prevented by NC of coolant through the gap between the RCS Hot Leg Nozzles and the Reactor Vessel. This passive method should provide more than adequate flow to prevent boron concentration to the point at which the boron will precipitate out of the solution. To provide further assurance, this procedure initiates two active methods for forced circulation in the reactor vessel.

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D. **Incorrect.** This is plausible because according to OP-TM-EOP-010, Guide 6, OTSG Pressure Control, Step 2, the operator is provided direction to verify SCM >25°F with the RNO action to maintain OTSG pressure more than 100 psig below RCS pressure. This is a step taken based on LSCM, but is in Guide 6, and not the action to take IAW Guide 22.

Technical Reference(s): OP-TM-EOP-010, Guide 22 (p31; Rev 11)
OP-TM-EOP-0101 (p67; Rev 3)
OP-TM-212-911 (p1; Rev 1)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP010-PCO-1 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level:	Memory or Fundamental Knowledge		X
	Comprehension or Analysis		
10 CFR Part 55 Content:	55.41	10	
	55.43		

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the ability to determine or interpret the actions to be taken, based on RCS temperature and pressure - saturated and superheated as they apply to a Large Break LOCA. (i.e. post-LOCA RCS temperature and pressure are used to determine SCM which is used to determine whether or not there is a need to ensure forced circulation through the Reactor Vessel).

The question is at the Memory cognitive level because the operator must recall that it is necessary to establish forced circulation in the vessel after a LOCA when the RCS is NOT subcooled (i.e. saturated).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	062 2.4.47	
	Importance Rating	4.2	

System AC Electrical Distribution - Emergency Procedures / Plan: Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.

Proposed Question: RO Question # 68

Plant conditions:

- The plant trips from 100% power.
- The 1600 psig and 500 psig ESAS signals have actuated.
- The 4 psig and 30 psig RB pressure ESAS signals have actuated.
- The RB Spray Pumps (BS-P-1A and 1B) are both running.
- The crew observes the BWST Level at 40 feet and lowering at 0.5 feet/minute.

Assuming the BWST level lowers at a constant rate, which ONE (1) of the following identifies the approximate time before the operator is required to have closed the breakers for the Core Flood Tank Outlet Valves (CF-V-1A and B), AND the EOP-010 Guide that directs this action?

A. 50 minutes;
Guide 20, Prior to Transfer to RB Sump.

B. 50 minutes;
Guide 21, Transfer to RB Sump Recirculation.

C. 60 minutes;
Guide 20, Prior to Transfer to RB Sump.

D. 60 minutes;
Guide 21, Transfer to RB Sump Recirculation.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-EOP-010, Guide 20 (p28; Rev 11) Step 1, the operator is directed to observe the rate of BWST level reduction and ensure the following actions prior to BWST level < 15 feet, one of which is

to close the breakers for CF-V-1A and B. According to OP-TM-EOP-0101, Guide 20 (p60; Rev 3) the basis for this action is that actuation of HPI/LPI will eventually require transfer to the Containment Sump, and there are several actions in Guide 20 which will require entry into a high radiation area after RB Sump recirculation has been established. For this reason, they are performed prior to transferring to RB Sump recirculation. Since the present level is 40' and the actions must be accomplished prior to the level lowering to < 15 feet, and the rate of lowering is constant (as stated in the conditions), the operator will need to complete the actions of Guide 20 within approximately 50 minutes (25 feet lowering at .5 feet/minute).

B. **Incorrect.** 1st part correct, 2nd part wrong. This plausible because according to OP-TM-EOP-010, Guide 21, (p29; Rev 11) there are actions associated with Guide 21 required to be taken at a BWST level of 15 feet; and the operator may confuse the Guides. Additionally, there is plausibility because the Guides are closely related (Yet distinguishable in purpose).

C. **Incorrect.** 1st part wrong, 2nd part correct. This plausible because according to OP-TM-EOP-010, Guide 21, (p29; Rev 11) there are actions associated with Guide 21 required to be taken at a BWST level of 9.5 feet; and the operator may confuse the levels. If so, the approximate time is 60 minutes rather than 50.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): OP-TM-EOP-010, Guide 20 (p28; Rev 11)
OP-TM-EOP-0101, Guide 20 (p60; Rev 3)
OP-TM-EOP-010, Guide 21, (p29; Rev 11)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP010-PCO-1 and 3 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	10	
	55.43		

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to diagnose and recognize trends (i.e. BWST Level) in an accurate and timely manner (i.e. choose correct approximate time) utilizing the appropriate control room reference material (EOP-010 Guide, which is required to be memorized per OS-24 Attachment 1) in order to open breakers (i.e. associated with AC Distribution).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and predict an allowable time to complete specified actions, and then identify the specific Guide which requires such actions (recalling that these actions cannot be accomplished after RB Sump Recirculation has been established) in order to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	E14 EA2.1	
	Importance Rating	3.4	

Ability to determine and interpret the following as they apply to the (EOP Enclosures) Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

Proposed Question: RO Question # 69

Plant conditions:

- A LOCA has occurred.
- "A" LPI = 900 gpm and stable.
- "B" LPI = 900 gpm and stable.
- SCM is 2˚F, slowly lowering.
- Containment Pressure is 8 psig, lowering.
- The crew is performing EOP-006, LOCA Cooldown, Step 3.9 – Initiate GUIDE 20, Prior to Transfer to RB Sump.

Which ONE (1) of the following correctly completes the statements below?

GUIDE 20 requires that the first step actions be completed prior to BWST level reaching less than 15 feet because ____1____. Considering the current conditions, HPI will be ____2____ when BWST level lowers to less than 15 feet.

A. (1) establishing LPI flow from the RB sump cannot be successfully completed without completion of GUIDE 20
(2) terminated IAW Rule 2

B. (1) establishing LPI flow from the RB sump cannot be successfully completed without completion of GUIDE 20
(2) placed in the piggyback mode IAW OP-TM-211-901 Emergency Injection HPI/LPI

C. (1) rising radiation levels may make areas of the Auxiliary Building inaccessible for critical operations that must be performed later in the event
(2) terminated IAW Rule 2

D. (1) rising radiation levels may make areas of the Auxiliary Building inaccessible for critical operations that must be performed later in the event
(2) placed in the piggyback mode IAW OP-TM-211-901 Emergency Injection HPI/LPI

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may not know the general content of GUIDE 20, if candidate believes GUIDES 22 and 23 can not be performed without competition of GUIDE 20. The steps in GUIDE 20 are NOT directly related to the implementation of LPI RB Sump Recirculation.

B. **Incorrect.** 1st part wrong, 2nd part wrong. This is plausible because the operator may not know the general content of GUIDE 20 (See A); and the operator may incorrectly believe that the conditions for HPI termination are NOT met (See D).

C. **Incorrect.** 1st part correct, 2nd part Wrong. This is plausible because placing the first part is correct see "D" the second part is incorrect as LPI is not greater than 1250 gpm each.

D. **Correct.** 1st part correct, 2nd part correct. According to OP-TM- EOP-0061 (p7; Rev 2), Step 3.9 indicates that future tasks in the Auxiliary Building may not be able to be performed due to radiation problems so critical operations are performed in advance of recirculation. Additionally, according to OP-TM-EOP-010 (p28; Rev 11), Guide 20, (p1of1) when BWST level is < 15 feet, the operator is directed to verify HPI is shutdown or placed in piggyback mode. According to OP-TM-211-901 (p13; Rev 5), Step 4.3.2, if at any time BWST level is < 15 feet, the operator is directed to evaluate RCS Subcooling and LPI. If Subcooling is < 25°F AND LPI flow is > 1250 gpm, then the operator is directed to terminate HPI in accordance with Attachment 7.3, Throttling HPI. Since both of these conditions are NOT met, HPI will be placed in the piggyback mode.

Technical Reference(s): OP-TM- EOP-0061 p7 Rev 2
OP-TM-EOP-010 p28 Rev 11
OP-TM-211-901 p13 Rev 5
UFSAR Appendix 11A Rev 18
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP006-PCO-1 (As available)

Question Source: Bank #
Modified Bank # IR-EOP006-PCO-1-Q02 (Note changes or attach parent)
New

Question History: Last NRC Exam:

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate the Ability to select between whether to terminate or place HPI on piggyback for the given plant conditions.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate parameters and decide on a course of action which demonstrates understanding. If the conditions were changed, a different answer, which is available, is appropriate.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	027 K1.01	
	Importance Rating	3.4	

Knowledge of the physical connections and/or cause-effect relationships between the CIRS and the following systems: CSS

Proposed Question: RO Question # 70

Which ONE (1) of the following describes how the majority of iodine is removed from the Reactor Building atmosphere following a large break LOCA?

A. During the Injection phase by providing a spray of subcooled borated water from the BWST into the Reactor Building volume.

B. During the Injection phase by providing a spray of water with an alkaline pH from the BWST into the Reactor Building volume.

C. During the Recirculation phase by providing a spray of subcooled borated water from the Reactor Building sump into the Reactor Building volume.

D. During the Recirculation phase by providing a spray of water with an alkaline pH from the Reactor Building sump into the Reactor Building volume.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because at one time the pH additive was added during the injection phase of a LOCA by injecting a liquid NaOH solution into the suction of the RB Spray Pumps; and the operator may incorrectly believe that the pH additive still enters the RB atmosphere during the injection phase. Additionally, the operator may incorrectly believe that the mechanism of iodine removal is through the introduction of borated water rather than through the maintenance of an alkaline solution in the RB.

B. **Incorrect.** This is plausible because at one time the pH additive was added during the injection phase of a LOCA by injecting a liquid NaOH solution into the suction of the RB Spray Pumps; and the operator may incorrectly believe that the pH additive still enters the RB atmosphere during the injection phase.

C. **Incorrect.** This is plausible because the operator may incorrectly believe that the mechanism of iodine removal is through the introduction of borated water rather than

through the maintenance of an alkaline solution in the RB.

D. **Correct.** According to TQ-TM-104-214-C001 (p4-5; Rev 6), in the event of a Large Break LOCA, the Building Spray System maintains Reactor Building pressure less than 55 psig by injecting spray water into the Reactor Building to reduce the pressure and temperature, thereby maintaining the integrity of the third and final boundary between fission products and the environment. Additionally, 23 TSP baskets on the Reactor Building basement floor (El. 281 ft.) ensure that iodine, which may be dissolved in the recirculated primary cooling water following a LOCA, remains in solution. As water level increases in the Reactor Building basement to interact with the TSP, the buffered basement water will be introduced to the Building Spray system once the recirculation mode begins. According to TQ-TM-104-214-C001 (p28; Rev 6), The absorption of elemental iodine is sensitive to pH. The pH of the water in the RB Sump is expected to be approximately 10.0 immediately following a design basis accident due to Cesium released from the fuel. Because of the addition of boric acid and radiolytic acids, the pH will decrease over time. The buffer agent (TSP) provided inside the containment building ensures that the pH of the sump water remains above 7.0.

Technical Reference(s): TQ-TM-104-214-C001 (p4-5 and 28; Rev 6) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: 214-GLO-2, 6 and 7 (As available)

Question Source: Bank # WTSI 70596

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2007 McGuire

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41 7

55.43

Design, components, and function of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

Comments:
The KA is matched because the operator must demonstrate Knowledge of the physical connections and/or cause-effect relationships between the Containment Iodine Removal System and the Containment Spray System (i.e. when the mechanism occurs and the means by which the mechanism occurs)

The question is at the Memory cognitive level because the operator must recall two pieces of information to correctly answer the question(i.e. when the mechanism occurs and the means by which the mechanism occurs).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	011 2.4.8	
	Importance Rating	3.8	

System Pressurizer Level Control - Emergency Procedures / Plan: Knowledge of how abnormal operating procedures are used in conjunction with EOP's.

Proposed Question: RO Question # 71

Plant status:

- 100% power.
- The crew determines that a primary system leak has occurred inside the Reactor Building.
- The leak is estimated to be about 5-10 gpm.
- The crew has entered OP-TM-AOP-050, "Reactor Coolant Leakage."

The following is observed:

- Pressurizer level is 195 inches and slowly lowering.
- MU-V-17, Makeup Flow Control Valve, is in AUTO and CLOSED.

Which ONE (1) of the following identifies whether or not OP-TM-EOP-010, Guide 9, "Inventory Control," is required, AND the action required by the RO?

A. Guide 9 is required to be initiated;
Place MU-V-17 in HAND and adjust Pressurizer level to setpoint.

B. Guide 9 is required to be initiated;
Leave MU-V-17 in AUTO, and OPEN MU-V-217 as needed to adjust Pressurizer level to setpoint.

C. Guide 9 is NOT required to be initiated;
Place MU-V-17 in HAND and adjust Pressurizer level to setpoint.

D. Guide 9 is NOT required to be initiated;
Leave MU-V-17 in AUTO, and OPEN MU-V-217 as needed to adjust Pressurizer level to setpoint.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-AOP-050 (p1; Rev 1), the procedure is required to be entered when RCS leakage (except OTSG tube leakage) exceeds TS. According to Technical Specification 3.1.6 (p3-12; Amendment 271), if the total RCS leakage rate > 10 gpm or the unidentified RCS leakage rate > 1 gpm, the reactor shall be placed in hot shutdown within 24 hours. Therefore, the entry conditions for AOP-050 are met. According to OP-TM-AOP-050 (p3; Rev 1) Step 3.1, the operator is directed to initiate OP-TM-EOP-010, Guide 9, RCS Inventory Control. According to OS-24 (p7; Rev 18) Step 4.1.4.B, Rules or Guides are applicable as described in each Rule or Guide when the EOP has been initiated or when the Rule or Guide is initiated by another procedure. Since AOP-050 has directed that Guide 9 be initiated, Guide 9 is required to be initiated. According to TQ-TM-104-220-C001 (p23; Rev 5) Pressurizer level is maintained at 220" when the Plant is operating at 100% full power. The level is sensed and applied to a level control circuit. The level control circuit when in the automatic mode will control the position of the normal makeup valve (MU-V-17). If the level drops below 220" the circuit will open the normal makeup valve until the levels returns to normal. According to OS-24 (p17; Rev 18) any time an automatic control interlock function fails to perform as designed and there is no specific procedure direction, the RO should take action to compensate directly for the failure. The RO should verbalize actions taken to inform the control room team of the condition and actions taken. (e.g. Pzr level < setpoint and MU-V-17 closed in automatic. The RO should place MU-V-17 in HAND, adjust makeup flow and announce the condition to the control room). Therefore, the operator should place MU-V-17 in HAND and adjust Pzr level to setpoint.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to TQ-TM-104-220-C001 (p23; Rev 5), Pzr level can also be controlled manually by the operator by using the RAISE/LOWER toggle switch on the level control station. When increased makeup flow is required, a jog control higher flow makeup valve (MU-V-217) is used. This valve is in parallel with the normal makeup valve. According to OP-TM-EOP-010, Guide 9 (p21; Rev 11), if the Pzr level is low, this is an appropriate action to take. However, the operator is directed to ensure that MU-V-17 is open prior to taking this action, and the direction to "ensure" implies that if it is NOT, the operator must make it happen.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that since the EOPs have NOT been entered, that the Guide cannot be entered either. Or, this is plausible because the operator may incorrectly believe that since the leakage is low, the Guide is NOT required.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): OP-TM-AOP-050 (p1, 3; Rev 1)
TS 3.1.6 (p3-12; Amendment 271)
OS-24 (p7, 17; Rev 18) Step 4.1.4.B
TQ-TM-104-220-C001 (p25; Rev 5)
(Attach if not previously provided)

OP-TM-EOP-010, Guide 9 (p21;
Rev 11)

Proposed References to be provided to applicants during examination:

Learning Objective: 220-GLO-2
TQ-TM-104-A50-C001 (Obj.1)
EOP010-PCO-6 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of how abnormal operating procedures are used in conjunction with EOP's (i.e. EOP Guides are applicable if directed by AOP).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and determine, based on these conditions the applicability of an EOP Guide within an AOP; and recognize that a failure has occurred (i.e. Pzr Level Control) and identify action that is required.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	022 2.4.2	
	Importance Rating	4.5	

System Containment Cooling - Emergency Procedures / Plan: Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.

Proposed Question: RO Question # 72

Plant conditions:

- 100% power.
- A steam leak occurs in the RB causing a slow rise in RB temperature.
- The crew entered OP-TM-AOP-051, "Secondary Side High Energy Leak."
- The crew has placed RB Emergency Cooling in service per OP-TM-534-901, "RB Emergency Cooling Operations."
- RB temperatures continue to rise.
- Reactor power rises.
- Tave lowers.

