Final Submittal

ST. LUCIE AUGUST 2004
EXAM NOS. 05000335/2004301
AND 05000389/2004301

AUGUST 9 - 20, 2004

1. Reactor Operator Written Examination

Nuclear Regulatory Commission
Reactor Operator Licensing
Examination

St Lucie Nuclear Plant

Nuclear Regulatory Commission Reactor Operator Licensing Examination

St Lucie Nuclear Plant

U.S. Nuclear Regulatory Commission
Site-Specific
RO Written Examination

Applicant Information

Name:	
Date: **8/20/2004**	Facility/Unit: **St. Lucie Nuclear Plant**
Region: I / II / III / IV	Reactor Type: W / CE / BW / GE
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass this examination, you must achieve a final grade of at least 80.00 percent. Examination papers will be collected six hours after the examination starts.

Applicant Certification

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

_____
Applicant's Signature

Results

Examination Value	_____	Points
Applicant's Score	_____	Points
Applicant's Grade	_____	Percent

1 Pt(s) Unit 1 was operating at 100% power when a reactor trip occurred. Given the following events and conditions shortly after the trip:

- Reactor power is $1x10^{-1}$% and is decreasing
- SUR is –1 DPM and is becoming less negative
- 3 CEAs in group B failed to insert into the core

Which one of the following actions is required by 1-EOP-01 (SPTA) to respond to this problem?

A. Manually drive group 3 rods to insert the CEAs

B. Manually trip the reactor

C. Deenergize the CEDM MG Sets

D. Initiate emergency boration

1 Pt(s) Which one of the following conditions will cause a high RCP seal cooler heat exchanger high temperature alarm while the unit is in Mode 3?

A. RCP thermal Barrier CCW tube rupture.

B. RCP seal flow increases from 1.0 gpm to 1.25 gpm.

C. Loss of control power to the seal cooler heat exchanger isolation valves.

D. Loss of instrument air to the seal cooler heat exchanger isolation valves.

1 Pt(s) Which one of the following choices correctly describes the power supply arrangement for the Unit 1 Boric Acid Pumps and the Gravity Feed valves?

A. **Both BAM pumps from MCC 1A6.**
Both Gravity Feed valves from MCC 1B6

B. **Both BAM pumps from MCC 1B6**
Both Gravity Feed valves from MCC 1A6.

C. **"A" BAM pump and Gravity Feed valve V2508 from MCC 1A6.**
"B" BAM pump and Gravity Feed valve V2509 from MCC 1B6.

D. **"A" BAM pump and Gravity Feed valve, V2508, from MCC 1B6.**
"B" BAM pump and Gravity Feed valve, V2509, from MCC 1A6.

1 Pt(s) Unit 1 was operating at 100% power with all instrumentation channels in an operable condition when a LOCA occurred. Given the following conditions:

Time	**0200**	**0202**	**0204**	**0206**
RCS Pressure (psia)				
PT-1102A	1595	1590	1590	1590
PT-1102B	1605	1602	1598	1595
PT-1102C	1605	1602	1602	1595
PT-1102D	2500	2500	2500	2500
Containment Pressure (psig)				
PT-07-2A	3.2	3.6	4.6	5.2
PT-07-2B	3.1	3.4	4.7	5.3
PT-07-2C	3.4	3.7	5.1	5.6
PT-07-2D	0.2	0.2	0.2	0.2

If the SIAS fails to actuate automatically, what is the earliest time that operators are required to manually actuate SIAS by procedure?

A. 0200

B. 0202

C. 0204

D. 0206

1 Pt(s) Units 1 and 2 were operating at 100% power. Given the following events and conditions:

- A large unisolable instrument air leak has developed in an unknown location outside containment.
- Instrument air pressure dropped to 65 psig on one of the units.

Which one of the following statements correctly describes:
1. The affected unit, and
2. The required action to maintain RCP seal integrity?

A. **1. Unit 1**
2. All RCPs are required to be stopped within 10 minutes due to CCW inside containment isolation valves failing closed.

B. **1. Unit 1**
2. All RCPs are required to be stopped within 30 minutes due to RCP seal heat exchanger valves failing closed.

C. **1. Unit 2**
2. All RCPs are required to be stopped within 10 minutes due to CCW inside containment isolation valves failing closed.

D. **1. Unit 2**
2. All RCPs are required to be stopped within 30 minutes due to RCP seal heat exchanger valves failing closed.

1 Pt(s) Unit 2 was shutdown to Mode 3. Given the following events and conditions:

- Pressurizer pressure = 2220 psia
- Pressurizer level = 50%
- The pressure control system operates as designed
- A pressurizer PORV spuriously opens

Which one of the following statements correctly describes the **initial** pressurizer level trend and the predominant cause for this trend?

A. Pressurizer level will increase as the water flashes in the reference leg of the pressurizer level detector.

B. Pressurizer level will increase due to the drop in pressurizer pressure.

C. Pressurizer level will decrease as inventory is lost out the open PORV.

D. Pressurizer level will decrease caused by the insurge cooling the pressurizer.

1 Pt(s) Unit 2 was operating at 100%. Given the following events and conditions:

- One PORV has a small leak and the following quench tank parameters are slowly trending up as follows:
  - Quench tank level = 71% - high level alarm
  - Quench tank temperature = 210 °F – high temperature alarm
  - Quench tank pressure = 15 psig – high pressure alarm

Which one of the following statements completely describes the required actions to correct this condition while minimizing liquid wastes?

A. Drain and vent the quench tank.

B. Drain the quench tank.
Cool the quench tank using the wrap around heat exchanger.

C. Drain and vent the quench tank.
Cool the quench tank using the wrap around heat exchanger.

D. Vent the quench tank.
Cool the quench tank by draining and refilling with primary makeup water.

1 Pt(s) Which one of the following RPS trips is credited in the safety analyses to protect against exceeding DNBR?

A. Low steam generator water level

B. Low steam generator pressure

C. High pressurizer pressure

D. High rate of change of power (high SUR)

1 Pt(s) Unit 1 is operating at 100% power. Given the following events and conditions:

- PT-07-2A (CNTMT PRESS TRANSMITTER) failed high and has not been bypassed.
- A loss of the MD instrument bus occurs.

Which of one the following selection is the complete set of Engineered Safety Features Actuation signal(s) that will actuate in addition to SIAS?

A. CIAS

B. CSAS

C. CIAS and MSIS

D. CSAS, MSIS and CIAS

1 Pt(s) Which one of the following cases would NOT allow manual initiation of AFAS by procedure OPS-521 (*Emergency Operating Procedure Implementation*)?

A. Automatic actuation of the system did not occur after the appropriate time delay had elapsed.

B. Automatic actuation of AFAS has occurred, however one motor driven AFW pump did not start and its associated discharge solenoid valve did not open.

C. During a loss of off-site power, after AFAS actuation, if one feedwater header pressurizes before the other (assuming neither feed header is ruptured).

D. When cooling down the RCS using only one steam generator, if the operable steam generator is affected by the AFAS rupture identification circuit.

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- Containment cooling system was in a normal alignment
- Containment cooling fans 2A, 2B and 2C were running
- An inadvertent SIAS occurred

Which one of the following sets correctly describes the status of the containment cooling fans?

A. 2A, 2B, 2C running in fast speed, 2D not running

B. 2A, 2B, 2C and 2D running in fast speed

C. 2A, 2B, 2C running in slow speed, 2D not running

D. 2A, 2B, 2C and 2D running in slow speed

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions occur simultaneously:

- A LOCA occurred
- Containment pressure reached a maximum of 9.5 psig
- The 2A3 bus lockout relay has actuated

What is the status of the containment spray (CS) pumps 30 seconds after the LOCA?

A. No CS pumps are running

B. 2A CS pump is running

C. 2B CS pump is running

D. 2A and 2B CS pumps are running

1 Pt(s) Unit 1 is operating at 55% power. Given the following events and conditions:

- The 1B and 1C condensate pumps are running
- The 1A and 1B Main Feed Pumps are running.
- A fault causes the 1C condensate pump motor breaker to trip.

What is the:
1. Expected automatic system response (if any), and
2. Appropriate operator actions?

A. **1. No automatic actions are expected**
2. Attempt to restart the tripped condensate pump.

B. **1. The 1A MFW Pump trips, the 1B MFW pump continues to run**
2. Rapidly reduce power to maintain feed suction pressure above 275 psig.

C. **1. The 1B MFW Pump trips, the 1A MFW pump continues to run**
2. Rapidly reduce power to maintain feed suction pressure above 275 psig.

D. **1. Both MFW Pumps trip**
2. Rapidly reduce power and trip when S/G level reaches 50% NR level.

1 Pt(s) Unit 1 was operating at 100% power when a steam rupture occurred inside containment. Given the following events and conditions:

Time	**0200**	**0205**	**0210**	**0220**
Steam Generator (psia)				
PT-8013A	602	599	590	485
PT-8013B	599	595	586	481
PT-8013C	604	602	592	487
PT-8013D	603	601	591	486
Steam Generator (psia)				
PT-8023A	603	750	821	823
PT-8023B	602	752	822	824
PT-8023C	598	748	818	820
PT-8023D	601	751	820	821
Containment Pressure (psig)	3.6	4.1	4.5	5.1
Pressurizer Pressure (psia)	1635	1620	1595	1495

What time will the main feedwater isolation valves (MFIVs) close?

A. 0200

B. 0205

C. 0210

D. 0220

1 Pt(s) Unit 2 was operating at 100% power when a loss of offsite power occurred. Given the following events and conditions:

- The 2C AFW pump was out of service.

0200 A reactor trip occurred due to a loss of off-site power
- The 2A emergency diesel generator automatically loaded on the bus
- The 2B emergency diesel generator started but its breaker didn't close
- AFAS actuated

0205 The 2B emergency diesel generator breaker was manually closed

Assuming no operator actions, which one of the following statements correctly describes the AFW lineup at 0206?

A. The 2A and 2B AFW pumps are running feeding their respective S/G's

B. The 2A AFW pump is running feeding only the 2A S/G. The 2B AFW pump is running but not feeding the 2B S/G.

C. The 2B AFW pump is running feeding only the 2B S/G. The 2A AFW pump is running but not feeding the 2A S/G.

D. The 2A and 2B AFW pumps are running but not feeding either S/G

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- Annunciator C-36 (MN XFMR 2A ALARM PANEL) alarms
- The ANPO reports the following alarms on the local alarm panel:
  - DEVICE 27X1 (NO VOLATGE POWER SOURCE #2)
  - DEVICE 27X3 (LOSS OF COOLER POWER SUPPLY)
- 2A main transformer cooling equipment supply breaker is closed
- 2A main transformer cooling pumps and fans are not operating

Which one of the following statements correctly describes the condition and the response to generate as much power as allowable by procedures?

A. Either main transformer can carry 100% of the generator output. Shutdown the 2A main transformer and shift 100% of the load to the 2B main transformer.

B. A potential overcurrent situation exists if the 2A transformer is shutdown. Immediately trip the reactor and enter 2-EOP-01.

C. A potential overcurrent situation exists if the 2A transformer is shutdown. Initiate a plant ramp down power at 20 MW per minute.

D. A potential overcurrent situation exists if the 2A transformer is shutdown. Cross connect the cooling system from transformer 2B and maintain 100% power.

1 Pt(s) The green indicating light on the 6.9 and 4.16 KV breakers indicates the breaker is in the open position and it also indicates:

A. The breaker is racked in and the closing spring is charged.

B. The breaker is racked out and the closing spring is discharged.

C. The breaker is racked in and DC tripping power is available.

D. The breaker is in the "TEST" position and DC tripping power is available.

1 Pt(s) Unit 1 was in Mode 3. Given the following events and conditions:

- An RCS Heatup was in progress
- RCS T_{avg} is 510 °F
- Pressurizer Pressure is 2235 psia

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

A. Total Loss of Feedwater

B. Excess Steam Demand Event

C. Loss of Coolant Accident

D. Loss of Off-Site Power

1 Pt(s) Unit 1 was operating at 100% power when a LOOP occurred. Given the following events and conditions:

- 125 VDC control power to the 1A EDG fails when offsite power is lost

Which one of the following statements correctly describes the affect of this malfunction on the 1A EDG?

A. The 1A EDG will not start.

B. The 1A EDG will start but will not develop an output voltage.

C. The 1A EDG will start and achieve rated output voltage but will not close onto the 1A3 safety bus.

D. The 1A EDG will start and pick up bus 1A3.

1 Pt(s) Unit 1 was operating at 50% power and Unit 2 is shutdown in an outage. Given the following events and conditions:

- A controlled radioactive liquid release to the circulating water (CW) discharge is in progress.
- 3 CW pumps are running
- 3 intake cooling water (ICW) pumps are running
- 3 CW and 3 ICW pumps are required on the release permit

Which one of the following conditions would automatically trip FCV6627X and terminate the release?

A. Waste monitor pump low discharge pressure alarm

B. Liquid waste monitor R-6627 alarms on high activity

C. Liquid waste monitor R-6627 alarms on low sample flow

D. Waste Monitor Tank low level alarms

1 Pt(s)

Unit 2 had just completed a startup and was in the process of raising power with normal condenser vacuum when a large mass of sea grass was entrained on the intake traveling screens. Given the following events and conditions:

- Hi-hi differential pressure alarm on the traveling screen
- Attempts to clear the sea grass clog are in progress
- Reactor power = 10%

Which one of the following statements correctly describes the proper procedure and the complete set of actions that are required to be taken if vacuum continues to degrade?

A. Enter ONP-2-0620030 (*Circulating Water System*) and trip the turbine if vacuum reaches 3.6 inches of Hg (abs).

B. Enter ONP-2-0620030 (*Circulating Water System*) and first trip the reactor and then trip the turbine if vacuum reaches 5.6 inches Hg (abs).

C. Enter 2-EOP-01 (SPTA) and trip the turbine if vacuum reaches 5.6 inches Hg (abs).

D. Enter 2-EOP-01 (SPTA) and first trip the reactor and then trip the turbine if vacuum reaches 3.6 inches Hg (abs).

1 Pt(s) Unit 1 is at 100% power when a large instrument air leak occurs. Given the following events and conditions:

- The NPO is dispatched to isolate the leak.
- The RO is monitoring the instrument air pressure as it continues to lower.

If instrument air pressure continues to decrease, at what value is the Unit required to be manually tripped?

A. 84 psig

B. 80 psig

C. 74 psig

D. 59 psig

1 Pt(s) Containment purge was in progress on Unit 2 in Mode 6 when Channel A CIAS monitor turned red on the PC-11.

The other channels indicated the following:

- Channel B Yellow
- Channel C Green
- Channel D White (declared OOS yesterday and bypassed)

Based on the above indications, which one of the following statements correctly describes the status of the Containment Purge System?

A. Stopped due to one channel in trip and the other in pretrip.

B. Stopped due to one channel in trip and the other in bypass.

C. Running, but will trip if another non-bypassed channel turns red.

D. Running, but will trip if another non-bypassed channel turns yellow.

1 Pt(s) A 35 gpm RCS leak is occurring from a seat leak in a code safety valve on Unit 2.

Which one of the following statements correctly describes the instrumentation available to determine:
1. the change in leak rate, and
2. the method to determine the location of the RCS leak?

A. **1. RCS leakage flow recorder FR-07-3 (REACTOR CAVITY LEAKAGE FLOW)**
2. Comparing the CIAS radiation monitor readings

B. **1. Reactor drain tank level change**
2. Tail pipe temperature and acoustic flow monitors

C. **1. Quench tank level change**
2. Tail pipe temperature and acoustic flow monitors

D. **1. Cavity sump level LI-07-6 (RX CAVITY LEVEL) change**
2. Sampling different atmospheric locations in the Containment

1 Pt(s) Unit 1 was in Mode 5 following a shutdown for refueling. Given the following events and conditions:

- Pressurizer level is 28%.
- The pressurizer low level alarm has annunciated.
- The pressurizer level interlock bypass key switch is in the "BYPASS" position.

Which one of the following statements correctly describes the charging pump control operations without operator action while filling the pressurizer solid?

A. At 31% pressurizer level, the second backup charging pump will automatically stop. At 32% pressurizer level the first back up charging pump will automatically stop.

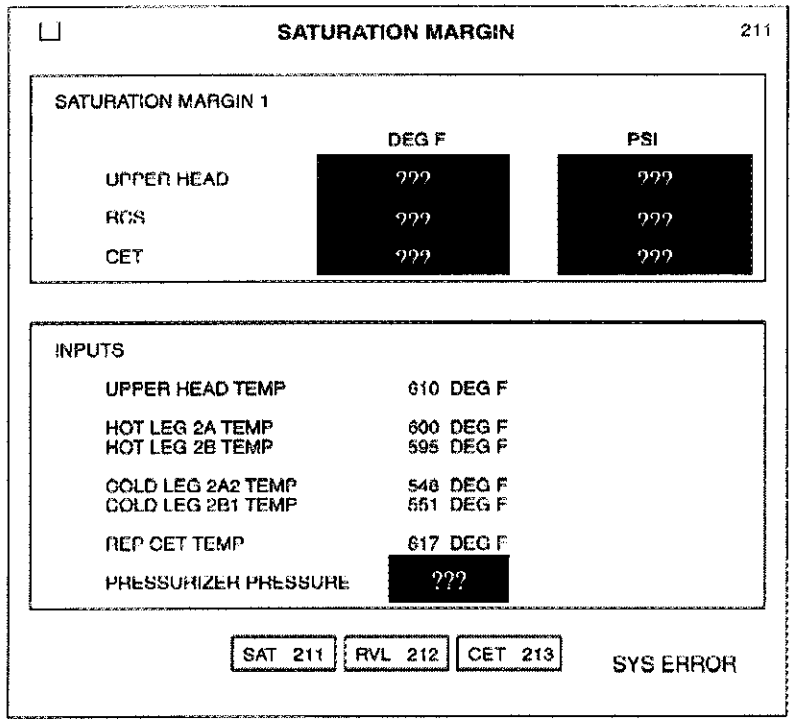
B. At 32% pressurizer level, the second backup charging pump will automatically stop. At 37% pressurizer level, the first backup charging pump will automatically stop.

C. At 37% pressurizer level, both backup charging pumps will automatically stop.

D. Both backup charging pumps will continue to run until the pressurizer is solid.

1 Pt(s) Unit 2 was operating at 100% power when a station blackout (SBO) occurred. Given the following QSPDS indications:

UNIT 2 QSPDS SATURATION MARGIN PAGE



[Where: ??? denotes a flashing reverse video display of "???" for the indicated parameter.

If pressurizer pressure is 2275 psia, which one of the following statements correctly describes the saturation margin and the verification of natural circulation?

References Provided:

A. Saturation margin is - 36°F subcooled and is not adequate to verify natural circulation.

B. Saturation margin is - 43°F subcooled and is not adequate to verify natural circulation.

C. Saturation margin is – 36 °F subcooled and is adequate to verify natural circulation.

D. Saturation margin is – 43 °F subcooled and is adequate to verify natural circulation.

---

1 Pt(s) Unit 1 is recovering from a design basis LOCA.

Which one of the following statements correctly describes the post-LOCA Iodine removal process from the containment atmosphere?

A. The containment spray system injects hydrazine (N_2H_4).

B. The containment spray system injects tri-sodium phosphate (TSP).

C. The containment spray system injects sodium hydroxide (NaOH).

D. The airborne radioactivity removal system uses charcoal filters.

1 Pt(s) Unit 1 is in Mode 6. Given the following events and conditions:

- "A" train containment purge system is in service with suction aligned to the refueling cavity.
- The upper guide structure is being lifted.
- A and C CIAS monitors indicate 95 mR/Hr.
- B and D CIAS monitors indicate 85 mR/Hr.

Which one of the following statements correctly describes the response of the containment purge system?

A. Containment purge is automatically secured.

B. Containment purge remains in its current configuration.

C. The purge suction is automatically aligned to the containment ring header.

D. The purge discharge is automatically aligned to the shield building exhaust system.

1 Pt(s) Which one of the following condensate and feed pump combinations is the complete list of pumps that will trip on a Unit 1 MSIS actuation?

A. MFW pumps only

B. MFW pumps and heater drain pumps only

C. MFW pumps and condensate pumps only

D. MFW pumps, heater drain pumps and condensate pumps

1 Pt(s) Unit 1 was operating at 100% power when the reactor tripped from a grid disturbance. Given the following events and conditions:

- Unit is in hot standby
- SBCS permissive switch is in AUTO
- All SBCS M/A controllers are in AUTO
- Offsite power is available
- The Thot RTD to selected RSS develops a short circuit

Which one of the following statements correctly describes the effect on the SBCS?

A. The SBCS will only modulate open PCV-8801.

B. All SBCS valves can quick open but will not modulate.

C. All SBCS valves will modulate open but are unable to quick-open.

D. All SBCS valves will respond with full quick open and modulation capability.

1 Pt(s) Unit 1 is at steady state 80% power with the following conditions:

- Charging pumps A and C are running
- Charging and letdown are balanced
- Pressurizer Level is steady
- HS-2210 (MAKE UP MODE SELECTOR) is in auto
- All other systems are in a normal alignment

If no operator actions are taken, which of the following failures will result in letdown flow diverting to the hold up tanks?

A. Selected pressurizer level channel failing low

B. V-2345 (Intermediate pressure letdown relief valve) lifts

C. Selected RRS T_{ave} program failing high

D. LT2227 (VCT LEVEL) channel failing high

1 Pt(s) Unit 1 was manually tripped from 100% power due to a fire in the control room. Given the following events and conditions:

- All operator actions in the control room from 1-ONP-100.02 (*Control Room Inaccessibility*) have been performed.
- The control room was evacuated.

Which one of the following statements correctly describes how reactor coolant system temperature is normally controlled when the hot shutdown control panel (HSCP) is operational?

A. Steam Bypass Control System (SBCS) in automatic control.

B. SBCS in manual control, locally at the valve.

C. Atmospheric Dump Valves (ADVs) in automatic control from the hot shutdown control panel.

D. ADVs in manual control, locally at the valve.

1 Pt(s) Unit 1 was operating at 100%. Given the following events and conditions:

- A waste gas release is being performed from the 1A Gas Decay Tank.

Which one of the following conditions will automatically terminate the release?

A. An unexpected drop in the 1A gas decay tank pressure

B. Gas decay tank oxygen concentration > 2% by volume

C. A high radiation alarm on the plant vent process radiation monitor

D. A high radiation alarm on the gaseous discharge monitor channel 42.

---

1 Pt(s) Unit 1 was in Mode 3. Given the following events and conditions:

- The 1A1 circ water (CW) pump amber permissive light was LIT
- The 1A1 CW pump RTGB hand switch was placed in start
- The 1A1 CW pump failed to start

Which one of the following statements correctly describes the cause of this pump start failure?

A. Pump lubricating water was only 2 psig

B. Condenser discharge valve is jammed shut

C. CW pump discharge valve failed to open

D. CW pump breaker is still racked out

1 Pt(s) Unit 1 is operating at 100% power when a loss of instrument air pressure occurs due to a header leak outside of containment. Given the following events and conditions:

Time	Event
0200	V2505 (RCP BLEED OFF) fails closed
0205	Instrument air pressure falls to 65 psig
0210	Low level alarm on the CCW Surge Tank
0220	Rupture of the CCW "N" Header

When is the reactor required to be tripped by procedure?

A. 0200 – within 30 minutes

B. 0205 - immediately

C. 0210 – within 10 minutes

D. 0220 – within 10 minutes

1 Pt(s) Unit 2 was shutdown to hot standby. Given the following sequence of events and conditions:

- RCS unidentified leakage = 0.5 gpm
- RCS identified leakage = 4.0 gpm
- RCP seal leakoff = 4.0 gpm
- SG-RCS tube leakage = 0.5 gpm

Time	Event
0200	All charging pumps have failed
0202	Letdown was secured
0205	Pressurizer level = 29% and slowly decreasing (assume 67gal/%) volumetric capacity for the pressurizer)

Assuming no operator action, how long after 0205 will the pressurizer heaters trip off?

A. Less than 10 minutes

B. 11-20 minutes

C. 21-30 minutes

D. Greater than 30 minutes

1 Pt(s) Unit 1 is drained down to Mid-Loop with the following conditions:

- The Unit has been shutdown for 4 days.
- RCS temperature is 120 °F.
- Shutdown Cooling has been lost.

Which one of the following correctly states the time to boil and the makeup flow rate for boil off?

References Provided:

A. 11 minutes 25 gpm

B. 11 minutes 65 gpm

C. 14 minutes 25 gpm

D. 14 minutes 65 gpm

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions:

0200 The Unit 1 CCW "N" header ruptured.
0203 The following annunciators occur simultaneously:
- S-6 (*CCW SURGE TANK LEVEL HIGH /COMPARTMENT A LEVEL LOW*)
- S-16 (*CCW Surge Tank Compartment B Level Low*)

If the annuciators are functioning properly at the correct setpoints, which one of the following sequences correctly lists:
1. The expected annunciator response and
2. The required operator actions?

A. **1. S-6 and S-16 clear**
2. Close: HCV-14A (1A CCW HDR SUPPLY TO THE N HDR)
HCV-14-9 (1N HDR RETURN TO THE 1A CCW HDR)
HCV-14-8B (1B CCW HDR SUPPLY TO THE N HDR)
HCV-14-10 (N HDR RETURN TO THE 1B CCW HDR)

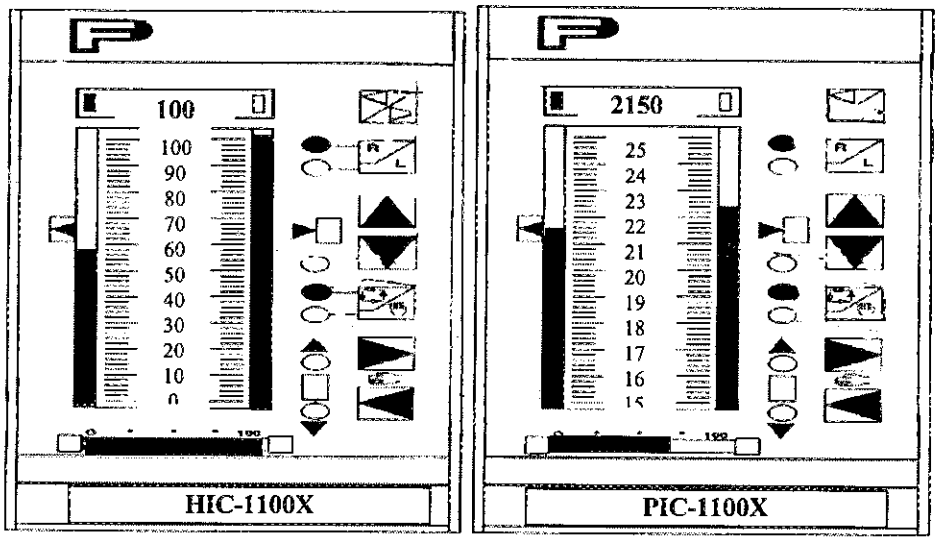
B. **1. S-6 and S-16 clear**
2. Close: HCV-14A and HCV-14-8B

C. **1. S-6 and S-16 – remain locked in**
2. Close: HCV-14A and HCV-14-8B

D. **1. S-6 and S-16 – remain locked in**
2. Close: HCV-14A, HCV-14-9, HCV-14-8B, and HCV-14-10

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- Proportional heaters are off
- X channel is selected for control
- PIC-1100X is selected for pressure control in automatic and indicates as displayed below
- HIC-1100 is selected for automatic control and indicates as displayed below



Which one of the following statements is correct regarding the status of the pressurizer pressure control system?

A. **The spray valve is not properly controlling in automatic – the spray valve is 100% open.**

B. **The spray valve is not properly controlling in automatic – the spray valve is 58% open.**

C. **The spray valve is not properly controlling in automatic – the spray valve is 0% open.**

D. **The spray valve is controlling pressure correctly in automatic at 75% open.**

1 Pt(s) Unit 1 was operating at 100% when an electrical transient occurred. Given the following events and conditions:

- 4 Reactor Trip Breakers opened.
- The Reactor has not tripped.

Which one of the following components has deenergized and caused this transient?

A. A CEA MG Set

B. A 120VAC Instrument Bus

C. An RPS "K" relay

D. A 120VDC bus

1 Pt(s) Unit 2 is responding to a steam generator tube rupture on the 2B steam generator. Given the following events and conditions:

- The reactor was tripped at 0145.
- The RCPs were tripped.
- The pressurizer is empty.
- The QSPDS subcooling display is not available.

Which one of the following sets of parameters indicates natural circulation cooldown is occurring in the 2A steam generator within all procedural requirements at 0215?

	Time	0200	0205	0210	0215
A.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**557**	**555**	**553**	**551**
	Loop A T-hot (°F)	**558**	**556**	**554**	**552**
	Loop A T-cold (°F)	**518**	**510**	**502**	**495**
B.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**557**	**555**	**553**	**551**
	Loop A T-hot (°F)	**558**	**556**	**554**	**552**
	Loop A T-cold (°F)	**518**	**516**	**514**	**512**
C.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**569**	**568**	**567**	**564**
	Loop A T-hot (°F)	**568**	**567**	**566**	**565**
	Loop A T-cold (°F)	**518**	**526**	**524**	**522**
D.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**557**	**565**	**573**	**581**
	Loop A T-hot (°F)	**558**	**556**	**554**	**552**
	Loop A T-cold (°F)	**518**	**516**	**514**	**512**

1 Pt(s) Unit 2 was operating at 100% power when a reactor trip occurred and AFAS actuated at 0200. Given the following events and conditions:

Time	0201	0202	0204	0208
Parameter				
A/B S/G levels	19%	22%	25%	29%
AFW isolation valve position	stroking open	open	open	shut

What is the earliest time that the operators should have manually throttled the Unit 2 AFW header isolation valves and what is the reason for the action at this time?

A. 0202 – to prevent AFW pump run out

B. 0202 – to prevent overcooling the RCS

C. 0208 – to prevent overcooling the RCS

D. 0208 – to prevent AFW pump run out

1 Pt(s) Unit 1 was operating at 100% power when a station blackout occurred at 2300. Given the following events and conditions:

- The emergency battery is supplying DC busloads
- The DC bus loads are constant

Which one of the following selections correctly characterizes the battery's discharge parameters as the battery reaches exhaustion?

A. Discharge current will decrease. Individual cell specific gravity decreases to ~1.0.

B. Discharge current will increase. Individual cell specific gravity increases to ~1.2.

C. Discharge current will increase. Individual cell specific gravity decreases to ~1.0.

D. Discharge current will decrease. Individual cell specific gravity increases to ~1.2.

1 Pt(s)

Unit 1 was recovering from a LOOP in 1-EOP-09 (LOSS OF OFFSITE POWER/LOSS OF FORCED CIRCULATION). Given the following events and conditions:

- 1A3 is energized from 1A diesel generator
- 1B3 is deenergized
- All CEAs are fully inserted
- T_{avg} is 532°F being maintained by ADVs

Which one of the following actions is necessary to permit exiting 1-EOP-09 to another approved procedure?

A. Cool down to less than 325°F.

B. Energize 1A3 from Unit 2 Startup Transformer.

C. Energize 1B3 from 1B emergency diesel generator.

D. Energize either 1A3 or 1B3 from Unit 1 Startup Transformer.

1 Pt(s) Unit 2 was operating at 100% power when an "MA" 120 VAC instrument bus low voltage condition occurred.

The operators entered ONOP-1-09070030 (*120V INSTRUMENT AC SYSTEM (CLASS 1E)/QSPDS*). Step 3 (partial) of this procedure states:

> *3. If instrument bus voltage from inverter is degraded, Then:*
> *A. Verify the other three instrument buses are energized.*
> *B. Open the affected inverter output breaker (CB-2).*
> *C. Open the affected inverter 125V DC Bus input breaker (CB-1).*

Why is it necessary to perform this step?

