U. S. NUCLEAR REGULATORY COMMISSION REGION I
OPERATOR LICENSING EXAMINATION REPORT

EXAMINATION REPORT NO. 50-470/84-05

FACILITY DOCKET NO. 50-470

LICENSEE: Combustion Engineering
1000 Prospect Hill Road
Windsor, Connecticut 06095

FACILITY: Combustion Engineering Training Center

DATES: January 23-25, 1984

CHIEF EXAMINER: Noel F. Dudley — Noel F. Dudley — 3-20-84 Date

APPROVED BY: R W Keller — Chief, Project Section 1D — 3/20/84 Date

SUMMARY: Nine written examinations and nine oral/simulator examinations were administered to instructors at the CE training center. Of these nine candidates, five passed all portions of the examination.

REPORT DETAILS

TYPE OF EXAMS: Initial __X__ Replacement ____ Requalification ____

EXAM RESULTS:

	RO Pass/Fail	SRO Pass/Fail	Inst. Cert Pass/Fail	Fuel Handler Pass/Fail
Written Exam	/	/	6/3	/
Oral Exam	/	/	7/2	/
Simulator Exam	/	/	7/2	/
Overall	/	/	5/4	/

1. CHIEF EXAMINER AT SITE: N. Dudley, NRC

2. OTHER EXAMINERS: R. Keller, NRC

   A. Prichard, PNL

3. PERSONS EXAMINED

Wilson, Neal Ernest	Instructor Certification
Deili, Armand G.	" "
Finnerty, Wayne M.	" "
Webber, Ronald Craig	" "
Nygard, Fred I.	" "
Nichols, III, John J.	" "
Chalfant, William J.	" "
Bjorklund, Dale	" "
Sundal, Harald W.	" "

1. Summary of generic strengths or deficiencies noted on oral exams:

   Candidates did not set a high priority on classifying events and initiating proper notifications.

2. Summary of generic strengths or deficiencies noted from grading of written exams:

   None

3. Comments on availability and candidate familiarization with plant reference material:

   Some procedures and prints required during the examination were not available in the Main Control Room, and adversely affected candidate performance.

   Some procedures used during the examination were not the latest revision.

   The availability and applicability of prints and procedures will be verified during the next examination. (#50-470/84-05-01)

4. Comments on availability and candidate familiarization with plant design, procedure, T. S. changes and LERs:

   None

5. Comments on interface effectiveness with plant training staff and plant operations staff during exam period.

   Not applicable.

6. Improvements noted in training programs as a result of prior operator licensing examinations/suggestions, etc:

   Significant improvements have been made in the simulator operating procedures.

7. Personnel Present at Exit Meeting:

NRC Personnel

N. Dudley

Facility Personnel

R. Price
W. Soule
T. Hooper
T. Krauser

8. Summary of NRC Comments made at exit interview:

Six of nine candidates were evaluated as definite passes on the simulator/oral examination. The improvement in simulator operating procedures was noted. However, some procedures and prints were unavailable in the Main Control Room and some procedures did not contain the latest revision.

9. Summary of facility comments and commitments made at exit interview:

   The facility commented that the written examination was difficult but provided no objection to the individual questions or answers.

10. CHANGES MADE TO WRITTEN EXAM

Question No.	Change	Reason
7.08	Replaced question	Original question required detailed knowledge of subsequent actions on an abnormal procedure, which are not required to be memorized.

Attachment:

Written Examination(s) and Answer Key(s) (SRO/RO)

Combustion Engineering
50-470/84-05

U.S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION

Facility: CE Training Center
Reactor Type: CE-PWR
Date Administered: January 23, 1984
Examiner: N. Dudley
Candidate: ____________

INSTRUCTIONS TO CANDIDATE:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

Category Value	% of Total	Candidate's Score	% of Category Value		Category
25	25	______	______	5.	Theory of Nuclear Power Plant Operation, Fluids, and Thermodynamics
25	25	______	______	6.	Plant Systems Design, Control, and Instrumentation
25	25	______	______	7.	Procedures - Normal, Abnormal, Emergency, and Radiological Control
25	25	______	______	8.	Administrative Procedures, Conditions, and Limitations
100		______ Final Grade			Totals

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

____
Candidate's Signature

DAN FOLEY
BOB PRICE
Bill Souder

QUESTION 5.01 (.50)

Assume RCP's are tripped following a LOCA. After the break has been isolated which of the following situations would be MOST desirable? (0.5)

	RCS Press	T PZR	Th	Tc
A.	600	520	500	480
B.	800	530	530	520
C.	1000	545	540	530
D.	1200	567	575	565

QUESTION 5.02 (1.50)

How is the margin to DNB affected by the following:

a. Pressurizer pressure decreasing (0.75)

b. Coolant flow rate decreasing. (0.75)

QUESTION 5.03 (1.50)

What will final reactor coolant pressure be if a 500 gpm LOCA occurred while operating at 100% power? Explain. assume no operator action (1.5)

QUESTION 5.04 (2.00)

a. How far, in terms of percent power, will wide range log channel indication initially drop after a trip from full power? Explain why? (1.0)

b. Explain why there would be a different response in the Delta T power indication? (1.0)

QUESTION 5.05 (1.50)

Explain HOW and WHY cycle efficiency varies with condenser pressure. (1.5)

QUESTION 5.06 (2.00)

a. Why does nucleate boiling heat transfer remove more heat than non-boiling heat transfer? (1.0)

b. Why does film boiling remove less heat than nucleate boiling? (1.0)

QUESTION 5.07 (2.00)

a. What TWO electrical parameters does a synchroscope monitor? (1.0)

b. What does a synchroscope measure to provide indication? (1.0)

QUESTION 5.08 (2.50)

a. What is the purpose of plotting 1/M? (0.75)

b. Why is the inverse count rate plotted? (0.75)

c. Why is the time between reactivity changes and logging of data important with regards to constructing an 1/M plot? (1.0)

QUESTION 5.09 (2.00)

The reactor is to be taken critical after a shutdown of one week. Boron concentration has been verified and the ECC predicts criticality at 55 inches on Group 5. What is the shutdown margin (SDM) when Group 2 is fully inserted? Figures have been provided. Show your work and state any assumptions. (2.0)

