Level RO Tier 1 Group 1 K/A# 055 2.2.25 Imp. RO 2.5 Imp. SRO 3.7

12. The coping study that was done to support the analysis for a loss of all AC power event at Prairie Island took credit for the condensate storage tanks (CSTs). The minimum volume of water in the CSTs ensures the affected unit can be...

a. placed in MODE 5 within 20 hours.
b. maintained in HOT STANDBY for at least 36 hours.
c. maintained in HOT SHUTDOWN for at least 36 hours.
d. placed in MODE 4 within 20 hours.

ANSWER: D

Explanation:
- a **Plausible because it matches the timeline for CST volume but not correct because cooling using the CST can not ensure Tavg can be reduced below 200°F.**
- b **Plausible because the CST basis discusses maintaining MODE 3 but incorrect because the CST does not have enough water for 36 hours.**
- c **Plausible because the CST can provide the water needed to cool down to MODE 4 but incorrect because the CST does not have enough water for 36 hours.**
- d **Correct.**

Technical References: **T.S. LCO 3.7.6 Bases**
Design Basis Document for Station Blackout
Objective: **P8186L-008**
KA Statement: **Equipment Control: Knowledge of bases in technical specification for limiting conditions for operation and safety limits. (Station Blackout)**

Cog. Level: **HIGH** 10CFR55.41: 10CFR55.43: **YES** New Question: **YES**
Bank: Ques. ID: Modified: Last NRC Exam:

Recommend RO Question #12 be deleted from the examination.

The Station Blackout (SBO) Rule Compliance Report credits the T.S. (3.4.B.1.d) minimum volume of 100,000 gallons with meeting the requirement of the SBO rule.

The Basis for T.S. LCO 3.7.6 discusses the minimum quantity of water in a CST on a single unit basis with the unit drawing water from its associated CST.

The exam question refers to CSTs (plural) and affected unit (singular). The normal plant configuration for Prairie Island (PI) has the Condensate Storage Tanks (CSTs) crosstied via valve C-41-2. We ensure this valve is maintained open by placing a Safeguards Hold card on the valve in accordance with SWI O-3, "Safeguards Hold Cards & Component Blocking or Locking."

This normal alignment provides a minimum of 200,000 gallons to a single affected unit. This is double the water discussed to in the LCO basis. Since the answer was based on the LCO basis and the question stem establishes conditions that are different, there is no correct answer for RO Question #21.

Ref: Design Bases Document Station Blackout, page 67 of 80
T.S. Bases, CSTs, Pages B3.7.6-2 and 3
Flow Diagram NF-39220 (in area D7)
SWI O-3 Table 1, Page 16 of 30
Checklist C28-1, Page 9 of 15

- RCS Inventory Control
- RCS Pressure Control
- RCS Wide Range Pressure
- RCS Wide Range Temperature
- Reactor Trip
- Reactor Vessel Level (RVLIS)
- Reactor Vessel Head Vent
- Safeguards Chilled Water
- Steam Generator Heat Removal
- Steam Generator Level
- Steam Generator Wide Range Level
- Steam Release Radiation/Flow Monitors
- T (SAT) Meter

The equipment identified in the Coping Study to perform the functions above includes the reactor trip breakers, the charging pumps, the refueling water storage tank, hot and cold leg temperatures, RCS pressure transmitters, component cooling to RCPs, motor driven auxiliary feedwater pump, turbine driven auxiliary feedwater pump, main steam safety valves, and instrumentation to monitor the listed functions.

4.2.4 Station Blackout Coping Capability Analyses. Section (a)(2) of 10 CFR 50.63 requires that "the capability for coping with a station blackout of [4 hours] shall be determined by an appropriate coping analysis" [Reference 6.1.1]. References 6.1.3 and 6.1.4 provide guidance acceptable to the NRC for performing the required analysis. Since the AAC source is available within ten minutes, a full coping analysis is not required [Reference 6.1.1 Section (c)(2)]. However, it is necessary to demonstrate the availability of sufficient condensate inventory for the four hour coping duration.

A. **Condensate Inventory.** Sufficient condensate inventory shall be available for decay heat removal during a 4-hour SBO at PINGP.

The Station Blackout Rule Compliance Report [Reference 6.3.1] states that 89,000 gallons of water is required for rapid cooldown of the RCS in accordance with 1ECA-0.0 and 2ECA-0.0 [Also see Reference 6.2.4]. Since the AAC power source is available, rapid cooldown is not necessary. The 89,000 gallons required for rapid cooldown is a bounding value of what PINGP needs for responding to a 4-hour SBO. PINGP Technical Specification 3.4.B.1.d [Reference 6.2.13] requires a minimum of 100,000 gallons in the Condensate Storage Tanks [Reference 6.6.16]. In addition, the Cooling Water system can provide an unlimited supply of river water for decay heat removal.

