August 30, 1984

Mr. Edward G. Greenman
Chief, Projects Branch #1
U. S. Nuclear Regulatory Commission, Region I
King of Prussia, PA 19406

Dear Mr. Greenman:

Thank you for the opportunity to review the Reactor Operator and Senior Reactor Operator written examinations administered at the Peach Bottom Atomic Power Station on August 28, 1984. We believe that both examinations were straight-forward, comprehensive and operationally oriented, and were professionally and fairly administered.

The new review process was workable and constructive, resulting in resolving the majority of our concerns through open dialogue with the examiners. After review and discussion of both examinations, four comments remain which require additional reference material for clarification of answers. Enclosed is a list of these comments by question number. For each comment, specific reference material supporting the clarification is provided.

Very truly yours,

Richard S. Fleischmann, II
Superintendent
Peach Bottom Atomic Power Station

cc: W. T. Ullrich
R. W. Bulmer
S. J. Mannix

Enclosure

PHILADELPHIA ELECTRIC COMPANY
COMMENTS ON
NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR/SENIOR REACTOR OPERATOR
LICENSE EXAMINATION
PEACH BOTTOM ATOMIC POWER STATION

August 28, 1984

3.04 This question asks the mechanisms of generating a reactor scram signal from a Turbine Control Valve fast closure.

Comment: Answer key references ETS pressure from LOT lesson plan. Lesson plan should state RETS (Relayed Emergency Trip Supply). PBAPS turbine uses Relayed ETS since drain lines are low capacity. Figure 1 to question 3.04 illustrates details of this arrangement. Answer key also discusses actuation of Fast Acting Solenoid in Control Pac. Fast Acting Solenoid is only actuated by Load Unbalance Relay (See Figure 2 to question 3.04) or last 10% of TCV test closure.

3.05b What are the effects of a condensate pump trip when Feed Flow is greater than 90%?

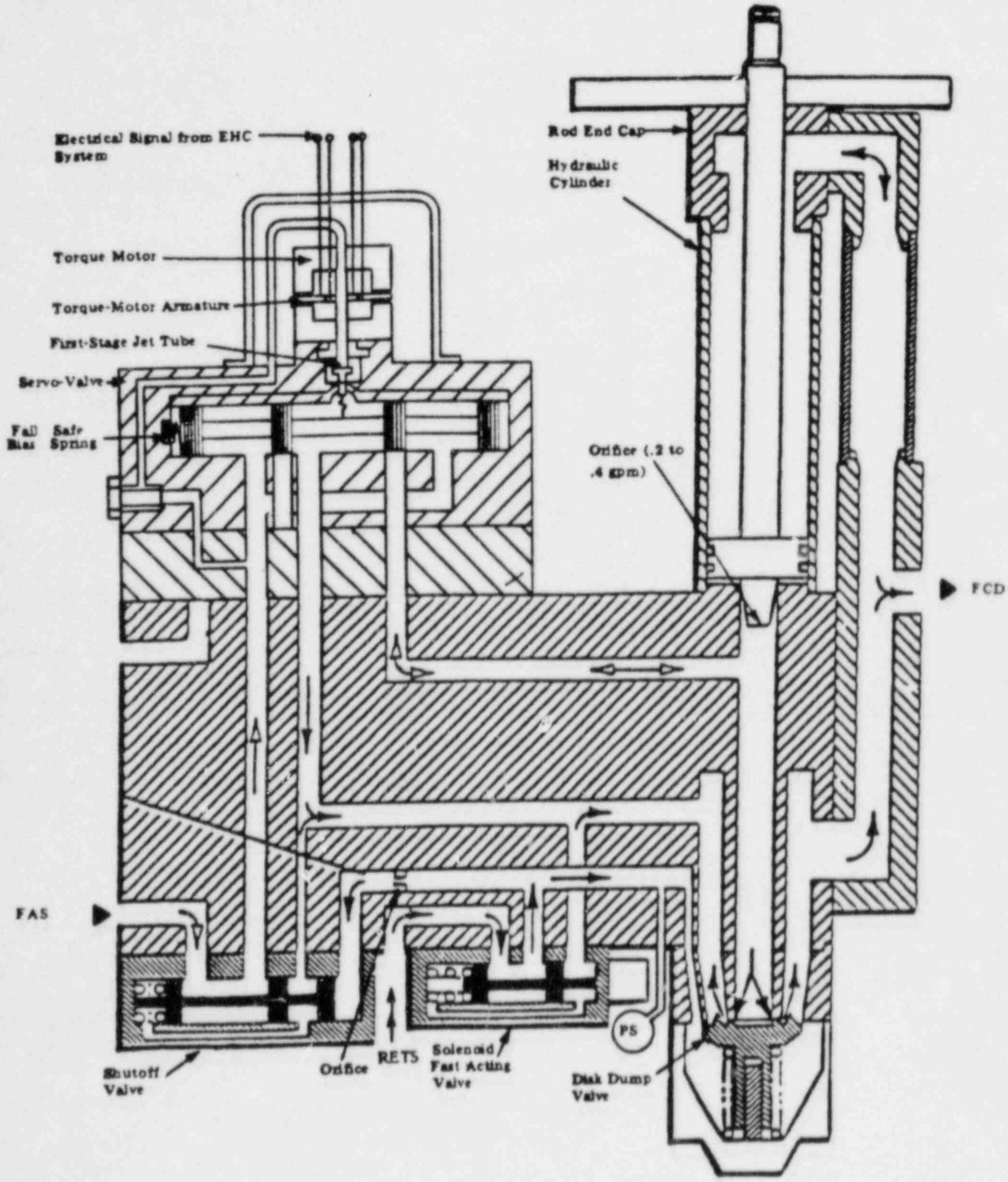
Comment: Reference lesson plan gives incorrect value to EHC load set runback triggered by the above conditions. EHC load set runback only occurs (at 1%/sec) when total feed flow is greater than 95%. Figure 3 to question 3.05b shows the conceptual logic while Figure 4 to question 3.05b is an LER involving this circuit.