A. To prepare to energize the MA bus from the MC bus.

B. To prevent blowing the DC input fuses on the A battery.

C. To ensure that the MA bus remains deenergized until repairs have been completed.

D. To prepare to energize the MA bus from its alternate source.

1 Pt(s) Unit 1 was operating at 100% power when several A-side AC electrical failures occurred and the operator entered ONP 1-0910054 (*Loss of a Safety Related AC Bus*). Given the following events and conditions:

- The 1A DC bus has no battery chargers available to supply the bus.
- The 1AB 480V load center is de-energized and unable to be restored.
- The 1C DC bus has a ground fault that is in the process of being isolated.
- The following annunciators have alarmed:
  - *A-50 125V DC BUS 1AB BATT CHGR TROUBLE*
  - *B-20 125V DC BUS / 1A BATT CHGR/BATT RM FAN TROUBLE*
  - *B-30 125V DC BUS 1A UNDERVOLTAGE/MAIN BATTERY BREAKER*
- 1A DC bus voltage = 20 volts

Which one of the following alignments correctly describes how to re-power the 1A DC bus?

A. Tie the 1A DC bus directly to the 1B DC bus

B. Tie the 1D DC bus directly to the 1A DC bus

C. Tie the 1C DC bus to the 1AB DC bus and tie the 1AB DC bus to the 1A DC bus

D. Tie the 1D DC bus to 1AB DC bus and tie the 1AB DC bus to the 1A DC bus

1 Pt(s) Unit 1 is at 100% power. Given the following events and conditions:

- Intake cooling water flow through the component cooling water (CCW) Heat Exchanger (HX) = 17,000 gpm.
- TCV-14-4A (1A CCW HX temperature control valve) is 75% OPEN
- Instrument air to TCV-14-4A is inadvertently isolated.

Which one of the following correctly describes the response of the CCW system?

A. 1A CCW HX outlet temperature decreases because TCV-14-4A drifts fully open.

B. 1A CCW HX outlet temperature increases because TCV-14-4A drifts fully open.

C. 1A CCW HX outlet temperature remains constant because TCV-14-4A movement is restricted by a mechanical stop to limit system flow rate.

D. 1A CCW HX outlet temperature remains constant because the TCV-14-4A actuator travel is pneumatically limited to restrict system flow rate.

1 Pt(s) Unit 1 was shutdown to Mode 6 for an outage. Given the following events and conditions:

- The Instrument Air pressure was dropping to 105 psig.
- The Instrument Air and Service Air systems were not cross-connected.
- The IA compressors were running 100% of the time.
- The Shift Manager is concerned that heavy IA usage may further reduce the pressure and cause a loss of instrument air.

If the all of the following activities are presently in progress, which action would reduce the air demand on the system and prevent a loss of instrument air?

A. Secure operating the main turbine backup lube oil vapor extractor.

B. Secure cycling the feedwater regulating valves for testing.

C. Secure the use of all pneumatic tools in the reactor auxiliary building.

D. Secure drawing vacuum in the condensers using the hotwell eductors.

1 Pt(s) Unit 1 is at 100% power. Given the following events and conditions:

- The backup charging pumps start
- All pressurizer heaters turn off
- Pressurizer level High/Low alarm annunciates
- Letdown decreases to minimum flow
- Actual pressurizer level is 67% and continues to increase

What instrument has failed and what actions are required to restore pressurizer level?

A. The selected pressurizer level channel failed high –shift to the operable level control channel on the low level cutout switch, reset and close the 480v heaters and verify the backup charging pumps stop.

B. The selected pressurizer level channel failed low – shift to the operable level control channel on the low level cutout switch, reset and close the 480v heaters and verify the backup charging pumps stop.

C. The non-selected pressurizer level channel failed high – manually stop the backup charging pumps.

D. The non-selected pressurizer level channel failed low - select LEVEL on the backup interlock bypass key switch and manually stop the backup charging pumps.

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions:

- The condenser air ejector monitor (channel 35) was out of service.
- A spurious reactor trip occurred and caused a steam generator tube rupture.
- SIAS actuates
- The operators completed 1-EOP-01 (*Standard Post Trip Actions*) and are completing steps in 1-EOP-04 (*Steam Generator Tube Rupture*).

Which one of the following methods will provide the most sensitive indication of the activity in the ruptured steam generator 20 minutes after the reactor trip occurred?

A. The main steam line monitors will provide continuous real time indication of activity in the S/Gs.

B. The steam generator blowdown monitors will provide continuous real time indication of activity in the S/Gs.

C. The steam generator blowdown monitors after restoring flow through the sample line but not reinitiating blowdown flow.

D. The steam generator blowdown monitors after restoring blowdown flow to the discharge canal.

1 Pt(s) Unit 2 is in Mode 3 performing a reactor startup. Given the following events and conditions:

- SBCS is in auto maintaining T_{ave} = 532 °F.
- Steam pressure regulator PCV 12-29 (to the SJAE) fails closed.
- Condenser vacuum rises to 15 inches Hg (abs) before the regulator can be manually bypassed.

Which one of the following statements describes how the SBCS controls RCS T_{ave}?

A. SBCS can maintain RCS temperature in automatic, only after condenser vacuum has been reduced below 12 inches Hg (abs) to prevent damage to the turbine and condenser.

B. SBCS can maintain RCS temperature in automatic only after condenser vacuum has been reduced to 5 inches Hg (abs) to prevent damage to the turbine and condenser.

C. SBCS can control RCS temperature manually only after depressing the *Emergency off/Vacuum interlock* pushbutton to prevent an inadvertent cooldown of the RCS.

D. SBCS can control RCS temperature only after the *permissive* switch is placed in *manual* and the *Emergency off/Vacuum interlock* pushbutton depressed to regain control of SBCS to prevent an inadvertent cooldown of the RCS.

1 Pt(s) Unit 2 was operating at 100% power when the 2A generator steam generator ruptured inside containment. Given the following events and conditions:

- The operators completed 2-EOP-01 (STPA) and transitioned to 2-EOP-05 (*Excess Steam Demand*)
- The operators are directed to maintain RCS pressure and temperature stable for 2 hours because the limits of Figure 1A has been exceeded.

What is the reason (as stated in CEN-152) for the requirement to stabilize RCS pressure and temperature under these conditions?

A. To protect the RCP seals from degrading due RCS pressure transients.

B. To prevent pressurized thermal shock from fracturing the reactor vessel.

C. To collapse any voids in the reactor vessel head prior to commencing the cooldown.

D. To prevent lowering RCS temperature from adding positive reactivity and causing a criticality accident.

1 Pt(s) Unit 2 RCS unidentified leakage is currently 3.5 gpm and stable. Given the following events and conditions:

- Unit 2 was being shutdown in accordance with Tech Specs for a containment entry to locate the source of the leak.
- A Loss of Offsite Power (LOOP) occurred.
- FR-07-3 (REACTOR CAVITY LEAKAGE FLOW) indicates '0' flow.
- Annunciator N-46 (REACTOR CAVITY LEAKAGE HIGH) from LS-07-12 (RX CAVITY LEVEL) remained illuminated.

Assuming that the RCS leakage continues, which one of the following statements correctly describes why;
1. FR-07-3 shows 0 flow, and
2. Annunciator N-46 remains illuminated?

A. **1. The weir tank V-notch became blocked with debris.**
2. LS-07-12 lost power.

B. **1. LS-07-12 lost power.**
2. The weir tank V-notch became blocked with debris.

C. **1. The weir tank V-notch became blocked with debris.**
2. LS-07-12 did NOT lose power.

D. **1. The instrument air supply to the level bubbler was depressurized.**
2. LS-07-12 did NOT lose power.

1 Pt(s) Unit 1 and Unit 2 were operating at 100% power. Given the following conditions and events:

- A loss of offsite power (LOOP) occurred on both units
- All diesel generators started properly and tied to their respective buses

Upon completion of standard post trip actions, which unit would have quicker control of natural circulation?

A. Unit 1, due to two ADV's air operated, capable of being controlled in auto or manual.

B. Unit 1, due to two ADV's, motor operated capable of being controlled manual only.

C. Unit 2, due to four ADV's motor operated capable of being controlled in auto or manual.

D. Unit 2, due to four ADV's air operated capable of being controlled in manual only.

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- The reactor spuriously tripped from 100% power.
- The operators entered 2-EOP-01 (*SPTA*)
- The Desk Operator is implementing 2-EOP-99 (*Appendices/Figures/Tables/Data Sheets*) Appendix X.

Which one of the following statements correctly describes when the startup channels will be energized?

A. Automatically energized when excore monitoring channel power decreases to 10^{-4}% power.

B. Automatically energized when the wide range log safety channel 10^{-3}% power bistable deenergizes.

C. Manually energized when wide range log safety channel is $<1x10^{-5}$% power.

D. Manually energized when the excore monitoring channel is <10,000 CPS.

1 Pt(s) Unit 2 was conducting refueling operations. Given the following events and conditions:

- One startup channel neutron flux monitor fails low

Which one of the following statements correctly describes the action that must be taken?

A. Immediately suspend core alterations until the inoperable channel is returned to operable status.

B. Immediately suspend core alterations until boron sampling has been initiated every twelve hours.

C. Fuel reload may continue, provided boron samples are taken every twelve hours.

D. Fuel reload may continue, provided the inoperable channel is returned to operable status within one hour.

1 Pt(s) The results from the quarterly surveillance run of the 2B Containment Spray Pump indicates that the pump is operating in the Required Action Range based on discharge pressure higher than the limiting value. The Unit Supervisor should then:

A. Request an engineering evaluation of the problem and a recommendation for operability.

B. Declare the pump inoperable, enter it into the Equipment Out-of-Service Log, and initiate actions to determine the cause of the condition.

C. Double the frequency of the surveillance, initiate a Condition Report, and inform Operations Management about the problem.

D. Require the surveillance to be repeated as soon as possible to confirm that the previous test was accurate.

1 Pt(s) Which one of the following conditions will allow the Spent Fuel Pool Upender to be raised to the vertical position with the Spent Fuel Handling Machine in the Upender zone?

A. The carriage is in the middle of the transfer canal.

B. The hoist is unloaded and above the *Near Full Down* position.

C. The hoist is loaded and above the *Near Full Down* position.

D. The hoist is loaded and at the *Up-Limit* position.

1 Pt(s) Unit 1 was operating at 90% power. Given the following events and conditions:

- CEA Reg Group 7 is at 105"
- T_{cold} = 548.2°F
- Axial Shape Index (ASI) is approaching the negative limit

Which one of the following statements correctly describes the actions that the operator must take to control ASI and T_{cold} parameters at this power?

A. Dilute for ASI and insert CEAs for RCS temperature

B. Borate for ASI and withdraw CEAs for RCS temperature

C. Insert CEAs for ASI and dilute for RCS temperature

D. Withdraw CEAs for ASI and borate for RCS temperature

1 Pt(s) Unit 1 is shutdown to mode 6 in an outage.

How are
- Damper 25-5A (Refuel Canal supply to Containment Purge) and
- Damper 25-5B (Containment Ring Header supply to Containment Purge)

positioned when the PURGE/REFUEL selector switch is positioned?

		Selector Switch Position	
		Purge	***Refuel***
A.	**Damper 25-5A**	***Closed***	***Full Open***
	Damper 25-5B	***Full Open***	***Closed***
B.	**Damper 25-5A**	***Closed***	***Partially Open***
	Damper 25-5B	***Full Open***	***Partially Open***
C.	**Damper 25-5A**	***Partially Open***	***Full Open***
	Damper 25-5B	***Full Open***	***Closed***
D.	**Damper 25-5A**	***Closed***	***Full Open***
	Damper 25-5B	***Full Open***	***Partially Open***

1 Pt(s) Unit 1 is in Mode 5 preparing to remove the reactor head.

- The Operators have been directed to swap operating shutdown cooling (SDC) loops from loop A to loop B using 1-NOP-03.05 (*Shutdown Cooling*).

Which one of the following statements correctly describes the required notification that must be performed prior to starting the 1A LPSI pump?

A. HP department must be notified due to the potential for contamination while venting the 1B LPSI pump.

B. HP department must be notified due to the potential for increased radiation levels around shutdown cooling components.

C. Chemistry department must be notified due to the potential for dilution of the reactor coolant system.

D. Chemistry department must be notified due to the potential for CCW leakage into the 1A SDC heat exchanger.

1 Pt(s) An evacuation of the Owner Controlled Area shall be conducted for:

A. Events classified as a Site Area Emergency or higher

B. Tornadoes or waterspouts approaching the plant site

C. Local evacuation of the Fuel Handling Building due to a dropped fuel assembly

D. Any emergency declaration involving a release

1 Pt(s) Unit 2 was starting up after a refueling outage. Given the following events and conditions:

- The letdown system is being placed in service in accordance with NOP-02.02 (*Charging and Letdown*)
- An operator incorrectly positions the isolation valve to the purification filter "B" during the initial valve lineup. The required valve position was "*open*" but the valve is actually *closed*. This error is unknown to the control room.
- The operators align CVCS valves in an attempt to establish letdown flow.

What actions will occur and what procedure are the control room operators required to enter?

A. The letdown system relief valves V-2354 and/or V-2345 open to protect the low pressure letdown piping. Immediately isolate letdown in ONP-02.02 (*Charging and Letdown*)

B. V-2516 (CONTAINMENT ISOL VALVE - IC) automatically closes on high D/P across the regenerative HX to protect the low pressure letdown piping. Correct the valve misalignment and restore letdown in accordance with NOP-02.02.

C. V-2520 (ION EXCHANGER BYPASS VALVE) automatically opens on high pressure to divert letdown around the ion exchangers and coolant purification filter into the VCT. Correct the valve misalignment and restore letdown in accordance with NOP-02.02.

D. PCV-2201Q (PRESSURE CONTROL VALVE) automatically closes on high pressure to isolate the low pressure letdown piping. Immediately isolate letdown in ONP-02.03.

---

1 Pt(s) Unit 1 is at 100% power with a normal electrical line-up. Given the following conditions related to intake cooling water (ICW):

- Annunciator E-30 (ICW HEADERS PRESS LOW) has just alarmed and locked in
- PIS-21-8A, ICW header 1A indicates 0 psig
- PIS-21-8B, ICW header 1B indicates 42 psig.
- 1A ICW Pump has tripped
- 1B ICW Pump is running
- 1C ICW Pump is in pull to lock
- One attempt to restart 1A ICW Pump was unsuccessful

Which one of the following actions should the control room operators perform next?

A. **-- Verify the 1A ICW pump is aligned to the 1A ICW header per the ICW operating procedure.**
-- Throttle the 1A ICW pump discharge valve 10 turns open.
-- Start the 1A ICW Pump.

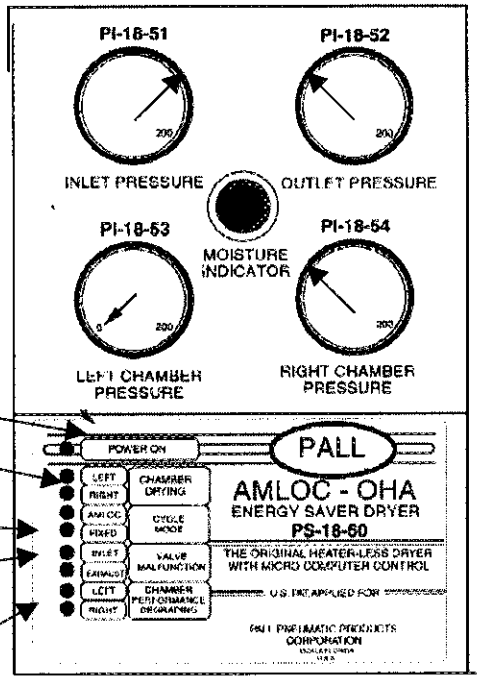
B. **-- Have electrical maintenance reset any relays associated with the 1C ICW Pump breaker on the 1AB 4.16 KV bus.**
-- Start the 1C ICW Pump.

C. **-- Ensure the 1C ICW pump is aligned to the 1A ICW header per the ICW operating procedure.**
-- Throttle the 1C ICW pump discharge valve 10 turns open.
-- Start the 1C ICW Pump.

D. **-- Have electrical maintenance reset any relays associated with the 1A ICW Pump breaker on the 1A3 4.16 KV bus.**
-- Start the 1A ICW Pump.

1 Pt(s) Unit 1 was operating at 100% power when instrument air header pressure dropped to 85 psig.
Given the following indications on the Unit 1 instrument air dryer:

Inlet press = 120 psig
Outlet press = 85 psig
Left chamber press = 0 psig
Right chamber press = 85 psig



Power on – lit
Chamber drying:
Left – not lit
Right – lit
Cycle mode:
AMLOC – not lit
Fixed – lit
Valve malfunction
Inlet – lit
Exhaust – not lit
Chamber performance degrading
Left – lit
Right – lit

Which one of the following statements correctly describes the cause of the problem and the correct method to temporarily maintain instrument air pressure until the air dryer can be repaired?

A. The inlet valve on the right dryer chamber has failed closed. Shift to the left dryer chamber and repressurize the air header.

B. The exhaust valve on the right dryer chamber has failed closed. Shift to the left dryer chamber and repressurize the air header.

C. The inlet valve on the right dryer chamber has failed closed. Bypass around the air dryer and repressurize the air header.

D. The exhaust valve on the right dryer chamber has failed closed. Bypass around the air dryer and repressurize the air header.

1 Pt(s) Unit 2 was operating at 100% power when a small break LOCA occurred. Given the following events and conditions:

- The leak was from the pressurizer surge line
- The hole size was 3 inches (effective diameter)
- All safety injection equipment operated as designed

Which one of the following statements correctly describes the status of pressurizer level and RCS pressure?

A. **Pressurizer level will decrease until the pressurizer empties. RCS pressure will drop rapidly to ~1400 psia and decrease very slowly over subsequent 10 minute period.**

B. **Pressurizer level will decrease to until the pressurizer empties. RCS pressure will drop rapidly to ~200 psia and decrease very slowly over subsequent 10 minute period.**

C. **Pressurizer level will first decrease then increase and act erratically. RCS pressure will drop rapidly to ~1400 psia and decrease very slowly over subsequent 10 minute period.**

D. **Pressurizer level will first decrease then increase and act erratically. RCS pressure will drop rapidly to ~200 psia and decrease very slowly over subsequent 10 minute period.**

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- CCW flow to RCP 1A1 motor air cooler has degraded due to flow blockage at the cooler outlet flow-restricting orifice.

Which one of the following conditions will be the FIRST indication of the problem, assuming no operator action?

A. Increased RCP motor stator temperature

B. Increased containment air temperature

C. Elevated RCP seal temperature

D. Elevated lower RCP motor bearing oil temperature

1 Pt(s) Unit 2 was operating at 100% power when a pressurizer safety valve lifted and stuck open. Given the following events and conditions:

- The operators tripped the reactor and entered 2-EOP-01 (SPTA)
- The operators tripped all RCPs on a loss of subcooling and performed a natural circulation cooldown in 2-EOP-03 (LOCA).
- The safety valve reseated at 1400 psia and the unit was stabilized.
- The unit has now been cooling down at 30 °F/hour from hot standby conditions for 5.5 hours in ONP-2-0120039 (Natural Circulation Cooldown).
- Highest CET = 532 °F
- Rep CET = 514 °F
- T_{hot} = 492 °F
- T_{cold} = 467 °F

What is the current saturation pressure of the upper head?

References provided:

A. **500 psia**

B. 630 psia

C. 775 psia

D. 900 psia

1 Pt(s) Unit 1 is at 100% power. Given the following events and conditions:

- The Desk Operator is performing the shift interval surveillance checks for Linear Heat Rate as required by Technical Specification Surveillance 4.2.1.2.

Which one of the following correctly describes how Linear Heat Rate is verified using DCS in accordance with 0-NOP-100-03 (*Monitoring Linear Heat Rate)* under this plant condition?

A. Verify all control element assemblies were above the Long Term Steady State Insertion Limits for the past 24 hours on DCS.

B. Verify the Axial Shape Index to be within COLR Figure 3.2-4 using DCS.

C. Verify no more than one incore detector reading on the DCS flux log is in alarm.

D. Verify DCS power has been less < 100% for the past 8 hours.

1 Pt(s) Safeguards equipment is protected from flooding in the event of a large pipe break in the -0.5' elevation of the RAB by:

A. Automatic isolation of all the RAB floor drains

B. Automatic pumping of safeguard sumps directly to the HUTs

C. Manual isolation of the safeguard sump room from the RAB floor drains from the control room

D. Gravity draining of the -0.5' elevation floor directly to the EDT

1 Pt(s) Unit 1 was shutdown for a refueling outage. Given the following events and conditions:

- Maintenance has been completed on a CCW component.
- The operators are refilling and venting the component to return to service.
- CCW SURGE TK LEVEL COMP B LOW annunciator alarmed.
- The crew entered the ONOP1-0310030 (*CCW Off Normal Operation*)

Which one of the following components could have caused the 1B CCW surge tank low-level alarm?

A. Sample heat exchanger

B. Spent fuel pool heat exchanger

C. Containment cooler HVS 1B

D. Containment cooler HVS 1D

1 Pt(s) Unit 2 was in Mode 5 after cooling down for a refueling outage. Given the following events and conditions:

- Shutdown cooling is in operation holding RCS temperature steady
- RCS temperature is 163 °F
- RCS pressure is 50 psia with a solid pressurizer

Which one of the following statements correctly describes the brittle fracture protection for the reactor vessel against an over-pressure condition?

References Provided:

A. The reactor vessel does not require protection against brittle fracture below 165 °F and 100 psia.

B. Only the full-flow shutdown cooling relief valves are required for brittle fracture protection.

C. Only the pressurizer PORVs in the LTOPs mode are required for brittle fracture protection.

D. Both the pressurizer PORVs and the full-flow shutdown cooling relief valves are required to provide protection.

1 Pt(s) Unit 2 was operating at 100% power when a LOOP occurred. Given the following events and conditions:

- Charging pump 2A was out of service for maintenance.
- The electric plant was in a normal lineup.
- A reactor trip occurred
- The 2B EDG failed to start
- The 2A EDG operated as designed
- 3 CEAs failed to insert into the core – operators took the appropriate actions in 2-EOP-01 (*SPTA*)

Which one of the following statements correctly describes the status of the boric acid pumps?

A. No BA pumps will be running and the emergency boration flow path will be through the gravity feed isolation valves V-2508/9.

B. No BA pumps will be running and the operator will have to manually initiate safety injection.

C. Both BA pumps will be running and provide emergency boration flow.

D. Both BA pumps will be running at shutoff head - V-2134 (*BA pump miniflow valve*) will protect the pumps from overheating.

1 Pt(s) Which one of the following functions are NOT monitored by QSPDS?

A. Inadequate core cooling

B. Reactor vessel level

C. Containment conditions

D. Core saturation margin

1 Pt(s) Unit 2 was conducting a turbine load increase to full power following an outage where the high-pressure turbine had been replaced. Given the following events and conditions:

- Turbine load was 200 MW – increasing slowly at 0.25 MW/min
- Annunciator D-15 (TURBINE VIBRATION ABNORMAL) alarmed
- The turbine supervisory indicated 15 mils turbine vibration and was confirmed to be valid
- Annunciator L-29 (LOSS OF LOAD/LCL PWR DENS CHANNEL TRIP BYPASSED) is dark

Which one of the following statements correctly describes the operator action(s) that are required to respond to this condition?

A. Open the main generator breakers to determine if the main generator causes the vibration – if the vibrations continue, trip the turbine.

B. Raise turbine load away from the destructive resonance point and request an engineering evaluation.

C. Immediately trip the turbine.

D. Trip the reactor and verify turbine trip.

Nuclear Regulatory Commission
Reactor Operator Licensing
Examination

St Lucie Nuclear Plant

ANSWER KEY

This document is removed from
Official Use Only category on
Date of examination 8/20/2004

Bank Question: 1025CE ***Answer: D***

1 Pt(s) Unit 1 was operating at 100% power when a reactor trip occurred. Given the following events and conditions shortly after the trip:

- Reactor power is $1x10^{-1}$% and is decreasing
- SUR is –1 DPM and is becoming less negative
- 3 CEAs in group B failed to insert into the core

Which one of the following actions is required by 1-EOP-01 (SPTA) to respond to this problem?

A. Manually drive group 3 rods to insert the CEAs

B. Manually trip the reactor

C. Deenergize the CEDM MG Sets

D. Initiate emergency boration

Distracter Analysis:

A. **Incorrect**: EOP-01 does not require driving control rods.
Plausible: Driving rods may cause the rods to insert into the core – this is an immediate action for ATWS for Westinghouse plants.

B. **Incorrect**: This action is not required if power is lowering.
Plausible: If the candidate thinks that a second trip may cause the CEAs to insert. Manually tripping the reactors is a contingency action in EOP-01 – but only if power is not lowering.

C. **Incorrect**: If the candidate thinks that deenergizing the CEDMs may cause the CEAs to insert. This is plausible if the hold coils on the CEAs had not released. This action is not required if power is lowering and SUR is negative.
Plausible: This is a contingency action in EOP-01 only if power is not lowering.

D. **Correct**:

Level: RO Exam

KA: EPE 007EA2.04(4.4)

Lesson Plan Objective: 0711822-4

Source: New

Level of knowledge: memory

References:
1. EOP-01 page 5
2. 0711822 page 15

EPE 000007EA2.04(4.4/4.6) (CE/E02) Reactor Trip - Stabilization – Recovery - Ability to determine or interpret the following as they apply to a reactor trip: EA2.04 If reactor should have tripped but has not done so, manually trip the reactor and carry out actions in ATWS EOP. 4.4 4.6 (CFR 41.7 / 45.5 / 45.6)

Objective 0711822-4. State the Standard Post Trip Actions and their acceptance criteria.

Bank Question: 1026CE ***Answer: A***

1 Pt(s) Which one of the following conditions will cause a high RCP seal cooler heat exchanger high temperature alarm while the unit is in Mode 3?

A. RCP thermal Barrier CCW tube rupture.

B. RCP seal flow increases from 1.0 gpm to 1.25 gpm.

C. Loss of control power to the seal cooler heat exchanger isolation valves.

D. Loss of instrument air to the seal cooler heat exchanger isolation valves.

Distracter Analysis:

A. **Correct**: A leak in the thermal barrier will cause hot RCS to enter the CCW system and CCW return outlet temperature will increase.

B. **Incorrect**: A small increase in seal flow will not cause the high temperature alarm.
Plausible: The increase in seal flow rate will introduce more hot RCS water into the seal cooler area and cause temperatures to increase.

C. **Incorrect**: Loss of control power causes the seal cooler isolation valves to fail OPEN enabling full flow to the seal cooler heat exchanger. This is the normal position of these valves with the RCPs in operation.
Plausible: If the students think that loss of control power causes the seal cooler heat exchanger isolation valves to close.

D. **Incorrect**: Loss of instrument air causes the seal cooler isolation valves to fail OPEN enabling full flow to the seal cooler heat exchanger. This is the normal position of these valves with the RCPs in operation.
Plausible: If the students think that loss of instrument air causes the seal cooler heat exchanger isolation valves to close.

KA: SYS 003K1.12 (3.0/3.3)

Lesson Plan Objective: 702202-7

Source: Mod 138

Level of knowledge: comprehension

References:
1. 0711202 pages 11-12,69, 72-74

KA SYS 003 Reactor Coolant Pump System (RCPS) K1 Knowledge of the physical connections and/or cause-effect relationships between the RCPS and the following systems: K1.12 CCWS 3.0 3.3 (CFR: 41.2 to 41.9 / 45.7 to 45.8)

Objective 0702020-07: Evaluate the operation of the RCPs (including operating bands or setpoints) during normal, off-normal and emergency conditions by:

A. Explaining the general sequence for starting a RCP.
B. Describing how the reactor trip, on Unit 2, monitors Component Cooling Water (CCW) flow.
C. Diagnosing a failure in the RCP seal assembly, given seal temperatures pressures and flow.
D. Describing how to diagnosis a leak at the RCP casing/cover interfaces.
E. Diagnosing a failure in the RCP Lube Oil System, given bearing temperatures and oil levels.

Bank Question: 1027CE ***Answer: A***

1 Pt(s) Which one of the following choices correctly describes the power supply arrangement for the Unit 1 Boric Acid Pumps and the Gravity Feed valves?

A. **Both BAM pumps from MCC 1A6.**
Both Gravity Feed valves from MCC 1B6

B. **Both BAM pumps from MCC 1B6**
Both Gravity Feed valves from MCC 1A6.

C. **"A" BAM pump and Gravity Feed valve V2508 from MCC 1A6.**
"B" BAM pump and Gravity Feed valve V2509 from MCC 1B6.

D. **"A" BAM pump and Gravity Feed valve, V2508, from MCC 1B6.**
"B" BAM pump and Gravity Feed valve, V2509, from MCC 1A6.

Distracter Analysis:

A. **Correct**:

B. **Incorrect**: Power supplies are reversed
Plausible: If the candidate reverses the power supplies.

C. **Incorrect**: Both BAM pumps are powered from 1A6, Both gravity feed valves are powered from 1B6.
Plausible: It is unusual for safety related loads to be powered from the same power supply.

D. **Incorrect**: Both BAM pumps are powered from 1A6, Both gravity feed valves are powered from 1B6.
Plausible: It is unusual for safety related loads to be powered from the same power supply.

Level: RO Exam

KA: SYS 004K2.06 (2.6*/2.7)

Lesson Plan Objective: 0702205-4

Source: Bank #219

Level of knowledge: memory

References:
1. 0711205 pages 32, 37, 38

SYS 004 Chemical Volume Control Knowledge of bus power supplies to the following: K2.06 Control instrumentation 2.6* 2.7 (CFR: 41.7)

Lesson Plan Objective: 0702205-4: Identify the power supplies to the following CVCS loads:

A. Charging pumps
B. Boric Acid pumps
C. Emergency Boration and Gravity Feed Valves

Bank Question: 1030CE ***Answer: C***

1 Pt(s) Unit 1 was operating at 100% power with all instrumentation channels in an operable condition when a LOCA occurred. Given the following conditions:

Time	**0200**	**0202**	**0204**	**0206**
RCS Pressure (psia)				
PT-1102A	1595	1590	1590	1590
PT-1102B	1605	1602	1598	1595
PT-1102C	1605	1602	1602	1595
PT-1102D	2500	2500	2500	2500
Containment Pressure (psig)				
PT-07-2A	3.2	3.6	4.6	5.2
PT-07-2B	3.1	3.4	4.7	5.3
PT-07-2C	3.4	3.7	5.1	5.6
PT-07-2D	0.2	0.2	0.2	0.2

If the SIAS fails to actuate automatically, what is the earliest time that operators are required to manually actuate SIAS by procedure?

A. 0200

B. 0202

C. 0204

D. 0206

Distracter Analysis: A SIAS is actuated by either 2-out-of-4 low pzr pressure (**1600 psia [1736 psia]**) signals or 2-out-of-4 high cntmt pressure (**5 psig [3.5 psig]**) signals.

A. **Incorrect**: Only 1 of 4 pressure channels is < 1600 psia
Plausible: If the candidate thinks that failed pressure CH4 changes the logic requirement from 2/4 to 1/3.

B. **Incorrect**: Only 1 of 4 pressure channels is < 1600 psia
Plausible: If the candidate confuses the Unit 1 and Unit 2 containment pressure setpoints (SIAS will actuate under these conditions in Unit 2).

C. **Correct**:

D. **Incorrect**: SIAS should auto actuate at 0204 – required by EOP-01 to manually actuate if auto fails.

Plausible: If the candidate confuses the Unit 2 pressure setpoint – then this would be the correct answer – meets containment pressure logic to actuate.