Which ONE (1) of the following identifies a condition that will require EOP Entry?

A. Tave lowers to 572.5.

B. Reactor power rises to 102.

C. RB pressure rises to 2 psig.

D. Primary Containment average air temperature above Elevation 320 exceeds 130°F.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because according to 1102-4 572.5 is the bottom end of the allowable Tave reduction for end of core Tave reduction. If it is believed that the unit must be tripped below this point this could be chosen. This is incorrect no action is specified in 1102-4 and Tave low is not specified in OS-24 memory items.

B. **Incorrect.** This is plausible because this is the Computer Alarm setpoint on the PPC however this is not the required trip setpoint. OS-24 lists 105.1 as the operator memory

required trip setpoint.

C. **Correct.** According to OP-TM-AOP-051 (p9; Rev 0) Step 4.1, IAAT RB pressure is > 2 psig, the Trip the Reactor and GO To EOP-001. According to OP-TM-AOP-0511 (p9; Rev 0) Step 4.1 is continuously applicable because of the approach to the automatic trip setpoint for RB pressure, and because a steam leak big enough to cause RB pressure to exceed 2 psig warrants an expedited plant shutdown and cooldown.

D. **Incorrect.** This is plausible because according to OP-TM-EOP-001 (p1; Rev 10), the entry condition into EOP-001 while operating at power is any unplanned condition requiring an automatic or manual Reactor Trip (OS-24 Attachment A). According to OS-24, Attachment A (p29; Rev 18) 2.1, Bullet 5, a reactor trip is required (automatic or manual) if any of the following limits are exceed: Containment pressure > 4 psig. The operator may incorrectly believe that the 4 psig requirement identified by Attachment A of OS-24 is the applicable trip criteria. If so, the operator may conclude that RB pressure of 2 psig has NOT met the trip criteria. Additionally, according to Technical Specification 3.17 (p3-80; Amendment 157) during power operations the Primary Containment average air temperature above Elevation 320 shall not exceed 130°F, and the average air temperature below Elevation 320 shall not exceed 120°F. The operator may incorrectly believe that if the TS limits are exceeded that a reactor trip is required.

Technical Reference(s):	OP-TM-AOP-051 (p9; Rev 0) Step 4.1 OP-TM-AOP-0511 (p9; Rev 0) OP-TM-EOP-001 (p1; Rev 10) OS-24, Attachment A (p29; Rev 18) 2.1, Bullet 5 Technical Specification 3.17 (p3-80; Amendment 157)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective:	824-GLO-10 TQ-TM-104-A51-C001 #3	(As available)

Question Source:	Bank #		
	Modified Bank #		(Note changes or attach parent)
	New	X	

Question History: Last NRC Exam: NA

Question Cognitive Level:	Memory or Fundamental Knowledge		X
	Comprehension or Analysis		
10 CFR Part 55 Content:	55.41	10	
	55.43		

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of system set points (i.e. 2 psig in RB during a steam leak in RB) associated with EOP entry conditions. The operation of the Containment Cooling System will have a direct effect on the RB pressure).

The question is at the Memory level because the operator must recognize a reactor trip setpoint exceeded.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	3	
	Group #	4	
	K/A #	G4 2.4.34	
	Importance Rating	4.2	

Emergency Procedures / Plan: Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.

Proposed Question: RO Question # 73

With the plant at 100% power the following events occur:

- Smoke appears in the Control Room.
- The crew enters OP-TM-EOP-020, Cooldown From Outside of Control Room.
- The URO completes IMA 2.2 through 2.7.
- The CRS makes the decision to evacuate the Control Room.
- The crew is preparing to perform the following two Attachments as directed by the procedure:
    - Attachment 11, Control Tower 2nd Floor Actions to Establish Control at Remote Shutdown Panels.
    - Attachment 12, Control Tower 3rd Floor Actions to Establish Control at Remote Shutdown Panels.

Which ONE (1) of the following describes how the actions outside the Control Room are expected to be accomplished?

A. The URO will complete Attachment 11 to start IA-P-1B at its MCC;
The ARO will complete Attachment 12 to transfer control of "A" train equipment to RSD from RSTSP-A.

B. The URO will complete Attachment 11 to transfer control of "A" train equipment to RSD from RSTSP-A;
The ARO will complete Attachment 12 to start IA-P-1B at its MCC.

C. The ARO will complete Attachment 11 to start IA-P-1B at its MCC;
The URO will complete Attachment 12 to transfer control of "A" train equipment to RSD from RSTSP-A.

D. The ARO will complete Attachment 11 to transfer control of "A" train equipment to RSD from RSTSP-A;
The URO will complete Attachment 12 to start IA-P-1B at its MCC.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to OP-TM-EOP-0201 (p14; Rev 6) Note proceeding step 2.8 states that specific roles are provided so that the RSD control can be established in as quickly and orderly a manner as possible. According to OP-TM-EOP-020 (p7; Rev 12) the ARO/STA is assigned to perform Attachment 12 and the URO/CRS is assigned to perform Attachment 11. According to OP-TM-EOP-0201 (p16; Rev 6), Attachment 12 will transfer control of A Train equipment to the RSD from RSTSP-A, and transfer Pumps/Breakers at the 1E 4160v switchgear to prepare to start EG-Y-1B if Bus 1E is de-energized. On the other hand, Attachment 11 will transfer control of the B Train equipment to the RSD from RSTSP-B, isolate 1S 480v Feeder Breaker control, locally start IA-P-1B at 1B ES MCC and transfer MU-P-1B to the RSD from RSTSP-C.

B. **Incorrect.** This is plausible because the examinee may not understand the train swapped by each attachment. According to OP-TM-EOP-0201 (p16; Rev 6), Attachment 12 will transfer control of A Train equipment to the RSD from RSTSP-A, and transfer Pumps/Breakers at the 1E 4160v switchgear to prepare to start EG-Y-1B if Bus 1E is de-energized. On the other hand, Attachment 11 will transfer control of the B Train equipment to the RSD from RSTSP-B, isolate 1S 480v Feeder Breaker control, locally start IA-P-1B at 1B ES MCC and transfer MU-P-1B to the RSD from RSTSP-C.

C. **Incorrect.** This is plausible because the examinee may confuse the roles of the ARO and URO.

D. **Incorrect.** This is plausible because the examinee may confuse the roles of the ARO and URO. Additionally, the examinee may not understand which train equipment is transferred at each location.

Technical Reference(s): OP-TM-EOP-0201 (p3, 14, 16 and 17; Rev 6)
OP-TM-EOP-020 (p3, 7; Rev 12) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-TM-104-E20 (PCO-5/6) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

	New	X	
Question History:		Last NRC Exam:	N/A
Question Cognitive Level:	Memory or Fundamental Knowledge		
	Comprehension or Analysis		X
10 CFR Part 55 Content:	55.41	10	
	55.43		

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of RO tasks performed outside (i.e. specific roles) the main control room during an emergency and the resultant operational effects (i.e. knowing that the IA system is restored at the motor control center).

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of the strategy for mitigating the evacuation of the Control Room event.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	E04 EA2.1	
	Importance Rating	3.2	

Ability to determine and interpret the following as they apply to the (Inadequate Heat Transfer) Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

Proposed Question: RO Question # 74

Plant conditions:

- The plant has tripped from 100% power due to a small break LOCA in the Reactor Building.
- The crew is implementing OP-TM-EOP-002, Loss of 25 degrees F Subcooling Margin.
- All RCPs are OFF.
- Natural circulation has NOT been verified.
- RCS Pressure is 1250 psig and slowly lowering.
- Incore temperatures are 572°F and rising.
- Adequate HPI exists.
- Feedwater is available to OTSG B, ONLY.
- After the reactor trip, RM-G-17, B OTSG Sampling Monitor, went off-scale HIGH.

Which ONE (1) of the following identifies the action that the crew should take next?

A. Go To EOP-009, HPI Cooling.

B. Go To EOP-008, RCS Superheated.

C. Go To EOP-005, OTSG Tube Leakage.

D. Go To EOP-004, Lack of Primary to Secondary Heat Transfer.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** According to OP-TM-EOP-009 (p1; Rev 6) the entry conditions are met when another EOP directs entry into this procedure. This is plausible from EOP-002, because according to OP-TM-EOP-002 (p5; Rev 8) the Step 3.12 RNO if no OTSGs are available, the operator will be directed to go to EOP-009. According to OP-TM-EOP-0091 (p1; Rev 1) HPI Cooling is required when neither OTSG is available for RCS heat

removal. According to OS-24 (p4; Rev 18) an OTSG is available if it is in a condition where primary to secondary heat transfer would be possible. The ability to control OTSG pressure and provide a source of feedwater is required for an OTSG to be available. Therefore, the B OTSG is available, and the entry condition for EOP-009 is NOT met. With tube leakage indicated into "B" OTSG it may be improperly considered "unavailable" and therefore feed / bleed cooling done per EOP-009.

B. **Incorrect.** According to OP-TM-EOP-008 (p1; Rev 8) the entry conditions are met when EOP-008 is directed by another procedure. According to OP-TM-EOP-002 (p5; Rev 8) Step 3.8 IAAT RCS Superheat is > 25°F, the operator is directed to EOP-008. In actuality, the RCS is close to 25°F subcooled; and the operator may confuse the issue.

C. **Incorrect.** According to OP-TM-EOP-005 (p1; Rev 7) the entry conditions are met when OTSG Tube Leakage exists and OTSG(s) are providing RCS heat removal. According to OS-24 (p5; Rev 18) OTSG Tube Leakage can be confirmed if primary to secondary leakage exists requiring a plant shutdown, OR post trip or during transient conditions a valid and unexpected alarm from offgas or steam line monitor RM-A-5, RM-A-15, RM-G-26 or RM-G-27) is in alarm. Therefore, under the stated conditions, the entry conditions are NOT met. This is plausible because according to OP-TM-EOP-002 (p5; Rev 8) the Step 3.13 the operator is directed to EOP-005 if OTSG Leakage exists; and the RM-G-17 is reading off-scale HIGH. However, this does NOT meet the OS-24 definition of OTSG Tube Leakage, and therefore the entry conditions for EOP-005 are NOT met.

D. **Correct.** According to OP-TM-EOP-004 (p1; Rev 7), the entry conditions for this EOP are a lack of Primary to Secondary Heat Transfer (LOHT) with the reactor shutdown, and the EOP has been initiated. According to OS-24 (p4; Rev 18) LOHT is defined as the inability of either OTSG to remove sensible heat from the RCS, and can be confirmed by one of the following sets of conditions: (1) incore temperatures or Thot rising above 580°F and at least one RC Pump operating (NOT the case in the stated conditions), (2) incore temperatures rising and no feedwater available (NOT the case in the stated conditions), or (3) incore temperatures rising and RCS circulation cannot be confirmed (Conditions exist). Therefore, a LOHT exists.

Technical Reference(s):
OP-TM-EOP-004 (p1; Rev 7)
OS-24 (p4 and 5; Rev 18)
OP-TM-EOP-009 (p1; Rev 6)
OP-TM-EOP-002 (p5; Rev 8)
OP-TM-EOP-0091 (p1; Rev 1)
OP-TM-EOP-008 (p1; Rev 8)
OP-TM-EOP-005 (p1; Rev 7)

(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: EOP004-PCO-1 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

What MUST be known:

1. EOP-004 is entered when an LOHT exists.
2. Under the stated conditions an LOHT exists (incore temperatures rising and RCS circulation cannot be confirmed).
3. HPI Cooling (EOP-009) is required when neither OTSG is available for RCS heat removal.
4. The B OTSG is AVAILABLE (EOP-009 entry is NOT required).
5. OTSG Tube Leakage is NOT confirmed IAW OS-24.
6. The entry conditions for EOP-008 are NOT met.

The KA is matched because the operator must demonstrate the ability to determine and interpret plant conditions during abnormal and emergency operations as they apply to the Inadequate Heat Transfer conditions and select the appropriate recovery procedure.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, determine that a procedure whose purpose is to restore PSHT may be useful under those conditions, and select it for use.

While traditionally, an SRO-ONLY task per 10CFR55.43(b.5), this question can be answered by solely by knowing plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of the identified EOP.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	A03 AK1.3	
	Importance Rating	3.0	

Knowledge of the operational implications of the following concepts as they apply to the (Loss of NNI-Y) Annunciators and conditions indicating signals, and remedial actions associated with the (NNI-Y).

Proposed Question: RO Question # 75

Plant conditions:

- Reactor is operating at 100% power, with ICS in full automatic.

Event:

- MAP H-1-8 ICS/NNI POWER LOST actuates.

At Panel PCL:

- ICS-HAND ICS/NNI Power indicator lamp is NOT lit.
- ICS-AUTO ICS/NNI Power indicator lamp is lit.
- SUBFEEDS AUTO/HAND Power indicator lamp is NOT lit.

The following alarms actuate with no change in alarm related parameters:

- C-2-7 DH PUMP SUCTION TEMP HI.
- G-2-5 PZR LEVEL HI/LO.
- D-3-8 RC PRESS NARROW RNG HI/LO.

Based on these conditions, which ONE (1) of the following identifies the event in progress, AND the appropriate procedure to be implemented?

A. TOTAL loss of ICS HAND Power;
OP-TM-AOP-026, Loss of ATB or ICS Hand Power.

B. TOTAL loss of ICS/NNI AUTO Power;
OP-TM-AOP-027, Loss of ATA or ICS Auto Power.

C. Loss of ICS HAND Power, SUBFEED, ONLY;
OP-TM-AOP-026, Loss of ATB or ICS Hand Power.

D. TOTAL loss of BOTH ICS HAND and AUTO Power;

OP-TM-AOP-025, Loss of ICS Hand and Auto Power.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to OP-TM-MAP-H0108 (p1; Rev 1), this alarm could occur because of a total loss of ICS HAND Power. The procedure directs the operator to determine the extent of the loss of power and go to the appropriate procedure, one of which is OP-TM-AOP-026. According to OP-TM-AOP-026 (p1; Rev 3), ICS HAND Power status is indicated by light on PCL and MAP H-1-8. Since Both lamps (loss of Hand and loss of Subfeeds) are NOT LIT, the operator will diagnose a TOTAL loss of ICS HAND Power; and the appropriate procedure is OP-TM-AOP-026, Loss of ATB or ICS Hand Power.

B. **Incorrect.** This is plausible because the ICS/NNI power distribution system is complex; and the operator may incorrectly believe that the stated conditions have resulted from a TOTAL loss of ICS/NNI AUTO Power. If so, the appropriate procedure to enter would be OP-TM-AOP-027, Loss of ATA or ICS Auto Power. However, the stated conditions do not address ICS AUTO lamp, and the therefore the operator cannot conclude loss of Auto Power has occurred in addition to loss of Hand Power.

C. **Incorrect.** This is plausible because the ICS/NNI power distribution system is complex; and the operator may incorrectly believe that the stated conditions have resulted from a PARTIAL loss of ICS HAND Power. If so, the appropriate procedure to enter would be OP-TM-AOP-026, Loss of ATB or ICS Hand Power. However, according to TQ-TM-104-621-C001 (16-17; Rev 2), if only the ICS Hand light goes out; the ICS 10 Amp Hand Subfeed breaker tripped., If only the Subfeeds Auto/Hand light goes out; then an operator must go to the 3rd floor of the control tower to determine which of the subfeeds are causing the trouble. If both an ICS Hand and the Subfeeds Auto/Hand lights go out (as is the case in the stated conditions), then the probable cause is the loss of an upstream breaker located in panel ATB (i.e. a total loss).

D. **Incorrect.** This is plausible because the ICS/NNI power distribution system is complex; and the operator may incorrectly believe that the stated conditions have resulted from a TOTAL loss of BOTH ICS HAND and AUTO Power. If so, the appropriate procedure to enter would be OP-TM-AOP-025, Loss of ICS Hand and Auto Power. However, the stated conditions do not address ICS AUTO lamp, and the therefore the operator cannot conclude loss of Auto Power has occurred in addition to loss of Hand Power.