BASES

BACKGROUND (continued)

Although the CSTs are a principal secondary side water source for removing residual heat from the RCS, they are not designed to withstand earthquakes and other natural phenomena, including missiles that might be generated by natural phenomena. However, the backup CL safety-related source is designed to withstand such phenomena.

A description of the CSTs is found in the USAR (Ref. 1).

APPLICABLE SAFETY ANALYSES

The CSTs may provide high purity cooling water to remove decay heat and to cool down the unit following events in the accident analysis as discussed in the USAR (Ref. 2).

The 100,000 gallon CSTs useable volume requirement for each unit in MODE 1, 2, or 3 is sufficient to:

a. Remove the decay heat generated by one reactor in the first 12 hours after shutdown; and

b. Ensure sufficient water is available to cool down a reactor from 547°F to 350°F using natural circulation at 25°F/hour; or

c. Ensure sufficient water is available to hold the unit in MODE 3 for 2 hours, followed by a cooldown to RHR entry conditions within the next 6 hours.

These calculations take into account the decay heat and reactor coolant system stored energy (Ref. 1).

The CST satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

The CSTs are considered OPERABLE when the CSTs' contents have at least 100,000 useable gallons per operating unit (MODES 1, 2, or 3).

This basis is established in Reference 2 and exceeds the volume required by the accident analysis.

The OPERABILITY of the CSTs is determined by maintaining the tank level at or above the minimum required level.

APPLICABILITY

In MODES 1, 2, and 3, and MODE 4, when steam generator is being relied upon for heat removal, the CSTs are required to be OPERABLE.

In MODE 5 or 6, the CSTs are not required because the AFW System is not required.

ACTIONS

A.1 and A.2

If the CSTs are not OPERABLE (e.g., level is not within limits), the OPERABILITY of the backup safety-related portion of the CL supply should be verified by administrative means within 4 hours and once every 12 hours thereafter. OPERABILITY of the backup safety-related portion of the CL supply must include verification that the flow paths from the backup water supply to the AFW pumps are OPERABLE in accordance with LCO 3.7.8. The CSTs must be restored to OPERABLE status within 7 days.

The 4 hour Completion Time is reasonable, based on operating experience, to verify the OPERABILITY of the backup safety-related portion of the Cooling Water supply. Additionally, verifying the backup water supply every 12 hours is adequate to ensure the backup water supply continues to be available. The 7 day Completion Time is reasonable, based on an OPERABLE backup