QUESTION 5.10 (3.00)

a. Sketch a temperature profile from the centerline of the fuel pellet to the center of the coolant channel. Indicate where each of the THREE modes of heat transfer occur. (2.0)

b. Briefly explain how crud buildup on the fuel rod affects reactivity. (1.0)

QUESTION 5.11 (3.00)

a. Explain how and why a moderator temperature change will affect the worth of a control rod. (1.0)

b. Explain how and why a change in boron concentration will affect the worth of a control rod. (1.0)

c. Explain how and why the incremental worth of a stuck rod compares to the incremental worth of a dropped rod? (1.0)

QUESTION 5.12 (2.00)

a. Why are the consequences of a steam line rupture more severe at the end of core life? (1.0)

b. Why are the consequences of a steam line rupture more severe from a no-load condition? (1.0)

QUESTION 5.13 (1.50)

→ What rod motion is necessary to maintain power at 10 -4% for the next 6 hr during a reactor restart following a trip from 100% sustained power operations. The trip occurred five (5) hours earlier. Explain your answer. (1.5)

QUESTION 6.01 (2.00)

For the CEDM lamp display shown below explain what each of the five lights indicate. (2.0)

RED	WHITE or BLUE
GREEN	AMBER

QUESTION 6.02 (2.00)

What actions should automatically occur in the Pressurizer Level and Pressure Control System if an unisolable steam leak develops in the Main Steam System while at 100% power? (2.0)

QUESTION 6.03 (2.00)

If a reactor trip signal was present, what effect would the simultaneous failure (to deenergize) of the Reactor Protection System (RPS) K-1 relay (to TCB-1 and 5) and K-2 relay (to TCB-2 and 6) have on the RPS? What should be done to correct the immediate problem? (2.0)

QUESTION 6.04 (2.00)

Sketch all the ways in which power can be provided to a vital 120 VAC bus. Start at an emergency diesel generator and include major components, voltage changes, and alternate power supplies. (2.0)

QUESTION 6.05 (2.50)

What effect will an SIAS have on each of the following components? (2.5)

a. Sea Water System outlet valves on the Component Cooling Water heat exchanger.
b. Sea Water System outlet valves on the Service Water heat exchanger.
c. The three (3) Component Cooling Water Pumps.
d. The three (3) Service Water Pumps.
e. Service Water supply valves to the plant air compressor.

QUESTION 6.06 (2.50)

What will be the sequence of events if SG-11 level detector (LT-111), which supplies a signal to the three element controller, fails low? Assume no operator action and pursue transient to the point where SG level is stabilized. For each automatic action indicate the source of the initiating signal. (2.5)

QUESTION 6.07 (3.00)

The following questions pertain to Figure 6. (3.0)

a. When would valves 1 and 2 be open?
b. When would valves 3 and 4 be automatically shut?
c. When would valves 5 and 6 be opened?
d. Why isn't valve 7 a motor operated valve?

QUESTION 6.08 (3.00)

Will the plant trip as a result of the following simultanious instrument failures? Explain your answers. (3.0)

a. SUR channels A and B fail high during a startup, when reactor power is at 10 -6%.
b. SG-11 level channel A fails low and SG-12 level channel A fails low while at 80% power.
c. Loop 1 Tc channel A fails high and loop 2 Th channel B fails high while at 80% power.
d. The lower UIC detectors for safety channels B and D fail low at 50% power.

QUESTION 6.09 (3.00)

How will the plant respond to each of the following transients if all systems are in automatic and there is no operator action? Answers should include major components which will respond automatically and the final plant conditions.

a. Load rejection from 70% to 60% power (1.0)
b. Load rejection from 80% to 20% power (1.0)
c. Turbine trip from 100% power (1.0)

SAFETY INJECTION AND CONTAINMENT SPRAY (BASIC)