Technical Reference(s): OP-TM-MAP-H0108 (p1; Rev 1)
OP-TM-AOP-026 (p1; Rev 3)
TQ-TM-104-621-C001 (16-17; Rev 2) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: N

Learning Objective: AOP026-PCO-4
621-GLO-2 (As available)

Question Source: Bank # WTS 65119/TMI: IS-AOP-026-PCO-4-Q02

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41 10

55.43

Administrative, normal, abnormal, and emergency operating procedures for the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the operational implications of the annunciators and conditions indicating signals (MAP H-1-8, indicating lights on PCL), and remedial actions associated with the NNI-Y as they apply to the Loss of NNI-Y (i.e. choose appropriate procedure to enter).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, compare these to the entry conditions of three AOPs, and choose the correct procedure in order to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		1
	K/A #	G1	2.1.35
	Importance Rating		3.9

Conduct of Operations: Knowledge of the fuel-handling responsibilities of SRO's.

Proposed Question: SRO Question # 76

A Licensed SRO is **NOT** required to _____

A. supervise ungrappling operations in the core.

B. supervise moving of spent fuel into the Spent Fuel Pool.

C. supervise off-loading of the core in the Reactor Building.

D. authorize placing the Pool Frame Limits Bypass keyed switch to "Bypass".

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** T.S. 6.2.2.2 The unit staff organization shall meet the following:
f. All REFUELING OPERATIONS shall be observed and directly supervised by either a licensed **Senior Reactor Operator** or Senior Reactor Operator Limited to Fuel Handling who has no other concurrent responsibilities during this operation.

Plausible if the student incorrectly believes that ungrappling is an activity that is not part of refueling operations.

B. **Correct.** Plausible because Technical Specifications 5.4.1 and 5.4.2 are in effect for Spent Fuel Pool placements and SRO's are responsible for fuel moves however Fuel loading into the Spent fuel pool is allowed to be done by non-licensed Fuel Handling Supervisors per 2.6 of 1505-1.

C. **Incorrect.** T.S. 6.2.2.2 The unit staff organization shall meet the following:
f. All REFUELING OPERATIONS shall be observed and directly supervised by either a licensed **Senior Reactor Operator** or Senior Reactor Operator Limited to Fuel Handling who has no other concurrent responsibilities during this operation.

Plausible if the student incorrectly believes that offloading is an activity that is not part of

refueling operations.

D. **Incorrect.** 1303-11.4 Refueling System Interlocks Tests Rev 48, pg 3
5.0 LIMITS AND PRECAUTIONS
5.2 **Permission is required from SRO in charge of fuel handling to bypass an interlock.**

Plausible if the student incorrectly believes that the SRO responsibility is limited to only the interlocks associated with the grappling of fuel.

Technical Reference(s): OU-AP-4001 (p3; Rev 7) Section 4.3
1505-1 (p3; Rev 54) (Attach if not previously provided)
1303-11.4 (Rev 48, pg 3)
T.S. 6.2.2.2

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-104-EOP-DBIG PCO-1 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41
55.43 7

Fuel handling facilities and procedures.

Comments:
The KA is matched because the operator must demonstrate the knowledge of the Fuel Handling Supervisor's responsibilities during fuel movement.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate the stated conditions, and then apply procedural administrative requirements to correctly answer the question.

The question is SRO-ONLY because it requires knowledge of the SRO-ONLY function of Refueling Floor SRO.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		2
	K/A #	029	A2.03
	Importance Rating		3.1

Ability to (a) predict the impacts of the following mal- functions or operations on the Containment Purge System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Startup operations and the associated required valve lineups

Proposed Question: SRO Question # 77

The plant is planning and preparing to conduct refueling operations.

Which ONE (1) of the following identifies a procedure, or procedures, that must be completed no more than seven days prior to the initial fuel movement?

A. OP-TM-823-253, Testing RB Purge Interlocks.

B. OP-TM-823-271, RB Ventilation System Lineup Verification.

C. OP-TM-823-201 (202, 203, 204), Stroke Time Testing of AH-V-1A (B, C, D).

D. OP-TM-823-251 (252), Local Leak Rate Testing of Purge Exhaust (Supply) Penetration Valves.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to Technical Specification 3.8 (p3-45; Amendment 260) the RB Purge Isolation Valves, and associated Radiation Monitors which initiate Purge Isolation, shall be tested and verified to be OPERABLE no more than 7 days prior to initial fuel movement in the RB. According to Technical Specification Basis 3.8 (p3-45a; Amendment 257) specification 3.8.9 requires testing of the RB Purge Isolation System. The test verifies that the Purge Isolation Valves will automatically close when they receive initiation signals from the radiation detectors that monitor RB Purge exhaust, and that the valves remain open when the isolation system is bypassed. The test is performed no more than 7 days prior to the start of fuel movement in the RB to ensure that the monitors, Purge Valves, and associated interlocks are functioning prior to operations that could result in a fuel handling accident within the RB. According to OP-TM-823-253 (p1; Rev 1) this procedure is performed to verify purge isolation valves will automatically close when they receive a close signal from a high alarm on RM-A-9G

and the valves remain open if the interlock is in DEFEAT as required by Technical Specification 3.8.9.

B. **Incorrect.** This is plausible because this is a procedure/surveillance performed on the RB Purge Isolation System. According to OP-TM-823-271 (p1; Rev 3) this procedure is performed to verify a portion of or the complete RB Ventilation System Lineup. However, there is no specific requirement to perform this within 7 days of the first fuel movement.

C. **Incorrect.** This is plausible because this is a procedure/surveillance performed on the RB Purge Isolation System. According to OP-TM-823-201 (p1; Rev 1) and the three others, is to close stroke test AH-V-1A through AH-V-1D as required by Technical Specification 4.2.2. However, there is no specific requirement to perform this within 7 days of the first fuel movement.

D. **Incorrect.** This is plausible because this is a procedure/surveillance performed on the RB Purge Isolation System. According to OP-TM-823-251 (p1; Rev 3) and OP-TM-823-252 (p1; Rev 5) the purpose of these procedures is to perform local leak rate testing of AH-V-1A through AH-V-1D as required by Technical Specification 4.4.1 and FSAR Table 5.7.3 for demonstrating leak rates within Administrative Limits; and to perform Remote Position Indication Testing of these valves to satisfy the requirements of Technical Specification 4.2.2. However, there is no specific requirement to perform this within 7 days of the first fuel movement.

Technical Reference(s): TS 3.8 (p3-45; Amendment 260)
TS Basis 3.8 (p3-45a; Amendment 257)
OP-TM-823-253 (p1; Rev 1)
OP-TM-823-271 (p1; Rev 3)
OP-TM-823-252 (p1; Rev 5)
OP-TM-823-201 (p1; Rev 1)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 824-GLO-14 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	X
	Comprehension or Analysis	

10 CFR Part 55 Content:	55.41	
	55.43	2

Facility operating limitations in the technical specifications and their bases.

Comments:

The KA is matched because the operator must demonstrate the ability to (a) predict the impacts of startup operations and the associated required valve lineups on the Containment Purge System (i.e. in the preparation and planning phase of Refueling Operations it must be determined that RB Purge will need to be started, and tested in accordance with TS 3.8.9 within 7 days of the initial fuel movement); and (b) based on those predictions, identify the procedure(s) required to control this operation (i.e. OP-TM-823-253). Question was written to the startup of the purge system and associated operations / valve line-ups as the system is not normally operated during plant start-up.

The question is at the Memory cognitive level because the operator must recall the TS requirement, and the procedure that satisfies this requirement.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/TRM action statements, the LCO/TRM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Required Actions and Surveillance Requirements in accordance with the rules of application; and demonstrate knowledge of the TS basis that is required to analyze TS required actions and terminology.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		2
	K/A #	A08	AA2.1
	Importance Rating		4.0

Ability to determine and interpret the following as they apply to the (Refueling Canal Level Decrease) Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

Proposed Question: SRO Question # 78

Plant conditions:

- Refueling operations in progress.

Event:

- Fuel assembly has just been transferred from Spent Fuel Pool.
- Main FH Bridge operator reports assembly full up at basket.
- Main FH Bridge operator reported lowering Fuel Transfer Canal water level.
- Control Room indications show an unexpected rapid rise in RB Sump level.

Which ONE (1) of the following identifies the action that should be initiated **FIRST** based on the above conditions, AND the procedure that will then be used to complete the action IAW OP-TM-AOP-060, Leakage While on Decay Heat Removal?

A. Return the fuel assembly to Spent Fuel Pool IAW;
1505-3, Fuel Handling Problems.

B. Return the fuel assembly to Spent Fuel Pool IAW;
1505-1, Fuel and Component Shuffles.

C. Maintain Fuel transfer canal level IAW;
1103-11, RCS Water Level Control.

D. Maintain Fuel transfer canal level IAW;
OP-TM-220-913, DH-P-1A or DH-P-1B Injection from BWST or RB Sump.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to OP-TM-AOP-0601 AOP-060 basis document the preference is to return the assembly to its previous location. AOP-060 step 3.1 state If fuel movement is in oprogress, then notify the fuel handling SRO to suspend fuel handling IAW 1505-1 Fuel and Component Shuffles. The basis document states several options are possible but the preference should be to return to the original location. The second part is incorrect the Fuel Component Shuffle procedure would continue to be the controlling document, it is plausible the candidate would believe that since the normal move could not be completed due to problems the Fuel handling problems procedure would apply.

B. **Correct.** Both parts correct. See A.

C. **Incorrect.** 1st part incorrect, 2nd part incorrect. According to OP-TM-AOP-060 Step 4 would deal with the inventory loss and this would be the correct action to take for that inventory loss, however step 1 is to suspend fuel movement. According to OP-TM-AOP-060 (p3; Rev 4) Step 3.4, the operator is directed to maintain RCS water level within the required band IAW 1103-11.

D. **Incorrect.** 1st part incorrect, 2nd part incorrect. This is plausible because according to OP-TM-AOP-060 (p3; Rev 4) Step 3.4, the operator is directed to maintain RCS water level within the required band IAW 1103-11. If this cannot be done the operator is directed to initiate makeup from a preferred source shown on Attachment 1. According to OP-TM-AOP-060, Attachment 1 (p27; Rev 4) there are five alternative sources of RCS Injection methods, of which using OP-TM-220-913, DH-P-1A or DH-P-1B Injection from BWST or RB Sump is one, however the BWST is empty during SF operations and the sump would not be initially used.

Technical Reference(s): OP-TM-AOP-060 (p1, 3 and 27; Rev 4) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: AOP-252-PCO-2 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: None

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X
10 CFR Part 55 Content:	55.41	
	55.43	5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate the ability to determine and interpret the facility conditions and selection of appropriate procedures during abnormal and emergency operations as they apply to the Refueling Canal Level Decrease.

The question is at the Comprehension/Analysis cognitive level because the operator must prioritize the actions in dealing with the level loss and select a governing procedure to use.

The question is SRO-ONLY because it cannot be answered *solely* by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed (i.e. fuel assembly movement interruption or inventory loss) and then determine what procedure to deal with the problem..

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		1
	K/A #	077	AA2.01
	Importance Rating		3.6

Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: Operating point on the generator capability curve

Proposed Question: SRO Question # 79

Plant conditions:

- 100% power.
- Generator Hydrogen Pressure is 55 psig.
- Generator output is 850 MWe
- The Main Generator Reactive Load has been adjusted to +100 MVARs as requested by the Transmission System Operator (TSO) in an attempt to prevent going below the lower voltage limits of 1107-11, TMI Grid Operations.

The TSO has just requested that the Unit reactive load be adjusted to +300 MVARs.

Which ONE (1) of the following identifies whether or not this reactive load is within the Generator Reactive Capability Curve, and if so, who, if anyone, must the CRS seek concurrence from before authorizing this adjustment?

A. This adjustment is NOT within the Generator Capability Curve.

B. This adjustment is within the Generator Capability Curve;
The CRS alone can authorize this adjustment.

C. This adjustment is within the Generator Capability Curve;
The CRS must obtain concurrence from the Shift Manager ONLY before authorizing this adjustment.

D. This adjustment is within the Generator Capability Curve;
The CRS must obtain concurrence from the Shift Manager and the Main Generator System Engineer before authorizing this adjustment.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the high limits of the capability curve have been exceeded.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that they can make the decision to adjust to this reactive load on their own.

C. **Correct.** According to 1107-11 (p18; Rev 24) for low Grid Voltage, IAAT generator reactive load exceeds limits per OP-TM-301-472, then place the voltage regulator to MANUAL and adjust maintain reactive load within limits. According to OP-TM-301-472 (p2; Rev 4) Step 4.1.1.1, if adjustment is required IAW 1107-11, then adjust Generator Voltage as requested but within the following limits: (1) +400 MVAR, -80 MVAR, Generator Voltage control in AUTO, Generator Hydrogen pressure > 58 psig, and Generator output voltage between 18050 and 19900 volts. IAAT it is necessary to raise reactive load to ≥ 200 MVAR in order to prevent going below the lower limit of the desired voltage band specified in 1107-11, then the CRS must obtain the SM concurrence.

D. **Incorrect.** This is plausible because the operator may incorrectly believe that not only the concurrence of the SM must be obtained but that the concurrence of the System Engineer, who would be responsible for the overall operation and performance of the Main Generator, is needed as well.

Technical Reference(s): 1107-11 (p18; Rev 24)
OP-TM-301-472 (p2; Rev 4) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: OP-TM-301-472 Attachment 7.1

Learning Objective: 301-GLO-10 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

What MUST be known:

1. The upper limits of the Main generator Capability Curve.
2. The threshold of Reactive Load that the CRS can decide to operate to the Main Generator at, on their own authority.
3. Approval authority required for operating the Main Generator at a reactive load ≥ 200 MVAR.

Routinely, this KA, ability to determine the operating point on the Generator Capability Curve, is associated with the RO level. Consequently, the KA is matched for the SRO by requiring identification of the upper limits (lagging of the curve) without reference to the Curve itself. In other words, no reference will be given to the operator. Rather, the SRO will be placed in a practical operational setting, and asked to decide whether or not a requested adjustment can be made, and still remain within the limits of the curve.

The question is at the Memory cognitive level because the operator must recall the upper limit of the curve, and then recall whose concurrence is required to adjust to an operating point > +200 MVARs.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select section of a procedure (Section 4.1 of OP-TM-301-472 which requires SM concurrence for reactive load adjustment > 200MVARs) to mitigate, recover, or with which to proceed. Additionally, the question requires the operator to make a commitment to the identification of whether or not that they can take an action based on their positional authority (i.e. as the CRS).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		1
	K/A #	055	EA2.05
	Importance Rating		3.7

Ability to determine or interpret the following as they apply to a Station Blackout: When battery is approaching fully discharged

Proposed Question: SRO Question # 80

Plant conditions:

- A station blackout has occurred.
- Attempts to start EG-Y-4, SBO Diesel, have been delayed.
- The crew has initiated Section 3.0, Follow-Up Actions, of both OP-TM-AOP-023, A DC System Failure, and OP-TM-AOP-024, B DC System Failure.
- Station Electricians report "A" Battery 100 VDC, and "B" Battery 125 VDC slowly lowering.

The following Annunciators are LIT:

- A-3-7, INVERTER 1A/1C/1E TROUBLE
- A-3-8, INVERTER 1B/1D/1F TROUBLE
- L-1-3, VOLTAGE REGULATOR DC LOSS
- PRF 1-1-1, CRD BREAKER TEST TROUBLE

Which ONE (1) of the following identifies how the CRS should proceed?

A. Continue in Section 3.0 of both OP-TM-AOP-023 and 24.

B. Continue in Section 3.0 of OP-TM-AOP-023;
Go to Section 4.0, B DC De-Energized, of OP-TM-AOP-024.

C. Go to Section 4.0, A DC De-Energized, of OP-TM-AOP-023;
Continue in Section 3.0 of OP-TM-AOP-024.

D. Go to Section 4.0, A DC De-Energized, of OP-TM-AOP-023; AND
Go to Section 4.0, B DC De-Energized, of OP-TM-AOP-024.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that the Control Rooms alarms do NOT indicate a loss of either the 1A DC Distribution Panel, or the 1B DC Distribution Panel. If so, this would be the correct response.

B. **Incorrect.** 1st part wrong, 2nd part wrong. This is plausible because the operator may incorrectly believe that the alarms indicate that the 1B DC Distribution Panel, rather than the 1A DC Distribution Panel has been lost. According to OP-TM-AOP-024 (p3; Rev 2) a NOTE prior to Step 3.3 states that a Loss of 1B Distribution Panel is evident in the Control Room by simultaneous alarms A-3-8, AA-3-5 and PRF 1-1-1. According to OP-TM-AOP-0241 (p6; Rev 1) these indications provide a means to assess the condition for Step 3.3 using available Control Room indications. According to OP-TM-AOP-024 (p3; Rev 2) Step 3.3, IAAT B or D Battery banks are de-energized, as indicated by the three simultaneous alarms, then the operator is directed to GO TO Section 4.0, B DC De-Energized.

