1. 000008AA2.20 1
Current conditions on Unit 1 are as follows:

- Reactor power is 100%.
- RCS hot and cold leg temperatures are stable.
- Pressurizer pressure is 2005 psia and slowly lowering.
- Pressurizer level is 59% and rising.
- Containment pressure is 0.2 psia and rising slowly.
- Charging pump 1A flow is lowering.
- Charging pumps 1B and 1C are in automatic and NOT running.
- One letdown orifice is in service.

Which one of the following containment leak locations correlates to the above indications?

A. RCS cold leg

B. Main steam line

C. Reactor vessel head

D. Pressurizer vapor space

K/A

Pressurizer Vapor Space Accident: Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: The effect of an open PORV or code safety, based on observation of plant parameters.

K/A Match Analysis
The applicant must understand that the indications in the stem are indicative of a vapor space accident, thereby testing the required knowledge of interpreting plant parameters to understand that a vapor space LOCA is occurring.

Answer Choice Analysis

A. Incorrect, but plausible if the applicant identifies an increase in containment pressure with LOCA condition but fails to identify that RCS temperatures are NOT decreasing as expected.

B. Incorrect, but plausible if the applicant identifies MSL as being inside containment and incorrectly believes that the rapid cooldown and subsequent depressurization will result in a lower pressure than a loss of coolant from the RCS.

C. Incorrect, but plausibel if the applicant identifies the Rx Vessel as a steam space because both spray valves are open causing a reactor trip on OTdelta-T. or Low Pressurizer Pressure, followed by an SI.

D. Correct.

Supporting References
ND-93.3-LP-5, Pressurizer Pressure Control, Rev. 9

References Provided to Applicant
none

Answer: D
2. 000009EK2.03 2
Unit 1 Initial Conditions:

- A small break loss-of-coolant accident (SBLOCA) occurred from 100% power.
- Operators are performing steps in 1-ES-1.2, "POST LOCA COOLDOWN AND DEPRESSURIZATION."
- A controlled RCS cooldown has been initiated at approximately 90 °F/hr.
- All Steam Generator (S/G) narrow range (NR) levels are approximately 45% and STABLE.
- All S/G pressures are approximately 650 psig and DECREASING.

Current conditions:

- Operators stopped the CHG pump flowing to the alternate header.
- Operators then "paused" for approximately five (5) minutes after stopping the CHG pump to allow RCS pressure to stabilize or increase before taking further actions to reduce SI flow.
- No additional operator actions were performed during the "pause."

Based on the conditions at the end of the "pause" (approximately five (5) minutes after stopping the CHG pump), which ONE of the following predicts:

(1) S/G NR level response
AND
(2) S/G pressure response?

A. (1) levels will be INCREASING.
(2) pressures will be DECREASING.

B. (1) levels will be INCREASING.
(2) pressures will be STABLE at a lower value.

C. (1) levels will be STABLE at the same value.

(2) pressures will be DECREASING.

D. (1) levels will be STABLE at the same value.
(2) pressures will be STABLE at a lower value.

K/A

Small Break LOCA
Knowledge of the interrelations between the small break LOCA and the following: S/Gs. (CFR: 41.7/45.7) (RO - 3.0)

K/A Match Analysis

The question forces the applicant to identify an expected set of S/G parameters during a SBLOCA accident condition.

Answer Choice Analysis

A. CORRECT. (1) With no adjustment to AFW flow control valves, AFW flow will INCREASE as the S/Gs continue to depressurize. This will tend to cause S/G levels to INCREASE. (2) Even with no adjustment to steam dump controls (or atmospheric controls), the S/Gs will continue to depressurize (perhaps at a slower rate)

B. INCORRECT. (1) is Correct, (2) is INCORRECT. Even with no adjustment to steam dump controls, the S/Gs will continue to depressurize. The distractor is plausible if the candidate loses sight that the cooldown will continue during the "pause."

C. INCORRECT. (1) is incorrect, levels will rise as AFW increases against a lowering S/G backpressure. Distractor is plausible if the candidate focuses on the fact that levels were initially stable, and assumes that they will stay that way. (2) is the correct option.

D. INCORRECT. Both (1) and (2) are incorrect; see above analyses.

Supporting References

-Surry procedure 1-ES-1.2, "POST LOCA COOLDOWN AND DEPRESSURIZATION," especially the continuous action page, and p.10 (steps 16 and 17: SI reduction steps)

-Steam Tables (for parameter validity).

References Provided to Applicant

Steam Tables.

Answer: A

3. 000011EK3.12 4

Unit 1 initial plant conditions:

Time = 0800

Reactor power = 100%

Current plant conditions:

Time = 0801

RCS pressure = 700 psig decreasing

RCS Subcooling = 20 ^{0}F decreasing

Based on the above conditions after transition to 1-E-1 (Loss of Reactor or Secondary Coolant): (1) which ONE of the following actions are directed by 1-E-1 with regard to RCPs and (2) what is the reason for that action?

A. (1) Secure RCPs
(2) To reduce the depletion of RCS water inventory.

B. (1) Secure RCPs
(2) To prevent the possibility of flywheel fracture if the pump continues to operate without coolant.

C. (1) Maintain RCPs operating
(2) They provide core cooling by pumping a 2 phase mixture through the core and loops.

D. (1) Maintain RCPs operating
(2) To prevent phase separation in the core region which could lead to core uncovery.

K/A

Large Break LOCA / 3

Knowledge of the reasons for the following responses as they apply to the Large Break LOCA: Actions contained EOP for emergency LOCA (large break).

K/A Match Analysis

Question requires knowledge of RCP trip criteria during a LB LOCA.

Answer Choice Analysis

A. Correct. Per 1-E-1, Step 1, if RCS subcooling is less that 30 ^{0}F, Stop all RCPs. As stated in Lesson Plan ND-95.3-LP-7, E.1.b, for large break LOCAs, the operation of the RCP's has little, if any effect during mitigation and recovery.

B. Incorrect. 1st part is correct. second part is plausible because in the lesson plan (same paragraph as in A), the RCP is maintained running for a short period of time to prevent flywheel fracture. However it would seem more likely to fracture during two phase operation.

C. Incorrect. With subcooling < 30 ^{0}F, RCPs are secured. Plausible because if subcooling were >30 ^{0}F, it would be correct.

D. Incorrect, With subcooling < 30 ^{0}F, RCPs are secured. Plausible because if subcooling were >30 ^{0}F, it could be correct depending on additional criteria.

Supporting References
ND-95.3 LP-7, Obj A, E

References Provided to Applicant
none

Answer: A

4. 000015AA2.09 1

Current Unit 1 plant conditions:

- Reactor power is at 33%
- MCR annunciator 1C-F2 “RCP BRG HI TEMP” alarm is lit.

The latest temperature readings obtained from TR-1-448 are as follows:

Temperatures (^{o}F)	**RCP 'A'**	**RCP 'B'**	**RCP 'C'**
Upper thrust bearing	181	178	163
Lower thrust bearing	173	193	172
Upper radial bearing	143	163	146
Lower radial bearing	172	189	158
Motor stator	285	273	302
Lower bearing seal water	153	183	167
Seal water	207	184	185

Given the above temperature readings, which one of the following correctly states the RCP, if any, that exceeds an ACTION LEVEL limit in Attachment 2, RCP Parameters, of 1-AP-9.00, RCP Abnormal Conditions?

A. RCP ‘A’.

B. RCP ‘B’.

C. RCP ‘C’.

D. No RCPs are exceeding an ACTION LEVEL limit.

K/A
Reactor Coolant Pump Malfunctions
Ability to determine and interpret the following as it applies to **Reactor Coolant Pump Malfunctions (Loss of RC Flow)**: When to secure RCPs on high stator temperatures.

K/A Match Analysis
Requires applicant to recognize that the RCP 'C' motor stator temperature has exceeded the temperature that requires tripping of the pump.

Answer Choice Analysis
A. In-Correct but plausible since the alarm point for high seal water temperature is 195ºF. However, the temperature where the ACTION LEVEL is reached occurs at 225ºF.
B. In-Correct but plausible since the alarm point for lower thrust bearing temperature is 175ºF. However, the temperature where the ACTION LEVEL is reached occurs at 195ºF.
C. Correct – The ACTION LEVEL for motor stator is when the temperature reaches 300ºF.
D. In-Correct but plausible if the applicant was not familiar with the ACTION LEVEL temperatures.

Supporting References
ND-88.1-LP-6, Reactor Coolant Pumps, Rev. 019 - Obj E
1-AP-9.00, RCP Abnormal Conditions, Rev. 20

References Provided to Applicant
none

Answer: C
5. 000022AG2.4.11 1
Initial plant conditions are as follows:

- Unit 1 is at 100% power.
- Unit 2 is at 100% power.
- Charging pump 1B is out of service with motor removed.

Current plant conditions are as follows:

- Charging pump 1A tripped.
- Attempts to start charging pump 1C have been unsuccessful from its normal power supply.
- The crew has entered 1-AP-8.00 "Loss of Normal Charging Flow".

- No indications of Unit 1 CH system leakage are observed.
- Charging pumps 2B and 2C are available and capable of auto-starting.
- RCP seal injection flow is zero.
- Component cooling water flow to the thermal barrier is normal.

Given the above conditions, which one of the following would be consistent with the actions required by 1-AP-8.00?

A. Trip Unit 1 reactor. Do NOT trip Unit 2 reactor.
   Cross-connect charging with Unit 2 per 1-AP-8.00.

B. Trip Unit 1 reactor. Do NOT trip Unit 2 reactor.
   Cross-connecting charging with Unit 2 is NOT permitted per 1-AP-8.00.

C. Trip Unit 1 and Unit 2 reactors.
   Cross-connect charging with Unit 2 per 1-AP-8.00.

D. Trip Unit 1 and Unit 2 reactors.
   Cross-connecting charging with Unit 2 is NOT permitted per 1-AP-8.00.

K/A:
022AG.2.4.11
Loss of Reactor Coolant Makeup
Knowledge of abnormal condition procedures as it relates to: Loss of Reactor Coolant Makeup.

K/A MATCH ANALYSIS:
The question focuses on recognizing the conditions within AP-8.00 for cross-connecting with the other unit's Charging System and the associated actions.

ANSWER CHOICE ANALYSIS:
A. In-Correct but plausible since these are required actions for cross-connecting with the other unit's charging system. However, Unit 2 is also required to be tripped.

B. In-Correct but plausible since tripping only the affected unit would be correct if Unit 1's charging system had a leak. Also, all the required conditions are in place to allow cross-connecting charging system.

C. Correct – Based on the loss of all charging on Unit 1, no signs of leaks, and an intact system as well as the availability of charging pumps on Unit 2, this choice contains all the actions per AP-8.00 for cross-connecting the charging systems including tripping both units.

D. In-Correct but plausible since tripping both units would be correct. Also, all the

required conditions are in place to allow cross-connecting charging system.

REFERENCES:
ND-88.3-LP-2, Charging and Letdown, Rev. 015

AP-8.00, Loss of Normal Charging Flow, Rev. 011

Answer: C
6. 000025AK1.01 1
Unit 1 initial conditions:
Time = 1500
Reactor shutdown for 60 hours following 16 months at 100%
RCS temperature = 320 ^{O}F
1B RHR pump OOS
RHR Cooldown is in progress

Current conditions:
Time = 1530
1A RHR pump trips

Based on the above conditions, which one of the following is the first method directed by 1-AP-27 (LOSS OF DECAY HEAT REMOVAL CAPABILITY) to restore decay heat removal from the core?

A. Establish Forced Feed Cooling with charging pumps.

B. Establish SG level between 11% and 65% in at least one SGs for natural circulation.

C. Increase steaming rate to establish an RCS temperature band of 280 ^{O}F and 290 ^{O}F for reflux boiling.

D. Start any RCP to establish forced circulation.

K/A
Loss of RHR System / 4.
Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: Loss of RHRS during all modes of operation.

K/A Match Analysis
Requires knowledge of implications of Loss of DHR on plant systems in order to restore decay heat removal.

Answer Choice Analysis
A. Incorrect: 3 Charging pumps are not required. Per AP-27 only one Charging

pump is started. A second may be started to increase flow to 550 gpm (Req per Attachment 7). Plausible because using charging pumps is a possible procedure path and depending on RCS pressure and time since shutdown, it could require multiple charging pumps.

B. Incorrect. This level is only required in <u>one</u> SG if natural circulation is established, if that doesn't work, reflux boiling is established. Plausible because if Reflux boiling is used, it would be correct.

C. Incorrect. This temperature is not required for natural circulation. Plausible because if Reflux boiling is used, it would be correct.

D. Correct. Per AP-27 Attachment 4, Attempt to start an RCP.

<u>Supporting References</u>
AP 27 (Loss of Decay Heat Removal Capability) Attachment 4 & 5

<u>References Provided to Applicant</u>
none

Note to licensee; Will SG levels at this point in the procedure support this question?
Answer: D

7. 000027AK3.03 1

Unit 1 initial conditions:
- Time = 1000
- Reactor power = 100%
- 1RCPCV 1455B (Pzr Spray Valve) fails open
- RCS pressure = 2100 psig decreasing

Current conditions:
- Time = 1001
- RCS pressure = 1900 psig decreasing
- 1-E-0 REACTOR TRIP OR SAFETY INJECTION in progress

Based on the above conditions: (1) state which one of the following actions is directed by 1-E-0 if the Pzr Spray Valve can not be closed and (2) state the reason why?

A. (1) Secure RCP A
(2) To reduce the rate of RCS pressure decrease.

B. (1) Secure RCP A
(2) To prevent inadvertent Safety Injection.

C. (1) Secure RCP C

(2) To reduce the rate of RCS pressure decrease.

D. (1) Secure RCP C
(2) To prevent inadvertent Safety Injection.

K/A
Pressurizer Pressure Control System Malfunction / 3
Knowledge of the reasons for the following responses as they apply to the Pressurizer Pressure Control Malfunctions: Actions contained in the EOP for Pzr PCS malfunction.

K/A Match Analysis
Requires knowledge of reasons for actions taken in the EOP for Pzr Pressure control malfunction.

Answer Choice Analysis
A. Incorrect: 1RCPCV 1455B is supplied by the 1C RCP. 2nd part is correct.
B. Incorrect: 1RCPCV 1455B is supplied by the 1C RCP. 2nd part is incorrect because it will not prevent SI. 2nd part is plausible because it will delay the SI initiation.
C. Correct: 1RCPCV 1455B is supplied by the 1C RCP. The RCP is secured to reduce the spray flow and therefore the rate of RCS pressure decrease.
D. Incorrect: 1st part is correct. 2nd part is incorrect because it will not prevent SI. 2nd part is plausible because it will delay the SIinitiation.

Supporting References
1-E-0 Step 7
LP ND-95.3-LP3, Obj A

References Provided to Applicant
none

Answer: C
8. 000029EA1.02 1
Unit 1 Initial Conditions:

- An Anticipated Transient Without SCRAM (ATWS) occurred at 100% power.
- The reactor remains at power. An operator is inserting control rods in manual.
- SI is NOT actuated.
- CHG flow was verified to be 77 GPM, and the BATP was placed in FAST.

Current conditions:

- Valve 1-CH-MOV-1350 will not open. An operator reports that the valve appears to be mechanically bound.
- Neither PORV automatically opened when RCS pressure rose above 2335 psig. An operator was able to manually open ONLY one PORV to control RCS pressure.

Based on the current conditions, which one of the following correctly identifies (1) the next required action to initiate emergency boration, in accordance with 1-FR-S.1, "RESPONSE TO NUCLEAR POWER GENERATION/ATWS," AND (2) the required action to operate the PORV as specified in FR-S.1?

A. (1) Manually actuate SI to provide for maximum flowrate injection into the RCS.
(2) Allow the RCS pressure to lower to 2210 psig before closing the PORV.

B. (1) Place switches for CH-MOV-1115B and -1115D to OPEN and switches for CH-MOV-1115C and -1115E to CLOSE.
(2) Allow the RCS pressure to lower to 2210 psig before closing the PORV.

C. (1) Manually actuate SI to provide for maximum flowrate injection into the RCS.
(2) Close the PORV when RCS pressure equals 2335 psig and lowering.

D. (1) Place switches for CH-MOV-1115B and -1115D to OPEN and switches for CH-MOV-1115C and -1115E to CLOSE.
(2) Close the PORV when RCS pressure equals 2335 psig and lowering.

K/A

Anticipated Transient Without SCRAM (ATWS)
Ability to operate and monitor the following as they apply to an ATWS: charging pump suction valves from RWST operating switch.
(CFR 41.7/45.5/45.6) (RO - 3.6)

K/A Match Analysis

The question requires the RO applicant to understand the intent of FR-S.1 step 5, and to know how the valve switches identified in the answers correspond to aligning CHG pump suction to the RWST.

Answer Choice Analysis

A. INCORRECT. (1) The distractor is plausible because actuating SI may trip the reactor, and will provide for increased flowrate into the RCS; however the Surry lesson plan for FR-S.1 specifically states that the operations team should NOT manually actuate SI in an attempt to get the reactor to trip. The SI would also trip off the MBFPs,

which may be providing the heat sink function (not stated in the question stem). (2) This distractor is also incorrect, because the step as read in FR-S.1 states: " ...open PRZR PORVs and block valves as necessary until PRZR pressure less than 2335 psig." This part is plausible, because the WOG background document to FR-S.1 specifically states that the intent of this step is to close the PORV when primary pressure drops to 200 psi below the PORV pressure setpoint to allow increased injection flow. Surry just happens to not follow this step as written in the WOG.

B. INCORRECT. Part (1) is the correct answer; FR-S.1 step 5.b RNO states that the operator is required to either "Manually align CHG pump suctions to RWST OR put the blender mode selector switch in the BORATE position and start the blender." The step is re-written to specify the individual switch combinations to fully meet the K/A. Part (2) is incorrect, as detailed in the analysis of A. above.

C. INCORRECT. See analyses for A. and B. above.

D. CORRECT. See analyses for A. and B. above.

Supporting References

-Surry procedure 1-FR-S.1, "Response to Nuclear Power Generation," rev 25 p. 3; step 5.b) RNO.

-Surry lesson plan ND-95.3-LP-36, rev. 13, especially p. 13

-WOG background document for FR-S.1, HP-Rev 2, p. 80 and 81.

References Provided to Applicant
none

Answer: D
9. 000038EA1.21 1
Unit 1 initial plant conditions:
Reactor power = 100%
Pzr level = 52 % constant
VCT Level = 40% decreasing
AP/16 (EXCESSIVE RCS LEAKAGE) initiated

Current Unit 1 conditions:
Leak determined to be SGTL in the 1A SG = 39 gpm increasing slowly
Transition from 1-AP-16 to 1-AP-24 (MINOR SG TUBE LEAK)

Based on the above conditions: (1) how will charging pump amps change as 1CH-FCV-1122 (Charging Flow Control Valve) opens to maintain pressurizer level and (2) is a reactor trip required per 1-AP-16 or 1-AP-24?

A. (1) pump amps will increase
(2) Yes

B. (1) pump amps will increase
(2) No

C. (1) pump amps will decrease
(2) Yes

D. (1) pump amps will decrease
(2) No

K/A
Steam Gen. Tube Rupture / 3
Ability to operate and monitor the following as they apply to a SGTR. Charging pump ammeter and running indicator.

K/A Match Analysis
Requires knowledge of how charging is controlled during a SGTR and charging pump indications.

Answer Choice Analysis

A. Incorrect: 1st part is correct. As charging flow increases to maintain pressurizer level, more work is performed so pump amps increase. 2nd part is plausible because the leak rate is significant enough to require a rapid plant shutdown.
B. Correct. As charging flow increases to maintain pressurizer level, more work is performed so pump amps increase. The leak rate that requires a reactor trip per AP16/24 is 50 gpm.
C. Incorrect: 1st part is plausible because pump discharge pressure will decrease as the discharge valve opens (common misconception) 2nd part is plausible because the leak rate is significant enough to require a rapid plant shutdown.
D. Incorrect: 1st part is plausible because pump discharge pressure will decrease as the discharge valve opens (common misconception) 2nd part is correct.

Supporting References
AP/16 Step 4,
AP/24 Step 1,
ND-93.3-LP-7 D.2.a, Obj B

References Provided to Applicant
none

Answer: B
10. 000040AA2.05 1
Which one of the following completes the below statements?

(1) The parameters used for SI Termination criteria in 1-E-2, "FAULTED STEAM GENERATOR ISOLATION," are RCS subcooling AND _____

AND

(2) The parameters used for SI Termination criteria in 1-ECA-2.1, "UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS?" are RCS subcooling AND _____?

A. (1) E-2: ONLY RCS pressure and PRZR level.
(2) ECA-2.1: RVLIS indication greater than values specified in a table (based upon number of running RCPs).

B. (1) E-2: ONLY RCS pressure and PRZR level.
(2) ECA-2.1: RCS pressure and PRZR level.

C. (1) E-2: Secondary heat sink, RCS pressure, and PRZR level.
(2) ECA-2.1: RVLIS indication greater than values specified in a table (based upon number of running RCPs).