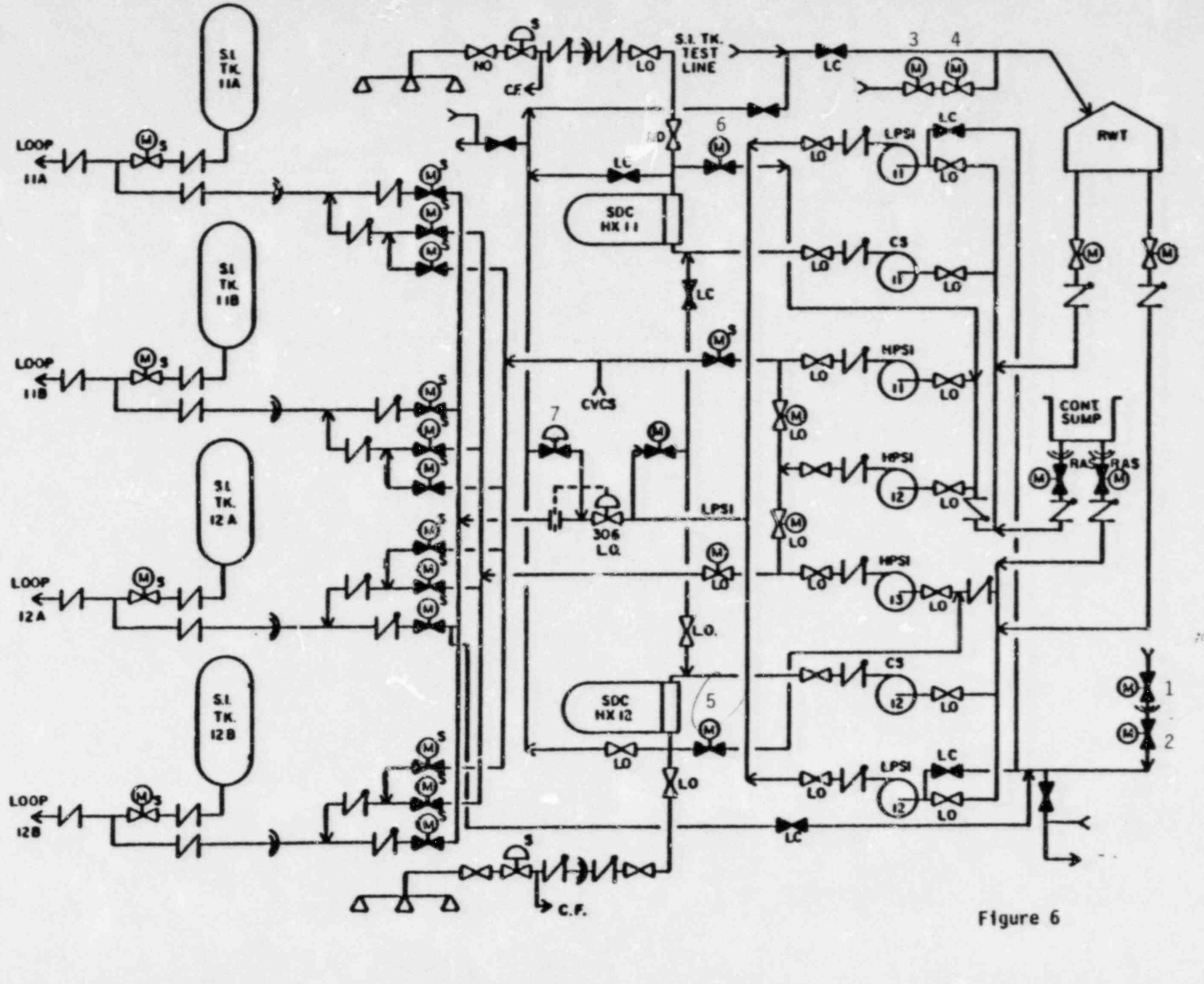


Figure 6

QUESTION 6.10 (3.00)

Compare the differences in detectors and signal processing between a linear power safety channel and a wide range log channel when power is at 50%. (3.0)

QUESTION 7.01 (1.50)

a. Should shutdown cooling be secured before or after forming a bubble in the pressurizer? (0.75)

b. How will pressure be controlled during formation of a bubble? (0.75)

QUESTION 7.02 (1.50)

If during containment purge operations the Main Vent Radiation Monitor reaches the alarm point, what actions are required? Indicate whether each action is accomplished manually or automatically. (1.5)

QUESTION 7.03 (2.00)

In preparation for reactor plant heat up RCP 11-A is started. If both RCP 11-B and RCP 12-A tripped on initial start, what should be the pump starting sequence to establish three running pumps in the shortest time if all subsequent RCP starts are successful. Explain your reasoning. (2.0)

QUESTION 7.04 (2.00)

a. What TWO conditions might cause quadrant tilt? (1.0)

b. What Reactor Protection System parameters are affected by quadrant tilt? (1.0)

QUESTION 7.05 (2.00)

What actions should be taken if an SIAS actuation has occurred, due to a reactor coolant system leak, and the following indications are present? (2.0)

The leak is isolated.
The RCP's are stopped.
PZR level is 150' and increasing.
PZR pressure is 1750 psia and increasiing.
Th is 600 F.
Tc is 560 F.
Core Exit Thermocouples are reading 615 F.

QUESTION 7.06 (2.00)

Following a reactor trip what three actions must be taken besides verifying proper automatic functions if all systems operate normally? (2.0)

QUESTION 7.07 (2.50)

a. What is the minimum time required to increase power from 20% to 100%? Figure B.6.1 is attached. (0.7)

b. How many gallons of demineralized water are required to raise reactor power from 50% all rods out to 100% all rods out? Show your work and assume initial boron concentration of 300 ppm. (1.8)
NEGLECT EFFECTS OF Xe.

QUESTION 7.08 (3.00)

What FOUR conditions are required before the Safety Injection Tanks can be considered operable. (2.0)

considered operable

QUESTION 7.09 (2.50)

A 1200 ppm deboration of the Reactor Coolant System (RCS) has been calculated to reach the critical boron concentration prior to a rod withdrawal startup. What actions should be taken if after reducing RCS boron concentration by 600 ppm the source range counts changed from 10 cps to 20 cps? Explain why these actions should be taken. (2.5)

QUESTION 7.10 (2.50)

In each of the following situations indicate when the reactor is required to be tripped.

a. Decreasing condenser vacuum, while at 80% power. (0.7)

b. Loss of an operating Component Cooling Water pump while at 50% power. (1.1)

c. A reactor coolant sytem leak which is slowly increasing while at 50% power. (0.7)

