Final Submittal

(Blue Paper)

NORTH ANNA JUNE 2008 EXAM
05000338/2008301 & 05000339/2008301

FINAL SRO

WRITTEN EXAMINATION

AND REFERENCES

& ANSWER KEY
& KAs

NORTH ANNA 2008 RO/SRO WRITTEN EXAM
LIST OF K/A's & EXAM ANSWER KEY - FINAL

#	ID	Answers
1	001 G2.4.31 1	C
2	003 A4.07 2	B
3	004 G2.2.3 3	A
4	005 K1.06 4	A
~~5~~	~~006 K2.02 5~~	~~B~~ DELETED
6	007 A4.10 6	C
7	007 K3.01 7	A
8	008 AA2.24 8	D
9	008 K4.01 9	D
10	009 G2.4.4 10	B
11	010 K5.01 11	C
12	011 EK2.02 12	C
13	012 K6.04 13	C
14	013 A1.07 14	D
15	013 K4.15 15	D
16	015 AK2.07 16	C
17	016 K1.02 17	D
18	017 A4.02 18	C
19	022 A2.06 19	D
20	022 AK3.03 20	D, also accept "A"
21	022 K1.04 21	B
22	025 AA1.12 22	D
23	026 A4.01 23	C, also accept "A"
24	026 AA2.01 24	C
25	026 K2.01 25	D
26	027 G2.2.42 26	A
27	028 K3.01 27	A
28	029 EK1.05 28	B
29	029 K4.03 29	B
30	032 AK3.01 30	C
31	033 K4.05 31	D
32	036 AA1.01 32	D
33	039 G2.1.32 33	B
34	041 K6.03 34	D
35	054 AK3.01 35	C
36	055 A3.03 36	A
37	055 EA1.06 37	A
38	056 AA2.72 38	A
39	057 G2.4.45 39	A
40	058 AK1.01 40	B
41	059 K1.02 41	C
42	060 AA2.05 42	C
43	061 G2.4.3 43	A
44	061 K2.01 44	A

NORTH ANNA 2008 RO/SRO WRITTEN EXAM
LIST OF K/A's & EXAM ANSWER KEY - FINAL

#	ID	Answers
45	062 G2.1.27 45	A
46	062 K3.03 46	A
47	063 K4.01 47	D
48	064 K3.02 48	D
49	065 AK3.03 49	B
50	071 A2.02 50	A
51	073 A1.01 51	D
52	073 K5.02 52	D
~~53~~	~~076 A1.02 53~~	~~C~~ DELETED
54	076 AK2.01 54	C
55	077 AA1.01 55	D
56	078 A4.01 56	C
57	078 K4.03 57	A
58	079 K1.01 58	C
59	103 A3.01 59	D
60	E03 EA1.2 60	D
61	E05 EK3.4 61	D
62	E09 EA2.1 62	D
63	E12 EK2.1 63	C
64	E15 EK2.1 64	D
65	E16 EK3.1 65	A
66	G2.1.20 66	A
67	G2.1.37 67	C
68	G2.1.41 68	D
69	G2.2.1 69	A
70	G2.2.39 70	A
71	G2.2.7 71	B
72	G2.3.15 72	C
73	G2.3.4 73	C
74	G2.4.32 74	B
75	G2.4.9 75	A
76	005 AA2.02 76	A
77	005 G2.2.40 77	D
78	006 A2.03 78	D
79	007 G2.2.44 79	C
80	008 G2.4.8 80	B
81	012 A2.04 81	D
82	017 A2.02 82	B
83	025 AA2.03 83	C
84	026 G2.1.7 84	C
85	027 G2.2.25 85	A
86	034 A2.03 86	B
87	038 EA2.15 87	A
88	051 G2.2.44 88	C

NORTH ANNA 2008 RO/SRO WRITTEN EXAM
LIST OF K/A's & EXAM ANSWER KEY - FINAL

ID		Answers
89	056 G2.2.36 89	A
90	059 G2.1.23 90	C
91	061 AA2.04 91	D
92	062 AA2.05 92	~~B~~ A
93	E13 G2.4.20 93	A
94	G2.1.4 94	B
95	G2.1.6 95	B
96	G2.2.11 96	~~D~~ B
97	G2.2.35 97	B
98	G2.3.6 98	A
99	G2.4.27 99	B
100	G2.4.6 100	A

U.S. Nuclear Regulatory Commission

Site-Specific SRO Written Examination

Applicant Information	
Name:	
Date: June 24, 2008	Facility/Unit: North Anna/Units 1 & 2
Region: II	Reactor Type: Westinghouse
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass the examination you must achieve a final grade of at least 80.00 percent overall, with 70.00 percent or better on the SRO-only items if given in conjunction with the RO exam; SRO-only exams given alone require a final grade of 80.00 percent to pass. You have 8 hours to complete the combined examination, and 3 hours if you are only taking the SRO portion.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Applicant's Signature

Results	
RO/SRO-Only/Total Examination Values	_____ / _____ / _____ Points
Applicant's Scores	_____ / _____ / _____ Points
Applicant's Grade Percent	_____ / _____ / _____

NAME _____

North Anna Power Station
2008 SRO Exam

1.
Given the following:

- During a Unit 1 load reduction for 1-PT-34.3, Turbine Valve Freedom Test, the following alarm is received:
  - 1A-D1, ROD CONTROL URGENT FAILURE
- The Ramp has been held and power is approximately 93%.
- Tave is 2.5°F higher than Tref.
- Investigation reveals that a Logic Cabinet Oscillator Failure has occurred.

Which ONE of the following describes how this failure will affect the Rod Control System, including the required action in accordance with the annunciator response procedure?

A. Rod motion is NOT inhibited in 'Bank Select'; adjust Turbine load or use rods in Bank Select to match Tave to Tref.

B. All rod motion is inhibited; adjust Turbine load ONLY to match Tave to Tref.

C. All rod motion is inhibited; adjust Turbine load or adjust RCS boron concentration to match Tave to Tref.

D. Rod motion is NOT inhibited in 'Bank Select'; use rods in Bank Select ONLY to match Tave to Tref.

2.

Given the following:

- Unit 1 cooldown and depressurization is in progress for refueling.
- RCS temperature is 195 degrees F and slowly decreasing.
- RCS pressure is 360 psig and slowly decreasing.
- "A" and "C" RCPs are running.
- RHR is in service.

The crew observes the following indications:

- Annunciator 1C-G8, RCP 1A-B-C SEAL LEAK LO FLOW is received.
- Seal leakoff flow on all three RCPs is approximately 0.7 gpm and slowly decreasing.
- All RCP Pump Radial Bearing temperatures are approximately 130 degreesF and stable.
- All RCP Seal Water outlet temperatures are approximately 160 degrees F and stable.
- RCP standpipe alarms are all CLEAR.

Which ONE of the following is correct concerning operation of 1-CH-HCV-1307, RCP Seal Bypass Isolation Valve?

A. Maintain closed and de-energized to address Appendix-R concerns.

B. Maintain closed and de-energized due to the potential for RCP seal damage.

C. Energize and open the valve to prevent overheating the #1 seals.

D. Energize and open the valve to prevent overheating pump radial bearing.

3.
Which ONE of the following describes a NORMAL Unit 2 BAST alignment?

A. 'C' BAST through 1-CH-P-2D to Unit 2 Boric Acid Filter to Unit 2 BIT/Blender.

B. 'A' BAST through 1-CH-P-2A to Unit 2 Boric Acid Filter to Unit 2 BIT/Blender.

C. 'C' BAST through 1-CH-P-2D through recirc valve 1-CH-HCV-1104 ONLY and back to 'C' BAST.

D. 'B' BAST through 1-CH-P-2A to Unit 2 Boric Acid Filter to Unit 2 BIT/Blender.

4.

Given the following:

- Unit 1 is in Mode 6.
- The unit has been shutdown for 11 days.
- Cavity level is 22 feet above the reactor vessel flange.
- RCS temperature is 109 degrees F.
- RHR Loop 1A is in service.

Which ONE of the following is the MINIMUM RHR flow requirement based on these plant conditions, including the reason for this minimum flow requirement, in accordance with 1-OP-14.1, Residual Heat Removal?

A. 2500 GPM; prevents flow induced chatter on SI Accumulator check valves.

B. 3000 GPM; satisfies Technical Specification minimum flow requirements in Mode 6.

C. 3000 GPM; prevents flow induced chatter on SI Accumulator check valves.

D. 2500 GPM; satisfies Technical Specification minimum flow requirements in Mode 6.

5.

Given the following:

- Unit 1 is in Mode 4 with a plant cooldown to Mode 5 in progress.
- RCS Pressure is 720 psig.
- RCS temperature is 325°F.

Which ONE of the following states the power supply to 1-SI-MOV-1865A, 'A' Accumulator Discharge Isolation Valve, and its required breaker position for the current plant conditions?

480 Volt MCC...

A. 1J1; breaker is closed.

B. 1H1; breaker is open.

C. 1H1; breaker is closed.

D. 1J1; breaker is open.

6.

Given the following:

- Unit 1 is in Mode 3.
- PRT level is 74% and INCREASING SLOWLY.
- PRT pressure is 12 psig and INCREASING SLOWLY.
- PRT temperature is 132°F and INCREASING SLOWLY.

- The following annunciators are LIT:
  - 1B-H1, PRZ RELIEF TK HI TEMP
  - 1B-G2, PRZ SAFETY VV LINE HI TEMP
  - 1B-H2, PRZ POWER RELIEF LINE HI TEMP

- Acoustic monitor indications are NORMAL.

Which ONE of the following identifies the cause of the conditions above, and includes the method used to identify the affected component in accordance with annunciator response procedures?

A. Pressurizer PORV leaking by;
Check tailpipe temperature indication to determine which PORV is leaking.

B. Pressurizer Safety Valve leaking by;
Check tailpipe temperature indication to determine which Safety Valve is leaking.

C. Pressurizer PORV leaking by;
Close block valves one-at-a-time to determine which PORV is leaking.

D. Pressurizer Safety Valve leaking by;
Check tailpipe temperatures with a contact pyrometer to determine which Safety Valve is leaking.

7.

Given the following:

- Unit 1 was initially at 100% power at the end of core life.
- Fuel failures have resulted in increased RCS activity (still within Tech Spec limits).
- A spurious Safety Injection (SI) occurred.
- One train of SI failed to reset from the control room.
- Multiple PRZR PORV lifts occurred during the recovery.
- PRT pressure is 115 psig.

Which ONE of the following identifies the current conditions in the Containment including the raditation monitor indications in the Main Control Room?

A. Containment Sump level constant;
Containment Particulate and Gaseous Radiation Monitors constant.

B. Containment Sump level increasing;
Containment Particulate and Gaseous Radiation Monitors increasing.

C. Containment Sump level increasing;
Containment High Range radiation Monitors constant.

D. Containment Sump level increasing;
Containment High Range Radiation Monitors increasing.

8.

Given the following:

- A reactor trip has occurred on Unit 1.
- Safety Injection is actuated.
- RCS pressure is 1200 psig.
- Containment pressure has peaked at 16 psia and is slowly trending down.
- Pressurizer level is 100%.
- The crew is performing 1-E-0, Reactor Trip or Safety Injection.

Which ONE of the following describes the method used to control RCS temperature and the approximate Main Steam pressure maintained?

A. Condenser Steam Dumps; 1035 psig.

B. SG PORVs; 1005 psig.

C. SG PORVs; 1035 psig.

D. Condenser Steam Dumps; 1005 psig.

9.

Given the following:

- Unit 1 is at 100% power.
- CC Pump 1A is running and CC Pump 1B is in standby.
- 4160 V Bus 1H normal feeder is inadvertantly opened.

Which ONE of the following describes the AUTOMATIC operation of CC Pumps for this event?

A. CC Pump 1B starts 15 to 20 seconds after Bus 1H is reenergized; CC Pump 1A does NOT re-start.

B. CC Pump 1B starts when Bus 1H is deenergized; CC Pump 1A starts as soon as Bus 1H is reenergized.

C. CC Pump 1B starts 15 to 20 seconds after Bus 1H is reenergized; CC Pump 1A starts 15 to 20 seconds after Bus 1H is reenergized.

D. CC Pump 1B starts when Bus 1H is deenergized; CC Pump 1A restarts 15 to 20 seconds after Bus 1H is reenergized.

10.

Given the following:

- A LOCA has occurred.
- The crew is performing 1-E-1, Loss of Reactor or Secondary Coolant.
- The following conditions exist:
  - All SG pressures – 930 psig and slowly trending down.
  - All SG levels – being controlled at 42% NR.
  - PZR level – off-scale high.
  - Containment Pressure – 23 psia.
  - RWST level – 32% and decreasing at 1% every 4 minutes.
  - RCS pressure – 1000 psig and stable.
  - Core Exit TCs – 500 degrees F.
  - RVLIS Full Range indication 74%.

Based on these indications, which ONE of the following procedure entry requirements are met?

A. 1-ES-1.3, Transfer to Cold Leg Recirculation

B. 1-ES-1.2, Post-LOCA Cooldown and Depressurization

C. 1-ES-1.1, SI Termination

D. 1-FR-C.2, Response to Degraded Core Cooling

11.

Given the following:

- The RCS is solid in Mode 5.
- The crew is preparing to draw a bubble in accordance with 1-OP-1.1, Unit Startup From Mode 5 At Less Than 140 Degrees F To Mode 5 At Less Than 200 Degrees F.
- PZR pressure is approximately 325 psig.
- PZR temperature is 335 degrees F.
- RCS temperature is 180 degrees F.

Assuming PZR Heatup rate is at the administrative limit of 1-OP-1.1, approximately how long will it take to reach saturation conditions in the pressurizer, and what action will be required when saturation conditions are reached?

A. 60 minutes; the letdown backpressure control valve potentiometer setpoint will be increased.

B. 30 minutes; letdown flow will be manually increased.

C. 60 minutes; letdown flow will be manually increased.

D. 30 minutes; the letdown backpressure control valve potentiometer setpoint will be increased.

12.

Given the following:

- A Large Break LOCA has occurred on Unit 1.
- The crew has completed transition to 1-ES-1.3, Transfer to Cold Leg Recirculation.
- RWST level is 14%.

Given these current plant conditions, which ONE of the following identifies the required ECCS and Charging pump alignment after the initial swapover to Cold Leg Recirculation is performed in accordance with 1-ES-1.3?