D. (1) E-2: Secondary heat sink, RCS pressure, and PRZR level.
(2) ECA-2.1: RCS pressure, and PRZR level.

K/A

Steam Line Rupture
Ability to determine and interpret the following as they apply to the Steam Line Rupture: When ESFAS systems may be secured.
(CFR: 43.5/45.13) (RO - 4.1)

K/A Match Analysis

The question gives the applicant an opportunity to demonstrate understanding of the differences behind the various criteria used for SI Termination (when ESFAS systems may be secured) given various cases of steam line rupture (the 'standard' E-2 case and the 'all faulted generators' case of ECA-2.1).

Answer Choice Analysis

A. INCORRECT. (1) Lists the SI Termination criteria in E-2 but omits the secondary heat sink portion. (2) is the SI Termination criteria as used in the procedure FR-P.1, "RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITION." This is a plausible, yet incorrect, answer, because the large RCS cooldown caused by an 'all faulted generators' condition (as in ECA-2.1) may cause a RED or ORANGE path in the INTEGRITY critical safety function. However, this is not what the question stem asks for.

B. INCORRECT. (1) incorrect as per the analysis of A. above, (2) is the correct SI Termination criteria from ECA-2.1; basically the exact same as E-2, without the heat sink portion.

C. INCORRECT. (1) is correct, (2) is the FR-P.1 criteria.

D. CORRECT. see above analysis.

Supporting References

-Surry procedure 1-E-2, "FAULTED STEAM GENERATOR ISOLATION," rev 15, p. 6 (step 8).

-Surry procedure 1-ECA-2.1, "UNCONTROLLED DEPRESSURIZATION OF ALL STEAM GENERATORS," rev. 29, p. 9 (step 12), p. 12-15 (step 17-23)

-Surry procedure 1-FR-P.1, "RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITION," rev 16, p. 5 (step 6)

References Provided to Applicant

None

Answer: D
11. 000055EK1.02 1
Unit 1 initial conditions:
Station Blackout occurs
1-ECA-0.0 (LOSS OF ALL AC POWER) in progress
SGs are to be depressurized to allow SI accumulators to inject into the RCS.

Based on the above conditions, which one of the following: (1) correctly states the maximum cooldown rate allowed during this depressurization and (2) the basis for that rate ?

A. (1) 25 ^{o}F/Hr
(2) To prevent a steam bubble from forming in the reactor vessel head.

B. (1) 25 ^{0}F/Hr
(2) To minimize RCS inventory loss.

C. (1) 100 ^{0}F/Hr
(2) To prevent a steam bubble from forming in the reactor vessel head.

D. (1) 100 ^{0}F/Hr
(2) To minimize RCS inventory loss.

K/A
Station Blackout / 6
Knowledge of the operation implications of the following concepts as they apply to the Station Blackout: Natural circulation cooling.

K/A Match Analysis
Requires knowledge of limitations placed on the plant during natural circulation as a result of a station blackout. RO knowledge because information is contained in EOP Note & Cautions.

Answer Choice Analysis
A. Incorrect: 1st part is plausible because 25 ^{0}F/Hr in the cooldown rate limit for natural circulation cooldown. 2nd part is plausible because it is the reason for limiting the cooldown rate during a natural circulation cooldown.
B. Incorrect: 1st part is plausible because 25 ^{0}F/Hr in the cooldown rate limit for natural circulation cooldown. 2nd part is correct.
C. Incorrect: 1st part is correct. 2nd part is plausible because it is the reason for limiting the cooldown rate during a natural circulation cooldown.
D. Correct: Note before ECA 0-0 Step 21 states that the SG's should be depressurized at the maximum controllable rate, not to exceed an RCS cooldown rate of 100 ^{0}F/Hr. This to minimize RCS Inventory loss.

Supporting References
ND-95.3-LP-17 Step 33. Obj: A
1-ECA-0.0 Step 21 Caution
1-ES-0.2 (Nat Circ Cooldown) Step 6

References Provided to Applicant
none

Answer: D

12. 000056AA1.29 1
Initial Conditions:

- Surry Unit 2 is in day 25 of a scheduled refueling outage.
- A Loss of All AC Power occurred on Unit 1, which was operating at 100% power.
- Control room operators implemented 1-ECA-0.0, "LOSS OF ALL AC POWER."
- Safety Injection (SI) initiated on Unit 1.
- Power was restored to one Unit 1 safeguards power train from an Emergency Diesel Generator.

Current conditions:

- Unit 1 control room operators are implementing 1-ECA-0.2, "LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED," and are performing the step that directs restoration of SW to CC HXs IAW 0-AP-12.01, "LOSS OF INTAKE CANAL LEVEL."
- Service water is isolated to all recirculation spray (RS) heat exchangers on both units.
- 2 ESW pumps are running.

Note: In 0-AP-12.01, "time zero" is defined as that time intake canal level reaches 23.5 FT.

Based on the current conditions, which one of the following correctly identifies (1) the 0-AP-12.01 restriction, if any, on CC HX SW flow from one hour after "time zero" to eight hours after "time zero," AND (2) the 0-AP-12.01 restriction on CC HX SW flow after eight hours have elapsed from "time zero?"

(Reference provided)

A. (1) There are no restrictions on CC HX SW flow.
(2) Crosstie CC. 3 CC HXs allowed with SW outlet valves 19 turns open for each HX.

B. (1) There are no restrictions on CC HX SW flow.
(2) 2 CC HXs allowed with SW outlet valves 19 turns open for each HX.

C. (1) Maximum allowable flow is one CC HX outlet SW valve fully open.
(2) Crosstie CC. 3 CC HXs allowed with SW outlet valves 19 turns open for each HX.

D. (1) Maximum allowable flow is one CC HX outlet SW valve fully open.
(2) 2 CC HXs allowed with SW outlet valves 19 turns open for each HX.

K/A

Loss of Offsite Power
Ability to operate and/or monitor the following as they apply to the Loss of Offsite Power: CCW heat exchanger temperature control valves.
(CFR: 41.7/45.5/45.6) (RO - 2.7)

K/A Match Analysis

The question requires the RO applicant to demonstrate knowledge to operate CCW heat exchanger SW valves in a post-loss of offsite power situation.

Answer Choice Analysis

A. INCORRECT. The CAUTION on p. 9 of 0-AP-12.01 specifically states, "from one hour from time zero to eight hours, the maximum allowable SW flow is one CC HX outlet SW valve fully open." The distractor is plausible, because from time zero to one hour, there is no restriction on SW flow (which is also stated in this same CAUTION). Using the tables provided in the given reference (p. 6-8 of 0-AP-12.01), the applicant should be able to easily determine that the flow limitation is 3 CCW HXs with valves throttled 19 turns open (as specified in step 23, both units considered to be "at power.")

B. INCORRECT. See analysis of A. above. 2 CCW HX with valves throttled 19 turns open is incorrect, but plausible, because it is the answer from step 21 with both units considered "at power," and because it is the answer from step 23 for the "at power" unit.

C. CORRECT. See analysis for A. and B. above.

D. INCORRECT. See analyses for A. and B. above.

Supporting References

-1-ECA-0.2, "LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED," rev. 15, p. 9.

-0-AP-12.01, "LOSS OF INTAKE CANAL LEVEL," rev. 25, especially p. 6-9.

References Provided to Applicant

- AP-12.01 pages 6, 7, and 8.

Answer: C
13. 000057AA2.20 2
Unit 2 is performing a plant startup with the reactor at 5% power when a loss of Vital Bus 1 occurs.

Which one of the following correctly describes: (1) the direct effect of the loss of Vital Bus I on the RPS system and (2) the energizing of the Source Range NI's if a shutdown were to occur?

A. An RPS trip signal is generated / Re-instatement of SRNIs will occur automatically.

B. An RPS trip signal is generated / Re-instatement of SRNIs will NOT occur automatically.

C. An RPS trip signal is NOT generated / Re-instatement of SRNIs will occur automatically.

D. An RPS trip signal is NOT generated / Re-instatement of SRNIs will NOT occur automatically.

K/A

Loss of Vital AC Inst. Bus.
Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: Interlocks in effect on loss of ac vital electrical instrument bus that must be bypassed to restore normal equipment operation.

K/A Match Analysis

Requires knowledge of how a loss of vital power affects interlocks.

Answer Choice Analysis

A. Incorrect: 1st part is correct. 2nd part is plausible because for Vital Bus 3 or 4, it would be correct.
B. Correct. The IR channel signal will fail HIGH on a loss of Vital bus I. With power <
P 10 this generates a high power trip (½) > 35% IR channels. The IR channel failed
high will also prevent the 2/2 signal <5 x 10^{-11} amps required to automatically energize the SR NI's when shutting down the reactor.
C. Incorrect: 1st part is plausible because if power were greater than 10%, it would be correct. 2nd part is plausible because for Vital Bus 3 or 4, it would be correct.
D. Incorrect: 1st part is plausible because if power were greater than 10%, it would be
correct. 2nd part is correct.

Supporting References

ND.93.2-LP-3 (Intermediate Range NI's) Obj: D
ND-93.2-LP-2 (Source Range NI's) Obj: C
ND-93.3-LP-5 (Vital Power)

References Provided to Applicant
none

Answer: B
14. 000058AG2.1.23 1
Unit 1 Initial Conditions:

- 100% power.

Current conditions:

- A complete loss of DC bus 1B has occurred.

Based on the current conditions, which one of the following correctly identifies (1) the required action in 1-AP-10.06, "LOSS OF DC POWER," for the generator output breakers, AND (2) the impact on Reactor Coolant Pump (RCP) operations?

A. (1) A control room operator is NOT required to manually open the Generator output breakers.
(2) 'A' RCP will stop, 'B' and 'C' RCPs will remain running.

B. (1) A control room operator is NOT required to manually open the Generator output breakers.
(2) 'A' RCP will remain running, 'B' and 'C' RCPs will stop.

C. (1) A control room operator is required to manually open the Generator output breakers.
(2) 'A' RCP will stop, 'B' and 'C' RCPs will remain running.

D. (1) A control room operator is required to manually open the Generator output breakers.
(2) 'A' RCP will remain running, 'B' and 'C' RCPs will stop.

K/A

Loss of DC Power
Ability to perform specific system and integrated plant procedures during all modes of plant operation (as related to Loss of DC Power)
(CFR: 41.10/43.5/45.2/45.6) (RO - 4.3)

K/A Match Analysis

The RO applicant must demonstrate knowledge of the effects of a loss of 1B DC bus, and how recovery actions are complicated by output generator and RCP operation.

Answer Choice Analysis

****

NOTE TO SURRY: Please validate this question against the action verb "VERIFY" in step 3 of 1-AP-10.06--e.g. if operators automatically match flags and always perform the RNO step, this question may need to be modified.

****

A. INCORRECT. Incorrect about the generator output breakers, but plausible because it would be true for a loss of 1A DC Bus. Incorrect about the RCP operation, but plausible because it would be true for a loss of 1A DC Bus.

B. INCORRECT. See analysis for A. above. Correct RCP operations, as specified in 125 VDC lesson plan on p. 18.

C. INCORRECT. Correct output breaker description, as specified in the lesson plan on p. 17. Incorrect RCP ops.

D. CORRECT. See above analyses.

Supporting References

- Surry lesson plan ND-90.3-LP-6, "125VDC DISTRIBUTION," rev. 14, p. 12-20.

- 1-AP-10.06, "LOSS OF DC POWER," rev. 13, p.

References Provided to Applicant
none

Answer: D
15. 00005AA2.01 1
Unit 1 initial conditions;
Reactor power = 90% decreasing
Shutdown in progress for refueling

Current plant conditions:
Reactor power = 70% decreasing
1G-B5 COMPUTER PRINTOUT ROD CONT SYS in alarm
QPTR = 1.05% increasing [HAVE LICENSEE VERIFY UNITS FOR QPTR]
The power decrease is stopped

(1) Based on the above indications, which one of the following conditions has occurred

and (2) what is the minimum QPTR that requires operator action when exceeded IAW Tech Spec 3.12 CONTROL ROD ASSEMBLIES AND POWER DISTRIBUTION LIMITS?

A. (1) Stuck control rod (2) 2%

B. (1) Stuck control rod
(2) 5%

C. (1) Control rod bank inserted past insertion limit
(2) 2%

D. (1) Control rod bank inserted past insertion limit
(2) 5%

K/A
Inoperable/Stuck Control Rod
Ability to determine and interpret the following as they apply to the Inoperable/Stuck Control Rod: Stuck or inoperable rod from in-core and ex-core NIs, in-core or loop temperature measurements.

K/A Match Analysis
Requires applicant to interpret ex-core NI data (QPTR) to determine that a control rod is stuck.

Answer Choice Analysis
A. Correct: A stuck control will cause QPTR to increase as the rest of the control rod bank moves. Per Tech Spec 3.12, QPTR of > 2% requires operator action.

B. Incorrect: 1st part is correct. 2nd part is incorrect because per Tech Spec 3.12, a QPTR of > 2% requires operator action. 2nd part is plausible because per T.S. 3.12 Bases, a measured QPTR of 2% ensures an actual QPTR due to instrument sensitivity and error could be 5%.

C. Incorrect: 1st part is incorrect because a control rod bank moving together will not produce QPTR issues. 1st part is plausible because a control rod bank inserted past its insertion limit will cause neutron flux distribution issues (flux difference). 2nd part is correct.

D. Incorrect: 1st part is incorrect because a control rod bank moving together will not produce QPTR issues. 1st part is plausible because a control rod bank inserted past its insertion limit will cause neutron flux distribution issues (flux difference). 2nd part is incorrect because per Tech Spec 3.12, a QPTR of > 2% requires operator action. 2nd part is plausible because per T.S. 3.12 Bases, a measured QPTR of 2% ensures an actual QPTR due to instrument sensitivity and error could be 5%.

Supporting References
1G-B5 COMPUTER PRINTOUT ROD CONT SYS
TS 3.12

References Provided to Applicant
none

Answer: A
16. 000065AA1.03 1
Unit 1 initial conditions:
Loss of Instrument air AP/40 (NON-RECOVERABLE LOSS OF INSTRUMENT AIR) initiated
E-0 REACTOR TRIP OR SAFETY INJECTION initiated
RCPs are secured - Natural Circulation established

Current plant conditions:
Instrument air restored
Per AP/39 (NATURAL CIRCULATION OF RCS) it is desired to restart a RCP.

Based on the above conditions, which one of the following correctly states (1) the status of CC to RCPs (with no operator action) and (2) what is an acceptable Seal Injection flow for RCP restart?

A. (1) CC supplying RCPs
(2) 8 gpm

B. (1) CC supplying RCPs
(2) 6 gpm

C. (1) CC is NOT supplying RCPs
(2) 8 gpm

D. (1) CC is NOT supplying RCPs
(2) 6 gpm

K/A
Loss of Instrument Air
Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: Restoration of sytems served by instrument air when pressure is regained.

K/A Match Analysis
Requires knowledge of how CC flow to RCPs is impacted upon a loss of IA and how restoration is accomplished when IA is returned.

Answer Choice Analysis

A. Correct: CC valves that failed closed on a loss of IA will automatically re-open when Instrument Air pressure returns. Pre-requisite for RCP restart is establish RCP Seal Injection Flow 6.5 gpm to 13 gpm.
B. Incorrect: 1st part is correct. 2nd part is plausible because seal injection flow is reduced to 6 gpm during loss of Instrument Air (AP/40).
C. Incorrect: CC will automatically return when IA pressure returns. 1st part is plausible because when a "trip" valve closes, it usually has to be reset before it can be opened. 2nd part is correct.
D. Incorrect: CC will automatically return when IA pressure returns. 1st part is plausible because when a "trip" valve closes, it usually has to be reset before it can be opened. 2nd part is plausible because seal injection flow is reduced to 6 gpm during loss of Instrument Air (AP/40).

Supporting References

1-OP-RC-001(RCP Operation)

References Provided to Applicant

none

utility to verify and supply documentation for CC operation with loss/return of IA
Answer: A
17. 000077AA2.07 1
Unit 1 Initial Conditions:

- 100% Power
- Both Megawatts and Megavars start to oscillate.
- System Operator reports that the regional grid is experiencing dynamic instabilities.

Current conditions:

- 230 KV system voltage is 218 KV
- 500 KV system voltage is 502 KV

Based on the current conditions, which one of the following identifies (1) the required operator action for continued voltage regulator operation, as specified in 0-AP-10.18, "RESPONSE TO GRID INSTABILITY," AND (2) the required entry into Technical Specification (TS) 3.16, "Emergency Power System?"

A. (1) Place the voltage regulator - in MANUAL.
(2) Entry into TS 3.16 is required ONLY for the 230 KV system. Entry into TS 3.16 for the 500 KV system is NOT required.

B. (1) Place the voltage regulator - in MANUAL.
(2) Entry into TS 3.16 is required for BOTH the 230 KV system AND the 500 KV system.

C. (1) Verify the voltage regulator - in AUTO, or place the voltage regulator in AUTO if possible.
(2) Entry into TS 3.16 is required for BOTH the 230 KV system AND the 500 KV system.

D. (1) Verify the voltage regulator - in AUTO, or place the voltage regulator in AUTO if possible.
(2) Entry into TS 3.16 is required ONLY for the 230 KV system. Entry into TS 3.16 for the 500 KV system is NOT required.

K/A

Generator Voltage and Electric Grid Disturbances
Ability to determine and interpret the following as they apply to Generator Voltage and Electric Grid Disturbances: operational status of offsite circuit.
(CFR: 41.5 and 43.5/45.5,45.7, and 45.8) (RO - 3.2)

K/A Match Analysis

The question requires the candidate to know that operation with the generator voltage regulator in AUTO is desired state during grid fluctuations, and to know the setpoints where 230 KV system voltage and 500 KV system voltage drop low enough to require entry into the applicable Technical Specification. RO applicants are required to know entry conditions into Technical Specifications; and the high-voltage 230 KV and 500 KV system minimum voltages for operability are NOT contained in the Technical Specification 3.16 bases, which may have made this question a SRO-only question.

Answer Choice Analysis

A. INCORRECT. (1) Surry procedure 0-AP-10.18, "RESPONSE TO GRID INSTABILITY," specifically requires voltage regulators to be in AUTO if possible. Placing the V/R to MANUAL is plausible, in that this is an operator action for a V/R failure, and that the applicant may (incorrectly) think that the V/R in MANUAL will dampen any electrical transients on the generator. Therefore, part (1) of distractor A. is incorrect. (2) 0-AP-10.18 lists the low voltage setpoints as follows: (a) 230 KV system: 220 KV; (b) 500 KV system: 505 KV. Therefore, BOTH voltages as given in the question stem are below the setpoint, and both systems must be declared INOPERABLE. Therefore, part (2) of distractor A. is also incorrect. Distractor part (2) plausibility is enhanced by the fact that the question stem system voltage is actually

greater than 500 KV.

B. INCORRECT. As specified in the analysis for A. above, the answer for (1) is incorrect, the answer for part (2) is the correct choice.

C. CORRECT. See above analysis.

D. CORRECT. See above analysis.

Supporting References

-Surry procedure 0-AP-10.18, "RESPONSE TO GRID INSTABILITY," rev 8, especially steps 6 and 7 on p. 4-5.

References Provided to Applicant

None

Answer: C
18. 0000W/E04 EA2.1 1
Unit 1 Initial Conditions:

- A loss-of-coolant accident (LOCA) occurred from 100% power.
- Operators are implementing 1-ECA-1.2, "LOCA OUTSIDE CONTAINMENT."

Current conditions:

- Operators have completed all the steps in ECA-1.2 that (a) attempt to verify proper valve alignment, and (b) locate and isolate the leak.
- RCS pressure continues to DECREASE.
- Annunciator 1B-F3, SFGS AREA SUMP HI LEVEL, is LIT.
- 1-VG-RM-110, VENT VENT 2 GAS, is below the HIGH setpoint, but is rapidly trending UP.
- RM-GW-130-1, PROCESS VENT STK PART, is below the HIGH setpoint, but is rapidly trending UP.

Based on the current conditions, which one of the following:

(1) is the NEXT overall mitigating strategy that should be implemented, as specified by ECA-1.2,
AND
(2) a release path to the environment _____ exist?

A. (1) Depressurize S/Gs to inject accumulators.
(2) DOES

B. (1) Conserve RWST inventory.
(2) DOES

C. (1) Depressurize S/Gs to inject accumulators.
(2) DOES NOT

D. (1) Conserve RWST inventory.
(2) DOES NOT

K/A

LOCA Outside Containment
Ability to determine and interpret the following as they apply to the LOCA Outside Containment: Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.
(CFR: 43.5 / 45.13) (RO - 3.6)

K/A Match Analysis

The question allows applicants to demonstrate their ability to follow procedures by knowing the overall mitigating strategy inherent in ECA-1.2, given an operationally valid situation, and using systems knowledge to identify an abnormal situation (radioactive release). The question is RO-level knowledge because it is testing the applicant's understanding of the overall mitigating strategy of an EOP, as specified by the major action categories of the EOP.