Level: RO Exam

KA: SYS 006A2.12 (4.5/4.8)

Lesson Plan Objective: 0702401-2

Source: New

Level of knowledge: analysis

References:
1. 0711401 pages 5, 14
2. EOP-01 page 9

SYS 006A2.12 ECCS Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.12 Conditions requiring actuation of ECCS 4.5 4.8 (CFR: 41.5 / 45.5)

Objective 0702401-02 ESFAS: Describe the five ESFAS Actuations including the following for each:

A. Input Parameters.
B. Actuation logic.
C. Actuation set points.
D. Blocking capability.
E. Primary event it was designed to mitigate.
F. Actuation mode (i.e. energized or de-energized to actuate).

Bank Question: 1032CE ***Answer: C***

1 Pt(s) Units 1 and 2 were operating at 100% power. Given the following events and conditions:

- A large unisolable instrument air leak has developed in an unknown location outside containment.
- Instrument air pressure dropped to 65 psig on one of the units.

Which one of the following statements correctly describes:
1. The affected unit, and
2. The required action to maintain RCP seal integrity?

A. **1. Unit 1**
2. All RCPs are required to be stopped within 10 minutes due to CCW inside containment isolation valves failing closed.

B. **1. Unit 1**
2. All RCPs are required to be stopped within 30 minutes due to RCP seal heat exchanger valves failing closed.

C. **1. Unit 2**
2. All RCPs are required to be stopped within 10 minutes due to CCW inside containment isolation valves failing closed.

D. **1. Unit 2**
2. All RCPs are required to be stopped within 30 minutes due to RCP seal heat exchanger valves failing closed.

Distracter Analysis:

A. **Incorrect**: Unit 1 has an instrument air compressor inside containment. This will prevent a loss of instrument air pressure for the N header containment isolation valves.
Plausible: This is the correct answer for Unit 2.

B. **Incorrect**: The RCP seal heat exchanger isolation valves fail open on a loss of instrument air. Unit 1 has an instrument air compressor inside containment. This will prevent a loss of instrument air pressure for the N header containment isolation valves.
Plausible: If the candidate reverses the failure mode or unit response for these events.

C. **Correct**: Unit 2 does not have inside containment IA compressors. Loss of IA will cause the CCW N header to isolate (valve fails closed) and RCP must be tripped within 10 minutes of loss of CCW.

D. **Incorrect**: The RCP seal heat exchanger isolation valves fail open on a loss of instrument air. The loss of CCW to containment requires RCP to be tripped in 10 minutes not 30 minutes.
Plausible: CCW will be lost to the RCP seal HX due to the closure of the containment isolation valve. If the candidate reverses the failure mode for these events.

Level: RO Exam

KA: SYS 007A2.05(3.3*/3.5)

Lesson Plan Objective: 0702209-06

Source: NRC exam 2002 #2092

Level of knowledge: comprehension

References:
1. 0711209 pages 18, 28, 52, 58
2. 0711413 pages 7-15 and 96
2. ONOP 1010030 Unit 1 pages 5-10
3. ONOP 1010030 Unit 2 pages 5-10

SYS 008A2.05(3.3*//3.5) Component Cooling Water 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: A2.05 Effect of loss of instrument and control air on the position of the CCW valves that are air operated 3.3* 3.5 (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Describe the control manipulations of the CCW system to:

A. Restore flow to the "N" Header following a SIAS.
B. Restore flow to the "N" Header following a SIAS reset.
C. Restore flow to RCPs following a SIAS.
D. Locally open the Unit 1 CCW outside containment isolation valves following:
    1) Solenoid valve failure.
    2) Loss of instrument air.
E. Reset the Unit 2 Radiation Monitoring flow isolation valve following a downstream low pressure condition.

Bank Question: 1033CE ***Answer: B***

1 Pt(s) Unit 2 was shutdown to Mode 3. Given the following events and conditions:

- Pressurizer pressure = 2220 psia
- Pressurizer level = 50%
- The pressure control system operates as designed
- A pressurizer PORV spuriously opens

Which one of the following statements correctly describes the **initial** pressurizer level trend and the predominant cause for this trend?

A. Pressurizer level will increase as the water flashes in the reference leg of the pressurizer level detector.

B. Pressurizer level will increase due to the drop in pressurizer pressure.

C. Pressurizer level will decrease as inventory is lost out the open PORV.

D. Pressurizer level will decrease caused by the insurge cooling the pressurizer.

Distracter Analysis:

A. **Incorrect**: The pressurizer level detector reference leg is not affected by the drop in pressure because it is cooled to containment ambient conditions. It will not flash.
Plausible: Partially correct – right trend, wrong reason. Pressurizer level does increase – if swell occurred, the level would in fact increase – but swell does not occur.

B. **Correct**: The decrease in pressurizer pressure causes swell in the pressurizer. Level will increase.

C. **Incorrect**: Pressurizer level increases, not decrease.
Plausible: Inventory will be lost out the PORV. If the candidate does not understand the Psat – Tsat relationship.

D. **Incorrect**: Pressurizer level will increase not decrease. Shrink will not occur because pressurizer pressure drops.
Plausible: If shrink occurred, pressurizer level would decrease.

Level: RO Exam

KA: SYS 010A1.05(2.8/2.9)

Lesson Plan Objective: 0702206-02

Source: Mod #25

Level of knowledge: comprehension

References:
1. 0711206 pages 38-41

010A1.05(2.8/2.9) Pressurizer Pressure Control - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PZR PCS controls including: A1.05 Pressure effect on level 2.8 2.9 (CFR: 41.5 / 45.5)

Objective 0702206-02 Describe the Unit 1 and Unit 2 PPLCS operating principles for each of the following:

a. Inherent Thermodynamics of a Saturated Pressurizer *
b. Pressurizer Level Program *

Bank Question: 1035CE ***Answer: D***

1 Pt(s) Unit 2 was operating at 100%. Given the following events and conditions:

- One PORV has a small leak and the following quench tank parameters are slowly trending up as follows:
  - Quench tank level = 71% - high level alarm
  - Quench tank temperature = 210 °F – high temperature alarm
  - Quench tank pressure = 15 psig – high pressure alarm

Which one of the following statements completely describes the required actions to correct this condition while minimizing liquid wastes?

A. **Drain and vent the quench tank.**

B. **Drain the quench tank.**
Cool the quench tank using the wrap around heat exchanger.

C. **Drain and vent the quench tank.**
Cool the quench tank using the wrap around heat exchanger.

D. **Vent the quench tank.**
Cool the quench tank by draining and refilling with primary makeup water.

Distracter Analysis: Level, temperature and pressure are all above alarm setpoints. Must drain, vent and cool. Note: Draining will reduce pressure but not temperature.

A. **Incorrect**: Insufficient action – will not reduce the quench tank temperature.
Plausible: Partially correct – must drain and vent.

B. **Incorrect**: Unit 2 does not have the wrap-around heat exchangers installed on the quench tank.
Plausible: This could be a correct answer for Unit 1 – if the candidate thinks that draining will drop pressure below 10 psig.

C. **Incorrect**: Unit 2 does not have the wrap-around heat exchangers installed on the quench tank.
Plausible: This is a correct answer for Unit 1

D. **Correct**: addresses all three conditions.

Level: RO Exam

KA: SYS 007A1.01(2.9/3.1)

Lesson Plan Objective: 0702206-9, 10

Source: New

Level of knowledge: comprehension

References:
1. 0711206 pages 33-36

SYS 007A1.01: Pressurizer Relief/Quench Tank Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRTS controls including: (CFR: 41.5 / 45.5) A1.01 Maintaining quench tank water level within limits 2.9 / 3.1

0702206-9 Describe the design considerations for the Pressurizer Quench Tank, as follows:

a. The Function *
b. The Operational Design

0702206-10 Describe the design considerations, including the limitations and Unit differences for the Pressurizer Quench Tank features, for the following:

a. Rupture Disc
b. System Interfaces
c. Cooling System

Bank Question: 1036CE ***Answer: A***

1 Pt(s) Which one of the following RPS trips is credited in the safety analyses to protect against exceeding DNBR?

A. Low steam generator water level

B. Low steam generator pressure

C. High pressurizer pressure

D. High rate of change of power (high SUR)

Distracter Analysis:

A. **Correct**: loss of SGWL causes a loss of heat removal capacity – which challenges DNB.

B. **Incorrect**: protects against a restart accident
Plausible: if the candidate confuses SG pressure and level trips

C. **Incorrect**: Protects against RCS overpressure accident in the event of a loss of load without a reactor trip
Plausible: A low-pressure condition would challenge DNB

D. **Incorrect**: Protects against high SUR rate from low powers condition – not credited in the safety analyses.
Plausible: A high SUR could cause an over-power condition – could potentially be considered a DNB challenge.

Level: RO Exam

KA: SYS 012K5.01(3.3*/3.8)

Lesson Plan Objective: 0702406-8

Source: MOD #2214

Level of knowledge: memory

References:
1. 0711404 pages 10-12

SYS 012K5.01 Reactor Protection: Knowledge of the operational implications of the following concepts as the apply to the RPS: K5.01 DNB 3.3* 3.8 (CFR: 41.5 / 45.7)

0702406-8: Analyze a given a set of plant parameters and indications to confirm that the RPS is in a tripped condition in response to an automatic trip demand,

Bank Question: 1037CE ***Answer: A***

1 Pt(s) Unit 1 is operating at 100% power. Given the following events and conditions:

- PT-07-2A (CNTMT PRESS TRANSMITTER) failed high and has not been bypassed.
- A loss of the MD instrument bus occurs.

Which of one the following selection is the complete set of Engineered Safety Features Actuation signal(s) that will actuate in addition to SIAS?

A. CIAS

B. CSAS

C. CIAS and MSIS

D. CSAS, MSIS and CIAS

Distracter Analysis:

A. **Correct**: The 2/4 bistable logic is met from the input from PT-07-2A (not yet bypassed – in trip condition) and the loss of power due to the lost instrument bus MD. CIAS is a "deenergize-to-actuate" feature.

B. **Incorrect**: CSAS is an "energize-to-actuate" bistable. The loss of the MD instrument bus will not actuate CSAS
Plausible: CSAS will actuate from 2/4 high containment pressure signals

C. **Incorrect**: MSIS will not actuate – does not actuate due to high containment pressure on unit 1.
Plausible: partially correct – CIAS will actuate. This answer would be correct for unit 2.

D. **Incorrect**: CSAS is an "energize-to-actuate" ESFAS feature. The loss of the MD instrument bus will not actuate CSAS
Plausible: partially correct – CIAS will actuate.

Level: RO Exam

KA: SYS 013K3.03(4.3/4.7)

Lesson Plan Objective: 0702401-8

Source: Bank #2004

Level of knowledge: comprehension

References:
1. 0711401 pages 17-18, 20-21, 29, 33

SYS 013K3.03(4.3/4.7) Engineered Safety Features Actuation - Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: K3.03 Containment 4.3 4.7 (CFR: 41.7 / 45.6)

Objective 0702401-8: Describe the effect of each one of the following conditions on the ESFAS system:

A. a failed ESFAS input.
B. a failed ESFAS component.
C. a loss of a single Instrument AC power supply.
D. a loss of multiple Instrument AC power supplies.
E. the loss of a single 125V DC bus.
F. a NORMAL/ISOLATE switch left in the isolate position.

Bank Question: 1038.3CE ***Answer: B***

1 Pt(s) Which one of the following cases would NOT allow manual initiation of AFAS by procedure OPS-521 (*Emergency Operating Procedure Implementation*)?

A. Automatic actuation of the system did not occur after the appropriate time delay had elapsed.

B. Automatic actuation of AFAS has occurred, however one motor driven AFW pump did not start and its associated discharge solenoid valve did not open.

C. During a loss of off-site power, after AFAS actuation, if one feedwater header pressurizes before the other (assuming neither feed header is ruptured).

D. When cooling down the RCS using only one steam generator, if the operable steam generator is affected by the AFAS rupture identification circuit.

Distracter Analysis:

A. **Incorrect**: Manual AFAS initiation is allowed for this case.
Plausible: If the candidate does not know the three conditions where manual initiation is allowed.

B. **Correct**:

C. **Incorrect**: Manual AFAS initiation is allowed for this case.
Plausible: If the candidate does not know the three conditions where manual initiation is allowed.

D. **Incorrect**: Manual AFAS initiation is allowed for this case.
Plausible: If the candidate does not know the three conditions where manual initiation is allowed.

Level: RO Exam

KA: SYS 013G1.23(3.9/4.9)

Lesson Plan Objective: 0702401-11

Source: New

Level of knowledge: memory

References:
1. OPS-521 page 10

SYS 013G1.23 Engineered Safety Features Actuation - Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 45.2 / 45.6) IMPORTANCE RO 3.9 SRO 4.0

Lesson Plan Objective: 0702411- 10: Describe the operator action to perform the following:

A. Block an ESFAS channel.
B. Actuate an ESFAS channel.
C. Reset an ESFAS channel actuation.
D. Place an ESFAS measurement channel in "Bypass."
E. Place an ESFAS measurement channel in "Trip."
F. Place all four ESFAS measurement channels in bypass when RCS temperature < 140 F.

Lesson Plan Objective 0702412-8: Describe the operator control manipulations of the AFAS to:

A. Manually actuate [or initiate] AFAS to feed either SG, including unit differences.
B. Reset AFAS following an actuation.
C. Place an AFAS channel in BYPASS.
D. Place an AFAS channel in TRIP.

Bank Question: 1039CE ***Answer: D***

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- Containment cooling system was in a normal alignment
- Containment cooling fans 2A, 2B and 2C were running
- An inadvertent SIAS occurred

Which one of the following sets correctly describes the status of the containment cooling fans?

A. 2A, 2B, 2C running in fast speed, 2D not running

B. 2A, 2B, 2C and 2D running in fast speed

C. 2A, 2B, 2C running in slow speed, 2D not running

D. 2A, 2B, 2C and 2D running in slow speed

Distracter Analysis:

A. **Incorrect**: SIAS causes all four containment cooling fans to start in slow speed
Plausible: if the candidate did not know that SIAS affects the cooling fans – this is the no change case.

B. **Incorrect**: SIAS causes all four containment cooling fans to start in slow speed
Plausible: If the candidate thinks that the fans start in fast speed.

C. **Incorrect**: SIAS causes all four containment cooling fans to start in slow speed
Plausible: If the candidate thinks that only the running fans shift to slow speed.

D. **Correct**: SIAS causes all four containment cooling fans to start in slow speed

Level: RO Exam

KA: SYS 022A3.01(4.1/4.3)

Lesson Plan Objective: 0702401-9

Source: New

Level of knowledge: memory

References:
1. 0711401 page 7
2. 0711207 pages 34-35
3. 0711602 page 7

SYS 022A3.01(4.1/4.3) Containment Cooling - Ability to monitor automatic operation of the CCS, including: A3.01 Initiation of safeguards mode of operation 4.1 4.3 (CFR: 41.7 / 45.5)

Objective 0702401-9: Explain the effect of an ESFAS actuation on both units for each of the following initial conditions.

A. Mode 1
B. RCS pressure at 1700 psia with SIAS blocked and SIT outlet valves closed.
C. Shutdown cooling is in service.

Bank Question: 1040CE ***Answer: C***

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions occur simultaneously:

- A LOCA occurred
- Containment pressure reached a maximum of 9.5 psig
- The 2A3 bus lockout relay has actuated

What is the status of the containment spray (CS) pumps 30 seconds after the LOCA?

A. No CS pumps are running

B. 2A CS pump is running

C. 2B CS pump is running

D. 2A and 2B CS pumps are running

Distracter Analysis: The containment pressure excursion causes a SIAS at 3 psig and CSAS at 5.4 psig on Unit 2. The 2A3 bus lockout prevents the 2A DG from loading on bus 2A3. The CS pumps are powered off the 5th load block and will sequence on in 12 seconds. Only the 2B CS pump will start. The SIAS set point for Unit 1 is 5 psig and the CSAS setpoint for Unit 1 is 10 psig.

A. **Incorrect**: Only CS pump 2B will have power from bus 2B3
Plausible: If the candidate does not recognize that CSAS has actuated – or if the candidate does not recognize that the DG sequencer has sequenced all safety loads after 30 seconds. This is the correct answer for unit 1 – where CSAS actuates at 10 psig.

B. **Incorrect**: CS pump 2A does not have power.
Plausible: If the candidate does not recognize that bus 2A3 will not be powered by DG 2A due to the bus lockout – or mixes up the power supplies to the CS pumps – or thinks that the sequencer has not completed sequencing in 30 seconds.

C. **Correct**:

D. **Incorrect**: CS pump 2A does not have power – the bus lockout relay actuation prevents the 2A DG from re-powering the bus.
Plausible: If the candidate thinks that the DG 2A will power up the bus.

Level: RO Exam

KA: SYS 026K2.01(3.4/3.6)

Lesson Plan Objective: 0702501-17, 070207-10

Source: New

Level of knowledge: comprehension

References:
1. 0711502 pages 19-21
2. 0711501 pages 48-50
3. 0711207 page 37
4. 0711401 pages 16-17

SYS 026K2.01(3.4*/3.6) Containment Spray - Knowledge of bus power supplies to the following: K2.01 Containment spray pumps 3.4* 3.6 (CFR: 41.7)

Objective 0702501-17: Predict the response of the diesel generator to the following conditions:

A. Loss of off-site power with no ESFAS (SIAS) start signal present.
B. ESFAS (SIAS) start signal with no loss of off-site power.
C. Concurrent loss of off-site power with an ESFAS (SIAS) start signal.
D. Loss of off-site power to the plant with the diesel in the standby mode, which is followed 10 minutes later by an ESFAS (SIAS) start signal.
E. Running a diesel generator surveillance with highly unstable system grid conditions.
F. Running the diesel unloaded or low-loaded for extended periods of time.
G. Lock-out on respective 4160 volt Bus associated with D/G.
H. Trip signals while in emergency mode.
I. Running the EDG for surveillance and then experiencing a LOOP or SIAS.

0702207-10: Analyze the signals (including bypasses and interlocks) which effect system operation by:

A. Describing the interlocks associated with the shutdown cooling hot leg suction valves on both units.
B. Describing the interlocks associated with the SIT discharge valve on both units.
C. Describe the effect of each safeguards signal (SIAS, CIAS, CSAS, RAS) on the ECCS and Containment Cooling systems on either unit.
D. Describing the effect of taking the control switch out of the "auto", "start", or "run" position on a component which receives a safeguards signal.

Bank Question: 1043CE ***Answer: B***

1 Pt(s) Unit 1 is operating at 55% power. Given the following events and conditions:

- The 1B and 1C condensate pumps are running
- The 1A and 1B Main Feed Pumps are running.
- A fault causes the 1C condensate pump motor breaker to trip.

What is the:
1. Expected automatic system response (if any), and
2. Appropriate operator actions?

A. **1. No automatic actions are expected**
2. Attempt to restart the tripped condensate pump.

B. **1. The 1A MFW Pump trips, the 1B MFW pump continues to run**
2. Rapidly reduce power to maintain feed suction pressure above 275 psig.

C. **1. The 1B MFW Pump trips, the 1A MFW pump continues to run**
2. Rapidly reduce power to maintain feed suction pressure above 275 psig.

D. **1. Both MFW Pumps trip**
2. Rapidly reduce power and trip when S/G level reaches 50% NR level.

Distracter Analysis: The 1C condensate pump is electrically interlocked with the 1A MFW when the 1B and 1C condensate pumps are running. The loss of the condensate pump automatically trips the respective side MFW pump when > 50% power. However, the loss of 1 feedwater/condensate pump above 50% power results in a drop in feedwater suction pressure that can cause the other MFP to trip if the FWRVs are also opening to raise SGWL.

A. **Incorrect**: The 1A MFW pump trips on electrical interlock
Plausible: If Unit 1 was < 50%, no automatic actions would occur. If the candidate thinks that there are no automatic actions but recognizes that one condensate/MFW can only provide up to 55% feedwater flow, the candidate will pick this distracter.

B. **Correct**: The 1A MFW is electrically interlocked with the 1C MFP.

C. **Incorrect**: The 1B MFW pump continues to run.
Plausible: If the candidate reverses the electrical interlock alignment between the condensate and feedwater pumps.

D. **Incorrect**: The 1B MFW pump continues to run.
Plausible: The loss of the condensate pump only trips the respective side MFW pump, not both feedwater pumps. If the candidate thinks that a feedwater transient may cause a loss of both MFPs, then tripping the reactor in response to this loss is the correct action. Note that the 2nd main feedwater pump quickly trips on low suction pressure if power is > ~ 60%. Loss of both MFW pumps is the typical plant response for higher power levels.

Level: RO Exam

KA: SYS 056A2.04(2.6/2.8*)

Lesson Plan Objective: 0702301-8

Source: MOD #365

Level of knowledge: memory

References:
1. 0711301 pages 12, 35, 63, 69, 82, 83
2. ONP 1-0700030 page 7

SYS 056A2.04(2.6/2.8*) Condensate - Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.04 Loss of condensate pumps 2.6 2.8* (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Objective 0702301-8: Predict the effects on applicable plant parameters for the following:

A. Feedwater heater level deviation from normal level
B. Feedwater heater normal drain valve failure
C. Feedwater heater alternate drain valve failure
D. MSR normal drain valve failure
E. MSR alternate drain valve failure
F. Given the plant is operating at 100% power: *
   1) Loss of a heater drain pump
   2) Loss of a condensate pump
   3) Loss of a MFW pump
   4) Loss of condenser vacuum
G. The condensate system recirc regulator fails as designed *
H. The condensate system reject regulator fails as designed
I. Loss of Instrument Air *

Bank Question: 1044CE ***Answer: B***

1 Pt(s) Unit 1 was operating at 100% power when a steam rupture occurred inside containment. Given the following events and conditions:

Time	0200	0205	0210	0220
Steam Generator (psia)				
PT-8013A	602	599	590	485
PT-8013B	599	595	586	481
PT-8013C	604	602	592	487
PT-8013D	603	601	591	486
Steam Generator (psia)				
PT-8023A	603	750	821	823
PT-8023B	602	752	822	824
PT-8023C	598	748	818	820
PT-8023D	601	751	820	821
Containment Pressure (psig)	3.6	4.1	4.5	5.1
Pressurizer Pressure (psia)	1635	1620	1595	1495

What time will the main feedwater isolation valves (MFIVs) close?

A. 0200

B. 0205

C. 0210

D. 0220

Distracter Analysis: The steam rupture will initially cause both S/Gs to reduce pressure until the MSIVs are closed. MFIVs will close on Unit 1 for MSIS or SIAS. They close on Unit 2 for MSIS or AFAS.

A. **Incorrect**: No Unit 1 MSIS or SIAS logics are satisfied.
Plausible: If the candidate confuses either of the Unit 1 and Unit 2 SIAS setpoints – the setpoint for Unit 2 Containment pressure (3.5 psig) and pressurizer pressure (1735 psig) are exceeded and a Unit 2 SIAS would have occurred. Also 2 S/G pressure instruments are < 600 psia – but not on the same S/Gs.

B. **Correct**: 2 of 4 S/G pressure instruments are < 600 psia

C. **Incorrect**: MFIV closed at 0205 on steam generator pressure.
Plausible: SIAS setpoint is reached at 0210 on pressurizer pressure (1600 psia).

D. **Incorrect**: MFIVs closed at 0205 on steam generator pressure.

Plausible: SIAS setpoint is reached on containment pressure (5.0 psig).

Level: RO Exam

KA: SYS

Lesson Plan Objective: 0702301-9

Source: New

Level of knowledge: analysis

References:
1. 0711301 pages 38-39, 57
2. 0711401 pages 14, 20

SYS 059K4.19(3.2/3.4) Main Feedwater - Knowledge of MFW design feature(s) and/or interlock(s) which provide for the following: K4.19 Automatic feedwater isolation of MFW 3.2 3.4 (CFR: 41.7)

Objective 0702301-9: Explain the effects on the Condensate, Feedwater and Heater Vent and Drain Systems to the following signals:

A. SIAS *
B. MSIS *
C. AFAS *

Bank Question: 1045CE ***Answer: B***

1 Pt(s) Unit 2 was operating at 100% power when a loss of offsite power occurred. Given the following events and conditions:

- The 2C AFW pump was out of service.

0200 A reactor trip occurred due to a loss of off-site power
- The 2A emergency diesel generator automatically loaded on the bus
- The 2B emergency diesel generator started but its breaker didn't close
- AFAS actuated

0205 The 2B emergency diesel generator breaker was manually closed

Assuming no operator actions, which one of the following statements correctly describes the AFW lineup at 0206?

A. The 2A and 2B AFW pumps are running feeding their respective S/G's

B. The 2A AFW pump is running feeding only the 2A S/G. The 2B AFW pump is running but not feeding the 2B S/G.

C. The 2B AFW pump is running feeding only the 2B S/G. The 2A AFW pump is running but not feeding the 2A S/G.

D. The 2A and 2B AFW pumps are running but not feeding either S/G

Distracter Analysis: The AFAS lockout circuit will actuate on d/p to lock out the 2B S/G FWIVs because the B AFW pump will not generate pressure until power is restored 2 minutes after the A AFW pump is running.

A. **Incorrect**: The 2B S/G will not be fed due to an AFAS lockout
Plausible: If the candidate does not recognize that the header d/p condition will exist due to the delay in repowering the B3 safety bas.

B. **Correct**:

C. **Incorrect**: The 2B S/G FWIV will be locked out by the d/p circuit. Can't feed the 2B S/G.
Plausible: If the candidate reverses the d/p response to the S/G FWIVs.

D. **Incorrect**: The 2A S/G will be fed.

Plausible: If the candidate does not recognize that the 2A S/G FWIV will open.

Level: RO Exam

KA: SYS 061K4.02(4.5/4.6)

Lesson Plan Objective: 0702412-7

Source: NRC 2001 #2014

Level of knowledge: comprehension

References:
1. 0711412 8-13, 26-27, 37-39, 50, 56, 71, 91-93

SYS 061K4.02(4.5/4.6) Auxiliary/Emergency Feedwater - Knowledge of AFW design feature(s) and/or interlock(s) which provide for the following: K4.02 AFW automatic start upon loss of MFW pump, S/G level, blackout, or safety injection 4.5 4.6 (CFR: 41.7)

Objective 0702412-7: Explain the response of the system, or the limitations imposed on the system by the following malfunctions:

A. Total loss of AC power.
B. Loss of off site power combined with the loss of one diesel generator.
C. Loss of single DC bus.

Bank Question: 1047.1CE ***Answer: C***

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- Annunciator C-36 (MN XFMR 2A ALARM PANEL) alarms
- The ANPO reports the following alarms on the local alarm panel:
  - DEVICE 27X1 (NO VOLATGE POWER SOURCE #2)
  - DEVICE 27X3 (LOSS OF COOLER POWER SUPPLY)
- 2A main transformer cooling equipment supply breaker is closed
- 2A main transformer cooling pumps and fans are not operating

Which one of the following statements correctly describes the condition and the response to generate as much power as allowable by procedures?

A. Either main transformer can carry 100% of the generator output. Shutdown the 2A main transformer and shift 100% of the load to the 2B main transformer.

B. A potential overcurrent situation exists if the 2A transformer is shutdown. Immediately trip the reactor and enter 2-EOP-01.

C. A potential overcurrent situation exists if the 2A transformer is shutdown. Initiate a plant ramp down power at 20 MW per minute.

D. A potential overcurrent situation exists if the 2A transformer is shutdown. Cross connect the cooling system from transformer 2B and maintain 100% power.

Distracter Analysis:

A. **Incorrect**: Each main transformer is limited to 475 MW or 635 MW if cooling is cross-connected.
Plausible: Some stations have transformers that can carry 100% of generator output.

B. **Incorrect**: A reactor trip is not required unless certain alarms are received.
Plausible: If the candidate does not recognize that operations can continue.

C. **Correct**:

D. **Incorrect**: Cross-connecting the cooling systems does not provide 100% current capacity – capacity is reduced to 63%.

Plausible: If the candidate does not know about the transformer uprate option/procedure.

Level: RO Exam

KA: SYS 062A2.09(2.7/3.0*)

Lesson Plan Objective: 0702502-2, 6

Source: New

Level of knowledge: comprehension

References:
1. 0711502 pages 10-11, 13, 68
2. ONP 2-0910031

SYS 062A2.09(2.7/3.0*) AC Electrical Distribution - Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.09 Consequences of exceeding current limitations 2.7 3.0* (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Objective 0702502-2: Illustrate the alignments of the Main Power Distribution system by:
A. Drawing a one line diagram of the Unit 1 and Unit 2 Main Power Distribution System including main, startup, auxiliary, and station service transformers; main and diesel generators; all electrical busses, breakers, load centers and MCC's.
B. Given a drawing and plant conditions, analyzing normal, off-normal and emergency lineups to verify proper operation of the Main Power Distribution system.

Objective 0702502-6: Given a set of plant conditions, diagnose a loss of a Main Power Distribution bus, including an assessment of the effect on plant operation.

Bank Question: 1048CE Answer: C

1 Pt(s) The green indicating light on the 6.9 and 4.16 KV breakers indicates the breaker is in the open position and it also indicates:

A. The breaker is racked in and the closing spring is charged.

B. The breaker is racked out and the closing spring is discharged.

C. The breaker is racked in and DC tripping power is available.

D. The breaker is in the "TEST" position and DC tripping power is available.

Distracter Analysis:

A. **Incorrect**: An amber light indicates that the closing spring is charged.
Plausible: If the candidate confuses the lights.

B. **Incorrect**: This would cause the amber light NOT to be lit.
Plausible: If the candidate confuses the lights.

C. **Correct**:

D. **Incorrect**: When placed in the "test" position, the breaker is racked out – the green light would not be on.
Plausible: If the candidate thinks that the breaker is racked in for TEST.

Level: RO Exam

KA: SYS 062A4.02(2.5/2.8)

Lesson Plan Objective: 0702502-3

Source: Bank #780

Level of knowledge: memory

References:
1. 0711502 pages 47-48

SYS 062A4.02(2.5/2.8) AC Electrical Distribution - Ability to manually operate and/or monitor in the control room: A4.02 Remote racking in and out of breakers 2.5 2.8 (CFR: 41.7 / 45.5 / to 45.8)

Objective 0702502-3: Describe the instrumentation, available in the control room, used to verify proper operation of the Main Power Distribution System under normal, off-normal and emergency conditions.

Bank Question: 1049CE Answer: C

1 Pt(s) Unit 1 was in Mode 3. Given the following events and conditions:

- An RCS Heatup was in progress
- RCS T_{avg} is 510 °F
- Pressurizer Pressure is 2235 psia

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

A. Total Loss of Feedwater

B. Excess Steam Demand Event

C. Loss of Coolant Accident

D. Loss of Off-Site Power

Distracter Analysis: Loss of safety related DC 1A bus will cause PT-1103 to fail low – which will cause PORV V1402 to open on Unit 1. Note this does not occur on Unit 2 where the logic for PORV actuation is 2/2.

A. **Incorrect**: A TLOF does not occur.
Plausible: There are many DC loads in the Feedwater system that could be potentially affected by a loss of DC power.

B. **Incorrect**: Excess steam demand will not occur in Mode 4.
Plausible: There are many DC loads in the SBCS that could be potentially affected by a loss of DC power.

C. **Correct**:

D. **Incorrect**: A LOOP will not occur.
Plausible: There are many DC loads in the AC electrical distribution system (control power to breakers) that could be potentially affected by a loss of DC power.