AMOUNT OF LOAD CHANGE

vs

TIME TO MAKE LOAD CHANGE

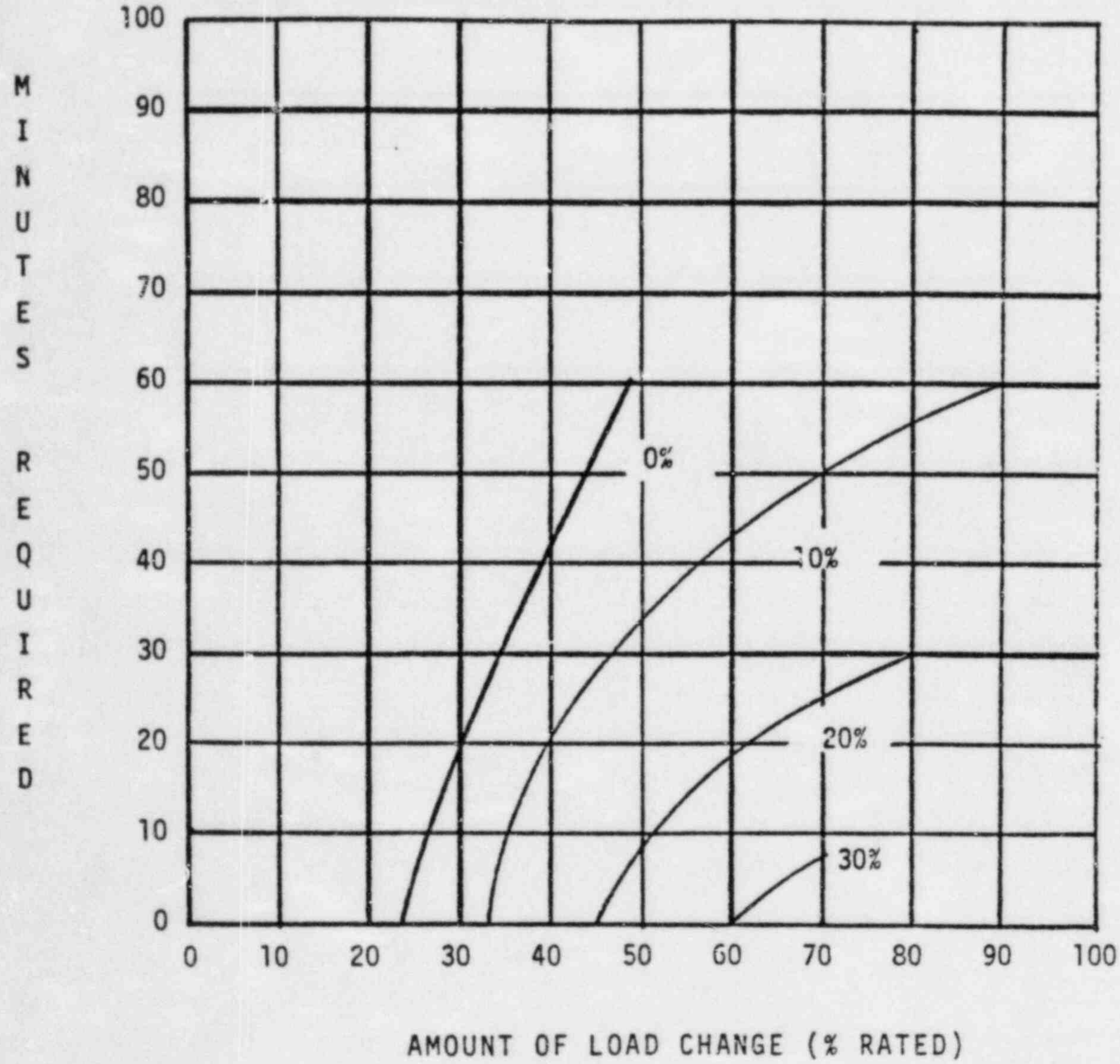


FIGURE B.6.1

QUESTION 7.11 (3.50)

a. During a SG tube rupture why must the RCS temperature be reduced below 525 F prior to isolating the affected SG? (0.75)

b. How is a SG isolated? (FOUR of five items required) (2.0)

c. Why must RCS pressure be maintained higher than the isolated SG pressure? (0.75)

QUESTION 8.01 (1.00)

On the midnight shift while operating at 100% power steady state the reactor trips on a low Steam Generator water level signal. Both Steam Generator water levels were in the operating band at the time of the trip. No instrument malfunction can be found. Who's permission is needed to perform a reactor startup? (1.0)

QUESTION 8.02 (1.50)

Which of the following operations/manipulations may be performed without direct reference to, but in compliance with approved plant operating procedures? (1.5)

a. Manual makeup to the VCT
b. Starting a ~~Sea~~ SALT Water Pump
c. Starting an RCP
d. Reducing turbine load 20%
e. Inserting or withdrawing an individual CEA

QUESTION 8.03 (1.50)

During a backshift work is being done to clear the drains around the fuel storage tank. The written procedure calls for pressurizing the drain lines to 10 psi with air, which is unsuccessful. The workers want to increase the pressure to 25 psi. What actions should the shift supervisor take? Explain your answer. (1.5)

QUESTION 8.04 (1.50)

a. What will be the major hazard of allowing the water level above irradiated fuel to drop below 23 feet during refueling operations? according to T.S. (0.75)

b. What technical specification item provides a safety in-depth backup to the 23 feet of water above the irradiated fuel reqirement? (0.75)

QUESTION 8.05 (2.00)

a. Who is responsible for insuring a worker does not exceed his weekly administrative dose while performing planned maintenance? (0.5)

b. May ~~Should~~ the shift supervisor sign an RWP if he feels clothing requirements are inadequate? Explain. (1.5)

QUESTION 8.06 (2.00)

For the RCS leakage conditions shown below indicate whether you could CONTINUE TO OPERATE indefinitely or should SHUTDOWN? Assume no other leakage than that listed and consider each item separately. (2.0)

a. 0.5 gpm each, from FIVE different valve packing glands
b. 0.2 gpm from a narrow range temperature RTD weld
c. 1.3 gpm of unknown origin
d. 3 gpm leakage by the seat of a PZR safety valve

QUESTION 8.07 (2.50)

a. What three persons should be notified if an Unusual Event is declared? (1.0)

b. In the event of a General Area Emergency, what are the titles -OR- responsibilities of the five members of the Emerency Operations team? (1.5)

QUESTION 8.08 (2.50)

Discuss the relationship between Limiting Conditions for Operations, Limiting Safety System Settings, and Safety Limits in terms of preventing release of radioactivity to the environment. (2.5)

QUESTION 8.09 (3.00)

Explain why each of the following situations SHOULD or SHOULD NOT be reported to the NRC within one hour. (3.0)

a. The reactor is critical at 10 -5% power and two wide range logarithmic nuclear instrumentation channels fail.
b. A 100 gpm leak develops in the ~~non-regenerative~~ LETDOWN heat exchanger while in Mode 3.
c. An expected actuation of an HPSI train occurs as part of surveillance testing.
d. A local evacuation siren becomes inoperable.

QUESTION 8.10 (3.00)

Explain why a shift supervisor SHOULD of SHOULD NOT approve each of the following maintenance requests. Assume the plant is at 100% steady state power. (3.0)

a. A request to tag out charging pump 12 for 20 minutes to perform routine maintenance. Charging pump 13 is inoperable.
b. A request to deenergize SG 11 water level safety channel A to install an approved modification. SG 12 water level safety channel B is bypassed.
c. A request to replace the gasket on the containment air lock inner door, which has been identified as leaking excessively. Overall air lock leakage is within specifications.