4.05c Question asks when actual Core Spray Injection to vessel would occur during a LOCA.

Comment: Answer key implies injection would occur as soon as 450 psig injection valve permissive is achieved. Figure 5 to question 4.05c is provided to detail actual core spray pump characteristics.

7.03b Question asks reason behind 50% speed limitation on running recirc pump when bringing on idle pump.

Comment: Answer key discusses minimizing chance of APRM scram due to flow redistribution. Figure 6 to question 7.03b details consideration of vibration induced by flow reversal.



EHC Control Pac for a Controlling Valve

TRANSPARENCY 6

LOR-84/2

Figure 1 to question 3.04

Peach Bottom Atomic Power Station
Delta, Pennsylvania
17314

February 22, 1973

FROM: J. Winzenried

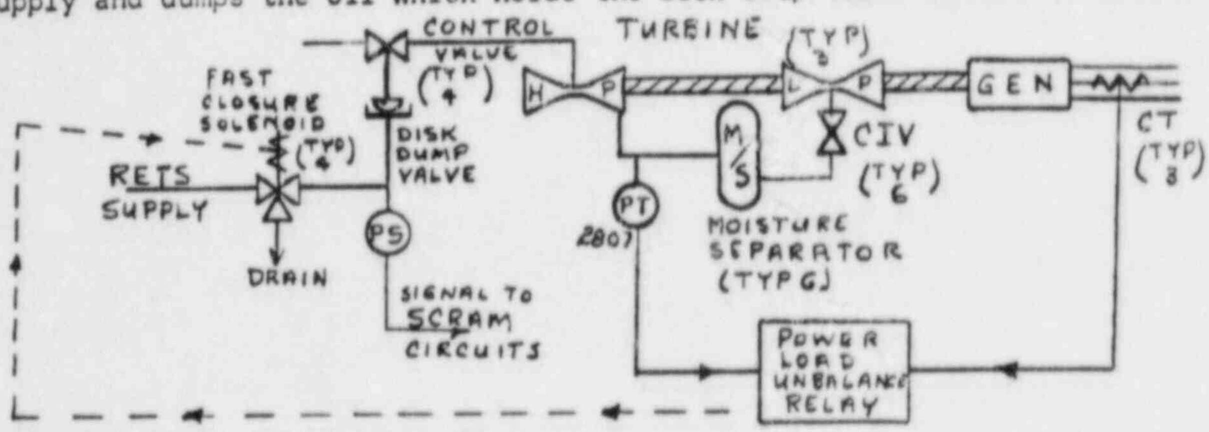
TO: BWR Trainees

SUBJECT: Load Reject Scram (Control Valve First Closure/RETS OIL LO PRESSURE)

The load reject condition (tripping of the 500KV generator output breakers 215 and 225) is detected by a "POWER-LOAD UNBALANCE" Relay which is in the turbine control package. The Power-Load Unbalance Relay compares generator amps (all three phases) to turbine cross-around pressure (see P&ID M-303 area H-3 PT-2807). Cross-around pressure is proportional to turbine load.

When turbine load is 40% greater than generator amps the Power-Load Unbalance Relay trips and sends a trip signal to the control valve fast closure solenoid.

In the "Tripped" condition, the fast closure solenoid blocks the RETS oil supply and dumps the oil which holds the disk dump valve closed to drain.