Level: RO Exam

KA: SYS 063K2.01(2.9*/3.1*)

Lesson Plan Objective: 0702503-5

Source: NRC 2001 #1982

Level of knowledge: comprehension

References:
1. ONOP 1-0030136 page 4
2. 0711206 pages 40-41, 47, 61-62, 87

SYS 063K2.01(2.9*/3.1*) DC Electrical - Knowledge of bus power supplies to the following: (CFR: 41.7) K2.01 Major DC loads 2.9* 3.1*

Objective 0702503-5: Evaluate the interfaces between the 120 Volt AC and 125 VDC Systems and other plant systems by:
A. Matching the major system loads with the correct power supply bus.
B. Predicting the effect of a loss an Instrument AC bus on each of the following systems:
1) RPS
2) ESFAS
3) AFAS
C. Predicting the effects on the 125 Volt DC for each the following conditions:
1) Battery Charger Failure
2) Ground
3) Placing a battery on Equalize charge.

Bank Question: 1050CE ***Answer: A***

1 Pt(s) Unit 1 was operating at 100% power when a LOOP occurred. Given the following events and conditions:

- 125 VDC control power to the 1A EDG fails when offsite power is lost

Which one of the following statements correctly describes the affect of this malfunction on the 1A EDG?

A. The 1A EDG will not start.

B. The 1A EDG will start but will not develop an output voltage.

C. The 1A EDG will start and achieve rated output voltage but will not close onto the 1A3 safety bus.

D. The 1A EDG will start and pick up bus 1A3.

Distracter Analysis:

A. **Correct**: 125 VDC control power is provided to the air start solenoids and field flashing circuits.

B. **Incorrect**: The EDG will not start.
Plausible: 125 VDC control power is provided to the field flashing circuits.

C. **Incorrect**: The EDG will not start.
Plausible: This could occur if control power was lost to the output breaker – but not control power to the EDG.

D. **Incorrect**: The EDG will not start.
Plausible: If the candidate is not aware that 125 VDC control power is required for EDG start. After starting, the EDG does not require any external source of power to continue operating.

Level: RO Exam

KA: SYS 064K2.03(3.2/3.6)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. 0711501 page 8

SYS 064K2.03(3.2*/3.6*) Emergency Diesel Generator - Knowledge of bus power supplies to the following: K2.03 Control power 3.2* 3.6 (CFR: 41.7)

Objective: none

Bank Question: 1051.1CE ***Answer: B***

1 Pt(s) Unit 1 was operating at 50% power and Unit 2 is shutdown in an outage. Given the following events and conditions:

- A controlled radioactive liquid release to the circulating water (CW) discharge is in progress.
- 3 CW pumps are running
- 3 intake cooling water (ICW) pumps are running
- 3 CW and 3 ICW pumps are required on the release permit

Which one of the following conditions would automatically trip FCV6627X and terminate the release?

A. Waste monitor pump low discharge pressure alarm

B. Liquid waste monitor R-6627 alarms on high activity

C. Liquid waste monitor R-6627 alarms on low sample flow

D. Waste Monitor Tank low level alarms

Distracter Analysis:

A. **Incorrect**: There is not automatic interlock on the waste monitor pump discharge pressure gage.
Plausible: Low discharge pressure meets the criteria for terminating the release – but it would require operator action to close FCV6627X and stop the pump.

B. **Correct**: high activity will trip R-6627 and close FCV6627X

C. **Incorrect**: Low sample flow will not automatically trip FCV6627X
Plausible: Low sample flow is a criterion for terminating the release

D. **Incorrect**: A WMT low-level alarm will not trip FCV6627X
Plausible: A WMT low-level alarm will automatically stop the associated waste monitor pump, which will terminate the release.

Level: RO Exam

KA: SYS 073A4.01(3.9/3.9)

Lesson Plan Objective: none

Source: new

Level of knowledge: memory

References:
1. 0511018 pages 7-8
2. 1-NOP-06.01pages 11-12

SYS 073A4.01(3.9/3.9) Process Radiation Monitoring - Ability to manually operate and/or monitor in the control room: A4.01 Effluent release 3.9 3.9 (CFR: 41.7 / 45.5 to 45.8)

Objective: 0502018-10: Predict the effects of a high alarm in the Waste Monitor Storage Tank in regards to liquid waste processing.

Bank Question: 1052.1CE ***Answer: A***

1 Pt(s) Unit 2 had just completed a startup and was in the process of raising power with normal condenser vacuum when a large mass of sea grass was entrained on the intake traveling screens. Given the following events and conditions:

- Hi-hi differential pressure alarm on the traveling screen
- Attempts to clear the sea grass clog are in progress
- Reactor power = 10%

Which one of the following statements correctly describes the proper procedure and the complete set of actions that are required to be taken if vacuum continues to degrade?

A. Enter ONP-2-0620030 (*Circulating Water System*) and trip the turbine if vacuum reaches 3.6 inches of Hg (abs).

B. Enter ONP-2-0620030 (*Circulating Water System*) and first trip the reactor and then trip the turbine if vacuum reaches 5.6 inches Hg (abs).

C. Enter 2-EOP-01 (SPTA) and trip the turbine if vacuum reaches 5.6 inches Hg (abs).

D. Enter 2-EOP-01 (SPTA) and first trip the reactor and then trip the turbine if vacuum reaches 3.6 inches Hg (abs).

Distracter Analysis: Must immediately trip the reactor if:
A. Differential pressure between the condensers is greater than or equal to 2.5" Hg. Abs. (PI-10-7A or PI-10-7B and PI-10-6).
B. Back pressure greater than 3.5" Hg. Abs. when less than 30% reactor power.
C. Back pressure greater than 5.5" Hg. Abs. when greater than 30% reactor power.

A. **Correct**: With reactor power below 10%, a reactor trip is not required. ONP-2-0620030 is the correct procedure to be used for a loss of circ water.

B. **Incorrect**: The turbine must be tripped at 3.5" Hg when power is below 30%. The reactor is not required to be tripped first when power is < 11%.
Plausible: If the candidate confuses the trip requirement for > 30% power.

C. **Incorrect**: The turbine must be tripped at 3.5" Hg not 5.6" Hg.
Plausible: If the candidate confuses the trip setpoints > 30% power.

D. **Incorrect**: The reactor is not required to be tripped if power is < 11%.

Level: RO Exam

KA: SYS 076A2.01(3.5*/3.7*)

Lesson Plan Objective: 0704201-8

Source: New

Level of knowledge: comprehension

References:
1. ONOP 02-0620030 page 5
2. 0704201 page 7

SYS 076A2.01(3.5*/3.7*) Service Water - Ability to (a) predict the impacts of the following malfunctions or operations on the SWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Loss of SWS 3.5* 3.7* (CFR: 41.5 / 43.5 / 45/3 / 45/13)

0702401– 8: Objective: State the Symptoms, Immediate Automatic and Immediate Operator actions for High delta T and high discharge temperature per Off Normal Operating Procedure 1[2]-0620030.

Bank Question: 1053CE Answer: D

1 Pt(s) Unit 1 is at 100% power when a large instrument air leak occurs. Given the following events and conditions:

- The NPO is dispatched to isolate the leak.
- The RO is monitoring the instrument air pressure as it continues to lower.

If instrument air pressure continues to decrease, at what value is the Unit required to be manually tripped?

A. 84 psig

B. 80 psig

C. 74 psig

D. 59 psig

Distracter Analysis:

A. **Incorrect**: The unit must be tripped below 60 psig and lowering.
Plausible: At 85 psig and lowering, the crosstie valve on Unit 2 will close.

B. **Incorrect**: The unit must be tripped below 60 psig and lowering.
Plausible: AT 80 psig, PCV-18-5 opens to utilize outside RCB I/A

C. **Incorrect**: The unit must be tripped below 60 psig and lowering.
Plausible: At 75 psig and lowering, the AOVs may lose operating capabilities and the operators must evaluate shutting down the unit (normal shutdown).

D. **Correct**: per ONOP 1-1010030

Level: RO Exam

KA: SYS 078A4.01(3.1/3.1)

Lesson Plan Objective: 0702413-7

Source: Bank #1548

Level of knowledge: memory

References:

1. 0711413 pages 43-44, 115
2. ONOP 1-1010030 pages 7-8

SYS 078A4.01(3.1/3.1) Instrument Air - Ability to manually operate and/or monitor in the control room: (CFR: 41.7 / 45.5 to 45.8) A4.01 Pressure gauges 3.1 3.1

Objective 0702413-7: Describe the licensed operator response to:

A. Instrument Air System Low Pressure Alarm.
B. Instrument Air System Pressure less than 75 psig for prolonged period.
C. Loss of Turbine Cooling Water with respect to Instrument Air System.
D. Loss of Off-site Power with respect to Instrument Air System.
E. Notification by a NLO that Service Air is cross-connected to Instrument Air.

Bank Question: 1054CE ***Answer: C***

1 Pt(s) Containment purge was in progress on Unit 2 in Mode 6 when Channel A CIAS monitor turned red on the PC-11.

The other channels indicated the following:

- Channel B Yellow
- Channel C Green
- Channel D White (declared OOS yesterday and bypassed)

Based on the above indications, which one of the following statements correctly describes the status of the Containment Purge System?

A. Stopped due to one channel in trip and the other in pretrip.

B. Stopped due to one channel in trip and the other in bypass.

C. Running, but will trip if another non-bypassed channel turns red.

D. Running, but will trip if another non-bypassed channel turns yellow.

Distracter Analysis: CIAS will actuate with 2/4 channels in trip (hi-hi alarm). Channel D is bypassed which causes the logic to change to 2/3.

A. **Incorrect**: This is insufficient to cause a CIAS
Plausible: if the candidate does not know the logic for CIAS

B. **Incorrect**: The logic is insufficient to cause a CIAS – bypassing a channel changes the logic from 2/4 to 2/3.
Plausible: Prior to placing channel D in bypass, the logic to cause a CIAS may have been satisfied.

C. **Correct**:

D. **Incorrect**: yellow = pretrip – not sufficient to meet the 2/3 logic coincidence requirements.
Plausible: If the candidate thinks that 1 trip and 2 pre-trip channels is sufficient.

Level: RO Exam

KA: SYS 103A3.01(3.9/4.2)

Lesson Plan Objective: 0702411-07

Source: Bank #649

Level of knowledge: memory

References:
1. 0711411 pages 12, 28-30, 58

SYS 103A3.01(3.9/4.2) Containment - Ability to monitor automatic operation of the containment system, including: (CFR: 41.7 / 45.5) A3.01 Containment isolation 3.9 4.2

Objective 0702411-7: Evaluate how the following different plant conditions effect Unit 2 Radiation Monitoring System response:

A. Primary-to-Secondary leaks.
B. Primary-to-Atmosphere leaks.
C. Primary-to-CCW leaks.
D. LOCAs
E. High fission product activity.

Bank Question: 1055CE Answer: C

1 Pt(s) A 35 gpm RCS leak is occurring from a seat leak in a code safety valve on Unit 2.

Which one of the following statements correctly describes the instrumentation available to determine:
1. the change in leak rate, and
2. the method to determine the location of the RCS leak?

A. 1. RCS leakage flow recorder FR-07-3 (REACTOR CAVITY LEAKAGE FLOW)
2. Comparing the CIAS radiation monitor readings

B. 1. Reactor drain tank level change
2. Tail pipe temperature and acoustic flow monitors

C. 1. Quench tank level change
2. Tail pipe temperature and acoustic flow monitors

D. 1. Cavity sump level LI-07-6 (RX CAVITY LEVEL) change
2. Sampling different atmospheric locations in the Containment

---

Distracter Analysis: Safety valve seat leakage would go to the quench tank.

A. **Incorrect**: Safety valve seat leakage would go to the quench tank. FR-07-3 does not quantify leak rate on Unit 2
Plausible: This would detect a leak into containment atmosphere. There are 4 CIAS radiation monitors in the 4 quadrants of containment – appears to be a reasonable indicator of leak location.

B. **Incorrect**: Safety valve seat leakage would go to the quench tank not the reactor drain tank.
Plausible: Partially correct – the tail pipe and acoustic flow monitors would identify the leaking safety valve.

C. **Correct**: Safety valve leak goes into the quench tank. Tail pipe and acoustic flow monitors would identify the leaking safety valve.

D. **Incorrect**: Safety valve leak goes into the quench tank not the reactor cavity sump.
Plausible: This would identify a leak into the containment atmosphere. This was the previous answer to the bank question.

Level: RO Exam

KA: SYS 002K6.12(3.0/3.5)

Lesson Plan Objective: 0702201-2

Source: MOD #1944

Level of knowledge: memory

References:
1. 0711201 pages 15-16
2. 0711600 pages 9-11, 35
3. 97111411 pages 12, 41
4. 0511018 page 6

SYS 002K6.12(3.0/3.5) Reactor Coolant - Knowledge of the effect or a loss or malfunction on the following RCS components: K6.12 Code Safety valves 3.0 3.5(CFR: 41.7 / 45.7)

Objective 0702201-2: Illustrate the flow paths of the RCS by:

A. Drawing a one-line diagram of the RCS. Include labeling of the major components, instrumentation and penetrations to other systems.

B. Drawing a one-line diagram of the Reactor Coolant Gas Vent System. Include labeling of the major components, instrumentation and penetrations to other systems.

Bank Question: 1056CE Answer: D

1 Pt(s) Unit 1 was in Mode 5 following a shutdown for refueling. Given the following events and conditions:

- Pressurizer level is 28%.
- The pressurizer low level alarm has annunciated.
- The pressurizer level interlock bypass key switch is in the "BYPASS" position.

Which one of the following statements correctly describes the charging pump control operations without operator action while filling the pressurizer solid?

A. At 31% pressurizer level, the second backup charging pump will automatically stop. At 32% pressurizer level the first back up charging pump will automatically stop.

B. At 32% pressurizer level, the second backup charging pump will automatically stop. At 37% pressurizer level, the first backup charging pump will automatically stop.

C. At 37% pressurizer level, both backup charging pumps will automatically stop.

D. Both backup charging pumps will continue to run until the pressurizer is solid.

Distracter Analysis: The programmed pressurizer level for 0 power is 33%. For Unit 1:

- The second backup charging pump auto-stops at –2% (31%)
- The first backup charging pump auto-stops at –1% (32%)
- Both backup charging pumps receive another auto stop signal at +4% (37%)
- With the pressurizer bypass interlock key switch in the "BYPASS" position, the charging pump auto-stop signals are defeated.

A. **Incorrect**: With the pressurizer bypass interlock key switch in the "BYPASS" position, the charging pump auto-stop signals are defeated.
Plausible: This would be the correct answer if the pressurizer bypass interlock key switch was NOT in the "BYPASS" position for Unit 1.

B. **Incorrect**: With the pressurizer bypass interlock key switch in the "BYPASS" position, the charging pump auto-stop signals are defeated.
Plausible: If the candidate confuses the Unit 2 setpoint (-1% deviation) with the Unit 1 setpoint for the 1st backup charging pump stop signal.

C. **Incorrect**: With the pressurizer bypass interlock key switch in the "BYPASS" position, the charging pump auto-stop signals are defeated.
Plausible: If the candidate thinks that the first set of auto stop signals is bypassed (-2% and –1%) are bypassed and only the +4% signal is active.

D. **Correct**:

Level: RO Exam

KA: SYS 011A4.01(3.5/3.2)

Lesson Plan Objective: 702206-12

Source: New

Level of knowledge: memory

References:
1. 0711206 pages 51, 55, 56

SYS 011A4.01(3.5/3.2) Pressurizer Level Control - Ability to manually operate and/or monitor in the control room: A4.01 Charging pump and flow controls 3.5 3.2 (CFR: 41.7 / 45.5 to 45.8)

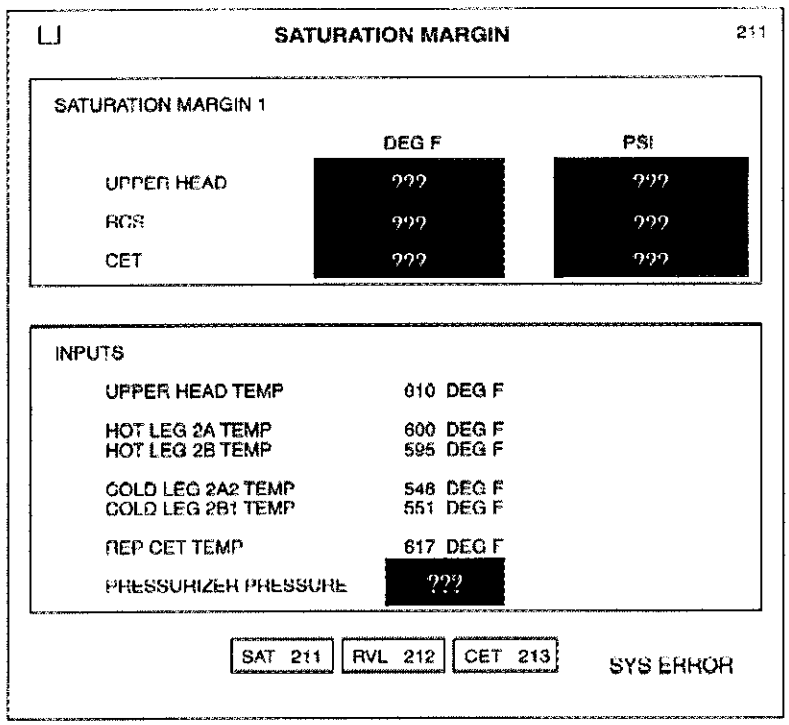
Objective 0702206-12: Describe the operation of the PPLCS, for the following transient states of plant operation, including actual and indicated, pressures and levels:

a. RCS Heatup
b. RCS Cooldown
c. Drawing a Steam Bubble in the Pressurizer
d. Taking the Pressurizer "Solid"
e. PORV Malfunctions
f. Code Safety Malfunctions

Bank Question: 1057.1CE ***Answer: A***

1 Pt(s) Unit 2 was operating at 100% power when a station blackout (SBO) occurred. Given the following QSPDS indications:

UNIT 2 QSPDS SATURATION MARGIN PAGE



[Where: ??? denotes a flashing reverse video display of "???" for the indicated parameter.

If pressurizer pressure is 2275 psia, which one of the following statements correctly describes the saturation margin and the verification of natural circulation?

References Provided: 2-EOP-99 Figure 1A

A. Saturation margin is - 36°F subcooled and is not adequate to verify natural circulation.

B. Saturation margin is - 43°F subcooled and is not adequate to verify natural circulation.

C. Saturation margin is – 36 °F subcooled and is adequate to verify natural circulation.

D. Saturation margin is – 43 °F subcooled and is adequate to verify natural circulation.

Distracter Analysis: When RCPs are lost, natural circulation is verified by using CET subcooling – RCS subcooling is used when RCPs are running. If the pressure input is lost to QSPDS, then subcooling must be verified by determining saturation temperature of the RCS based on Rep CET temperatures. At 2275 psia, the corresponding saturation temperature is 653°F. The requirement is to have +40 °F subcooling for subcooling to be adequate to verify natural circulation – due to instrument errors – therefore Rep CET temp must be < 613°F.

A. **Correct**: The subcooling value for CETs is used to verify natural circulation. Subcooling margin must be ≥ 40 °F for natural circulation to be verified. Subcooling margin = 653-617=36 °F

B. **Incorrect**: Subcooling margin = 36 °F not 43 °F.
Plausible: Partially correct -- the subcooling margin is not adequate to verify natural circulation. Subcooling margin is incorrect – it was derived from 653-610= 43°F based on using RCS upper head temp (this parameter is used to verify subcooling when RCPs are running). This saturation margin selected would be acceptable for natural circulation to be verified (but the wrong temp was used).

C. **Incorrect**: The subcooling margin is not adequate for verification of natural circulation.
Plausible: Partially correct – the subcooling margin (36 °F) is correct.

D. **Incorrect:** The value for subcooling is incorrect and the correct value is not adequate for verification of natural circulation.
Plausible: If the candidate uses the value for highest cold leg temperature instead of REP CET temperature, the calculated values for subcooling margin is 653-551= 98 °F. 98 °F would be adequate to verify natural circulation.

Level: RO Exam

KA: SYS 017K3.01(3.5*/3.7*)

Lesson Plan Objective: 0702407-10, 15

Source: MOD #585

Level of knowledge: comprehension

References:
1. 0711407 pages 25-28, 66, 75
2. 2-EOP-09 page 11
3. 2-EOP-99 figure 1A

SYS 017K3.01(3.5*/3.7*) In-core Temperature Monitor - Knowledge of the effect that a loss or malfunction of the ITM system will have on the following: (CFR: 41.7 / 45.6) K3.01 Natural circulation indications 3.5* 3.7*

Objective 0702407-10, 15:
10: Describe 2 methods other than the QSPDS of determining RCS subcooling.
15: Given sample QSPDS data, verify adequate core flow during Natural Circulation.

Bank Question: 1058CE Answer: C

1 Pt(s) Unit 1 is recovering from a design basis LOCA.

Which one of the following statements correctly describes the post-LOCA Iodine removal process from the containment atmosphere?

A. The containment spray system injects hydrazine (N_2H_4).

B. The containment spray system injects tri-sodium phosphate (TSP).

C. The containment spray system injects sodium hydroxide (NaOH).

D. The airborne radioactivity removal system uses charcoal filters.

Distracter Analysis:

A. **Incorrect**: On Unit 1, the CIRS injects NaOH.
Plausible: This is correct for Unit 2.

B. **Incorrect**: On Unit 1, the CIRS injects NaOH.
Plausible: TSP is used in baskets inside the Unit 2 containment to maintain sump pH for proper operation of the Hydrazine in Iodine removal.

C. **Correct**:

D. **Incorrect**: The airborne radioactivity removal system is not used in the post-LOCA environment.
Plausible: This system is used to remove Iodine and other gaseous radioactivity from containment atmosphere during normal operations and following accidents – but not in a "post-LOCA" condition.

Level: RO Exam

KA: SYS 027K1.01(3.4*/3.7*)

Lesson Plan Objective: 0702207-1

Source: New

Level of knowledge: memory

References:
1. 0711207 pages 39-40

2. 0711602 page 28

SYS 027K1.01(3.4*/3.7*) Containment Iodine Removal - Knowledge of the physical connections and/or cause effect relationships between the CIRS and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8) K1.01 CSS 3.4* 3.7*

Objective 0702207-1: State the functions of the following systems and components:

A. Safety Injection System.
B. Containment Heat Removal System.
C. Safety Injection Tanks.
D. Iodine Removal System.
E. Shutdown Cooling System.

Bank Question: 1059CE Answer: A

1 Pt(s) Unit 1 is in Mode 6. Given the following events and conditions:

- "A" train containment purge system is in service with suction aligned to the refueling cavity.
- The upper guide structure is being lifted.
- A and C CIAS monitors indicate 95 mR/Hr.
- B and D CIAS monitors indicate 85 mR/Hr.

Which one of the following statements correctly describes the response of the containment purge system?

A. Containment purge is automatically secured.

B. Containment purge remains in its current configuration.

C. The purge suction is automatically aligned to the containment ring header.

D. The purge discharge is automatically aligned to the shield building exhaust system.

Distracter Analysis:

A. **Correct**: A and B CIAS radiation monitors trip on high alarm (90 mR/hr) causing CIAS actuation.

B. **Incorrect**: A and B CIAS radiation monitors trip on high alarm (90 mR/hr) causing CIAS actuation.
Plausible: If the candidate does not recall that the high alarm setpoint decreases from 10 R/hr in Modes 1-4 to 90 mR/hr in mode 6.

C. **Incorrect**: A and B CIAS radiation monitors trip on high alarm (90 mR/hr) causing CIAS actuation.
Plausible: This is a manual line up of the purge system

D. **Incorrect**: A and B CIAS radiation monitors trip on high alarm (90 mR/hr) causing CIAS actuation.
Plausible: The spent fuel pool ventilation is automatically re-aligned to the shield building on high radiation but not containment purge.

Level: RO Exam

KA: SYS 029K1.02(3.3/3.6)

Lesson Plan Objective: 0702410-9

Source: NRC exam 2002 #2126

Level of knowledge: comprehension

References:
1. 0711410 pages 17-18
2. 0711602 pages 8-10, 66

SYS 029K1.02(3.3/3.6) Containment Purge - Knowledge of the physical connections and/or cause effect relationships between the Containment Purge System and the following systems: K1.02 Containment radiation monitor 3.3/ 3.6

Objective 0702410-9: Analyze the signals (including bypasses and interlocks) which effect system operation by:

A. Describing the automatic control features of the area monitors.
B. Describing the automatic control features of the process monitors.

Bank Question: 1060CE Answer: D

1 Pt(s) Which one of the following condensate and feed pump combinations is the complete list of pumps that will trip on a Unit 1 MSIS actuation?

A. MFW pumps only

B. MFW pumps and heater drain pumps only

C. MFW pumps and condensate pumps only

D. MFW pumps, heater drain pumps and condensate pumps

Distracter Analysis:

A. **Incorrect**: The heater drain and condensate pumps will also trip on Unit 1
Plausible: MFW pumps are the most likely pumps to be tripped.

B. **Incorrect**: The condensate pumps are also tripped.
Plausible: This answer is correct for unit 2.

C. **Incorrect**: The MFW pumps will also trip
Plausible: If the candidate confuses the heater drain pumps and condensate pumps.

D. **Correct**:

Level: RO Exam

KA: SYS 035K1.13(2.7/2.8)

Lesson Plan Objective: 0702401-9

Source: New

Level of knowledge: memory

References:
1. 0711408 page 42
2. 0711401 page 20

SYS 035K1.13(2.7/2.8) Steam Generator - Knowledge of the physical connections and/or cause-effect relationships between the S/GS and the following systems: K1.13 Condensate system 2.7 2.8 (CFR: 41.2 to 41.9 / 45.7 to 45.8)

Objective 0702401-9: Explain the effect of an ESFAS actuation on both units for each of the following initial conditions.

A. Mode 1
B. RCS pressure at 1700 psia with SIAS blocked and SIT outlet valves closed.
C. Shutdown cooling is in service.

Bank Question: 1061CE ***Answer: A***

1 Pt(s) Unit 1 was operating at 100% power when the reactor tripped from a grid disturbance. Given the following events and conditions:

- Unit is in hot standby
- SBCS permissive switch is in AUTO
- All SBCS M/A controllers are in AUTO
- Offsite power is available
- The Thot RTD to selected RSS develops a short circuit

Which one of the following statements correctly describes the effect on the SBCS?

A. The SBCS will only modulate open PCV-8801.

B. All SBCS valves can quick open but will not modulate.

C. All SBCS valves will modulate open but are unable to quick-open.

D. All SBCS valves will respond with full quick open and modulation capability.

Distracter Analysis:

A. **Correct**: The Thot failure causes the quick open solenoids to remain closed due to the false high RCS temp signal (> 560 °F) in the system.

B. **Incorrect**: the quick open solenoid will not actuate.
Plausible: If the candidate reverses the actuation logic on the quick open solenoid.

C. **Incorrect**: All SBCS valves will not modulate – the failed Thot input causes all valves but PCV-8801 to remain closed.
Plausible: If the candidate does not understand the effect of the failed Thot input to the SBCS.

D. **Incorrect**: the quick open solenoid will not actuate.
Plausible: If the candidate does not understand the effect of the failed Thot input to the SBCS.

Level: RO Exam

KA: SYS 041K6.03(2.7/2.9)

Lesson Plan Objective: 0702406-7

Source: Bank #572

Level of knowledge: comprehension

References:
1. 0711406 pages 7, 12-15

SYS 041K6.03(2.7/2.9) Steam Dump/Turbine Bypass Control - Knowledge of the effect of a loss or malfunction on the following will have on the SDS: K6.03 Controller and positioners, including ICS, S/G, CRDS 2.7 2.9 (CFR: 41.7 / 45.7)

Objective 0702406-7: Describe the operator actions to required to respond to the following normal, off-normal, and emergency conditions:

A. Operate the SBCS controls manually to cool the RCS down to less than hot-standby conditions.
B. Recover from a temporary loss of condenser vacuum.
C. Respond to a SBCS controller malfunction.
D. Respond to a stuck open SBCS valve.

Bank Question: 1062CE ***Answer: D***

1 Pt(s) Unit 1 is at steady state 80% power with the following conditions:

- Charging pumps A and C are running
- Charging and letdown are balanced
- Pressurizer Level is steady
- HS-2210 (MAKE UP MODE SELECTOR) is in auto
- All other systems are in a normal alignment

If no operator actions are taken, which of the following failures will result in letdown flow diverting to the hold up tanks?

A. Selected pressurizer level channel failing low

B. V-2345 (Intermediate pressure letdown relief valve) lifts

C. Selected RRS T_{ave} program failing high

D. LT2227 (VCT LEVEL) channel failing high

Distracter Analysis: Note –the makeup system is normally operated in manual – but is set to auto for this question. LT-2226 controls the VCT level. LT-2227 controls the 3 way divert valve V2500 (high) or the VCT to RWT auto swap (low).

A. **Incorrect**: Would cause minimum letdown and maximum charging thereby lowering VCT level.
Plausible: If the candidate reverses the failure logic – opposite of what happens. Psychometrically balanced with "B".

B. **Incorrect**: This relief discharges to the relief valve collection header.
Plausible: If the candidate thinks that V-2345 discharges to the HUTs.

C. **Incorrect**: Changes pressurizer programmed level to go high - would cause minimum letdown, maximum charging and lowering VCT level.
Plausible: If the candidate reverses the RRS failure logic.

D. **Correct**: This will cause the VCT to immediately divert to the HUT

Level: RO Exam

KA: SYS 068K1.07(2.7/2.9)

Lesson Plan Objective: 0702205-2

Source: MOD #2176

Level of knowledge: comprehension

References:
1. 0711205 pages 12, 17-20, 75
2. 0711206 pages 49-50, 62
3. 0511018 pages 6, 11-12, 24, 58-59

SYS 068K1.07(2.7/2.9) Liquid Rad Waste - Knowledge of the physical connections and/or cause effect relationships between the Liquid Radwaste System and the following systems: K1.07 Sources of liquid wastes for LRS 2.7 2.9 (CFR: 41.2 to 41.9 / 45.7 to 45.8)

Objective 0702205-2: Illustrate the flow paths of the CVCS by:

A. Drawing a one-line diagram of the CVCS, including major components, piping, relief valves and instrumentation. Label the valves that are control room operated.

B. Using a one line diagram, outline the following flow paths:

1) Normal Charging and Letdown
2) Boron Concentration and Control
   a. Normal Boration
   b. Normal Dilution
   c. Emergency Boration
3) VCT Level Control
4) Chemistry Control
5) RCP Seal Injection
6) Alternate charging alignment using High Pressure Safety Injection (HPSI)

Objective 0502018-3: List the sources of liquid waste to each of the following tanks and pumps:

Equipment Drain Tank
Chemical Drain Tank
Aerated Waste Storage Tank
Laundry Drain Tank
Waste Condensate Tank
Waste Monitor Tank
Safeguard Sumps

Bank Question: 1063CE Answer: C

1 Pt(s) Unit 1 was manually tripped from 100% power due to a fire in the control room. Given the following events and conditions:

- All operator actions in the control room from 1-ONP-100.02 (*Control Room Inaccessibility*) have been performed.
- The control room was evacuated.

Which one of the following statements correctly describes how reactor coolant system temperature is normally controlled when the hot shutdown control panel (HSCP) is operational?

A. Steam Bypass Control System (SBCS) in automatic control.

B. SBCS in manual control, locally at the valve.

C. Atmospheric Dump Valves (ADVs) in automatic control from the hot shutdown control panel.

D. ADVs in manual control, locally at the valve.

Distracter Analysis:

A. **Incorrect**: Main steam isolation valves (MSIVs) are tripped in the control room incapacitating the SBCS.
Plausible: This could be the answer if the MSIVs remained open.

B. **Incorrect**: MSIVs are tripped in the control room incapacitating the SBCS.
Plausible: This is a psychometrically designed distracter.

C. **Correct**:

D. **Incorrect**: The ADVs are normally controlled at the HSCP.
Plausible: There is a contingency for local ADV operation.