Answer Choice Analysis

A. INCORRECT. (1) The next mitigating strategy/major action category is to transition to ECA-1.1 to conserve RWST inventory. Plausible because depressurizing S/Gs to inject accumulators would rapidly cool-down and depressurize the RCS, as well as assisting the operator in maintaining RCS inventory that is being lost via the LOCA. (2) is the correct option; a release path exists by definition because the LOCA is outside containment; also, the radiation monitors are not yet in alarm and ventilation has not yet isolated.

B. CORRECT. (1) The next step in the ECA-1.2 procedure would be to transition to ECA-1.1 to conserve RWST inventory. This is stated explicitly on p. 6 of the lesson plan for ECA-1.2. (2) is also correct, as described for A. above.

C. INCORRECT. (1) see analysis for A. above; (2) is incorrect regarding the existence of a release path. Plausible if the applicant believes that radiation levels below the alarm setpoint do not count as a release path, or that realignment of ventilation when radiation levels exceed the alarm setpoint will secure (vs. mitigate) the

release path.

D. INCORRECT. (1) is correct, (2) incorrect [as detailed above].

Supporting References

- Surry procedure 1-ECA-1.2; complete procedure.

- Westinghouse (WOG) background document for ECA-1.2, rev 2, especially p. 6

- the second part of this question is modified from question W/E04EK1.2 that appeared on the 2006 Surry RO exam.

- Surry lesson plant ND-95.3-LP-21, "ECA-1.2, LOCA OUTSIDE CONTAINMENT," rev. 7, p. 6.

References Provided to Applicant

none

Answer: B
19. 0000W/E05 EA1.1 1
Unit 1 initial conditions:
Loss of Main and Auxiliary Feedwater
EOP transition from E-0 to 1-FR-H.1(RESPONSE TO LOSS OF SECONDARY HEAT SINK)

Current plant conditions:
The 1A SG is to be depressurized to establish condensate flow to the SG.

Based on the above conditions: (1) why is steam flow limited during the depressurization and (2) what actions are directed by 1-FR-H.1 if condensate flow to the 1A SG does not occur with SG pressure = 550 psig?

A. (1) To prevent main steam line isolation
(2) Initiate SI to commence RCS Bleed & Feed.

B. (1) To prevent main steam line isolation
(2) Depressurize 1B or 1C SG to establish condensate flow.

C. (1) To limit cooldown rate to < 100 ^{0}F/Hr
(2) Initiate SI to commence RCS Bleed & Feed.

D. (1) To limit cooldown rate to < 100 ^{0}F/Hr
(2) Depressurize 1B or 1C SG to establish condensate flow.

K/A
Inadequate Heat Transfer - Loss of Secondary Heat Sink
Ability to operate and / or monitor the following as they apply to the (Loss of Secondary Heat Sink): Components, and functions of control and safety systems including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

K/A Match Analysis
Requires knowledge of the operations of system components and how to operate them in such a manner as to avoid inadvertent system activation.

Answer Choice Analysis
A. Correct: IAW 1-FR-H.1 note, steam flow during depressurization is limited to 1 x10E6 PPH to prevent Main Steam Line Isolation. If one SG depressurization is unsuccessful, the RCS Feed and Bleed is the next major action.
B. Incorrect: 1st part is correct. 2nd part is incorrect because depressurizing the A SG was not successful. 2nd part is plausible because if the A SG was not able to be depressurized, it would be correct.
C. Incorrect: 1st part is plausible because in other portions of the EOP rapid depressurization of the SGs are limited to 100 ^{0}F/Hr. 2nd part is correct.
D. Incorrect: 1st part is plausible because in other portions of the EOP rapid depressurization of the SGs are limited to 100 ^{0}F/Hr. 2nd part is plausible because if the A SG was not able to be depressurized, it would be correct.

Supporting References
ND-95.3-LP-41Step 13-18, Obj: B 1-FR-H.1(Response to Loss of Secondary Heat Sink)

References Provided to Applicant
none

Answer: A
20. 0003A3.04 1
Initial Unit 1 Conditions:
- Power Range NIs are: N-41=35.3%, N-42=35.2%, N-43=34.7%, N-44=35.6%
- Delta T Power is 34%
- All four RCPs are operating

Current Unit 1 Conditions:
- The speed sensing relay actuates on RCP 1A
- RCP 1A frame vibrations indicate 10 mils

Based on the above conditions, which one of the following (1) correctly states the status of the Unit 1 reactor AND (2) correctly states that status of the 1C-H4, RCP FRAME DANGER, alarm?

A. (1) Unit 1 reactor automatically trips.
   (2) 1C-H4 is illuminated.

B. (1) Unit 1 reactor does NOT automatically trips.
   (2) 1C-H4 is illuminated.

C. (1) Unit 1 reactor automatically trips.
   (2) 1C-H4 is NOT illuminated.

D. (1) Unit 1 reactor does NOT automatically trips.
   (2) 1C-H4 is NOT illuminated.

K/A:
003A3.04
Reactor Coolant Pump
Ability to monitor automatic operation of the reactor coolant pumps including RCS flow.

K/A MATCH ANALYSIS:
The question requires the applicant to know how the low RCS flow (as caused by an automatic RCP trip) affects the reactor status, thereby testing knowledge of automatic operation of RCPs including RCS low flow.

ANSWER CHOICE ANALYSIS:

A.	Correct. With ¾ PRNIs > 35%, the reactor will trip on low flow. 1C-H4 alarms at 5 mils.
B. B. A.	Incorrect. Rx will trip with ¾ PRNIs >35%. Plausible because one PRNI is less than 35% and delta-T power is less than 35%. Could also be plausible if applicant has a misconception of the power level at which the low flow trip is blocked.
C. C. B.	Incorrect. The second part is incorrect because frame vibes are > 5 mils. Plausible because 1C-H5, RCP SHAFT DANGER, alarms at 20 mils. Therefore, if the applicant confuses the two vibration alarms for an RCP, they would conclude that NOT illuminated is correct.
D. D. C.	Incorrect. See above.

REFERENCES:

1C-H4, RCP FRAME DANGER, Revision 3
1C-H5, RCP SHAFT DANGER, Revision 2
ND-93.3-LP-16, Permissive/Bypass/Trip Status Lights, Revision 9
ND-88.1-LP-6-DRR, Reactor Coolant Pumps, Revision 19

Answer: A
21. 0003A4.08 1
Current plant conditions on Unit 1 are as follows:

- Reactor power is 100%.
- A complete loss of containment instrument air has occurred.
- Pressure is slowly bleeding off the affected valve actuators.

Which one of the following describes the effect on cooling flow through the reactor coolant pump (RCP) thermal barrier heat exchangers and RCP motor coolers?

Cooling flow through…

A. the RCP thermal barrier heat exchangers AND motor coolers will decrease.

B. the RCP thermal barrier heat exchangers will decrease. Cooling flow through the motor coolers will be unaffected.

C. the RCP thermal barrier heat exchangers will be unaffected. Cooling flow through the motor coolers will decrease.

D. the RCP thermal barrier heat exchangers AND motor coolers will be unaffected.

K/A
Reactor Coolant Pumps
Ability to manually operate and/or monitor in the control room **Reactor Coolant Pumps** *cooling water flow*.

K/A Match Analysis
Requires applicants to monitor the effects on cooling water flow (CCW) to the Reactor Coolant Pumps as a result of the loss of Containment Instrument Air.

Answer Choice Analysis (*See drawing contained in supporting documentation.)*
A. In-Correct but plausible since the Motor Cooler Isolation Return Valves (1-CC-TV-105A,B,C) fail closed on a loss of air as do the Combined Thermal Barrier CC Return Valves (1-CC-TV-140A,B). However, the 1-CC-TV-105 valves are located outside containment, are supplied from the Station Instrument Air system and will not be affected by the loss of Containment Instrument Air. 1-CC-TV-140A is supplied by the Containment Instrument Air and will drift closed on a loss of Containment Instrument Air.
B. Correct –The Thermal Barrier Isolation valves (1-CC-TV-120A,B,C) are supplied

by
the Containment Instrument Air system and fail open on loss of air, which would maintain flow through Thermal Barrier Heat Exchangers. However,
1-CC-TV-140A
will drift closed on a loss of Containment Instrument Air, which would result in cooling flow to the Thermal Barrier Heat Exchangers decreasing. The 1-CC-TV-105 valves are located outside containment, are supplied from the Station Instrument Air system and will not be affected by the loss of Containment Instrument Air (CAI).

C. In-Correct but plausible if the applicant believes that the 1-CC-TV-140 valves fail in the same manner as the 1-CC-TV-120 valves (i.e., open). The Motor Cooler Isolation Return Valves (1-CC-TV-105A,B,C) fail closed on a loss of air. However,
the 1-CC-TV-105 valves are located outside containment, are supplied from the Station Instrument Air system and will not be affected by the loss of Containment Instrument Air (CAI).

D. In-Correct but plausible since the 1-CC-TV-120 valves (inside containment) and the
1-CC-TV-105 valves (outside containment) will remain open. However, the 1-CC-TV-140A will drift closed on a loss of Containment Instrument Air.

Supporting References
ND-88.5-LP-1, Component Cooling System, Rev. 23 - Obj C

References Provided to Applicant
none

Answer: B

22. 0004A4.08 1

Current plant conditions are as follows on Unit 2:

- Reactor power is 100%
- Pressurizer level is 50% and slowly lowering.
- 2-FCV-1122, charging flow controller, is operating in AUTO and at 100% output.
- VCT level is 45% and stable.
- Seal injection flow to each of RCPs is in the range of 8 – 8.5 gpm.
- Charging pump 2A is running with 2B available, but not running.

Which one of the following manual actions would have an affect that would help reverse the Pressurizer level trend?

A. Start an additional charging pump.

B. Place 2-FCV-1122 in MANUAL and raise output to 100%.

C. Lower loading on controller for 2-HCV-1186, RCP seal injection supply valve.

D. Place makeup mode selector switch in MANUAL and place the makeup mode control switch to START.

K/A
Chemical and Volume Control System
Ability to manually operate and/or monitor in the control room **Chemical and Volume Control System:** *Charging*.

K/A Match Analysis
Requires applicant to know that the charging flow controller has a different control band in manual mode versus automatic mode.

Answer Choice Analysis
A. In-Correct but plausible since starting an additional pump would increase flow. However, the flow limiter associated with the Charging Flow Control valve will limit flow to 115 gpm.
B. Correct – In "Auto" the flow range on FCV-1122 is clamped at a minimum of 25 gpm and a maximum of 115 gpm. When the controller is placed in manual the flow range can be adjusted from 0 up to ~132 gpm under normal operating conditions.
C. In-Correct but plausible since closing the RCP Seal Injection Supply valve would make more water available to the Charging Header. However, the flow limiter associated with the Charging Flow Control valve will limit flow to 115 gpm.
D. In-Correct but plausible since increasing level in the VCT would raise the suction pressure which would result in a higher flow for the same discharge pressure on the charging pump. However, the flow limiter associated with the Charging Flow Control valve will limit flow to 115 gpm.

Supporting References
ND-93.3-LP-7, Pressurizer Level Control System, Rev. 09 - Obj D
ND-88.3-LP-2, Charging and Letdown, Rev. 025

References Provided to Applicant
none

Answer: B
23. 0005 G2.4.9 2
Unit 1 initial conditions:
Time = 1000
Cold Shutdown ~ 50 hours after an extended full power run
1RC-LR-105 = 12.0 ft.

1A RHR pump operating
1 RC-LI-100A = 2000 gpm

Current conditions:
Time = 1010
RHR HX LO FLOW annunciator, 1B-G6 in alarm
1-RH-FI-1605 = 50 to 150 gpm oscillating
1A RHR pump amps oscillating
1RC-LR-105 = 12.0 ft.
1-AP-27(LOSS OF DECAY HEAT REMOVAL CAPABILITY) initiated

Based on the above conditions, which one of the following actions are directed by 1AP/27 to restore RHR flow after securing the 1A RHR pump?

A. Vent the 1A RHR pump, restart the 1A RHR pump and verify the RHR heat sink.

B. Vent the 1B RHR pump, start the 1B RHR pump and verify the RHR heat sink.

C. Close RHR FCVs, then re-start the 1A RHR pump and throttle to the pre-event rate.

D. Close RHR FCVs, then start the 1B RHR pump and throttle to the pre-event rate.

K/A
Residual Heat Removal
Knowledge of low power / shutdown implications in accident (e.g. loss of coolant accident or loss of residual heat removal) mitigation strategies.

K/A Match Analysis
Requires knowledge of loss of RHR mitigation strategies

Answer Choice Analysis
A. Incorrect: Plausible because this would be correct if the 1B RHR pump were not available.
B. Incorrect: Plausible because there is air in the common suction line and there would be some air getting to the 1B RHR pump so it would make sense to vent the 1B RHR pump prior to starting.
C. Incorrect: 1st part is correct. 2nd part is plausible because the 1A RHR pump is restarted if the 1B RHR pump is unavailable.
D. Correct: Correct per AP/27

Supporting References
AP/27 Step 11,
ND-95.2-LP-12 Obj: D/F
1-OP-RH-001

References Provided to Applicant
none

Answer: D
24. 00068 AG2.4.42 1
Plant conditions:
Unit 1 = 100%
Unit 2 = shutdown for refueling
MAIN CONTROL ROOM OXYGEN MONITOR alarms
Fire is recognized in the rear area of the control room
0-AP-20.00, MAIN CONTROL ROOM INACCESSIBILITY is initiated
Operators proceed to the Auxiliary Shutdown Panel with FCA procedures

Based on the above conditions, which one of the following states equipment that is operated from the Auxiliary Shutdown Panel as directed by AP-20?

A. CC pumps

B. RHR pumps

C. CH- HCV-1311 Aux Pressurizer Spray

D. CH-FCV-1122 Charging Flow Controller

K/A
Control Room Evac.
Knowledge of emergency response facilities.

K/A Match Analysis
Requires knowledge of equipment used during Control Room Evacuation.

Answer Choice Analysis
A. Incorrect: Plausible because it is directed by AP/20 to be operated locally if needed, but it is not operated from the ASP.
B. Incorrect: Plausible because it is directed by AP/20 to be operated locally if needed, but it is not operated from the ASP.
C. Incorrect: Plausible because charging is controlled from the ASP and Pzr heaters are controlled in Manual (won't de-energize as pressure increases)
D. Correct:

Supporting References
AP/20 MAIN CONTROL ROOM INACCESSIBILITY
ND-93.4-LP5 Obj: B&D

References Provided to Applicant
none

Answer: D
25. 0006K1.05 1
Initial plant conditions on Unit 1 are as follows:

- Reactor tripped following an inadvertent SI.

Current plant conditions on Unit 1 are as follows:

- 1-ES-1.1, SI Termination, has been initiated.
  - SI signal has been reset
  - Actions have been completed to re-establish charging and letdown.
- Seal leakoff flow from each RCP is ~3 gpm.
- PRT level shows a slow rising trend.
- VCT level is 43% and stable.
- Reactor Pressure is stable at 2235 psig.
- Tailpipe temperatures are 105°F and stable.

Which one of the following would be consistent with the above conditions?

A. 1-CH-MOV-1381 “Seal Return Header Isolation Valve” is closed causing 1-CH-RV-1382B “Seal Return Heat Exchanger Relief Valve” to lift.

B. A component cooling water leak has developed on the Seal Return Heat Exchanger causing 1-CH-RV-1382B “Seal Return Heat Exchanger Relief Valve” to lift.

C. 1-CH-MOV-1381 “Seal Return Header Isolation Valve” is closed causing 1-CH-RV-1382A “Seal Return Relief Valve” to lift.

D. A component cooling water leak has developed on the Seal Return Heat Exchanger causing 1-CH-RV-1382A “Seal Return Relief Valve” to lift.

K/A
Emergency Core Cooling System
Knowledge of the physical connections and/or cause-effect relationships between **Emergency Core Cooling** and the following systems: *RCP seal injection and return*.

K/A Match Analysis
Requires applicant to recognize that 1-CH-MOV-1381, Seal Return Header Isolation Valve, closes on a SI (ECCS) actuation signal.

Answer Choice Analysis

A. In-Correct but plausible since 1-CH-MOV-1381 closes on an SI actuation and must be manually reopened. However, 1-CH-RV-1382B is downstream of the 1-CH-MOV-1381 and would not be experiencing system pressure. Also 1-CH-RV-1382B relieves to the VCT not the PRT.

B. In-Correct but plausible since component cooling water is at a higher pressure than Seal Water Return pressure and could cause 1-CH-RV-1382B to lift and relieve. However, a leak on the Heat Exchanger would be indicated by an increasing level in the VCT not the PRT.

C. Correct –1-CH-MOV-1381 closes on an SI actuation and must be manually reopened. As pressure in the seal return line builds, leak-off flow would decrease until the pressure reached 150 psig causing 1-CH-RV-1382A to lift and relieve to the PRT.

D. In-Correct but plausible since component cooling water is at a higher pressure than Seal Water Return pressure. However, 1-CH-RV-1382A is upstream of 1-CH-MOV-1381 and would not be affected by a component cooling water leak.

Supporting References
ND-88.3-LP-3, Seal Injection, Rev. 07 - Obj F

References Provided to Applicant
none

Answer: C
26. 0007A1.03 1
Unit 1 Initial Conditions:

- 100% Power
- Pressurizer Relief Tank (PRT) level is 62% and STABLE
- A leaking pressurizer code safety valve has been identified.

Current conditions:

- A PRT annunciator has just alarmed
- PRT level is 76% and INCREASING
- PRT temperature is 126 °F and INCREASING
- PRT pressure is 3 psig and INCREASING

Based on the current conditions, which one of the following identifies (1) the parameter that caused the PRT annunciator, AND (2) chemistry will sample the PRT gas space when PRT level INCREASES by 5% because large changes in PRT level can result in an undesirable atmosphere in the PRT gas space _____(2)_____?

A. (1) High level
(2) due to PG O2 off-gassing as PRT temperature changes.

B. (1) High temperature
(2) due to PG O2 off-gassing as PRT temperature changes.

C. (1) High level
(2) due to H2 concentration potentially exceeding 4% in the process vent.

D. (1) High temperature
(2) due to H2 concentration potentially exceeding 4% in the process vent.

K/A

System 007: Pressurizer Relief Tank/Quench Tank System (PRTS)
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including: monitoring quench tank temperature.
(CFR: 41.5 / 45.5) (RO - 2.6)

K/A Match Analysis

Given a plausible scenario that would require monitoring of PRT parameters (leaking safety valve), the candidate must demonstrate ability to recognize the correct abnormal parameter and the correct reason chemistry samples the PRT gas space when PRT level and temperature changes.

Answer Choice Analysis

****

NOTE TO SURRY: Please explain what is meant by "PG O2." We may need to spell this out on the test instead of just symbols (what is in the procedure).

****

A. INCORRECT. Surry procedure 1-OP-RC-011, "Pressurizer Relief Tank Operations," table in step 5.1.1, identifies high level at 83% and high temperature at 125 °F. Therefore, high temperature is the correct choice. 72% is plausible, because this is greater than 75% (a possible high level setpoint). (2) is the correct choice, taken word-for-word from the precautions & limitations, and notes in section 5.2 of 1-OP-RC-011.

B. CORRECT. See above explanation; high temperature is correct, correct reason for chemistry sample.

C. INCORRECT. (1) is incorrect as per the above. (2) is also incorrect, but plausible.

Another precaution and limitation (4.9) in 1-OP-RC-011 states: "...these limits ensure Hydrogen concentration in the Process Vent remains below the 4% flammability limit."

D. INCORRECT. (1) is correct choice, (2) incorrect as per the above.

Supporting References

- Surry UFSAR Table 4.1-3, "PRESSURIZER AND PRESSURIZER RELIEF TANK DESIGN DATA." REV 36, P. 4.1-21.

-Surry Unit 1 procedure 1-OC-RC-011, "PRESSURIZER RELIEF TANK OPERATIONS." REV 23, p. 7,8,9.

References Provided to Applicant
none

Answer: B
27. 0008 A2.04 1
Unit 1 plant conditions:
Reactor power = 100%
Charging flow = 50 gpm increasing
CC-RI-105 alarms
CC surge tank level = 64% increasing
1-AP-16.00 EXCESSIVE RCS LEAKAGE is initiated

Based on the above conditions, which one of the following describes where the excess volume in the CC system will go to and (2) what actions are directed first by 1-AP-16.00 to attempt to isolate the leak?

A. (1) The process vent system
(2) Isolate letdown and place excess letdown in service

B. (1) The process vent system
(2) Isolate thermal barrier on suspected RCP and increase surveillance

C. (1) The auxiliary building sump
(2) Isolate letdown and place excess letdown in service

D. (1) The auxiliary building sump
(2) Isolate thermal barrier on suspected RCP and increase surveillance

K/A
Component Cooling Water System (CCWS)
Ability to (a) predict the impacts of the following malfunctions or operations on the

CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: PRMS alarm.