C. **Correct.** 1st part correct, 2nd part correct. According to MAP A-1-7 (p2; Rev 17) IAAT A or C battery voltage is < 125 VDC and lowering, then GO TO OP-TM-AOP-023. According to MAP A-1-8 (p2; Rev 17) IAAT B or D battery voltage is < 125 VDC and lowering, then GO TO OP-TM-AOP-024. According to OP-TM-AOP-023 (p3; Rev 2) a NOTE prior to Step 3.4 states that a Loss of 1A Distribution Panel is evident in the Control Room by simultaneous alarms A-3-7, L-1-3 and PRF 1-1-1. According to OP-TM-AOP-0231 (p7; Rev 1) these indications provide a means to assess the condition for Step 3.4 using available Control Room indications. According to OP-TM-AOP-023 (p3; Rev 2) Step 3.4, IAAT A or C Battery banks are de-energized, as indicated by the three simultaneous alarms, then the operator is directed to GO TO Section 4.0, A DC De-Energized. On the other hand, according to OP-TM-AOP-024 (p3; Rev 2) a similar NOTE exists for the B DC Distribution System, however, one of the three MCB Annunciators (AA-3-5) is NOT lit. Therefore, the operator should continue in Section 3.0 in OP-TM-AOP-024.

D. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may incorrectly believe that the presence of the alarms in the Control Room indicate that both 1A DC Distribution Panel and 1B DC Distribution Panel have been lost. If so, this would be the correct ACTION.

Technical Reference(s): MAP A-1-7 (p2; Rev 17)
MAP A-1-8 (p2; Rev 17)
OP-TM-AOP-023 (p3; Rev 2)
OP-TM-AOP-0231 (p7; Rev 1)
OP-TM-AOP-024 (p3; Rev 2)
OP-TM-AOP-0241 (p6; Rev 1)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-A23-C001 (PCO-2c) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

What MUST be known:

1. There are three specific Annunciators that if were to occur simultaneously when in OP-TM-AOP-023, it would alert the operator to a loss of the 1A Distribution Panel.
2. When the 1A Distribution Panel is lost, this is indicative of the battery, or batteries approaching fully discharged, and Section 4.0 of OP-TM-AOP-023 must be implemented.
3. There are three specific Annunciators that if were to occur simultaneously when in OP-TM-AOP-024, it would alert the operator to a loss of the 1B Distribution Panel.
4. When the 1B Distribution Panel is lost, this is indicative of the battery, or batteries approaching fully discharged, and Section 4.0 of OP-TM-AOP-024 must be implemented.

The KA is matched because the operator must demonstrate the ability to determine or interpret when the station batteries are approaching fully discharged during a Station Blackout by identifying the expected MCB Annunciators.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, and apply the correct procedural response. Since varying the conditions can make any one of the distracters correct, the operator will demonstrate understanding of the event.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a section of a procedure to mitigate, recover, or with which to proceed.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		1
	K/A #	056	2.4.45
	Importance Rating		4.3

Evolution Loss of Off-site Power - Emergency Procedures / Plan: Ability to prioritize and interpret the significance of each annunciator or alarm.

Proposed Question: SRO Question # 81

Plant conditions:

- 100% power.
- All Systems in AUTO.
- DC-P-1A is OOS for Maintenance

Subsequently:

- A loss of offsite power occurs.
- EG-Y-1B "B" Emergency DG fails to start.
- The following Control Room Annunciators are reported in alarm:
  - MAP NN-1-1, 230 KV BUS 8 TRIP
  - MAP NN-2-1, 230 KV BUS 4 TRIP
  - MAP B-1-2, 4KV ES MOTOR TRIP

- Dispatcher calls and reports offsite power is now available.

Which ONE (1) of the following identifies the action that must be taken FIRST to mitigate this event?

A. Initiate OP-TM-AOP-013, Loss of 1D 4160 Volt Bus;
Return Bus 1D to its normal AC Supply.

B. Initiate OP-TM-AOP-014, Loss of 1E 4160 Volt Bus;
Return Bus 1E to its normal AC Supply.

C. Initiate OP-TM-AOP-041, Loss of Seal Injection;
Attempt to start Makeup Pump MU-P-1A to supply Seal Injection.

D. Initiate OP-TM-AOP-041, Loss of Seal Injection;
Attempt to start Makeup Pump MU-P-1B to supply Seal Injection.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because according to MAP NN-2-1 (p2; Rev 8) the operator is directed to initiate OP-TM-AOP-013. However, there are two issues with entering this procedure first. First of all, NOT all of the entry conditions are met. According to OP-TM-AOP-013 (p1; Rev 6) at least one auxiliary transformer must be energized, and there is no indication that this is so. Secondly, according to OP-TM-AOP-013 (p3; Rev 6) Step 3.3, the operator is first directed to deal with the lack of Seal Injection before addressing the restoration of normal power.

B. **Incorrect.** This is plausible because according to MAP NN-1-1 (p2; Rev 8) the operator is directed to initiate OP-TM-AOP-014. However, there are two issues with entering this procedure first. First of all, NOT all of the entry conditions are met. According to OP-TM-AOP-014 (p1; Rev 6) at least one auxiliary transformer must be energized, and there is no indication that this is so. Secondly, according to OP-TM-AOP-014 (p3; Rev 6) Step 3.3, the operator is first directed to deal with the lack of Seal Injection before addressing the restoration of normal power.

C. **Correct.** According to MU and Purification Flow Diagram 302-661 (Rev 59), MU-V-77A/B are normally OPEN, and MU-V-76A/B are normally CLOSED, such that MU-P-1A and MU-P-1B are normally aligned to supply Seal Injection. According to OP-TM-211-000 (p1; Rev 20) the MU System is normally aligned with MU-P-1B in operation on 1E 4160V ES Bus. When MU-P-1B trips, Seal Injection will be lost. According to OP-TM-AOP-020 (p3; Rev 13) the follow-up actions to such an event will direct that the operator verify seal injection flow > 22 gpm at Step 3.5. Additionally, according to OP-TM-MAP-B0102 (p2; Rev 0) the operator will be directed to enter AOP-041 if an ES condition does NOT exist, and no MU Pumps are running. With MU-P-1B tripped, there will be no Seal Injection flow, and the RNO will be implemented. The Step 3.5 RNO will direct the operator to initiate OP-TM-AOP-041. According to OP-TM-AOP-041 (p3 and 5; Rev 5) Step 3.5, the operator will be directed to verify that a MU Pump is operating. Since none is, the RNO will need to be implemented. The Step 3.5 RNO directs the operator to ensure MU-V-17 is CLOSED, Verify MU-T-1 Level is in the unrestricted operation region, and if MU-V-77A/B are OPEN (which they are) Go To Section 4.0 which will direct the operator to start Makeup Pump MU-P-1A.

D. **Incorrect.** This is plausible because according to OP-TM-AOP-041 (p3; Rev 5) Step 4.4 RNO, if the MU-P-1A cannot be started, the operator will make an attempt to start MU-P-1B on the "D" bus, and align it to supply seal flow IAW section 7.0. MU-P-1A may be incorrectly determined to be un-available due to loss of DC-P-1A ability to cool the pump, however the RNO for step 4.3 would align NS cooling as the alternate.

Technical Reference(s): MU and Purification Flow Diagram 302-661 (Rev 59)
OP-TM-211-000 (p1; Rev 20)
OP-TM-AOP-020 (p3; Rev 13)
OP-TM-AOP-041 (p3 and 5; Rev 5)
(Attach if not previously provided)

OP-TM-MAP-B0102 (p2; Rev 0)
MAP NN-2-1 (p2; Rev 8)
OP-TM-AOP-013 (p1 and 3; Rev 6)
MAP NN-1-1 (p2; Rev 8)
OP-TM-AOP-014 (p1 and; Rev 6)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-A20-C001 (PCO-1)
TQ-TM-104-A41-C001 (PCO-1) (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41
55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

What MUST be known:

1. The ES selected MU Pump for both Train A and B is switch selectable.
2. When the MU&P System is aligned for ES Standby, MU-P-1B is in operation on the 1E 4160V Bus, and MU-P-1A and 1C are ES Selected.
3. When offsite power is lost, MU-P-1B tripped resulting in a loss of Seal Injection flow.
4. MAPs direct the operator to initiate all three AOPs.
5. Of the three AOPs, only one of the three have all of its entry conditions met.
6. AOP-041 will prefer MU-P-1A over MU-P-1C under normal plant lineup conditions.

The KA is matched because the operator must demonstrate the Ability to prioritize and interpret the significance of each annunciator or alarm, by choosing the priority of actions associated with three annunciators.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and determine an appropriate strategy from four actions within the procedure or referenced procedure under consideration to correctly answer the question.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed. The SRO level decisions are how to handle the loss of component cooling and Which of the two available make up pumps to use IAW the follow-up action of the AOP, in addition to determining the correct procedure to use when presented multiple procedures directed from Main Annunciators.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		1
	K/A #	064	2.1.32
	Importance Rating		2.8

System Emergency Diesel Generator - Conduct of Operations: Ability to explain and apply all system limits and precautions.

Proposed Question: SRO Question # 82

Plant conditions:

- 100% power.
- The Emergency Feedwater Pump EF-P-2B is OOS for maintenance.
- EF-P-2B is presently being re-tested and will require two hours for completion.

Subsequently, the Emergency Diesel Room "A" Air Handling Unit, AH-E-29, trips and cannot be restarted.

Which ONE (1) of the following identifies whether or not Technical Specification 3.0.1 applies, AND if so, identifies the minimum ACTION needed to exit Technical Specification 3.0.1?

A. Technical Specification 3.0.1 does NOT apply.

B. Technical Specification 3.0.1 does apply;
Complete maintenance on EF-P-2B and declare it OPERABLE, ONLY.

C. Technical Specification 3.0.1 does apply;
Align the "A" Emergency Diesel Generator Room for emergency cooling and declare EG-Y-1A OPERABLE, ONLY.

D. Technical Specification 3.0.1 does apply;
Complete maintenance on EF-P-2B and declare it OPERABLE, and Align the "A" Emergency Diesel Generator Room for emergency cooling and declare EG-Y-1A OPERABLE.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the Operability of AH-E-29A does NOT affect the Operability of EG-Y-1A. If so, TS 3.0.1 would NOT be applicable.

B. **Correct.** According to 1107-3 (p14; Rev 129) if AH-E-29A is not available, then declare EG-Y-1A inoperable and enter the appropriate TS ACTION per 3.7.2. According to Technical Specification 3.7.2.c (p3-43; Amendment 258) if one DG is inoperable operation may continue for 7 days provided that EG-Y-1B is verified to be OPERABLE immediately, and within 24 hours the operator determines that EG-Y-1B is NOT inoperable due to a common mode failure, or test EG-Y-1B in accordance with Technical Specification 4.6.1.a. Additionally, the operator must verify that all required systems, subsystems, trains, components, and devices that depend on EG-Y-1B as a source of emergency power are also OPERABLE, or follow Technical Specification 3.0.1. Since EF-P-2B is OOS, Technical Specification 3.0.1 applies.

C. **Incorrect.** This is plausible because TS 3.0.1 does apply; and because according to 1107-3 (p14; Rev 129) operation of an EDG without room ventilation requires action within 1 hour. According to HVA-1-11 (p1; Rev 11) if EG-Y-1A operation is required, within 1 hour of the loss of ventilation, perform OP-TM-861-910, Emergency Ventilation of EG-Y-1A Room. However, this procedure directs the operator to ensure compliance with Technical Specification 3.7.2.c, and therefore the action of aligning Emergency ventilation does not restore operability. The operator may incorrectly believe that it does, and if so, this action must be taken within one hour, which is an hour before EF-P-2B is projected to be declared OPERABLE.

D. **Incorrect.** This is plausible because TS 3.0.1 does apply; but the operator may incorrectly believe that both actions must be taken to render TS 3.0.1 inapplicable.

Technical Reference(s): 1107-3 (p14; Rev 129)
3.7.2.c (p3-43; Amendment 258)
HVA-1-11 (p1; Rev 11) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 861-GLO-14 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X
10 CFR Part 55 Content:	55.41	
	55.43	2

Facility operating limitations in the technical specifications and their bases.

Comments:

What MUST be known:

1. The operability of AH-E-29A directly affects the operability of EG-Y-1A.
2. With one DG inoperable and the opposite Train MD EFW Pump inoperable, TS 3.0.1 applies.
3. Although it is procedurally required to align the EG-Y-1A Room for emergency cooling, this alignment does NOT affect the EG-Y-1A operability.
4. The operator can avoid the applicability of TS 3.0.1 in one of two possible ways, complete repairs of EF-P-2B and declare it OPERABLE, or complete repairs of AH-E-29A and declare it OPERABLE.

The KA is matched because the operator must identify that operability of AH-E-29A directly affects the operability of EG-Y-1A, and recognize that the required action of aligning emergency cooling to the EG-Y-1A Room does not affect this inoperability. The information that the operability of AH-E-29A directly affects the operability of EG-Y-1A is found in the P&L section of 1107-3.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, recognize the operability connection between AH-E-29A and EG-Y-1A, and the disconnect between the required action of aligning emergency cooling to the EG-Y-1A Room and the EG-Y-1A operability, and determine the needed actions to avoid reliance on TS 3.0.1.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/TRM action statements, the LCO/TRM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Required Actions and Surveillance Requirements in accordance with the rules of application; and apply the generic LCO requirements (i.e. TS 3.0.1).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		1
	K/A #	003	2.2.36
	Importance Rating		4.2

System Reactor Coolant Pump - Equipment Control: Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.

Proposed Question: SRO Question # 83

Plant Conditions:

- 48% power.
- The 1B 6.9 KV Bus has been removed from service for corrective maintenance.

Which ONE (1) of the following identifies the allowable time period that the plant can be operated in this condition, AND the reason for this time limitation?

A. 24 hours;
The ECCS cooling performance has not been determined specifically for this plant condition.

B. 24 hours;
Sustained operation in this flow configuration will cause the maximum allowable radial peaking limits to be exceeded.

C. 48 hours;
The ECCS cooling performance has not been determined specifically for this plant condition.

D. 48 hours;
Sustained operation in this flow configuration will cause the maximum allowable radial peaking limits to be exceeded.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to Technical Specification 3.1.1.1.a (p3-1a; Amendment 261) the RCP combinations permissible for a given power level are shown in Specification Table 2.3-1. According to Technical Specification Table

2.3-1 (p2-10; Amendment 262) when operating with one RCP in each loop, ONLY, the nominal operating power is 49%. According to Technical Specification 3.1.1.1.a (p3-1a; Amendment 261) Power Operation with one idle RCP in each loop shall be restricted to 24 hours. According to the basis section of Technical Specification 3.1.1.1.b (p3-2; Amendment 266) the limitation on power operation with one idle RCP in each loop has been imposed since the ECCS cooling performance has not been calculated in accordance with the Final Acceptance Criteria requirements specifically for this mode of reactor operation.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to the COLR Table 3 (p15; Rev 7) the facility is bounded by MARP Limits, and the operator may incorrectly believe that operation with one idle RCP in each loop adversely challenges these limits.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because according to Technical Specification 3.19.1 (p3-95; Amendment 187) some TS have 48 hour ACTION statements; and the operator may incorrectly believe that this specification presents a 48 hour ACTION, rather than a 24 hour ACTION.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): Technical Specification 3.1.1.1.a (p3-1a; Amendment 261)
Technical Specification Table 2.3-1 (p2-10; Amendment 262)
basis section of Technical Specification 3.1.1.1.b (p3-2; Amendment 266)
Technical Specification 3.19.1 (p3-95; Amendment 187)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 226-GLO-14 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	X
	Comprehension or Analysis	

10 CFR Part 55 Content:	55.41	
	55.43	2

Facility operating limitations in the technical specifications and their bases.

Comments:

What MUST be known:

1. Power Operation with one idle RCP in each loop shall be restricted to 24 hours.
2. The reason for this is because the ECCS cooling performance has not been calculated in accordance with the Final Acceptance Criteria requirements specifically for this mode of reactor operation.

The KA is matched because the operator must demonstrate the ability to analyze the effect of maintenance activities, such as de-energizing the 1B 7KV Bus, on the status of limiting conditions for operations; specifically 3.1.1.1.