Level: RO Exam

KA: G2.4.34 (3.8)

Lesson Plan Objective: 0702864-08

Source: NRC exam 2001 #1964

Level of knowledge: memory

References:
1. 1ONP-100.02 pages 11, 22-23
2. 0704403 page 2
3. 0702304 page 29

K/A G2.4.34: Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications. (CFR: 43.5 / 45.13)

Objective 0702864-08: Given an Off-Normal system condition; describe the basic content and sequence of procedural steps applicable to the Off-Normal Condition by stating the overall strategy to restore the system to normal plant conditions.

Bank Question: 1064CE Answer: D

1 Pt(s) Unit 1 was operating at 100%. Given the following events and conditions:

- A waste gas release is being performed from the 1A Gas Decay Tank.

Which one of the following conditions will automatically terminate the release?

A. An unexpected drop in the 1A gas decay tank pressure

B. Gas decay tank oxygen concentration > 2% by volume

C. A high radiation alarm on the plant vent process radiation monitor

D. A high radiation alarm on the gaseous discharge monitor channel 42.

Distracter Analysis:

A. **Incorrect**: Drop in pressure does not automatically stop a release – requires manual action.
Plausible: This is a symptom of a leak in a GDT.

B. **Incorrect**: Must be manually terminated – no automatic interlock on the gas decay tanks.
Plausible: Vent gas surge header has an automatic interlock to terminate discharges to the gas surge tank at 2% O2. The gas decay tanks are monitored for high O2 level – but do not have an interlock.

C. **Incorrect**: High radiation on plant vent monitor does not stop the release. Gaseous activity is diluted by the time the discharge reaches this monitor.
Plausible: High radiation on waste gas discharge monitor will automatically stop the release. If the candidate confuses which monitor is used to monitor the release rate – they are both in the vent path.

D. **Correct**: The gaseous discharge monitor channel 42 will automatically stop the release.

Level: RO Exam

KA: SYS 071K4.06(2.7*/3.5*)

Lesson Plan Objective: 0502019-10

Source: MOD #2013

Level of knowledge: memory

References:
1. 0511019 pages 5, 7, 11, 13

SYS 071K4.06(2.7*/3.5*) Waste Gas Disposal - Knowledge of design feature(s) and/or interlock(s) which provide for the following: K4.06 Sampling and monitoring of waste gas release tanks 2.7* 3.5* (CFR: 41.7)

Objective 0502019-10: Explain how the Waste Gas System (V-6565) interfaces with the RAB ventilation.

Bank Question: 1065CE Answer: C

1 Pt(s) Unit 1 was in Mode 3. Given the following events and conditions:

- The 1A1 circ water (CW) pump amber permissive light was LIT
- The 1A1 CW pump RTGB hand switch was placed in start
- The 1A1 CW pump failed to start

Which one of the following statements correctly describes the cause of this pump start failure?

A. Pump lubricating water was only 2 psig

B. Condenser discharge valve is jammed shut

C. CW pump discharge valve failed to open

D. CW pump breaker is still racked out

Distracter Analysis: All four conditions are required to satisfy the interlock to start the CW pump. However, conditions A, B and D are would prevent obtaining the amber permissive light.

A. **Incorrect**: This condition would prevent the amber permissive light.
Plausible: This condition is required to satisfy the pump start interlock

B. **Incorrect**: This condition would prevent the amber permissive light.
Plausible: This condition is required to satisfy the pump start interlock

C. **Correct**:

D. **Incorrect**: This condition would prevent the amber permissive light.
Plausible: This condition is required to satisfy the pump start interlock

Level: RO Exam

KA: SYS 075K4.01(2.5/2.8)

Lesson Plan Objective: 0704201-5

Source: New

Level of knowledge: comprehension

References:
1. 0704201 pages 18, 53, 55

SYS 075K4.01(2.5/2.8) Circulating Water - Knowledge of circulating water system design feature(s) and interlock(s) which provide for the following: K4.01 Heat sink 2.5 2.8 (CFR: 41.7)

Objective 0704201-5: Describe the automatic actions which occur in the circulating water system when the circulating water pump and discharge valve control switch is placed in the START position for the starting of the first of two pumps with a common discharge tunnel. Include in your discussion all interlocks that must be satisfied for pump start.

Bank Question: 1068CE Answer: D

1 Pt(s) Unit 1 is operating at 100% power when a loss of instrument air pressure occurs due to a header leak outside of containment. Given the following events and conditions:

Time	Event
0200	V2505 (RCP BLEED OFF) fails closed
0205	Instrument air pressure falls to 65 psig
0210	Low level alarm on the CCW Surge Tank
0220	Rupture of the CCW "N" Header

When is the reactor required to be tripped by procedure?

A. 0200 – within 30 minutes

B. 0205 - immediately

C. 0210 – within 10 minutes

D. 0220 – within 10 minutes

Distracter Analysis:

A. **Incorrect**: Unit 1 has inside containment air compressors and the CBO valves can be aligned via a relief valve to the quench tank.
Plausible: Unit 2 does not have this design feature – must trip if instrument air is lost in Unit 2.

B. **Incorrect**: Does not require a reactor trip – the reactor must be tripped at 60 psig on both units.
Plausible: If the candidate does not know the reactor trip requirement.

C. **Incorrect**: Low level in the CCW surge tank will not require a reactor trip.
Plausible: CCW surge tank low-level alarm on Unit 2 will prevent restoration of CCW flow to containment – but this is not applicable for a loss of instrument air.

D. **Correct**: loss of CCW flow to the RCPs will require a reactor trip. Note that on Unit 2, the reactor will trip automatically after 10 minutes of lost flow (but not Unit 1).

Level: RO Exam

KA: APE 015/17AA1.03(3.7*/3.8)

Lesson Plan Objective: 0702202-4

Source: Mod #956

Level of knowledge: comprehension

References:
1. 0711202 pages 46-47
2. 0711209 pages 16-17
3. ONP 1-1010030 page 7
4. ONP 2-1010030 page 7

APE 015/17AA1.03(RCP Malfunction – AA1.03 Ability to operate and / or monitor the following as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): Reactor trip alarms, switches, and indicators. 3.7* 3.8 (CFR 41.7 / 45.5 / 45.6)

Objective 0702202-4: Evaluate the physical interfaces between the RCPs and other plant systems by:

A. Deleted

B. Predicting the effect of a loss of Component Cooling Water (CCW) on RCP operation.

C. Predicting the effects of the following failures on the RCP integral heat exchanger outlet valve:

1) loss of instrument air
2) loss of control power

Bank Question: 1069CE Answer: B

1 Pt(s) Unit 2 was shutdown to hot standby. Given the following sequence of events and conditions:

- RCS unidentified leakage = 0.5 gpm
- RCS identified leakage = 4.0 gpm
- RCP seal leakoff = 4.0 gpm
- SG-RCS tube leakage = 0.5 gpm

Time	Event
0200	All charging pumps have failed
0202	Letdown was secured
0205	Pressurizer level = 29% and slowly decreasing (assume 67gal/%) volumetric capacity for the pressurizer)

Assuming no operator action, how long after 0205 will the pressurizer heaters trip off?

A. Less than 10 minutes

B. 11-20 minutes

C. 21-30 minutes

D. Greater than 30 minutes

Distracter Analysis:
Loss to RCS from RCP seals = CBO = 1 gpm per RCP x 4 = 4.0 gpm
Loss to RCS from unidentified leakage = 0.5 gpm
Loss to RCS from identified leakage (includes SG leakage) = 4.0 gpm
Total loss to RCS from all sources of leakage = 8.5 gpm

Pzr low-low level alarm/heater cutout = 27% on unit 2 (28% on unit 1)
Δ level = 29% - 27% = 2%
Δ volume = 2% x 67 gal/% = 134 gal
Time to alarm = 134 gal / 8.5 gpm = **15.6 minutes**

A. **Incorrect**: 15.6 minutes is the correct time to the low level alarm.
Plausible: If the candidate uses the Unit 1 heater cutoff set point of 28%.
B. **Correct**: 15.6 minutes is the time to the low level alarm.
C. **Incorrect**: 15.6 minutes is the time to the low level alarm.

Plausible: If the candidate thinks that the 4.0 RCP CBO leakage is included as part of identified leakage (it is controlled leakage not identified leakage per tech spec definitions), the time calculated would be 27 minutes.

D. **Incorrect**: 15.6 minutes is the time to the low level alarm.
Plausible: If time is calculated from normal pzr level for hot standby instead of 29%.

Level: RO Exam

KA: APE 022AA2.04(2.9/3.8)

Lesson Plan Objective: multiple

Source: Bank - PSHA[BCH1]

Level of knowledge: analysis

References:
1. 0711202 pages 14, 74
2. 0711206 pages 51-52, 65, 124
3. Tech Spec Definitions pages 1-4, 1-7
4. Tech Spec 3.4.6.2 page 3/4 4-14

APE 022AA2.04(2.9/3.8) Loss of Reactor Coolant Makeup - Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Pump Makeup: How long PZR level can be maintained within limits 2.9 3.8 (CFR: 43.5 / 45.13).

Objective - multiple:

Bank Question: 1070CE Answer: D

1 Pt(s) Unit 1 is drained down to Mid-Loop with the following conditions:

- The Unit has been shutdown for 4 days.
- RCS temperature is 120 °F.
- Shutdown Cooling has been lost.

Which one of the following correctly states the time to boil and the makeup flow rate for boil off?

References Provided: ONP1-0440030 Figures 1, 2

A. 11 minutes 25 gpm

B. 11 minutes 65 gpm

C. 14 minutes 25 gpm

D. 14 minutes 65 gpm

Distracter Analysis:
From figure 1 = 14 minutes to boil off
From figure 2 = 65 gpm make flow required

A. **Incorrect**: Flow rate for boil off > 11 min and > 25 gpm
Plausible: if candidate misreads the makeup flow curve

B. **Incorrect**: Time to boil off > 11 minutes.
Plausible: Partially correct – flow rate is 65 gpm. If the candidate reads the wrong temperature curves (80 °F or 100 °F) for the correct time (96 hours)

C. **Incorrect**: Boil off flow rate > 25 gpm
Plausible: Partially correct – the time to boil is 14 minutes - If the candidate misreads the flow rate in figure 2.

D. **Correct**:

Level: RO Exam

KA: APE 025AK1.01(3.9/4.3)

Lesson Plan Objective: 0702207-13

Source: NRC #2027

Level of knowledge: comprehension

References:
1. ONP 1-0440030 pages 30-32
2. 0711207 pages 53, 63
3. ONP 2-0440030 pages 39-42

APE 025AK1.01(3.9/4.3) Loss of RHR System - Knowledge of the operational implications of the following concepts as they apply to Loss of Residual Heat Removal System: AK1.01 Loss of RHRS during all modes of operation 3.9 4.3 (CFR 41.8 / 41.10 / 45.3)

Objective 0702207-13: Evaluate the interface between the Emergency Core Cooling and Containment Cooling Systems and other plant systems by:

A. Describing the possible flow paths and indications of an Interfacing System LOCA involving the RCS and ECCS.
B. Explaining how a loss of inventory and possibly core uncovery could occur during Mid-Loop SDC operations.
C. Recognizing the effect of a loss of CCW on the Safety Injection System including SDC.

Bank Question: 1071.1CE ***Answer: D***

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions:

0200 The Unit 1 CCW "N" header ruptured.
0203 The following annunciators occur simultaneously:
- S-6 (*CCW SURGE TANK LEVEL HIGH /COMPARTMENT A LEVEL LOW*)
- S-16 (*CCW Surge Tank Compartment B Level Low*)

If the annuciators are functioning properly at the correct setpoints, which one of the following sequences correctly lists:
1. The expected annunciator response and
2. The required operator actions?

A. 1. S-6 and S-16 clear
2. Close: HCV-14A (1A CCW HDR SUPPLY TO THE N HDR)
HCV-14-9 (1N HDR RETURN TO THE 1A CCW HDR)
HCV-14-8B (1B CCW HDR SUPPLY TO THE N HDR)
HCV-14-10 (N HDR RETURN TO THE 1B CCW HDR)

B. 1. S-6 and S-16 clear
2. Close: HCV-14A and HCV-14-8B

C. 1. S-6 and S-16 – remain locked in
2. Close: HCV-14A and HCV-14-8B

D. 1. S-6 and S-16 – remain locked in
2. Close: HCV-14A, HCV-14-9, HCV-14-8B, and HCV-14-10

Distracter Analysis:

A. **Incorrect**: The S-6/16 alarms do not cause the affected (both) essential headers to isolate on Unit 1. Operator action is required to isolate the N Header for a leak. Both alarms will clear on the nonessential header after it is isolated when the surge tank refills.
Plausible: This is the correct sequence on Unit 2 where the alarms cause the N header to isolate.

B. **Incorrect**: The S-6/16 alarms do not cause the affected (both) essential headers to isolate on Unit 1.
Plausible: Partially correct - the N header supply valves must be manually closed. Plausible if the candidate thinks that the return header valves auto-close.

C. **Incorrect**: The S-6/16 alarms do not cause the affected (both) essential headers to isolate on Unit 1.
Plausible: Partially correct – the alarms do not clear. If the candidate confuses the units and thinks that only the header supply valves auto-close on low surge tank level.

D. **Correct**: The A and B surge tank levels will refill and the alarms will clear only after the operator takes manual action to isolate the N Header from the A and B essential headers.

Level: RO Exam

KA: APE 025G2.4.50(3.3/3.3)

Lesson Plan Objective: 0702209-8

Source: New

Level of knowledge: comprehension

References:
1. 0711209 page 8-9, 42
2. 1-ARP-01-S-6 and S-16
3. ONP-1-0310030 pages 6, 12-13

APE 000026G2.4.50(3.3/3.3) Loss of Component Cooling Water - Ability to verify system alarm setpoints and operate controls identified in the alarm response manual. (CFR: 45.3) RO 3.3 SRO 3.3

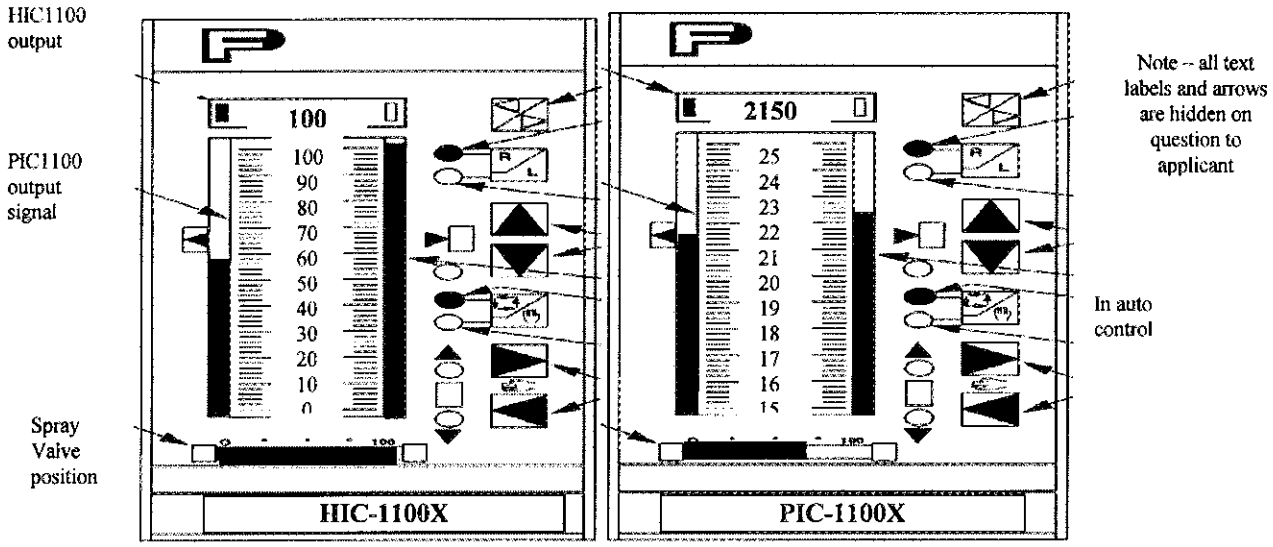
Objective 0702209-8: Describe the operation of CCW during normal, off-normal and emergency conditions including:

A. Loss of Offsite Power (LOOP).
B. CCW Surge Tank Low Level.
C. CCW Surge Tank High Level
D. CCW Radiation Monitor High Alarm.
E. Loss of CCW Heat Exchanger.
F. High motor bearing temperature on CCW pump.
G. Loss of A or B CCW pump.
H. Rupture of the CCW "N" Header.
I. Loss of Shutdown Cooling Heat Exchanger.

Bank Question: 1072.1CE ***Answer: A***

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- Proportional heaters are off
- X channel is selected for control
- PIC-1100X is selected for pressure control in automatic and indicates as displayed below
- HIC-1100 is selected for automatic control and indicates as displayed below



Which one of the following statements is correct regarding the status of the pressurizer pressure control system?

A. The spray valve is not properly controlling in automatic – the spray valve is 100% open.

B. The spray valve is not properly controlling in automatic – the spray valve is 58% open.

C. The spray valve is not properly controlling in automatic – the spray valve is 0% open.

D. The spray valve is controlling pressure correctly in automatic at 75% open.

Distracter Analysis:

A. **Correct**: The spray valve will be open 100% when the demand signal on HIC-1100 = 100% (bottom horizontal display).

B. **Incorrect**: The spray valve should be controlling pressure at 100% open.
Plausible: The spray valve on Unit 1 will control pressure at 50% when PIC-1100 reads +75%.

C. **Incorrect**: The spray valve should be controlling pressure at 100% open.
Plausible: If the candidate confuses the spray valve and proportional heater control settings – the proportional controller will control at 0%when PIC=1100 = 75%

D. **Incorrect**: The spray valve should be controlling pressure at 100% open.
Plausible: If the candidate equates the PIC-1100 output to the spray valve setting.

Level: RO Exam

KA: APE 027AK2.03(2.6/2.8)

Lesson Plan Objective: 0702206-6

Source: New

Level of knowledge: comprehension

References:
1. 0711206 pages 45-46, 117

APE 027AK2.03(2.6/2.8) Pressurizer Pressure Control System Malfunction - Knowledge of the interrelations between the Pressurizer Pressure Control Malfunctions and the following: AK2.03 Controllers and positioners 2.6 2.8 (CFR 41.7 / 45.7)

Objective 0702206-6: Describe the automatic functions for the PPLCS components, including trips, interlocks, control features, and setpoints:

a. Proportional and Backup Heaters *
b. Main and Auxiliary Sprays *
c. Power Operated Relief Valves (PORVs) *
d. Letdown Flow Control Valves *
e. Backup Charging Pumps *
f. Code Safety Valves *
g. Low Range Pressure Instrumentation Channels *
h. Pressurizer Level Channels *

Bank Question: 1073CE Answer: B

1 Pt(s) Unit 1 was operating at 100% when an electrical transient occurred. Given the following events and conditions:

- 4 Reactor Trip Breakers opened.
- The Reactor has not tripped.

Which one of the following components has deenergized and caused this transient?

A. A CEA MG Set

B. A 120VAC Instrument Bus

C. An RPS "K" relay

D. A 120VDC bus

Distracter Analysis:

A. **Incorrect**: The CEA MG sets are operated in parallel. If one CEA MG deenergized, the other MG set would carry the loads.
Plausible: If the candidate MG sets are not in running parallel, may think that think that one MG set power 4 TCBs.

B. **Correct**:

C. **Incorrect**: A single RPS "K" relay will cause 2 TCBs to open, not 4 TCBs.
Plausible: Two K relays deenergizing will cause this condition

D. **Incorrect**: The loss of a 120VDC instrument bus will cause a reactor trip – because 2 - 120 VAC instrument busses will be deenergized.
Plausible: If the candidate confuses the 120 VAC instrument bus and the 120 VDC instrument bus.

Level: RO Exam

KA: EPE 029EK2.06(2.9*/3.1)

Lesson Plan Objective:0702404-7

Source: Bank #1896

Level of knowledge: comprehension

References:
1. NOP 2-0970030 page 4
2. 0711404 pages 38
3. 0711405 page 35

EPE 000029EK2.06(2.9*/3.1) Anticipated Transient w/o Scram - Knowledge of the interrelations between the and the following an ATWS: EK2.06 Breakers, relays, and disconnects 2.9* 3.1* (CFR 41.7 / 45.7)

Objective 0702404-7: Determine the Reactor Protection System response to each of the following:

A. Failed power supplies.
B. Failed RPS components.
C. Failed instrument busses.
D. Failed channel inputs.

Bank Question: 1074CE Answer: B

1 Pt(s) Unit 2 is responding to a steam generator tube rupture on the 2B steam generator. Given the following events and conditions:

- The reactor was tripped at 0145.
- The RCPs were tripped.
- The pressurizer is empty.
- The QSPDS subcooling display is not available.

Which one of the following sets of parameters indicates natural circulation cooldown is occurring in the 2A steam generator within all procedural requirements at 0215?

	Time	0200	0205	0210	0215
A.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**557**	**555**	**553**	**551**
	Loop A T-hot (°F)	**558**	**556**	**554**	**552**
	Loop A T-cold (°F)	**518**	**510**	**502**	**495**
B.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**557**	**555**	**553**	**551**
	Loop A T-hot (°F)	**558**	**556**	**554**	**552**
	Loop A T-cold (°F)	**518**	**516**	**514**	**512**
C.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**569**	**568**	**567**	**564**
	Loop A T-hot (°F)	**568**	**567**	**566**	**565**
	Loop A T-cold (°F)	**518**	**526**	**524**	**522**
D.	**Pressurizer pressure (psig)**	**1310**	**1205**	**1195**	**1180**
	Pressurizer temperature (°F)	**580**	**578**	**576**	**574**
	Representative CET (°F)	**557**	**565**	**573**	**581**
	Loop A T-hot (°F)	**558**	**556**	**554**	**552**
	Loop A T-cold (°F)	**518**	**516**	**514**	**512**

Distracter Analysis: The following conditions support natural circulation:

- Loop $\Delta T < 50$ °F
- T-hot stable or decreasing

- T-cold stable or decreasing
- No abnormal differences between T-hot and Rep CET temp (abnormalities are defined as > 20 °F difference in 2-EOP-03 but not in 2-EOP-04)
- NC subcooling > 20 °F (use difference between PZR water temp and T-hot when QSPDS is not available).

A. **Incorrect**: Exceeds the 50 °F loop ΔT limit.
Plausible: Meets all other requirements.

B. **Correct:** This shows indication of natural circulation flow occurring - decreasing S/G pressure, T-cold at S/G saturation conditions and decreasing, T-hot decreasing.

C. **Incorrect**: Subcooling has been lost - > 20°F between T-hot and Pzr water temp.
Plausible: Meets all other requirements.

D. **Incorrect**: Rep CET temp and T-hot is abnormal – Rep CET is increasing while T-hot is decreasing.
Plausible: Meets all other requirements.

Level: RO Exam

KA: EPE 038EA2.09(4.2/4.2)

Lesson Plan Objective: 0702824-3

Source: MOD PSHA #602

Level of knowledge: comprehension

References:
1. 2-EOP-04 page 19
2. ONP 2-0120039 page 5
3. CEN-152 pages B6-6, 7, 47

000038 Steam Generator Tube Rupture - Ability to determine or interpret the following as they apply to a SGTR: EA2.09 Existence of natural circulation, using plant parameters. 4.2 4.2 (CFR 43.5 / 45.13)

Objective 0702824-3: State the Reactor Coolant System and Steam Generator conditions necessary to establish and maintain single-phase natural circulation and state the parameters that are monitored to verify its effectiveness.

Bank Question: 1076CE ***Answer: B***

1 Pt(s) Unit 2 was operating at 100% power when a reactor trip occurred and AFAS actuated at 0200. Given the following events and conditions:

Time	0201	0202	0204	0208
Parameter				
A/B S/G levels	19%	22%	25%	29%
AFW isolation valve position	stroking open	open	open	shut

What is the earliest time that the operators should have manually throttled the Unit 2 AFW header isolation valves and what is the reason for the action at this time?

A. 0202 – to prevent AFW pump run out

B. 0202 – to prevent overcooling the RCS

C. 0208 – to prevent overcooling the RCS

D. 0208 – to prevent AFW pump run out

Distracter Analysis: 210 seconds = 3.5 minutes
The reason to throttle AFW flow at this time is to prevent RCS overcooling.

A. **Incorrect**: The reason to manually throttle AFW is to prevent RCS overcooling.
Plausible: Partially correct – the valves can be throttled at 0202. If candidates think that the reason for manually throttling the valves is to prevent AFW pump run out.

B. **Correct**: AFW isolation valves are now fully open. The reason to manually throttle AFW is to prevent RCS overcooling.

C. **Incorrect**: can throttle valves at 0202 – not the earliest time.
Plausible: Partially correct –the reason to manually throttle AFW is to prevent RCS overcooling. Plausible if candidate believes that the 210-second timer (3.5 minutes) must elapse before valves can be manually throttled.

D. **Incorrect**: can throttle valves at 0202. The reason to manually throttle AFW is to prevent RCS overcooling.
Plausible: If candidate believes AFW must reach the reset point in order to manually throttle the AFW isolation valves and does not know the reason for taking this action.

Level: RO Exam

KA: APE 054AK3.02(3.4*/3.7*)

Lesson Plan Objective: 0702412-8

Source: Mod #667

Level of knowledge: comprehension

References:
1. 0711412 pages 47, 50-51

APE 000054AK3.02(3.4*/3.7*) Loss of Main Feedwater - Knowledge of the reasons for the following responses as they apply to the Loss of Main Feedwater (MFW): AK3.02 Matching of feedwater and steam flows 3.4* 3.7* (CFR 41.5,41.10 / 45.6 / 45.13)

Objective 0702412-8: Describe the operator control manipulations of the AFAS to:

A. Manually actuate [or initiate] AFAS to feed either SG, including unit differences.
B. Reset AFAS following an actuation.
C. Place an AFAS channel in BYPASS.
D. Place an AFAS channel in TRIP.

Bank Question: 1077.2CE ***Answer: C***

1 Pt(s) Unit 1 was operating at 100% power when a station blackout occurred at 2300. Given the following events and conditions:

- The emergency battery is supplying DC busloads
- The DC bus loads are constant

Which one of the following selections correctly characterizes the battery's discharge parameters as the battery reaches exhaustion?

A. Discharge current will decrease. Individual cell specific gravity decreases to ~1.0.

B. Discharge current will increase. Individual cell specific gravity increases to ~1.2.

C. Discharge current will increase. Individual cell specific gravity decreases to ~1.0.

D. Discharge current will decrease. Individual cell specific gravity increases to ~1.2.

Distracter Analysis:

A. **Incorrect**: The discharge rate increases not decreases as voltage drops and load remains constant.
Plausible: If the candidate thinks that voltage and current drop off together. Partially correct – specific gravity approaches 1.0.

B. **Incorrect**: Specific gravity is too high for battery exhaustion and does not increase with discharge.
Plausible: Partially correct - battery discharge current increases.

C. **Correct**: Discharge rate increases as volts decreases and load remains constant. Specific gravity decreases to ~1.0.

D. **Incorrect**: Voltage drops off and current increases. Specific gravity is too high for battery exhaustion and does not increase.
Plausible: If the candidate thinks current drops off.

Level: RO Exam

KA: EPE 055EA1.05(3.3/3.6)

Lesson Plan Objective: none

Source: MOD PSHA #906

Level of knowledge: comprehension

References:
1. 0711503 page 50
2. Tech Spec 3.8.2.1

EPE 055EA1.05(3.3/3.6) Station Blackout - Ability to operate and monitor the following as they apply to a Station Blackout: EA1.05 Battery, when approaching fully discharged 3.3 / 3.6

Objective: none

Bank Question: 1078CE ***Answer: D***

1 Pt(s) Unit 1 was recovering from a LOOP in 1-EOP-09 (LOSS OF OFFSITE POWER/LOSS OF FORCED CIRCULATION). Given the following events and conditions:

- 1A3 is energized from 1A diesel generator
- 1B3 is deenergized
- All CEAs are fully inserted
- T_{avg} is 532°F being maintained by ADVs

Which one of the following actions is necessary to permit exiting 1-EOP-09 to another approved procedure?

A. Cool down to less than 325°F.

B. Energize 1A3 from Unit 2 Startup Transformer.

C. Energize 1B3 from 1B emergency diesel generator.

D. Energize either 1A3 or 1B3 from Unit 1 Startup Transformer.

Distracter Analysis:

A. **Incorrect**: A cooldown is not required if exiting to an approved procedure.
Plausible: Cooling down would be required unless there was an approved procedure.

B. **Incorrect**: Must be energized from a unit 1 startup transformer
Plausible: If the candidate thinks that energizing both safety busses is required and does not understand the requirement to energize from an affected unit startup transformer.

C. **Incorrect**: Must be energized from a unit 1 startup transformer
Plausible: This would energize both safety busses from Unit 1 power sources.

D. **Correct**: Must have one safety bus reenergized from an offsite source.

Level: RO Exam

KA: APE 056G2.1.23(3.9/4.0)

Lesson Plan Objective: 070835-4

Source: Bank #1098

Level of knowledge: memory

References:
1. 2-EOP-09 page 5
2. 0711835 pages 11-12

APE 056 G2,1,23(3.9/4.0) Loss of Off-site Power - Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 45.2 / 45.6) RO 3.9 SRO 4.0

Objective 0702835-4: Given a LOOP event, EOP-09 (Loss of Offsite Power), and plant status; the student should be able to determine if the exit criteria, for the Loss of Offsite Power EOP, have been accomplished.

Bank Question: 1079.1CE ***Answer: D***

1 Pt(s) Unit 2 was operating at 100% power when an "MA" 120 VAC instrument bus low voltage condition occurred.

The operators entered ONOP-1-09070030 (*120V INSTRUMENT AC SYSTEM (CLASS 1E)/QSPDS*). Step 3 (partial) of this procedure states:

> *3. If instrument bus voltage from inverter is degraded, Then:*
> *A. Verify the other three instrument buses are energized.*
> *B. Open the affected inverter output breaker (CB-2).*
> *C. Open the affected inverter 125V DC Bus input breaker (CB-1).*

Why is it necessary to perform this step?

A. To prepare to energize the MA bus from the MC bus.

B. To prevent blowing the DC input fuses on the A battery.

C. To ensure that the MA bus remains deenergized until repairs have been completed.

D. To prepare to energize the MA bus from its alternate source.

Distracter Analysis:

A. **Incorrect**: The MA bus cannot be reenergized from the MC bus.
Plausible: If the candidate is not aware of train separation requirements in mode 1. In the vital DC system, the C DC bus can be used to reenergize the A DC bus via the AB bus in emergency conditions or when in mode 6.

B. **Incorrect**: The DC input fuses are not affected by this step.
Plausible: This is a caution in OP for this system – but for a different problem.

C. **Incorrect**: The completion of the ONOP will attempt to reenergize the MA bus from the alternate source
Plausible: if the candidate is not aware of the alternate source provisions.

D. **Correct**: Step 3 a-c prepares the deenergized bus to be loaded for its alternate source.

Level: RO Exam

KA: APE 057AK3.01(4.1/4.4)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. OP 2-0970020 page 9
2. 07111503 pages 26, 30, 42
3. ONOP 2-0970030 pages 4-6

APE 057AK3.01(4.1/4.4) Loss of Vital Ac Elec. Inst. Bus - Knowledge of the reasons for the following responses as they apply to the Loss of Vital AC Instrument Bus: AK3.01 Actions contained in EOP for loss of vital ac electrical instrument bus 4.1 / 4.4

Objective none:

Bank Question: 1080CE Answer: D

1 Pt(s) Unit 1 was operating at 100% power when several A-side AC electrical failures occurred and the operator entered ONP 1-0910054 (*Loss of a Safety Related AC Bus*). Given the following events and conditions:

- The 1A DC bus has no battery chargers available to supply the bus.
- The 1AB 480V load center is de-energized and unable to be restored.
- The 1C DC bus has a ground fault that is in the process of being isolated.
- The following annunciators have alarmed:
  - *A-50 125V DC BUS 1AB BATT CHGR TROUBLE*
  - *B-20 125V DC BUS / 1A BATT CHGR/BATT RM FAN TROUBLE*
  - *B-30 125V DC BUS 1A UNDERVOLTAGE/MAIN BATTERY BREAKER*
- 1A DC bus voltage = 20 volts

Which one of the following alignments correctly describes how to re-power the 1A DC bus?