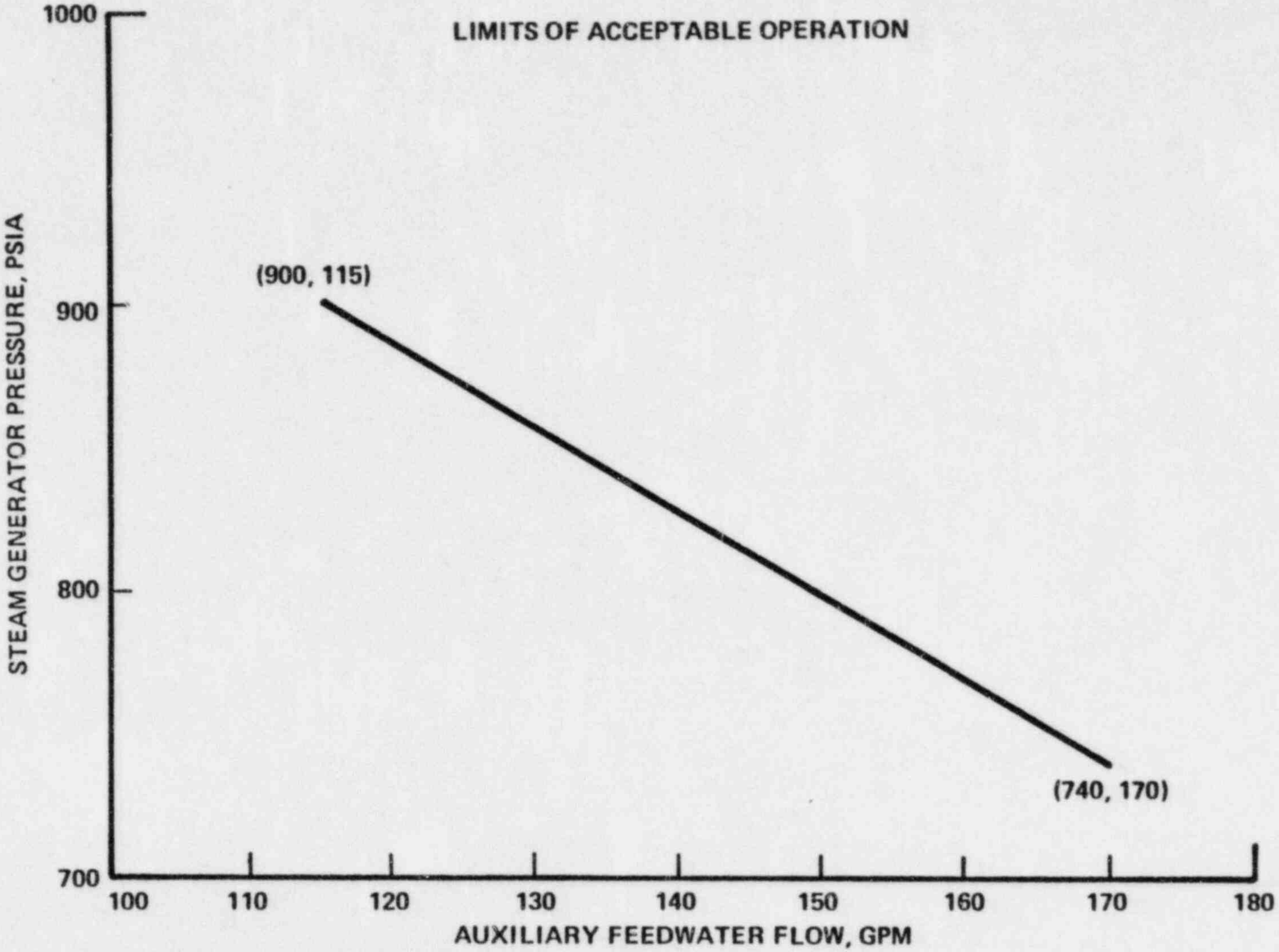
QUESTION 8.11 (4.50)

For each of the following situations indicate what REQUIREMENT, if any, applies and what ACTION, if any, should be taken. Consider each situation seperately.

a. Diesel generator A's operability load test, which is required every 31 days, is scheduled for today. The last three tests were completed 36, 68, and 102 days ago respectively. The plant is at 100% power. (1.5)
b. The plant is at 295 F and heating up at 1 F per minute, when an HPSI pump is found inoperable. (1.5)
c. The plant is at 100% power when it is determined that flow from each Auxiliary Feedwater pump was 120 and 125 gpm repectively when SG pressure was 850 psia. Figure 3.7.1 is attached. (1.5)

Figure 3.7-1

STEAM GENERATOR PRESSURE vs AUXILIARY FEEDWATER FLOW



ANSWERS -- NRC -- 84/01/23 -- DUDLEY, N

ANSWER 5.01 (.50)

C (0.5)

REFERENCE
Steam Tables 6
Natural Circulation-Loss of Forced Coolant Flow, pp 23-30

ANSWER 5.02 (1.50)

a. Decreases (slightly) with PZR pressure decrease (0.75)
b. Decreases with decreasing flow rate (0.75)

REFERENCE
Thermal Hydraulics, p 14 7

ANSWER 5.03 (1.50)

1100 to 1250 psi [0.75] Pressure will be the discharge head of an HPSI pump which will allow ~~250~~ gpm flow. [0.75] (1.5)
500-130= 370÷2 = 185 gpm

REFERENCE
System Descriptions: ESF, p 8 33

ANSWER 5.04 (2.00)

a. The power drops to 5-6% due to the removal of prompt neutrons. [0.5] The 5-6% power level is sustained by delayed neutrons. [0.5] (1.0)

b. Delta T power will fall less quickly [0.3] due to loop transit time [0.2] and decay heat from fission fragment decay. [0.5] (1.0)

REFERENCE

48

ANSWERS -- NRC -- 84/01/23 -- DUDLEY,N

Press ↑ eff ↑

ANSWER 5.05 (1.50)

Cycle efficiency increases as condenser vacuum decreases. [0.75] Lower condenser vacuum, the less subcooling, and the less energy removed from cycle by circ water. [0.75] (1.5)

REFERENCE

50

ANSWER 5.06 (2.00)

a. Nucleate boiling creates turbulent flow [0.2] which promotes more mixing.[0.3] Coolant picks up latent heat of vaporization [0.3] and carries it to cooler parts of the channel.[0.2] (1.0)

b. In film boiling, a film of steam coats the clad surface and forms an insulating layer, [0.4] which drastically reduces the heat transfer coefficient. [0.6] (1.0)

REFERENCE

Thermal Dynamics, pp 10,13

52

ANSWER 5.07 (2.00)

a. Synchroscope provides phase angle [0.5] and frequency difference between two different machines.[0.5] (1.0)

b. Synchroscope measures the voltage across one phase of each machine and compares the voltages. (1.0)

REFERENCE

72

ANSWER 5.08 (2.50)

a. Criticality prediction based on count rate. (0.75)

b. Approach to 0 vs. infinity is easier to see. (0.75)

c. As Keff approaches 1 it takes longer for count rate to stabilize. (1.0)