The question is at the Memory cognitive level because the operator must recall two pieces of information to correctly answer the question.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/TRM action statements, the LCO/TRM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Required Actions in accordance with the rules of application; and to demonstrate knowledge of the TS basis that is required to analyze TS required actions and terminology.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		1
	K/A #	E02	EA2.1
	Importance Rating		4.0

Ability to determine and interpret the following as they apply to the (Vital System Status Verification): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.

Proposed Question: SRO Question # 84

Plant conditions:

- 100% power.
- Emergency Diesel Generator EG-Y-1B is running loaded on the 1E 4160V due to a failure of its associated auxiliary transformer.
- Makeup Pump MU-P-1A is supplying Seal Injection and RCS Makeup.

Event:

- The reactor trips due to a large RCS leak.
- 1600 psig ESAS actuation occurs.
- MU-P-1A trips.

Which ONE (1) of the following identifies the bus that Makeup Pump MU-P-1B will be started on, AND the procedure that will be used to start it?

A. 1D 4160V bus IAW OP-TM-AOP-041, Loss of Seal Injection.

B. 1D 4160V bus IAW OP-TM-211-901, Emergency Injection, (HPI/LPI).

C. 1E 4160V bus IAW OP-TM-AOP-041, Loss of Seal Injection.

D. 1E 4160V bus IAW OP-TM-211-901, Emergency Injection, (HPI/LPI).

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because according to OP-TM-AOP-041 (p1; Rev 5) the entry conditions are met for AOP-041; and the operator may incorrectly believe that it is this procedure, rather than OP-TM-211-901 that will

direct the re-start of MU-P-1B. Although this procedure provides direction to start each of the Makeup Pumps under varying conditions, the specific directions are located in a Section of the procedure (4.0, 5.0 and 6.0) in which the specific entry condition of all MU Pumps OFF will NOT be met.

B. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-211-000 (p1; Rev 20) when the MU&P System is aligned for ES Standby, MU-P-1B is in operation on the 1E 4160V Bus, and MU-P-1A and 1C are ES Selected. According to TQ-TM-104-211-C001 (p45-46; Rev 4), when the EDG is supplying its associated ESF Bus, the position of the ES-Select Switch on each ESF Train will ensure that the EDG will not provide power to more than one MU Pump at any one time. This is accomplished by causing the non-Engineered Safeguards pump to trip if both the normal (1SA-E2) and alternate (1SB-E2) bus feeder breakers are open and prevents starting the non- Engineered Safeguards selected pump at any time. Therefore, with MU-P-1C selected, when the EG-Y-1B is loaded onto Bus 1E, MU-P-1B will trip and cannot be started. When the 1600 psig ESAS signal occurs, MU-P-1C will start. When MU-P-1A trips, only one MU Pump will be running. According to OS-24 (p20; Rev 18) if a Safety System has or should have actuated, the operator must ensure that all components are in the required position. This is done by implementing Emergency Support procedures during the VSSV such as OP-TM-211-901 (According OS-24 (p30; Rev 18) Licensed operators must commit Section 4.1 of OP-TM-211-901 to memory for this reason). According to OP-TM-211-901 (p1; Rev 5) the procedure is used following automatic actuation of HPI (or LPI). According to OP-TM-211-901 (p5-6; Rev 5) Step 4.2.3.3, if MU-P-1B is operable but lined up to an inoperable power supply, then INITIATE OP-TM-211-449, Aligning MU-P-1B To 1D 4160V BUS, to transfer MU-P-1B power supply. MU-P-1B cannot be started on the 1E 4160V bus since the bus is separated from the grid and MU-P-1C is already running. Selecting MU-P-1B for ES on the 1E bus would trip MU-P-1C (1105-3 (p4; Rev 51) Limit and Precaution 2.1.2 - Do Not start a 2nd makeup pump on an ES Bus during a blackout with diesels operating. Rotation of the 43SS during this condition will cause the operating makeup pump on the same ES Bus to trip.) Once the power supply to MU-P-1B is transferred to Bus 1D, the pump can be started per Step 4.2.3.1.C.3.d.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe the pump can be restarted on the 1E bus because a normal power is available or examinee is unaware of 43SS interlock.

Technical Reference(s):	OP-TM-211-000 (p1; Rev 20) TQ-TM-104-211-C001 (p45-46; Rev 4) OS-24 (p20 and 30; Rev 18) OP-TM-211-901 (p1 and 5/6; Rev 5) 1105-3 (p4; Rev 51)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 211-GLO-2 and 12 (As available)

Question Source: Bank # IS-211-901-PCO-4-Q02

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2008 TMI Q#88

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

What MUST be known:

1. The ES selected MU Pump for both Train A and B is switch selectable.
2. When the MU&P System is aligned for ES Standby, MU-P-1B is in operation on the 1E 4160V Bus, and MU-P-1A and 1C are ES Selected.
3. When the failure of the 1A Aux Transformer occurred, MU-P-1B tripped.
4. When the 1600 psig ESAS occurs the MU-P-1C pump will automatically start.
5. OS-24 requires that the operator ensure that when a Safety System actuates, all components are in the required position.
6. Because of this OP-TM-211-901 will be implemented during the VSSV.
7. OP-TM-211-901 will direct the operator to align MU-P-1B to Bus 1D.
8. Once the power supply is transferred, OP-TM-211-901 provides specific steps to start MU-P-1B.

The KA is matched because the operator must demonstrate the ability to determine and interpret the facility conditions and selection of appropriate procedures during abnormal and emergency operations during the Vital System Status Verification of EOP-001 (i.e. Action to take/procedure to use in off-normal MU System/HPI lineup).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and then choose an appropriate action with the appropriate procedure.

The question is SRO-Only because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed. The answer to this question is found in section 4.2 which is NOT a license memory required section. The mitigative approach applies knowledge of which of the two available busses the swing pump should be aligned to and the selection of the appropriate procedure to accomplish the task.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		2
	K/A #	G2	2.2.23
	Importance Rating		4.6

Equipment Control: Ability to track Technical Specification limiting conditions for operations.

Proposed Question: SRO Question # 85

With the plant at 100% power, the following timeline of events occur:

0600 HPI through MU-V-16D Flow Transmitter MU-FI-1129 is declared inoperable.

0800 HPI through MU-V-16D Flow Transmitter MU-FI-1129 is restored to OPERABLE status.
HPI through MU-V-16C Flow Transmitter MU-FI-1128 is declared inoperable.

1000 HPI through MU-V-16C Flow Transmitter MU-FI-1128 is restored to OPERABLE status.
HPI through MU-V-16B Flow Transmitter MU-FI-1127 is declared inoperable.

1200 HPI through MU-V-16B Flow Transmitter MU-FI-1127 is restored to OPERABLE status.
HPI through MU-V-16A Flow Transmitter MU-FI-1126 is declared inoperable.

1400 HPI through MU-V-16A Flow Transmitter MU-FI-1126 is restored to OPERABLE status.

No plant component re-alignments were made during this period.

Which ONE (1) of the following identifies the time period, or periods, that Technical Specification ACTION is required in accordance with Technical Specification 3.3.2?

The ACTION statement of Technical Specification 3.3.2 is applicable from....

A. 0600 until 1400.

B. 0600 until 1000, ONLY.

C. 1000 until 1400, ONLY.

D. 0600 until 0800, and then again from 1000 to 1200.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the associated Train of HPI is inoperable anytime that one HPI Flow indicator is inoperable. If so, this would be correct.

B. **Incorrect.** This is plausible because the operator may incorrectly believe that the associated Train of HPI is inoperable anytime that one HPI Flow indicator is inoperable, and NOT aligned to supply Seal Injection. If so, this would be correct.

C. **Correct.** According to OP-TM-211-000 (p1 and 30; Rev 20) when the MU System is aligned for ES Standby, MU-P-1B is in operation on the 1E 4160V Bus supplying Seal Water Injection via the A Train. According to OP-TM-211-000 (p15; Rev 20) HPI flow indication (MU-FI-1126, 1127, 1128 and 1129) are required to be OPERABLE for the associated Train to be OPERABLE, if that train is also aligned to provide Seal Injection. When an HPI Flow Indicator is inoperable, ensure compliance with TS 3.3.2 and initiate a 72 hour TS time clock. An inoperable HPI Flow Indicator with the HPI Train NOT aligned to supply seal injection does not affect the OPERABILITY of the HPI Train per TS 3.3. According to Make-Up & Purification Flow Diagram 302-661 (Rev 59) MU-FI-1126 and 1127 are the flow indicators associated with the A Train. Accordingly, when these indicators are removed from service, TS 3.3 ACTION is applicable, and a 72-hour clock is started. Consequently the ACTION is applicable from 1000-1400, ONLY.

D. **Incorrect.** This is plausible because the operator may incorrectly believe that the ATrain HPI Flow Indicators are MU-FI-1127 and 1129. If so, this would be correct.

Technical Reference(s): OP-TM-211-000 (p1, 15 and 30; Rev 20)
Make-Up & Purification Flow Diagram 302-661 (Rev 59) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 211-GLO-14 (As available)

Question Source:	Bank #		
	Modified Bank #		(Note changes or attach parent)
	New	X	

Question History:	Last NRC Exam:	N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X

10 CFR Part 55 Content:	55.41	
	55.43	2

Facility operating limitations in the technical specifications and their bases.

Comments:

The KA is matched because the operator must demonstrate the Ability to track Technical Specification limiting conditions for operations by identifying the specific time periods on a timeline of plant events, when an LCO ACTION statement must be entered.

The question is at the Comprehension/Analysis cognitive level because the operator must assess plant events, and apply specific system operability guidance to identify when a TS ACTION statement must be entered.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/TRM action statements, the LCO/TRM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Required Actions and Surveillance Requirements in accordance with the rules of application.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		2
	K/A #	071	A2.02
	Importance Rating		3.6

Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Use of waste gas release monitors, radiation, gas flow rate, and totalizer

Proposed Question: SRO Question # 86

Plant conditions:

- 100% power.
- Controlled Access Area and Machine Shop Flow Rate Transmitter, AH-FT-150, is out-of-service.
- A release of Waste Gas Decay Tank, WDG-T-1C, is in progress.

One hour into the release the following event(s) occur:

- Waste Gas Disposal Effluent Atmospheric Monitor, RM-A-7 fails LOW.
- I&C determines RM-A-7 to be out-of-service.

Which ONE (1) of the following identifies the actions that need to be taken?

A. Suspend the release by closing Waste Decay Tank discharge, WDG-V-47 and declare RM-A-7 inoperable.

B. Suspend the release until at least two independent samples of the tank contents are analyzed and approval to recommence the release is obtained from the Shift Manager.

C. Continue the release as long as Auxiliary and Fuel Handling Building Exhaust monitor, RM-A-8, and Fuel Handling Building Flow Rate Transmitter, AH-FT-149, remain OPERABLE.

D. Continue the release as long as Auxiliary and Fuel Handling Building Exhaust monitor, RM-A-8, Fuel Handling Building Flow Rate Transmitter, AH-FT-149, AND WGDT Release Flow, AH-FT-123, remain OPERABLE.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to CY-TM-170-300 (p23; Rev 2) the radioactive gaseous process and effluent monitoring instrumentation channels shown in Table 2.1-2 shall be OPERABLE, under conditions identified on the Table. With less than the minimum number of radioactive gaseous process or effluent monitoring instrumentation channels OPERABLE, take ACTION shown in Table 2.1-2. According to CY-TM-170-300 (p24 and 27; Rev 2) Table 2.1-2 Item #1, RM-A-7 and FT-123 must be OPERABLE when releases are made via this pathway; however, OPERABILITY is NOT required when discharges are positively controlled through the closure of WDG-47 or where RM-A-8, AH-FT-149 and AH-FT-150 are OPERABLE, and RM-A-8 is capable of automatic closure of WDG-47. Since AH-FT-150 is NOT OPERABLE, RM-A-7 and FT-123 must be OPERABLE for the release to continue. Since the failure of RM-A-7 has resulted in the instrument being removed from service, RM-A-7 is declared inoperable and the release must be suspended.

B. **Incorrect.** This is plausible because according to CY-TM-170-300 (p27; Rev 2), ACTION 25 specifically states these actions. However, these actions are prior to the release starting, and the release is already been started.

C. **Incorrect.** This is plausible because RM-A-8 is capable of automatically closing WDG-47 and the operator may incorrectly believe that with FT-147 OPERABLE this is an acceptable alternative to continuing the release.

D. **Incorrect.** This is plausible because RM-A-8 is capable of automatically closing WDG-47 and the operator may incorrectly believe that with FT-147 and FT-123 OPERABLE this is an acceptable alternative to continuing the release.

Technical Reference(s): CY-TM-170-300 (p23-24 and 27; Rev 2) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 231-GLO-14 (As available)

Question Source: Bank #

Modified Bank # TMI: QS-661-GLO-14-Q03 (Note changes or attach parent)

New

Question History: Last NRC Exam: None

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X

10 CFR Part 55 Content:	55.41	
	55.43	2

Facility operating limitations in the technical specifications and their bases.

Comments:

What MUST be known:

1. In order to perform a WGDT Release, RM-A-7, or an alternative monitoring system must be OPERABLE.
2. The ODCM states that an acceptable alternative to RM-A-7 operability is RM-A-8, AH-FT-149 and AH-FT-150 are OPERABLE, and RM-A-8 is capable of automatic closure of WDG-47.
3. Under the stated conditions, neither method of monitoring is OPERABLE.

The KA is matched because the operator must demonstrate the ability to (a) predict the impacts of malfunctions on the waste gas release radiation and flow monitors on the Waste Gas Disposal System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations.

The question is at the Comprehensive/Analysis cognitive level because the operator must evaluate plant conditions and apply operability requirements of the ODCM to predict an outcome.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/ODCM action statements, the LCO/ODCM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Required Actions in accordance with the rules of application.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		3
	K/A #	G3	2.3.6
	Importance Rating		3.8

Radiation Control: Ability to approve release permits.

Proposed Question: SRO Question # 87

Plant conditions:

- The plant is at 100% power.
- The following timeline of events are associated with the release of Waste Decay Tank "A" (WDG-T-1A):

Monday	0800	Grab Sample of WDG-T-1A.
Monday	1600	Release Permit for WDG-T-1A approved.
Tuesday	2000	The WDG-T-1A release is started.
Tuesday	2200	The WDG-T-1A release is stopped at the direction of the Shift Manager due to a Radiation Monitor problem. The tank is only partially released.

- The tank has remained isolated since the release was stopped.
- WDG-T-1A Tank pressure is the same as it was when the release was stopped.

Which ONE (1) of the following identifies the latest time at which the release may be restarted without requiring a new Release Permit?

A. Wednesday at 0159.

B. Wednesday at 0759.

C. Wednesday at 0959.

D. Any time as long as WDG-T-1A remains isolated.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly remember the time a reactor building release may be secured for.

B. **Incorrect.** This is plausible because According to 6610-ADM-4250.11 (p3; Rev 13), Step 4.1.E states that a WGDT release may be secured for up to 12 hours this confuses the 12 hours from start of release vice stop.

C. **Correct.** According to 6610-ADM-4250.11 (p3; Rev 13), Step 4.1.E states that a WGDT release may be secured for up to 12 hours, as long as the tank has remained isolated, no other inputs have been made to the tank, and the SM has approved securing the release. The release of the tank may be restarted without generating a new permit. According to the Tuesday 2200 entry, the SM has approved the securing of the release, and tank conditions permit restart for up to 12 hours. Therefore, the latest time is Wednesday at 1000.

D. **Incorrect.** This is plausible because the operator may incorrectly believe that the release, if secured, may be restarted at any time based on the tank remaining isolated (one part of the requirement).

Technical Reference(s): 6610-ADM-4250.11 (p3; Rev 13) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: GLO-231-10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 4

Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.

Comments:

What MUST be known:

1. A release in progress may be secured for up to 12 hours without requiring a new Release permit upon re-initiation.
2. If the release was secured on Tuesday at 2200, the latest that it can be restarted without requiring a new release permit is 1000 on Wednesday.

The KA is matched because the operator must identify the time period upon which a release already in progress, and secured before complete, may be re-initiated without requiring a new permit, thereby demonstrating the ability to operate within the confinement of an approved release permit (i.e. if the operator knows that the latest time of re-initiation is 1000 on Wednesday, and the interruption will require re-initiation after this time, the operator will know that a new release permit is required).

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate a timeline, and apply the rule allowing the SM to secure the on-going release for up to 12 hours.