A. Tie the 1A DC bus directly to the 1B DC bus

B. Tie the 1D DC bus directly to the 1A DC bus

C. Tie the 1C DC bus to the 1AB DC bus and tie the 1AB DC bus to the 1A DC bus

D. Tie the 1D DC bus to 1AB DC bus and tie the 1AB DC bus to the 1A DC bus

---

Distracter Analysis:

A. **Incorrect**: It is not physically possible to tie the 1A DC bus to the 1B DC bus due to interlocks.
Plausible: If the candidate does not recall the interlocks, the buses are both physically connected to the 1AB DC bus.

B. **Incorrect**: Not physically possible – there is no direct connection between these buses.
Plausible: If the candidate does not recall the system alignment.

C. **Incorrect**: The 1C DC bus has a ground fault – do not tie a bus with a low ground to the 1A DC bus – the 1 A DC bus will now be grounded.
Plausible: If the candidate does not understand the impact of a ground fault.

D. **Correct**:

Level: RO Exam

KA: APE 058AK2.02(3.3*/3.6)

Lesson Plan Objective: 0702829-13, 14

Source: Mod #2161

Level of knowledge: comprehension

References:
1. 0711503 pages 57, 58

APE 058AK2.02(3.3*/3.6) Loss of DC Power - Ability to determine and interpret the following as they apply to the Loss of DC Power: AA2.02 125V dc bus voltage, low/critical low, alarm. 3.3* / 3.6

Objective 0702829-13, 14:

13: Given a Off-Normal system condition; describe the basic content and sequence of procedural steps applicable to the Off-Normal Condition by stating:

* Off-normal conditions addressed in procedure
* Overall strategy to restore system to normal plant conditions
* Basis behind selected Cautions and Notes

14. Given a Off-Normal system condition; use appendices, tables, figures, or other ONP attachments to answer system related questions.

Bank Question: 1081CE ***Answer: A***

1 Pt(s) Unit 1 is at 100% power. Given the following events and conditions:

- Intake cooling water flow through the component cooling water (CCW) Heat Exchanger (HX) = 17,000 gpm.
- TCV-14-4A (1A CCW HX temperature control valve) is 75% OPEN
- Instrument air to TCV-14-4A is inadvertently isolated.

Which one of the following correctly describes the response of the CCW system?

A. **1A CCW HX outlet temperature decreases because TCV-14-4A drifts fully open.**

B. **1A CCW HX outlet temperature increases because TCV-14-4A drifts fully open.**

C. **1A CCW HX outlet temperature remains constant because TCV-14-4A movement is restricted by a mechanical stop to limit system flow rate.**

D. **1A CCW HX outlet temperature remains constant because the TCV-14-4A actuator travel is pneumatically limited to restrict system flow rate.**

Distracter Analysis: Note the Unit 2 system flow rate max limit is 19,000 gpm. The Unit 1 systems flow rate is 17,000 gpm. However, the operators must manually prevent CCW flow from exceeding the system limit. There is no design feature to prevent exceeding this flow maximum value.

A. **Correct**: TCV-14-4A fails open on a loss of IA pressure leading to full flow through the HX. Temperature decreases.

B. **Incorrect**: temperature decreases not increases.
Plausible: If candidate reverses the logic for the valve failure.

C. **Incorrect**: There is no mechanical stop to limit the valve travel in the open direction.
Plausible: The valve has a mechanical stop to prevent fully closing.

D. **Incorrect**: There is no electrical interlock on this valve. The system flow rates are limited to 17,000 gpm by manual control action.
Plausible: There is also a pneumatic limiter – but it prevents a low flow condition not a high flow condition.

Level: RO Exam

KA: APE 062AA1.06(2.9/2.9)

Lesson Plan Objective: none

Source: NRC exam 2000 #1898

Level of knowledge: comprehension

References:
1. 0704201 pages 27-28, 30, 34
2. 0711209 page 14

APE 062AA1.06(2.9/2.9) Loss of Nuclear Service Water - Ability to operate and / or monitor the following as they apply to the Loss of Nuclear Service Water (SWS): AA1.06 Control of flow rates to components cooled by the SWS 2.9 / 2.9

Objective 0704201-8: State the controls available to the Control Room operator for operation of the ICW System.

Bank Question: 1082CE ***Answer: B***

1 Pt(s) Unit 1 was shutdown to Mode 6 for an outage. Given the following events and conditions:

- The Instrument Air pressure was dropping to 105 psig.
- The Instrument Air and Service Air systems were not cross-connected.
- The IA compressors were running 100% of the time.
- The Shift Manager is concerned that heavy IA usage may further reduce the pressure and cause a loss of instrument air.

If the all of the following activities are presently in progress, which action would reduce the air demand on the system and prevent a loss of instrument air?

A. **Secure operating the main turbine backup lube oil vapor extractor.**

B. **Secure cycling the feedwater regulating valves for testing.**

C. **Secure the use of all pneumatic tools in the reactor auxiliary building.**

D. **Secure drawing vacuum in the condensers using the hotwell eductors.**

Distracter Analysis:

A. **Incorrect**: IA does not supply air to the backup lube oil vapor extractors – the supply comes from service air.
Plausible: If the candidate confuses the loads between service air and IA. The LO vapor extractors are an important load because they ensure lube oil flow to the main turbine bearings. They are so important that they have installed temporary air compressors during an outage to ensure lube oil flow,

B. **Correct**: Feedwater regulating valves are controlled by instrument air.

C. **Incorrect**: IA does not supply air to pneumatic tools – supply comes from service air. Pneumatic tools are often large loads on the service air system during outages.
Plausible: The reactor auxiliary building has many nuclear grade systems – may think that IA supplies the air fittings in this building. This has been an old problem in some plants when maintenance workers have used instrument air for service tools.

D. **Incorrect**: IA does not supply air to the hotwell eductors – the supply comes from service air
Plausible: Drawing a vacuum is an important activity – may think the hotwell eductors come from IA.

Level: RO Exam

KA: APE 065AA1.02(2.6/2.8)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. 0711413 pages 10-11, 50-52, 96
2, 0711301 page 37
3. 1-NOP-17.01

APE 065AA1.02(2.6/2.8) Loss of Instrument Air - Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: AA1.02 Components served by instrument air to minimize drain on system. 2.6 / 2.8 (CFR 41.7 / 45.5 / 45.6)

Objective none:

Bank Question: 1084.1CE ***Answer: B***

1 Pt(s) Unit 1 is at 100% power. Given the following events and conditions:

- The backup charging pumps start
- All pressurizer heaters turn off
- Pressurizer level High/Low alarm annunciates
- Letdown decreases to minimum flow
- Actual pressurizer level is 67% and continues to increase

What instrument has failed and what actions are required to restore pressurizer level?

A. **The selected pressurizer level channel failed high –shift to the operable level control channel on the low level cutout switch, reset and close the 480v heaters and verify the backup charging pumps stop.**

B. **The selected pressurizer level channel failed low – shift to the operable level control channel on the low level cutout switch, reset and close the 480v heaters and verify the backup charging pumps stop.**

C. **The non-selected pressurizer level channel failed high – manually stop the backup charging pumps.**

D. **The non-selected pressurizer level channel failed low - select LEVEL on the backup interlock bypass key switch and manually stop the backup charging pumps.**

Distracter Analysis:

A. **Incorrect**: The pressurizer level control channel failed low not high.
Plausible: Partially correct – the operator actions as correct for a failed low pzr level instrument. This change was directed by the NRC.

B. **Correct**: The selected pressurizer level channel failed low – operator actions are proper for this case.

C. **Incorrect**: If the non-selected pressurizer level channel failed high, the actual pressurizer level would not change.
Plausible: Partially correct - Manually stopping the backup charging pumps would decrease pressurizer level.

D. **Incorrect**: If the non-selected pressurizer level channel failed low, pressurizer pressure would decrease but level would stay constant.

Plausible: Manually stopping the backup charging pumps will decrease Pzr level. Selecting level on the backup interlock bypass key switch will defeat the backup stop signal to the backup charging pump on Unit 2.

Level: RO Exam

KA: APE 028AA1.07(3.3/3.3)

Lesson Plan Objective: 0702206-11

Source: Mod #2111

Level of knowledge: comprehension

References:
1. 0711206 pages 48-56, 76-77

APE 028AA1.07(3.3/3.3) Pressurizer Level Malfunction - Ability to operate and / or monitor the following as they apply to the Pressurizer Level Control Malfunctions: AA1.07 Charging pumps maintenance of PZR level (including manual backup) 3.3 /3.3 (CFR 41.7 / 45.5 / 45.6)

Objective 0702206-11: Predict the effects on the PPLCS of a Pressurizer level or pressure control channel failing high or low.

Bank Question: 1085CE Answer: C

1 Pt(s) Unit 1 was operating at 100% power. Given the following events and conditions:

- The condenser air ejector monitor (channel 35) was out of service.
- A spurious reactor trip occurred and caused a steam generator tube rupture.
- SIAS actuates
- The operators completed 1-EOP-01 (*Standard Post Trip Actions*) and are completing steps in 1-EOP-04 (*Steam Generator Tube Rupture*).

Which one of the following methods will provide the most sensitive indication of the activity in the ruptured steam generator 20 minutes after the reactor trip occurred?

A. The main steam line monitors will provide continuous real time indication of activity in the S/Gs.

B. The steam generator blowdown monitors will provide continuous real time indication of activity in the S/Gs.

C. The steam generator blowdown monitors after restoring flow through the sample line but not reinitiating blowdown flow.

D. The steam generator blowdown monitors after restoring blowdown flow to the discharge canal.

Distracter Analysis: Unit 1 and Unit 2 have different blowdown monitor configurations. Unit channels 44 and 45 tap off upstream of the blowdown isolation valves. They will trip on high activity but flow can be manually restored without reinitiating blowdown flow. On Unit 2, the blowdown monitors are in the blowdown line and cannot be used without having blowdown flow. CIS causes the blowdown monitor to isolate – CIS is actuated by SIAS.

A. **Incorrect**: N^{16} has a short γ decay half-life. There will be no N^{16} measurable source term a few minutes after the reactor trip. The MSIV from the affected S/G will also be closed and no steam from that generator will pass by the MSL monitor.
Plausible: The main steam line radiation monitors are sensitive to activity from a SGTR prior to the reactor trip.

B. **Incorrect**: The Unit 1 S/G blowdown monitors will isolate on high activity or on CIS – they will not continuously provide indication of S/G activity.
Plausible: If the candidate does not understand the high activity trip isolation – thinks it only alarms. If the candidate does not recognize that SIAS causes CIS.

C. **Correct**: Unit 1 S/G blowdown monitors will isolate – but can be manually reinitiated without restarting blowdown flow.

D. **Incorrect**: Restoring blowdown flow alone will not resume flow through the Unit 1 S/G blowdown monitors. Would not restore blowdown flow to the discharge canal if the S/G had a tube rupture.
Plausible: This would restore S/G activity monitoring for Unit 2.

Level: RO Exam

KA: APE 037AA2.08(2.8/3.3)

Lesson Plan Objective: 0702411-7

Source: MOD PSHA 605.1

Level of knowledge: comprehension

References:
1. 0711410 pages 24-26, 68
2. 0711411 pages 17, 21, 25, 39, 57
3. CEN 152 bases pages B6-1-2

APE 037AA2.08(2.8/3.3) Steam Generator Tube Leak - Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: AA2.08 Failure of Condensate air ejector exhaust monitor 2.8 / 3.3 (CFR: 43.5 / 45.13)

Objective 0702410-07: Evaluate how the following different plant conditions effect Unit 1 Radiation Monitoring System response:

A. Primary-to-Secondary leaks.
B. Primary-to-Atmosphere leaks.
C. Primary-to-CCW leaks.
D. LOCAs
E. High fission product activity.

Bank Question: 1086CE Answer: A

1 Pt(s) Unit 2 is in Mode 3 performing a reactor startup. Given the following events and conditions:

- SBCS is in auto maintaining T_{ave} = 532 °F.
- Steam pressure regulator PCV 12-29 (to the SJAE) fails closed.
- Condenser vacuum rises to 15 inches Hg (abs) before the regulator can be manually bypassed.

Which one of the following statements describes how the SBCS controls RCS T_{ave}?

A. SBCS can maintain RCS temperature in automatic, only after condenser vacuum has been reduced below 12 inches Hg (abs) to prevent damage to the turbine and condenser.

B. SBCS can maintain RCS temperature in automatic only after condenser vacuum has been reduced to 5 inches Hg (abs) to prevent damage to the turbine and condenser.

C. SBCS can control RCS temperature manually only after depressing the *Emergency off/Vacuum interlock* pushbutton to prevent an inadvertent cooldown of the RCS.

D. SBCS can control RCS temperature only after the *permissive* switch is placed in *manual* and the *Emergency off/Vacuum interlock* pushbutton depressed to regain control of SBCS to prevent an inadvertent cooldown of the RCS.

Distracter Analysis:

A. **Correct**: Auto is maintained because the system will reset to auto if all M/A station are in auto. The purpose of this interlock (minimum of 12 inches Hg before SBCS can again be placed in auto) is to protect the turbine and condenser.

B. **Incorrect**: The setpoint for the SBCS operation is 12 inches of Hg, not 5 inches.
Plausible: Partially correct - If the candidate confuses interlock setpoint with the normal vacuum requirement for a turbine manual trip (above 30% power). The reason is correct.

C. **Incorrect**: Auto is available even without the interlock pushbutton depressed. The reason for the vacuum interlock has nothing to do with inadvertent RCS cooldown.

Plausible: If any M/A stations had been in manual, then the Emergency off/vacuum interlock pushbutton would have to be pushed to reset the auto controllers.

D. **Incorrect**: The permissive switch does not need to be selected to manual. The reason for the vacuum interlock has nothing to do with inadvertent RCS cooldown – this is another interlock.
Plausible: If the permissive switch was in manual (not auto) then the Emergency off/Vacuum interlock pushbutton would have to be depressed to regain control of SBCS.

Level: RO Exam

KA: APE 051AK3.01(2.8*/3.1*)

Lesson Plan Objective: 0702406-5, 6

Source: Bank #1882

Level of knowledge: comprehension

References:
1. 0711406 pages 15-16, 32

APE 051AK3.01(2.8*/3.1*) Loss of Condenser Vacuum - Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: AK3.01 Loss of steam dump capability upon loss of condenser vacuum 2.8* / 3.1* (CFR 41.5,41.10 / 45.6 / 45.13)

Objective: 0702406-5, 6:
5: Evaluate the operation of the SBCS (including operating bands and setpoints) during normal, off-normal and emergency conditions by:

A. Describing how the SBCS automatically maintains primary temperature post-trip.
B. Describing how the SBCS automatically controls primary temperatures while power is increased in preparation for turbine roll.
C. Predicting the SBCS response to a reactor trip from 100% power.
D. Predicting the SBCS response to a load rejection event.

6: Analyze the signals (including bypasses and interlocks) which effect system operation by:

A. Discriminating between a valve permissive and a controller permissive.
B. Explaining how a valve permissive and a controller permissive function with the actuation signals to protect against a single failure causing actuation of the system.
C. Describing the condenser vacuum interlock.
D. Describing the Emergency Off interlock.

Bank Question: 1088CE Answer: B

1 Pt(s) Unit 2 was operating at 100% power when the 2A generator steam generator ruptured inside containment. Given the following events and conditions:

- The operators completed 2-EOP-01 (STPA) and transitioned to 2-EOP-05 (*Excess Steam Demand*)
- The operators are directed to maintain RCS pressure and temperature stable for 2 hours because the limits of Figure 1A has been exceeded.

What is the reason (as stated in CEN-152) for the requirement to stabilize RCS pressure and temperature under these conditions?

A. To protect the RCP seals from degrading due RCS pressure transients.

B. To prevent pressurized thermal shock from fracturing the reactor vessel.

C. To collapse any voids in the reactor vessel head prior to commencing the cooldown.

D. To prevent lowering RCS temperature from adding positive reactivity and causing a criticality accident.

Distracter Analysis:

A. **Incorrect**: Seal injection can be maintained through this event – the seals are never in jeopardy. Pressure fluctuations are a problem but they will not challenge the seals.
Plausible: This is a concern for an SBO, not an ESDE.

B. **Correct**: This is the EOP bases for this step stated in CEN-152.

C. **Incorrect**: A large ESDE can cause voids in the RCS. But this is not the reason for the soak time. Voids are collapsed by ECCS flow.
Plausible: If the candidate confuses the bases.

D. **Incorrect**: Adequate shutdown margin is constantly maintained in the RCS to prevent a recriticallity accident.
Plausible: Lowering RCS temperature causes positive reactivity and can cause recriticallity accidents unless the core has adequate shutdown margin from the boric acid concentration.

Level: RO Exam

KA: CE/A11 AK3.4 (3.1/3.3)

Lesson Plan Objective: none

Source: New

Level of knowledge: memory

References:
1. 2-EOP-05 step 16 pages 12-13
2. CEN-152 page B7-15, 32-34
3. 0711826 pages 9, 11-12, 19

CE/A11AK3.4 (3.1/3.3) RCS Overcooling - Knowledge of the reasons for the following responses as they apply to the (RCS Overcooling) - AK3.4 RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated. IMPORTANCE RO 3.1 SRO 3.3 (CFR: 41.5 / 41.10, 45.6, 45.13)

Objective 0702826-14: Describe the basis for operator actions included in all steps, notes, and cautions in the EOPs

Bank Question: 1089CE Answer: D

1 Pt(s) Unit 2 RCS unidentified leakage is currently 3.5 gpm and stable. Given the following events and conditions:

- Unit 2 was being shutdown in accordance with Tech Specs for a containment entry to locate the source of the leak.
- A Loss of Offsite Power (LOOP) occurred.
- FR-07-3 (REACTOR CAVITY LEAKAGE FLOW) indicates '0' flow.
- Annunciator N-46 (REACTOR CAVITY LEAKAGE HIGH) from LS-07-12 (RX CAVITY LEVEL) remained illuminated.

Assuming that the RCS leakage continues, which one of the following statements correctly describes why;
1. FR-07-3 shows 0 flow, and
2. Annunciator N-46 remains illuminated?

A. 1. The weir tank V-notch became blocked with debris.
2. LS-07-12 lost power.

B. 1. LS-07-12 lost power.
2. The weir tank V-notch became blocked with debris.

C. 1. The weir tank V-notch became blocked with debris.
2. LS-07-12 did NOT lose power.

D. 1. The instrument air supply to the level bubbler was depressurized.
2. LS-07-12 did NOT lose power.

Distracter Analysis:

A. **Incorrect**: A blockage of the weir tank V-notch will cause the tank level to increase – which will show a higher than accurate flow rate indication on both FR-07-3 (bubbler level) and LS-07-12 (float switch level). LS-07-12 does not lose power.
Plausible: The lesson plan discusses V-notch flow blockage as a potential cause for inaccuracy on the reactor cavity flow rate indicators. The flow indication is derived from a tank level with a known leakage rate through the V-notch - where a higher tank level means a higher flow rate. The indications are partially correct for a flow blockage condition – annunciator N46 (tank level) would remain illuminated but FR-07-03 would not show 0 flow.

B. **Incorrect**: FR-07-3 and LS-7-12 do not lose power during a LOOP.

Plausible: If the candidate thinks loss of power will cause both indications due to failure of the level and flow transmitters.

C. **Incorrect**: As discussed in "A" above, a blocked V-notch would cause a high flow rate – not a 0 flow rate. Both indicators would show abnormally high flow rates.
Plausible: Partially correct -- LS-7-12 does not lose power.

D. **Correct**: FR-07-3 requires instrument air to function. A loss of instrument air causes the flow indication to show 0 flow. LS-7-12 does not lose power and continues to indicate high tank level due to the leakage into the tank.

Level: RO Exam

KA: APE CE/A16 AK2.1 (3.2/3.5)

Lesson Plan Objective: 0702600-5

Source: MOD #2049

Level of knowledge: comprehension

References:
1. 0711600 pages 9-11

APE CE/A16 Excess RCS Leakage - Knowledge of the interrelations between the (Excess RCS Leakage) and the following: (CFR: 41.7 / 45.7) AK2.1 Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features. IMPORTANCE RO 3.2 SRO 3.5

Objective 0702600-5: Describe the plant instrumentation, including principles of operation, physical location, alarms (if applicable), and indications associated with each of the following:

A. Reactor cavity sump level.
B. Reactor cavity flow.
C. Containment sump level.
D. Seismic activity.
E. Containment temperature (narrow and wide range) .
F. Containment pressure (narrow and wide range).

Bank Question: 1090CE Answer: C

1 Pt(s) Unit 1 and Unit 2 were operating at 100% power. Given the following conditions and events:

- A loss of offsite power (LOOP) occurred on both units
- All diesel generators started properly and tied to their respective buses

Upon completion of standard post trip actions, which unit would have quicker control of natural circulation?

A. Unit 1, due to two ADV's air operated, capable of being controlled in auto or manual.

B. Unit 1, due to two ADV's, motor operated capable of being controlled manual only.

C. Unit 2, due to four ADV's motor operated capable of being controlled in auto or manual.

D. Unit 2, due to four ADV's air operated capable of being controlled in manual only.

Distracter Analysis:

A. **Incorrect**: Unit 1 has two air operated ADVs that can not be controlled from the control room until air is restored in Appendix H from 1-EOP-09.
Plausible: If the candidate confuses the capacity and function of the ADVs.

B. **Incorrect**: Unit 1 has air operated ADVs – not motor operated ADVs.
Plausible: Unit 2 ADVs are motor operated.

C. **Correct**:

D. **Incorrect**: Unit 2 has motor operated ADVs that will operate in auto or manual after the LOOP.
Plausible: If the candidate confuses the Unit capabilities.

Level: RO Exam

KA: APE CE/A13 AK1.1 (3.0/3.5)

Lesson Plan Objective: 0702304-7

Source: NRC exam 2002 #2127

Level of knowledge: memory

References:
1. 0711304 pages 8-16

APE CE/A13 AK1.1 (3.0/3.5) Natural Circ - Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Operations) AK1.1 Components, capacity, and function of emergency systems. IMPORTANCE RO 3.0 SRO 3.5(CFR: 41.8 / 41.10 / 45.3)

Objective 0702304-7: Describe the operation of the Unit 1 and Unit 2 ADVs and their controllers (as applicable), given any of the following:

A. Loss of power to the ADVs
B. Loss of power to the controllers
C. Loss of Instrument Air
D. The ADV failed open

Bank Question: 1091CE Answer: C

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- The reactor spuriously tripped from 100% power.
- The operators entered 2-EOP-01 (*SPTA*)
- The Desk Operator is implementing 2-EOP-99 (*Appendices/Figures/Tables/Data Sheets*) Appendix X.

Which one of the following statements correctly describes when the startup channels will be energized?

A. Automatically energized when excore monitoring channel power decreases to 10^{-4}% power.

B. Automatically energized when the wide range log safety channel 10^{-3}% power bistable deenergizes.

C. Manually energized when wide range log safety channel is <1x10^{-5}% power.

D. Manually energized when the excore monitoring channel is <10,000 CPS.

Distracter Analysis:

A. **Incorrect**: The BF^3 detectors do not automatically energize – they must be manually energized.
Plausible: On Unit 1, the fission chambers shift from Campbelling mode to pulse counting mode automatically at 1x10-3%. The training material states that the BF3 detectors must be energized at 10-4%. The procedure (2-EOP-99) requires manually energizing the BF3 detectors on unit 2 is 1x10-5%.

B. **Incorrect**: Unit 2 has BF3 detectors, which must be manually energized at 1x10-4%.
Plausible: The unit 1 fission counters will automatically shift from Campbell counting to pulse counting at 10-3%.

C. **Correct**:

D. **Incorrect**: The excore monitoring channel is not used for this process.
Plausible: The BF3 detectors are automatically deenergized when source range counts exceed 10,000 CPS.

Level: RO Exam

KA: APE 032AA1.01(3.1*/3.4*)

Lesson Plan Objective: 0702403-11

Source: MOD #470

Level of knowledge: memory

References:
1. 0711403 pages 24, 29
2. 2-EOP-99 Appendix X section 2 page 117

APE 032AA1.01(3.1*/3.4*) Loss of Source Range NI - Ability to operate and / or monitor the following as they apply to the Loss of Source Range Nuclear Instrumentation: AA1.01 Manual restoration of power 3.1* 3.4* (CFR 41.7 / 45.5 / 45.6)

Objective 0702403-11: Identify the actuation power level and the function provided by each NI circuit bistable.

Bank Question: 1092CE ***Answer: A***

1 Pt(s) Unit 2 was conducting refueling operations. Given the following events and conditions:

- One startup channel neutron flux monitor fails low

Which one of the following statements correctly describes the action that must be taken?

A. Immediately suspend core alterations until the inoperable channel is returned to operable status.

B. Immediately suspend core alterations until boron sampling has been initiated every twelve hours.

C. Fuel reload may continue, provided boron samples are taken every twelve hours.

D. Fuel reload may continue, provided the inoperable channel is returned to operable status within one hour.

Distracter Analysis:

A. **Correct**:
B. **Incorrect**: Cannot resume until channel is restored.
Plausible: The sampling requirement is part of the TSAS.
C. **Incorrect**: Must suspend core alterations.
Plausible: The sampling requirement is part of the TSAS.
D. **Incorrect**: Must suspend core alterations.
Plausible: If candidate does not know this Tech Spec, this is a typical action statement for 1 of 2 channels out of service.

Level: RO Exam

KA: G2.1.11(3.0/3.8)

Lesson Plan Objective: 0702403-14

Source: Bank #476

Level of knowledge: memory

References:

1. Unit 2 Tech Spec 3.9.2

K/A G2.1.11(3.0/3.8): Knowledge of less than one-hour technical specification action statements for systems. (CFR: 43.2 / 45.13)

Objective 0702403-14: Given a list of available Nuclear Instrumentation, identify if the Technical Specifications LCO requirements are being challenged during the following evolutions:

A. Reactor start-up.
B. Refueling operations.
C. Mode 1 operation.

Bank Question: 1094CE ***Answer: B***

1 Pt(s) The results from the quarterly surveillance run of the 2B Containment Spray Pump indicates that the pump is operating in the Required Action Range based on discharge pressure higher than the limiting value. The Unit Supervisor should then:

A. Request an engineering evaluation of the problem and a recommendation for operability.

B. Declare the pump inoperable, enter it into the Equipment Out-of-Service Log, and initiate actions to determine the cause of the condition.

C. Double the frequency of the surveillance, initiate a Condition Report, and inform Operations Management about the problem.

D. Require the surveillance to be repeated as soon as possible to confirm that the previous test was accurate.

Distracter Analysis:

A. **Incorrect**: The pump must be declared inoperable.
Plausible: Some plants rely on engineering to evaluate the problem and recommend operability.

B. **Correct**:

C. **Incorrect**: The pump must be declared inoperable.
Plausible: This is an alert range action.

D. **Incorrect**: The pump must be declared inoperable.
Plausible: Could be desirable to avoid unnecessary equipment outage/repair.

Level: RO Exam

KA: G2.2.12 (3.0/3.4)

Lesson Plan Objective: 0902732-06

Source: Bank #1268

Level of knowledge: memory

References:
1. LP 0902732 page 9

K/A G2.2.12: Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)

Objective 0902732-06: Describe the required action if pump parameters, during surveillance testing, fall into the:

- Alert Range
- Required Action Range

Bank Question: 1095CE Answer: D

1 Pt(s) Which one of the following conditions will allow the Spent Fuel Pool Upender to be raised to the vertical position with the Spent Fuel Handling Machine in the Upender zone?

A. The carriage is in the middle of the transfer canal.

B. The hoist is unloaded and above the *Near Full Down* position.

C. The hoist is loaded and above the *Near Full Down* position.

D. The hoist is loaded and at the *Up-Limit* position.

Distracter Analysis:

A. **Incorrect**: If the carriage is traversing the refueling canal, neither upender will move. The carriage must be at either upender.
Plausible: The carriage in the middle of the canal will not present a hazard to the upender – especially if unloaded.

B. **Incorrect**: The hoist must be above the near down position if the hoist in unloaded.
Plausible: There is an interlock for interference in this condition.

C. **Incorrect**: If the hoist is loaded, the upender will not move unless it is in the Up-limit position.
Plausible: If the candidate reverses the interlock logic - loaded to not loaded.

D. **Correct**: This will allow the upender to move.

Level: RO Exam

KA: G2.2.28 (2.6/3.5)

Lesson Plan Objective: 0702208-06

Source: Bank #322

Level of knowledge: memory

References:
1. 0711208 pages 58-59
2. 0702208 page 31

K/A G2.2.28(2.6/3.5) : Knowledge of new and spent fuel movement procedures. (CFR: 43.7 / 45.13)

Objective 0702208-06: Describe the weighing systems and hoist vertical movement interlocks and operation associated with:

A. Refueling.
B. Spent Fuel Machine.
C. New Fuel Elevator.

Bank Question: 1096CE Answer: C

1 Pt(s) Unit 1 was operating at 90% power. Given the following events and conditions:

- CEA Reg Group 7 is at 105"
- T_{cold} = 548.2°F
- Axial Shape Index (ASI) is approaching the negative limit

Which one of the following statements correctly describes the actions that the operator must take to control ASI and T_{cold} parameters at this power?

A. Dilute for ASI and insert CEAs for RCS temperature

B. Borate for ASI and withdraw CEAs for RCS temperature

C. Insert CEAs for ASI and dilute for RCS temperature

D. Withdraw CEAs for ASI and borate for RCS temperature

Distracter Analysis:

A. **Incorrect**: Rods are used for ASI control.
Plausible: This is right actions for the wrong reasons.

B. **Incorrect**: Rods are used for ASI control.
Plausible: This is a psychometric distracter.

C. **Correct**:

D. **Incorrect**: Rods must be inserted.
Plausible: If the candidate reverses the ASI indication or controls.

Level: RO Exam

KA: G2.2.2 (4.0/3.5)

Lesson Plan Objective: 0702801-01

Source: Bank #1751

Level of knowledge: comprehension

References:
1. LP 0702801 page 4
2. 0-NOP-100.02 pages 10, 15-17
3. LP 0702402 page 32

K/A G2.2.2: Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels. (CFR: 45.2)

Objective 0702801-01: Explain the basis for the selected limits and precautions contained in the Normal Operating Procedures required to take the plant from 100% to Mode 6, and back to 100%.

Bank Question: 1097CE Answer: D

1 Pt(s) Unit 1 is shutdown to mode 6 in an outage.

How are
- Damper 25-5A (Refuel Canal supply to Containment Purge) and
- Damper 25-5B (Containment Ring Header supply to Containment Purge)

positioned when the PURGE/REFUEL selector switch is positioned?

		Selector Switch Position	
		Purge	***Refuel***
A.	**Damper 25-5A**	***Closed***	***Full Open***
	Damper 25-5B	***Full Open***	***Closed***
B.	**Damper 25-5A**	***Closed***	***Partially Open***
	Damper 25-5B	***Full Open***	***Partially Open***
C.	**Damper 25-5A**	***Partially Open***	***Full Open***
	Damper 25-5B	***Full Open***	***Closed***
D.	**Damper 25-5A**	***Closed***	***Full Open***
	Damper 25-5B	***Full Open***	***Partially Open***

Distracter Analysis:

A. **Incorrect**: 25-5B is Partially Open in Refuel.
Plausible: This is a credible lineup if the candidate does not know the system.