REFERENCE

89

ANSWER 5.09 (2.00)

SDM is the amount the reactor would be subcritical with the most reactive rod stuck out. [1.0]

SD group	+	Reg group(5 at ~~100~~ 55 steps)	-	stuck rod	=	SDM	
6.9	+	(4.1-1.2=) 2.9	-	2.1	=	7.7 % delta rho	
[0.3]		[0.3]		[0.3]		[0.1]	(2.0)

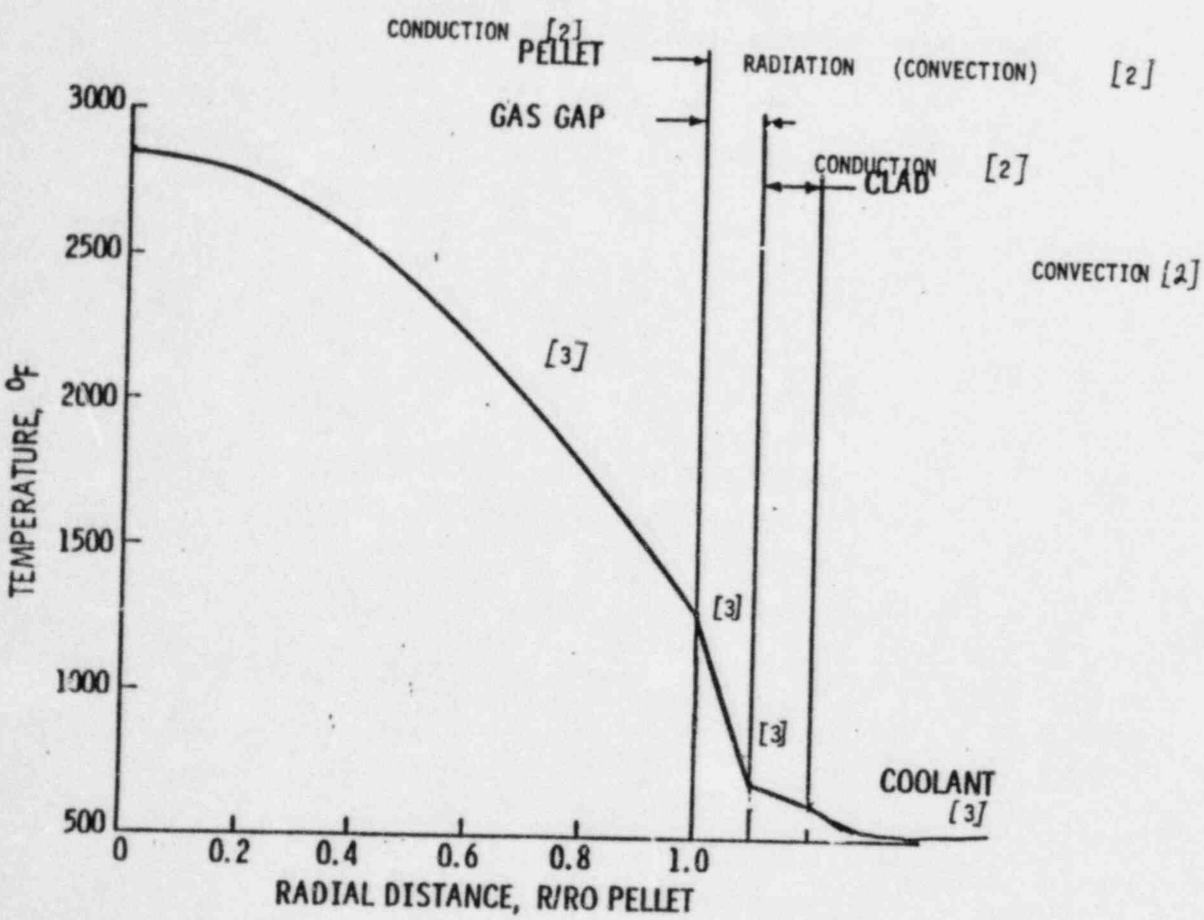
REFERENCE

General Reactor Operating Characteristics, p 36 122

TDB, pp 7,8,10,11

ANSWER 5.10 (3.00)

a. FUEL ROD TEMPERATURE PROFILE



(2.0)

a. Fuel temperature increases [0.5] adding negative reactivity (by doppler broadening) [0.5] (1.0)

REFERENCE
Thermal Hydraulics, p 2.1 246

ANSWER 5.11 (3.00)

a. As moderator temperature goes up, the diffusion length in water increases and the CEA is worth more. (1.0)

b. As boron concentration decreases, the diffusion length of neutrons in water increases and the CEA is worth more. (1.0)

c. Incremental stuck rod worth is more [0.5] due to the higher local neutron flux. [0.5] (1.0)

REFERENCE
General Reactor Operating Characteristics, p 26 296

ANSWER 5.12 (2.00)

a. EOL-MTC is most negative due to low boron concentration.[0.5] Therefore the cooldown caused by the steam line break will cause more positive reactivity to be added.[0.5] (1.0)

b. No-load -Mass of water in SG is maximun.[0.5] Therefore more water can be converted to steam to cause cooldown.[0.5] (1.0)

REFERENCE
General Reactor Operating Characteristics, p 18 315

ANSWER 5.13 (1.50)

Rods must be withdrawn for 3 hours then inserted.[0.5]
Xe is still building in due to I decay.[0.5]
Xe decay will be greater then I decay after 3 hours.[0.5] (1.5)

REFERENCE
General Reactor Operating Characteristics, p 44 342

ANSWER 6.01 (2.00)

Red- upper limit (> 134")
Green- lower limit (< 6")
White- regulating or part length CEA between limits
Blue- Shutdown CEA below exercise limit
Amber- CEA (< 2") [0.4each] (2.0)

REFERENCE
System Descriptions: CEA Control System, par. D-1-b-2-a 344

ANSWER 6.02 (2.00)

Letdown to ~~maximum~~ MIN (128 gpm at ~~+35"~~ -4) [0.5]
PZR heaters on (at ~~+13"~~ ~~300~~) [0.5]
~~Backup signal to stop both~~ START Backup Charging pumps START (at ~~+13"~~ ~~+100~~ -6") [0.5]
~~Spray valve opens (+100 psia) [0.5]~~ (Heater CUTOFF) -11" (2.0)