The question is SRO-Only because the responsibility for approval and application of release permits rests with the Shift Manager. Failure to comply with the facility SRO administrative responsibilities would lead to an unapproved release.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		4
	K/A #	G4	2.4.9
	Importance Rating		4.2

Emergency Procedures / Plan: Knowledge of low power / shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.

Proposed Question: SRO Question # 88

Plant conditions:

- RCS Temperature 130°F.
- Decay Heat Removal Train B in service.
- RCS is vented to atmosphere.
- Level is established at 100" in the pressurizer.

Subsequently:

- Decay Heat Removal Pump DH-P-1B trips and cannot be re-started.
- Attempts to start Decay Heat Removal Pump DH-P-1A have failed.
- The crew enters OP-TM-EOP-030, Loss of Decay Heat Removal, and implements Section 5.0, Feed and Bleed Core Cooling.
- Incore Temperature 142°F, and rising at 0.5°F/minute.

Which ONE (1) of the following identifies a procedure, or procedures, that must be initiated at this time?

A. OP-TM-244-911, Containment Closure, ONLY.

B. OP-TM-534-901, RB Emergency Cooling Operation, ONLY.

C. OP-TM-244-911, Containment Closure and OP-TM-212-942, BWST Makeup From Emergency Feedwater.

D. OP-TM-534-901, RB Emergency Cooling Operation, and OP-TM-212-942, BWST Makeup From Emergency Feedwater.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to OP-TM-EOP-030 (p27; Rev 3) Step 5.2, IAAT incore temperature > 140°F, then initiate OP-TM-244-911. According to OP-TM-EOP-030 (p27; Rev 3) Step 5.3, IAAT incore temperature is approaching 200°F, then initiate OP-TM-534-901. According to OP-TM-EOP-030 (p27; Rev 3) Step 5.4, IAAT the RCS has been saturated for 2 hours, then initiate OP-TM-212-942. Since the Incore temperature is > that required for the initiation of Containment Closure, ONLY this OP must be performed now.

B. **Incorrect.** This is plausible because this procedure is performed as a Carryover Step in Section 5.0 of EOP-030, however the conditions has NOT been met. This is also plausible because according to OP-TM-EOP-030 (p15; Rev 3) Step 4.3, if the operator were initiating Emergency OTSG Cooling per section 4.0, rather than Feed and Bleed Cooling, then the criteria for initiating OP-TM-244-911 is NOT met; and the operator may incorrectly believe that this is the ONLY procedure that must be initiated.

C. **Incorrect.** This is plausible because the first part is correct, and the second part is a procedure is performed as a Carryover Step in Section 5.0 of EOP-030, however the conditions has NOT been met.

D. **Incorrect.** This is plausible because both procedures are performed as Carryover Steps in Section 5.0 of EOP-030, however the conditions have NOT been met.

Technical Reference(s): OP-TM-EOP-030 (p27; Rev 3) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-EOP030-C001 (PCO-6) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate Knowledge of low power / shutdown implications in loss of DHR mitigation strategies, specifically, which procedures must be implemented under a given set of plant conditions.

The question is at the Comprehension/Analysis cognitive level because the operator must assess the plant conditions, and identify which Emergency Support Procedures must be initiated, which could change based on the stated conditions.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		1
	K/A #	006	2.2.37
	Importance Rating		4.6

System Emergency Core Cooling - Equipment Control: Ability to determine operability and / or availability of safety related equipment.

Proposed Question: SRO Question # 89

Plant Conditions:

- 100% power for 10 days after a Refueling Outage.
- While reviewing system records, the DH System Engineer reports that OP-TM-212-211, LPI Test of DH Train A, was NOT completed during the previous Refueling Outage.

Which ONE (1) of the following identifies the status of Decay Heat Removal Pump DH-P-1A, AND the action required by Technical Specifications?

A. OPERABLE;
Perform a risk evaluation, manage the risk impact, perform the surveillance within the next 90 days, or declare the pump INOPERABLE.

B. OPERABLE;
Perform a risk evaluation, manage the risk impact, perform the surveillance at the first reasonable opportunity.

C. INOPERABLE;
Perform the surveillance within the next 72 hours.

D. INOPERABLE;
Initiate a plant shutdown and cooldown.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because according to Technical Specification 4.5.2.4 (p4-42; Amendment 225), at intervals not to exceed 3 months, the components required for emergency core cooling will be tested. The operator may incorrectly believe that the missed surveillance is associated with this specification.

B. **Correct.** According to Technical Specification 4.5.2.2 (p4-41; Amendment 234), During each refueling period and following maintenance or modification that affects system flow characteristics, system pumps and high point vents shall be vented, and a system test shall be conducted to demonstrate that the system is operable. According to OP-TM-212-211 (p1; Rev 8), this surveillance is done to meet the requirements of Technical Specification 4.5.2.2. Since it was NOT completed during the last Refueling Outage, it is a missed surveillance. According to Technical Specification 4.0.2 (p4-1; Amendment 256), Systems and components are assumed to be OPERABLE when the associated SRs have been met. If it is discovered that a surveillance was not performed within its specified frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified frequency, <u>whichever is greater</u>. Consequently, the grace period allowed is until the next Refueling Outage. Therefore, if the LCO does NOT need to be declared not met, the pump will remain OPERABLE. However, Technical Specifications does place requirements on the Licensee. For instance, the same specification states that a risk evaluation shall be performed for any surveillance delayed greater than 24 hours and the risk impact shall be managed. Since the surveillance is delayed until the next Refueling Outage, these requirements are needed. Secondly, according to the basis section of Technical Specification 4.0 (p4-1b; Amendment 256), when a surveillance with a frequency based not on time intervals, but upon specified unit conditions, operating situations, or requirements of regulations (e.g., prior to entering power operation after each fuel loading, or in accordance with 10 CFR 50, Appendix J, as modified by approved exemptions, etc.) is discovered to not have been performed when specified, Surveillance Standard 4.0.2 allows for the full delay period of up to the specified frequency to perform the surveillance. However, since there is not a time interval specified, the missed surveillance should be performed at the first reasonable opportunity. Consequently, the surveillance must be performed at the earliest reasonable opportunity (i.e. if the plant experiences a mid-cycle cooldown).

C. **Incorrect.** This is plausible because the operator may incorrectly interpret the missed surveillance as grounds for inoperability. If so, the action stated is reasonable. According to Technical Specification 3.3.2 (p3-23; Amendment 263), 72 hours of allowed outage time is provided if ECCS components are inoperable.

D. **Incorrect.** This is plausible because the operator may incorrectly interpret the missed surveillance as grounds for inoperability. If so, the action stated is reasonable. The operator may conclude that before DH-P-1A can be declared OPERABLE the surveillance must be performed, and according to OP-TM-212-211 (p2; Rev 8) the surveillance cannot be performed unless the RCS temperature < 140°F and RCS is vented to RB atmosphere.

Technical Reference(s):	TS 4.5.2.2 (p4-41 and 4-42; Amendments 234 and 225) OP-TM-212-211 (p1-2; Rev 8) TS 4.0.2 (p4-1 and 4-1b; Amendment 256)	(Attach if not previously provided)

Proposed References to be provided to applicants during examination: TS 4.5.2.2 (p4-41 and 4-42; Amendments 234 and 225)

Learning Objective: 212-GLO-14 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: None

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 2

Facility operating limitations in the technical specifications and their bases.

Comments:

What MUST be known:

1. Non-compliance with an LCO is NOT based solely on discovery of a missed surveillance.
2. If a Surveillance is discovered to be missed a grace period is allowed up to the frequency of the missed surveillance.
3. The frequency of the missed surveillance is during Refueling Outage (Provided in Reference).
4. If a surveillance is missed, and not completed within 24 hours of discovery, the operator must perform a risk evaluation and manage the risk impact.
5. If the missed surveillance has a non-specific frequency, the grace period up to that allowed by the frequency is permitted, however, the operator must perform the surveillance at the first reasonable opportunity.

The KA is matched because the operator must demonstrate ability to determine operability and/or availability of safety related equipment, specifically a DHR Pump.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate DHR Pump conditions, recall the Technical Specifications associated with the missed surveillances, identify the component status and apply the appropriate actions based on the evaluation.

The question is SRO-ONLY because it cannot be answered *solely* by knowing ≤ 1 hour TS/TRM action statements, the LCO/TRM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Required Actions in accordance with

the rules of application, and apply the generic LCO requirements; and to know information contained within the basis section of the Technical Specification, to correctly answer the question.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		2
	K/A #	005	AA2.01
	Importance Rating		4.1

Ability to determine and interpret the following as they apply to the Inoperable / Stuck Control Rod: Stuck or inoperable rod from in-core and ex-core NIS, in-core or loop temperature measurements

Proposed Question: SRO Question # 90

Plant conditions:

- A transient reduced power from 100% to 85%.
- When power stabilized MAP G-2-1, CRD PATTERN ASYMMETRIC, alarmed.
- One Group 7 Rod was 8 inches higher than the Group 7 Absolute Group Average Position.
- The crew suspected a position indication problem and entered OP-TM-622-416, Evaluating PI Problems.

Which ONE (1) of the following identifies the parameters that the operator must observe to distinguish between an actual misaligned rod and a position indication problem, AND assuming that the rod is actually misaligned, what is the status of the higher rod?

A. The imbalance meters on Panel CC and FIDMS printouts, ONLY; OPERABLE.

B. The imbalance meters on Panel CC and FIDMS printouts, ONLY; INOPERABLE.

C. The imbalance meters on Panel CC, the FIDMS printouts, and the Core Exit T/Cs; OPERABLE.

D. The imbalance meters on Panel CC, the FIDMS printouts, and the Core Exit T/Cs; INOPERABLE.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-622-416 (p2; Rev 2) the operator is directed to analyze reactor tilt and imbalance indications to determine the real rod misalignment by (1) observing the imbalance meters on CC for flux

imbalance, and (2) obtaining several FIDMS printouts. According to Technical Specifications 4.7.1.2 (p4-48; Amendment 211) if a control rod is misaligned with its group average by more than an indicated nine inches, the rod shall be declared inoperable and the limits of 3.5.2.2 shall apply. According to Technical Specifications 4.7.1.2 (p4-49; Amendment 157), basis indicates that a rod is considered inoperable if (1) it cannot be exercised, (2) if the trip insertion time is greater than the specified allowable time, or if (3) the rod deviates from its group average position by more than nine inches. Since the indicated deviation is only 8", the rod is considered OPERABLE.

B. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may incorrectly believe that the operability of the rod is dependent upon the alarm actuation of 7 inches.

C. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because the operator may incorrectly believe that OP-TM-622-416 directs the operator to consider the CETs when analyzing for a stuck rod.

D. **Incorrect.** 1st part wrong, 2nd part wrong. See B and C.

Technical Reference(s): OP-TM-622-416 (p2; Rev 2)
TS 4.7.1.2 (p4-48; Amendment 211)
TS 4.7.1.2 (p4-49; Amendment 157)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 622-GLO-10 and 14 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content:	55.41	
	55.43	2, 5

Comments:
The KA is matched because the operator must demonstrate the Ability to determine and interpret a Stuck/inoperable rod from in-core and ex-core NIS, in-core or loop temperature measurements as they apply to the Inoperable/Stuck Control Rod by identifying what indications must be observed and analyzed.

The question is at the Memory cognitive level because the operator must recall the parameters required to be observed to distinguish between a stuck rod and control rod position indication problems; and to identify the criteria that constitutes rod inoperability.

The question is SRO-Only because the SRO must recall a strategy in an operational support procedure (i.e. OP-TM-622-416) for distinguishing between a stuck rod and a control rod position indication problem; and demonstrate knowledge of the TS Surveillance Requirements and TS basis that is required to analyze TS required actions and terminology.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		1
	K/A #	015 2.1.25	
	Importance Rating		4.2

Evolution Reactor Coolant Pump Malfunctions - Conduct of Operations: Ability to interpret reference materials, such as graphs, curves, tables, etc.

Proposed Question: SRO Question # 91

Plant conditions:

- RCP failures have resulted in a plant shutdown.
- A plant cooldown and depressurization is in progress in accordance with 1102-11, Plant Cooldown.
- Reactor Coolant Pumps RC-P-1C and RC-P-1D are operating.
- Reactor Coolant Pumps RC-P-1A and RC-P-1B are shutdown.
- RCS temperature is 475°F.
- RCS pressure is 720 psig.

Which ONE (1) of the following correctly completes the statement below?

For the present plant conditions the operator must use ____(1)____ to evaluate the RCP operation during the RCS cooldown; and there is an ____(2)____ amount of NPSH for the RCPs.

A. (1) Attachment 7.3, RCS Pressure Temperature Limits for Other than Normal RCP Combinations, of OP-TM-226-000, Reactor Coolant Pumps
(2) adequate

B. (1) Enclosure 4, RCS Press/Temp and Cooldown Monitoring Requirements, of 1102-11, Plant Cooldown
(2) inadequate

C. (1) Enclosure 4, RCS Press/Temp and Cooldown Monitoring Requirements, of 1102-11, Plant Cooldown
(2) adequate

D. (1) Attachment 7.3, RCS Pressure Temperature Limits for Other than Normal RCP Combinations, of OP-TM-226-000, Reactor Coolant Pumps
(2) inadequate

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the operator may use incorrectly, or apply the plant conditions to Enclosure 4, Figure 1 of 1102-11 (which is the wrong figure), and correctly determine adequate NPSH conditions.

B. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because Enclosure 4, Figure 1 of 1102-11 would be applicable if the operator determined that the present RCP combination was normal for plant cooldown; and then applied the plant conditions to Attachment 7.3 of OP-TM-226-000 (which is the wrong figure [Error carried forward]), and correctly determine inadequate NPSH conditions.

C. **Incorrect.** 1st part wrong, 2nd part wrong. This is plausible because Enclosure 4, Figure 1 of 1102-11 would be applicable if the operator determined that the present RCP combination was normal for plant cooldown; and if the present plant conditions are applied using this figure, the operator would correctly determine that adequate NPSH exists.

D. **Correct.** 1st part correct, 2nd part correct. According to OP-TM-226-151 (p2; Rev 1) Step 4.1 the operator must evaluate final RCP combinations for effects of vibration and procedural requirements. It states that 1102-11 specifies the use of RC-P-1A and 1B for plant cooldown. It also indicates that RC-P-1C and RC-P-1D are designated for alternate use and requires use of PT curves in OP-TM-226-000, Attachments 7.3 and 7.4 instead of 1102-11 Figures 1 and 1A. 1102-11 makes a similar statement. According to 1102-11, Enclosure 7 (p1; Rev 140) if RC-P-1A or RC-P-1A is not OPERABLE, then shutdown RC-P-1A and 1B, and perform cooldown with RC-P-1C and 1D; using OP-TM-226-000 Attachments 7.3 and 7.4 for the RCP Operating Limits in place of those on Figure 1 and 1A. Based on the stated conditions, the operator must use Attachment 7.3 of OP-TM-226-000, rather than Figure 1 of 1102-11 (both will be provided to the operator). If the operator intersects the point of 475°F with 720 psig, the operator will clearly see that an adequate amount of SCM exists, but that an inadequate amount of NPSH for 0/2 RCP combination is available.

Technical Reference(s): OP-TM-226-151 (p2; Rev 1)
1102-11, Enclosure 7 (p1; Rev 140) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: 1102-11 Enclosure 4, Figure 1 (Curve ONLY)
OP-TM-226-000, Attachment 7.3 (Curve ONLY)

Learning Objective: 226-GLO-10 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate the Ability to interpret reference materials, such as Attachment 7.3 of OP-TM-226-000.

The question is at the Comprehension/Analysis cognitive level because the operator must correctly interpret the graph.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed (i.e. Attachment 7.3 of OP-TM-226-000 vs. Enclosure 4 of 1102, Figure 1).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		2
	K/A #	037	2.1.32
	Importance Rating		4.0

Evolution Steam Generator Tube Leak - Conduct of Operations: Ability to explain and apply all system limits and precautions.

Proposed Question: SRO Question # 92

Plant conditions:

- Letdown Monitors RM-L-1 and RM-L-1 LO are in alarm, and Chemistry suspects failed fuel.
- OP-TM-EOP-005, OTSG Tube Leakage, is in progress.
- OTSG A Tube Leakage is 24 gpm.
- The reactor is shutdown.
- Both OTSGs are being steamed.
- The 1600 psig ESAS is BYPASSED.
- RCS pressure is 1200 psig and stable.
- SCM is 30°F and stable.
- The crew has just initiated an RCS Cooldown IAW Guide 11, Cooldown Rate Limits.
- Both OTSG levels are 25 inches in the Startup Range, and stable.
- An AO reports that a Main Steam Safety Valve on OTSG A is leaking steam.