K/A Match Analysis
Requires knowledge of the impact of a PRMS alarm on CCW system operations and how the AP mitigates the event.

Answer Choice Analysis
A. Incorrect: 1st part is incorrect because the vent to the process vent system closed when the rad monitor alarmed. 1st part is plausible because if there were no alarm,
it would be correct. 2nd part is correct per AP/16.

B. Incorrect: 1st part is incorrect because the vent to the process vent system closed when the rad monitor alarmed. 1st part is plausible because if there were no alarm,
it would be correct. 2nd part is incorrect because AP/16 isolates systems in order of most likely to stop the leak. Letdown is isolated before the RCPs are examined for suspected leakage. 2nd part is plausible because it is performed by AP/16.

C. Correct: When the rad monitor alarms, the CC surge tank vent to the process vent system closes. As pressure increases in the system due to the RCS leak, system pressure increases to 35 psig when the tank relief lifts and discharges to the AB sump. Indications are entry conditions for AP/16 EXCESSIVE RCS LEAKAGE which isolates systems in order of most likely to stop the leak. Letdown is isolated before the RCPs are examined for suspected leakage.

D. Incorrect: 1st part is correct. 2nd part is incorrect because AP/16 isolates systems
in order of most likely to stop the leak. Letdown is isolated before the RCPs are examined for suspected leakage. 2nd part is plausible because it is performed by AP/16.

Supporting References
ND-93.5-LP1
ND-88.5-LP-1 Obj: A
1-AP-16.00 (Excessive RCS Leakage)

References Provided to Applicant
none

Answer: C
28. 0008 G2.1.7 1
Unit 1 Initial Conditions:

- 75% Power at End-of-Life (EOL) conditions.
- Rod Control is in AUTOMATIC.
- VCT automatic makeup controls are set to the current RCS boron concentration.
- Excess Letdown is in service in preparation for removing Normal Letdown from service.

Current conditions:

- Component Cooling (CC) surge tank level is slowly DECREASING at 1% every 5 minutes. [** SURRY VALIDATE A CORRECT SLOW LEVEL RATE **]
- Reactor power is slowly INCREASING.

Based on the current conditions and assuming NO other operator actions, which one of the following identifies (1) the location of the CC leak that would cause the current conditions, AND (2) the expected impact of the CC leak on rod control?

	LEAKING COMPONENT	**ROD CONTROL**
A.	(1) Seal Water Heat Exchanger	(2) Rods will step IN.
B.	(1) Seal Water Heat Exchanger	(2) Rods will step OUT.
C.	(1) Excess Letdown Heat Exchanger	(2) Rods will step IN.
D.	(1) Excess Letdown Heat Exchanger	(2) Rods will step OUT.

K/A

008 Component Cooling Water (CCW)
Generic 2.1.7: Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. (CFR: 41.5 / 43.5 / 45.12 / 45.13) (RO - 4.4)

K/A Match Analysis

The RO applicant, given an operationally valid condition and a change in reactor behavior, will demonstrate the ability to analyze the condition and predict the operational impacts of the condition.

Answer Choice Analysis

A. CORRECT. A leak in the Seal Water HX will leak to the CVCS system, which will result in a dilution and inward rod motion.

B. INCORRECT. Plausible as a leak in the Seal Water HX will leak to the CVCS

system which will result in a dilution. Rods will move in not out, but plausible if the candidate believes reactor power has increased due to rod motion out, or if the candidate believes that the nuclear power/turbine power mismatch circuitry will actuate before the Tave/Tref mismatch.

C. INCORRECT. Plausible as Excess Letdown has just been placed in service, but with the pressure in this HX, the RCS will leak to the CCW system. Rods will move in.

D. INCORRECT. Plausible as Excess Letdown has just been placed in service, but with the pressure in this HX, the RCS will leak to the CCW system. Rods will move in not out, but plausible if the candidate believes reactor power has increased due to rod motion out, or if the candidate believes that the nuclear power/turbine power mismatch circuitry will actuate before the Tave/Tref mismatch.

Supporting References

-Surry lesson plan ND-88.3-LP-2, "Charging and Letdown," rev. 15.

References Provided to Applicant
none

Answer: A
29. 000W/E07 EK2.1 1
Unit 1 Initial Conditions:

- A small break loss of coolant accident (SBLOCA) has occurred.
- 'A' and 'B' RCPs are running, 'C' RCP is stopped.
- CETs = 730 ^{o}F
- RVLIS Full Range = 35%
- RCS Subcooling = 12 ^{o}F

Current conditions:

- Control room operators are ready to depressurize all S/Gs to 200 psig.
- An electrical transient causes a loss of all CCW flow.
- 'B' RCP seal delta-P DECREASES until it reads offscale low.
- 'B' RCP seal leakoff flow DECREASES until it reads offscale low.

(1) Based on the INITIAL conditions, which one of the following identifies the procedure that was required to be entered, AND (2) based on CURRENT conditions which one of the following states the required action(s) for continued RCP operation, in accordance with that procedure?

A. (1) FR-C.1, RESPONSE TO INADEQUATE CORE COOLING
(2) Maintain 'A' RCP running, secure 'B' RCP.

B. (1) FR-C.1, RESPONSE TO INADEQUATE CORE COOLING
(2) Maintain both 'A' and 'B' RCPs running.

C. (1) FR-C.2, RESPONSE TO DEGRADED CORE COOLING
(2) Maintain 'A' RCP running, secure 'B' RCP.

D. (1) FR-C.2, RESPONSE TO DEGRADED CORE COOLING
(2) Maintain both 'A' and 'B' RCPs running.

K/A
Degraded Core Cooling
Knowledge of the interrelations between the (Degraded Core Cooling) and the following: components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.
(CFR: 41.7/45.7) (RO - 3.6)

K/A Match Analysis
Requires the applicant to demonstrate knowledge of failure modes (loss of RCP support systems) and Degraded Core Cooling situation.

Answer Choice Analysis

A. INCORRECT. FR-C.1 is incorrect - see SFST flow chart. Second part of distractor is plausible as well, because 'B' RCP support conditions have been lost and the 'A' RCP will be maintained running to provide for some core cooling.

B. INCORRECT. See above.

C. INCORRECT. Correct procedure, wrong RCP operations.

D. CORRECT. See above explanations.

Supporting References

- 1-FR-C.2, "RESPONSE TO DEGRADED CORE COOLING," REV 21, p. 2, 5, and 10.

References Provided to Applicant
none

Answer: D
30. 000W/E08 EK1.3 1
Unit 1 initial conditions:
Reactor power = 100%
1A Steam Line Pressure HI/LOW in alarm

Reactor trip

Current plant conditions:
1-E-2 (FAULTED STEAM GENERATOR ISOLATION) initiated

Based on the above conditions, which one of the following states (1) the parameter used to stabilize RCS temperature per 1-E-2 and (2) why this parameter is used?

A. (1) Hottest RCS Loop Th
(2) it ensures that a steam relief from the intact SG will not contribute to the RCS cooldown following a secondary side break

B. (1) Hottest RCS Loop Th
(2) to minimize RCS re-pressurization which reduces the magnitude of Pressurized Thermal Shock (PTS)

C. (1) Hottest RCS Loop Tc
(2) to minimize RCS re-pressurization which reduces the magnitude of Pressurized Thermal Shock (PTS)

D. (1) Hottest RCS Loop Tc
(2) it ensures that steam relief from the intact SG will not contribute to the RCS cooldown following a secondary side break

K/A
RCS Overcooling - PTS / 4
Knowledge of the operational implications of the following concepts as they apply to the (Pressurized Thermal Shock): annunciators and conditions indicating signals, and remedial actions associated with the (Pressurized thermal Shock).

K/A Match Analysis
Requires knowledge of conditions having to do with PTS, and reasons for actions taken to mitigate.

Answer Choice Analysis
A. Correct: Per 1-E-2 FAULTED STEAM GENERATOR ISOLATION, Step 7, the PORV is adjusted to stabilize RCS Temperature per Attachment 2 which used the "Maximum Hot Leg Temperature". Reason given in Lesson is to ensure that steam relief from the intact SG will not contribute to the RCS cooldown.

B. Incorrect: 1st part is correct. 2nd part is plausible because minimizing any re-pressurization will reduce the tensile stress that contributes to PTS.

C. Incorrect: 1st part is plausible because a Tc is more representative of actual SG pressure. 2nd part is plausible because minimizing any re-pressurization will reduce

the tensile stress that contributes to PTS

D. Incorrect: 1st part is plausible because a Tc is more representative of actual SG pressure. 2nd part is correct.

Supporting References
1-E-2 FAULTED STEAM GENERATOR ISOLATION
95.3-LP-12 B.10.D Obj: A

References Provided to Applicant
none

Answer: A
31. 000W/E13 EK2.2 1
Unit 1 initial conditions:
Reactor power = 100%
Condenser vacuum = 25" Hg decreasing rapidly

Current plant conditions:
1-ES-0.1 (REACTOR TRIP RESPONSE) in progress
Condenser vacuum = 0" Hg

Based on the above conditions, which one of the following states (1) the temperature at which the RCS would be maintained with no operator action and (2) what temperature the RCS is directed to be maintained by 1-ES-0.1

A. (1) 550 ^{0}F
(2) 547 ^{0}F

B. (1) 550 ^{0}F
(2) 535 ^{0}F

C. (1) 556 ^{0}F
(2) 535 ^{0}F

D. (1) 556 ^{0}F
(2) 547 ^{0}F

K/A

Steam Generator Over-pressure /4
Knowledge of the interrelations between the (Steam Generator Overpressure) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems and relations between the proper operations of the systems to the operation of the facility.

K/A Match Analysis
Requires knowledge of interrelationships of the SG overpressure protection and heat removal from the RCS/SGs.

Answer Choice Analysis

A. Correct:SG PORV setpoint = 1035 psig + 15 psi = 1050 psia = 550 ^{0}F. Per 1-ES-0.1, monitor RCS temperature stable at or trending to 547 ^{0}F.
B. Incorrect: 1st part is correct. 2nd part is plausible because 535 ^{0}F is used as criteria in shifting from AFW to Main Feedwater (Step 16).
C. Incorrect: 556 ^{0}F would be correct if PORV were failed (556 ^{0}F coincides with the setpt of the lowest SG Safety valve). 2nd part is plausible because 535 ^{0}F is used as criteria in shifting from AFW to Main Feedwater (Step 16).
D. Incorrect: 556 ^{0}F would be correct if PORV were failed (556 ^{0}F coincides with the setpt of the lowest SG Safety valve). 2nd part is correct.

Supporting References
ND89.1-LP-2 Obj B.
1-ES-0.1 (REACTOR TRIP RESPONSE)

References Provided to Applicant
none

Answer: A
32. 000W/E16 EA1.1 1
Unit 1 Initial Conditions:

- A loss of coolant accident (LOCA) has occurred.
- Operators have completed 1-ES-1.3, "TRANSFER TO COLD LEG RECIRCULATION," and are waiting for 8 hours to elapse to initiate hot leg recirculation.

Current conditions:

- Only one containment spray pump is running.
- Operators have entered 1-FR-Z.3, "RESPONSE TO HIGH CONTAINMENT RADIATION," based on a YELLOW path in the CONTAINMENT critical safety function.

Based on the current conditions, which ONE of the following identifies (1) the reason FR-Z.3 requires operators to verify proper NaOH addition to the containment spray AND (2) after checking proper NaOH system response, what is the NEXT overall mitigating strategy in FR-Z.3?

A. (1) NaOH addition will enhance the iodine absorption capacity of the spray.
(2) Check recirculation spray systems.

B. (1) NaOH addition will ensure cladding oxidation will not exceed 17% of nominal clad thickness, as required by 10CFT50.46, "ECCS Acceptance Criteria."
(2) Check recirculation spray systems.

C. (1) NaOH addition will ensure cladding oxidation will not exceed 17% of nominal clad thickness, as required by 10CFT50.46, "ECCS Acceptance Criteria."
(2) Notify plant response personnel of containment radiation level.

D. (1) NaOH addition will enhance the iodine absorption capacity of the spray.
(2) Notify plant response personnel of containment radiation level.

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K/A

High Containment Radiation
Ability to operate and/or monitor the following as they apply to the (High Containment Radiation): components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features. (CFR: 41.7/45.5/45.6) (RO - 3.1)

K/A Match Analysis

The question requires the RO applicant to demonstrate knowledge relating to (1) the components and functions of the NaOH system, which is one of the few systems incorporated into FR-Z.3, and (2) the major action categories of FR-Z.3.

Answer Choice Analysis

A. INCORRECT. The first part (1) of this distractor is the correct reason for checking proper NaOH system operation. I am using language as found in the standard WOG STS B 3.6.7, which states, "Radioiodine in its various forms is the fission product of primary concern in the evaluation of a DBA. It is absorbed by the spray from the containment atmosphere. To enhance the iodine absorption capacity of the spray, the spray solution is adjusted to an alkaline pH that promotes iodine hydrolysis, in which iodine is converted to nonvolatile forms. Because of its stability when exposed to radiation and elevated temperature, sodium hydroxide (NaOH) is the preferred spray additive." The second part (2) of this distractor is incorrect; the major action category in FR-Z.3 after checking activity removal systems is to "Notify plant response personnel of radiation level." However, the second part distractor is plausible because, in procedure FR-Z.1, the next steps after checking for NaOH system operation are to ensure proper

recirculation spray system operation.

B. INCORRECT. See analysis for A. above. However, the (1) distractor is plausible, because the language is taken from 10CFR50.46 regarding oxidation of the zirconium-based cladding, and NaOH addition promotes a basic pH/is also associated with chemistry concerns. The second part of the distractor is the same incorrect but plausible distractor as analyzed in A. above.

C. INCORRECT. Incorrect reason for NaOH addition, but correct part (2) for the major action category. See analysis for A. above.

D. CORRECT. See above analyses.

Supporting References

- Critical Safety Function status tree F-5 for CONTAINMENT, rev. 002

- 1-FR-Z.1, "RESPONSE TO CONTAINMENT HIGH PRESSURE," rev. 17, p. 2

- 1-FR-Z.3, "RESPONSE TO CONTAINMENT HIGH RADIATION LEVEL," rev. 7, p. 2.

- 1-ES-1.3, "TRANSFER TO COLD LEG RECIRCULATION," rev. 17, esp. p. 10.

-10CFR50.46(b)(2), "ECCS Acceptance Criteria," p. 762.

- SPS Lesson Plan ND-91-LP-5, "Containment Spray System," rev 16, especially notes for slide 17.

- SPS Lesson Plan ND-95.3-LP-50, "FR-Z.3, RESPONSE TO CONTAINMENT HIGH RADIATION," rev 6 (all).

- NUREG 1431, Standard Westinghouse Technical Specifications, rev. 3, Bases to 3.6.7, "Spray Additive System."

References Provided to Applicant
none

Answer: D
33. 0010 A3.02 3
Unit 1 plant conditions:
Plant runback occurs from 100% to 90%
RCS HI PRESSURE ALARM lit

Based on the above conditions, which one of the following states (1) the status of the Pressurizer Spray valves and (2) what the maximum Pressurizer spray flow rate is based on?

(Pressure reference setpoint signal equals 2235 psig)

A. (1) Full Open
(2) To prevent the PORVs from opening during a 10% step load decrease.

B. (1) Full Open
(2) To prevent exceeding the capacity of the PORVs during a load rejection from 100% power.

C. (1) Modulated Open (< 100%)
(2) To prevent exceeding the capacity of the PORVs during a load rejection from 100% power.

D. (1) Modulated Open (< 100%)
(2) To prevent the PORVs from opening during a 10% step load decrease.

K/A
Pressurizer Pressure Control
Ability to monitor automatic operation of the Pzr PCS, including: PZR pressure.

K/A Match Analysis
Requires knowledge of automatic operation of the Pzr pressure control system and the bases for spray flow.

Answer Choice Analysis
A. Correct: Pressurizer High Pressure alarm setpt = 2310 psig and when the reference signal setpt = 2235, the spray valves will be full open @ 2305 psig. Design of the Pzr spray valves is to prevent the PORVs from opening during a 10% step load decrease.
B. Incorrect: 1st part is correct. 2nd part is plausible because the PORV's will open on a load rejection from 100%.
C. Incorrect: 1st part is plausible because if the reference setpoint signal were higher, it could be correct. 2nd part is plausible because the PORV's will open on a load rejection from 100%.
D. Incorrect: 1st part is plausible because if the reference setpoint signal were higher, it could be correct. 2nd part is correct.

Supporting References
ND-93.3-LP-5 Obj B

References Provided to Applicant
none

Answer: A
34. 0012 A4.07 1
Unit 1 plant conditions:
Reactor power = 50% power
RPS testing in progress
1RTA closed
1RTB A is closed
1RTB B is open

Based on the above conditions, if an operator closes (attempts to close) RTB B which one of the following states (1) the status of the RPS trip bypass breakers and (2) the status of the Reactor?

A. (1) 1RTB A and 1RTB B will open
(2) The reactor will trip

B. (1) 1RTB A and 1RTB B will open
(2) The reactor will NOT trip

C. (1) Only 1RTB B will open
(2) The reactor will trip

D. (1) Only 1RTB B will open
(2) The reactor will NOT trip

K/A
Reactor Protection
Ability to manually operate and/or monitor in the control room: M/G set breakers.

K/A Match Analysis
Requires knowledge of the manual operation of the RPS MG Set Breakers.

Answer Choice Analysis
A. Incorrect: 1st part is correct. 2nd part is plausible because if RTA were open, it would be correct.
B. Correct: If both bypass breakers are closed at the same time, each bypass breaker's trip coil will be energized, and both bypass breakers will open. As long as both RTA and RTB are closed initially, there is no signal that will cause them to open.
C. Incorrect: 1st part is plausible because the breakers are interlocked such that both breakers can not be closed at the same time. 2nd part is plausible because if RTA were open, it would be correct.

D. Incorrect: 1st part is plausible because the breakers are interlocked such that both breakers can not be closed at the same time.

Supporting References
ND-93.3-LP10 Obj: B

References Provided to Applicant
none

Answer: B
35. 0012 K1.05 1
Unit 1 initial conditions:
Reactor power = 5%
Pressurizer Pressure transmitter (PT 456) failed low (I&C investigating)

Current plant conditions:
Pressurizer Pressure transmitter (PT 455) fails low

Based on the current plant conditions, which one of the following correctly describes (1) the effect on Main Control Room Narrow Range Pressurizer Pressure indication and (2) the effect on the reactor?

A. (1) Indicated pressure = actual pressure
(2) A Reactor Trip will occur

B. (1) Indicated pressure = actual pressure
(2) A Reactor Trip will NOT occur

C. (1) Indicated pressure fails low
(2) A Reactor Trip will occur

D. (1) Indicated pressure fails low
(2) A Reactor Trip will NOT occur

K/A
Reactor Protection:
Knowledge of the physical connections and/or cause-effect relationships between the RPS and the following systems: ESFAS

K/A Match Analysis
Requires knowledge of how an ES initiation (SI) affects the RPS system.

Answer Choice Analysis

A. Correct: Pzr Pressure indication receives a signal from PT - 444 & 445. PT 455 & 456 failing low will cause an SI (2/3) to occur which will in turn, cause a reactor trip.

B. Incorrect: 1st part is correct. 2nd part is plausible because the "Low Pzr Pressure" reactor trip is not in effect at 5%.

C. Incorrect: 1st part is plausible because if it were PT 445, it would be correct. 2nd part is correct.

D. Incorrect: 1st part is plausible because if it were PT 445, it would be correct. 2nd part is plausible because the "Low Pzr Pressure" reactor trip is not in effect at 5%.

Supporting References

ND-93.3-LP10 Obj: C,
ND-88.1-LP-3 Obj: B,
ND-93.3-LP-5 Obj: B
NE-93.3-LP-11

References Provided to Applicant

none

Answer: A

36. 0013 K2.01 1

Current conditions on Unit 1 are as follows:

- Reactor is at 100% power.
- Vital Bus I has been lost.

Which one of the following describes the function that will be impacted due to the loss of Vital Bus I?

A. Automatic recirculation mode swapover on 'A' Train will be disabled.

B. Automatic recirculation mode swapover on 'B' Train will be disabled.

C. CH-HCV-1105 (B BAST recirc fails shut)

D. B FRV bypass control

K/A

ESFAS:
Knowledge of bus power supplies to the following: ESFAS/safeguards equipment control.

K/A Match Analysis
Requires applicant to know that the ESFAS function for automatic recirc mode swapover Train 'A' is supplied by Vital Bus I.

Answer Choice Analysis
A. Correct – The “A” train for automatic recirc mode swapover is powered from Vital Bus I.

B. In-Correct but plausible since the “B” train for automatic recirc mode swapover is powered from Vital Bus IV.

C. In-Correct but plausible it is powered by Vital Bus III.

D. In-Correct but plausible it is powered by Vital Bus II.

Supporting References
ND-90.3-LP-5, Rev. 015, Obj F

References Provided to Applicant
none

Answer: A
37. 0022 K1.04 1
Unit 2 Initial Conditions:

- 100% Power.
- Chilled CC is in service to Containment.