A. Low Head SI Pump flowing to Charging pumps ONLY; Charging Pump suction from LHSI Pumps.

B. Low Head SI Pump suction from Containment Sump; Charging Pump suction from RWST.

C. Low Head SI Pump suction from Containment Sump; Charging Pump suction from LHSI Pumps.

D. Low Head SI Pump flowing to Charging pumps ONLY; Charging Pump suction from RWST.

13.

Given the following:

- A plant load reduction is in progress.
- Turbine First Stage Pressure Channel, 1-MS-PT-1446, sticks at 50%.
- Reactor power is currently 8%.

Which ONE of the following identifies the RPS permissive affected by this transmitter failure, including the MINIMUM number of RCPs, which if lost, would cause a Reactor Trip ?

A. P-8 cannot be satisfied; the reactor would trip on loss of 2 RCPs.

B. P-7 cannot be satisfied; the reactor would trip on loss of ONLY 1 RCP.

C. P-7 cannot be satisfied; the reactor would trip on loss of 2 RCPs.

D. P-8 cannot be satisfied; the reactor would trip on loss of ONLY 1 RCP.

14.

An event has occurred on Unit 1 resulting in core damage.

Containment pressure peaked at 28 psia.
Containment radiation peaked at 2E+5R/hr.

Current Plant parameters are as follows:

- RCS temperature is slowly trending down.
- All SGs are 15% Narrow Range and rising.
- AFW flow to each SG is 150 gpm.
- Containment pressure is 16 psia and slowly trending down.
- Containment radiation is 1E+4R/hr and slowly trending down.

Which ONE of the following identifies the AFW flow requirements in accordance with 1-E-0, Reactor Trip or Safety Injection, and the Adverse Containment criteria?

A. AFW may be reduced to 50 gpm to each SG since Containment pressure has decreased to the current value.

B. AFW may be reduced to 50 gpm to each SG since Containment radiation has decreased to the current value.

C. Total AFW flow must be maintained > 340 gpm because of the Containment pressure transient.

D. Total AFW flow must be maintained > 340 gpm because of the Containment radiation transient.

15.

- The Unit is at 100% power.
- A failure of a semi-automatic tester board has occurred in the Solid State Protection System resulting in a General Warning condition.

Which ONE of the following describes how the system is designed for the operator to identify the condition and determine the affected Train?

A. A common Safeguards Trouble annunciator is provided in the control room; RED GENERAL WARNING light in the affected train's logic cabinet will be extinguished.

B. Train-specific Safeguards Trouble annunciators are provided in the control room; RED GENERAL WARNING light in the affected train's logic cabinet will be extinguished.

C. A common Safeguards Trouble annunciator is provided in the control room; RED GENERAL WARNING light in the affected train's logic cabinet will be LIT.

D. Train-specific Safeguards Trouble annunciators are provided in the control room; RED GENERAL WARNING light in the affected train's logic cabinet will be LIT.

16.

Given the following:

- Unit 1 is at 100% power.
- The following alarm is received:
  - 1C-G7, RCP 1A-B-C SEAL LEAK HI FLOW
- RCP 1B Seal Leakoff flow indicates 6 GPM.
- RCP 1B No. 1 Seal DP indicates 220 psid and stable.
- Annunciator 1C-G2, RCP 1B STANDPIPE HI LEVEL is NOT LIT.
- Seal leakoff has lowered on RCP 1A and 1C.
- Seal Return temperature is rising slowly.

Which ONE of the following identifies the RCP seal problem, including the required actions in accordance with 1-AP-33.1, Reactor Coolant Pump Seal Failure?

A. RCP #1 seal;
monitor RCP bearing temperatures and initiate a plant shutdown to Hot Standby.

B. RCP #2 seal;
trip the reactor, trip the RCP, and isolate seal leakoff within 5 minutes.

C. RCP #1 seal;
trip the reactor, trip the RCP, and isolate seal leakoff within 5 minutes.

D. RCP #2 seal;
monitor RCP bearing temperatures and initiate a plant shutdown to Hot Standby.

17.

The Unit is currently at 100% and stable. Control group heaters are operating properly and one additional set of PRZR backup heaters are locked on.

Which ONE of the following malfunctions can occur WITHOUT affecting PRZR heater status regardless of the position of the Pressurizer Level Control selector switch?

A. PRZR level Channel 1-RC-LT-460 failing LOW.

B. PRZR level Channel 1-RC-LT-459 failing HIGH.

C. PRZR level Channel 1-RC-LT-459 failing LOW.

D. PRZR level Channel 1-RC-LT-460 failing HIGH.

18.

Given the following:

- A LOCA has occurred on Unit 1.
- 1A Charging Pump is tripped.
- 1B Charging Pump is running.
- BOTH LHSI Pumps are tripped.
- RCPs are running.
- RCS pressure is 1600 psig and lowering.
- Containment pressure peaked at 21 psia and is now slowly trending down.
- Core Exit T/Cs are 545 degrees F.

Which ONE of the following identifies the requirement for operation of RCPs in accordance with 1-E-0, Reactor Trip or Safety Injection, including the reason?

A. Leave RCPs running because forced circulation provides sufficient core cooling.

B. Stop RCPs because continued operation will result in damage to the RCPs due to loss of cooling water.

C. Stop RCPs because an inadequate core cooling condition could develop if RCPs were tripped or lost later in the event.

D. Leave RCPs running because ECCS flow is inadequate to ensure adequate core cooling.

19.

Given the following:

- Unit 1 is at 100% power.
- The Mechanical Chiller has tripped and cannot be restarted.
- The crew enters 1-AP-35, Loss of Containment Air Recirculation Cooling.

Which ONE of the following identifies the Containment temperature that requires entering the action statement for TS 3.6.5, Containment Air Temperature, and also identifies the required actions to be taken for these plant conditions in accordance with 1-AP-35?

A. 115 degrees F; ensure Containment Air Recirc Fans are running with backdraft dampers closed.

B. 105 degrees F; ensure steam chiller running or align Service Water to Containment Air Recirc Fans.

C. 105 degrees F; ensure Containment Air Recirc Fans are running with backdraft dampers closed.

D. 115 degrees F; ensure steam chiller running or align Service Water to Containment Air Recirc Fans.

20.

Given the following:

- Unit 1 is at 100% power following a refueling outage.
- The crew has isolated a Letdown line leak in accordance with 1-AP-16, Increasing Primary Plant Leakage.
- The crew is preparing to place Excess Letdown in service.
- Excess Letdown will be aligned to the VCT.

Which ONE of the following identifies 1) an Excess Letdown Lineup restriction and 2) the reason why reactor power must be monitored when placing excess letdown in service in accordance with 1-OP-8.5, Operation of Excess Letdown?

A. Flow through ONLY one loop drain to prevent the possibility of bypassing SI flow to the 2 intact loops in a design basis accident;
a dilution may occur due to lower boron concentrations in the Excess Letdown piping.

B. Excess Letdown Pressure must NOT exceed 75 psig to prevent overpressurizing the VCT;
a dilution may occur due to lower boron concentrations in the Excess Letdown piping.

C. Excess Letdown Pressure must NOT exceed 75 psig to prevent overpressurizing the VCT;
a boration may occur due to higher boron concentrations in the Excess Letdown piping.

D. Flow through ONLY one loop drain to prevent the possibility of bypassing SI flow to the 2 intact loops in a design basis accident;
a boration may occur due to higher boron concentrations in the Excess Letdown piping.

21.

Both Units are at 100%.

- A fault on the Unit 2B station service bus results in a Main Generator Lockout and Reactor Trip.
- All Unit 2 Station Service Busses are deenergized due to the feeder breaker to 2B Station Service bus failing to open on the fault.

Which ONE of the following describes the status of Containment cooling to the Units?

A. Containment Air Recirc Fans remain running on BOTH Units; Chilled water flow to Containment Air Recirc Fans is lost on Unit 2 ONLY.

B. Containment Air Recirc Fans remain running on BOTH Units; Chilled water flow to Containment Air Recirc Fans is lost on BOTH Units.

C. Containment Air Recirc Fans trip on Unit 2; Chilled water flow to Containment Air Recirc Fans is lost on Unit 2 ONLY.

D. Containment Air Recirc Fans trip on Unit 2; Chilled water flow to Containment Air Recirc Fans is lost on BOTH Units.

22.

Given the following:

- Unit 1 has just entered Mode 4 with cooldown to Mode 5 in progress.
- RHR Pump 1A is in service.

The OATC notes the following:

- RHR Pump 1A motor amps indicate 10 and stable.
- 1-RH-FCV-1605 in automatic indicates 100% demand.

Which ONE of the following identifies the status of the 1-RH-FCV-1605, RHR Heat EXchanger Bypass Valve AND predicts the trend on Core Exit TCs?

A. 1-RH-FCV-1605 operating as designed;
Core Exit TCs stable.

B. 1-RH-FCV-1605 failed;
Core Exit TCs lowering.

C. 1-RH-FCV-1605 failed;
Core Exit TCs increasing.

D. 1-RH-FCV-1605 operating as designed;
Core Exit TCs increasing.

23.

Given the following:

- A reactor trip and safety injection has occurred.
- RCS pressure is 1000 psig and stable.
- Containment pressure is 23 psia and rising slowly.
- The crew is performing 1-E-0, Reactor Trip or Safety Injection.

Which ONE of the following describes the appropriate operator action and the SEQUENCE of the action required?

A. CDA is not required, however Quench Spray is required; start Quench Spray Pumps and then open Quench Spray discharge valves.

B. CDA is required; manually actuate CDA, stop RCPs, verify Quench Spray running, and verify Containment Isolation Phase B.

C. CDA is not required, however Quench Spray is required; open Quench Spray Discharge Valves and then start Quench Spray Pumps.

D. CDA is required; manually actuate CDA, stop CC pumps, verify Quench Spray running, verify Containment Isolation Phase B, and stop RCPs.

24.

Given the following:

- The unit is operating at 100% power.
- CC Surge Tank level indication on 1-CC-LI-101 is 50% and lowering.

Which ONE (1) of the following is a possible source of the leak and the source of water for maintaining CC System inventory?

A. Non-Regenerative Heat Exchanger; Condensate System

B. Non-Regenerative Heat Exchanger; PG water

C. 1A CC Heat Exchanger; Condensate System

D. 1A CC Heat Exchanger; PG water

25.

Given the following on Unit 1:

- Reactor Trip due to a LOCA.
- Safety Injection was actuated 11 minutes ago.
- CDA was automatically actuated 7 minutes ago.
- RCS pressure is 1125 psig.
- RWST level is 72% and lowering.

Which ONE of the following describes the operational status of Inside Recirculation Spray Pump 1-RS-P-1B?

A. NOT running; power is available directly from 4160 volt bus 1J.

B. Running; power is supplied directly from 480 volt bus 1J1.

C. Running, power is supplied directly from 4160 volt bus 1J.

D. NOT running; power is available directly from 480 volt bus 1J1.

26.

Given the following:

- Unit 1 is operating at 100% power.
- An instrument failure causes PORV 1-RC-PCV-1455C to lift.
- RCS Pressure is recovering at a much slower rate than expected.
- The operator closes the PORV Block Valve, 1-RC-MOV-1536, and pressure is now 2100 psig and increasing as expected.
- All other equipment appears to be operating normally.

Which ONE (1) of the following describes the action(s) required within ONE hour in accordance with Technical Specifications?

A. Maintain closed and maintain power to 1-RC-MOV-1536.

B. Restore RCS pressure to within limits of the COLR.

C. Verify P-11 interlock is in required state for existing unit condition..

D. Maintain closed and remove power from 1-RC-MOV-1536.

27.

Given the following:

- Unit 1 was initially at 100%.
- Unit 1 experienced a large break LOCA
- The crew placed 1-HC-HC-1, Hydrogen Recombiner in service on Unit 1 Containment.
- The Recombiner tripped within 5 minutes and could not be restarted.
- Hydrogen concentration is now 3%.

Given these plant conditions which ONE of the following identifies the required operator response in accordance with 1-E-1, Loss of Reactor or Secondary Coolant?

A. Place 2-HC-HC-1, Hydrogen Recombiner, in service on Unit 1 Containment.

B. Place 1-HC-F-1, Containment Atmosphere Purge Blower, in service on Unit 1 Containment.

C. Place 2-HC-F-1, Containment Atmosphere Purge Blower, in service on Unit 1 Containment.

D. Vent Unit-1 containment through the Auxiliary Building Iodine Filters.

28.

During an ATWS at 100% Reactor Power, EOL conditions, which ONE of the following actions will insert the MOST negative reactivity within the FIRST 30 seconds of the ATWS?

A. Initiation of Emergency Boration

B. Manual Turbine Trip

C. Automatic Control Rod Insertion

D. Manual Control Rod Insertion

29.

Given the following:

- Both units are in Mode 5.
- Containment Purge is in progress on each unit in preparation for Containment entry. with both purge supply fans running.
- Unit 1 Manipulator Crane Area Radiation Monitor RM-162 indication is rising.
- Unit 1 Containment Particulate and Gaseous Radiation Monitors, RM-159 and 160 are in alarm.
- Unit 2 containment conditions are normal.

Which ONE of the following predicts the final status of Containment Purge after ALL automatic actuations have taken place?

A. Purge Supply Fans 1-HV-F-4A and 1-HV-F-4B NOT running;
Containment Purge Supply isolation valves closed on BOTH units.

B. Purge Supply Fans 1-HV-F-4A and 1-HV-F-4B both running;
Unit 1 Containment Purge Supply isolation valves closed;
Unit 2 Containment Purge Supply isolation valves open.

C. Purge Supply Fans 1-HV-F-4A and 1-HV-F-4B NOT running;
Unit 1 Containment Purge Supply isolation valves closed;
Unit 2 Containment Purge Supply isolation valves open.

D. Purge Supply Fans 1-HV-F-4A and 1-HV-F-4B both running;
Containment Purge Supply isolation valves closed on BOTH units.

30.

Given the following conditions:

- A reactor startup is in progress and operators have just completed a rod pull.
- Both Intermediate Range channels indicate approximately 3 E -11 amps and trending up.
- Source Range Channel N-31 indicates $1X10^3$ CPS and is trending down slowly.
- Source Range Channel N-32 indicates approximately $6X10^3$ CPS and trending up slowly.

Which ONE of the following describes the required operator response in accordance with 1-AP-4.1, Malfunction of Source Range Nuclear Instrumentation, and the reason for the response?

A. Suspend the reactor startup; due to insufficient overlap between Source Range and Intermediate Range channels.

B. Continue the reactor startup; the operable Source Range channel is adequate to provide protection against a boron dilution event.

C. Suspend the reactor startup; with only one Source Range channel operable, there is inadequate protection against an uncontrolled rod withdrawal.