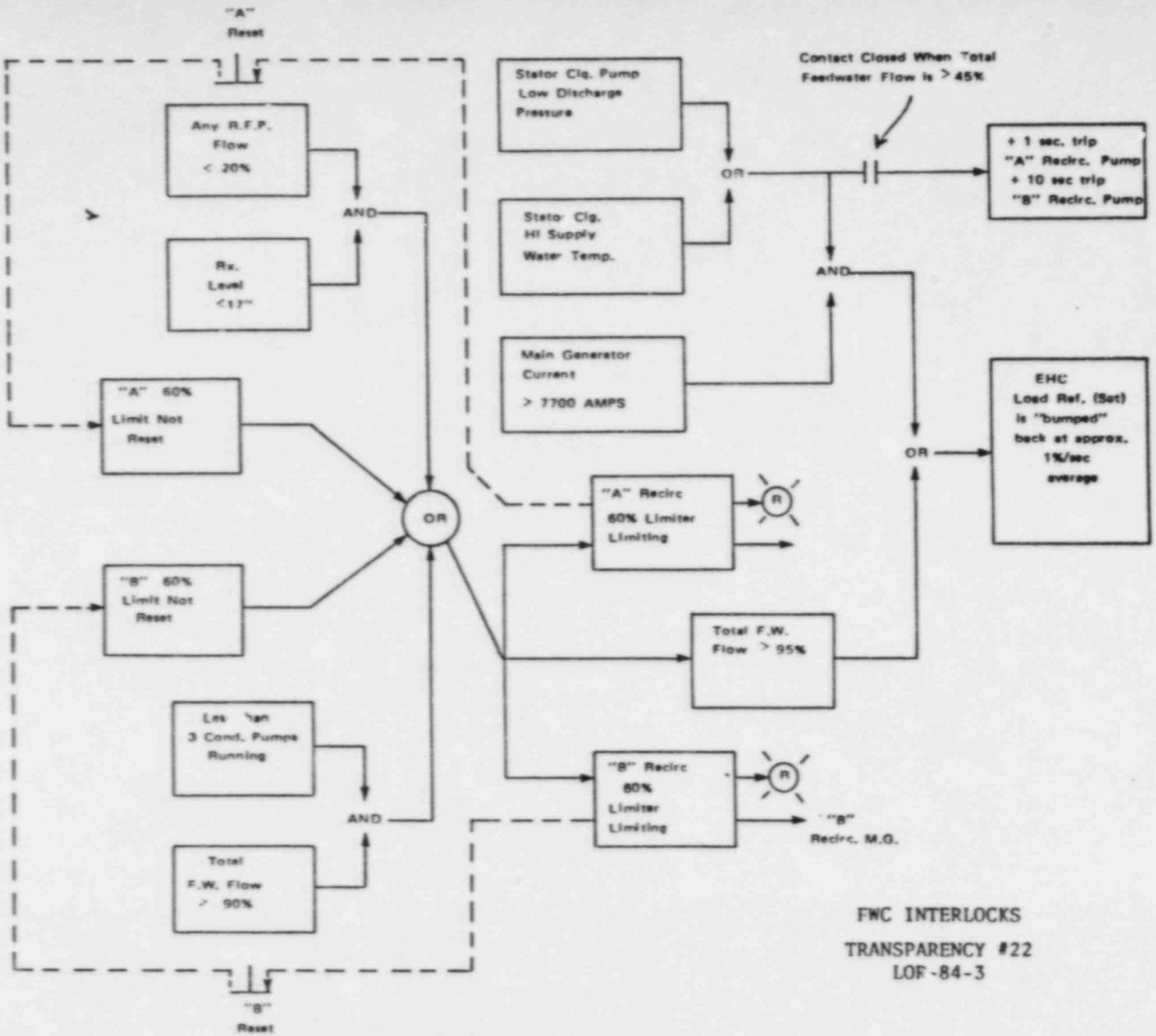


When the disk dump valve opens the control valve goes closed in 0.2 sec.

The pressure switch (PS) detects the decreasing oil pressure (setpoint 500 to 850 psig) before the disk dump valve opens and sends the scram signal. Thus, this scram signal anticipates the pressure and resulting flux transient which will occur when the control valves go shut in 0.2 seconds.

J. Winzenried

Figure 2 to question 3.04



FWC INTERLOCKS

TRANSPARENCY #22
LOF-84-3

Figure 3 to question 3.05b

2840011500

COPY

SAS

PHILADELPHIA ELECTRIC COMPANY

2301 MARKET STREET

P.O. BOX 8699

PHILADELPHIA, PA. 19101

(215) 841-4000

March 7, 1984

Docket No. 50-278

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Licensee Event Report

This LER deals with a reactor scram on APRM high flux caused by the failure of a relay in the turbine EHC runback logic.

Reference:	Docket No. 50-278
Report Number:	3-84-05
Event Date:	February 9, 1984
Report Date:	March 7, 1984
Facility:	Peach Bottom Atomic Power Station RD #1, Box 208, Delta, PA 17314

This LER is submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(IV).