Current conditions:

- 2-CD-REF-1A, Unit 2 Turbine Building Chiller Unit, trips due to a fault. [SURRY VERIFY EQUIPMENT NOMENCLATURE]

Based on the current conditions, which one of the following describes (1) the effect on Unit 2 containment indicated partial pressure, AND (2) Unit 2 containment temperature?

A. (1) Indicated partial pressure will INCREASE.
(2) Containment temperature will INCREASE.

B. (1) Indicated partial pressure will DECREASE.
(2) Containment temperature will INCREASE.

C. (1) Indicated partial pressure will INCREASE.
(2) Containment temperature will DECREASE.

D. (1) Indicated partial pressure will DECREASE.
(2) Containment temperature will DECREASE.

K/A

022 Containment Cooling System (CCS)
Knowledge of the physical connections and/or cause-effect relationships between CCS and the following systems: Chilled Water.
(CFR 41.2 to 41.9 / 45.7 to 45.8) (RO - 2.9*)

K/A Match Analysis

The question requires the RO applicant to understand the relationship between the failed chiller unit and the effect on containment cooling system.

Answer Choice Analysis

A. INCORRECT. (1) Based on the given conditions, containment partial pressure will DECREASE due to the loss of chilled CC. Containment temperature will INCREASE due to the loss of chilled CC. Therefore, for this distractor (1) is incorrect and (2) is correct. All other distractors are plausible logical combinations of the correct trends.

B. CORRECT. See above analyses.

C. INCORRECT. See analyses for A. above.

D. INCORRECT. See analyses for A. above.

Supporting References

-Old Surry exam question 022K3.02 from 2004-301 exam. Modified to re-arrange logical choices.

-Surry lesson plan ND-88.5-LP-1, rev. 23, especially p. 26-27.

References Provided to Applicant
none

Answer: B

38. 0026 K3.02 1

Unit 1 plant conditions:

Reactor power = 100%
Testing of 'A' Train CS in progress

Current conditions:

LBLOCA occurs
Containment pressure = 10 psig increasing
CS-MOV-101A&B (Containment Spray pump discharge valves) do not open

Based on the above conditions, which one of the following: (1) states which Recirculation Spray (RS) System pump suction(s) is/are being supplied by CS Train B and (2) if sufficient containment spray flow is being supplied to meet the design basis of the CS system?

A. (1) RS Train B ONLY
(2) The CS design basis is being met.

B. (1) RS Train B ONLY
(2) The CS design basis is NOT being met.

C. (1) RS Train A and B
(2) The CS design basis is being met.

D. (1) RS Train A and B
(2) The CS design basis is being met.

K/A

Containment Spray
Knowledge of the effect that a loss or malfunction of the CSS will have on the following: Recirculation spray system.

K/A Match Analysis

Requires knowledge of the effect of CS failure on containment recurculating spray system.

Answer Choice Analysis

A. Correct: CS train A supplys RS train A ONLY. Only one CS train is required per system purpose.
B. Incorrect: 1st part is correct. 2nd part is plausible because 1 train of CS is not supplying spray to containment.
C. Incorrect: CS train A supplys RS train A ONLY. 1st part is plausible because CS pump discharges can be cross connected but are upstream of the discharge valves.

2nd part is correct.

D. Incorrect: CS train A supplys RS train A ONLY. 1st part is plausible because CS pump discharges can be cross connected but are upstream of the discharge valves. 2nd part is plausible because 1 train of CS is not supplying spray to containment.

Supporting References
ND-91-LP-5 Obj: B
TS 3.4 Spray Systems

References Provided to Applicant
none

Answer: A
39. 0036AA2.01 1
Unit 1 Initial Conditions:

- Defueling operations are in progress.
- 1-RM-RM-159/160, Containment Particulate/Gas, both read 1.3 mr/hr
- 1-RM-RM-152, New Fuel Storage Area, reads 1.7 mr/hr.

Current conditions:

- An irradiated fuel assembly is being moved from the Reactor Vessel towards the Upender.
- 1-RM-RM-159/160, Containment Particulate/Gas, both read 1.5 mr/hr.
- 1-RM-RM-152, New Fuel Storage Area, reads 15.3 mr/hr.

Based on the current conditions, which one of the following describes REQUIRED operator actions, in accordance with 0-AP-22.00, "FUEL HANDLING ABNORMAL CONDITIONS?"

(1) Fuel handling operations MUST STOP _____,
AND
(2) after placing MCR emergency ventilation is service, THEN _____ ?

A. (1) in the Fuel Building. Fuel Handling operations may continue in Containment.
(2) IMMEDIATELY start one emergency supply fan (1-VS-F-41 or 2-VS-F-41 preferred)

B. (1) in the Fuel Building. Fuel Handling operations may continue in Containment.
(2) Wait 50 minutes before starting one emergency supply fan (1-VS-F-41 or

2-VS-F-41 preferred)

C. (1) in BOTH the Fuel Building AND Containment
(2) Wait 50 minutes before starting one emergency supply fan (1-VS-F-41 or 2-VS-F-41 preferred)

D. (1) in BOTH the Fuel Building AND Containment
(2) IMMEDIATELY start one emergency supply fan (1-VS-F-41 or 2-VS-F-41 preferred)

K/A

Fuel Handling Incidents
Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: ARM system indications.
(CFR: 43.5/45.13) (RO - 3.2)

K/A Match Analysis

The question requires the RO applicant to demonstrate knowledge of how to interpret ARM system readings, as well as utilizing knowledge of the overall mitigating strategy of the AP for fuel handling incidents.

Answer Choice Analysis

A. INCORRECT. (1) it is relatively easy to determine that the fuel handling problem is in the Fuel Building based on the ARM indications, harder to discredit that the problem is not in containment because the containment radiation readings in the current conditions are slightly higher than the initial readings. However, 0-AP-22.00 specifically states that all fuel handling operations must STOP. (2) is incorrect; the procedure specifically requires setting a 50 minute timer before starting the emergency supply fan. Plausible because the 0-AP-22.00 does contain several time-critical operator actions, and the wording is taken directly from step 15 of 0-AP-22.00.

B. INCORRECT. (1) is incorrect, (2) is correct. See analysis of A. above.

C. CORRECT. (1) is correct, (2) is correct. See analysis of A. above.

D. INCORRECT. (1) is correct, (2) incorrect. See analysis of A. above.

Supporting References

- SPS Lesson Plan ND-92.5-LP-7, "Refueling Abnormal Procedures," rev 13, p. 3, 8, and 9.

- Procedure 0-AP-22.00, "FUEL HANDLING ABNORMAL CONDITIONS," rev 22, p. 2.

-Modified from Oconee 2009-301 RO exam, question 20.

References Provided to Applicant

none

Answer: C
40. 0037AG2.4.4 1
Unit 1 is at 20% power during a power increase following a maintenance shutdown.

Initial conditions:
Time = 1000
An existing 2 gallon per day tube leak exists on the 1A SG
CHG LINE FLOW = 47 gpm increasing
1-AP-16 (EXCESSIVE RCS LEAKAGE) is entered

Current conditions:
Main Steam Line Rad Monitor level increasing (NOT in alarm)
Leak rate determined to be 6 gpm

Based on the above conditions, which one of the following: (1) correctly states if 1-AP-24 (MINOR SG TUBE LEAK) is required to be initiated IAW 1AP/16 and (2) what procedure is required to shut down the unit?

A. (1) Yes
(2) 1-AP-23 RAPID LOAD REDUCTION.

B. (1) Yes
(2) GOP-2.2 UNIT SHUTDOWN, LESS THAN 30% TO HSD

C. (1) No
(2) 1-AP-23 RAPID LOAD REDUCTION.

D. (1) No
(2) GOP-2.2 (UNIT SHUTDOWN, LESS THAN 30% TO HSD).

K/A
Steam Generator tube Leak
Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures.

K/A Match Analysis
Requires knowledge of AP entry conditions and Major mitigation strategies.

Answer Choice Analysis
A. Correct: From AP/16, step 7, check if radiation levels normal or stable if pre-existing SGTL. RNO is Initiate AP/24. Step 1 in AP/24 if Reactor Trip is not required (no reason it should), Initiate a shutdown per AP/23.
B. Incorrect: 1st part is correct. 2nd part is plausible because if remaining in AP/16 with a tube leak of < 10 gpm, shutdown using the GOP is required.
C. Incorrect: 1st part is plausible because the plant is already operating with a small SGTL. 2nd part is correct if AP/24 is initiated.
D. Incorrect: 1st part is plausible because the plant is already operating with a small SGTL. 2nd part is plausible because if remaining in AP/16 with a tube leak of < 10 gpm, shutdown using the GOP is required.

Supporting References
AP/16
AP/24

References Provided to Applicant
none

Answer: A
41. 0039 A1.05 1
Unit 1 Initial Conditions:

- A Steam Generator (S/G) tube rupture caused an automatic reactor trip and SI from 100% power.
- A small break loss of coolant accident (SBLOCA) is also in progress.
- Control room operators are implementing 1-ECA-3.1, "SGTR WITH LOSS OF REACTOR COOLANT-SUBCOOLED RECOVERY."

Current conditions:

- A maximum-rate cooldown in accordance with ECA-3.1 was commenced at time 1500.
- The following data has been logged over the last hour: (consider that the time is currently 1600)

TIME RCS COLD LEG TEMP

1500	395 °F
1515	370 °F
1530	346 °F
1545	321 °F
1600	296 °F

Based on the current conditions, which one of the following correctly describes the cooldown from 1500 to 1600?

(1) The Technical Specification cooldown rate limit _____ ,
AND
(2) The cooldown is _____ .

A. WAS exceeded.
required to be temporarily stopped.

B. WAS exceeded.
NOT required to be stopped.

C. was NOT exceeded.
NOT required to be stopped.

D. was NOT exceeded.
required to be temporarily stopped.

K/A

Main and Reheat Steam System (MRSS)
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MRSS controls including: RCS T-ave.
(CFR: 41.5/45.5) (RO - 3.2*)

K/A Match Analysis

Requires the applicant to demonstrate knowledge of RCS temperature limits on cooldown rates, as related to Tech Specs and an operationally valid ECA-3.1 scenario.
Answer Choice Analysis

A. INCORRECT. Tech Spec cooldown rate limit is 100 degrees F in an hour. ECA-3.1 cooldown rate limit is the same, step 16.a states "maintain cooldown rate in RCS cold legs - LESS THAN 100 degrees F/hr." Therefore, neither the Tech Spec nor the ECA-3.1 cooldown rate was violated in the period from 1500-1600. Distractors are

plausible if the applicant believed that ECA-3.1 allowed for a max rate cooldown in excess of Tech Specs (allowed in E-3, but NOT in ECA-3.1), or if the applicant believes that the change over one of the 15-minute, or 30-minute periods counts toward the 100 F/hr limit.

B. INCORRECT. see analysis for A. above. Plausible if the applicant believes that the 100 degree F/hr limit was violated in either the initial 15 minute period or the last 30 minute period, but the cooldown can continue.

C. CORRECT. see analysis for A. above.

D. INCORRECT. See analysis for A. above. Plausible if the applicant believes that the 100 degree F/hr limit was violated in either the initial 15 minute period or the last 30 minute period, and the cooldown needs to stop.

Supporting References

-steam tables

-Surry procedure 1-ECA-3.1, "SGTR WITH LOSS OF REACTOR COOLANT-SUBCOOLED RECOVERY," rev. 36, p. 13.

-modified from Indian Point 3 Audit exam question #77 from October 2006.

References Provided to Applicant

none
Answer: C
42. 0039 K4.04 1
Unit 1 Initial Conditions:

- A reactor startup is in progress.
- All Steam Generator (S/G) Power Operated Relief Valves (PORV) are 10% open, and the controllers are being operated in automatic.

Current conditions:

- The 1A S/G PORV controller setpoint begins to continuously LOWER below 1000 psig.

Based on the current conditions, which one of the following correctly describes the effect of this setpoint drift if no operator action is taken?

A. If uncorrected, the 522 °F minimum temperature for criticality Tech Spec limit may be violated.

B. If uncorrected, the 545 °F minimum temperature for criticality Tech Spec limit may be violated.

C. 1B and 1C S/G PORVs will open to relieve more steam and maintain Tave within acceptable limits.

D. 1B and 1C S/G PORVs will not respond, and Tave will increase above the limit of 577 °F.

K/A

039 Main and Reheat Steam System (MRSS)
Knowledge of MRSS design feature(s) and/or interlocks which provide for the following: Utilization of steam pressure program control when steam dumping through atmospheric relief/dump valves, including T-ave. limits.
(CFR: 41.7) (RO - 2.9)

K/A Match Analysis

RO applicant must demonstrate knowledge of S/G PORV operation in automatic pressure control, along with knowledge of Tave limits.

Question is C/A because the applicant must recall how the S/G PORV controller operates in automatic. Steam header pressure is compared to setpoint. If the setpoint lowers, the S/G PORV will open, releasing more steam. The energy release will cool the RCS, lowering Tave. If uncorrected, the minimum temperature for criticality Tech Spec limit may be violated.

Answer Choice Analysis

A. CORRECT. See the above C/A analysis.

B. INCORRECT. Incorrect because the minimum Tech Spec. limit for criticality is 522, not 545. Plausible because the PORV will open, lowering Tave, and because 545 is the low Tave alarm setpoint.

C. INCORRECT. Incorrect because the PORV will open, not close. Plausible because the 1B and 1C S/G PORVs will open to relieve more steam. Also plausible if the candidate confuses the setpoint drifting low with the controller output signal drifting low--which would cause the 1A S/G PORV to go closed, or if the applicant incorrectly picks the wrong direction of valve movement given the setpoint vs. actual pressure difference.

D. INCORRECT. Incorrect because the S/G PORV will open, not close. Plausible because the high-Tave alarm setpoint is 577 degrees F. Also plausible if the candidate

confuses the setpoint drifting low with the controller output signal drifting low--which would cause the 1A S/G PORV to go closed, or if the applicant incorrectly picks the wrong direction of valve movement given the setpoint vs. actual pressure difference.

Supporting References

-modified from Turkey Point 2009 exam question #43.

-Surry Technical Specifications 3.1.E, "Minimum Temperature for Criticality," p. TS 3.1-18.

-Surry ARP for 1H-A3, "HI - LO T AVG LOOP 1A," rev. 4, p. 3.

References Provided to Applicant
none

Answer: A
43. 0059 K4.16 2
Unit 2 plant conditions:
1GOP 1.5 UNIT STARTUP, 2% REACTOR POWER TO MAX ALLOWABLE POWER in progress
Reactor Power = 12%
2A MFW pump is feeding all SGs at 1100 gpm each

Based on the above plant conditions, which one of the following conditions will cause the A MFW pump to trip?

A. MFW pump suction header pressure 65 psig for > 15 sec

B. Bus voltage dips to 65% and returns to normal

C. 'A' Main Feed Pump Recirc Valve closed for > 15 sec

D. A MFW pump lube oil pressure decreases to 5 psig

K/A
Main Feedwater
Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following:
Automatic trips for MFW pumps.

K/A Match Analysis
Requires knowledge of MFW pump trip/interocks.

Answer Choice Analysis

A. Incorrect: Plausible because suction pressure of > 100 psig is a MF pump start permissive.
B. Correct: Bus voltage ~ 70 % is a MF pump trip
C. Incorrect: Plausible because for Unit 1, it would be correct.
D. Incorrect: Plausible because the main turbine low lube oil pressure trip is 6 psig.

Supporting References

ND-89.3-LP-3 Obj: E
GOP 2.8

References Provided to Applicant

none

check with utility for 3300 gpm = 1.6 E6 lbm/hr = 12% power
Answer: B
44. 0060AK3.02 1
Unit 1 plant conditions:
Reactor power = 50%
1-GW-RM-130 (MGPI) high alarm sounds

Based on the above conditions: (1) which one of the following valves are interlocked to reposition upon receiving the high alarm and (2) why does that action occur?

A. (1) GW-FCV-101 (Waste Gas Decay Tank bleed FCV)
(2) To isolate a potential release path to the unit vent

B. (1) GW-FCV-101 (Waste Gas Decay Tank bleed FCV)
(2) To redirect flow through the waste gas charcoal filters

C. (1) GW-FCV-100 (Process Vent Flow Control Valve) (2) To isolate all potential release paths to the Unit Vent

D. (1) GW-FCV-100 (Process Vent Flow Control Valve) (2) To redirect flow through the waste gas charcoal filters

K/A

Accidental Gaseous Radwaste Release: Knowledge of the reasons for the following responses as they apply to the Accidental Gaseous Radwaste: Isolation of the auxiliary building ventilation.

K/A Match Analysis
Requires knowledge of the Aux Building Process Ventilation system interlocks and how they act to isolate the system from the unit vent.

Answer Choice Analysis
A. Correct: 1-GW-RM-130 (MGPI) high alarm causes GW-FCV-101 (Waste Gas Decay Tank bleed FCV) to close, isolating the WGDTs from the Process Vent system.
B. Incorrect: 1st part is correct. 2nd part is incorrect because it does not redirect any flow, it isolates the tank. 2nd part is plausible because a gas release will normally go through the Waste Gas Charcoal Filters.
C. Incorrect: 1st part is incorrect because GW-FCV-100 (Process Vent Flow Control Valve) is not controlled by the RM in alarm. 1st part is plausible because the rad monitor is down stream of GW-FCV-101 and will monitor all process vent system streams going to the unit vent. 2nd part is incorrect becasue the valve doesn't go closed. 2nd part is plausible because if it did go closed, it would isolate all of the potential release paths from that system.
D. Incorrect: 1st part is incorrect because GW-FCV-100 (Process Vent Flow Control Valve) is not controlled by the RM in alarm. 1st part is plausible because the rad monitor is down stream of GW-FCV-101 and will monitor all process vent system streams going to the unit vent. 2nd part is incorrect because it does not redirect any flow, it isolates the system. 2nd part is plausible because a gas release will normally go through the Waste Gas Charcoal Filters.

Supporting References
ND-92.4-LP-1 Obj: B

References Provided to Applicant
none

Answer: A
45. 0061 K5.02 1
Unit 1 Initial Conditions:

- The plant operated continuously at 100% power for a period of time before an automatic reactor trip occurred.

Current conditions:

- Offsite power is NORMAL.
- Both motor-driven Auxiliary Feedwater (AFW) pumps 1-FW-P-3A and

1-FW-P-3B are running.
- All Steam Generator (S/G) narrow range levels are LESS THAN 12%.
- Control room operators have transitioned to 1-ES-0.1, "REACTOR TRIP RESPONSE."

Based on the current conditions, which one of the following:

(1) identifies the core burnup at time of trip that will result in the GREATER required AFW system flowrate to maintain S/G levels stable,
AND
(2) is the MINIMUM AFW flowrate required by ES-0.1 for the current plant conditions?

	CORE BURNUP	**MINIMUM REQUIRED AFW FLOWRATE**
A.	(1) 1,000 MWD/MTU	(2) 350 GPM
B.	(1) 1,000 MWD/MTU	(2) 540 GPM
C.	(2) 10,000 MWD/MTU	(2) 350 GPM
D.	(2) 10,000 MWD/MTU	(2) 540 GPM

K/A

061 Auxiliary/Emergency Feedwater (AFW) System
Knowledge of the operational implications of the following concepts as they apply to the AFW: decay heat sources and magnitude.
(CFR: 41.5/45.7) (RO - 3.2)

K/A Match Analysis

Given a plausible operational situation, requires the applicant to demonstrate knowledge of the relative magnitude and behavior of decay heat sources, as they apply to the AFW system operation. The applicant will also demonstrate knowledge of AFW flowrate requirements as specified in 1-ES-0.1.

Answer Choice Analysis

A. INCORRECT. (1) 100% power at a lower core burnup will result in less decay heat load. Plausible if the candidate considers that there is more fuel present in the core at lower burnups, or if the candidate considers that there are certain casualties (such as a main steam line break) that are more severe at lower powers. (2) is also incorrect; ES-0.1 step 2.e) requires greater than 540 gpm AFW flow when RCPs are running and all S/G NR levels are below 12%. Choice (2) is plausible because 350 gpm would be

correct if the RCPs were not running.

B. INCORRECT. (1) is incorrect choice, (2) is correct. See analysis of A. above.

C. INCORRECT. (1) is correct choice, (2) is incorrect. See analysis of A. above.

D. INCORRECT. (1) and (2) are correct based on the explanation of A. above.

Supporting References

-1-ES-0.1, "REACTOR TRIP RESPONSE," rev. 44, p. 3.

-Question is modified from VC Summer 2007-301 ILO exam, RO question 061K5.02.

References Provided to Applicant

none

Answer: D
46. 0061 K6.01 1
Unit 1 Initial Conditions:

- 100% Power.
- The MCR Undervoltage (UV) bypass switch for turbine-driven Auxiliary Feedwater (AFW) pump FW-P-2 steam supply valves PCV-MS-102A and -102B is in "BYPASS" position for routine maintenance.
- At the completion of maintenance, the UV bypass switch is returned to the "NORMAL" position, as required.
- Due to an electrical failure, all signals will respond as if the UV bypass switch was still in the "BYPASS" position. Operators are unaware of this condition.