D. Continue the reactor startup; the operable Source Range channel is adequate to provide protection against an uncontrolled rod withdrawal.

31.

- Operators are performing a blended make-up to the Spent Fuel Pool (SFP) following completion of cask loading operations.
- A calibration error results in 1-CH-FT-1114, PG Water to blender flow transmitter indicating less than the actual flowrate.

Which ONE of the following predicts the effect on boron concentration of the blended flow based on these plant conditions, and identifies the Technical Specification minimum required boron concentration for the SFP?

A. Boron concentration of the blended flow will be greater than the calculated value; 2600 ppm.

B. Boron concentration of the blended flow will be less than the calculated value; 2500 ppm.

C. Boron concentration of the blended flow will be greater than the calculated value; 2500 ppm.

D. Boron concentration of the blended flow will be less than the calculated value; 2600 ppm.

32.

Given the following:

- Unit 1 is in Mode 6 with Core offload in progress.
- A fuel assembly becomes visibly damaged when removed from the core.
- Containment radiation is rising slowly.
- The assembly is returned to its location.
- Containment evacuation has been initiated.

Which ONE of the following identifies 1) the expected indications and 2) the crew's response in accordance with 0-AP-5.2, MGP Radiation Monitoring System?

A. Vent Stack 'B' Radiation Monitor indication increases;
Verify Containment Purge Exhaust automatically isolates when Vent Stack 'B' Radiation Monitor exceeds alarm setpoint.

B. Vent Stack 'A' Radiation Monitor indication increases;
Verify Containment Purge Exhaust automatically isolates when Vent Stack 'A' Radiation Monitor exceeds alarm setpoint.

C. Vent Stack 'A' Radiation Monitor indication increases;
Manually divert Containment Purge Exhaust through the Auxiliary Building Iodine Filters

D. Vent Stack 'B' Radiation Monitor indication increases;
Manually divert Containment Purge Exhaust through the Auxiliary Building Iodine Filters.

33.

Which ONE of the following describes the reason for equalizing Main Steam pressure when opening a Main Steam NRV that has been closed?

A. Prevent damage to valve internals due to excessive DP when opening the NRV.

B. Prevent excessive swell of SG volume.

C. Prevent themal overload of breaker for NRV due to excessive DP when opening the NRV.

D. Prevent inadvertent Hi Steam Line Differential Pressure SI.

34.

Given the following:

- Unit 1 is at 100% power.
- Rod Control is in MANUAL.
- All other controls are in AUTO.
- A Turbine control valve failure results in a load rejection.
- Tavg - Tref deviation indicates 11 degrees F.
- 1M-D4, STEAM DUMP ARMED, is illuminated.

Which ONE of the following describes Steam Dump response?

A. Two banks of steam dumps are modulating open;
Two banks of steam dumps are closed.

B. One bank of steam dumps is tripped open;
One bank of steam dumps is modulating open.

C. Four banks of steam dumps are tripped open.

D. Two banks of steam dumps are tripped open;
One bank of steam dumps is modulating open.

35.

Given the following:

- Reactor power is 75%.
- 1B MFW Pump is out of service for pump coupling repairs.
- The following alarms are received:
  - 1F-A4, MAIN FD PPS DISCH HDR LO PRESS
  - 1F-A5, MAIN FD PP 1A-1B-1C AUTO TRIP
  - 1F-F1/F2/F3, SG 1A/1B/1C LEVEL ERROR
  - 1F-D1/D2/D3, STM GEN 1A/1B/1C FW<STM FLOW CH III-IV
- The BOP determines that 1C MFW Pump is tripped.
- The crew enters 1-AP-31, Loss of Feedwater.

Which ONE of the following describes the action required, and reason for the action?

A. Reduce load; prevent operating MFW pump motor windings from overheating due to excessive current.

B. Trip the reactor; prevents damage to operating Main Feedwater Pump due to pump runout flow and cavitation.

C. Trip the reactor; prevents a challenge to the Reactor Protection System from loss of secondary heat sink.

D. Reduce load; reduces steam flow to within the capacity of the operating MFW pump.

36.

Initial Conditions:

- A Steam Generator Tube Leak is occurring on Unit 1.
- The crew is entering 1-AP-24, Steam Generator Tube Leak.
- Condenser Air Ejector Radiation Monitor 1-SV-RM-121 is in Hi-Hi alarm.

Current conditions:

- Reactor Trip.
- Safety Injection is actuated.
- The crew is performing actions of 1-E-0, Reactor Trip or Safety Injection.

Which ONE of the following describes the alignment of the Condenser Air Ejector steam supply and exhaust for the current conditions?

A. Exhaust isolated on Phase A isolation; steam supply to air ejectors isolated on Phase A isolation.

B. Exhaust diverted to Containment on Phase A isolation; steam supply to air ejectors isolated on Phase A isolation.

C. Exhaust diverted to Containment on HI-HI radiation; steam supply to air ejectors isolated on HI-HI radiation.

D. Exhaust isolated on HI-HI radiation; steam supply to air ejectors isolated on HI-HI radiation.

37.

Given the following:

- A loss of all AC Power has occurred.
- The crew is performing actions of 1-ECA-0.0, Loss of All AC Power.
- 1H EDG has failed and CANNOT be restarted.
- The crew is performing 1-ECA-0.0, Attachment 4, Attempting to restore power to 1H (1J) Emergency Bus.
- Attempts to start EDG 1J are in progress.
- RCP Seal Water Outlet temperature is 200°F and rising at 2°F per minute.

Which ONE of the following describes the action required in accordance with ECA-0.0?

A. Place 1J EDG in MANUAL-LOCAL, press EMER GEN Alarm & Shutdown RESET Button, and verify Shutdown Relay Status Light is lit. After one minute, place 1J EDG in MANUAL - REMOTE and determine if the EDG starts.

B. Place Charging Pumps in PTL prior to attempting to start 1J EDG in MANUAL - LOCAL.

C. Perform Attachment 3, RCP seal isolation, prior to attempting to start 1J EDG in MANUAL- LOCAL.

D. Place 1J EDG in MANUAL-REMOTE, press EMER GEN Alarm & Shutdown RESET Button, and verify Shutdown Relay Status Light is lit. After one minute, place 1J EDG in MANUAL - LOCAL and determine if the EDG starts.

38.

Given the following:

- AFW pump 1-FW-P-2 is tagged out to replace the overspeed trip tappet.
- Unit 1 reactor trip from 100% power.
- Severe weather causes a Loss of Off-Site power.
- An electrical fault on 1H Bus has caused a bus lockout.

Which ONE of the following describes the response of the AFW System during this event?

A. 1-FW-P-3B starts as soon as the 4160 Volt emergency bus is energized;
AFW will be supplied to B SG.

B. 1-FW-P-3B starts approximately 20 seconds after the 4160 Volt emergency bus is energized;
AFW will be supplied to C SG.

C. 1-FW-P-3B starts approximately 20 seconds after the 4160 Volt emergency bus is energized;
AFW will be supplied to B SG.

D. 1-FW-P-3B starts as soon as the 4160 Volt emergency bus is energized;
AFW will be supplied to C SG.

39.

The Unit is in MODE 3 preparing to startup.

Loss of vital bus 1-I occurred and power has not yet been restored.
Station Emergency Manager just declared a Notification of Unusual Event.

Which ONE of the following describes the correct response and required notifications?

A. Monitor RCP temperatures due to loss of CC flow;
Notification of State and Local authorities is required within the next 15 minutes.

B. Monitor RCP temperatures due to loss of CC flow;
Notification of State and Local authorities is required within the next 60 minutes.

C. Monitor SG PORVs due to loss of condenser steam dumps;
Notification of State and Local authorities is required within the next 15 minutes.

D. Monitor SG PORVs due to loss of condenser steam dumps;
Notification of State and Local authorities is required within the next 60 minutes.

40.

Given the following:

- Unit 1 is at 100% power.
- All DC Bus voltages are approximately 131 VDC.
- The following alarm is received in the control room:
  - 1H-B3, BATTERY CHGR 1-III TROUBLE
- Battery Charger 1-III DC Output breaker has tripped and CANNOT be reset.
- DC Bus 1-III voltage is 118 volts and lowering.

Which ONE of the following describes the action that will be taken to restore DC Bus 1-III in accordance with 1-OP-26.4.3, Main Station Swing Battery Chargers 1C-I and 1C-II Operation?

A. Place Swing Battery Charger 1C-I in service with the NORMAL/EQUALIZE switch in EQUALIZE.

B. Place Swing Battery Charger 1C-II in service with the NORMAL/EQUALIZE switch in NORMAL.

C. Place Swing Battery Charger 1C-II in service with the NORMAL/EQUALIZE switch in EQUALIZE.

D. Place Swing Battery Charger 1C-I in service with the NORMAL/EQUALIZE switch in NORMAL.

41.

Given the following:

- The plant is at 25% power.
- A Condensate header rupture occurs, and the following conditions are present:
  - All Main Feedwater pumps tripped.
  - 10 seconds later SG levels are 30% narrow range and lowering.
  - Reactor power remains at 25%.

Which ONE of the following describes the operation of the Reactor Protection System and the Auxiliary Feedwater (AFW) Pumps for this condition?

A. A reactor trip setpoint has NOT been exceeded; AFW Pumps are NOT running.

B. A reactor trip setpoint has been exceeded; AFW Pumps are running.

C. A reactor trip setpoint has NOT been exceeded; AFW Pumps are running.

D. A reactor trip setpoint has been exceeded; AFW Pumps are NOT running.

42.

Given the following:

- Release of Waste Gas Decay Tank 1B is in progress.
- 1-GW-RI-178-1, Process Vent Normal Range Monitor, indication is rising.
- 1-GW-RI-178-2, Process Vent High Range Monitor, indication is just coming on scale.

The following alarms are received:

- 2B-A5, PROCESS VENT VNT STACK A&B LOW RAD MON ALERT/RAD
- 2B-B5, PROCESS VENT VNT STACK A&B HI HI RADIATION

Which ONE of the following describes the status of the Waste Gas Decay Tank release lineup?

A. 1-GW-FCV-101 AND 1-GW-PCV-117 closed when 1-GW-RI-178-1 HI radiation alarm was received.

B. 1-GW-FCV-101 remained open UNTIL 1-GW-RI-178-2 HI radiation alarm was received. 1-GW-PCV-117 does NOT receive a close signal.

C. 1-GW-FCV-101 closed when 1-GW-RI-178-1 HI radiation alarm was received. 1-GW-PCV-117 does NOT receive a close signal.

D. 1-GW-FCV-101 AND 1-GW-PCV-117 remained open until 1-GW-RI-178-2 HI radiation alarm was received.

43.

Given the following:

- A LOCA occurred on Unit 1 thirty minutes ago.
- The crew is performing 1-E-1, Loss of Reactor or Secondary Coolant.
- 1-RM-RMS-165 and 1-RM-RMS-166, Containment High Range Radiation Monitors, both have amber and red lights illuminated in the control room.

Which ONE of the following describes the additional indications observed if an actual high radiation condition exists?

A. SAFE/RESET green light on drawers LIT;
UNIT 1 CONT HI RANGE RADIATION TROUBLE annunciator received on Unit 2.

B. SAFE/RESET green light on drawers LIT;
UNIT 1 CONT HI RANGE RADIATION TROUBLE annunciator received on Unit 1.

C. SAFE/RESET green light on drawers NOT LIT;
UNIT 1 CONT HI RANGE RADIATION TROUBLE annunciator received on Unit 2.

D. SAFE/RESET green light on drawers NOT LIT;
UNIT 1 CONT HI RANGE RADIATION TROUBLE annunciator received on Unit 1.

44.

Which ONE of the following states the power supplies to AFW Discharge MOVs, 1-FW-MOV-100A, B, C?

A. MCC 1J1-2N

B. 1A Semi-Vital Bus

C. 1B Semi-Vital Bus

D. MCC 1H1-2N

45.

In accordance with the applicable Fire Contingency Action (FCA) procedure, which ONE of the following describes actions required to maintain power supply to the **Unit-1** remote monitoring excore neutron flux detector (channel one) following a fire in the given location?

A. Following a fire in the Main Control Room, supplied from Unit-2 vital bus inverter 2-1, which will be disconnected from vital bus 2-I.

B. Following a fire in Unit-1 emergency switchgear, supplied from Unit-2 vital bus inverter 2-1, which will be disconnected from vital bus 2-I.

C. Following a fire in the Main Control Room, supplied from Unit-1 vital bus inverter 1-1, which will be disconnected from vital bus 1-I.

D. Following a fire in Unit-1 emergency switchgear, supplied from Unit-1 vital bus inverter 1-1, which will be disconnected from vital bus 1-I.

46.

Given the following:

- Both Units are at 100% power.
- A Fire in RSST 'A' causes an overcurrent lockout on Transfer Bus D.

Which ONE of the following describes the battery chargers that are temporarily deenergized?

A. 1-III and 1-IV

B. 2-I and 2-II

C. 2-III and 2-IV

D. 1-I and 1-II

47.

If a loss of Battery Charger 1-I were to occur, what would be the effect on the operation of its associated inverter and the vital DC bus?

A. NO static switch automatic transfer; vital DC bus voltage initially decreases by several volts and then continues to decrease at the same rate over time.

B. Static switch automatic transfer occurs; vital DC bus voltage initially decreases by several volts and then continues to decrease at a faster rate over time.

C. Static switch automatic transfer occurs; vital DC bus voltage initially decreases by several volts and then continues to decrease at the same rate over time.

D. NO static switch automatic transfer; vital DC bus voltage initially decreases by several volts and then continues to decrease at a faster rate over time.

48.

Given the following:

- A lightning strike has occurred resulting in a loss of the North Anna Switchyard.
- The 1J EDG Battery and Battery Charger are BOTH lost.
- 125 VDC Bus 1-I is lost.
- A spurious SI occurs.
- The crew has entered 1-E-0, Reactor Trip or Safety Injection, and manually actuated SI.

Which ONE of the following describes the reason that no J Train ESF equipment is running?

A. 1J EDG did NOT start due to loss of the DC fuel oil pump.

B. 1J EDG started, but the EDG output breaker did NOT close due to loss of DC field flash capability.

C. 1J EDG started and the EDG output breaker is closed, but no control power is available to 1J Bus load breakers.

D. 1J EDG did NOT start due to loss of power to both start circuits.

49.

Unit 1 is operating at 100% power.