Very truly yours,

W. T. Ullrich
Superintendent
Nuclear Generation Division

cc: Dr. Thomas E. Murley, Administrator
Region I, USNRC

Mr. A. R. Blough
Site Inspector

8403130158

xcc: R. S. Fleischmann, II
W. M. Alden/MBR
DAC

Figure 4 to question 3.05b

NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): Peach Bottom Atomic Power Station - Unit 3
DOCKET NUMBER (2): 0 5 0 0 0 2 7 8
PAGE (3): 1 OF 0 3

TITLE (4): Reactor Scram Due to APRM High Flux

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 2	0 9	8 4	8 4	0 0 5	0 0	0 3	0 7	8 4		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): N
POWER LEVEL (10): 0 9 2

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

- [X] 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER (12)

NAME: B. L. Clark, Senior Engineer - Special Projects
TELEPHONE NUMBER: AREA CODE 2 1 5 — 8 4 1 - 5 0 1 7

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	S R	C P L G	Z 0 1 0	Y					
X	T C	2	A 1 0 9	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

- [ ] YES (If yes, complete EXPECTED SUBMISSION DATE)
- [X] NO

EXPECTED SUBMISSION DATE (15): MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

Abstract 3-84-05

On February 9, 1984, at 6:07 p.m., a runback and subsequent relay failure in the Main Turbine Electrohydraulic Control System (EHC) resulted in a Unit 3 reactor auto scram on high neutron flux.

With Unit 3 operating at about 92% power, the 3B reactor feed pump (RFP) turbine experienced high vibration. Manually tripping the reactor feedpump turbine caused an automatic runback of the recirculation pumps and the turbine EHC system. A faulty relay contact in the EHC system kept the closing circuit of the main turbine control valves energized which resulted in a reactor auto scram on high neutron flux.

The faulty EHC relay and a faulty reactor feedpump turbine coupling which was causing the vibration were replaced. A routine test will be instituted to functionally test this relay and the EHC runback logic each refueling outage.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Peach Bottom Atomic Power Station Unit 3	0 5 0 0 0 2 7 8	8 4	— 0 0 5	— 0 0	0 2 OF 0 3

TEXT (If more space is required, use additional NRC Form 366A's) (17)

Description of the Event:

On February 9, 1984, Peach Bottom Atomic Power Station, Unit 3, was operating at about 92% power. At approximately 6:00 p.m., the 3B reactor feed pump experienced high vibration. The reactor operator, in an effort to decrease the vibration, reduced flow through the pump. Vibration continued and the operator manually tripped the pump. The ensuing transient caused reactor water level to decrease.

With feedwater flow greater than 95% and reactor water level below plus 17 inches, recirculation pump and EHC runback signals were correctly initiated.

The EHC runback is designed to slowly pulse down the turbine load at approximately 1% per minute. An Agastat relay (Model 2432 PDC) failure caused the EHC system to runback at a rapid continuous rate. The main turbine bypass valves opened to compensate for the reduced turbine load. When all bypass valves were fully open and the control valves continued to close, a high neutron flux auto scram occurred at 6:07 p.m.

Consequences of the Event:

The Reactor Protection System functioned properly and the reactor successfully auto scrammed on high flux. Since the Reactor Protection System functioned properly and no design limits were exceeded, the safety consequences of this event are considered minimal.

Cause of the Event:

The cause of the event was the failure of an Agastat relay (Model 2432 PDC) in the turbine EHC runback logic.

NRC Form 366A

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Peach Bottom Atomic Power Station Unit 3	0 5 0 0 0 2 7 8	8 4	0 0 5	0 0	0 3 OF 0

TEXT (If more space is required, use additional NRC Form 366A's) (17)

The relay, if operating properly, should have decreased turbine load at approximately 1% per ~~minute~~ second until feedwater flow was less than 95%. However, a contact within this relay remained closed after the EHC runback was initiated causing a runback at a ~~much faster rate~~ and preventing the runback from stopping when it was no longer needed. The cause of the 3B reactor feedpump vibration problem was a faulty Zurn coupling.

Corrective Actions:

The Agastat relay was replaced. A routine test has been written and will be instituted to functionally test this relay and the EHC runback logic each refueling outage.

The Zurn coupling on the 3B reactor feedpump turbine was replaced and the turbine was returned to satisfactory service.