REFERENCE
System Descriptions: PLCS pp 10,11
PPCS pp 19,22 345

ANSWER 6.03 (2.00)

No reactor trip. [0.7] Trip signal would not be sent trip TCB's and CEDM would remain energized. [0.6] Manually trip plant. [0.7] (2.0)

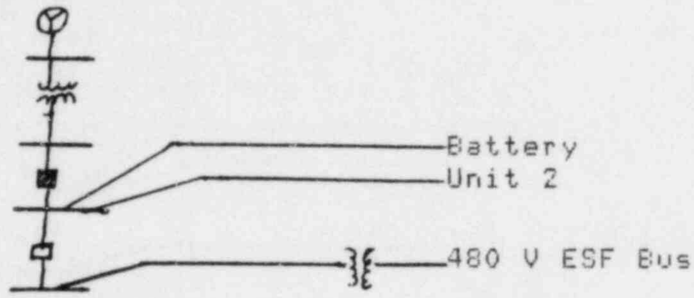
REFERENCE
Sysrem Descriptions: RPS p 27 346

ANSWER 6.04 (2.00)

EDG
4.1KV

Transformer
480VAC
Battery Charger
125VDC

Inverter
120 VAC vital



[0.2 each] (2.0)

REFERENCE
System Descriptions:Electrical Power Distribution pp 2-3 347

ANSWER 6.05 (2.50)

a. Valves on both HX open
b. No effect
c. All pumps start
d. Two of three pumps start
e. Valve is open (no effect) [0.5 each] (2.5)

REFERENCE
System Descriptions: Support Systems pp 2,4,6,7 348

ANSWER 6.06 (2.50)

High /low level alarm for SG-11 [0.1]
Turbine Trip [0.4] due to SG level safety channel [0.2]
Reactor Trip [0.4] due to turbine trip [0.2]
MFRV shuts [0.4] due to Reactor Trip [0.2]
FWR Bypass valve positions for 5% flow [0.4] due to Reactor Trip [0.2]
(2.5)

REFERENCE
System Description: Feedwater Regulating System p 11 349
Turbine Generator p 18

ANSWERS -- NRC -- 84/01/23 -- DUDLEY,N

ANSWER 6.07 (3.00)

a. Shutdown Cooling operating [0.75]
b. RAS [0.75]
c. Can be opened during recirculation phase to cool HPSI [0.75]
d. * Throttling capabilities required to control coolant t(emperature [0.75] (3.0)

REFERENCE
System Descriptions: Engineered Safety Features pp 6,9,13,15 350

ANSWER 6.08 (3.00)

a. No [0.35] not until power reaches 10 -4%. [0.4]
b. No [0.35] 2/4 channels must be tripped [[0.4]
c. Yes [0.35] both TM/LP channels will trip [0.4]
d. Yes [0.35] both APD channels will trip [0.4] (3.0)

REFERENCE
System Descriptions: Reactor Protection System pp 10,12,14-16,17 351

ANSWER 6.09 (3.00)

a. Rods will drive in to lower Tave [0.4]
Steam ~~dump~~ BYPASSES will open if SG pressure is > 900 psia [0.2]
Plant stabilizes at 60% power [0.4] (1.0)

b. Plant trips (on high pressure) [0.4]
All steam dump and bypass valves quick open [0.3]
Plant stabilizes at 532 F [0.3] (1.0)

c. ~~Rods drive in to lower Tave~~ Rx TRIP [0.3]
All steam dump and bypass valves quick open [0.3]
Plant stabilizes at 532 F, ~~2% power~~ [0.4] (1.0)

REFERENCE
System Descriptions: Reactor Regulating System 352

ANSWER 6.10 (3.00)

Wide range log channels use a single group of fission chambers [0.4] which supply a signal to an RMS (campbelling) circuit [0.4] and an LCR circuit [0.4]. LCR circuit provides constant output which is combined with the RMS output to produce power level. [0.3] (1.5)

Safety channels use two groups of UIC, U and L [0.5], which provide signals to two meters for Upper and Lower core power meters [0.5] and summed power to a recorder.[0.5] (1.5)

REFERENCE
System Descriptions: Nuclear Instrumentation Fig 4.3-5,4.4-2 353

ANSWERS -- NRC -- 84/01/23 -- DUDLEY,N

ANSWER 7.01 (1.50)

a. After formation of a bubble shutdown cooling should be secured. (0.75)

b. CVCS backpressure regulator will control pressure prior to bubble formation. (0.75)

REFERENCE
Op. Procedure B.1, pp B.1.5-B.1.7 355

ANSWER 7.02 (1.50)

Stop containment purge supply and exhaust fans manually [0.6]
Stop penetration room exhaust fan manually [0.3]
Close containment purge exhaust [0.2] supply [0.2] and sample valves manually. [0.2] (1.5)

REFERENCE
Op. Procedure C.15, pp C.15.2, C.15.3 356

ANSWER 7.03 (2.00)

Start RCP 12-A then RCP 12-B [0.6]
A cold RCP can be started three consecutive times if no other pump is operating in the loop. [0.7]
An RCP must be idled for 60 minutes between starts if there is a pump operating in the loop. [0.7] (2.0)

REFERENCE
OP. Procedure C.3, pp C.3.2, C.3.3 357

ANSWERS -- NRC -- 84/01/23 -- DUDLEY,N

ANSWER 7.04 (2.00)

a. Dropped rod
Flow blockage
Asymmetric core loading
Crud build up [any 2, 0.5 each] (1.0)

b: Axial Power Distributuion [0.5]
Thermal Margin [0.5] (1.0)

REFERENCE
Op. Procedure B.1, pp B.1.5-B.1.7 358
System Descriptions: RPS, p 27

ANSWER 7.05 (2.00)

~~Isolate letdown. [0.7]~~ e
~~Stop plant depressurization. [0.7]~~ e
Pressurize the plant using heaters and auxilary spray [0.6] (2.0)
BUBBLE BEING FORMED IN HEAD

REFERENCE
AOP-7, p 2 361

ANSWERS -- NRC -- 84/01/23 -- DUDLEY, N

ANSWER 7.06 (2.00)

Depress both Reactor trip pushbuttons [0.7]
Manually trip turbine [0.7]
Announce Reactor Trip over the public address system [0.6] (2.0)

REFERENCE
EOP 1, pp 2,5 362

ANSWER 7.07 (2.50)

a. 30 min. (0.7)

b. (-.75) - (-1.25) = .5% delta k/k [0.6]
87 ppm/% delta k/k X .5 % delta k/k = 43.5 ppm [0.6]
~~10,500~~ 15,000 gal. [0.6] (1.8)

REFERENCE
Op. Procedure B.6, p B.6.7 363
Technical Data Book Index, pp 6,18,22

ANSWER 7.08 (3.00) (to detailed?)