- The following alarm is received:
  - 1F-F8, SAND FLTR IA SUPPLY LO PRESS.
- The OATC notes instrument air pressure is 85 psig and rapidly decreasing.
- The crew initiates 1-AP-28, LOSS OF INSTRUMENT AIR.
- Instrument Air pressure continues to lower.
- The SRO directs tripping the reactor and closing Main Steam Trip Valves.

Which ONE of the following identifies the reason for manually closing the Main Steam Trip Valves?

A. To avoid a High Steam Line Delta P safety injection due to closure of a single main steam trip valve.

B. To avoid a High Steam Flow safety injection due to closure of a single main steam trip valve.

C. To avoid a Lo-Lo SG level reactor trip due to closure of all main steam trip valves.

D. To avoid a High PZR Pressure reactor trip due to closure of all main steam trip valves.

50.

Given the following:

- The crew is preparing to release WGDT 1B.
- The maximum allowed flowrate per the release permit is 300 SCFM.

Which ONE of the following describes the **preferred** method for controlling the WGDT release flow rate in accordance with 0-OP-23.2, WGDT and Waste Gas Diaphragm Compressors?

A. 1-GW-FCV-101, WGDT to Process Vent, should be placed in AUTOMATIC and adjusted to control flow rate at less than 3 SCFM.

B. 1-GW-FCV-101, WGDT to Process Vent, should be placed in MANUAL and adjusted to control flow rate at less than 3 SCFM.

C. 1-GW-FCV-101, WGDT to Process Vent, should be placed in AUTOMATIC and adjusted to control flow rate at 290 $\pm$ 5 SCFM.

D. 1-GW-FCV-101, WGDT to Process Vent, should be placed in MANUAL and adjusted to control flow rate at 290 $\pm$ 5 SCFM.

51.

Given the following:

- Each Unit has a containment vacuum pump running.
- 1-GW-RI-178-3, Process Vent particulate radiation Monitor indication spiked, causing an ALERT and HIGH alarm to lock in.

Which ONE of the following describes the plant response?

A. ONLY the unit 1 vacuum pump discharge valve will automatically close.

B. ONLY the unit 1 vacuum pump will trip.

C. Both units' vacuum pumps will trip; discharge valves remain open.

D. Both units' vacuum pump discharge valves will automatically close.

52.

Initial Conditions:

- Operations noted a step increase on 1-CH-RM-128, Unit 1 Reactor Coolant Letdown Monitor.
- Health Physics identified a hot spot in the letdown piping four (4) feet from 1-CH-RM-128 detector.
- General area survey taken at 1-CH-RM-128 detector was 60 mRem/hour prior to flushing the hot spot.
- No Radiation Monitors in alarm.

Current Conditions:

- Operations flushed the hot spot and relocated it to two (2) feet from 1-CH-RM-128 detector.
- 1-CH-RM-128 Hi alarm –LIT.
- Annunciator 1K-D2, Rad Monitor System Hi Rad Level – LIT solid.

Based on current conditions, which ONE of the following identifies the expected general area survey at 1-CH-RM-128 detector, and also predicts the response of Annunciator 1K-D2, if a high alarm subsequently occurs on 1-SV-RM-121, Condenser Air Ejector Radiation Monitor?

A. 120 mRem/hour;
Annunciator 1K-D2 will remain LIT solid.

B. 240 mRem/hour;
Annunciator 1K-D2 will remain LIT solid.

C. 120 mRem/hour;
Annunciator 1K-D2 will blink and horn will sound until acknowledged.

D. 240 mRem/hour;
Annunciator 1K-D2 will blink and horn will sound until acknowledged.

53.

Given the following:

- Unit 1 is at 100% power.
- Three BC fans are running in SLOW speed and the fourth is in standby.
- Computer alarms are received on several components cooled by the Bearing Cooling System.
- Subsequently, the following alarms are received 90 seconds apart:
  - 1A-F4, BASIN TEMP HI/LOW
  - 1T-C1, HYDROGEN TEMP OR CORE MONITOR
- The crew enters 1-AP-19, Loss of Bearing Cooling Water, and verifies a Bearing Cooling Pump is running.

Which ONE of the following describes the initial action required in accordance with 1-AP-19?

A. Bypass 1-BC-TCV-104, Generator Hydrogen Cooler TCV, to lower hydrogen temperature.

B. Place Bearing Cooling in Lake - to - Lake Mode and verify the operation of the Circ Water System to ensure cooling requirements are met.

C. Start available Bearing Cooling Tower Fans or shift fans to high speed; verify Bearing Cooling temperatures are decreasing.

D. Verify Generator Hydrogen temperature is above the alarm setpoint and initiate a plant load reduction until the alarm is clear.

54.

Given the following:

- Unit 1 is at 40% power.
- The B SG has developed a 60 gpd tube leak.
- Operators are preparing to shutdown the Unit due to fuel failure resulting in RCS activity increasing at a steady rate.

Based on these plant conditions, which ONE of the following identifies how 1-SV-RM-121, Condenser Air Ejector Radiation Monitor, and 1-MS-RI-191, "B" SG N-16 Radiation Monitor, will respond as RCS activity increases?

A. 1-SV-RM-121 indication will not change;
1-MS-RI-191 indication will not change.

B. 1-SV-RM-121 indication will not change;
1-MS-RI-191 indication will increase.

C. 1-SV-RM-121 indication will increase;
1-MS-RI-191 indication will not change.

D. 1-SV-RM-121 indication will increase;
1-MS-RI-191 indication will increase.

55.

Given the following:

- Both units are at 100% power.
- Due to voltage and frequency fluctuations on the grid, the crew is performing actions contained in 0-AP-8, Response to Grid Instability.
- The crew has verified equipment operability.

Which ONE of the following describes the operation of the Main Generator Voltage Regulators per 0-AP-8, and the condition that requires the offsite power source to be declared inoperable?

A. Place voltage regulators in MANUAL; grid voltage decreases to 504 kV

B. Maintain voltage regulators in AUTO; grid voltage increases to 536 kV

C. Place voltage regulators in MANUAL; grid voltage increases to 536 kV

D. Maintain voltage regulators in AUTO; grid voltage decreases to 504 kV

56.

Which ONE (1) of the following describes the operation of Instrument Air Compressor "1-IA-C-1" when it is placed in AUTO?

A. Compressor will start and run continuously for an indefinite period of time. Unloader valves will CLOSE when pressure drops to 103 psig. Unloader valves will OPEN when pressure rises to 109 psig.

B. Compressor will start and run continuously for an indefinite period of time. Unloader valves will CLOSE when pressure drops to 98 psig. Unloader valves will OPEN when pressure rises to 106 psig.

C. Compressor will start and load when pressure drops to 98 psig. Compressor will unload when pressure rises to 106 psig.

D. Compressor will start and load when pressure drops to 103 psig. Compressor will unload and shut down when pressure increases to 109 psig.

57.

Instrument Air Compressor 1-IA-C-1 has been running loaded for the past 15 minutes.

Which ONE of the following choices completes the following sentence?

Either a _____ OR a _____ will result in a trip of the Air Compressor.

A. Low Oil Pressure;
Cooling System Fault caused by low cooling system DP

B. High Discharge Pressure;
Cooling System Fault caused by high pressure on surge line

C. High Discharge Pressure;
Cooling System Fault caused by low cooling system DP

D. Low Oil Pressure;
Cooling System Fault caused by high pressure on surge line

58.

Given the following:

- A loss of Instrument Air is occurring on Unit 1.
- The immediate actions of 1-AP-28, Loss of Instrument Air, are complete.
- Instrument Air pressure is 90 psig and dropping slowly.

Which ONE of the following describes the compressor status and the action to be taken based on the system pressure in accordance with 1-AP-28?

A. All Service Air Compressors running and loaded; all Instrument Air Compressors running unloaded;
Isolate Instrument Air to Containment by closing 1-IA-TV-102A or 1-IA-TV-102B, Containment Instrument Air Trip Valves.

B. All Service Air Compressors running and loaded; all Instrument Air Compressors running unloaded;
Verify Instrument Air supplied to Containment by verifying open 1-IA-TV-102A and 1-IA-TV-102B, Containment Instrument Air Trip Valves.

C. All Instrument and Service Air Compressors running and loaded;
Isolate Instrument Air to Containment by closing 1-IA-TV-102A or 1-IA-TV-102B, Containment Instrument Air Trip Valves.

D. All Instrument and Service Air Compressors running and loaded;
Verify Instrument Air supplied to Containment by verifying open 1-IA-TV-102A and 1-IA-TV-102B, Containment Instrument Air Trip Valves.

59.

Given the following:

- A LOCA has occurred on Unit 1.
- The following conditions exist:
  - RCS pressure is 1700 psig.
  - Containment pressure has peaked at 21 psia and is now slowly decreasing.
- The crew is performing 1-E-0, Reactor Trip or Safety Injection.
- The RO is performing Attachment 5, Verification of Phase A Isolation.
- The following valves are identified as OPEN:
  - 1-CH-MOV-1115B, RWST To Charging Pumps Isolation
  - 1-CH-MOV-1289B, Normal Charging Line Isolation
  - 1-IA-TV-102A, Containment Instrument Air Trip Valve
  - 1-SW-MOV-108A, Service Water to CC Heat Exchanger Isolation

For the current plant conditions, which ONE of the following valves must be repositioned to place it in the required accident configuration?

A. 1-SW-MOV-108A

B. 1-CH-MOV-1115B

C. 1-IA-TV-102A

D. 1-CH-MOV-1289B

60.

Given the following:

- A LOCA has occurred on Unit 1.
- The crew is performing 1-ES-1.2, Post LOCA Cooldown and Depressurization.
- During the SI flow reduction sequence, the following conditions exist:
  - All RCPs are stopped.
  - Two Charging Pumps are running.
  - RCS pressure is 1100 psig and stable.
  - RCS Subcooling based on Core Exit TCs is 55°F
  - Pressurizer level is 44%.
  - Containment pressure is 20.9 psia.

Which ONE of the following describes the response to these conditions in accordance with 1-ES-1.2, and the reason for this response?

A. Continue the RCS cooldown while stopping one Charging Pump;

   RCS subcooling is adequate to prevent loss of subcooling margin when one Charging Pump is stopped.

B. One Charging Pump may be stopped ONLY IF at least one Low Head SI pump is running;

   RCS subcooling is NOT adequate to prevent loss of subcooling margin when one Charging Pump is stopped.

C. Maintain PZR level stable or increasing while stopping one Charging Pump;

   RCS subcooling is adequate to prevent loss of subcooling margin when one Charging Pump is stopped.

D. Charging Pumps must remain running with flow aligned to the BIT;

   RCS subcooling is NOT adequate to prevent loss of subcooling margin when one Charging Pump is stopped.

61.

Initial Conditions:

- Unit 1 tripped from 100% power due to a loss of all feed flow.
- Multiple failures caused a loss of all AFW.

Current conditions:

- ALL SG Wide Range levels are 12% and slowly lowering.
- RCS Hot Leg Temperatures are 560°F and slowly lowering.
- Core Exit TCs are 565°F and slowly lowering.
- Local actions have restored the capability to feed from AFW.

Which ONE of the following describes the method for recovery of Heat Sink in accordance with 1-FR-H.1, Loss of Secondary Heat Sink, and includes the Basis for that method?

A. Feed only ONE SG at 100 gpm;
Minimum flow to ensure adequate heat sink.

B. Feed all three SGs at 340 gpm total flow;
Minimum flow to ensure adequate heat sink.

C. Feed all three SGs at 340 gpm total flow;
Ensure symetric cooling during Natural Circulation.

D. Feed only ONE SG at 100 gpm;
Limit thermal stresses to SG components.

62.

Given the following:

- A loss of off-site power due to a Tornado hitting the switchyard.
- The crew has stabilized the Unit using 1-ES-0.1, Reactor Trip Response.
- Operations Management has directed performance of a Natural Circulation Cooldown.

Which ONE of the following procedures will be used to perform the RCS Cooldown, and which ONE of the following is the MAXIMUM cooldown rate allowable in accordance with the EOP that will be used?

A. ES-0.2A, Natural Circulation Cooldown with CRDM Fans; 15 degrees F/Hr.

B. ES-0.2B, Natural Circulation Cooldown without CRDM Fans; 25 degrees F/Hr.

C. ES-0.2B, Natural Circulation Cooldown without CRDM Fans; 15 degrees F/Hr.

D. ES-0.2A, Natural Circulation Cooldown with CRDM Fans; 25 degrees F/Hr.

63.

Upon entry into 1-ECA-2.1, Uncontrolled Depressurization of All Steam Generators, the crew determines that RCS cooldown rate is 109°F/Hr.

Which ONE (1) of the following identifies the requirement for controlling AFW flow in accordance with 1-ECA-2.1?

A. Total flow is maintained >340 gpm until ANY SG narrow range level is >11%.

B. Total flow is maintained >340 gpm until ALL SG narrow range levels are >11%.

C. Flow is reduced to 100 gpm to each SG, and narrow range level in ALL SG's is controlled at less than 50%.

D. Flow is reduced to 100 gpm to each SG, and narrow range level in ALL SG's is controlled at greater than 11%.

64.

Given the following:

- A small-break LOCA occurred on Unit 1.
- The crew transitions to 1-E-1, Loss of Reactor or Secondary Coolant.

Which ONE of the following will FIRST cause an ORANGE condition on the Containment CSF Status Tree?

A. Recirc Spray sump level at 4 feet 10 inches.

B. Annunciator 1J-A6, RX CONT SUMP HI LEVEL, is LIT.

C. Containment circular sump level indication off-scale high.

D. Recirc Spray sump level at 11 feet 10 inches.

65.

A Small Break LOCA has occurred on Unit 1.

The following plant conditions exist:

- Complications in recovery have resulted in some core damage.
- Containment Pressure peaked at 22 psia and is slowly decreasing.
- The team has transitioned to 1-FR-Z.3, Response to High Containment Radiation Level.

Which ONE of the following describes a strategy provided by 1-FR-Z.3 to mitigate the condition?

A. Place Containment Atmosphere Filtration System in service.

B. Start Outside Recirc Spray pumps and injecting the CAT.

C. Start Inside Recirc Spray pumps and injecting the CAT.

D. Vent Containment via the Iodine Filter banks.

66.

In Emergency Operating Procedure 1-E-0, Reactor Trip or Safety Injection, steps designated with an asterisk (*) next to the step are _____ ; these steps apply from the time they are encountered until _____.

A. Continuous Action Steps;
transition from 1-E-0 is made

B. Decision Making Steps;
the EOP Network is exited

C. Decision Making Steps;
transition from 1-E-0 is made

D. Continuous Action Steps;
the EOP Network is exited

67.