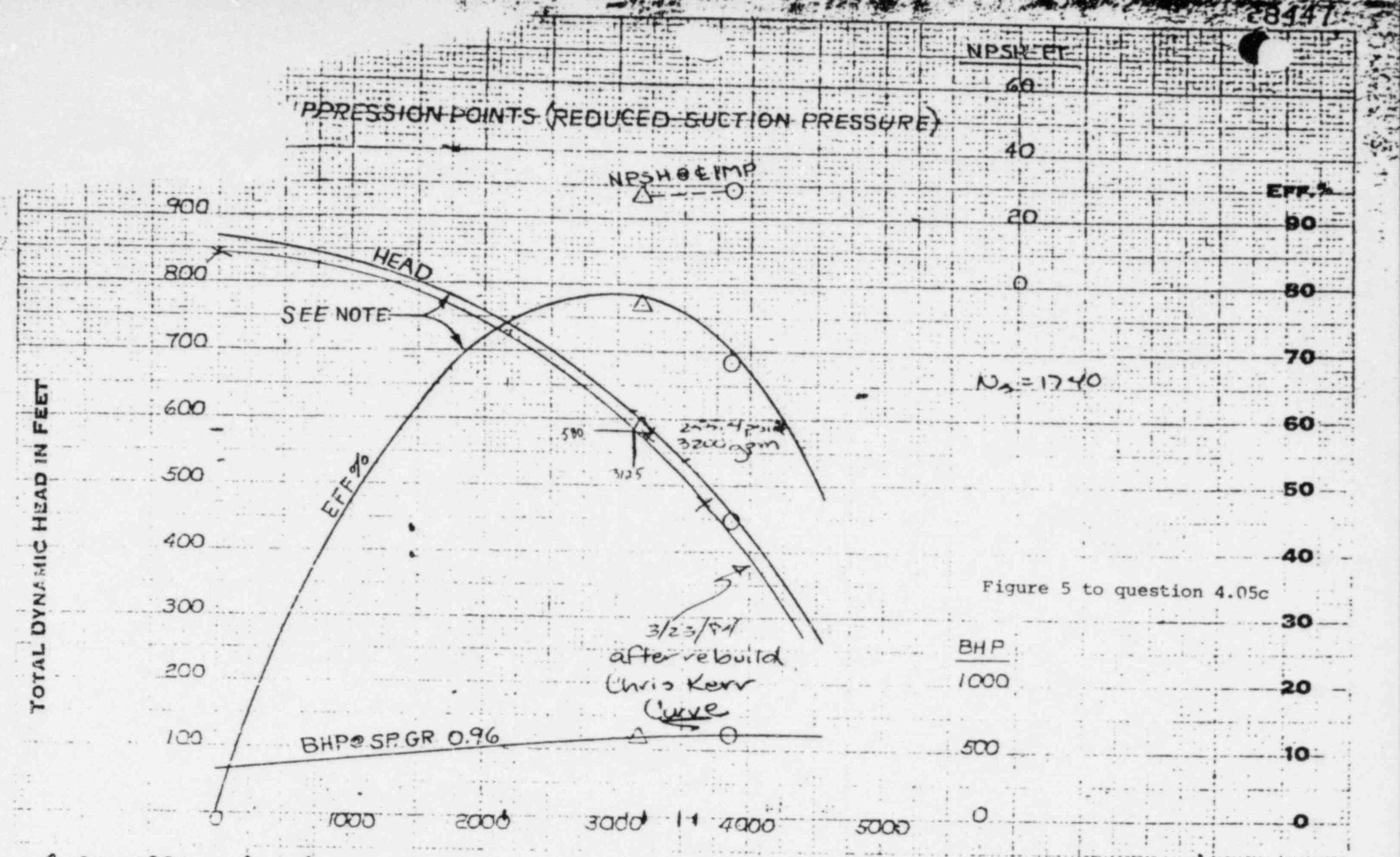


Figure 5 to question 4.05c

CORE SPRAY PUMP 3A

NOTE: SEE DATA SHEET T-280414-1
FOR CURVE DATA.

WITNESS TEST PERFORMANCE
BINGHAM-WILLAMETTE COMPANY
PORTLAND, OREGON

GENERAL ELECTRIC CO APED PHILADELPHIA ELECT. CO PEACH BOTTOM UNIT 3 CORE SPRAY PUMP PUMP 0280414	CHARACTERISTIC CURVE SHEET BINGHAM PUMP CO. PORTLAND CH ORE	IMPELLER MAX. DIA. $14\frac{1}{2}$ MIN. DIA. EYE AREA 610 SQ. IN.	12 X 16 X $14\frac{1}{2}$ CVDS PUMP		
			DIA. IMPELLER $14\frac{1}{16} \times 13\frac{13}{16}$ e11°	IMPELLER PATT. 1213CVDS-4	3575 R.P.M.
			N.P.S.H. REQUIRED	REFERENCE	CURVE No 2844

C-102

3.6.F & 4.6.F BASES

Jet Pump Flow Mismatch

Requiring the discharge valve of the lower speed loop to remain closed until the speed of faster pump is below 50% of its rated speed provides assurance when going from one to two pump operation that excessive vibration of the jet pump risers will not occur.

Operation with one recirculation loop in service is permitted. In such instances, the designated adjustments for APRM rod block and scram setpoints, RBM setpoint, MCPR fuel cladding integrity safety limit, MCPR operating limits, and MAPLHGR limits are required.