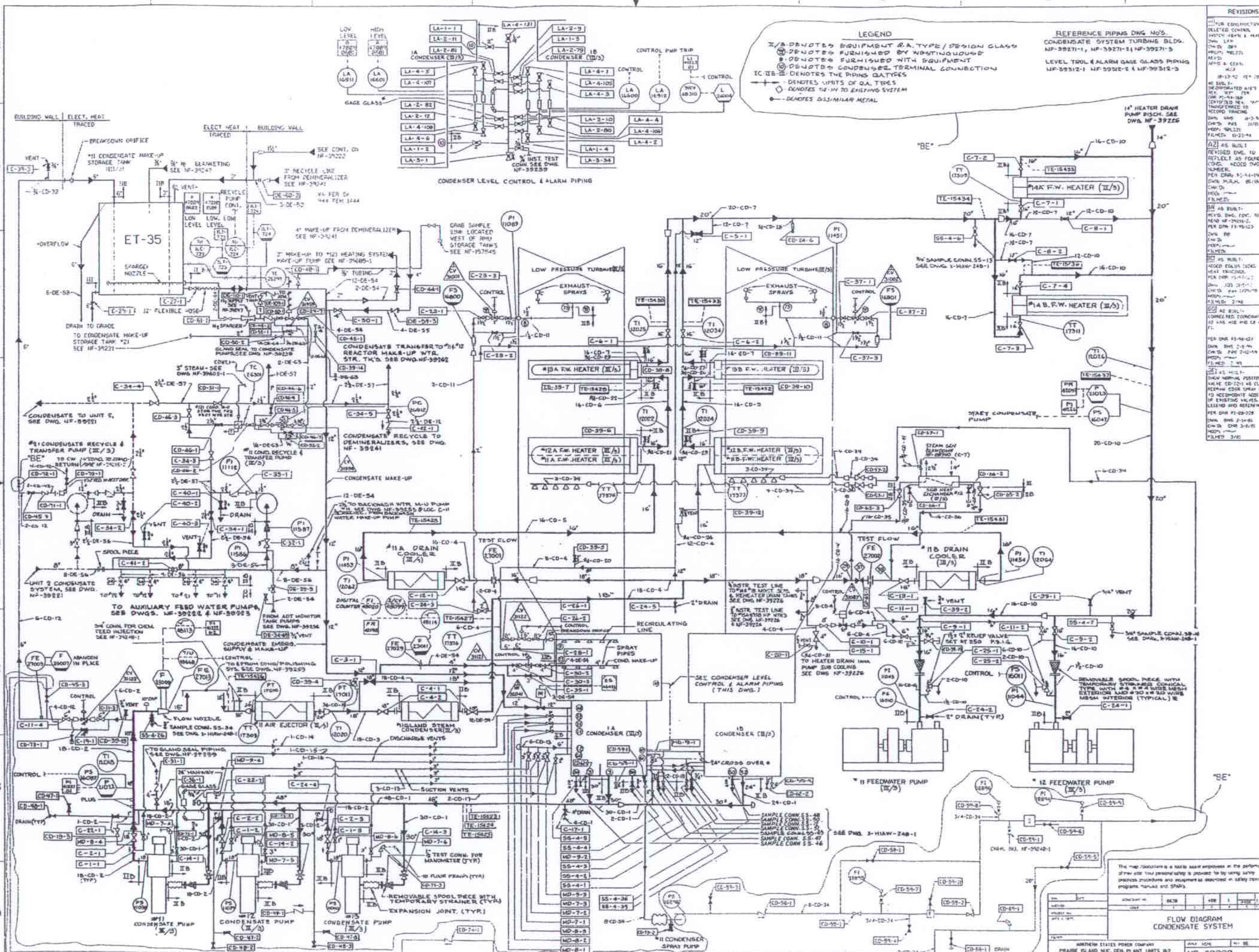
LEGEND
II/B DENOTES EQUIPMENT Q.A. TYPE / DESIGN CLASS
DENOTES FURNISHED BY WESTINGHOUSE
DENOTES FURNISHED WITH EQUIPMENT
DENOTES CONDENSER TERMINAL CONNECTION
IC-IIB-III DENOTES THE PIPING Q.A. TYPES
DENOTES LIMITS OF Q.A. TYPES
DENOTES TIE-IN TO EXISTING SYSTEM
DENOTES DISSIMILAR METAL
REFERENCE PIPING DWG NO'S.
CONDENSATE SYSTEM TURBINE BLDG.
NF-39271-1, NF-39271-2 & NF-39271-3
LEVEL TROL & ALARM GAGE GLASS PIPING
NF-39312-1 NF-39312-2 & NF-39312-3
CONDENSER LEVEL CONTROL & ALARM PIPING
ET-35
LOW PRESSURE TURBINE (II/3)
EXHAUST SPRAYS
#14A F.W. HEATER (II/3)
#14B F.W. HEATER (II/3)
#13A F.W. HEATER (II/3)
#13B F.W. HEATER (II/3)
#12A F.W. HEATER (II/3)
#11A F.W. HEATER (II/3)
#12B F.W. HEATER (II/3)
#11B F.W. HEATER (II/3)
#11A DRAIN COOLER (II/3)
#11B DRAIN COOLER (II/3)
1A CONDENSER (III/3)
1B CONDENSER (III/3)
#11 FEEDWATER PUMP (II/3)
#12 FEEDWATER PUMP (II/3)
#11 CONDENSATE PUMP (II/3)
#12 CONDENSATE PUMP (II/3)
#13 CONDENSATE PUMP (II/3)
#11 CONDENSER SPRAY PUMP
#11 AIR EJECTOR (II/3)
#11 GLAND STEAM CONDENSER (II/3)
TO AUXILIARY FEED WATER PUMPS, SEE DWGS. NF-39222 & NF-39223
CONDENSATE TO UNIT 2, SEE DWG. NF-39221
CONDENSATE TRANSFER TO #11 & #12 REACTOR MAKE-UP WTR. STR. TK'S. SEE DWG. NF-39262
CONDENSATE RECYCLE TO DEMINERALIZERS, SEE DWG. NF-39241
CONDENSATE MAKE-UP
RECIRCULATING LINE
SPRAY PIPES
TEST FLOW
SUCTION VENTS
DISCHARGE VENTS
REMOVABLE SPOOL PIECE WITH TEMPORARY STRAINER (TYP)
EXPANSION JOINT (TYP)
SEE CONDENSER LEVEL CONTROL & ALARM PIPING (THIS DWG.)
"BE"
REVISIONS
FLOW DIAGRAM
CONDENSATE SYSTEM
NORTHERN STATES POWER COMPANY
PRAIRIE ISLAND NUC. GEN. PLANT UNITS 1&2
NF-39220