In accordance with OP-AP-300, Reactivity Management, reactor power is required to be reduced below 100% PRIOR to performing which ONE of the following evolutions?

A. Reducing Steam Generator Blowdown Flow Rate

B. Performing a blended makeup to the RCS

C. Operating the Steam Driven Aux Feed Pump Turbine

D. Raising Letdown temperature

68. Given the following:

Unit 1 is shut down in preparation for Refueling in accordance with 1-OP-4.1, Controlling procedure for Refueling.

In accordance with 1-OP-4.1, which ONE of the following choices describes

(1) the method of filling the Refueling Cavity
and
(2) which evolution constitutes the FIRST Core Alteration?

A. (1) Gravity fill from RWST, then LHSI pump
(2) Lifting of the Reactor Vessel Upper Internals

B. (1) LHSI pump ONLY
(2) Lifting of the Reactor Vessel Upper Internals

C. (1) LHSI pump ONLY
(2) Control Rod Drive Shaft unlatching

D. (1) Gravity fill from RWST, then LHSI pump
(2) Control Rod Drive Shaft unlatching

69.

Given the following:

- An approach to criticality is in progress in accordance with 1-OP-1.5, Unit Startup from Mode 3 to Mode 2.
- Source Range count rate prior to the last rod withdrawal was 4,000 CPS.
- Source Range count rate is now 7,000 CPS and slowly increasing.
- Source Range startup rate is +0.3 DPM and stable.
- Two minutes have elapsed since the last rod withdrawal.
- Control Bank 'C' is at 110 steps.

Which ONE of the following describe the sequence of actions required by 1-OP-1.5?

A. Initiate Boration at greater than or equal to 10 gpm, then trip the reactor.

B. Allow Source Range count rate to stabilize, then continue rod withdrawal.

C. Insert Control Bank 'D' to 5 steps, then trip the reactor.

D. Initiate Boration at greater than or equal to 10 gpm, then insert Control Bank 'D' to 5 steps.

70.

Given the following:

- Unit 1 is at 45% power.
- Plant startup is in progress.
- No other evolutions are in progress

Which ONE of the following parameter values requires Technical Specification action within ONE (1) hour?

A. Containment air partial pressure 12.9 psia.

B. Quadrant Power Tilt Ratio 1.022.

C. RCS unidentified leakage is 1.20 gpm.

D. RWST temperature 38 degrees F.

71.

Which ONE of the following Periodic Tests is designated as an Infrequently Conducted or Complex Evolution?

A. Rod operability testing in accordance with 1-PT-17.1, Control Rod Operability.

B. Turbine overspeed trip test in accordance with 1-PT-34.5, Turbine-Generator Overspeed Trip Test.

C. Turbine valve freedom test in accordance with 1-PT-34.3, Turbine Valve Freedom Test.

D. Solid State Protection System testing in accordance with 1-PT-36.1A, Train A Reactor Protection and ESF Logic Actuation Test.

72.

Given the following:

- Unit 1 is defueled and the fuel assembly insert shuffle is in progress.
- Annunciator 1K-D3, RAD MONITOR SYSTEM FAILURE TEST, actuates.
- The new fuel storage area radiation monitor is noted to be pegged high and unresponsive to source check.
- The fuel pit bridge radiation monitor indication has not changed.
- Health Physics reports radiation levels in the fuel building have not changed.

Which ONE of the following describes the FIRST action that will be required in accordance with 0-AP-5.1, Common Unit Radiation Monitoring System?

A. Verify the fuel building ventilation exhaust is aligned to the charcoal filter.

B. Reset the new fuel storage area radiation monitor by pulling and reinserting fuses.

C. Place the fuel building radiation automatic interlock key switch in DISABLE within two minutes.

D. Place the fuel building radiation automatic interlock key switch in ENABLE within two minutes.

73.

Which ONE of the following identifies the 10 CFR 20 annual limit for TEDE and also identifies the EPIP 4.04 Emergency Exposure Limit for saving valuable equipment?

A. 5 rem;
25 rem

B. 3 rem;
10 rem

C. 5 rem;
10 rem

D. 3 rem;
25 rem

74.

Given the following:

- Both Units are at 100% power.
- The following alarm is received on Unit 2 Panel F:
  - UNIT #1 ANN SYS POWER SUPPLY FAILURE
- The crew enters 1-AP-6, Loss of Main Control Room Annunciators.

Which ONE of the following describes requirements in accordance with 1-AP-6 if the Unit 1 Annunciators are not immediately restored?

A. NOT required to station an additional operator to monitor the unit-1 PCS;
Log AFD every 3 hours.

B. Station an additional operator to monitor the unit-1 PCS;
Log AFD every hour.

C. NOT required to station an additional operator to monitor the unit-1 PCS;
Log AFD every hour.

D. Station an additional operator to monitor the unit-1 PCS;
Log AFD every 3 hours.

75.

Given the following:

- Unit 1 is in Mode 5.
- RCS Drain Down to Mid Loop is in progress in preparation for welding on a Hot Leg opening.
- RHR Pump 1A is in service.
- RHR Pump 1B is available.
- During the drain down, RHR amps and discharge pressure begin fluctuating erratically.
- RCS temperature has risen from 121 degrees F to 127 degrees F.
- The crew enters 1-AP-11, Loss of RHR, and stops the RCS drain down.

Which ONE (1) of the following describes the <u>next actions</u> that will be required in accordance with 1-AP-11?

A. Reduce RHR flow to minimum required to maintain RCS temperature and/or raise RCS level to ensure at least 10 inches above the Hot Leg centerline.

B. Reduce RHR flow to minimum required to maintain RCS temperature and maximize CC flow to inservice RHR heat exchangers.

C. Stop RHR Pump 1A and initiate Attachment 8, Reflux Boiling to control RCS temperature.

D. Stop RHR Pump 1A and immediately start RHR Pump 1B, then verify that RCS temperature stabilizes.

76.

Initial conditions:

- A spurious Turbine Runback occurred on Unit 1.
- Tave was 5.5 degrees F higher than Tref and rising.
- Control Bank D rods were inserting at the required rate.

Current conditions:

- Reactor power 58%.
- Steam Dumps closed.
- Rod Motion stopped.
- Tave and Tref are approximately equal and stable.
- Control Bank D Group Step counters are at 170 steps.
- All Control Bank D rods indicate approximately 170 steps, with the exception of Rod H-8, which is at 184 steps.

A blown fuse is the cause of the mispositioned rod.

Which ONE of the following idenifies (1) the rod speed of rod H-8 PRIOR to the blown fuse and (2) whether or not the H-8 control rod is operable?

A. 72 SPM ; H-8 is OPERABLE.

B. 64 SPM ; H-8 is INOPERABLE.

C. 72 SPM ; H-8 is INOPERABLE.

D. 64 SPM ; H-8 is OPERABLE.

77.

Given the following:

- Unit 1 is in Mode 6 with refueling cavity level at 289' 10".
- Upper internals have been removed.
- 1A RHR pump is in operation with 1B RHR pump in standby.
- An electrical fault on 1H bus causes a loss of the bus.

Which ONE of the following describes the action required, and the basis for the action in accordance with Technical Specifications?

A. Immediately initiate action to establish >/= 23 feet of water above the top of the reactor vessel flange;

   provides acceptable results in conjunction with actions to initiate containment closure to limit radioactive release to the environment.

B. Immediately suspend any RCS makeup from sources with a boron concentration less than that required by TS 3.9.1;

   ensures that there will be NO RCS makeup without adequate mixing.

C. Immediately initiate action to establish >/= 23 feet of water above the top of the reactor vessel flange;

   ability to remove decay heat and ensure mixing of borated RCS water is degraded.

D. Immediately suspend any RCS makeup from sources with a boron concentration less than that required by TS 3.9.1;

   ensures that if RCS boron concentration is reduced due to RCS makeup, acceptable margin for subcritical operation is maintained.

78.

Given the following:

- Unit 1 has been at 100% power for 12 months.
- The following alarms are received approximately 5 minutes apart:
  - 1J-D7, ACCUM 1A-1B-1C HI-LO LEVEL
  - 1J-D8, ACCUM 1A-1B-1C HI-LO PRESS
- SI Accumulator levels and pressures are as follows:

	Level	Pressure
1A	67%	655 psig
1B	72%	670 psig
1C	59%	610 psig

Given these levels and pressures which ONE of the following predicts the reason for the alarms AND identifies the status of accumulator operability in accordance with Technical Specifications?

A. Check valve leakage is occurring;
SI accumulators are all operable.

B. Vent valve leakage is occurring;
one SI accumulator is inoperable.

C. Vent valve leakage is occurring;
SI accumulators are all operable.

D. Check valve leakage is occurring;
one SI accumulator is inoperable.

79.

The following conditions exist:

- Unit 1 is at 100% power.
- 1-SI-P-1B, "B" Low Head Safety Injection Pump is tagged out for maintenance.
- The 1H Emergency Diesel Generator (EDG) is subsequently determined to be inoperable due to the discovery that non-qualified parts were used the last time maintenance was performed on the EDG.

Based on these plant conditions, which ONE of the following identifies the equipment that must be declared inoperable AND the required action in accordance with Technical Specifications?

A. Declare the 1H EDG and 1-SI-P-1A, "A" Low Head Safety Injection Pump inoperable;
Verify correct breaker alignment and indicated power availability for each required offsite circuit within 8 hours.

B. Declare the 1H EDG inoperable; 1-SI-P-1A, "A" Low Head Safety Injection Pump remains operable;
Verify correct breaker alignment and indicated power availability for each required offsite circuit within 1 hour.

C. Declare the 1H EDG and 1-SI-P-1A, "A" Low Head Safety Injection Pump inoperable;
Verify correct breaker alignment and indicated power availability for each required offsite circuit within 1 hour.

D. Declare ONLY the 1H EDG inoperable; 1-SI-P-1A, "A" Low Head Safety Injection Pump remains operable;
Verify correct breaker alignment and indicated power availability for each required offsite circuit within 8 hours.

80.

Given the following:

- Both Units were initially at 100% power with 1J EDG OOS.
- Operators began Unit 1 shutdown due to a steam leak inside Containment on the B SG.
- 1-RC-PT-1444 failed high causing the associated PORV, 1-RC-PCV-1455C to open.
- Attempts to close PORV 1-RC-PCV-1455C and the associated PORV Block Valve, 1-RC-MOV-1536 were unsuccessful and operators tripped the Unit.
- The following occurred immediately following the reactor trip:
  - B SG failed catastrophically inside Containment
  - Off-site power was lost
  - Low Head SI pump 1-SI-P-1A tripped on overcurrent during startup.
  - Power Supply estimates off-site power restoration in 1.5 to 2 hours.

Which ONE of the following describes the procedure the operators will transition to when leaving 1-E-0, Reactor Trip or Safety Injection, AND how power is required to be restored to 1J Emergency Bus?

A. 1-E-1, Loss of Reactor or Secondary Coolant;
restore power to 1J Emergency Bus when off-site power becomes available.

B. 1-E-1, Loss of Reactor or Secondary Coolant;
restore power to 1J Emergency Bus using the SBO diesel.

C. 1-E-2, Faulted Steam Generator Isolation;
restore power to 1J Emergency Bus when off-site power becomes available.

D. 1-E-2, Faulted Steam Generator Isolation;
restore power to 1J Emergency Bus using the SBO diesel.

81.

Unit 1 is at 100% power.

1K-G1, SFGDS PROT SYS TR A TROUBLE has been alarming intermittently.

Instrument Department has determined a 48VDC power supply in Train A is degrading and will most likely fail completely in the near future.

Which ONE of the following describes the correct response?

Reference Provided

A. Online replacement of the power supply is permitted;
following power supply replacement the Reactor Trip Bypass Breaker may be closed for up to 2 hours to perform 1-PT-36.1A, Train A Reactor Protection and ESF Logic Actuation Logic Test.

B. Online replacement of the power supply is NOT permitted;
be in Hot Standby within 30 hours.

C. Online replacement of the power supply is NOT permitted;
be in Hot Standby within 48 hours.

D. Online replacement of the power supply is permitted;
following power supply replacement the Reactor Trip Bypass Breaker may be closed for up to 4 hours to perform 1-PT-36.1A, Train A Reactor Protection and ESF Logic Actuation Logic Test.

82.

Given the following:

- A LOCA is in progress on Unit 1.
- All RCPs are stopped.
- RVLIS Full Range is 27%.
- Core Exit TCs are reading 1250 degrees F.
- ALL SG NR levels are OFF-SCALE low.
- NO source of SG feed has been established.
- NO source of ECCS has been established.
- The crew has attempted secondary depressurization in accordance with FR-C.1, Response to Inadequate Core Cooling, but the attempt was ineffective.

Given these plant conditions, which ONE of the following identifies the procedure action to mitigate this event?

A. Immediately transition to SACRG-1, Severe Accident Control Room Guideline Initial Response, BEFORE opening PZR PORVs and Block Valves, and other RCS Vent Paths.

B. Remain in FR-C.1, open PZR PORVs and Block Valves, and other RCS Vent Paths.

C. Open PZR PORVs and Block Valves, and other RCS Vent Paths and THEN transition to SACRG-1, Severe Accident Control Room Guideline Initial Response.

D. Remain in FR-C.1, start one RCP in an idle loop.

83.

Given the following:

Unit 1 is in Mode 5 with RCS draindown in progress.

- The crew observes 1B RHR Pump discharge flow and motor amps oscillating.
- The crew isolates known RCS drain paths and maximizes Charging flow.
- RCS level continues to decrease.
- Annunciator E-A8, RHR SYSTEM LO FLOW, is alarming intermittently.
- Containment sump pumps are running continuously.
- An operator leaving Containment reports leakage observed from the PZR Surge Line.

Which ONE of the following describes the procedural guidance that will mitigate these plant conditions?

A. Perform 1-AP-17, Shutdown LOCA; initiate Attachment 8, Hot Leg Injection.

B. Perform 1-AP-11, Loss of RHR, Attachment 2, Minimum RCS Level for Indicated Flow.

C. Perform 1-AP-17, Shutdown LOCA, Attachment 7, Cold Leg Injection.

D. Perform 1-AP-11, Loss of RHR, Attachment 3, Determining Acceptable RHR Flow Reductions.

84.

- Unit 1 is at 100% power. Unit 2 is in Mode 5.
- Unit 1 and 2 CC systems are split.