1. The isolation valve open and the power to the valve operator removed [0.5]. Page 2
2. Proper level (between 1113 and 1179 cuft) [0.5]
3. Proper boron concentration (1720 to 2700 ppm) [0.5]
4. Proper pressure (200 to 250 psig) [0.5] (2.0)

--- REFERENCE --- (DUD0000384) ---
T.S., p 3/4 5-1 384

ANSWER 7.09 (2.50)

If deboration is completed the reactor could be critical. [0.5]
Make the reactor at least 1% delta K/K subcritical [0.6]
Recheck criticality calculations [0.6] and boron concentration [0.6]
Notify Reactor Engineer [0.2] (2.5)

REFERENCE
Op. Procedure B.2, p B.2.4 379

ANSWER 7.10 (2.50)

a. Low Vacuum Alarm (20" Hg) (0.7)

b. Loss exceeding 10 min. [0.5] or RCP seal high temp. alarm (250 F) [0.3] or RCP bearing high temp alarm (195 F) [0.3] (1.1)

c. Leak greater than charging pump capacity. (132 gpm) (0.7)

REFERENCE
AOP 1, p 2 380
AOP 8, p 2
AOP 3, p 2

ANSWER 7.11 (3.50)

a. Prevents lifting the SG safety valves. (0.75)

b. Close MSIV
Close MSIV bypass valves
Close MFW isolation valve
Close AFW isolation valve
Close steam supply to AFW pump [any 4, 0.5 each] (2.0)

c. Prevents diluting the RCS (activation of SG impurities) (0.75)

REFERENCE
AOP 6, p4 381

ANSWER 8.01 (1.00)

Station Superintendent (or Operation's Supervisor) (1.0)
POSRC

REFERENCE
AP 2, p 7 368

ANSWER 8.02 (1.50)

a. * Requires procedure
b. * Does not require procedure
c. * Requires procedure
d. * Requires procedure
e. * Requires procedure [0.3 each] (1.5)

REFERENCE
AP 2, p 5 369

ANSWER 8.03 (1.50)

The shift supervisor should initiate a temporary change and route it to the appropriate Department Head. [0.75] The work should not be continued since there is an unreviewed safety issue and the intent of the procedure is changed. [0.75] (1.5)

REFERENCE
AP 10, pp6-7 370

ANSWER 8.04 (1.50)

a. Increased release of iodine. (0.75)

b. Containment purge valve isolation system. (0.75)
or cooling considerations or crane movement

REFERENCE
T.S., pp B 3/4 9-2, B 3/4 9-3 371

ANSWERS -- NRC -- 84/01/23 -- DUDLEY,N

ANSWER 8.05 (2.00)

a. Health Physics (0.5)

b. Yes [0.5] Shift supervisor's signature indicates an awareness of the work [0.5] and that plant conditions are suitable and will be unchanged. [0.5] (1.5)

REFERENCE
AP-7, p 8 372
AP-8, p 4

ANSWER 8.06 (2.00)

a. Continue to operate
b. Shutdown
c. Shutdown
e. Continue to operate [0.5 each] (2.0)

REFERENCE
T.S., p 3/4 4-15 373

ANSWER 8.07 (2.50)

a. Duty officer, Shift Technical Advisor, and Security Coordinator. [0.33 each] (1.0)

A

b. Dir. of Section Emergency Operation- overall station control
Manager of Control Room Operations- shift supervisor responsibility
Manager of Radiological Consequence Assessment- assesses radiological situation
Manager of Technical Support- provides technical support
Manager of External Communications- handles external communications [0.3 each] (1.5)

REFERENCE
Emergency Plan, pp see 22, bh 2 374

AP-5

ANSWER 8.08 (2.50)

LCO's indicate lowest performance level of equipment required for safe operation of facility. [0.8] If proper automatic action occurs prior to reaching Limiting Safety System Settings, then Safety Limits will not be exceeded. [0.8] If Safety Limits are not exceeded then fuel and RCS intergrity will be maintained.[0.9] (2.5)

REFERENCE
T.S., pp 2-3, B 2-1 375
10CFR50.36 c.2

ANSWER 8.09 (3.00)

a. Should [0.35] due to shutdown required by T.S.[0.4]
b. * Should not [0.35] since principle safety barriers are not seriously degraded. [0.4] (Should unusual event)
c. Should not [0.35] since planned actuation. [0.4]
d. Should [0.35] since portion of offsite notification system is lost. [0.4] (3.0)

REFERENCE
AP 5, pp 5-6 376

ANSWER 8.10 (3.00)

a. No [0.4] Should not enter action statement to perform routine maintenance. [0.6]
b. Yes [0.4] Only 3 channels/SG are required to be operable. [0.6]
c. No [0.4] By opening outer door air lock leakage will be excessive. [0.6] (3.0)

REFERENCE
T.S., pp 3/4 3-2, 3/4 6-3, 3/4 1-11 377

ANSWERS -- NRC -- 84/01/23 -- DUDLEY,N

ANSWER 8.11 (4.50)

a. Each test is within 25% of required time [0.35] and each three consecutive tests within 3.25 of reqired time [0.4].

Delare DG A inoperable. [0.25] Prove operability of DG B within 1 hr. [0.3] Conduct load test on DG A. [0.2] (1.5)

b. Cannot enter a higher mode with reliance on action statement. [0.75]

Stop heatup. [0.45] Restore HPSI pump operability prior to entering mode 3. [0.3] (1.5)

c. Unable to comply with LCO or Action Statement. [0.75]

Start shutdown within one hour. [0.25] Hot standby within next 6 hours. [0.25] Hot Shutdown within following 6 hours. [0.25] (1.5)

REFERENCE
T.S., pp. 3/4 0-1, 3/4 0-2, 3/4 5-3, 3/4 7-4, 3/4 8-1 378