Current conditions:

- A loss of all offsite power causes a Station Blackout.
- The control room enters 1-ECA-0.0, "LOSS OF ALL AC POWER."
- Safety Injection (SI) is NOT actuated.

Based on the current conditions, which one of the following correctly identifies the expected plant response?

A. (1) MS-PCV-102A and -102B will receive automatic open signals.
(2) AFW discharge valves FW-MOV-151A through -151F will receive automatic open signals.

B. (1) MS-PCV-102A and -102B will receive automatic open signals.

(2) AFW discharge valves FW-MOV-151A through -151F will NOT receive automatic open signals.

C. (1) MS-PCV-102A and -102B will NOT receive automatic open signals.
(2) AFW discharge valves FW-MOV-151A through -151F will receive automatic open signals.

D. (1) MS-PCV-102A and -102B will NOT receive automatic open signals.
(2) AFW discharge valves FW-MOV-151A through -151F will NOT receive automatic open signals.

K/A
061 Auxiliary / Emergency Feedwater (AFW) System
Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Controllers and positioners.
(CFR: 41.7 / 45.7)

K/A Match Analysis
RO applicants will demonstrate knowledge of the operational impacts of a malfunction on an extremely risk-important AFW system.

Answer Choice Analysis

****

SURRY: PLEASE CAFEFULLY VALIDATE THE CORRECT ANSWER FOR

TECHNICAL ACCURACY. IF THE MOVS GET AUTO-OPEN SIGNALS FROM

S/G LO-LO LEVEL CONDITIONS THAT ARE NOT BLOCKED BY THE UV BYPASS

SWITCH, CORRECT ANSWER WILL CHANGE TO 'A'

****

A. INCORRECT. Surry lesson plan for AFW states, "when the switch is placed in "BYPASS" during an undervoltage condition, it will defeat: (1) The automatic open signal to MS-PCV-102A or -B on UV, (2) the signal which auto closes the BD trip valves on UV, and (3) the auto open signal to FW-MOV-151A-F on UV. [...] This modification will NOT defeat the auto open function of the PCV on low-low SG levels or AMSAC conditions even if the UV condition is present and the PCV switch is in "BYPASS." Therefore, if the only signal present was an undervoltage signal, choice D would be correct, that the UV switch in bypass would block all automatic signals. However, given the question situation, the low-low S/G levels will still send the auto-open signal to

the PCV valves, so the pump should start; but the AFW MOVs would stay CLOSED.

B. CORRECT. see analysis of A. above.

C. INCORRECT. see analysis of A. above.

D. INCORRECT. see analysis of A. above.

Supporting References

-Surry lesson plan ND-89.3-LP-4, "AUXILIARY FEEDWATER," rev. 25, p. 13-14.

References Provided to Applicant
none

Answer: B
47. 0062 K2.01 1

Unit 1 Initial Conditions:

- 100% Power.

Current conditions:

- Loss of letdown.
- Steam dump control NOT affected.
- Loss of Component Cooling to ALL RCP thermal barrier heat exchangers.
- Component Cooling to ALL other RCP heat exchangers is NOT affected.

Based on the current conditions, which one of the following correctly identifies the vital AC bus or buses that has/have been de-energized?

A. Vital Bus I is de-energized. Vital Buses II, III, and IV are energized.

B. Vital Bus I and Vital Bus III are de-energized. Vital Buses II and IV are energized.

C. Vital Bus II is de-energized. Vital Buses I, III, and IV are energized.

D. Vital Bus II and Vital Bus IV are de-energized. Vital Buses I and III are energized.

K/A

A.C. Electrical Distribution
Knowledge of bus power supplies to the following: Major system loads.

(CFR: 41.7) (RO - 3.3)

K/A Match Analysis

Given a plausible operational scenario, the RO applicant must demonstrate an application of his or her knowledge of vital bus loads to diagnose the abnormal plant condition.

Answer Choice Analysis

A. CORRECT. All indications come from a loss of vital bus I only. All other distractors are plausible, but incorrect, combinations of the other vital buses.

B. INCORRECT.

C. INCORRECT.

D. INCORRECT.

Supporting References

- Surry lesson plan ND-90.3-LP-5, "VITAL AND SEMI-VITAL BUS DISTRIBUTION," rev. 15, p. 15-16.

-this question is taken directly out of the Surry ILO exam bank, question ID: EE00013 on p. 66 of 786.

References Provided to Applicant
none

Answer: A
48. 0062 K3.03 1
Unit 1 plant conditions:
Reactor power = 100%
UPS 1A1 Battery charger fails

Based on the above conditions, which one of the following actions will automatically occur to power loads on DC bus 1A?

A. UPS 1B1 will power DC bus 1A

B. Battery 1A will pickup loads for the next two hours

C. DC bus 1A will cross connect to DC bus 1B

D. UPS 1A2 will power DC bus 1A

K/A
AC electrical Distribution.
Knowledge of the effect that a loss or malfunction of the ac distribution system will have on the following: DC system.

K/A Match Analysis
Requires knowledge of how the malfunction of an AC system will have on DC systems.

Answer Choice Analysis
A. Incorrect: Plausible because it could power DC Bus 1A through DC Bus 1B if that line up were directed.
B. Incorrect: Plausible because this would be true if both AC chargers were lost.
C. Incorrect: Plausible because this would be a manual action if DC bus 1A power were lost.
D. Correct: 2 UPS normally supply the DC buses.

Supporting References
90.3-LP-6 Obj: A

References Provided to Applicant
none

Answer: D
49. 0063 K3.02 1
Which one of the following correctly describes an impact of the 1A 125V DC bus de-energizing?

A. Main generator output breakers will fail to automatically open on a turbine trip.

B. 1A 4160V bus voltage will decrease with turbine coastdown.

C. Pressurizer PORV (1-RC-PCV-1456) will not operate.

D. 1J 4160V bus breakers will not operate from the Main Control Room.

K/A
DC Electrical Distribution.
Knowledge of the effect that a loss or malfunction of the DC Electrical System will have on the following: Components using DC control power.

K/A Match Analysis

Requires the applicant to know the major breakers supplied control power from 1A DC Bus.

Answer Choice Analysis
A. In-Correct but plausible since this would occur if the failure occurred on the 1B DC bus.

B. Correct – 1A DC Bus provides control power for the breakers associated with the 1A, 1D and 1H 4160V buses. Loss of this DC bus will result in 1A 4160V bus failing to swap over to the 'A' RSST.

C. In-Correct but plausible since this would occur as the result of a loss of 1B DC bus.

D. In-Correct but plausible since this would occur as the result of a loss of 1B DC bus.

Supporting References
ND-90.3-LP-6, 125 VDC Distribution, Rev. 018, Obj. D

References Provided to Applicant
none

Answer: B
50. 0064 K4.10 1
Unit 1 Initial Conditions:

- A spurious safety injection from 100% power occurred four (4) minutes ago.

Current conditions:

- An electrical grid transient has JUST resulted in a Station Blackout.

Based on the current conditions, which one of the following correctly identifies the SEQUENCE that ALL equipment will automatically load onto the **"J"** bus after EDG #3 re-energizes the bus? (assume NO operator action)

A. (1) 1-VS-F-58B (Filtered Exhaust Fan), THEN
(2) "A" group pressurizer heaters, THEN
(3) 1-FW-P-3B (Motor Driven Auxiliary Feedwater Pump)

B. (1) 1-VS-F-58B (Filtered Exhaust Fan), THEN
(2) 1-FW-P-3B (Motor Driven Auxiliary Feedwater Pump), THEN
(3) "A" group pressurizer heaters

C. (1) 1-FW-P-3B (Motor Driven Auxiliary Feedwater Pump), THEN
(2) 1-VS-F-58B (Filtered Exhaust Fan), THEN
(3) "A" group pressurizer heaters

D. (1) 1-FW-P-3B (Motor Driven Auxiliary Feedwater Pump), THEN
(2) "A" group pressurizer heaters, THEN
(3) 1-VS-F-58B (Filtered Exhaust Fan)

K/A

Emergency Diesel Generators (EDG)
Knowledge of the EDG system design feature(s) and/or interlock(s) which provide for the following: Automatic load sequencer - blackout.
(CFR: 41.7) (RO - 3.5)

K/A Match Analysis

Given an operationally valid situation, the RO applicant will demonstrate knowledge of the correct functioning of the #3 EDG automatic load sequencer.

Answer Choice Analysis

****

NOTE TO SURRY: Please carefully validate this question because your lesson plan is not completely clear about the filtered exhaust fan sequencer. Specifically, the text implies that F-58A is the only fan that sequences on, but H/T-7.5 contradicts this.

****

A. INCORRECT. 1-FW-P-3B also starts 10 seconds after a loss of 2/2 RSS buses for the affected unit with a SI signal in-service. Plausible if applicant only focuses on the loss of voltage to the "J" bus.

B. INCORRECT. The MDAFW pump is the first load that is re-sequenced on to the bus for this condition. Plausible because the MDAFW pumps will sequence on to the bus at 140 seconds (between 1-VS-F-58B and "A" pressurizer heaters) if the station blackout occurs with a Hi-Hi CLS signal present.

C. CORRECT. The MDAFW pump 1-FW-P-3B starts 10 seconds after a loss of 2/2 RSS buses for the affected unit with a SI signal in-service. 1-VS-F-58B sequences onto bus "J" at 30 seconds, and the "A" group of pressurizer heaters sequences onto the bus at 180 seconds.

D. INCORRECT. See above analyses. Plausible if the applicant believes Filtered Exhaust Fans are unaffected (e.g. load sequencing is generated on the fan's alternate

power source only) and would not sequence.

Supporting References

- Question is modified from a 064K4.10 question in the 2006-301 Surry ILO written exam.

- Surry lesson plan ND-90.3-LP-7, "STATION SERVICE AND EMERGENCY DISTRIBUTION PROTECTION AND CONTROL," rev. 21, p. 34-40 and section H/T-7.5.

References Provided to Applicant
none

Answer: C
51. 0073 K5.02 1
Unit 1 Initial Conditions:

- Radiography operations are in progress on a section of main steam piping.
- The radiographers want to verify the correct position of the camera by using a main steam line radiation monitor located on the same elevation and close to the area where the radiography needs to take place.
- To obtain a baseline reading, the camera source was placed 3.21 feet away from the radiation monitor detector. The radiation monitor read 5.92 R/hr.

Current conditions:

- The camera has been moved into position to image the piping section.
- Engineering calculations show that the camera should be placed 17.46 feet away from the radiation monitor detector.

The distances listed above include the difference in height from the camera to the radiation monitor detector. Consider the radiography camera as a radiation point source. Carry all calculations to three (3) decimal places.

Based on the current conditions, which ONE of the following correctly identifies the expected reading on the radiation monitor, if the camera was positioned correctly?

A. 0.037 R/hr

B. 0.200 R/hr

C. 1.088 R/hr

D. 2.538 R/hr

K/A

Process Radiation Monitoring (PRM) System
Knowledge of the operational implications as they apply to concepts as they apply to the PRM system: Radiation intensity changes with source distance.

K/A Match Analysis

Given an operationally valid situation, the RO applicant is required to demonstrate knowledge of how PRM readings would change with a change in source distance.

Answer Choice Analysis

A. INCORRECT. For the given situation, modeling the radiography camera as a point source, the reading will change as a ratio of the initial and final distances to the second power. This distractor is incorrect, but plausible, if the ratio is taken to the third power instead of the second. i.e. (5.92)*(3.21 ft / 17.46 ft)^3 = 0.037 R/hr

B. CORRECT. Ratio the initial distance divided by the final distance, then square the fraction: (5.92)*(3.21/17.46)^2 = 0.200 R/hr.

C. INCORRECT. This distractor is plausible, because it represents the ratio taken to the first power, i.e. modeling the camera as a plane source instead of a point source. (5.92)*(3.21/17.46) = 1.088 R/hr

D. INCORRECT. This distractor is the square root of the value of the distance ratio, i.e taking the ratio to the 1/2 power: (5.92)*(3.21/17.46)^0.5 = 2.538 R/hr

Supporting References

-John R. Lamarsh, Introduction to Nuclear Engineering, 2nd edition, chapter 9.11.

References Provided to Applicant
none

Answer: B
52. 0076 K4.02 1
Unit 2 initial conditions:
Reactor power = 100%
Charging Service Water Pump 2A operating

Current conditions:
Annunciator 2D-G5, SW OR CC PPS DISCH TO CHRG PPS LO PRESS in alarm

Operator reports that Charging Service Water pump discharge pressure = 6 psig oscillating

Based on the above conditions, which one of the following correctly states: (1) the status of the Charging Service Water pumps and (2) what actions are directed per AP-12 SERVICE WATER SYSTEM ABNORMAL CONDITIONS?

A. (1) Charging Service Water Pumps 2A and 2B are operating
(2) Stop operating Charging Service Water Pumps, then vent and restart pumps as necessary.

B. (1) Charging Service Water Pumps 2A and 2B are operating
(2) Stop the pump with the lowest discharge pressure, then vent and restart the secured pump.

C. (1) Only Charging Service Water Pump 2A is operating
(2) Stop operating Charging Service Water Pump, then vent and restart pumps as necessary.

D. (1) Only Charging Service Water Pump 2A is operating
(2) Start the other Charging Service Water Pump, then if necessary, stop, vent and restart as required.

K/A
Service Water
Knowledge of SWS design feature(s) and/or interlock(s) which provide for the following:
Automatic start features associated with SWS pump controls.

K/A Match Analysis
Requires knowledge of Service Water pump auto-start features.

Answer Choice Analysis

A. Incorrect: 1st part is correct (Standby pump starts at 8 psig discharge pressure). 2nd part is plausible because if discharge pressure = 0 psig, it would be correct.

B. Correct: Per AP/12 with discharge pressure < 15 psig:
2) IF BOTH pumps are running, THEN secure the pump with the lowest discharge pressure.
3) IF BOTH pumps have ZERODischarge pressure, THEN stop BOTH pumps
4) Vent discharge of secured pump(s). Restart pump(s), stop pump(s), and vent as necessary.

C. Incorrect: 1st part is plausible because most of the Service Water pumps do not have auto-start features. 2nd part is plausible because it would be correct if only one pump were available.

D. Incorrect: 1st part is plausible because most of the Service Water pumps do not have auto-start features. 2nd part is plausible because if it didn't auto-start, it could correct the abnormal conditions.

Supporting References
ND-89.5-LP-2 Obj: B AP/12 SERVICE WATER SYSTEM ABNORMAL CONDITIONS

References Provided to Applicant
none

Answer: B
53. 01 K2.05 1
Which one of the following identifies the bus that feeds the #1 Motor Generator associated with the control rod drive system on Unit 1?

A. Bus 1C2.

B. Bus 1A1.

C. Bus 1C1.

D. Bus 1A2.

K/A

001 Control Rod Drive
Knowledge of bus power supplies to the following: M/G *s*ets.

K/A Match Analysis

Requires applicant to know which bus supplies the #1 Rod Drive MG set.

Answer Choice Analysis

A. In-Correct but plausible since the 1C2 480V bus supplies the #2 Rod Drive MG set.

B. Correct – Power to the #1 Rod Drive MG set is supplied from 1A1 480V bus.

C. In-Correct but plausible since the applicant could select 1C1 due to confusion with bus nomenclature.

D. In-Correct but plausible since the applicant could select 1A2 due to confusion with bus nomenclature.

Supporting References

ND-93.3-LP-3, Rod Control System, Rev. 17, Obj. D

References Provided to Applicant
none

Answer: B
54. 0103 A1.01 1
A loss of coolant accident (LOCA), coincident with a failure of ALL containment spray pumps to start, causes containment pressure to INCREASE.

Which one of the following correctly describes the expected equipment status as containment pressure continues to rise?

A. All containment recirculation fans will operate at pressures up to 17.7 psia. At 17.7 psia, containment recirculation fans 1A and 1B will automatically trip. Containment recirculation fan 1C will continue to run at pressures greater than 17.7 psia.

B. All containment recirculation fans will operate at pressures up to 23.0 psia. At 23.0 psia, containment recirculation fans 1A and 1B will automatically trip. Containment recirculation fan 1C will continue to run at pressures greater than 23.0 psia.

C. All containment recirculation fans will operate at pressures up to 17.7 psia. At 17.7 psia, all containment recirculation fans will automatically trip.

D. All containment recirculation fans will operate at pressures up to 23.0 psia. At 23.0 psia, all containment recirculation fans will automatically trip.

K/A

Containment System
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: Containment pressure, temperature, and humidity.
(CFR: 41.5 / 45.5) (RO - 3.7)

K/A Match Analysis

The question requires the RO applicant to demonstrate recognition of expected plant

conditions given an operationally valid scenario and a changing containment pressure situation.

Answer Choice Analysis

A. INCORRECT. Surry lesson plan ND-88.4-LP-6 states: "the air recirculation fans will operate in containment pressure up to 8.3 psig (23 psia). At this point the 1A and 1B fans are tripped by a Hi-Hi CLS signal. This is to protect the emergency buses from an overload condition caused by the starting and running of the pumps in the SI and CLS systems. The 1C fan will remain running, since it is not powered from an emergency bus." The distractor of 17.7 psia is plausible, because it corresponds to the 3.0 psig SI actuation signal.

B. CORRECT. See above analysis.

C. INCORRECT. See above analysis. Plausible if the candidate assumes that all fans will trip to protect the fans.

D. INCORRECT. see above analyses.

Supporting References

-Modified from Surry 2002-301 test question 022A4.05.

-Surry lesson plan ND-88.4-LP-6, "CONTAINMENT VENTILATION," rev. 9, p. 5.

References Provided to Applicant
none

Answer: B
55. 0103 K4.06 1
Unit 1 Initial Conditions:

- 100% Power.

Current conditions:

- Containment pressure transmitter 1-PT-LM-100B failed a calibration surveillance four (4) days ago.
- All Technical Specification 3.7, "Instrumentation Systems," required actions for 1-PT-LM-100B have been completed.

Based on the current conditions, which one of the following identifies (1) the MINIMUM containment pressure, AND (2) the MINIMUM number of OPERABLE containment pressure channels that must actuate in order to close 1-TV-RM-100A/B/C (Containment

Particulate and Gas Radiation Monitor 1-RM-RI-159/160 trip valves)?

A. (1) 23.0 psia
   (2) two (2)

B. (1) 23.0 psia
   (2) three (3)

C. (1) 17.7 psia
   (2) two (2)

D. (1) 17.7 psia
   (2) three (3)

K/A

103 Containment System
Knowledge of containment system design feature(s) and/or interlock(s) which provide for the following: Containment isolation system.
(CFR: 41.7) (RO - 3.1)

K/A Match Analysis

Given an operationally valid scenario, the RO applicant will demonstrate knowledge of containment system design features as they relate to the containment isolation system.

Answer Choice Analysis

A. INCORRECT. Correct logic, but incorrect setpoint. Plausible is applicant believes a Hi-Hi CLS is required to close the RM trip valves.

B. INCORRECT. Incorrect logic and setpoint. See analysis for C. below.

C. CORRECT. A Hi-CLS signal closes 1-TV-RM-100A/B/C. The setpoint for the Hi-CLS signal is 17.7 psia (3.0 psig). The logic for a Hi-CLS signal (with all containment pressure channels normal) is 3/4. TS 3.7 requires tripping an inoperable containment pressure channel within 72 hours (3 days), resulting in a 2/3 actuation logic for the remaining (functioning normally) channels.

D. INCORRECT. Correct pressure setpoint, but only 2/3 channels are required to actuate. Plausible if applicant does not understand CLS logic or fails to recognize TS 3.7 requires tripping (e.g. not bypassing) the inoperable channel.

Supporting References

-Surry 2006-301 exam question 103K4.06 with answer choices scrambled.

-Surry lesson plan ND-91-LP-5, "Containment Spray System," rev. 16, p. 5 and p. 8.

References Provided to Applicant
none

Answer: C
56. 011 K6.06 1
Unit 1 Initial Conditions:

- 100% Power.

Current conditions:

- A controller failure causes the Unit 1 Operator to place the Charging Flow Controller to MANUAL.
- The Unit 1 Operator attempts to reduce charging flow to 20 gpm to mitigate a high Pressurizer Level.

Based on the current conditions, which one of the following correctly describes the behavior of FCV-1122 when the Operator attempts to reduce charging flow to 20 gpm?

A. The Flow Limit Summator no longer limits flow, and FCV-1122 can be manually closed to allow 20 gpm flow.

B. The Flow Limit Summator no longer limits flow; however, FCV-1122 can only be manually closed to allow 25 gpm flow.

C. The Flow Limit Summator will limit charging flow to a minimum of 25 gpm.

D. The Flow Limit Summator will limit charging flow to a minimum of 30 gpm.

K/A

Pressurizer Level Control System (PZR LCS)
Knowledge of the effect of a loss or malfunction on the following will have on the PZR LCS: correlation of demand signal indication on charging pump flow valve controller to the valve position.
(CFR: 41.7 / 45.7) (RO - 2.5*)

K/A Match Analysis

Given an operationally valid scenario, the RO applicant will demonstrate knowledge of

the relationship between the controller output signal and the valve position with the controller in MANUAL.