The projected offsite integrated dose has just been reported at 0.2R Whole Body and 1.5R Thyroid.

Which ONE (1) of the following identifies whether or not OTSG A should be isolated under the present conditions, and if NOT, identifies the reason why?

A. OTSG A should be isolated immediately, and then 10CFR50.54x invoked.

B. OTSG A should be isolated immediately, and additional cooling picked up on OTSG B.

C. OTSG A should NOT be isolated immediately;
OTSG levels are not approaching high level isolation criteria.

D. OTSG A should NOT be isolated immediately;
RCS pressure is too high to isolate OTSG under the present conditions.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may not know about the criteria for isolating the because the OTSG should be isolated and 10CFR50.54x will be invoked however the immediate is not correct, emergency cooldown to get RCS pressure under 1000 psig will be done first, it is the emergency cooldown that would be the cause for invoking 10CFR5054x.

B. **Incorrect.** This is plausible because this would be correct, if RCS pressure was < 1000 psig. Under those circumstances the operator would meet the WAAT condition of Step 3.35, and implement Attachment 1A immediately, and then Guide 12.

C. **Incorrect.** This is plausible because the operator may know both the OTSG level criteria (which is NOT met), the criteria for the projected offsite dose; but incorrectly believe that the projected offsite dose criteria is NOT met. For instance, the operator may incorrectly believe that both the whole body and thyroid criteria must be met to require OTSG isolation (which is NOT the case).

D. **Correct.** According to OP-TM-EOP-0051 (p3; Rev 2) the strategy for OTSG leakage is to steam both OTSGs until DHR is initiated. However, the preferred approach cannot be maintained under all conditions. For instance, the OTSG must be isolated if the level cannot be maintained < 85% (which is NOT the case). However, if the projected integrated dose consequence is significant (i.e. 0.5R whole body or 1.5R Thyroid) and both OTSGs are available then steaming/feeding of the OTSG with the largest leakage is terminated, the OTSG is isolated and the cooldown will be performed using one OTSG (Which is the case, under the stated conditions). This strategy is reflected in EOP-005. According to OP-TM-EOP-005 (p17; Rev 7) Step 3.35, IAAT both OTSGs are available (as is the case in the stated conditions), and projected or actual offsite integrated dose approaches 0.5R whole body, or 1.5R thyroid, then: (1) When RCS pressure is < 1000 psig then initiate Attachment 1A to isolate the most affected OTSG, and (2) when the affected OTSG TBVs and ADVs are closed, then PERFORM Guide 12. However, under the stated conditions, the operator cannot implement Attachment 1A because RCS pressure is still 1200 psig. When RCS pressure is subsequently reduced to < 1000 psig, the operator will perform this action based on the action being a Carryover Step. According to OP-TM-EOP-0051 (p15; Rev 2) an OTSG will NOT be isolated until RCS pressure is less than 1000 psig to preclude the possibility of lifting the MSSV, and a rapid cooldown and depressurization should be continued IAW Step 3.30 until this is satisfied.

Technical Reference(s): OP-TM-EOP-0051 (p3; Rev 2)
OP-TM-EOP-005 (p17; Rev 7)
Step 3.35 (Attach if not previously provided)
OP-TM-EOP-0051 (p15; Rev 2)

Proposed References to be provided to applicants during examination: None

Learning Objective:	TQTM104EOP05P1 PCO-4b, 5a, 5c and 6a	(As available)

Question Source:	Bank #		
	Modified Bank #		(Note changes or attach parent)
	New	X	

Question History:		Last NRC Exam:	N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X

10 CFR Part 55 Content:	55.41	
	55.43	5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate ability to explain and apply all system limits and precautions such as during an OTSG tube leak event do NOT isolate an OTSG that is available unless RCS pressure is < 1000 psig.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, and determine a course of action (i.e. isolate or do not isolate one OTSG), and then state the reason if the OTSG re-mains un-isolated demonstrating understanding of the application of MS System limitations.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a section of a procedure to mitigate (i.e. Attachment 1A or not), recover, or with which to proceed. Additionally, the operator must demonstrate knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps (i.e. Attachment 1A can only be performed when RCS Pressure is < 1000 psig).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		1
	K/A #	038 2.1.20	
	Importance Rating		4.6

Evolution Steam generator Tube Rupture - Conduct of Operations: Ability to interpret and execute procedure steps.

Proposed Question: SRO Question # 93

Plant conditions:

- 100% power.
- Motor Driven EFW Pump EF-P-2B is Out of Service for maintenance.

Event:

- OTSG tube rupture was identified on the A OTSG (estimated at 350 gpm).
- The crew is performing OP-TM-EOP-005, OTSG Tube Leakage.
- HPI has been initiated per Guide 9, RCS Inventory Control, and Pressurizer level is being maintained at 200 inches.
- The Turbine Driven EFW Pump, EF-P-1, is running.
- EF-P-2A Motor Driven EFP pump is operating.

Which ONE (1) of the following describes the FIRST action(s) the CRS would order IAW OP-TM-EOP-005 to minimize off-site dose?

A. Close ONLY MS-V-13A, EF-P-1 Steam Supply Valve, at the local handwheel.

B. Close MS-V-13A and MS-V-13B, EF-P-1 Steam Supply Valves, at the local handwheel.

C. Defeat all 8 HSPS switches and close ONLY MS-V-13A, EF-P-1 Steam Supply Valve, from the control room.

D. Defeat all 8 HSPS switches and close MS-V-13A and MS-V-13B, EF-P-1 Steam Supply Valves, from the control room.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because this step is taken per step 3.12 if EF-P-1 is NOT

running and the affected OTSG is identified and either motor driven pump is operating. This is incorrect because the pump is running and pre-emptive actions can not be taken to prevent pump start from the affected OTSG.

B. **Incorrect.** This is plausible because the affected OTSG's MS-V-13 is gagged closed per step 3.12 if EF-P-1 is NOT running and the affected OTSG is identified and either motor driven pump is operating the thought that both should be maintained closed (as is the case in step 3.36) to limit off-site dose may lead the candidate to chose this distracter.

C. **Incorrect.** This is plausible because the candidate may confuse the correct action step 3.36 for remote closing of the valve (correct action) and the previous gage action step 3.12 affected OTSG only (incorrect action). This is incorrect because a motor driven pump has been verified as operating and both steam sources are isolated to minimize off-site releases.

D. **Correct.** This correct per step 3.36 IAAT either EF-P-2A or B are operating then defeat all eight switches and close MS-V-13A and B.

Technical Reference(s): OP-TM-EOP-005 (p19; Rev 7) Step 3.36 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQTM104EOP05P1 (PCO-2a and 4b) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal,

abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate the Ability to interpret and execute procedure steps in OP-TM-EOP-005, specifically Step 3.12 IAAT and 3.36 IAAT which under the stated conditions will require that MS-V-13A and B should be CLOSED to prevent an unnecessary radioactive release.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of why a specific EOP action is taken, and because if the conditions were changed, one of the distractors could become the correct answer.

The question is SRO-ONLY because it cannot be answered solely by EOP mitigation knowledge and involves SRO decision points and actions ordered by the CRS.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		2
	K/A #	086	2.2.12
	Importance Rating		3.4

System Fire Protection - Equipment Control: Knowledge of surveillance procedures.

Proposed Question: SRO Question # 94

Plant Conditions:

- The Reactor is operating at 100% power.
- FS-P-1, Circulating Water Diesel Fire Pump, has just completed its monthly thirty (30) minute operability run IAW Surveillance procedure 3303-M1 Fire Pump Periodic Operation.
- The Auxiliary Operator reports FO-T-4 FS-P-1 Fuel Oil Tank level at 242 gallons at the end of the run.
- Current Altitude Tank, FS-T-1, volume is 85,000 gallons.

Which ONE (1) of the following identifies the action(s) that need to be performed in regard to the Fire Suppression System?

A. Restore inoperable equipment to operable status within the next seven (7) days.

B. Establish a backup Fire Suppression water system within twenty-four (24) hours.

C. Be in Hot Shutdown within one (1) hour and Cold Shutdown within the following thirty (30) hours.

D. No actions are required as long as the other two (2) Fire Pumps and Water Supply systems remain operable.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** Plausible for inoperability with backup available this would be the Time Clock for using backup equipment. do not have two water sources.

B. **Correct.** For suppression system inoperability if either less than 2 pumps or less than 2 water supplies as is the case. FS-T-1 is inoperable because it contains less than 90,000 gallons. The circ water flume is inoperable because it does not have an operable fire pump to deliver the water to the ring header, FS-P-1 is inoperable because

FO-T-4 contains less than 250 gallons of oil.

C. **Incorrect.** Plausible for inoperability with no backup available. 1038 2.3.2.1 list this after an or step, however 24 hours are available first to repair the condition 1038 2.3.2.2 or provide backup equipment 1038 2.3.2.1.

D. **Incorrect.** Plausible for a failure to recognize that the low fuel level makes FS-P-1 inoperable or that FS-P-1 being inoperable removes the second water supply. According to 1038 Rev 76 page 37 Need 2 pumps FS-P-3 and FS-P-2 remain, and 2 separate water supplies > 90,000 gals. Only the river via FS-P-2 or 3 remains as a water source.

Technical Reference(s): 1038 Rev 76 page 37
3303-M1 Rev 41 pg 13 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 811-GLO-14 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge
Comprehension or Analysis X

10 CFR Part 55 Content: 55.41
55.43 2

Facility operating limitations in the technical specifications and their bases.

Comments:

The KA is matched because the operator must demonstrate Knowledge of surveillance procedures, specifically that while the FO-T-4 fuel level is required for operability of FS-P-1.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions and determine operability of several systems/components. Determining which water source is available and what pumps are available to meet the requirements of 2 sources.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/TRM action statements, the LCO/TRM information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Surveillance Requirements in accordance with the rules of application.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		2
	K/A #	G2 2.2.5	
	Importance Rating		3.2

Equipment Control: Knowledge of the process for making design or operating changes to the facility.

Proposed Question: SRO Question # 95

Plant conditions:

- 100% power.
- The Unit 1 River Diesel Fire Pump (FS-P-3) was taken out of service to investigate a problem with the engine starting circuitry.
- I&C has installed a temporary header pressure meter for troubleshooting.
- I&C reports that all troubleshooting and maintenance is complete.
- Operations requests the temporary meter be left installed for 30 days for further monitoring.

Which ONE (1) of the following identifies the process that should be used in order to restore the Fire Pump to service?

Process this change using a……..

A. Controlled Exclusion.

B. Temporary Configuration Change Package.

C. Maintenance Rule Temporary Change (MR90).

D. Procedurally Controlled Temporary Configuration Change.

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** This is plausible because CC-AA-112 identifies this process as a potential means to control a Temporary Configuration Change. According to CC-AA-112 (p2; Rev 17) a Controlled Exclusion is a category of temporary changes that are controlled in an alternate approved manner than that identified within CC-AA-112. According to CC-AA-112 (p6-7; Rev 17) Step 4.2.1, Temporary Configuration Changes that are made via existing approved procedures, including maintenance procedures and work orders,

including the installation of MT&E, are Controlled Exclusions. However, this change is NOT MT&E. A NOTE prior to Step 4.2.1.A states that when OPS Shift Management directs I&C shift technicians to install a temporary monitor for use by the Operations Department, the instrumentation is NOT MT&E, but considered to be instrumentation because it will be used for monitoring by the Operations Department.

B. **Correct.** According to CC-AA-112 (p5; Rev 17) there are several processes identified within the procedure for controlling Temporary Configuration Changes. For instance, if the TCC is controlled in an alternate approved manner, such as by a procedure, then the change can be made by processing a Controlled Exclusion. On the other hand, if the TCC will be installed and removed multiple times, then the change should be processed using a Procedurally Controlled TCC. Furthermore, if the TCC is made in direct support of Maintenance Activities then the change can be made using a Maintenance Rule Temporary Change, or MR90. If the change cannot meet the requirements of a Controlled Exclusion, a Procedurally Controlled TCC, or an MR90 change, then the full design change process must be used, and a Temporary Configuration Change Package must be initiated.

C. **Incorrect.** This is plausible because CC-AA-112 identifies this process as a potential means to control a Temporary Configuration Change. According to CC-AA-112 (p2; Rev 17) a Maintenance Rule Temporary Change, or MR90, is in direct support of maintenance activities that meet the criteria for Maintenance Rule 10CFR65(a)(4). Whether this is such an activity or not, is NOT the issue in this case, since the maintenance is complete, the temporary change cannot remain under this process.

D. **Incorrect.** This is plausible because CC-AA-112 identifies this process as a potential means to control a Temporary Configuration Change. According to CC-AA-112 (p2 and 9; Rev 17) a Procedurally Controlled Temporary Configuration Change is a change controlled by a procedure developed specifically by a procedure to control this specific change. This type of process is used to control changes that are repetitive, and/or performed on a regular basis.

Technical Reference(s): CC-AA-112 (p1-2, 5 and 9; Rev 17) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-106-EQC-C001 (obj. -1) (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41

55.43 3

Facility licensee procedures required to obtain authority for design and operating changes in the facility.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the process for making design or operating changes to the facility (i.e. the use of Controlled Exclusions, MR90 changes, TPPC, or procedurally controlled TCCs).

The question is at the Memory cognitive level because the operator must recall the requirements for initiating a TCCP. (Borderline HCL because the operator must assess plant conditions and then apply the rules of usage for Controlled Exclusions, MR90s, TPPCs, and Procedurally Controlled TCCs.)

The question is SRO-Only because the operator must demonstrate knowledge of the process for controlling temporary design changes to the plant, which is an SRO-ONLY function.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		1
	K/A #	G1	2.1.5
	Importance Rating		3.9

Conduct of Operations: Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.

Proposed Question: SRO Question # 96

Plant conditions:

- 100% power.
- The RO makes the following statement to the CRS:

  "By the requirements of 10 CFR 26, I believe I am too fatigued to perform the duties assigned to me and would like to make a self-declaration of fatigue."

- There are no other Licensed personnel available on site.

Which ONE (1) of the following correctly completes the statements below?

In accordance with LS-AA-119, Fatigue Management and Work Hour Limits, the RO must be removed from duties ____(1)____. If the CRS authorizes a break period of 10 hours before returning to duty, a Fatigue Assessment is ____(2)____ upon returning to duty.

A. (1) as soon as practicable
(2) required

B. (1) as soon as practicable
(2) NOT required

C. (1) as soon as LS-AA-119-1001, Fatigue Management, Attachment 1, Fatigue Assessment, has been completed.
(2) required

D. (1) as soon as LS-AA-119-1001, Fatigue Management, Attachment 1, Fatigue Assessment, has been completed.
(2) NOT required

Proposed Answer: B

Explanation (Optional):

A. **Incorrect.** 1st part correct, 2nd part wrong. This is plausible because the Fatigue Assessment would be required if a break of less than 10 hours were granted by the CRS, or the Fatigue was identified not by the individual, but supervisor observation (i.e. for Cause).

B. **Correct.** 1st part correct, 2nd part correct. According to LS-AA-119 (p19; Rev 9) individuals making a self-declaration of fatigue must be removed as soon as practicable, from duty and complete Section 1 of LS-AA-119-1001, Attachment 1. According to LS-AA-119 (p17; Rev 9) a fatigue assessment is not required for an individual who has made a self-declaration of fatigue if the CRS permits or requires the individual to take a break of at least ten hours before the individual returns for duty.

C. **Incorrect.** 1st part wrong, 2nd part wrong. See A and D.

D. **Incorrect.** 1st part wrong, 2nd part correct. This is plausible because LS-AA-119 step 5.6 states that LS-AA-119-1001, Fatigue Management, Attachment 1, Fatigue Assessment, must be completed prior to the end of shift, but states it in addition to being removed as soon as practicable, not as a requirement to be removed. The step further states that the individual has until the end of shift to turn in Attachment 1 to his/her cognizant supervisor prior to the end of shift.