B. **Incorrect**: 25-5A is Full Open Refuel.
Plausible: This is a credible lineup if the candidate does not know the system.

C. **Incorrect**: 25-5A is closed in Purge, and 25-5B is Partially Open in Refuel.
Plausible: This is a credible lineup if the candidate does not know the system.

D. **Correct**:

Level: RO Exam

KA: G2.3.9 (2.5/3.4)

Lesson Plan Objective: 0702602-02

Source: Bank #849

Level of knowledge: memory

References:
1. 0711602 pages 8-9
2. 0702602 page 6

K/A G2.3.9: Knowledge of the process for performing a containment purge. (CFR: 43.4 / 45.10)

Objective 0702602-02: Purge/Refueling Switch Located on RTGB 106[HVAC]

a. Purge position - allows the system to take suction from the containment ring header. Dampers DPR-25-5B open and DPR-25-5A closed
b. Refueling position – allows the purge system to take suction from 40 air inlets just above the water level during refueling. Dampers DPR-25-5A open and DPR-25-5B partially open.

Bank Question: 1098CE ***Answer: B***

1 Pt(s) Unit 1 is in Mode 5 preparing to remove the reactor head.

- The Operators have been directed to swap operating shutdown cooling (SDC) loops from loop A to loop B using 1-NOP-03.05 (*Shutdown Cooling*).

Which one of the following statements correctly describes the required notification that must be performed prior to starting the 1A LPSI pump?

A. HP department must be notified due to the potential for contamination while venting the 1B LPSI pump.

B. HP department must be notified due to the potential for increased radiation levels around shutdown cooling components.

C. Chemistry department must be notified due to the potential for dilution of the reactor coolant system.

D. Chemistry department must be notified due to the potential for CCW leakage into the 1A SDC heat exchanger.

Distracter Analysis:

A. **Incorrect**: HP is notified due to increased radiation levels.
Plausible: Although HP monitors some venting activities, this not required for SDC swap over.

B. **Correct**: Swapping SDC loops will significantly change the radiation levels in the SDC components. HP must be notified whenever radiation levels are significantly changed.

C. **Incorrect**: HP is notified due to increased radiation levels.
Plausible: Although Chemistry samples SDC boron concentration, not on SDC swap over.

D. **Incorrect**: HP is notified due to increased radiation levels.
Plausible: Although Chemistry monitors for SDC heat exchanger leakage it is generally for primary to secondary leakage, and not for each SDC swap over.

Level: RO Exam

KA: G2.3.10 (2.9/3.3)

Lesson Plan Objective: 0702207-05B

Source: New

Level of knowledge: memory

References:
1. 1-NOP-03.05 pages 12, 33

K/A G2.3.10: Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure. (CFR: 43.4 / 45.10)

Objective 0702207-05B: Explaining the basic procedural steps involved in placing Unit 1 and Unit 2 on shutdown cooling.

Bank Question: 1099CE ***Answer: A***

1 Pt(s) An evacuation of the Owner Controlled Area shall be conducted for:

A. Events classified as a Site Area Emergency or higher

B. Tornadoes or waterspouts approaching the plant site

C. Local evacuation of the Fuel Handling Building due to a dropped fuel assembly

D. Any emergency declaration involving a release

Distracter Analysis:

A. **Correct**:

B. **Incorrect**: Sheltering would be the required action.
Plausible: These are significant events requiring emergency response.

C. **Incorrect**: A local evacuation of the FHB does not require evacuation of the owner-controlled area.
Plausible: If the candidates confuse a local evacuation with the site evacuation.

D. **Incorrect**: Site area emergency or higher.
Plausible: This level would require a local evacuation.

Level: RO Exam

KA: G2.4.29 (2.6/4.0)

Lesson Plan Objective: 0702833-10

Source: Bank #1136

Level of knowledge: memory

References:
1. EPIP 02 page 33

K/A G2.4.29: Knowledge of the emergency plan. (CFR: 43.5 / 45.11)

Objective 0702833-10: Describe the three conditions that warrant a owner controlled area evacuation as described in the criteria for and conduct of evacuation.

Bank Question: 1100CE ***Answer: A***

1 Pt(s) Unit 2 was starting up after a refueling outage. Given the following events and conditions:

- The letdown system is being placed in service in accordance with NOP-02.02 (*Charging and Letdown*)
- An operator incorrectly positions the isolation valve to the purification filter "B" during the initial valve lineup. The required valve position was "*open*" but the valve is actually *closed*. This error is unknown to the control room.
- The operators align CVCS valves in an attempt to establish letdown flow.

What actions will occur and what procedure are the control room operators required to enter?

A. **The letdown system relief valves V-2354 and/or V-2345 open to protect the low pressure letdown piping. Immediately isolate letdown in ONP-02.02 (*Charging and Letdown*)**

B. **V-2516 (CONTAINMENT ISOL VALVE - IC) automatically closes on high D/P across the regenerative HX to protect the low pressure letdown piping. Correct the valve misalignment and restore letdown in accordance with NOP-02.02.**

C. **V-2520 (ION EXCHANGER BYPASS VALVE) automatically opens on high pressure to divert letdown around the ion exchangers and coolant purification filter into the VCT. Correct the valve misalignment and restore letdown in accordance with NOP-02.02.**

D. **PCV-2201Q (PRESSURE CONTROL VALVE) automatically closes on high pressure to isolate the low pressure letdown piping. Immediately isolate letdown in ONP-02.03.**

Distracter Analysis: Note: on Unit 2, coolant purification filter "A" is normally isolated and bypassed. "A" is upstream of the ion exchangers. Coolant purification filter "B" is on line and downstream of the ion exchangers. These filters are in a series, not parallel alignment.

A. **Correct**: Both V-2354 and V-2345 are sized to permit 100% letdown flow to protect the downstream piping.

B. **Incorrect**: There will not be a high D/P condition across the letdown HX. Hi D/P only occurs when there is high flow.
Plausible: Partially correct - If there was a high D/P across the letdown HX – V-2516 would close.

C. **Incorrect**: V-2520 automatically diverts flow around the ion exchangers but not around the letdown purification filter "B".
Plausible: If the candidate does not know the system alignment.

D. **Incorrect**: PCV-2201Q has a delimiter stop that prevents the valve from closing all the way. The valve may be closed manually – but if this occurred, relief valve V-2345 would open to protect the letdown HX.
Plausible: If the candidate confuses the location of the letdown pressure control valves (PCV-2201P/Q) and the letdown level control valves (LCV-2110P/Q) which are located upstream of relief valve V2345.

Level: RO Exam

KA: SYS 004A2.24(2.8/2.8)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. 0711205 pages 8-16, 45-46, 71, 75
2. 2-NOP-02.02 page 7
3. 2-ONP-02.03 page 4

SYS 004A2.24(2.8/2.8) Chemical Volume Control - Ability to (a) predict the impacts of the following malfunctions or operations on the CVCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.24 Isolation of both letdown filters at one time: downstream relief lifts 2.8 2.8 (CFR: 41.5 / 43/5 / 45/3 / 45/5). [Note – this question was swapped from the SRO exam to the RO exam at the direction of the NRC Chief Examiner because it was considered inappropriate for testing at the SRO level. It was swapped with question 1041.1. The original K/A was not changed.]

Objective 0702205-9(?): Evaluate the effects of CVCS operations on the RCS and other plant parameters to the following:

A. Inadvertent boration
B. Inadvertent dilution
C. Increase or decrease of letdown temperature (e.g. - loss of CCW to letdown heat exchanger)

D. Shifting ion exchanger while divert valve lined up to VCT
E. Loss of Charging and Letdown
F. RCS crud burst
G. Failed fuel element
F. Inadvertent start of a charging pump while the RCS is solid

Bank Question: 1102CE Answer: C

1 Pt(s) Unit 1 is at 100% power with a normal electrical line-up. Given the following conditions related to intake cooling water (ICW):

- Annunciator E-30 (ICW HEADERS PRESS LOW) has just alarmed and locked in
- PIS-21-8A, ICW header 1A indicates 0 psig
- PIS-21-8B, ICW header 1B indicates 42 psig.
- 1A ICW Pump has tripped
- 1B ICW Pump is running
- 1C ICW Pump is in pull to lock
- One attempt to restart 1A ICW Pump was unsuccessful

Which one of the following actions should the control room operators perform next?

A. **– Verify the 1A ICW pump is aligned to the 1A ICW header per the ICW operating procedure.**
– Throttle the 1A ICW pump discharge valve 10 turns open.
– Start the 1A ICW Pump.

B. **– Have electrical maintenance reset any relays associated with the 1C ICW Pump breaker on the 1AB 4.16 KV bus.**
– Start the 1C ICW Pump.

C. **– Ensure the 1C ICW pump is aligned to the 1A ICW header per the ICW operating procedure.**
– Throttle the 1C ICW pump discharge valve 10 turns open.
– Start the 1C ICW Pump.

D. **– Have electrical maintenance reset any relays associated with the 1A ICW Pump breaker on the 1A3 4.16 KV bus.**
– Start the 1A ICW Pump.

Distracter Analysis:

A. **Incorrect**: The 1A ICW pump will be started next.
Plausible: The ICW Operating Procedure requires throttling the discharge valve before starting an ICW pump.

B. **Incorrect**: The 1A ICW pump must be aligned and the discharge valve throttled.
Plausible: This starts the right pump in the manner matched to answer D (psychometric balance).

C. **Correct**:

D. **Incorrect**: The 1A ICW pump will be started next.
Plausible: Resetting the relays could allow restart of the pump in certain instances.

Level: RO Exam

KA: G2.4.24 (3.3/3.7)

Lesson Plan Objective: 0702862-08

Source: Bank #1823

Level of knowledge: comprehension

References:
1. ONP 1-06400030 page 5
2. OP 1-06400020 page 23

K/A G2.4.24 (3.3/3.7): Knowledge of loss of cooling water procedures. (CFR: 41.10 / 45.13)

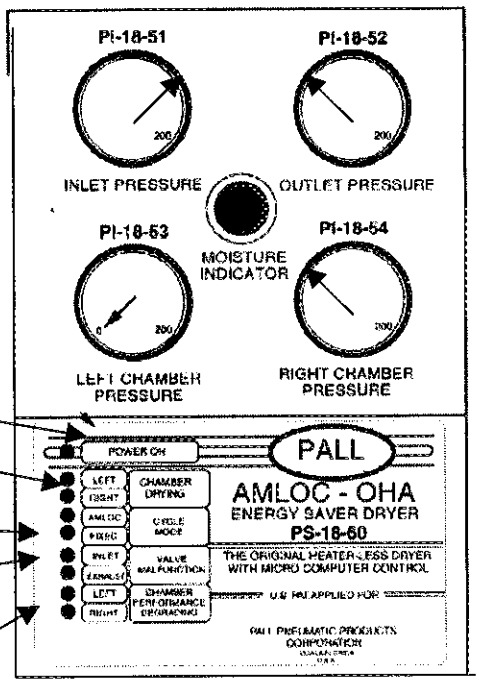
Objective 0702862-08: DESCRIBE the basic content and sequence of procedural steps applicable to the Off Normal Condition, addressed in the procedure, by stating the overall strategy to restore the system to normal plant conditions.

Bank Question: 1104CE ***Answer: C***

1 Pt(s)

Unit 1 was operating at 100% power when instrument air header pressure dropped to 85 psig.
Given the following indications on the Unit 1 instrument air dryer:

Inlet press = 120 psig
Outlet press = 85 psig
Left chamber press = 0 psig
Right chamber press = 85 psig



Power on – lit
Chamber drying:
Left – not lit
Right – lit
Cycle mode:
AMLOC – not lit
Fixed – lit
Valve malfunction
Inlet – lit
Exhaust – not lit
Chamber performance degrading
Left – lit
Right – lit

Which one of the following statements correctly describes the cause of the problem and the correct method to temporarily maintain instrument air pressure until the air dryer can be repaired?

A. The inlet valve on the right dryer chamber has failed closed. Shift to the left dryer chamber and repressurize the air header.

B. The exhaust valve on the right dryer chamber has failed closed. Shift to the left dryer chamber and repressurize the air header.

C. The inlet valve on the right dryer chamber has failed closed. Bypass around the air dryer and repressurize the air header.

D. The exhaust valve on the right dryer chamber has failed closed. Bypass around the air dryer and repressurize the air header.

Distracter Analysis:

A. **Incorrect**: The proper operator action is to bypass the dryer unit per 1-ONP-1010030. The dryer unit is computer controlled and there is no way to manually shift to the left chamber. In addition, the left chamber performance degrading indication is lit and the chamber is completely depressurized – which indicates a leak or failure.
Plausible: Partially correct. A failed closed inlet valve would cause chamber air pressure to drop to header pressure and all the other indications.

B. **Incorrect**: If the exhaust valve failed closed, the "exhaust" annunciator would be lit. Also, the dryer pressure would be at 120 psig inlet pressure.
Plausible: If the candidate reverses the logic between the inlet and outlet valve failure.

C. **Correct**:

D. **Incorrect**: A failed exhaust valve would show chamber pressure at 120 psig.
Plausible: Partially correct – bypassing dryer unit is the correct response. If the candidate does not understand the panel display and mixes up the unit 1 and unit 2 system alignments.

Level: RO Exam

KA: SYS 078G2.4.4(4.0/4.3)

Lesson Plan Objective: 0702413-2, 3

Source: New

Level of knowledge: comprehension

References:
1. 0711413 pages 23-24, 29-34, 40-46, 48, 96-97, 99-100, 104
2. ONP 1-1010030 pages 7-8

SYS 078G2.4.4(4.0/4.3) Instrument Air - G2.4.4 Ability to recognize abnormal indications for system operating parameters, which are entry-level conditions for emergency and abnormal operating procedures. (4.0/4.3) (CFR 41.10 / 43.2 / 45.6) [Note – this question was swapped (with question 1042) from the SRO exam to the RO exam at the direction of the NRC Chief Examiner because it was not considered appropriate for testing at the SRO level. The original K/A was not changed.]

Objective 0702413-2, 3:
2: Illustrate the flowpaths of the Plant Air system by:

A. Drawing a one line diagram of the Unit 1 or Unit 2 Instrument Air System. Include only the major components, piping, valves, and instrumentation associated with the supply of Instrument Air. Specifically, include the:

1) Air Compressors
2) Air receivers
3) Air dryers
4) Instrument Air After Filters

3: Describe the instrumentation, available in the control room, used to evaluate the Plant Air System status under normal, off-normal and emergency conditions.

Bank Question: 1107.1 ***Answer: A***

1 Pt(s) Unit 2 was operating at 100% power when a small break LOCA occurred. Given the following events and conditions:

- The leak was from the pressurizer surge line
- The hole size was 3 inches (effective diameter)
- All safety injection equipment operated as designed

Which one of the following statements correctly describes the status of pressurizer level and RCS pressure?

A. Pressurizer level will decrease until the pressurizer empties. RCS pressure will drop rapidly to ~1400 psia and decrease very slowly over subsequent 10 minute period.

B. Pressurizer level will decrease to until the pressurizer empties. RCS pressure will drop rapidly to ~200 psia and decrease very slowly over subsequent 10 minute period.

C. Pressurizer level will first decrease then increase and act erratically. RCS pressure will drop rapidly to ~1400 psia and decrease very slowly over subsequent 10 minute period.

D. Pressurizer level will first decrease then increase and act erratically. RCS pressure will drop rapidly to ~200 psia and decrease very slowly over subsequent 10 minute period.

Distracter Analysis:

A. Correct:

B. Incorrect: RCS pressure will decrease to approximately saturation pressure for the existing RCS temperature – around 1400 psia.
Plausible: Partially correct - the pressurizer will empty. RCS pressure of 200 psia is the shutoff head pressure of the LPSI pumps. If the candidate confuses the small break response with large break response.

C. Incorrect: Pressurizer level will not react erratically for a break that is not in the pressurizer steam space area.
Plausible: Partially correct – the RCS pressure response is correct.

D. Incorrect: Pressurizer level will not react erratically for a break that is not in the pressurizer steam space area. RCS pressure will decrease to approximately saturation pressure for the existing RCS temperature – around 1400 psia.

Plausible: RCS pressure of 200 psia is the shutoff head pressure for the LPSI pumps. If the candidate confuses the small break response with large break response.

Level: RO Exam

KA: EPE 009EA2.06(3.8/4.3)

Lesson Plan Objective: 0702824-5, 8

Source: New

Level of knowledge: comprehension

References:
1. 0711824 pages 5-7, 9-12, 52
2. 0711201 pages 24-25, 34, 38-39
3. 0711207 page 74

KA EPE 009EA2.06(3.8/4.3) Small Break LOCA - Ability to determine or interpret the following as they apply to a small break LOCA: EA2.06 Whether PZR water inventory loss is imminent 3.8/ 4.3 (CFR: 43.5 / 45.13) [Note – this question was swapped from the SRO exam to the RO exam at the direction of the NRC Chief Examiner. The K/A was not changed. It is noted that this K/A is not tied to 10CFR55.41 in the K/A catalogue but it was considered appropriate for RO testing by the both the NRC and the licensee.]

Objective 0702824-5, 8:
5: Describe the effects that the following factors would have on a LOCA
A. RCS and Containment Pressure
B. Break Location

8: Explain the expected trends for the following key parameters during a small break LOCA inside the Containment
D. Pressurizer Level

Objective 0702201-2: Illustrate the flow paths of the RCS by:
A. Drawing a one-line diagram of the RCS. Include labeling of the major components, instrumentation and penetrations to other systems.
B. Drawing a one-line diagram of the Reactor Coolant Gas Vent System. Include labeling of the major components, instrumentation and penetrations to other systems.

Bank Question: 1108CE Answer: B

1 Pt(s) Unit 2 was operating at 100% power. Given the following events and conditions:

- CCW flow to RCP 1A1 motor air cooler has degraded due to flow blockage at the cooler outlet flow-restricting orifice.

Which one of the following conditions will be the FIRST indication of the problem, assuming no operator action?

A. Increased RCP motor stator temperature

B. Increased containment air temperature

C. Elevated RCP seal temperature

D. Elevated lower RCP motor bearing oil temperature

Distracter Analysis:

A. **Incorrect**: The motor air coolers cool the air leaving the RCP motor to reduce containment heat loads.
Plausible: If the candidate thinks that the CCW motor coolers cool the air entering the RCP motors.

B. **Correct**: The RCP motor air coolers cool the air leaving the RCP motors to reduce containment air temperature.

C. **Incorrect**: Flow blockage to the motor air cooler does not affect the CCW flow path to the seal coolers.
Plausible: If the candidate does not understand the cooling flow path between the seal cooler and the motor air coolers – thinks they are in series not parallel.

D. **Incorrect**: The CCW motor coolers cool the air leaving the motor – not entering the motor. A blockage in the CCW supply would not restrict airflow through the cooler but would increase exit air temperature to containment.
Plausible: If the candidate thinks that the lower bearing oil coolers are in series with the motor air coolers for CCW flow,

Level: RO Exam

KA: APE 015/17 AA2.02(2.8/3.0)

Lesson Plan Objective: none

Source: New

Level of knowledge: comprehension

References:
1. 0711202 pages 22, 27, 55-57, 82

APE 015/17 AA2.02 (2.8/3.0) RCP Malfunction - AA2.02 Abnormalities in RCP air vent flow paths and/or oil cooling system 2.8 3.0 (CFR: 43.5 / 45.13)

Objective: none

Bank Question: 1114CE ***Answer: C***

1 Pt(s)

Unit 2 was operating at 100% power when a pressurizer safety valve lifted and stuck open. Given the following events and conditions:

- The operators tripped the reactor and entered 2-EOP-01 (SPTA)
- The operators tripped all RCPs on a loss of subcooling and performed a natural circulation cooldown in 2-EOP-03 (LOCA).
- The safety valve reseated at 1400 psia and the unit was stabilized.
- The unit has now been cooling down at 30 °F/hour from hot standby conditions for 5.5 hours in ONP-2-0120039 (Natural Circulation Cooldown).
- Highest CET = 532 °F
- Rep CET = 514 °F
- T_{hot} = 492 °F
- T_{cold} = 467 °F

What is the current saturation pressure of the upper head?

References provided: ONP 2-0120039 Figure 3 and Steam Tables

A. **500 psia**

B. **630 psia**

C. **775 psia**

D. **900 psia**

Distracter Analysis:

A. **Incorrect**: The correct pressure is 775 psia
Plausible: If the candidate uses T_{cold} to determine saturation conditions.

B. **Incorrect**: The correct pressure is 775 psia.
Plausible: If the candidate uses T_{hot} or uses the 50 °F/hr cooldown line.

C. **Correct**: The correct pressure is 775 psia -- can be determined using Figure 3 of ONP 2-0120039 or steam tables.

D. **Incorrect**: The correct pressure is 775 psia
Plausible: If he candidate uses the highest CET or misreads the curve – this is the pressure for 4.4 hours.

Level: RO Exam

KA: APE 008AA2.14(4.2/4.4)

Lesson Plan Objective: 0702858-9

Source: NRC exam 2001 #1775

Level of knowledge: memory

References:
1. ONP-2-0120039 Figure 3 (Unit 2)
2. ONP-1-0120039 Figure 3 (Unit 1)

KA APE: 008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) AA2. Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: AA2.14 Saturation temperature monitor. 4.2 4.4 (CFR: 43.5 / 45.13)
Replaced KA when Question was swapped with Ques_1067 from the SRO exam to the RO exam. CE/A13 AA2.2(2.9/3.8) Natural Circ - Ability to determine and interpret the following as they apply to the (Natural Circulation Operations) AA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. IMPORTANCE RO 2.9 SRO 3.8 (CFR: 43.5 / 45.13)

Objective 0702858-9: RCS Related ONOPs - Given an Off-Normal system condition; use appendices, tables, figures or other ONP attachments to answer system related questions.

Bank Question: 1116CE ***Answer: C***

1 Pt(s) Unit 1 is at 100% power. Given the following events and conditions:

- The Desk Operator is performing the shift interval surveillance checks for Linear Heat Rate as required by Technical Specification Surveillance 4.2.1.2.

Which one of the following correctly describes how Linear Heat Rate is verified using DCS in accordance with 0-NOP-100-03 (*Monitoring Linear Heat Rate)* under this plant condition?

A. Verify all control element assemblies were above the Long Term Steady State Insertion Limits for the past 24 hours on DCS.

B. Verify the Axial Shape Index to be within COLR Figure 3.2-4 using DCS.

C. Verify no more than one incore detector reading on the DCS flux log is in alarm.

D. Verify DCS power has been less < 100% for the past 8 hours.

Distracter Analysis:

A. **Incorrect**: The incore flux map alarms are verified.
Plausible: This is part of the excore verification method that is not available at 100% power.

B. **Incorrect**: The incore flux map alarms are verified.
Plausible: This is part of the excore verification method that is not available at 100% power.

C. **Correct**:

D. **Incorrect**: The incore flux map alarms are verified.
Plausible: This verification is for another Tech Spec.

Level: RO Exam

KA: G2.1.19 (3.0)

Lesson Plan Objective: none

Source: Mod #1588

Level of knowledge: memory

References:
1. OP-1-0010125 page 20
2. 0-NOP-100.03 pages 6-8
3. Unit 1 Tech Spec LCO 3.2.1

K/A G2.1.19: Ability to use plant computer to obtain and evaluate parametric information on system or component status. (CFR: 45.12)

Objective: none

Bank Question: 1126CE ***Answer: C***

1 Pt(s) Safeguards equipment is protected from flooding in the event of a large pipe break in the -0.5' elevation of the RAB by:

A. Automatic isolation of all the RAB floor drains

B. Automatic pumping of safeguard sumps directly to the HUTs

C. Manual isolation of the safeguard sump room from the RAB floor drains from the control room

D. Gravity draining of the -0.5' elevation floor directly to the EDT

Distracter Analysis:

A. **Incorrect**: There is no automatic isolation of the floor drains.
Plausible: If the candidate confuses auto action with required the manual action.

B. **Incorrect**: The safeguard room sumps are automatically pumped to the EDT – not the HUT.
Plausible: Some sumps are pumped to the HUT.

C. **Correct**: The control room is required to manually isolate the floor drains to prevent flooding the safeguards equipment.

D. **Incorrect**: The floor drains do not gravity drain directly to the EDT
Plausible: The sump is pumped to the EDT.

Level: RO Exam

KA: SYS 005A1.05(3.3*/3.3*)

Lesson Plan Objective: 0502018-02

Source: Bank #1437

Level of knowledge: memory

References:
1. 0511018 page 12

SYS 005A1.05(3.3*/3.3*) Residual Heat Removal - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: A1.05 Detection of and response to presence of water in RHR emergency sump . 3.3* 3.3* (CFR: 41.5 / 45.5)

Objective: 0502018-02 Describe the effects of a leak in the -0.5 elevation of the RAB and the actions that should be taken if flooding should occur.

Bank Question: 1127CE Answer: D

1 Pt(s) Unit 1 was shutdown for a refueling outage. Given the following events and conditions:

- Maintenance has been completed on a CCW component.
- The operators are refilling and venting the component to return to service.
- CCW SURGE TK LEVEL COMP B LOW annunciator alarmed.
- The crew entered the ONOP1-0310030 (*CCW Off Normal Operation*)

Which one of the following components could have caused the 1B CCW surge tank low-level alarm?

A. Sample heat exchanger

B. Spent fuel pool heat exchanger

C. Containment cooler HVS 1B

D. Containment cooler HVS 1D

Distracter Analysis: The surge tank low level alarm on Unit 2 causes the "N" CCW header to automatically isolate from the "A" and "B" CCW headers.

A. **Incorrect**: The sample heat exchanger is off the "N" CCW header which auto isolates from the B header
Plausible: If the candidate does not know that the N header has isolated due to the low-low CCW B surge tank level

B. **Incorrect**: The fuel pool HX is off the N header, which isolated from the B header.
Plausible: If the candidate does not know that the N header has isolated due to the low-low CCW B surge tank level or thinks that the fuel pool is off the B CCW header.

C. **Incorrect**: The 1B containment cooler is off the "A" CCW header.
Plausible: This is the only case where a "B" component is supplied by the "A" train.

D. **Correct**: The "D" containment cooler is supplied by the "B" CCW header.

Level: RO Exam

KA: SYS 008A4.02(2.5*/2.5*)

Lesson Plan Objective: 0702209-08

Source: Bank #2245

Level of knowledge: comprehension

References:
1. 0711209 pages 25, 29, 31-33, 37, 51, 53

SYS 008A4.02(2.5*/2.5*) Component Cooling Water - Ability to manually operate and/or monitor in the control room: A4.02 Filling and draining operations of the CCWS including the proper venting of the components 2.5* 2.5 (CFR: 41.7 / 45.5)

Objective: 0702209-08 Describe the operation of CCW during normal, off-normal and emergency conditions including:

A. Loss of Offsite Power (LOOP).
B. CCW Surge Tank Low Level.
C. CCW Surge Tank High Level
D. CCW Radiation Monitor High Alarm.
E. Loss of CCW Heat Exchanger.
F. High motor bearing temperature on CCW pump.
G. Loss of A or B CCW pump.
H. Rupture of the CCW "N" Header.
I. Loss of Shutdown Cooling Heat Exchanger.

Bank Question: 1128CE Answer: B

1 Pt(s) Unit 2 was in Mode 5 after cooling down for a refueling outage. Given the following events and conditions:

- Shutdown cooling is in operation holding RCS temperature steady
- RCS temperature is 163 °F
- RCS pressure is 50 psia with a solid pressurizer

Which one of the following statements correctly describes the brittle fracture protection for the reactor vessel against an over-pressure condition?

References Provided: Unit 2 Tech Spec 3.4.9.3

A. The reactor vessel does not require protection against brittle fracture below 165 °F and 100 psia.

B. Only the full-flow shutdown cooling relief valves are required for brittle fracture protection.

C. Only the pressurizer PORVs in the LTOPs mode are required for brittle fracture protection.

D. Both the pressurizer PORVs and the full-flow shutdown cooling relief valves are required to provide protection.

Distracter Analysis:

A. **Incorrect**: Brittle fracture is a concern until the reactor vent path is established.
Plausible: If the candidate thinks that brittle fracture is not a concern at low pressures after the cooldown is over – PTS requires pressure stress.

B. **Correct**: - for Unit 2 which does not have SDC relief valves.

C. **Incorrect**: Unit 2 LTOPs are inoperable below 165 °F.
Plausible: Unit 1 does not have full flow shutdown cooling relief valves. This could be a good answer for Unit 1. Note: the NRC directed us to remove the Unit 1 distracter Tech Specs from this question during the exam review.

D. **Incorrect**: Unit 2 LTOPs are inoperable below 165 °F.
Plausible: If the candidate does not recognize that LTOPs are inoperable < 165 °F.

Level: RO Exam

KA: SYS 005K5.01(2.6/2.9)

Lesson Plan Objective: 0702207-05

Source: New

Level of knowledge: comprehension

References:
1. 0711207 pages 43-44, 60
2. Unit 1 Tech Spec LCO 3.4.13
3. Unit 2 Tech Spec LCO 3.4.9.3

SYS 005K5.01(2.6/2.9) Residual Heat Removal - Knowledge of the operational implications of the following concepts as they apply the RHRS: K5.01 Nil ductility transition temperature (brittle fracture) 2.6 2.9 (CFR: 41.5 / 45.7)

Objective 0702207-05: Describe the shutdown cooling flowpath, including unit differences, by:

A. Explaining how the design of the Unit 2 suction cooling hot leg suction valve power supply provides for a single failure.
B. Explaining the basic procedural steps involved in placing Unit 1 and Unit 2 on shutdown cooling.
C. Explaining how the RCS temperature is controlled while on shutdown cooling at both Units 1 and 2.

Bank Question: 1129CE ***Answer: C***

1 Pt(s) Unit 2 was operating at 100% power when a LOOP occurred. Given the following events and conditions:

- Charging pump 2A was out of service for maintenance.
- The electric plant was in a normal lineup.
- A reactor trip occurred
- The 2B EDG failed to start
- The 2A EDG operated as designed
- 3 CEAs failed to insert into the core – operators took the appropriate actions in 2-EOP-01 (*SPTA*)

Which one of the following statement correctly describes the status of the boric acid pumps?

A. No BA pumps will be running and the emergency boration flow path will be through the gravity feed isolation valves V-2508/9.

B. No BA pumps will be running and the operator will have to manually initiate safety injection.

C. Both BA pumps will be running and provide emergency boration flow.

D. Both BA pumps will be running at shutoff head - V-2134 (*BA pump miniflow valve*) will protect the pumps from overheating.

Distracter Analysis: When 3 CEAs fail to insert, operators should manually initiate emergency boration and both BA pumps should start. When power is lost, both BA pumps will restart and the 2C charging pump will be restart (due to the 2A pump being out of service and the 2C pump would be powered from the AB aligned to bus 2A3). The 2C charging pump will be powered when the 2A EDG re-powers bus 2A3.

A. **Incorrect**: Both BA pumps will be running – they are both powered from MCC-2B6 off bus 2B3.
Plausible: If the candidates do not recognize HPSI did not start and BA pumps have power -- or they do not recognize they must emergency borate.

B. **Incorrect**: Both BA pumps will run
Plausible: Manual safety injection is the equivalent of emergency boration for reactivity control. *Note: The NRC directed this*

distracter be added in place of an original distracter that the 2B BA pump was running and would provide emergency boration flow. The change was made to enhance the psychometric balance of the distracters – directed by NRC.

C. **Correct**: No charging pumps will be running – both BA pumps will run and the miniflow valves will protect the pumps.