Answer Choice Analysis

A. CORRECT, because when the charging flow controller is in MANUAL, the Flow Limit Summator no longer limits the minimum and maximum values of charging. Therefore, FCV-1122 can be closed manually to any value.

B. INCORRECT, because when the charging flow controller is in MANUAL, the flow limit summator no longer limits the minimum and maximum values of charging. Distractor is incorrect because FCV-1122 may be manually closed to any value, even below 25 gpm flow. Distractor is plausible because the candidate may not know that FCV-1122 may be throttled to any value with the controller in MANUAL.

C. INCORRECT, because when the charging flow controller is in MANUAL, the flow limit summator no longer limits the minimum and maximum values of charging. The distractor states that the flow limit summator will limit flow, which is contrary to the fact that it will not limit flow. Distractor is plausible because candidate may not know that the flow limit summator does not function with the controller in MANUAL.

D. INCORRECT, because when the charging flow controller is in MANUAL, the flow limit summator no longer limits the maximum and minimum values of charging. The distractor states that the flow limit summator will limit flow, which is contrary to the fact that it will not limit flow. Distractor is plausible because candidate may not know that the flow limit summator does not function with the controller in MANUAL.

Supporting References

-this question is taken directly from 011K6.06 from the 2004-301 Surry exam.

-Surry lesson plan ND-93.3-LP-7, "PRESSURIZER LEVEL CONTROL SYSTEM," rev. 9, p. 6.

References Provided to Applicant
none

Answer: A
57. 014A4.01 1
Initial Unit 1 Conditions:
- Unit 1 is at 100% power
- All control rods are fully withdrawn

Current Unit 1 Conditions:
- A control rod in the lead bank drops to the bottom of the core (check wording with

licensee)
- Unit 1 remains at 70% power
- Delta flux is within band
- 1G-A6, ROD CONT SYS URGENT FAILURE, is lit due to a logic cabinet failure

Which one of the following correctly states (1) the control rod select switch position to recover the rod in accordance with 0-AP-1.01, Control Rod Misalignment AND (2) when the step counters are required to be reset in accordance with 0-AP-1.01?

A. (1) Place the ROD CONT MODE SEL SWITCH to MANUAL for rod recovery.
   (2) Step counters are required to be reset prior to rod recovery.

B. (1) Place the ROD CONT MODE SEL SWITCH to the affected bank for rod recovery.
   (2) Step counters are required to be reset prior to rod recovery.

C. (1) Place the ROD CONT MODE SEL SWITCH to MANUAL for rod recovery.
   (2) Step counters are NOT required to be reset until after the rod is recovered.

D. (1) Place the ROD CONT MODE SEL SWITCH to the affected bank for rod recovery.
   (2) Step counters are NOT required to be reset until after the rod is recovered.

K/A:
014A4.01
Rod Position Indication
Ability to manually operate and/or monitor in the control room: Rod Selection Control

K/A MATCH ANALYSIS:
The question requires knowledge of the rod select switch position to recover a dropped rod and knowledge of when the position indication (group counters) are required to be manipulated in conjunction with the rod control recovery.

ANSWER CHOICE ANALYSIS:

A.	Incorrect. Part 1 is not correct because 0-AP-1.01 requires the mode select switch to be selected to the affected bank position. Plausible because 0-AP-1.00 requires the switch to be placed in MANUAL prior to entering 0-AP-1.01. Also plausible because the lead bank rod motion would be possible in MANUAL. Part 2 is correct.
B. B. A .	Correct. The ROD CONT MODE SEL SWITCH is required to be selected to the affected bank (0-AP-1.01 Page 5 of 9). Also step counters are required to be reset prior to rod recovery (0-AP-1.01 Page 7 of 9).
C . C . B	Incorrect. Part 2 is incorrect because the step counters must be reset prior to rod recovery. Plausible because the applicant could have a misconception that the rod should first be withdrawn prior to adjusting the step counters to read the same as the group.

.	
D . D . C .	Incorrect. See above.

REFERENCES:
0-AP-1.01, Control Rod Misalignment, Revision 17.
1G-A6, ROD CONT SYS URGENT FAILURE, Revision 001.
ND-93.3-LP-3, Rod Control System (Handouts)

Answer: B
58. 015K5.10 1
Unit 1 plant conditions:
Unit Startup in progress following refueling
Reactor power = 90%
1-GOP-1.5 UNIT STARTUP, 2% REACTOR POWER TO MAX ALLOWABLE
POWER in progress
Axial Flux Difference = 0
All Control Rods are fully withdrawn

Based on the above conditions: (1) which one of the following states the maximum rate at which power can be increased to 100% IAW 1-GOP-1.5 (2) how will Axial Flux Difference change as power is increased ?

A. (1) 3% in 1 hour
(2) become positive

B. (1) 3% in 1 hour
(2) become negative

C. (1) 4% in 1 hour
(2) become positive

D. (1) 4% in 1 hour
(2) become negative

K/A
Nuclear Indication
Knowledge of the operational implications of the following concepts as they apply to the NIS: Ex-core detector operation.

K/A Match Analysis
Requires knowledge of Ex-Core detectors and how they are affected by plant operation.

Answer Choice Analysis
A. Incorrect: 1st part is correct. 2nd part is plausible because for a "rodded" startup, it would be correct.
B. Correct: Per GOP 1.5 Attachment 1, from 80 to 100%, the limit for power increases is 3% in 1 hour. As coolant passes up through the reactor core, it heats up. The hotter water causes less moderation of neutrons so power and neutron flux shifts towards the bottom of the core which causes the Axial Flux Difference to become negative.
C. Incorrect: Incorrect because from 80 to 100%, the maximum ramp rate is 3% in 1 hour. Plausible because from 40 to 80 % it would be correct. 2nd part is plausible because for a "rodded" startup, it would be correct.
D. Incorrect: Incorrect because from 80 to 100%, the maximum ramp rate is 3% in 1 hour. Plausible because from 40 to 80 % it would be correct. 2nd part is correct.

Supporting References
1-GOP 1.5 Attachment 1
ND-93.2-LP-4 Obj: H

References Provided to Applicant
none

Answer: B
59. 017K5.02 1
Initial Unit 2 conditions:
- Reactor power = 100% steady state

Current Unit 2 conditions:
- A LOCA is in progress
- 2-E-1, Loss of Reactor or Secondary Coolant, is being performed
- All RCPs have been stopped
- Containment presure = 47 psia and slowly increasing
- Total AFW flow = 485 gpm
- SG WR levels are: "A" = 48%, "B" = 40%, "C" = 39%
- RCS pressure = 920 psig
- IR NIs = 2E-11 amps, with SUR = 0
- CETCs indicate 600°F
- RVLIS full range = 45%

Which one of the following correctly states the procedure to which the control room crew is required to transition?

A. FR-C.1, Response to Inadequate Core Cooling

B. FR-C.2, Response to Degraded Core Cooling

C. FR-Z.1, Response to Containment High Pressure

D. FR-H.5, Response to Steam Generator Low Level

K/A:
017K5.02
Incore Temperature Monitoring
Knowledge of the operational implications of the following concepts as they apply to the ITM system: Saturation and subcooling of water.

K/A MATCH ANALYSIS:
To arrive at the correct answer, the applicant must recognize that CET values place require a transition to FR-C.2. This procedure transition is based on incore temperature limitations which are related to subcooling conditions in the core.

ANSWER CHOICE ANALYSIS:
A. Incorrect. C.1 would only be entered if CETs = 700F. Plausible because all conditions, except for CET values would lead the applicant to C.1. Also CET values are well above normal which would indicate an issue with core cooling.
B. Correct. Orange Path on Core Cooling. CET < 1200F / SCM < 85F / No RCPs on / CET < 700 and RVLIS < 46%.
C. Incorrect. Conditions for Z.1 on an Orange Path are met; however, C.2 Orange Path is a higher priority. Plausible because the conditions are met for Z.1.
D. Incorrect. Conditions are met for H.5 on a Yellow Path; however, C.2 is required to be entered first. Plausible because the conditions are met for H.5.

Surry Exam Bank Question #1066
Previous Surry Exam 2002-301 (Not one of the previous 2 exams)

REFERENCES:
Surry Safety Functions Status Trees

Answer: B
60. 035A2.01 1
Unit 1 initial conditions:
Reactor trip from 100% power

SI actuated
1-E-0 REACTOR TRIP OR SAFETY INJECTION initiated

Current plant conditions:
A NR SG level = 26% decreasing
B NR SG level = 22% decreasing
C NR SG level = 29% decreasing

Based on the above plant conditions, which one of the following correctly states (1) the minimum SG level at which the first signal to start an AFW pump occurs (assuming no operator action) and (2) the minimum level that is required to be attained prior to reducing SI flow IAW 1-E-0 REACTOR TRIP OR SAFETY INJECTION?

A. (1) 13% in 2/3 SG
(2) 12%

B. (1) 13% in 2/3 SG
(2) 22%

C. (1) 17% in 2/3 SG
(2) 12%

D. (1) 17% in 2/3 SG
(2) 22%

K/A
Steam Generator
Ability to (a) predict the impacts of the following malfunctions or operations on the S/Gs; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Reactor trip / Turbine Trip.

K/A Match Analysis
Requires knowledge of how a reactor trip w/SI affects SG levels and how level affects procedure use.

Answer Choice Analysis
A. Incorrect: 1st part is plausible because 13% is the AMSAC setpt to start AFW pumps. 2nd part is correct.
B. Incorrect: 1st part is plausible because 13% is the AMSAC setpt to start AFW pumps. 2nd part is plausible because 22% is the bottom of the control band (22-50%) used in 1-E-0 if SI flow is not throttled.
C. Correct: AFW pumps receive a start signal on LO-LO level of 17% in any 2/3 Sgs. 12% level in any SG or total feed flow > 350 gpm is used as part of the SI throttle criteria.

D. Incorrect: 1st part is correct. 2nd part is plausible because 22% is the bottom of the
control band (22-50%) used in 1-E-0 if SI flow is not throttled.

Supporting References
ND-89.3-LP-4 Aux FDW
ND-95.3-LP-3 E-0 Obj C

References Provided to Applicant
none

Answer: C
61. 041 A3.03 1
Unit 1 Initial Conditions:

- 100% power.
- Rod control is selected to P-446, Channel III turbine first stage impulse pressure.
- P-447, Channel IV turbine first stage impulse pressure, fails LOW.

Current conditions:

- No operator actions have been performed to address the P-447 failure.
- Control rods are INSERTING in automatic.
- Annunciator 1H-D7, "STM DUMP PERM," is lit.
- Steam flow on all channels is INCREASING.

Based on the current conditions, which one of the following correctly identifies the cause?

A. A main steam line safety valve has lifted and will not reseat.

B. A T-cold instrument has failed HIGH.

C. P-446 has failed HIGH.

D. P-464, Steam header pressure, has failed HIGH.

K/A

Steam Dump/Turbine Bypass Control
Ability to monitor automatic operation of the SDS, including: Steam flow.
(CFR: 41.7 / 45.5) (RO - 2.7)

K/A Match Analysis

The question gives the RO applicant an opportunity to demonstrate integrated knowledge of the steam dump control system, given a set of operational conditions including abnormal steam flow.

Answer Choice Analysis

A. INCORRECT. The steam line safety vale may cause the increased steam flow indication, but the increase in steam demand would cause Tave to DECREASE, which would tend to cause automatic rod control to move rods OUT (rather than in).

B. CORRECT. Tave would indicate high, and with the steam dumps armed, the dumps would open, causing steam flow to increase. The false high Tave would also cause rods to drive in.

C. INCORRECT. P-446 failing LOW would cause steam dumps to open; however, failing HIGH will keep steam dumps from opening (plausible but incorrect).

D. INCORRECT. P-464 failing HIGH would cause everything listed to happen, if the steam dumps were in pressure control mode, but they are still in the Tave control mode.

Supporting References

-Surry lesson plan ND-93.3-LP-9. "STEAM DUMPS," rev. 13, p. 6,7,21.

-Surry lesson plan ND-93.3-LP-2, "DELTA T/TAVG INSTRUMENTATION SYSTEM," rev. 10, p. handouts/diagrams pages.

References Provided to Applicant
none

Answer: B
62. 055 G2.4.45 1
Unit 1 Initial Conditions:

- Unit was at 28% power when condenser vacuum began to lower.

Current conditions:

- Annunciator 1E-E3, "DELTA FLUX DEVIATION," is lit.
- Annunciator 1G-H8, "ROD BANK D EXTRA LO LIMIT," is lit.
- Annunciator 1F-B6, "TURB LO VAC," has been lit for five (5) minutes.
- Control rods are inserting in automatic.

- Condenser vacuum continues to DECREASE with no signs of recovery.
- Turbine is at 14% load and DECREASING.

Based on the current conditions, which one of the following identifies the required operator action, in accordance with 1-AP-14.00, "LOSS OF MAIN CONDENSER VACUUM?"

A. Commence an emergency boration using 1-AP-3.00, "EMERGENCY BORATION."

B. IMMEDIATELY trip the Reactor and enter 1-E-0, "REACTOR TRIP OR SAFETY INJECTION."

C. IMMEDIATELY trip the Turbine and stabilize the unit using the steam dumps.

D. IF condenser vacuum is less than 24.5 in-Hg for a five (5) minute period, THEN trip the Turbine and stabilize the unit using the steam dumps.

K/A

Condenser Air Removal
Ability to prioritize and interpret the significance of each annunciator or alarm.
(CFR: 41.10 / 43.5 / 45.3 / 45.12) (RO - 4.1)

K/A Match Analysis

Based on an operationally valid set of plant conditions and alarms associated with condenser air removal, recognize entry conditions into E-0.

Answer Choice Analysis

A. INCORRECT. Must trip the reactor and GO TO 1-E-0 based on being less than 30% turbine power with condenser vacuum less than 26.5 in Hg for 5 minutes with no signs of recovery. This is recognized by the TURB LO VAC alarm being "in" for 5 minutes (setpoint is 25 in Hg vacuum). Plausible because of the LO-LO insertion limit alarm in the question stem. Also technically incorrect because the emergency boration is directed in 1-AP-14.00, and NOT in 1-AP-3.00.

B. CORRECT. Must trip the reactor and GO TO 1-E-0 based on being less than 30% turbine power with condenser vacuum less than 26.5 in Hg for 5 minutes with no signs of recovery. This is recognized by the TURB LO VAC alarm being "in" for 5 minutes (setpoint is 25 in Hg vacuum).

C. INCORRECT. A reactor trip is required based on condenser vacuum as described above. This statement is plausible, because it would be correct if turbine power/reactor power were less than 10% (or if the output breakers were open).

D. INCORRECT. See above analysis. Distractor is plausible, because it is the correct reasoning when power is greater than 30%; however, must trip the Rx--not the turbine. I want this distractor to basically improve the plausibility of C.

Supporting References

-1-AP-14.00, "LOSS OF MAIN CONDENSER VACUUM," rev. 5, esp. attachment 3.

-Surry lesson plan ND-95.1-LP-6, "LOSS OF CONDENSER VACUUM," rev. 10.

References Provided to Applicant
none

Answer: B
63. 072 K4.01 1
Unit 1 initial conditions:
Shut down for refueling
Containment purge in progress

Current plant conditions:
A High radiation signal on the containment particulate (1-RM-RI-159 CTMT PARTC) radiation monitor occurs

Based on the above conditions which one of the following correctly states the status of the containment purge components?

A. Containment purge supply fans (1-VS-F-4A and B) off
Containment purge supply MOVs (1-VS-MOV-100A and B) closed,
Containment purge discharge MOVs (1-VS-MOV-100C and D) closed

B. Containment purge supply fans (1-VS-F-4A and B) off
Containment purge supply MOVs (1-VS-MOV-100A and B) closed,
Containment purge discharge MOVs (1-VS-MOV-100C and D) open

C. Containment purge supply fans (1-VS-F-4A and B) on
Containment purge supply MOVs (1-VS-MOV-100A and B) closed,
Containment purge discharge MOVs (1-VS-MOV-100C and D) open

D. Containment purge supply fans (1-VS-F-4A and B) on
Containment purge supply MOVs (1-VS-MOV-100A and B) open,
Containment purge discharge MOVs (1-VS-MOV-100C and D) open

K/A

Area Radiation Monitoring.
Knowledge of ARM system design feature(s) and/or interlock(s) which provide for the following: containment ventilation isolation.

K/A Match Analysis
Requires knowledge of ARM system interactions/interlocks with the containment purge system.

Answer Choice Analysis
A. Correct. Upon receiving the radiation alarm, the purge supply fan trips and the containment isolation MOVs close to prevent any release to the atmosphere.
B. Incorrect: Discharge dampers will be closed. Plausible because these dampers remaining open will allow the escaping air to be filtered and monitored.
C. Incorrect: Discharge dampers will be closed. Plausible because these dampers remaining open will allow the escaping air to be filtered and monitored.
D. Incorrect: All of the stated dampers will be closed and the purge fan off. Plausible because if a different containment ARM alarmed, it would not control this function and it would be correct.

Supporting References
ND-88.4-LP-6 Obj D

References Provided to Applicant
none

Licensee verify Containment Purge is not a subsystem of Containment Vent.
Answer: A
64. 078 K3.03 1
Plant initial conditions:
Reactor Power = 100% both units
Operator reports air leak on Unit 1 instrument air header
1B-E6 IA LO HDS PRESS/IA COMPR 1 TRBL in alarm
Instrument Air Systems are in their normal alignments

Based on the above conditions, which one of the following correctly states the status of (1) Unit 2 Instrument Air pressure and (2) the Unit 1 Instrument Air Compressor?

A. (1) Unit 2 Instrument Air pressure will be decreasing
(2) operating.

B. (1) Unit 2 Instrument Air pressure will be decreasing
(2) NOT operating.

C. (1) Unit 2 Instrument Air pressure will be normal and stable
(2) operating.

D. (1) Unit 2 Instrument Air pressure will be normal and stable
(2) NOT operating.

K/A
Instrument Air
Knowledge of the effect that a loss of malfunction of the IAS will have on the following:
Cross-tied units.

K/A Match Analysis
Requires knowledge of lineups of the IA system and how a leak on one will affect the other.

Answer Choice Analysis
A. Incorrect: Unit IA headers are normally split so a loss of IA on one unit does not affect the other. Plausible because Service Air headers are normally cross connected. In AUTO, the IA compressor will start if IA header pressure decreases to 90 psig. Annunciator setpt is 80 psig.
B. Incorrect: Unit IA headers are normally split so a loss of IA on one unit does not affect the other. Plausible because Service Air headers are normally cross connected. 2nd part is plausible because there numerous setpts for the IA system
both above and below 90 psig.
C. Correct: Instrument air headers are normally split
2nd part is correct.
D. Incorrect: 1st part is plausible because IA is kept split from containment air system.
2nd part is plausible because there numerous setpts for the IA system both above and below 90 psig.

Supporting References
ND-92.1 LP1 Station Air Systems Obj: B, E. Annunciator Response 1B-E6 IA LO HDS PRESS/IA COMPR 1 TRBL

References Provided to Applicant
none
utility to provide instances when the unit air headers may be split
Answer: C
65. 086 A1.05 1
Unit 1 Initial Conditions:

- 100% Power

- Fire Water Tank 1-FP-TK-1A is at 300,000 gallons
- Fire Water Tank 1-FP-TK-1B is at 275,000 gallons.

Current conditions:

- There is an explosion and fire in a main transformer.
- Main transformer deluge system actuates.
- The Diesel fire pump is the ONLY fire pump running, and is pumping at the rated design flow rate.

Based on the current conditions, which one of the following correctly identifies (1) the expected rate at which each fire water storage tank level is changing, AND (2) how long after deluge actuation would the station be required to enter the LCO for TR 3.7.1, "Fire Suppression Water System," based ONLY on fire water tank levels?

Assume that the level in each tank is lowering at the same rate.

A. (1) level is decreasing approximately 1 ft every 6 minutes
   (2) 10 minutes

B. (1) level is decreasing approximately 1 ft every 6 minutes
   (2) 20 minutes

C. (1) level is decreasing approximately 1 ft every 3 minutes
   (2) 10 minutes

D. (1) level is decreasing approximately 1 ft every 3 minutes
   (2) 20 minutes

K/A

Fire Protection System (FPS)
Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Fire Protection System operating the controls including:
Fire Water Storage Tank Level

K/A Match Analysis

Given a plausible operational scenario, the RO applicant can demonstrate his or her ability to monitor fire water tank level, including the design limit/TRM LCO entry setpoint.