Technical Reference(s): LS-AA-119 (p18-19; Rev 9)
LS-AA-119-1001 (p10; Rev 1) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-104-PREWATCH-DBIG
PCO-1 (As available)

Question Source: Bank #
Modified Bank # (Note changes or attach parent)
New X

Question History: Last NRC Exam: NA

Question Cognitive Level: Memory or Fundamental Knowledge X
Comprehension or Analysis

10 CFR Part 55 Content: 55.41

55.43 1

Conditions and limitations in the facility license

Comments:

The KA is matched because the operator must demonstrate Ability to use procedures related to shift staffing, such as overtime limitations/fatigue management.

The question is at the Memory cognitive level because the operator must recall the requirements for the removal from 10CFR26 controlled work, and the requirements for performing a fatigue assessment.

The question is SRO-ONLY because it is related to the required actions (procedures and processes) that would be employed if minimum staffing requirements are not met (Section 6 of Technical Specifications).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		3
	Group #		4
	K/A #	G4	2.4.5
	Importance Rating		4.3

Emergency Procedures / Plan: Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.

Proposed Question: SRO Question # 97

Plant conditions:

- 100% power.
- A Credible Threat for a land attack is received in the Control Room from the NRC.
- CODE WHITE has been declared by Security.

Which ONE (1) of the following identifies actions that are required?

A. Initiate contact with the NRC over the ENS line within 15 minutes IAW OP-TM-AOP-008, Security Threat/Intrusion, ONLY.

B. Initiate contact with the NRC over the ENS line within 15 minutes IAW OP-TM-AOP-008, Security Threat/Intrusion; AND
Trip the reactor trip within 30 minutes IAW OP-TM-EOP-001, Reactor Trip.

C. Initiate contact with the NRC over the ENS line within 15 minutes IAW OP-TM-AOP-008, Security Threat/Intrusion; AND
Commence a plant shutdown immediately IAW 1102-10, Plant Shutdown.

D. Initiate contact with the NRC over the ENS line within 15 minutes IAW OP-TM-AOP-008, Security Threat/Intrusion; AND
Restrict site accessibility within one hour IAW OP-TM-108-111-1001, TMI Site Inaccessibility Plan.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to OP-TM-AOP-008 (p1; Rev 6) when a Credible Threat for a land attack was received in the Control Room from the NRC, the entry conditions were met. According to OP-TM-AOP-008 (p3; Rev 6) IAAT a Credible Threat is received then within 15 minutes initiate contact with the NRC using the ENS.

B. **Incorrect.** This is plausible because according to According to OP-TM-AOP-008 (p3; Rev 6) Step 3.4 IAAT a Code BLUE or YELLOW is declared then perform Attachment 1; and Step 3.6 IAAT an airborne attack against TMI is probable (estimated within 30 minutes) then perform Attachment 2. According to OP-TM-AOP-008, Attachment 1 (p17; Rev 6) Step 1.2, the operator is directed to trip the reactor if the reactor is NOT shutdown. According to OP-TM-AOP-008, Attachment 2 (p19; Rev 6) Step 2.2, the operator is directed to trip the reactor if the reactor is NOT shutdown.

C. **Incorrect.** This is plausible because the operator may correctly believe that a reactor trip is NOT warranted under the stated conditions, but incorrectly believe that a plant shutdown is required.

D. **Incorrect.** This is plausible because according to OP-TM-AOP-008 (p9; Rev 6) the operator may review this procedure if staff augmentation is desired.

Technical Reference(s): OP-TM-AOP-008 (p1, 3, 9, 17 and 19; Rev 6) (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: TQ-TM-104-A08-C001 (PCO-1a) (As available)

Question Source: Bank # IS-AOP-008-PCO-4-Q01

Modified Bank # (Note changes or attach parent)

New

Question History: Last NRC Exam: 2008 TMI Q# 100

Question Cognitive Level: Memory or Fundamental Knowledge X

Comprehension or Analysis

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

What MUST be known:

1. When the NRC notifies TMI of a credible threat against it, the entry conditions for AOP-008 are met.
2. AOP-008 requires the operator to initiate contact with the NRC over the ENS line within 15 minutes.

The KA is matched because when placed within an AOP (i.e. AOP-008), the operator must consider actions of that AOP as well as whether or not actions within NOPs and EOPs are applicable thereby demonstrating knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.

The question is at the Memory cognitive level because the operator must recall to two pieces of information to correctly answer the question.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed; and to demonstrate knowledge of when to when to implement attachments and appendices, including how to coordinate these items with procedure steps.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		1
	Group #		2
	K/A #	A06	2.4.18
	Importance Rating		4.0

Evolution Control Room Evac. - Emergency Procedures / Plan: Knowledge of the specific bases for EOPs.

Proposed Question: SRO Question # 98

With the plant at 100% power the following events occur:

- Smoke appears in the Control Room.
- The crew enters OP-TM-EOP-020, Cooldown From Outside of Control Room.
- The URO completes IMA 2.2 through 2.7.
- The CRS makes the decision to evacuate the Control Room.
- The ARO announces over the plant page system, "EOP-020 Remote Shutdown Sequence initiated"

Which ONE (1) of the following describes how the crew will address the operation of Makeup Pump Discharge to Reactor Coolant Loop Isolation Valves MU-V-16A and 16B throughout this procedure?

They will be CLOSED and their breaker OPENED as part of……

A. Attachment 5, Preventing Spurious Operation of MOVs, to prevent uncontrolled HPI flow to the RCS.

B. Attachment 1, Initiating Train B DHR From the RSD Station, when preparing to cooldown to < 329°F.

C. Attachment 2, Bypassing ESAS HPI and LPI Actuation, just prior to depressurizing the RCS below 1675 psig.

D. Attachment 5, Preventing Spurious Operation of MOVs, to prevent HPI pump runout on the side aligned to Seal Injection.

Proposed Answer: A

Explanation (Optional):

A. **Correct.** According to OP-TM-EOP-020 (p65-66; Rev 12) Attachment 5 will first open

the breakers for MU-V-16A and B, and then direct the operator to ensure that they are closed. According to OP-TM-EOP-020 (p7; Rev 12) Step 3.1, the PSSD NLO will be directed (by means of the evacuation announcement) to perform Attachment 5 immediately upon evacuating the Control Room. According to OP-TM-EOP-0201 (p16; Rev 6) Attachment 5 addresses potential failures which could have a significant impact on event mitigation. Other failure may occur. Prevention of spurious operation of motor operated valves by opening their breakers before the spurious operation occurs is preferred to having to detect and react to spurious operation. Therefore, each valve that could spuriously operate in this fire area is ensured to be in the correct position and the breaker is opened.

B. **Incorrect.** This is plausible because these valves receive an open signal as part of HPI actuation, and the operator may incorrectly believe that this Attachment addresses the positioning of the valves.

C. **Incorrect.** This is plausible because according to OP-TM-EOP-0201 (p26; Rev 6) Step 4.1 provides guidance for actions required to be performed before cooling down to < 329°F with the PORV inoperable, in order to comply with TS 3.1.12.1. According to Technical Specification 3.1.12.1 (p3-18b; Amendment 234) if the reactor vessel head is installed (which it is in the stated conditions) and RCS temperature is ≤329F, HPI Pump breakers shall not be racked in unless MU-V-16A/B/C/D are closed with their breakers open. The operator may incorrectly believe that the action to close the MU-V-16 valves is on Attachment 1, which is performed just after Step 4.17. Additionally, the EOP Basis document indicates that Step 4.17 does not need to address the MU-V-16A/B valves because they were previously closed as part of Attachment 5; and the operator may not know this.

D. **Incorrect.** This is plausible because this would without the ability to read Seal injection flow pump runout on ES initiation can not be readily determined.

Technical Reference(s): OP-TM-EOP-020 (p65-66; Rev 12)
OP-TM-EOP-0201 (p16 and 26; Rev 6)
Technical Specification 3.1.12.1 (p3-18b; Amendment 234)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: N-TM-TQ-TM-104-E20-C001P1 (PCO-1) (As available)

Question Source: Bank #

Modified Bank #		(Note changes or attach parent)
New	X	

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate Knowledge of the specific bases for EOPs; specifically OP-TM-EOP-020, Cooldown From Outside of Control Room, regarding the Attachment in which MU-V-16A and B are positioned, and when this is performed.

The question is at the Comprehension/Analysis cognitive level because the operator must demonstrate an understanding of the strategy that is employed in EOP-020, by identifying that the MU-V-16 A and B valves are preemptively positioned immediately during a fire in the control room event.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to demonstrate knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps. The basis for the actions is tested to ensure SRO understanding of mitigative actions of the follow-ups.

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		1
	K/A #	026	A2.01
	Importance Rating		3.0

Ability to (a) predict the impacts of the following malfunctions or operations on the CSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Reflux boiling pressure spike when first going on recirculation

Proposed Question: SRO Question # 99

Plant conditions:

- A LOCA has occurred in the RB.
- RB pressure peaked at 35 psig.

16 hours later:

- The crew enters Guide 21, Transfer to RB Sump Recirculation, of OP-TM-EOP-010, Emergency Procedures Rules, Guides and Graphs, and places RB Sump Recirculation in service.
- RB Pressure is now 4.5 psig.
- RM-G-22 and 23 are in HIGH Alarm.

Which ONE (1) of the following describes how the operator should address continued operation of the RB Spray System (BS)?

A. Both trains of BS must remain in service until RB pressure is less than 4 psig.

B. Initiate OP-TM-214-901, RB Spray Operation;
Shutdown both trains of BS immediately.

C. Initiate OP-TM-214-901, RB Spray Operation;
Shutdown one train of BS immediately, and the second within about 2 hours.

D. Initiate OP-TM-214-901, RB Spray Operation;
Shutdown one train of BS immediately, and the second after the TSC has indicated that the RB atmosphere I-131 concentration is acceptable.

Proposed Answer: D

Explanation (Optional):

A. **Incorrect.** This is plausible because the operator may incorrectly believe that the threshold for pressure reduction is 4 psig; the setpoint of the first automatic action during ESAS.

B. **Incorrect.** This is plausible because this action would be appropriate if there were evidence that the DH Pumps were cavitating.

C. **Incorrect.** This is plausible because the operator may incorrectly believe that the time duration for operation of the BS System in this mode is 20 hours, rather than 24 hours; and may incorrectly believe that RM-G-22/23 must be below their alarm setpoints to shutdown the second train.

D. **Correct.** According to OP-TM-EOP-010 (p29; Rev 11) the last step of Guide 21 directs the operator to Initiate Guide 22. According to OP-TM-EOP-010 (p30; Rev 11) upon entering Guide 22 the operator will check for cavitation of the DH Pumps and in-leakage into the BWST, and then initiate shutdown of the RB Spray System in accordance with Section 5.0, Return to Normal. According to OP-TM-214-901 (p7; Rev 4) the operator is directed to immediately shutdown one train of RB Spray if Guide 22 is in progress. Then, the operator is directed to evaluate RB temperature and pressure trends, and to continue to shutdown the other train if the BS System operating time is approaching 24 hours, OR the RB pressure is < 5 psig <u>AND</u> either RM-G-22/23 are below their alarm setpoint (Not the case), or the TSC has determined RB atmosphere I-131 concentration is acceptable. According to OP-TM-EOP-0101 (p66; Rev 3) once the RB Sump recirculation has begun the RB is being sprayed with hot sump water rather than cold BWST water. Consequently, this operation has little or no impact on the RB cooling, and continued operation has an adverse impact on the ECCS sump strainer (debris accumulation), LPI NPSH and RB equipment. The system must be operated until it is confirmed that the RB iodine concentration has been effectively reduced such that offsite dose will not be adversely affected by shutting off the BS. The shutdown criteria of OP-TM-214-901 must be satisfied to shutdown both trains, but if two trains are running one can be shutdown immediately.

Technical Reference(s): OP-TM-EOP-010 (p29; Rev 11)
OP-TM-EOP-010 (p30; Rev 11)
OP-TM-214-901 (p7; Rev 4)
OP-TM-EOP-0101 (p66; Rev 3)
(Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 214-GLO-12 (As available)

Question Source:	Bank #		
	Modified Bank #		(Note changes or attach parent)
	New	X	

Question History:		Last NRC Exam:	N/A

Question Cognitive Level:	Memory or Fundamental Knowledge	
	Comprehension or Analysis	X

10 CFR Part 55 Content:	55.41	
	55.43	5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:

The KA is matched because the operator must demonstrate ability to (a) predict the impacts of the reflux boiling pressure spike when first going on recirculation on the CSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of this operation (i.e. the operator must identify how to operate the BS System after RB Sump recirculation is established).

The question is at the Comprehension/Analysis cognitive level because the operator must assess plant conditions and apply termination criteria for the BS System, which would change if the stated conditions were changed.

The question is SRO-ONLY because it cannot be answered solely by knowing system knowledge, immediate operator actions, plant parameters that require direct entry into EOPs, or knowing the purpose, overall sequence of events, or overall mitigative strategy of a procedure; AND requires the operator to assess plant conditions and then select a procedure or section of a procedure to mitigate, recover, or with which to proceed; and to demonstrate knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event specific sub-procedures or emergency contingency procedures (i.e. Initiate OP-TM-214-901, and identify correct action within).

Examination Outline Cross-reference:	Level	RO	SRO
	Tier #		2
	Group #		1
	K/A #	061	A2.08
	Importance Rating		2.9

Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Flow rates expected from various combinations of AFW pump discharge valves

Proposed Question: SRO Question # 100

Plant conditions:

- An unisolable steam line rupture on "A" OTSG in intermediate building, creating an uninhabitable condition.
- The crew has entered OP-TM-EOP-003, Excessive Heat Transfer.
- The IMA's have been completed with the following exception:
  - EF-V-30D, "A" OTSG flow control valve is 100% open and cannot be closed from the Control Room.

What action listed below is appropriate for the given conditions and which procedure would be used?

A. Have an NLO manually close EF-V-52D, EF-V-30D Block valve, to isolate EFW to the "A" OTSG
IAW Rule 3, Excessive Heat Transfer.

B. Close EF-V-2A, EFW Discharge X-connect, within two minutes to avoid thermal shock to the "A" OTSG
IAW Rule 3, Excessive Heat Transfer.

C. Close EF-V-2A, EFW Discharge X-connect, and shutdown EF-P-2A Motor driven EFW pump, from the Control Room to isolate EFW to the "A" OTSG
IAW OP-TM-424-901, Emergency Feedwater.

D. Close EF-V-2B, EFW Discharge X-connect, shutdown EF-P-2A Motor driven EFW pump and EF-P-1 Turbine driven EFW pump to avoid thermal shock
IAW OP-TM-424-901, Emergency Feedwater.

Proposed Answer: C

Explanation (Optional):

A. **Incorrect.** This is plausible because this is the normal method that is called for, however EF-V-52D is located in the Intermediate Building and therefore can not be done.

B. **Incorrect.** This is plausible because this action is specified in OP-TM-102-106 Time critical actions for fires that cause EF-V-30 to open when not called for, incorrect for this application closing this alone will not stop flow.

C. **Correct.** According to OP-TM-424-901, Emergency Feedwater, if affected EF-V-52 is not closed and primary-to –secondary heat transfer is excessive (XHT) then perform the following, Close EF-V-2A(B) and shutdown EF-P-2A(B)

D. **Incorrect.** This is plausible because this would work, however it would unnecessarily remove EF-P-1 from service and would be an incorrect interpretation of which EF-V-2 to close.

Technical Reference(s): OP-TM-424-901 Rev 1 page 8 step 4.3.2 (Attach if not previously provided)

Proposed References to be provided to applicants during examination: None

Learning Objective: 424-GLO-14 (As available)

Question Source: Bank #

Modified Bank # (Note changes or attach parent)

New X

Question History: Last NRC Exam: N/A

Question Cognitive Level: Memory or Fundamental Knowledge

Comprehension or Analysis X

10 CFR Part 55 Content: 55.41

55.43 5

Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.

Comments:
The KA is matched because the operator must demonstrate the ability to (a) predict the impacts of the flow rates expected from various combinations of EFW pump discharge valves on the AFW (I.e. flow will continue when it should not); and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those operations by using OP-TM-424-901 to stop flow with the area being inaccessible.

The question is at the Comprehension/Analysis cognitive level because the operator must evaluate plant conditions, recall the TS exception allowed for surveillance testing when more than one flowpath to an OTSG is inoperable, and then apply the exception correctly, identifying the allowable conditions in the process.

The question is SRO-ONLY because it cannot be answered solely by knowing ≤ 1 hour TS/TRM action statements, the LCO information listed "above the line," or by knowing the TS Safety Limits; AND requires the operator to apply the Surveillance Requirements in accordance with the rules of application and demonstrate knowledge of the TS basis that is required to analyze TS required actions.