Figure 6 to question 7.03b

MASTER COPY

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: _PEACH_BOTTOM_2&3________

REACTOR TYPE: _BWR-GE4________________

DATE ADMINISTERED: _84/08/28______________

EXAMINER: _KVARME,_J.______________

APPLICANT: ________________________

INSTRUCTIONS TO APPLICANT:

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	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	25.00	___________	________	1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
25.00	25.00	___________	________	2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
25.00	25.00	___________	________	3. INSTRUMENTS AND CONTROLS
25.00	25.00	___________	________	4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
100.00	100.00	___________	________	TOTALS

FINAL GRADE _________________%

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

____
APPLICANT'S SIGNATURE

QUESTION 1.01 (1.50)

Attached FIGURE 1 shows a basic closed loop fluid system with its head vs. flow plot. The two pumps are identical, single speed, radial, centrifugal pumps. Initially, assume Pump 1 is operating to supply flow to Component 1, as shown.

a. WHAT is Point X on the System Head vs. Flow Plot? (0.5)

b. WHICH pump curve, A or B, most accurately shows BOTH PUMPS operating to supply system flow? (0.5)

c. WHICH WAY, to the LEFT or to the RIGHT, would the System Curve shift if Component 2 was valved into the system, in addition to Component 1? (0.5)

QUESTION 1.02 (3.00)

A hot reactor is increased in power by withdrawing control rods. The void fraction increases 1.5% and fuel temperature increases 40 degrees F. Assuming no change in moderator temperature, what was the reactivity worth of the control rod? Show all work and state any assumptions you make. (3.0)

QUESTION 1.03 (3.00)

Classify the heat exchanger on the attached figure according to:

a. operational mode (1.0)

b. type of heat rejection (1.0)

c. flow path (1.0)

QUESTION 1.04 (3.25)

Concerning THERMAL LIMITS:

a. Since MCPR is not a directly measurable parameter, WHAT are THREE (3) measurable core parameters needed by the process computer to calculate MCPR? (1.0)

b. With regard to MAPRAT: (2.25)
   1. WHAT is the RELATIONSHIP between MAPRAT & MAPLHGR?
   2. The process computer prints out a MAPRAT of 1.05. Is this acceptable?
   3. WHAT physical consequence could occur if the MAPRAT limit is exceeded?

QUESTION 1.05 (3.00)

Three (3) minutes following a reactor scram from high power, indicated reactor power is 75 on range 4 and decreasing.

a. WHAT will INDICATED power be one (1) minute later? (Show calculations) (1.5)

b. Explain WHY power decreased at this rate. (1.5)

QUESTION 1.06 (3.00)

a. List three(3) factors that cause excess reactivity of the core to decrease over cycle life. (1.5)

b. List three(3) factors that will cause Shutdown Margin (SDM) to increase. (1.5)

QUESTION 1.07 (1.50)

a. During power operations, Samarium is not normally considered an operational concern as is Xenon. State two(2) reasons why Xenon is an operational concern while Samarium is not. (1.0)

b. True or False: At lower power levels, Xenon equilibrium is reached FASTER than at higher power levels. (0.5)

QUESTION 1.08 (3.00)

With Unit 2 at rated conditions the EHC pressure setpoint (on the controlling pressure regulator) is lowered to its minimum value with the DECREASE pushbutton. Assuming NO further operator action, answer the following using attached FIGURE:

a. WHY does APRM power gradually decrease in AREA 1? (0.5)

b. WHAT is causing total steam flow to be >100% rated flow at POINT 2? (0.5)

c. WHY did total feed flow increase to full scale at POINT 3? (0.5)

d. WHAT caused total feed flow to go to zero at POINT 4? (0.5)

e. WHAT is indicated by the oscillations in the wide range reactor pressure trace (AREA 5)? (0.5)

f. WHY do the peaks in the pressure oscillations occurring in AREA 5 become farther apart with time? (0.5)

QUESTION 1.09 (.75)

The reactor is operating at a steam dome temperature of 536 degrees F when reactor power is increased so that steam dome temperature increases to 544 degrees F. WHICH of the following statements is most correct?

a. Steam pressure increased, steam enthalpy increased.

b. Steam pressure remained constant, steam enthalpy decreased.

c. Steam pressure increased, steam enthalpy decreased.

d. Steam pressure remained constant, steam enthalpy increased.

QUESTION 1.10 (3.00)

Following a normal reduction in power from 90% to 70% with recirculation flow, HOW will the following change (increase, decrease, or remain the same) AND WHY:

a. The pressure difference between the reactor and the turbine steam chest. (1.0)

b. Condensate depression at the exit of the condenser. (1.0)

c. Final Feedwater temperature. (1.0)

QUESTION 2.01 (3.00)

Indicate whether the following statements are TRUE or FALSE. If false, EXPLAIN WHY.

1. Scram valves are normally held closed by spring pressure and opened by air pressure from a single air line which is controlled by the scram pilot valve.