Table 1 Component Blocking and Locking Log

*** Component located in Containment or Annulus**
T = Turb Bldg A = Aux Bldg D = D5/D6 Dsl Gen Bldg S = Screenhouse R = Also held for Appendix R

	Equipment Name		Valve/Bkr No.	Status OP/CL	Card No.	Lock No.	Key No.	Date ON	SS	OFF	SS	ON	SS	OFF	SS	ON	SS
	MV-32096 Supply Bkr	A	1K1-F1	OFF	1-135	E-313	30										
	MV-32097 Supply Bkr	A	1KA2-C3	OFF	1-136	E-483	31										
	MV-32207 Supply Bkr	A	1KA2-D1	OFF	1-137	E-597	29										
	MV-32070 Supply Bkr	A	1LA1-A2	OFF	1-138	E-617	35										
M²	MV-32242 Supply Bkr	A, R	1LA1-A3	OFF	1-139	E-507	32										
	MV-32073 Supply Bkr	A, R	1LA1-B4	OFF	1-140	E-221	36										
M²	MV-32243 Supply Bkr	A, R	1LA2-A3	OFF	1-141	E-182	33										
	MV-32068 Supply Bkr	A, R	1LA2-B1	OFF	1-142	E-521	34										
	12 Clg Wtr Pmp Discharge	S	CL-39-2	OP	1-143	Block	N/A										
	22 Clg Wtr Pmp Discharge	S	2CL-39-2	OP	1-144	Block	N/A										
	RH Exch 11 Outlet Handwheel	A	CV-31235	OP	1-145	Block	N/A										
	RH Exch 12 Outlet Handwheel	A	CV-31236	OP	1-146	Block	N/A										
	Reserved for Future Use				1-147												
	11 CS Pmp Recirc to RWST	A	CS-24-1	CL	1-148	Block	N/A										
	12 CS Pmp Recirc to RWST	A	CS-24-2	CL	1-149	Block	N/A										
M²	Cond Storage Tank X-Conn	T	C-41-2	OP	1-151	Block	N/A										
	11 SI Pump Rcrc	A	SI-15-3	OP	1-152	Block	N/A										
	12 SI Pump Rcrc	A	SI-15-4	OP	1-153	Block	N/A										
	12 & 21 AFW Pmp Dsch X-Conn	T	AF-13-1	CL	1-154	Block	N/A										

C CHECKLIST	CONDENSATE SYSTEM - UNIT 1	NUMBER: C28-1
		REV: 30
		Page 9 of 15

COMPONENTS	DESCRIPTION	STATUS	INITIAL
	695' TURBINE BLDG (CONT'D)		
C-34-3	11 COND RECYCLE AND TRANSFER PUMP DISCHARGE	OPEN	
C-34-1	11-21 COND RECYCLE AND TRANSFER PUMP CROSSOVER	CLOSED	
C-40-1	11 COND RECYCLE AND TRANSFER PUMP DISCH VLV DRAIN	CLOSED	
C-32-1	11 COND RECYCLE AND TRANSFER PUMP SUCTION VALVE	OPEN	
DE-29-5	ADT TO 11 COND RECYCLE AND TRANSFER PUMP	CLOSED	
C-41-2	U1/U2 COND X-CONN	BLOCKED & TAGGED OPEN	
C-40-4	21 COND RECYCLE AND TRANSFER PMP DISCH VALVE DRAIN	CLOSED	
C-34-2	21-11 COND RECYCLE AND TRANSFER PUMP CROSSOVER	CLOSED	
C-34-4	11-21 COND RECYCLE AND TRANSF PMP DISCH CROSSOVER	OPEN	
CD-113-5 ROOT ISOL	12 FW PMP SUCT PS-16011, 12 FW PMP SUCT PI-11044	OPEN	
CD-113-4 ROOT ISOL	11 FW PMP SUCT PS-16010, 11 FW PMP SUCT PI-11043	OPEN	
CP-30-1	11 BACKWASH WATER MAKEUP PUMP RECIRC	OPEN	
CP-12-1	11 BACKWASH WATER MAKEUP PUMP SUCTION	OPEN	
C-24-1	12 FWP SUCTION DRAIN	CLOSED	
C-24-2	11 FWP SUCTION DRAIN	CLOSED	
GS-10-12	SEAL INJECTION TO FW PUMP VENT	CLOSED	
CD-133-1 ROOT ISOL	1A CDSR COND M-U INLT F XMTR FT-23011 LO (E 0.7/4.1/695')	OPEN	