Answer Choice Analysis

A. INCORRECT. See attached calculation sheet.

B. CORRECT. See attached calculation sheet.

C. INCORRECT. See attached calculation sheet.

D. INCORRECT. See attached calculation sheet.

Supporting References

- Surry TRM TR 3.7.1, "Fire Suppression Water System," rev. 19, p. 3.7.1-1

- Surry lesson plan ND-92.2-LP-1, "FIRE PROTECTION SYSTEMS," rev. 12, especially p. 6.

References Provided to Applicant

none

Answer: B

66. G2.1.29 1

Which one of the following (1) correctly states the maximum allowable length of a valve wrench used IAW OP-AA-100, Conduct of Operations, AND (2) whether OP-AA-100 allows a valve wrench to be used on manual valves as well as motor operated valves (MOVs)?

A. (1) Valve wrench length is limited to approximately 1.5 times the handwheel diameter.

   (2) Valve wrench is permitted to be used on manual valves but not MOVs.

B. (1) Valve wrench length is limited to approximately 2.0 times the handwheel diameter.

   (2) Valve wrench is permitted to be used on manual valves but not MOVs.

C. (1) Valve wrench length is limited to approximately 1.5 times the handwheel diameter.

   (2) Valve wrench is permitted to be used on both manual valves and MOVs.

D. (1) Valve wrench length is limited to approximately 2.0 times the handwheel diameter.

   (2) Valve wrench is permitted to be used on both manual valves and MOVs.

K/A
Knowledge of how to conduct system lineups, such as valves, breakers, switches, etc.

K/A Match Analysis
Requires applicant to know the restrictions on use of additional force when aligning valves.

Answer Choice Analysis
A. Correct – A lever up to 1 ½ times the handwheel diameter may be used to open manual valves, but is not to be used on MOVs.

B. In-Correct but plausible since leverage is allowed, but the restriction limits the size to 1 ½ times. 2nd half of response is correct.

C. In-Correct but plausible since a lever up to 1 ½ times the handwheel diameter may be used to open the valve. However, use of leverage is only allowed on manual valves.

D. In-Correct but plausible since leverage is allowed to open the valve, but the lever is limited to 1 ½ times the diameter of the handwheel. In addition, use of leverage is only allowed on manual valves.

Supporting References
OP-AA-100, Conduct of Operations. Rev. 05

References Provided to Applicant
none

Answer: A
67. G2.1.40 1
Unit 1 Initial Conditions:

- Core re-fueling operations are in progress.
- Approximately 3/4 of the new core has been loaded without incident.

Current conditions:

- One Source Range count rate is double (2X) the initial reference value.
- The other Source Range count rate is (1.75X) (less than double) the initial reference value.
- The 1/M plot is approaching 0.65.

Based on the current conditions, which one of the following identifies the MINIMUM conditions that would require stopping core alterations, in accordance with the Precautions and Limitations of 1-OP-FH-001, "CONTROLLING PROCEDURE FOR REFUELING?"

A. Core alterations are required to be stopped immediately and subcriticality reevaluated.

B. Core alterations may continue, but IF BOTH Source Range count rates reach one doubling from the reference value, then core alterations are required to be stopped immediately and subcriticality reevaluated.

C. Core alterations may continue, but IF the 1/M plot approaches 0.5, then core alterations are required to be stopped immediately and subcriticality reevaluated.

D. Core alterations may continue, but IF BOTH Source Range count rates reach one doubling from the reference value, AND the 1/M plot approaches 0.5, then core alterations are required to be stopped immediately and subcriticality reevaluated.

K/A

Generic topic K/A:
Knowledge of refueling administrative requirements.
(CFR: 41.10 / 43.5 / 45.13) (RO - 2.8)

K/A Match Analysis

The question requires the RO applicant to demonstrate knowledge of an important precaution and limitation with respect to reactivity control during refueling operations.

Answer Choice Analysis

A. CORRECT. Precaution and Limitation 4.49 of procedure 1-OP-FH-001, "CONTROLLING PROCEDURE FOR REFUELING," states: "If the Source Range count rate on either detector doubles from the reference value, or the 1/M plot approaches 0.5, all core alterations must be stopped immediately and subcriticality reevaluated." The additional distractors are incorrect, but plausible, combinations of the sections of this P&L.

B. INCORRECT. See analysis of A. above.

C. INCORRECT. See analysis of A. above.

D. INCORRECT. See analysis of A. above.

Supporting References

-Surry procedure 1-OP-FH-001, "CONTROLLING PROCEDURE FOR REFUELING," rev. 21, p. 18 of 103, step 4.49.

References Provided to Applicant
none

Answer: A
68. G2.1.44 1
Unit 1 initial conditions:
Core re-load in progress
SR NI background count rate = 10 cps

Current plant conditions:
1G-C1, NIS SOURCE RNG SHUTDN HI FLUX alarms

Based on the above conditins, which one of the following correctly states (1) the minimum count rate that would cause the alarm and (2) what actions are directed by ARP 1G-C1?

A. (1) 42 cps
(2) Direct the refueling SRO to place fuel in a safe condition and evacuate containment.

B. (1) 42 cps
(2) Emergency borate and direct the refueling SRO to stop all refueling activities.

C. (1) 60 cps
(2) Direct the refueling SRO to place fuel in a safe condition and evacuate containment.

D. (1) 60 cps
(2) Emergency borate and direct the refueling SRO to stop all refueling activities.

K/A
Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.

K/A Match Analysis
Requires knowledge of MCR indications and actions for alarms during refueling activities.

Answer Choice Analysis
A. Correct: Per 1G-C1, alarm setting = 0.5 decades above background, place fuel in a safe conditions, and evacuate containment.
B. Incorrect: 1st part is correct. 2nd part is incorrect because you are not directed to

emergency borate. 2nd part is plausible because if this conditinos occurred at a hot
zero power, it may be correct.

C. Incorrect: 1st part is incorrect because the setting is 0.5 decades above background. 0.5 decases on a log scale = 3.16 or about 32 counts above background. 1st part is plausible because 0.5 decades on a linear scale is 50 counts above background. 2nd part is correct.

D. Incorrect: 1st part is incorrect because the setting is 0.5 decades above background. 0.5 decases on a log scale = 3.16 or about 32 counts above background. 1st part is plausible because 0.5 decades on a linear scale is 50 counts above background. 2nd part is incorrect because you are not directed to emergency borate. 2nd part is plausible because if this conditinos occurred at a hot
zero power, it may be correct.

Supporting References
1G-C1 Alarm Response Guide NIS SOURCE RNG SHUTDN HI FLUX

References Provided to Applicant
none

Licensee to verify that emergency boration would not be a method used to "borate as necessary" if Shutdown Margin margin was determined to be inadequate".
Answer: A

69. G2.2.40 1

Current plant conditions are as follows on Unit 1:

- The plant is in Hot Shutdown.
- Chemistry samples on the RWST indicate a boron concentration of 2700 ppm.

Based on the above conditions, which one of the following describes whether action statements are required to be performed for the following LCOs:

- LCO 3.3, Safety Injection
- LCO 3.4, Spray Systems

Action(s) of:

A. LCO 3.3 and LCO 3.4 are required.

B. LCO 3.3 is (are) required, but action(s) of LCO 3.4 is (are) NOT required

C. LCO 3.3 is (are) NOT required, but action(s) of LCO 3.4 is (are) required

D. Neither LCO 3.3. NOR LCO 3.4 are required.

K/A
Ability to apply Technical Specifications for a system.

K/A Match Analysis
Requires applicant to apply the definition of Hot Shutdown, know the applicability requirements for the LCOs and determine if any actions are required based on the plant conditions.

Answer Choice Analysis
A. In-Correct but plausible since boron concentration limits are the same for both LCO 3.3 and LCO 3.4. However, in the current plant condition, the limits don't apply for LCO 3.3.

B. In-Correct but plausible since boron concentration limits are the same for both LCO 3.3 and LCO 3.4. The applicant may well believe that the Spray system operability are not required in the current plant conditions while SI operability is required.

C. Correct – RWST boron concentration limits (2300 – 2500 ppm) apply to LCO 3.4 anytime RCS pressure and temperature are above 320 psig and 450°F. However, the limits only apply to LCO 3.3 when the reactor is critical and are no longer applicable in Hot Shutdown.

D. In-Correct but plausible since the plant is shutdown. The applicant may well believe that neither system is required for the given plant conditions.

Supporting References
T.S. LCO 3.3, Safety Injection
T.S. LCO 3.4, Spray Systems

References Provided to Applicant
none

Answer: C
70. G2.2.42 1
Unit 1 Initial Conditions:

- Reactor startup is in progress in accordance with 1-OP-RX-006, "WITHDRAWAL OF THE CONTROL BANKS TO CRITICAL CONDITIONS."
- Reactor power is at the fourth doubling point.
- Both Source Range channels read approximately 5.4E+03 cps and STABLE.
- The Senior Reactor Operator has just directed the Reactor Operator to withdraw control rods to criticality.

Current conditions:

- The reactor operator has not yet begun to move rods out.
- Annunciator 1G-A3, NIS SOURCE RNG LOSS OF DET VOLT, alarms and remains lit.

Based on the current conditions, which one of the following correctly states ALL the required action(s) as listed in Technical Specification 3.7, INSTRUMENTATION SYSTEMS, that must be completed within one hour?

A. IMMEDIATELY verify the operability of two Intermediate Range Nuclear Instrument channels before continuing with power ascension.

B. IMMEDIATELY suspend all reactivity changes. Verify the operability of two Intermediate Range Nuclear Instrument channels within one hour and at least once per every one hour thereafter.

C. IMMEDIATELY open the reactor trip breakers.

D. IMMEDIATELY suspend reactivity changes that are more positive than necessary to meet the required shutdown margin or refueling boron concentration limit.

K/A

Tier 3: Generic
Ability to recognize system parameters that are entry-level conditions for Technical Specifications.
(CFR: 41.7 / 41.10 / 43.2 / 43.3 / 45.3) (RO - 3.9)

K/A Match Analysis

Given an operational scenario involving the required nuclear instrumentation for a reactor startup, the RO applicant will demonstrate his or her ability to recognize entry-level conditions into the Technical Specifications, including knowledge of less-than-one-hours TS action statement requirements.

Answer Choice Analysis

A. INCORRECT. TS 3.7 requires positive reactivity changes that are more positive than necessary to meet the required shutdown margin or refueling boron concentration limit to be suspended. Distractor is plausible if the candidate believes that two operable IRNI channels allow for a continuation of the power ascention. TS 3.7 also specifies increasing THERMAL POWER above 11%RTP within 24 hours for an IRNI failure when power is above P-6 but below 7%.

B. INCORRECT. TS 3.7 requires positive reactivity changes that are more positive than necessary to meet the required shutdown margin or refueling boron concentration

limit to be suspended. Distractor is plausible if the candidate believes that two operable IRNI channels allow for a continuation of the power ascention.

C. INCORRECT. TS 3.7 requires positive reactivity changes that are more positive than necessary to meet the required shutdown margin or refueling boron concentration limit to be suspended. Distractor is plausible because immediately opening all reactor trip breakers is the required action for BOTH source range channels INOPERABLE.

D. CORRECT. TS 3.7 requires positive reactivity changes that are more positive than necessary to meet the required shutdown margin or refueling boron concentration limit to be suspended. There are no other required actions in the specification that are one hour or less tech specs.

Supporting References

-Surry Technical Specification 3.7, "INSTRUMENTATION SYSTEMS," amendment nos. 228 and 228, p. 3.7-10, 3.7-14, 3.7-15.

-This question is modified from SRO question 015G2.1.33 from Surry ILO exam 2006-301. (modified to ensure one-hour TS and RO applicability)

References Provided to Applicant
none

Answer: D
71. G2.3.5 1
You are assigned to oversee work being performed in a Radiation area.

Which one of the following describes: (1) the types of radiation that are measured by the “DAD” and (2) if the DAD dose rate alarm "alarms", are you required to leave the area and contact HP?

A. (1) Gamma & X-Ray ONLY
(2) No

B. (1) Gamma & X-Ray ONLY
(2) Yes

C. (1) Gamma, Beta and Neutron
(2) No

D. (1) Gamma, Beta and Neutron
(2) Yes

K/A

Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.

K/A Match Analysis
Requires knowledge of how to use personnel monitoring equipment.

Answer Choice Analysis
A. Correct. The DAD detects gamma and X-ray only. You do not have to leave the area, just move until the alarm stops.
B. Incorrect: 1st part is correct. 2nd part is incorrect because you just have to move to an area where the alarm stops. It is plausible because the dose alarm does require you to go to HP.
C. Incorrect: 1st part is plausible because if asked about the TLD, it would be correct. 2nd part is correct.
D. Incorrect: 1st part is plausible because if asked about the TLD, it would be correct. 2nd part is incorrect because you just have to move to an area where the alarm stops. It is plausible because the dose alarm does require you to go to HP.

Supporting References
ND-81.2-LP2, Obj: C

References Provided to Applicant
none

Answer: A
72. G2.3.7 1
Given the following conditions at a work site:

- Airborne activity: 3 DAC
- Radiation level: 40 mr/hr
- Radiation level with shielding: 10 mr/hr
- Time to place shielding: 15 minutes
- Time to conduct task with respirator: 1 hour
- Time to conduct task without respirator: 30 minutes

Assume the following:

- The airborne dose rate with a respirator will be zero (0).
- A radiation level of 40 mr/hr will be received while placing the shielding.
- All tasks will be performed by one worker.
- Shielding can be placed in 15 minutes with, or without, a respirator.

Based on the given conditions AND the provided Radiological Work Permit (RWP),

which one of the following would meet all requirements of the RWP?

A. Conduct the task WITHOUT a respirator or shielding.

B. Conduct the task WITH a respirator, but WITHOUT shielding.

C. Place the shielding WITH a respirator, and conduct the task WITH a respirator.

D. Place the shielding WITH a respirator, but conduct the task WITHOUT a respirator.

K/A

Tier 3: Generic.
Ability to comply with radiation work permit requirements during normal or abnormal conditions.
(CFR: 41.12/45.10) (RO - 3.5)

K/A Match Analysis

The question requires the use a provided RWP and complete the required ALARA calculations to determine the best course of action.

Answer Choice Analysis

3 DAC X 2.5 mr/DAC X 0.5 hr = 3.75 mr

A. INCORRECT. 20 mr conducting task, plus 3.75 mr = 23.75 mr. Would NOT result in dose being maintained ALARA.

B. INCORRECT. 40 mr conducting task, zero airborne = 40 mr. Would NOT result in dose being maintained ALARA.

C. INCORRECT. 10 mr placing shielding, plus 10 mr conducting task, zero airborne = 20 mr. Would NOT result in dose being maintained ALARA.

D. CORRECT. 10 mr placing shielding, plus 5 mr conducting task, plus 3.75 mr airborne while conducting task = 18.75. This is the lowest dose of all the possible options.

Supporting References

- Browns Ferry 2006 and 2008 ILO exam RO question G 2.3.10.

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NOTE TO SURRY: I need to have your HP's create a "bogus" RWP that would cover this question's situation. Please include specific language about entering an area with greater than 1 DAC airborne activity, such as "Entry into an area with a posted airborne activity of greater than 1 DAC requires use of a respirator, unless the overall dose for the task will be higher. Maintain ALARA at all times." or something similar.

****

References Provided to Applicant

- "bogus" (i.e. fictitious) Radiological Work Permit created by Surry HP personnel.

Answer: D
73. G2.4.14 1
Unit 1 initial conditions:
Reactor Trip
Critical safety functions as follows.
SUBCRITICALITY - GREEN
HEAT SINK - ORANGE
CORE COOLING - ORANGE
INVENTORY - RED
CONTAINMENT - GREEN
INTEGRITY - ORANGE

Based on the above conditions, when addressing Critical Safety Functions (CSFs) which one of the following CSFs has the highest priority and should therefore be addressed first?

A. Heat Sink

B. Core Cooling

C. Inventory

D. Integrity

K/A
Knowledge of general guidelines for EOP usage.

K/A Match Analysis
Requires knowledge of prioritizing conditions when using the EOP.

Answer Choice Analysis

A. Incorrect: Plausible because it is a higher “priority”CSF.
B. Incorrect: Plausible because it is a higher “priority” CSF. Would be correct if no Red condition existed.
C. Correct: Red gives it the higher priority.
D. Incorrect: Plausible because it is a higher “priority” CSF.

Supporting References

ND-95.3-LP-26 Sect. B & C, Obj: B & C

References Provided to Applicant

none

Answer: C

74. G2.4.18 1

Unit 1 initial conditions:

Loss of all feedwater has occurred from 100% power
EOPs are progress

Current plant conditions:

Transition to 1-FR-H.1 RESPONSE TO LOSS OF SECONDARY HEAT SINK has just been made
1A WR SG level = 4% decreasing
1B WR SG level = 5% decreasing
1C WR SG level = 6% decreasing
RCS pressure = 2300 psig increasing
CETC = 580 ^{o}F increasing
All RCPs are secured

Based on the above conditions: (1) which one of the following actions are directed by 1-FR-H.1 and (2) what is the bases for that action?

A. (1) Commence bleed and feed
(2) At least Two SGs are considered Dry so transition to another form of decay heat removal must be made before conditions degrade further

B. (1) Commence bleed and feed
(2) RCS pressure may reach pressurizer safety valve setpoints, so transition to another form of decay heat removal must be made to prevent water relief through the safety valves.

C. (1) Cross Connect with Unit 2 AFW and feed at the maximum available rate
(2) To reduce RCS temperature to < 550 ^{o}F for establishing a heat sink

D. (1) Cross Connect with Unit 2 AFW and feed at the maximum available rate
(2) To increase SG level to > 7% in any SG for establishing a heat sink

K/A
Knowledge of the specific bases for EOPs.

K/A Match Analysis
Requires knowledge of the specific Basis for EOP steps.

Answer Choice Analysis
A. Correct. Caution in 1-FR-H.1 step 2: If WIDE RANGE level in any 2 SGs is less than 7% [22%] OR PRZR pressure is greater than or equal to 2335 psig due to loss of secondary heat sink, RCPs should be tripped and Steps 11 through 18 should be immediately initiated for bleed and feed.
B. Incorrect: 1st part is correct: 2nd part is incorrect. 2nd part is plausible because water relief thru safeties is not desired.
C. Incorrect: 1st part is incorrect because the criteria for commencing Feed and Bleed has been met. 1st part is plausible because it would be correct if 2 SG levels were > 7%. 2nd would be correct for a dry SG.
D. Incorrect: 1st part is incorrect because the criteria for commencing Feed and Bleed has been met. 1st part is plausible because it would be correct if 2 SG levels were > 7%. 2nd would be correct for a dry SG.

Supporting References
EOP 1-FR-H.1 RESPONSE TO LOSS OF SECONDARY HEAT SINK
ND-95.3-LP41
Response to Loss of Secondary Heat Sink B.4 Obj: B

References Provided to Applicant
none

Answer: A
75. G2.4.49 1
Unit 1 initial conditions:
Reactor power = 100%
1A Charging pump operating
1B and 1C Charging pumps in STBY
1D-E5, CHG PP TO REGEN HX HI-LO FLOW alarms
1D-F5, CHG PP TO REGEN HX LO PRESS alarms
1A Charging pump discharge pressure fluctuating between 600 and 1000 psig
Charging flow fluctuating between 5 and 20 gpm

VCT level = 42% stable
1-AP-8 LOSS OF NORMAL CHARGING FLOW initiated

Based on the above conditions, which one of the following sequence of actions are directed by 1-AP-8 ?

A. Initiate 1-E-0 **AND** 2-E-0 REACTOR TRIP OR SAFETY INJECTION, then cross connect charging after both units have been tripped.

B. Initiate 1-E-0 **(Do NOT initiate 2-E-0)** REACTOR TRIP OR SAFETY INJECTION, then cross connect charging with Unit 2.

C. Place all CHG pumps in PTL, Isolate letdown and Initiate 1-E-0 REACTOR TRIP OR SAFETY INJECTION.

D. Place all CHG pumps in PTL, Initiate 1-E-0 REACTOR TRIP OR SAFETY INJECTION then secure ALL RCPs.

K/A
Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.

K/A Match Analysis
Requires knowledge of conditions that require operator actions to prevent equipment damage.

Answer Choice Analysis
A. Incorrect: Plausible because if all of Unit 1s CHG pumps had cavitated, it would be correct.
B. Incorrect: Unit 2 would also be tripped if this procedure path was taken. Plausible because Unit 1 is tripped prior to cross-connecting with Unit 2 and if all 3 CHG pumps had cavitated, it would be directed by procedure.
C. Correct: Per AP/8 LOSS OF NORMAL CHARGING FLOW, if indications of a loss of suction (Gas binding) it directs placing all CHG pumps in PTL, isolating letdown and initiating 1-E-0.
D. Incorrect: 1st part is correct. 2nd part is plausible because it would be correct coincident with no CC flow to a RCP.

Supporting References
OP AA 100 Sect. 4. **Immediate Actions**
AP/8 Loss of Normal Charging Flow Steps 1-5

References Provided to Applicant
none

Licensee to verify charging pump switch position.
Answer: C