2. Back-up scram solenoids energize upon a scram.

3. Cooling water flow enters the exhaust port and will leak past seals into the reactor vessel.

QUESTION 2.02 (3.50)

Concerning the Standby Liquid Control System:

A. Why is it necessary for the system to be capable of injecting the contents of the SLC tank in a MAXIMUM time of 125 minutes? (1.0)

B. What are Three (3) uses of the SLC injection sparger OTHER THAN poison injection? (1.5)

C. List Three (3) of four indications that an operator has availible to determine that Standby Liquid Control is indeed injecting into the Reactor Vessel. (1.0)

QUESTION 2.03 (3.00)

Regarding the Standby Gas Treatment System:

A. What are Three (3) of the four conditions which will auto initiate the system? Setpoints are required. (1.5)

B. Consider Unit 2 & 3 seperately. Indicate the primary and back-up "FAN" (A,B, or C) and the primary and back-up "FILTER-TRAIN" (A or B) for an auto initiation signal. (1.5)

QUESTION 2.04 (1.50)

What automatic trips are associated with the Fuel Pool Cooling water pumps? Setpoints are NOT REQUIRED. (1.5)

QUESTION 2.05 (3.75)

A. List the automatic start signals for the emergency diesel generators. Give setpoints where applicable. (2.25)

B. Briefly EXPLAIN the response of the ESW/ECW systems with respect to the diesel generator on an auto start. (1.5)

QUESTION 2.06 (3.50)

A. What is the largest heat load on the RBCCW system? (.75)

B. What is the most important load on the RBCCW system? (.75)

C. Upon loss of the feeder buses to the drywell chilled water chillers and pumps, what equipment is ISOLATED AND SUPPLIED in the RBCCW System? (2.0)

QUESTION 2.07 (3.25)

A. What are the two sources of steam for the Reactor Feed Pump Turbines? Be specific. (1.0)

B. For the following statements, indicate whether TRUE or FALSE. If false, EXPLAIN why.

1. The "C" Reactor Feed Pump discharge bypass valve's purpose is to provide the pump with minimum flow for cooling during low flow operations. (.75)

2. The Motor Speed Changer (MSC) of the feed pump turbine can regulate turbine speed only between 2200 rpm and full speed. (.75)

3. A reactor feed pump turbine has 5 low pressure and 1 high pressure control valve. (.75)

QUESTION 2.08 (1.00)

Identify FOUR (4) possible discharge flow paths of the HPCI pump. (1.0)

QUESTION 2.09 (2.50)

With regard to the Main Steam Safety Relief Valve (SRVs):

A. EXPLAIN HOW/WHY an SRV discharge pipe (tail pipe) could be damaged due to its vacuum breaker sticking shut during repeated actuation (lifting) of the SRV. (2.0)

B. How (INCREASE, DECREASE, REMAINS the SAME) would Drywell Pressure be expected to respond to an SRV discharge line vacuum breaker STICKING OPEN during actuation of the SRV? (.5)

QUESTION 3.01 (2.00)

What are the FOUR (4) conditions which will cause a PCIS Group IIA (Reactor Water Cleanup System) isolation? Setpoints NOT required. (2.0)

QUESTION 3.02 (3.00)

Refer to the attached Recirculation Flow Control Figure for the following:

A. The plant is operating at 26% power and both recirc pump M/A transfer stations are in MANUAL and set for 28% speed. The recirc flow 'A' limit annunciator is clear. Recirc Pump 'A' M/A transfer station is then placed in AUTO. INdicate HOW the speed o. Recirc Pump 'A' would change (increase, decrease or remain the same) and WHICH component(s) of the control system is(are) limiting. (1.5)

B. Following a 'runback' of the recirc system from 100% power due to the trip of one feed pump, WHAT action must be taken by the control room operator prior to resetting the 'runback'? WHY? (Assume RFP is restarted prior to reset.) (1.5)

QUESTION 3.03 (2.50)

What are the signals required to initiate the Automatic Depressurization System (ADS) (setpoints required) and for each identify WHY each signal is used? (2.5)

QUESTION 3.04 (3.00)

Briefly describe the sensing method of a Turbine Control Valve fast closure and HOW does it interface with the Reactor Protection System (RPS) Logic? (3.0)

QUESTION 3.05 (4.00)

Briefly state what will occur from each of the below changes in the feedwater flow conditions. (NOTE: Consider only other components and systems and NOT integrated plant response.)