- The OATC reports the following alarms and indications:

  - 1G-E8, COMP COOL PP 1B AUTO TRIP
  - 1G-B3, CC HX 1A-1B CC OUTLET LO FLOW
  - 1G-C3, CC HX OUTLET LO PRESS
  - 1C-C4, RCP 1A-B-C CC THERM BARR HI/LO FLOW
  - 1A-E6, RCP 1B VIBRATION ALERT/DANGER

  - RCP Thermal Barrier Heat Exchanger flow indicators all read 0 GPM.
  - RCP Motor Bearing temperatures are 146°F and rising at 5°F per minute.
  - 1B RCP Vibration readings:
    - 2-3 mils Seismic
    - 8-10 mils Proximity

Given these plant conditions, which ONE of the following identifies the required procedure AND also identifies the Design Basis of the CC System in accordance with the Technical Specification Bases?

A. 1-AP-15, Loss of Component Cooling;
TWO CC Subsystems are sufficient to accomplish a fast cooldown of one unit while maintaining normal loads on the other unit.

B. 1-E-0, Reactor Trip or Safety Injection;
THREE CC Subsystems are sufficient to accomplish a fast cooldown of one unit while maintaining normal loads on the other unit.

C. 1-AP-15, Loss of Component Cooling;
THREE CC Subsystems are sufficient to accomplish a fast cooldown of one unit while maintaining normal loads on the other unit.

D. 1-E-0, Reactor Trip or Safety Injection;
TWO CC Subsystems are sufficient to accomplish a fast cooldown of one unit while maintaining normal loads on the other unit.

85.

Given the following:

- Unit 1 is in Mode 3 during a plant cooldown.
- Chemistry sample of the Quench Spray System Chemical Addition Tank determines that NaOH concentration is 10% by weight.
- Chemical Addition Tank contains approximately 5510 gallons.
- 1-QS-P-1B, Quench Spray Pump 1B, is out of service.

Which ONE of the following describes how the current status of the Quench Spray/Chemical Addition Tank affects the plant during a Design Basis LOCA in accordance with the Technical Specification Bases?

A. Chemical Addition Tank NaOH concentration (10% by weight) is outside of limits which affects the pH of the resultant Containment sump water solution and the ability to effectively remove Iodine following a DBA LOCA.

B. Chemical Addition Tank volume (5510 gallons) is outside of limits which affects the ability to maintain Containment within design pressure limits and affects the ability to maintain Iodine at acceptable levels following a DBA LOCA.

C. Inoperability of 1-QS-P-1B will result in a Containment peak temperature higher than the value calculated in the accident analysis for a DBA LOCA.

D. Inoperability of 1-QS-P-1B will result in a Containment peak pressure higher than the value calculated in the accident analysis for a DBA LOCA.

86.

Given the following:

- Unit 1 core off-load in progress.
- The 3 most recently off-loaded irradiated fuel assemblies are stored as follows:

Assembly(Enrichment)	Burnup	Location
Assembly A (4.6%)	30,000 MWD/MTU	Non-Matrix location
Assembly B (3.2%)	30,000 MWD/MTU	Low-Reactivity 5X5 matrix
Assembly C (3.2%)	20,000 MWD/MTU	Low Reactivity 5X5 matrix

Which ONE of the following identifies the minimum required action in accordance with Technical Specification 3.7.18, Spent Fuel Pool Storage AND the Bases for the action?

Reference Provided

A. ONLY ONE fuel assembly is required to be moved;
ensures that Keff will remain <0.95 for all postulated accidents assuming that the soluble boron in the Spent Fuel Pool is at the TS 3.7.17, Fuel Storage Pool Boron Concentration, minimum limit.

B. TWO fuel assemblies are required to be moved;
ensures that Keff will remain <0.95 for all postulated accidents assuming that the soluble boron in the Spent Fuel Pool is at the TS 3.7.17, Fuel Storage Pool Boron Concentration, minimum limit.

C. TWO fuel assembly are required to be moved;
ensures that Keff will remain <0.95 for all postulated accidents assuming NO soluble boron in the Spent Fuel Pool.

D. ONLY ONE fuel assembly is required to be moved;
ensures that Keff will remain <0.95 for all postulated accidents assuming NO soluble boron in the Spent Fuel Pool.

87.

- Unit 1 has experienced a Steam Generator Tube Rupture.
- The crew is performing 1-ES-3.1, Post-SGTR Cooldown Using Backfill.
- Core Exit TCs are 345°F
- RCS Hot Leg Temperatures are 335°F
- RCS Wide Range Pressure is 600 psig
- 1C RCP is running and the crew has commenced depressurizing the RCS.

Given the above plant conditions, which ONE of the following identifies the parameter that will determine when the depressurization will be stopped, AND also provides the Basis for controlling the rate of depressurization?

A. RCP number 1 seal differential pressure;
control the depressurization rate to ensure pressure control is not lost.

B. RCS Subcooling based on Core Exit TCs;
control the depressurization rate to ensure pressure control is not lost.

C. RCS Subcooling based on Core Exit TCs;
control the depressurization rate to minimize head voiding.

D. RCP number 1 seal differential pressure;
control the depressurization rate to minimize head voiding.

88.

Given the following:

- Unit 1 is at 100% power.
- The following alarm is received:
  - 1B-A5, CW PP 1A-1B-1C-1D AUTO TRIP
- CW Pump 1B motor indicates 0 amps
- CW Pumps 1A, 1C, and 1D motors indicate 300-310 amps.
- Condenser pressure is 3 inches Hg absolute and degrading slowly.

Which ONE of the following describes the mitigation strategy for the event in progress?

A. Perform 1-AP-13, Loss of One or More Circulating Water Pumps; reduce CW Pump amps to prevent motor damage.

   Perform 1-AP-14, Low Condenser Vacuum; guidance for estimating RCS boration flow rates during a load reduction is NOT provided in 1-AP-14.

B. Perform 1-AP-13, Loss of One or More Circulating Water Pumps; contact HP to determine if liquid waste release must be secured.

   Perform 1-AP-14, Low Condenser Vacuum; guidance for estimating RCS boration flow rates during a load reduction is NOT provided in 1-AP-14.

C. Perform 1-AP-13, Loss of One or More Circulating Water Pumps; contact HP to determine if liquid waste release must be secured.

   Perform 1-AP-14, Low Condenser Vacuum; guidance for estimating RCS boration flow rates during a load reduction is provided in 1-AP-14.

D. Perform 1-AP-13, Loss of One or More Circulating Water Pumps; reduce CW Pump amps to prevent motor damage.

   Perform 1-AP-14, Low Condenser Vacuum; guidance for estimating RCS boration flow rates during a load reduction is provided in 1-AP-14.

89.

Given the following:

- Unit 1 is at 100% power.
- 120 VAC Vital Bus Inverter 1-II failed 8 hours ago.
- 120 VAC Vital Bus 1-II is being powered from its associated constant voltage source transformer.

Which ONE of the following identifies the minimum Technical Specification LCOs that contain required actions for these plant conditions, including the required compensatory measures in accordance with the Technical Specification Bases?

Reference Provided

A. TS 3.8.7, Inverters - Operating, Limiting Action is required to be entered;
TS 3.8.9, Distribution Systems - Operating, Limiting Action is NOT required to be entered;
Concurrent planned EDG maintenance is NOT allowed.

B. BOTH TS 3.8.9, Distribution Systems - Operating AND TS 3.8.7, Inverters - Operating Limiting Actions are required to be entered;
Concurrent planned EDG maintenance is NOT allowed.

C. TS 3.8.9, Distribution Systems - Operating, Limiting Action is required to be entered;
TS 3.8.7, Inverters - Operating, Limiting Action is NOT required to be entered;
Concurrent planned EDG maintenance can be performed.

D. BOTH TS 3.8.9, Distribution Systems - Operating AND TS 3.8.7, Inverters - Operating Limiting Actions are required to be entered;
Concurrent planned EDG maintenance can be performed.

90.

Given the following:

- 1-FR-H.1, Response to Loss of Secondary Heat Sink, is in progress.
- Attempts to establish Aux Feedwater flow are unsuccessful.
- RCS Bleed and Feed has NOT been initiated.

- Main Feedwater flow has <u>just</u> been established and SG levels are as follows:

  - '1A' 40% wide range and rising
  - '1B' 40% wide range and stable
  - '1C' 29% wide range and lowering

- Core exit TCs are stable.
- Containment pressure is 19.2 psia.

Which ONE (1) of the following describes the appropriate operator action?

A. Return to procedure and step in effect and continue efforts to establish AFW flow.

B. Perform Steps 14 through 23 of 1-FR-H.1 to initiate RCS bleed and feed.

C. Remain in 1-FR-H.1 until Core Exit TCs indicate a decreasing trend.

D. Remain in 1-FR-H.1 until all SG wide range levels indicate an increasing trend.

91.

Given the following:

The Unit is in Mode 6.

Rod Unlatching is in progress.

Manipulator Crane radiation monitor, 1-RM-RMS-162, suddenly pegs high.

The following alarms are received:

- 1K-D2, RAD MONITOR SYSTEM HI RAD LEVEL
- 1K-D3, RAD MONITOR SYSTEM HI-HI RAD LEVEL

HP has confirmed that radiation levels on the refueling deck are normal and Operations has declared 1-RM-RMS-162 inoperable.

Which ONE of the following describes the required actions in accordance with 1-AP-5, Unit 1 Radiation Monitoring System?

A. Verify Control Room Bottled Air dump;
Core alterations may continue with 1-RM-RMS-162 inoperable. Continuous HP coverage is required.

B. Verify Containment Ventilation Isolation;
Core alterations may NOT continue with 1-RM-RMS-162 inoperable.

C. Verify Control Room Bottled Air dump;
Core alterations may NOT continue with 1-RM-RMS-162 inoperable.

D. Verify Containment Ventilation Isolation;
Core alterations may continue with 1-RM-RMS-162 inoperable. Continuous HP coverage is required.

92.

Given the following:

- Both units are at 100% power.
- 1-SW-P-1A and 1-SW-P-1B are running.
- 2-SW-P-1B is OOS.
- 1-SW-P-1B trips and 2-SW-P-1A is started.

Which ONE of the following describes the Technical Specification action required, and the Bases for the action?

A. Restore the Service Water Loop to operable status within 72 hours;
Ensures design flows to the RS Heat Exchangers are achieved following a LOCA with ONE additional failure.

B. Throttle Service Water to CC Heat Exchangers within 1 hour;
Ensures design flows to the RS Heat Exchangers are achieved following a LOCA with NO additional failures.

C. Restore the Service Water Loop to operable status within 72 hours;
Ensures design flows to the RS Heat Exchangers are achieved following a LOCA with NO additional failures.

D. Throttle Service Water to CC Heat Exchangers within 1 hour;
Ensures design flows to the RS Heat Exchangers are achieved following a LOCA with ONE additional failure.

93.

Given the following:

- A reactor trip has occurred on Unit 1.
- Following transition to 1-ES-0.1, Reactor Trip Response, the STA reports all CSF status trees GREEN with the EXCEPTION of Heat Sink, which is YELLOW.
- The following SG conditions are observed:
  - A SG pressure 1050 psig and stable.
  - A SG level 25% NR and rising.
  - B SG pressure 1150 psig and stable.
  - B SG level 92% NR and rising.
  - C SG pressure 1050 psig and stable.
  - C SG level 20% NR and rising.
- B MSIV indicates CLOSED.
- AFW flow is 160 GPM to each SG.
- The crew determines that entry to a Yellow Path procedure will help mitigate the event.

Which ONE of the following describes the mitigation strategy used to restore the Heat Sink Critical Safety Function to GREEN?

A. Perform 1-FR-H.3, Response to Steam Generator High Level; isolate AFW flow to B SG. Initiate blowdown from B SG and DO NOT dump steam from B SG.

B. Perform 1-FR-H.2, Response to Steam Generator Overpressure; Isolate AFW flow to B SG and do not restore AFW flow until a steam release path is established.

C. Perform 1-FR-H.2, Response to Steam Generator Overpressure; Verify Main Feedwater Isolation. Dump steam from B SG to reduce Hot Leg temperatures.

D. Perform 1-FR-H.3, Response to Steam Generator High Level; Verify Main Feedwater Isolation. Dump steam from B SG to reduce Hot Leg temperatures and initiate blowdown from B SG.

94.

Given the following:

- The date is 6/5/2008.
- Both Units are in Mode 1.
- Shift complement is at MINIMUM allowed by Technical Specifications.
- One of the Reactor Operators becomes ill and must be transported to the hospital.
- TWO potential replacements are identified for call-in.
- BOTH replacements have been assigned to OPS Support for the last year.

The last times they were on shift are as follows:

Operator A	Operator B
• 12 hours on March 24 BOP	12 hours on March 21 RO
• 12 hours on February 23 BOP	12 hours on March 20 RO
• 12 hours on February 22 BOP	12 hours on March 19 RO
• 12 hours on January 19 BOP	12 hours on March 18 RO
• 12 hours on January 18 BOP	12 hours on January 5 WCC

Which ONE of the following identifies the Technical Specification requirement to replace the Reactor Operator, and which operator will be selected as the replacement?

A. Action must be taken to ensure the Reactor Operator is replaced within 2 hours; Operator B will be selected.

B. Action must be taken to ensure the Reactor Operator is replaced within 2 hours; Operator A will be selected.

C. Action must be taken to ensure the Reactor Operator is replaced within 1 hour; Operator B will be selected.

D. Action must be taken to ensure the Reactor Operator is replaced within 1 hour; Operator A will be selected.

95.

Given the following:

- The Shift Manager is in the control room discussing an upcoming evolution with the Unit 2 Unit Supervisor.
- The Unit 1 Unit Supervisor is on a plant walkdown when the following events occur:
  - Unit 1 experienced a spurious Turbine runback.
  - While stabilizing the unit at 65% power, a turbine trip occurred.
  - The Unit 1 reactor did NOT trip, either automatically or manually from the control room.
  - PZR PORV, 1-RC-PCV-1455C, is stuck OPEN.
  - The associated block valve, 1-RC-MOV-1536, did NOT close when the OATC took the control switch to close.
  - Safety Injection is actuated.
  - The Unit 1 Unit Supervisor was injured while returning to the control room and needs medical assistance in the Turbine Building.

In accordance with DNAP-0509, Dominion Nuclear Procedure Adherence and Usage, which ONE of the following identifies who will be the EOP 'Reader,' AND also identifies the required EOP flowpath upon exiting 1-FR-S.1, Response to Nuclear Power Generation/ATWS?