D. **Incorrect**: The gravity feed valves are opened on a SIAS, which did not occur. Both BA pumps will run and no charging pumps will run.
Plausible: If the gravity feed valves had opened, only a check valve in the line prevents this flow path from being a viable flow path.

Level: RO Exam

KA: SYS 024AK2.04(2.6/2.5)

Lesson Plan Objective: 0702205-2, 10

Source: New

Level of knowledge: comprehension

References:
1. 0711205 pages 25-26, 31-32, 37-38, 58,75
2. 0711502 pages 19-20

SYS 024AK2.04(2.6/2.5) Emergency Boration - Knowledge of the interrelations between the Emergency Boration and the following: AK2.04 Pumps 2.6 2.5 (CFR 41.7 / 45.7)

Objectives0702206-2, 10:
2 Illustrate the flow paths of the CVCS by:
A. Drawing a one line diagram of the CVCS, including major components, piping, relief valves and instrumentation. Label the valves that are control room operated.
B. Using a one line diagram, outline the following flow paths:
1) Normal Charging and Letdown
2) Boron Concentration and Control
a. Normal Boration
b. Normal Dilution
c. Emergency Boration
3) VCT Level Control
4) Chemistry Control
5) RCP Seal Injection
6) Alternate charging alignment using High Pressure Safety Injection (HPSI)

10 Explain the effects on the CVCS for the following signals:

A. SIAS

B. CIAS

Bank Question: 1130CE ***Answer: C***

1 Pt(s) Which one of the following functions are NOT monitored by QSPDS?

A. **Inadequate core cooling**

B. **Reactor vessel level**

C. **Containment conditions**

D. **Core saturation margin**

Distracter Analysis:

A. **Incorrect**: this is an output from QSPDS
Plausible: If the candidate does not know the purpose or functions of QSPDS

B. **Incorrect**: this is an output from QSPDS
Plausible: If the candidate does not know the purpose or functions of QSPDS

C. **Correct**: comes from ERDADS for ERDs -- QSPDS inputs to ERDADs -- but not containment conditions.

D. **Incorrect**: this is an output from QSPDS
Plausible: If the candidate does not know the purpose or functions of QSPDS

Level: RO Exam

KA: SYS 074G2.1.27(2.8/2.9)

Lesson Plan Objective: 0702407-3

Source: New

Level of knowledge: memory

References:
1. 0711407 page 6

SYS 074G2.1.27(2.8/2.9) Inad. Core Cooling - Knowledge of system purpose and or function. (CFR: 41.7) RO 2.8 SRO 2.9

Objective: 0702407-3 Describe the three functions of the Inadequate Core Cooling (ICC) System portion of the QSPDS. Include the parameters monitored for each function and the method used to monitor each.

Bank Question: 1131CE Answer: D

1 Pt(s) Unit 2 was conducting a turbine load increase to full power following an outage where the high-pressure turbine had been replaced. Given the following events and conditions:

- Turbine load was 200 MW – increasing slowly at 0.25 MW/min
- Annunciator D-15 (TURBINE VIBRATION ABNORMAL) alarmed
- The turbine supervisory indicated 15 mils turbine vibration and was confirmed to be valid
- Annunciator L-29 (LOSS OF LOAD/LCL PWR DENS CHANNEL TRIP BYPASSED) is dark

Which one of the following statements correctly describes the operator action(s) that are required to respond to this condition?

A. Open the main generator breakers to determine if the main generator causes the vibration – if the vibrations continue, trip the turbine.

B. Raise turbine load away from the destructive resonance point and request an engineering evaluation.

C. Immediately trip the turbine.

D. Trip the reactor and verify turbine trip.

Distracter Analysis: Per 2-ONP-22.02, if the reactor power is > 15% (135 MW) the reactor must be tripped before the turbine is tripped.

A. **Incorrect**: Not the correct immediate action. Also – must trip the reactor prior to tripping the turbine if L-29 is cleared.
Plausible: If the candidate thinks that a vibration in the main generator could cause a vibration alarm in the turbine.

B. **Incorrect**: Not the correct immediate action.
Plausible: St Lucie has experienced destructive resonance vibration problems when a new turbine rotor has been accelerated past the resonance point – at low speeds. This action may be appropriate IF the vibration occurs during the initial turbine start up per a special engineering procedure.

C. **Incorrect**: Must trip the reactor before tripping the turbine above 15% power.
Plausible: If the candidate does not recognize that power is > 15%.

D. **Correct**:

RO Exam References:

Steam Tables
Unit 2 2-EOP-99 Figure 1A
Unit 1 1-ONOP 1-0440030 Figures 1, 2
Unit 2 ONP 2-0120039 Figure 3 and Steam Tables
Unit 2 Tech Spec 3.4.9.3

FPL	ST. LUCIE UNIT 2 EMERGENCY OPERATING PROCEDURE SAFETY RELATED	Procedure No. **2-EOP-99** Current Revision No. **29** Effective Date **01/29/04**

Title:

APPENDICES / FIGURES / TABLES / DATA SHEETS

Responsible Department: **OPERATIONS**

REVISION SUMMARY:

Revision 29 - Incorporated PCR 03-2810 to incorporate operator feedback issues. (J. Martin, 11/18/03)

Revision 28 - **THIS PROCEDURE HAS BEEN COMPLETELY REWRITTEN**. Incorporated PCR 03-0277 to incorporate Operations and Training Department feedback and made changes to allow procedure to conform with writer's guide. (S. Napier, 03/20/03)

Revision 27 – THIS PROCEDURE HAS BEEN COMPLETELY REWRITTEN. Revised procedure to incorporate CEN-152 revision 5.1 criteria. (Steve Napier, 10/03/01)

AND

Added an Appendix X and changed title from "appendices" to "appendixes". (Steve Napier, 08/10/01)

Revision 26 - Made changes as a result of PMAIs, Engineering, LOR and other user feedback. (Ron Pennenga, 02/02/01)

Revision 25 - Deleted compensatory measures in Appendix O for V3523 outage. V3551 is no longer normally deenergized. (Ron Pennenga, 05/11/00)

Revision 24 - Changed SDM requirement of 5000 pcm to value required by COLR due to Tech. Spec. AM #105. (Ron Pennenga, 04/18/00)

Revision	FRG Review Date	Approved By	Approval Date
0	09/19/89	G. J. Boissy Plant General Manager	09/19/89
Revision	FRG Review Date	Approved By	Approval Date
29	11/18/03	G. L. Johnston Plant General Manager	11/18/03
		N/A Designated Approver	
		N/A Designated Approver (Minor Correction)	

S_2_OPS	
DATE	
DOCT	PROCEDURE
DOCN	2-EOP-99
SYS	
COM	COMPLETED
ITM	29

1.0 TITLE

APPENDICES / FIGURES / TABLES / DATA SHEETS

2.0 PURPOSE

This addendum contains the Appendices, Figures, Tables, and Data Sheets required to be used in conjunction with the Unit 2 Emergency Operating Procedures. The following items are included:

APPENDIXES		FIGURES		TABLES		DATA SHEETS	
A	Sampling Steam Generators	1A	RCS Pressure Temperature (containment temperature less than 200°F)	1	SIAS	1	* See below
B	Power Restoration to a Deenergized Bus	1B	RCS Pressure Temperature (containment temperature greater than 200°F)	2	CIAS		
C	Diesel Generator Local Start	2	SI Flow Vs. RCS Press.	3	CSAS		
D	Restoration of Offsite Power with EDGs in Operation	3	Time Until S/D Cooling Req. Vs. Cond. Avail.	4	RAS		
E	Recovery From Unit to Unit AC Crosstie	4	Cond. Required for Cooldown	5	MSIS		
F	Alternate Method of Crosstying AC Power from Unit to Unit Using 2A4 or 2B4 Switchgear	5	RWT Level Vs. Cntmt. Sump Level	6	Vital Power Breaker Configuration (LOOP)		
G	Local Operation of the 2C Auxiliary Feedwater Pump	-	N/A	7	Vital Power Breaker Configuration / Station Blackout		
H	Operation of the 2A & 2B Instrument Air Compressors	-	N/A	8	Emerg. Diesel Gen. Loading (LOOP)		
I	MSIV Local Closure	-	N/A	9	125 VDC Equip. Which May Be Deenergized to Extend Battery Life		
J	Restoration of CCW and CBO to the RCPs	-	N/A	-	N/A		
K	RCS Fill and Drain Method of Void Elimination	-	N/A	11	Emerg. Diesel Generator Loading (SBO)		
L	Placing Hydrogen Analyzer in Service	-	N/A	12	Alternate SG Heat Removal Paths		
M	Operation of Hydrogen Recombiners	-	N/A	13	RCP Operating Limits		
N	Hydrogen Purge System Operation	-	N/A	-	N/A		
O	Simultaneous Hot And Cold Leg Injection	-	N/A	-	N/A		
P	Restoration of Components Actuated by ESFAS	-	N/A	-	N/A		
Q	N/A	-	N/A	-	N/A		
R	Steam Generator Isolation	-	N/A	-	N/A		
S	Safety Injection Throttling and Restoration	-	N/A	-	N/A		
T	Alternate Charging Flow Path to RCS Through 'A' HPSI Header	-	N/A	-	N/A		
U	N/A	-	N/A	-	N/A		
V	Receiving AC Power From Unit 1 Using SBO Crosstie	-	N/A	-	N/A		
W	Supplying Unit 1 With AC Power Using SBO Crosstie	-	N/A	-	N/A		
X	Secondary Post Trip Actions	-	N/A				
-	N/A						
-	N/A						
-	N/A						

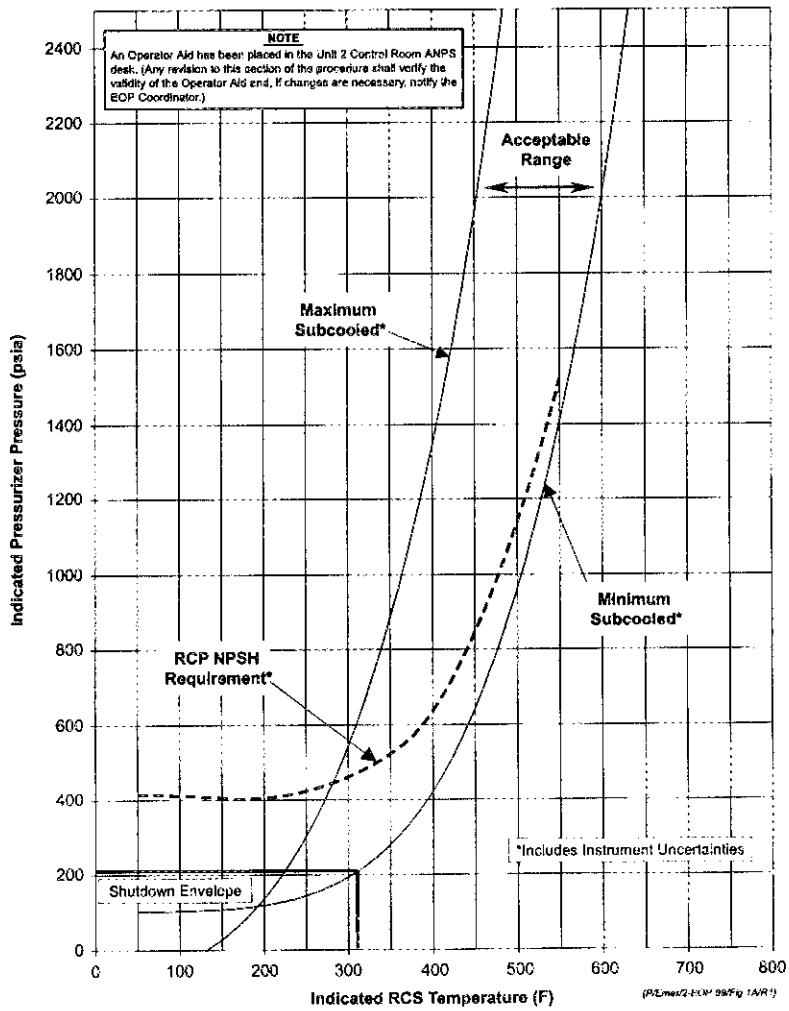
* Determination of Condensate Required to Remove Decay Heat and RCP Heat

FIGURE 1A
RCS PRESSURE TEMPERATURE
(Page 1 of 1)

(Containment Temperature Less Than or Equal to 200°F)

CAUTION

The RCP NPSH curve assumes one pump is operating in each loop. RCP instrumentation should be monitored for seal and pump performance in accordance with 2-EOP-99, Table 13.



RCS Pressure Range	Required QSPDS Subcooled Margin Reading (Rep CET)
2250 psia to 1000 psia	40 to 180°F
1000 psia to 500 psia	50 to 170°F
Less than 500 psia	80 to 160°F

/R29

FPL

ST. LUCIE UNIT 1

OFF NORMAL OPERATING PROCEDURE

SAFETY RELATED

Procedure No.
1-0440030

Current Revision No.
32

Effective Date
02/26/04

Title:

SHUTDOWN COOLING OFF-NORMAL

Responsible Department: **OPERATIONS**

REVISION SUMMARY:

Revision 32 - Incorporated PCR 04-0188 to add precaution about potential reactivity effects contained in this procedure. (J. Folden, 02/14/04)

Revision 31 – Incorporated PCR 02-2421 for CR 02-2168, JPN-PSL-SENP-94-029 R4, PSL-ENG-SENS-99-028 R2 to provide a correction formula to adjust Figure 1 for a vented RCS with ≥ 30% Pzr level. (Chris Buehrig, 05/23/03)

Revision 30 - Changed the max level for nozzle dam installation and removal. (A. Kimpel, 04/19/02)

Revision 29B - Changed reference to Table 1 in 1-NOP-03.05 to Figure 2. (M. Gilmore, 03/21/01)

Revision 29A - Corrected noun description for FCV-3306. (M. B. Gilmore, 03/05/01)

Revision 29 - Revised procedure based on additional design basis requirements and design margin for MV-03-2 actuator. (M. Gilmore, 11/16/00)

Revision	FRG Review Date	Approved By	Approval Date
0	11/26/74	K. N. Harris Plant General Manager	12/10/74
32	02/13/04	G. L. Johnston Plant General Manager	02/14/04
		N/A Designated Approver	
		N/A Designated Approver (Minor Correction)	

S_1_OPS	
DATE	
DOCT	PROCEDURE
DOCN	1-0440030
SYS	
COM	COMPLETED
ITM	32

TABLE OF CONTENTS

FIGURE 1
TIME TO CORE BOILING
(Page 1 of 2)

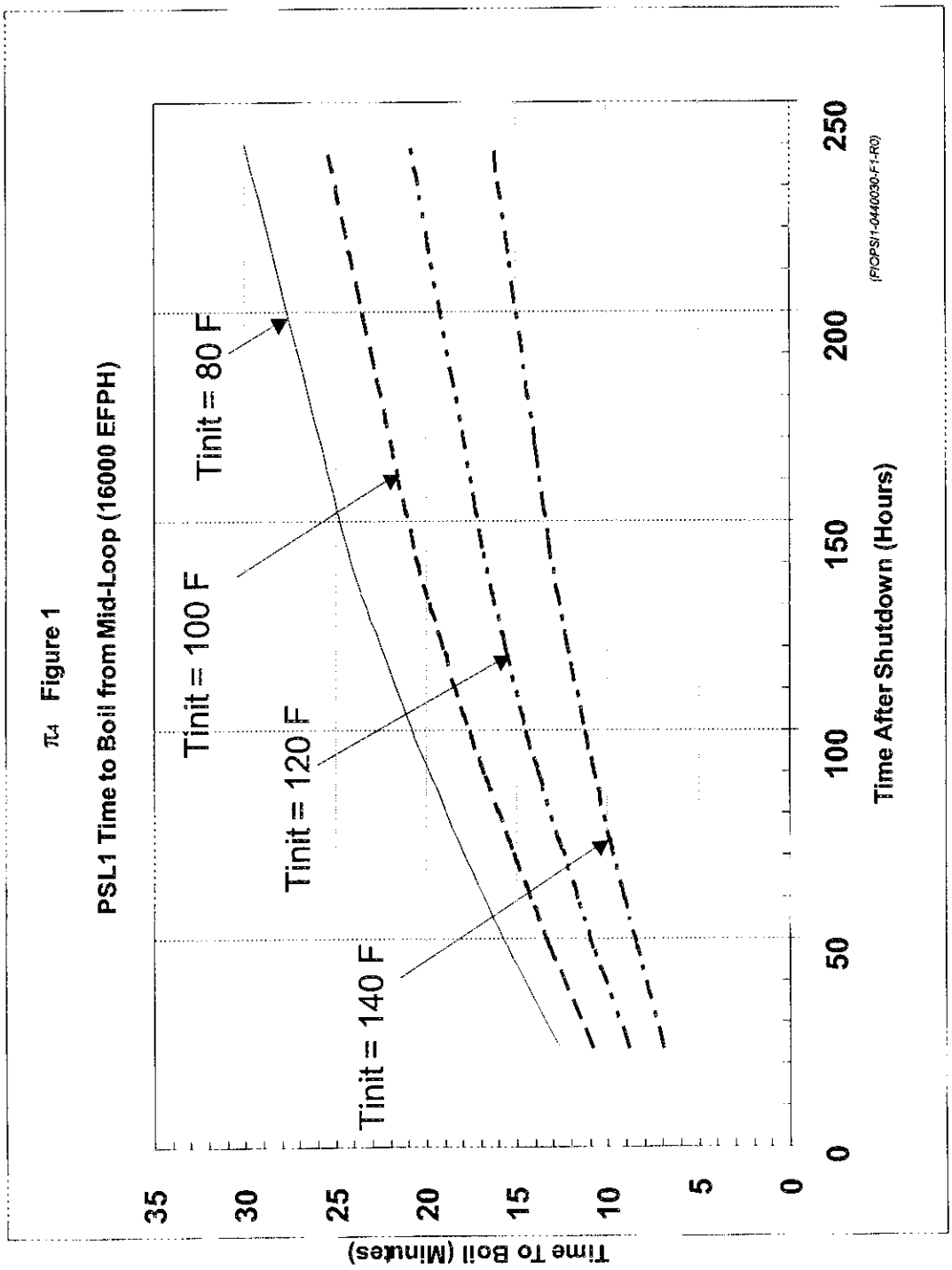


FIGURE 1
TIME TO CORE BOILING
(Page 2 of 2)

CORRECTION FORMULAS

1. If the Refueling Cavity level is greater than 36 feet, Then PERFORM the following equations to correct time to boil.

   A. _____ ft - 36 = _____ ft
   Cavity level - 36 = adjusted level.

   B. {1 + [0.23] x [_____ ft]} = _____
   {1 + [0.23] x [adjusted level]} = multiplier

   C. _____ x _____ min = _____ min
   multiplier x time to boil from curve = corrected time to boil

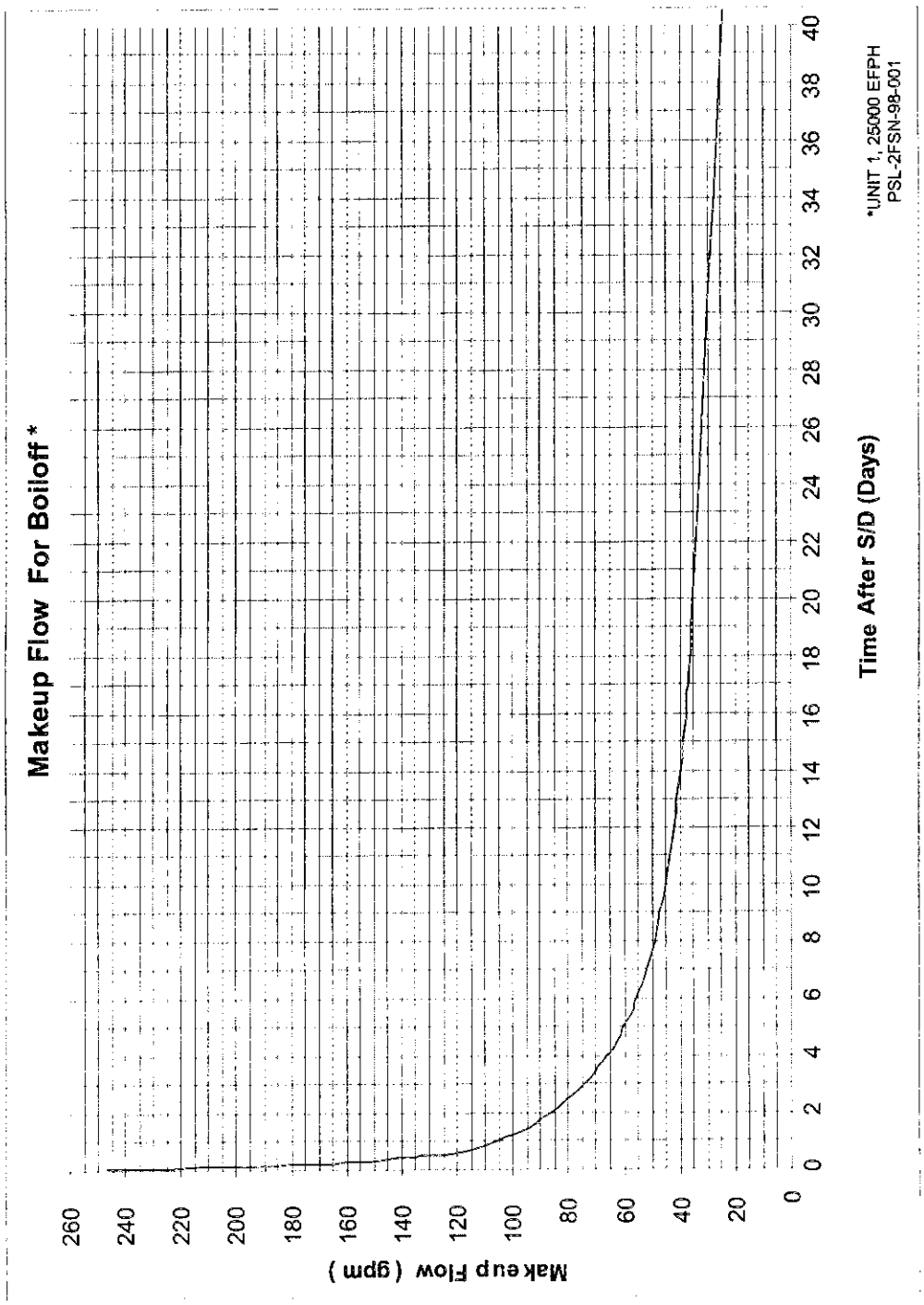
2. If the core shuffle or reload has been completed, Then PERFORM the following equation to correct time to boil.

   ¶1 _____ x 1.35 = _____ min
   Time to boil from curve **or** corrected time to boil from 1.C x 1.35 = corrected time to boil

3. If the Pzr level is ≥ 30% level and RCS is vented with S/G u-tubes filled, Then PERFORM the following equation to correct time to boil.

   ¶2 _____ + 32 = _____ min
   Time to boil from curve + 32 = corrected time to boil

FIGURE 2
FLOW TO MAKEUP FOR BOIL-OFF
(Page 1 of 1)



FPL	ST. LUCIE UNIT 2 OFF-NORMAL OPERATING PROCEDURE SAFETY RELATED	Procedure No. 2-0120039 Current Revision No. 32 Effective Date 03/02/04

Title:

NATURAL CIRCULATION COOLDOWN

Responsible Department: **OPERATIONS**

REVISION SUMMARY:

Revision 32 - Incorporated PCR 04-0245 to add precaution about potential reactivity effects contained in this procedure. (J. Folden, 02/14/04)

Revision 31 - Incorporated PCR 03-2503 to add reference to operator aid. (D. Pottorff, 11/20/03)

Revision 30 - Revised pressure/temperature limit figures per T.S. License Amendment #112. (M.B. Gilmore, 02/09/01)

Revision 29 - **THIS PROCEDURE WAS COMPLETELY REWRITTEN**. Re-arranged steps to fit the designed logic of the RCS cooldown during Natural Circulation conditions, deleted cautions, prior to IS 4, deleted CA 4 "target flange" (it was outside plant design), replaced Step 5, deleted IS 20, and added note delineating required available sub-systems for Letdown operation. (Ron Pennenga, 10/27/00)

Revision 28 - Added new Figure 5 for temperature compensation correction during cooldown and modified note to reflect new figure. (J. Folden, 08/24/00)

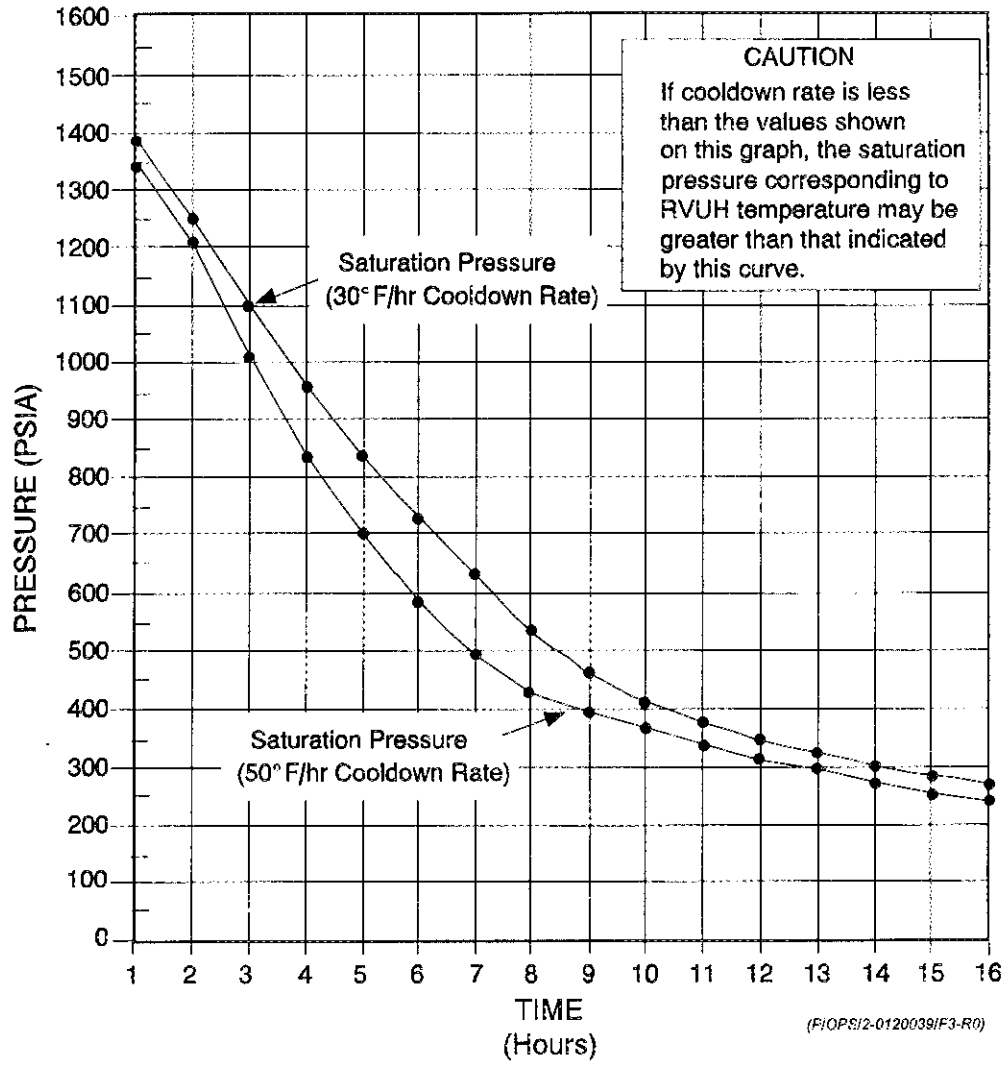
Revision 27 - Revised shutdown margin requirements per Tech Spec. Amendment #105. (M. Gilmore, 04/13/00)

Revision	FRG Review Date	Approved By	Approval Date
0	12/23/85	J. H. Barrow (for) Plant General Manager	12/26/85
32	02/13/04	G. L. Johnston Plant General Manager N/A Designated Approver N/A Designated Approver (Minor Correction)	02/14/04

S_2_OPS	
DATE	
DOCT	PROCEDURE
DOCN	2-0120039
SYS	
COM	COMPLETED
ITM	32

TABLE OF CONTENTS

FIGURE 3
UPPER HEAD SATURATION PRESSURE VS. TIME
(Page 1 of 1)



REACTOR COOLANT SYSTEM

OVERPRESSURE PROTECTION SYSTEMS

LIMITING CONDITION FOR OPERATION

3.4.9.3 Unless the RCS is depressurized and vented by at least 3.58 square inches, at least one of the following overpressure protection systems shall be OPERABLE:

a. Two power-operated relief valves (PORVs) with a lift setting of less than or equal to 470 psia and with their associated block valves open. These valves may only be used to satisfy low temperature overpressure protection (LTOP) when the RCS cold leg temperature is greater than the temperature listed in Table 3.4-4.

b. Two shutdown cooling relief valves (SDCRVs) with a lift setting of less than or equal to 350 psia.

c. One PORV with a lift setting of less than or equal to 470 psia and with its associated block valve open in conjunction with the use of one SDCRV with a lift setting of less than or equal to 350 psia. This combination may only be used to satisfy LTOP when the RCS cold leg temperature is greater than the temperature listed in Table 3.4-4.

APPLICABILITY: MODES 4[#], 5 and 6.

ACTION:

a. With either a PORV or an SDCRV being used for LTOP inoperable, restore at least two overpressure protection devices to OPERABLE status within 7 days or:

   1. Depressurize and vent the RCS with a minimum vent area of 3.58 square inches within the next 8 hours; OR

   2. Be at a temperature above the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3 within the next 8 hours.

b. With none of the overpressure protection devices being used for LTOP OPERABLE, within the next eight hours either:

   1. Restore at least one overpressure protection device to OPERABLE status or vent the RCS; OR

   2. Be at a temperature above the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3.

With cold leg temperature within the LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE of Table 3.4-3.

LIMITING CONDITION FOR OPERATION

ACTION: (Continued)

c. In the event either the PORVs, SDCRVs or the RCS vent(s) are used to mitigate a RCS pressure transient, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 30 days. The report shall describe the circumstances initiating the transient, the effect of the PORVs, SDCRVs or vent(s) on the transient and any corrective action necessary to prevent recurrence.

d. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.4.9.3.1 Each PORV shall be demonstrated OPERABLE by:

a. In addition to the requirements of the Inservice Testing Program, operating the PORV through one complete cycle of full travel at least once per 18 months.

SURVEILLANCE REQUIREMENTS (Continued)

b. Performance of a CHANNEL FUNCTIONAL TEST on the PORV actuation channel, but excluding valve operation, within 31 days prior to entering a condition in which the PORV is required OPERABLE and at least once per 31 days thereafter when the PORV is required OPERABLE.

c. Performance of a CHANNEL CALIBRATION on the PORV actuation channel, at least once per 18 months.

d. Verifying the PORV isolation valve is open at least once per 72 hours when the PORV is being used for overpressure protection.

4.4.9.3.2 The RCS vent(s) shall be verified to be open at least once per 12 hours* when the vent(s) is being used for overpressure protection.

* Except when the vent pathway is provided with a valve which is locked, sealed, or otherwise secured in the open position, then verify these valves open at least once per 31 days.

TABLE 3.4-3

LOW TEMPERATURE RCS OVERPRESSURE PROTECTION RANGE

Operating Period, EFPY	Cold Leg Temperature, F° During Heatup	Cold Leg Temperature, F° During Cooldown
≤ 21.7	≤ 247	≤ 230

TABLE 3.4-4

MINIMUM COLD LEG TEMPERATURE FOR PORV USE FOR LTOP

Operating Period EFPY	T_{cold}, F° During Heatup	T_{cold}, F° During Cooldown
≤ 21.7	165	165