A. Unit 2 Unit Supervisor;
   Go to 1-E-1, Loss of Reactor or Secondary Coolant.

B. Unit 2 Unit Supervisor;
   Return to 1-E-0, Reactor Trip or Safety Injection.

C. Shift Manager;
   Go to 1-E-1, Loss of Reactor or Secondary Coolant.

D. Shift Manager;
   Return to 1-E-0, Reactor Trip or Safety Injection.

96.

Given the following:

- Unit 1 is operating at 100% power.
- The following alarm is received several times in a 10 minute period:
  - 1D-H5, HIGH CAPACITY S/G BLOWDOWN TROUBLE
- Local indication at the High Capacity S/G Blowdown Control Panel is normal.
- The Instrument Technician investigating the alarm determines that the comparator card for the annunciator is failing.
- A replacement comparator card is unavailable and assistance has been requested from Engineering.
- To restore functionality of the alarm in the interim a jumper must be installed.

Which ONE of the following procedures will govern the installation of the jumper, and who, by title, must provide **FINAL** approval of the jumper?

A. OP-NA-200-1001, Equipment Clearance Process; FSRC (formerly known as SNSOC).

B. VPAP-1403, Temporary Modifications; Shift Manager.

C. OP-NA-200-1001, Equipment Clearance Process; Shift Manager.

D. VPAP-1403, Temporary Modifications; FSRC (formerly known as SNSOC).

97.

Given the following:

- A Unit 1 RCS heatup is in progress.
- RCS Tave is 342°F.
- 1H Emergency Diesel Generator is declared INOPERABLE due to failure of the Shutdown Relay.

Which ONE of the following identifies (1) the current OPERATIONAL MODE and (2) the Technical Specification requirements to enter the next higher Mode?

A. (1) Mode 3
(2) Change to Mode 2 may be performed provided the TS 3.8.1, AC Sources - Operating, Action Statements for 1H EDG inoperability are satisfied. Risk evaluation and NRC approval is NOT required.

B. (1) Mode 4
(2) Change to Mode 3 may be NOT performed without a risk evaluation and approval from the NRC.

C. (1) Mode 3
(2) Change to Mode 2 may be NOT performed without a risk evaluation and approval from the NRC.

D. (1) Mode 4
(2) Change to Mode 3 may be performed provided the TS 3.8.1, AC Sources - Operating, Action Statements for 1H EDG inoperability are satisfied. Risk evaluation and NRC approval is NOT required.

98.

Which ONE of the following describes the Release Permit approval process in accordance with 0-OP-23.3, Waste Gas Decay Tanks & Waste Gas Diaphram Compressors, AND also identifies the Technical Specification Bases for the maximum radioactivity content in each gas storage tank?

A. Operations initiates the release request and Health Physics (HP) authorizes the release permit;
an individual at the exclusion boundary will not exceed 0.5 rem total body exposure in the event of an uncontrolled release of a tanks contents.

B. Chemistry initiates the release request and Health Physics (HP) authorizes the release permit;
an individual at the exclusion boundary will not exceed 0.5 rem total body exposure in the event of an uncontrolled release of a tanks contents.

C. Chemistry initiates the release request and Health Physics (HP) authorizes the release permit;
an individual at the exclusion boundary will not exceed 0.1 rem total body exposure in the event of an uncontrolled release of a tanks contents.

D. Operations initiates the release request and Health Physics (HP) authorizes the release permit;
an individual at the exclusion boundary will not exceed 0.1 rem total body exposure in the event of an uncontrolled release of a tanks contents.

99.

Initial conditions:

- Unit 1 is in Mode 3 shutting down for a scheduled refueling.
- A fire is in progress in the Motor Driven AFW Pump House.
- The Fire Brigade is at the scene.

Current conditions:

- The fire was burning for 12 minutes and is now extinguished.
- The 1B MDAFW Pump motor was destroyed by the fire.

Which ONE of the following describes the impact on Safe Shutdown Functions, and whether E-Plan action is required in accordance with 0-FCA-0, Fire Protection - Operations Response?

A. The Reactor Heat Removal function required to get from Mode 4 to Mode 5 is affected;
EPIP 1.01, Emergency Manager Controlling Procedure is NOT required to be implemented.

B. The Reactor Heat Removal function required to get to Mode 4 is affected;
EPIP 1.01, Emergency Manager Controlling Procedure is required to be implemented.

C. The Reactor Heat Removal function required to get to Mode 4 is affected;
EPIP 1.01, Emergency Manager Controlling Procedure is NOT required to be implemented.

D. The Reactor Heat Removal function required to get from Mode 4 to Mode 5 is affected;
EPIP 1.01, Emergency Manager Controlling Procedure is required to be implemented.

100.

- A LOCA has occurred on Unit 1.
- RCS pressure indicates 190 psig and stable.
- RCS temperature is 260 degrees F and lowering.
- Containment pressure is 27 psia.
- Low Head SI flow indicates 1200 gpm on each train.
- All equipment is operating as designed.
- The crew has just entered 1-ES-1.3, Transfer to Cold Leg Recirculation.
- The STA reports a RED path on the INTEGRITY CSF Status Tree.

Given these plant conditions, which ONE of the following describes the hierarchy of requried procedure actions?

A. Remain in 1-ES-1.3 until transfer to Cold Leg Recirculation is complete through step 8;
Transition to 1-FR-P.1 and verify that RCS pressure is below the Low Head SI pump shutoff head, then return to 1-ES-1.3.

B. Remain in 1-ES-1.3 until transfer to Cold Leg Recirculation is complete through step 8;
Transition to 1-FR-P.1 and perform the actions to stop the RCS cooldown, then return to 1-ES-1.3.

C. Immediately transition to 1-FR-P.1, Response to Imminent Pressurized Thermal Shock;
Verify that RCS pressure is below the Low Head SI pump shutoff head and then return to 1-ES-1.3.

D. Immediately transition to 1-FR-P.1, Response to Imminent Pressurized Thermal Shock;
Perform the actions of 1-FR-P.1 to stop the RCS cooldown and then return to 1-ES-1.3.

3.3 INSTRUMENTATION

3.3.1 Reactor Trip System (RTS) Instrumentation

LCO 3.3.1 The RTS instrumentation for each Function in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1.

ACTIONS

NOTE

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one or more required channels or trains inoperable.	A.1 Enter the Condition referenced in Table 3.3.1-1 for the channel(s) or train(s).	Immediately
B. One Manual Reactor Trip channel inoperable.	B.1 Restore channel to OPERABLE status. OR B.2 Be in MODE 3.	48 hours 54 hours
C. One channel or train inoperable.	C.1 Restore channel or train to OPERABLE status. OR C.2.1 Initiate action to fully insert all rods. AND	48 hours 48 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	C.2.2 Place the Rod Control System in a condition incapable of rod withdrawal.	49 hours
D. One Power Range Neutron Flux–High channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing and setpoint adjustment of other channels. ----------	
	D.1.1 Place channel in trip.	72 hours
	AND	
	D.1.2 Reduce THERMAL POWER to ≤ 75% RTP.	78 hours
	OR	
	D.2.1 Place channel in trip.	72 hours
	AND	
	----------NOTE---------- Only required to be performed when the Power Range Neutron Flux input to QPTR is inoperable. ----------	
	D.2.2 Perform SR 3.2.4.2.	Once per 12 hours
	OR	
	D.3 Be in MODE 3.	78 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	E.1 Place channel in trip.	72 hours
	OR	
	E.2 Be in MODE 3.	78 hours
F. One Intermediate Range Neutron Flux channel inoperable.	F.1 Reduce THERMAL POWER to < P-6.	24 hours
	OR	
	F.2 Increase THERMAL POWER to > P-10.	24 hours
G. Two Intermediate Range Neutron Flux channels inoperable.	----------NOTE---------- Limited plant cooldown or boron dilution is allowed provided the change is accounted for in the calculated SDM. ----------	
	G.1 Suspend operations involving positive reactivity additions.	Immediately
	AND	
	G.2 Reduce THERMAL POWER to < P-6.	2 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. One Source Range Neutron Flux channel inoperable.	----------NOTE---------- Limited plant cooldown or boron dilution is allowed provided the change is accounted for in the calculated SDM. ----------	
	H.1 Suspend operations involving positive reactivity additions.	Immediately
I. Two Source Range Neutron Flux channels inoperable.	I.1 Open Reactor Trip Breakers (RTBs).	Immediately
J. One Source Range Neutron Flux channel inoperable.	J.1 Restore channel to OPERABLE status.	48 hours
	OR	
	J.2.1 Initiate action to fully insert all rods.	48 hours
	AND	
	J.2.2 Place the Rod Control System in a condition incapable of rod withdrawal.	49 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
K. Required Source Range Neutron Flux channel inoperable.	----------NOTE---------- Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM. ---------- K.1 Suspend operations involving positive reactivity additions. AND K.2 Perform SR 3.1.1.1.	 Immediately 1 hour AND Once per 12 hours thereafter
L. One channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ---------- L.1 Place channel in trip. OR L.2 Reduce THERMAL POWER to < P-7.	 72 hours 78 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
M. One Reactor Coolant Pump Breaker Position channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	M.1 Restore channel to OPERABLE status.	72 hours
	OR	
	M.2 Reduce THERMAL POWER to < P-7.	78 hours
N. One Turbine Trip channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	N.1 Place channel in trip.	72 hours
	OR	
	N.2 Reduce THERMAL POWER to < P-8.	76 hours
O. One train inoperable.	----------NOTE---------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------	
	O.1 Restore train to OPERABLE status.	24 hours
	OR	
	O.2 Be in MODE 3.	30 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
P. One RTB train inoperable.	----------NOTES---------- 1. One train may be bypassed for up to 2 hours for surveillance testing, provided the other train is OPERABLE. 2. One RTB may be bypassed for up to 2 hours for maintenance on undervoltage or shunt trip mechanisms, provided the other train is OPERABLE. 3. One RTB train may be bypassed for up to 4 hours for concurrent surveillance testing of the RTB and automatic trip logic, provided the other train is OPERABLE. ---------- P.1 Restore train to OPERABLE status. OR P.2 Be in MODE 3.	 1 hour 7 hours
Q. One or more channels inoperable.	Q.1 Verify interlock is in required state for existing unit conditions. OR Q.2 Be in MODE 3.	1 hour 7 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
R. One or more channels inoperable.	R.1 Verify interlock is in required state for existing unit conditions. OR R.2 Be in MODE 2.	1 hour 7 hours
S. One trip mechanism inoperable for one RTB.	S.1 Restore inoperable trip mechanism to OPERABLE status. OR S.2 Be in MODE 3.	48 hours 54 hours

SURVEILLANCE REQUIREMENTS

- NOTE -
Refer to Table 3.3.1-1 to determine which SRs apply for each RTS Function.
- -

SURVEILLANCE		FREQUENCY
SR 3.3.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.2	----------NOTE---------- Not required to be performed until 12 hours after THERMAL POWER is ≥ 15% RTP. ---------- Compare results of calorimetric heat balance calculation to power range channel output. Adjust power range output if calorimetric heat balance calculation result exceeds power range channel output by more than +2% RTP.	 24 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.3.1.3	----------NOTE---------- Not required to be performed until 72 hours after THERMAL POWER is ≥ 15% RTP. ---------- Compare results of the incore detector measurements to Nuclear Instrumentation System (NIS) AFD. Adjust NIS channel if absolute difference is ≥ 3%.	31 effective full power days (EFPD)
SR 3.3.1.4	----------NOTE---------- This Surveillance must be performed on the reactor trip bypass breaker immediately after placing the bypass breaker in service. ---------- Perform TADOT.	31 days on a STAGGERED TEST BASIS
SR 3.3.1.5	Perform ACTUATION LOGIC TEST.	31 days on a STAGGERED TEST BASIS
SR 3.3.1.6	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	92 days
SR 3.3.1.7	----------NOTE---------- Not required to be performed for source range instrumentation prior to entering MODE 3 from MODE 2 until 4 hours after entry into MODE 3. ---------- Perform COT.	92 days

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.3.1.8	----------NOTE---------- This Surveillance shall include verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. ---------- Perform COT.	-----NOTE----- Only required when not performed within previous 92 days ---------- Prior to reactor startup AND Four hours after reducing power below P-6 for source range instrumentation AND Twelve hours after reducing power below P-10 for power and intermediate range instrumentation AND Once per 92 days thereafter
SR 3.3.1.9	----------NOTES---------- 1. Adjust NIS channel if absolute difference ≥ 3%. 2. Not required to be performed until 72 hours after THERMAL POWER is ≥ 50% RTP. ---------- Compare results of the excore channels to incore detector measurements.	 92 EFPD

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.3.1.10	----------NOTE---------- This Surveillance shall include verification that the time constants are adjusted to the prescribed values. ---------- Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.11	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.12	Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.13	Perform COT.	18 months
SR 3.3.1.14	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	18 months
SR 3.3.1.15	----------NOTE---------- Verification of setpoint is not required. ---------- Perform TADOT.	Prior to exceeding the P-8 interlock whenever the unit has been in MODE 3, if not performed within the previous 31 days

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.3.1.16	----------NOTE---------- Neutron detectors are excluded from response time testing. ----------	
	Verify RTS RESPONSE TIME is within limits.	18 months on a STAGGERED TEST BASIS

Table 3.3.1-1 (page 1 of 5)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Manual Reactor Trip	1, 2	2	B	SR 3.3.1.14	NA
	3[a], 4[a], 5[a]	2	C	SR 3.3.1.14	NA
2. Power Range Neutron Flux					
a. High	1, 2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 110% RTP
b. Low	1[b], 2	4	E	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16	≤ 26% RTP
3. Power Range Neutron Flux Rate					
a. High Positive Rate	1, 2	4	E	SR 3.3.1.7 SR 3.3.1.11	≤ 5.5% RTP with time constant ≥ 2 sec
b. High Negative Rate	1, 2	4	E	SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 5.5% RTP with time constant ≥ 2 sec
4. Intermediate Range Neutron Flux	1[b], 2[c]	2	F, G	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 40% RTP
5. Source Range Neutron Flux	2[d]	2	H, I	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16	≤ 1.3 E5 cps
	3[a], 4[a], 5[a]	2	I, J	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 1.3 E5 cps
	3[e], 4[e], 5[e]	1	K	SR 3.3.1.1 SR 3.3.1.11	NA

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(b) Below the P-10 (Power Range Neutron Flux) interlocks.

(c) Above the P-6 (Intermediate Range Neutron Flux) interlocks.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

(e) With the Rod Control System incapable of rod withdrawal. In this condition, source range Function does not provide reactor trip but does provide indication.

Table 3.3.1-1 (page 2 of 5)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
6. Overtemperature ΔT	1, 2	3	E	SR 3.3.1.1 SR 3.3.1.3 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.16	Refer to Note 1 (Page 3.3.1-16)
7. Overpower ΔT	1, 2	3	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.12	Refer to Note 2 (Page 3.3.1-17)
8. Pressurizer Pressure					
a. Low	1[(f)]	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.16	≥ 1860 psig
b. High	1, 2	3	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.16	≤ 2370 psig
9. Pressurizer Water Level–High	1[(f)]	3	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.16	≤ 93%
10. Reactor Coolant Flow–Low	1[(f)]	3 per loop	L	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.16	≥ 89%
11. Reactor Coolant Pump (RCP) Breaker Position	1[(f)]	1 per RCP	M	SR 3.3.1.14	NA
12. Undervoltage RCPs	1[(f)]	1 per bus	L	SR 3.3.1.6 SR 3.3.1.10 SR 3.3.1.16	≥ 2870 V
13. Underfrequency RCPs	1[(f)]	1 per bus	L	SR 3.3.1.6[(g)] SR 3.3.1.10 SR 3.3.1.16	≥ 56 Hz
14. Steam Generator (SG) Water Level–Low Low	1, 2	3 per SG	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10 SR 3.3.1.16	≥ 17%

(f) Above the P-7 (Low Power Reactor Trips Block) interlock.

(g) Required to be performed for Unit 2 only.

Table 3.3.1-1 (page 3 of 5)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
15. SG Water Level–Low	1, 2	2 per SG	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≥ 24%
Coincident with Steam Flow/Feedwater Flow Mismatch	1, 2	2 per SG	E	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.10	≤ 42.5% full steam flow at RTP
16. Turbine Trip					
a. Low Auto Stop Oil Pressure	1(h)	3	N	SR 3.3.1.10 SR 3.3.1.15	≥ 40 psig
b. Turbine Stop Valve Closure	1(h)	4	N	SR 3.3.1.10 SR 3.3.1.15	≥ 0% open
17. Safety Injection (SI) Input from Engineered Safety Feature Actuation System (ESFAS)	1, 2	2 trains	O	SR 3.3.1.14	NA
18. Reactor Trip System Interlocks					
a. Intermediate Range Neutron Flux, P-6	2(d)	2	Q	SR 3.3.1.11 SR 3.3.1.13	≥ 3E-11 amp
b. Low Power Reactor Trips Block, P-7	1	1 per train	R	SR 3.3.1.5	NA
c. Power Range Neutron Flux, P-8	1	4	R	SR 3.3.1.11 SR 3.3.1.13	≤ 31% RTP
d. Power Range Neutron Flux, P-10	1, 2	4	Q	SR 3.3.1.11 SR 3.3.1.13	≥ 7% RTP ≤ 11% RTP
e. Turbine Impulse Pressure, P-13	1	2	R	SR 3.3.1.10 SR 3.3.1.13	≤ 11% turbine power
19. Reactor Trip Breakers(i)	1, 2	2 trains	P	SR 3.3.1.4	NA
	3(a), 4(a), 5(a)	2 trains	C	SR 3.3.1.4	NA
20. Reactor Trip Breaker Undervoltage and Shunt Trip Mechanisms	1, 2	1 each per RTB	S	SR 3.3.1.4	NA
	3(a), 4(a), 5(a)	1 each per RTB	C	SR 3.3.1.4	NA
21. Automatic Trip Logic	1, 2	2 trains	O	SR 3.3.1.5	NA
	3(a), 4(a), 5(a)	2 trains	C	SR 3.3.1.5	NA

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

(h) Above the P-8 (Power Range Neutron Flux) interlock.

(i) Including any reactor trip bypass breakers that are racked in and closed for bypassing an RTB.

Table 3.3.1-1 (page 4 of 5)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following nominal trip setpoint by more than 2.0% of ΔT span.

$$\Delta T \leq \Delta T_0 \left\{ K_1 - K_2 \frac{(1+\tau_1 s)}{(1+\tau_2 s)}[T - T'] + K_3(P - P') - f_1(\Delta I) \right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the nominal T_{avg} at RTP, ≤ [*]°F.

P is the measured pressurizer pressure, psig
P' is the nominal RCS operating pressure, ≥ [*] psig

$K_1 \leq$ [*] $K_2 \geq$ [*]/°F $K_3 \geq$ [*]/psig

$\tau_1 \geq$ [*] sec $\tau_2 \leq$ [*] sec

$$f_1(\Delta I) = \begin{cases} [*]\{[*] - (q_t - q_b)\} & \text{when } q_t - q_b < [*]\% \text{ RTP} \\ 0 & \text{when } [*]\% \text{ RTP} \leq q_t - q_b \leq [*]\% \text{ RTP} \\ [*]\{(q_t - q_b) - [*]\} & \text{when } q_t - q_b > [*]\% \text{ RTP} \end{cases}$$

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

Table 3.3.1-1 (page 5 of 5)
Reactor Trip System Instrumentation

Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following nominal trip setpoint by more than 2% of ΔT span.

$$\Delta T \leq \Delta T_0 \left\{ K_4 - K_5 \left[\frac{\tau_3 s}{1 + \tau_3 s} \right] T - K_6 [T - T'] - f_2(\Delta I) \right\}$$

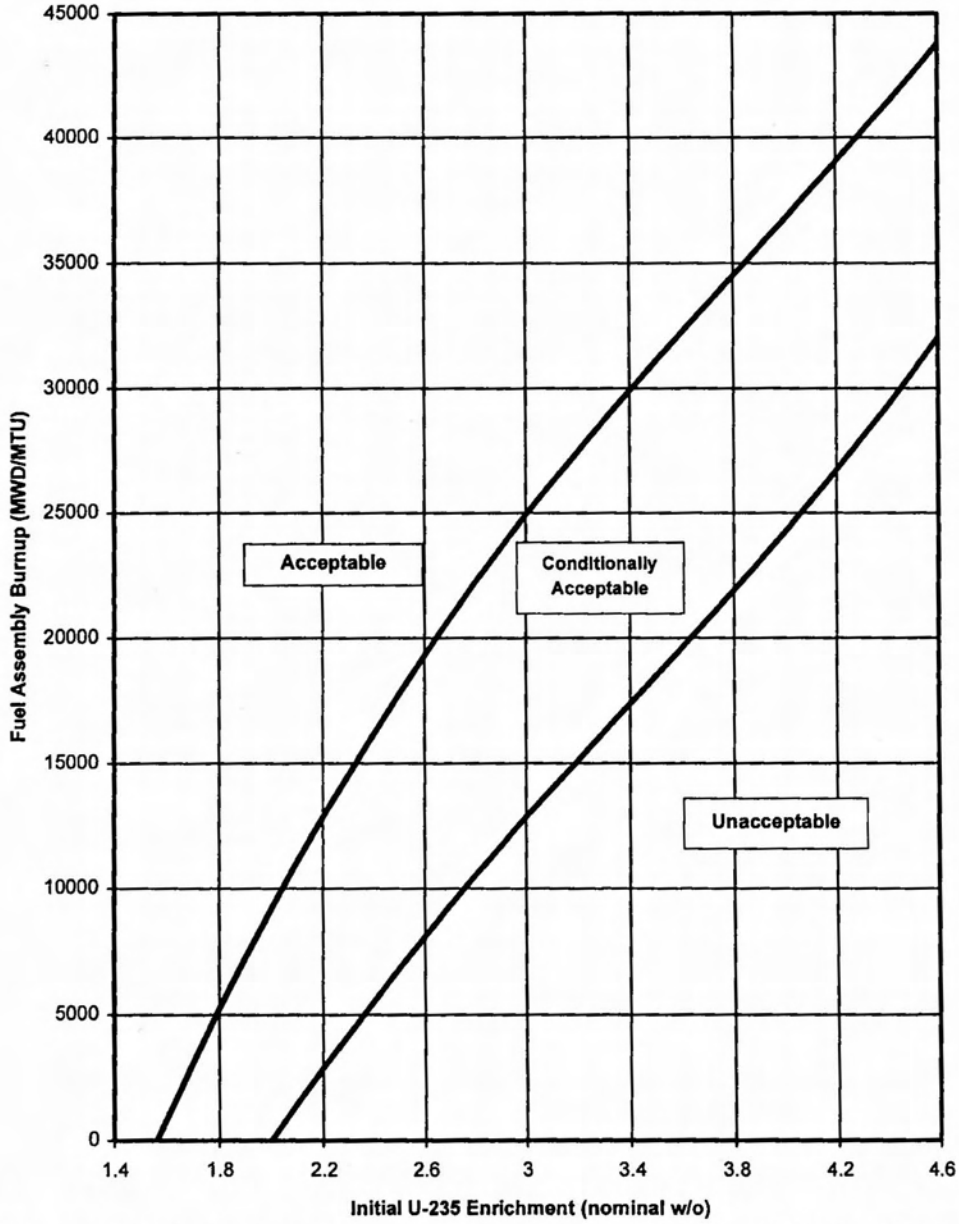
Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T' is the nominal T_{avg} at RTP, ≤ [*]°F.

$K_4 \leq$ [*]
$K_5 \geq$ [*]/°F for increasing T_{avg}
[*]/°F for decreasing T_{avg}
$K_6 \geq$ [*]/°F when $T > T'$
[*]/°F when $T \leq T'$

$\tau_3 \geq$ [*] sec

$f_2(\Delta I)$ = [*]

The values denoted with [*] are specified in the COLR.



Acceptable: Acceptable for storage in non-matrix location or low reactivity location in matrix configuration. May also be placed in high reactivity locations in matrix configuration.

Conditionally Acceptable: Acceptable for storage in non-matrix location, but must be placed in high reactivity location if stored in matrix configuration.

Unacceptable: Must be stored in high reactivity location in matrix configuration. Surry spent fuel must be stored in high reactivity locations in a matrix.

Figure 3.7.18-1 (page 1 of 1)
Burnup Credit Requirements

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters–Operating

LCO 3.8.7 The Train H and Train J inverters shall be OPERABLE.

- - - - - - - - - - - - - - - NOTE - - - - - - - - - - - - - - -
One inverter may be disconnected from its associated DC bus for ≤ 24 hours to perform an equalizing charge on its associated battery, provided:

a. The associated AC vital bus is energized from its constant voltage source transformer; and

b. All other AC vital buses are energized from their associated OPERABLE inverters.

- -

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One inverter inoperable.	A.1	---------NOTE-------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems–Operating" with any vital bus de-energized. ---------- Restore inverter to OPERABLE status.	7 days
B. Required Action and associated Completion Time not met.	B.1 AND B.2	Be in MODE 3. Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage and alignment to required AC vital buses.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems–Operating

LCO 3.8.9 The following distribution subsystems shall be OPERABLE:

a. The Train H and Train J AC, DC, and AC vital buses; and

b. One AC and DC bus on the other unit for each required shared component.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more LCO 3.8.9.a AC electrical power distribution subsystem(s) inoperable.	A.1 ---------NOTE-------- Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources–Operating," for DC train(s) made inoperable by inoperable distribution subsystem(s). ---------- Restore AC electrical power distribution subsystem(s) to OPERABLE status.	8 hours <u>AND</u> 16 hours from discovery of failure to meet LCO

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more LCO 3.8.9.a AC vital bus(es) inoperable.	B.1 Restore AC vital bus subsystem(s) to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
C. One or more LCO 3.8.9.a DC electrical power distribution subsystem(s) inoperable.	C.1 Restore DC electrical power distribution subsystem(s) to OPERABLE status.	2 hours AND 16 hours from discovery of failure to meet LCO
D. --------NOTE---------- Separate Condition entry is allowed for each AC subsystem. ---------- One or more required LCO 3.8.9.b AC electrical power distribution subsystem(s) inoperable.	D.1 Declare associated shared component(s) inoperable.	Immediately
E. --------NOTE---------- Separate Condition entry is allowed for each DC subsystem. ---------- One or more required LCO 3.8.9.b DC electrical power distribution subsystem(s) inoperable.	E.1 Declare associated shared component(s) inoperable.	Immediately

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time for Condition A, B, or C not met.	F.1 Be in MODE 3. AND F.2 Be in MODE 5.	6 hours 36 hours
G. Two or more LCO 3.8.9.a electrical power distribution subsystems inoperable that result in a loss of safety function.	G.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required AC, DC, and AC vital bus electrical power distribution subsystems.	7 days

GENERIC FUNDAMENTALS EXAMINATION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

$\dot{Q} = \dot{m}c_p\Delta T$

$\dot{Q} = \dot{m}\Delta h$

$\dot{Q} = UA\Delta T$

$\dot{Q} \propto \dot{m}^3_{Nat\ Circ}$

$\Delta T \propto \dot{m}^2_{Nat\ Circ}$

$K_{eff} = 1/(1 - \rho)$

$\rho = (K_{eff} - 1)/K_{eff}$

$SUR = 26.06/\tau$

$$\tau = \frac{\bar{\beta}_{eff} - \rho}{\lambda_{eff}\,\rho}$$

$$\rho = \frac{\ell^*}{\tau} + \frac{\bar{\beta}_{eff}}{1 + \lambda_{eff}\,\tau}$$

$\ell^* = 1 \times 10^{-4}$ sec

$\lambda_{eff} = 0.1\ sec^{-1}$ (for small positive ρ)

$DRW \propto \varphi^2_{tip}/\varphi^2_{avg}$

$P = P_o 10^{SUR(t)}$

$P = P_o e^{(t/\tau)}$

$A = A_o e^{-\lambda t}$

$CR_{S/D} = S/(1 - K_{eff})$

$CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

$\dot{m} = \rho A\bar{v}$

$\dot{W}_{Pump} = \dot{m}\Delta P\upsilon$

$E = IR$

Thermal Efficiency = Net Work Out/Energy In

$$\frac{g(z_2 - z_1)}{g_c} + \frac{(\bar{v}_2^2 - \bar{v}_1^2)}{2g_c} + \upsilon(P_2 - P_1) + (u_2 - u_1) + (q - w) = 0$$

$g_c = 32.2$ lbm-ft/lbf-sec^2

CONVERSIONS

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1 Mw = 3.41×10^6 Btu/hr

1 hp = 2.54×10^3 Btu/hr

1 Btu = 778 ft-lbf

°C = (5/9)(°F - 32)

°F = (9/5)(°C) + 32

1 Curie = 3.7×10^{10} dps

1 kg = 2.21 lbm

1 gal_{water} = 8.35 lbm

1 ft^3_{water} = 7.48 gal