A. Total Feedwater and Total Steam flow are > 25%. Total Feedwater flow then drops below 25%. (1.0)

B. Total Feedwater flow is > 90% and a condensate pump trips. (1.0)

C. Recirc Pump speed is 40% and Total Feedwater Flow drops to less than 20%. (1.0)

D. Total Feedwater flow is >95%. Feedwater Flow 'A' then drops to < 20% and Reactor Water Level drops to < 17". (1.0)

QUESTION 3.06 (2.50)

Briefly DESCRIBE each of the FIVE different ranges of Reactor Vessel Level Indication in terms of the following:

a. The NAME of the indicating range.
b. Its SPAN.
c. Its ZERO REFERENCE.
d. Its CALIBRATION TEMPERATURE (Hot or Cold). (2.5)

QUESTION 3.07 (3.00)

Consider the Neutron Monitoring System:

A. Why is it necessary to gamma compensate the Source and Intermediate Range Monitor signals? (1.0)

B. At what percent power should the APRM flow biased scram occur with 50% recirc loop flow? (1.0)

C. What are FOUR conditions that will result in an 'APRM INOPERATIVE' while in the Startup Mode? (1.0)

QUESTION 3.08 (2.00)

Briefly EXPLAIN the function of the 2 Second Auxilary Timer in the Reactor Manual Control System (RMCS). Include in your explanation what occurs when this timer times out. (2.0)

QUESTION 3.09 (3.00)

Unit 2 is operating with the following conditions:

Reactor power	=100%
Total Core Flow	=100%
Reactor Pressure	=1010 psig
Turbine Load Set	=100%
Turbine Speed Select	=1800 rpm
Pressure Set	=920 psig
Max Combined Flow Set	=100 (Equivalent to 125% steam flow)
Load Limit Set	=100%
Bypass Capacity	=25%
Recirculation Flow Control	=Master Manual

Using the attached EHC Logic and Pressure Control Diagrams EXPLAIN the system response to each of the following below. (NOTE: Show any calculations you may make and take the problem to a stable point condition.)

A. The bias signal to the 'A' pressure regulator is inadvertently increased to + 5 psi. (1.5)

B. Grid frequency increases suddenly to a value consistent with 1804.5 rpm turbine speed. (1.5)

QUESTION 4.01 (2.00)

One of the steps in the TRIP Procedure T-100, 'SCRAM', has the operator place the Mode Switch in the 'SHUTDOWN' position. State TWO goals accomplished by this action. (2.0)

QUESTION 4.02 (2.00)

You are the Reactor Operator during high power operations and suddenly notice that Reactor Pressure is at 1050 psig. What are your immediate actions? (NOTE: Assume a scram HAS NOT occur.) (2.0)

QUESTION 4.03 (.50)

Choose the correct statement below: (.5)

In accordance with ON-100, 'Failure of a Jet Pump', if a jet pump failure is confirmed:

A. Secure the associated recirc pump and isolate that recirc loop.
B. Immediately stop both recirc pumps and scram the reactor.
C. Commence a controlled plant shutdown in accordance with GP-3.
D. Immediately scram the plant and cooldown to < 212 F.

QUESTION 4.04 (3.00)

WHEN MUST the Reactor Operator initiate the Standby Liquid Control (SLC) System 'WITHOUT' the Shift Supervisor's permission? (3.0)

QUESTION 4.05 (2.00)

You are the Reactor Operator during a LOCA and your attention is focused on the Core Spray System.

A. How soon should the Core Spray Pumps start after the receipt of all the initiation signals? (NOTE: Consider both with and without Normal power availible.) (1.0)

B. What action should you take if the 'A' Core Spray pump did not auto start. (.5)

C. Core Spray injection into the Reactor Vessel is blocked until the condition of low Reactor Pressure occurs. Pump discharge will be through the minimum flow recirc valves until that time. At what Reactor PRESSURE will the Core Spray System inject into the Reactor Vessel? (.5)

QUESTION 4.06 (3.00)

According to Procedure OT-114:

A. List FOUR (4) observations an operator could make in order to verify that a Safety Relief Valve (SRV) is stuck open while at high power. (2.0)

B. What immediate action(s) should the operator take for a stuck open SRV? (1.0)

QUESTION 4.07 (2.00)

With the reactor shutdown and cooled down to less than 212 F, according to GP-12, 'Core Cooling Procedure':

A. If only one loop of Shutdown Cooling is ON ~~and~~ WITH NO recirc flow through the other loop, reactor level must be maintained high enough to prevent WHAT from occurring? (1.0)

B. HOW would coolant temperature stratification be indicated by reactor vessel metal surface temperatures? (1.0)

QUESTION 4.08 (2.00)

What are TWO (2) reasons for requiring by procedure that HPCI and RCIC NOT be operated at less than 2200 rpm? (2.0)

QUESTION 4.09 (3.00)

What are the FOUR (4) entry conditions for the 'Reactor Pressure Vessel (RPV) Control, 'TRIP procedure, T-101? (NOTE: Setpoints are required where applicable.) (3.0)

QUESTION 4.10 (2.50)

Regarding ON-113, 'Loss of RBCCW':

A. What THREE (3) automatic actions should be verified if the non-regen heat exchanger outlet temperature reaches 200 F? (1.5)

B. WHEN must the recirc pumps be tripped following a loss of RBCCW? (.5)

C. When shutting down the recirc pumps, WHY are they first runback to minimum speed, then tripped 10 seconds apart? (.5)

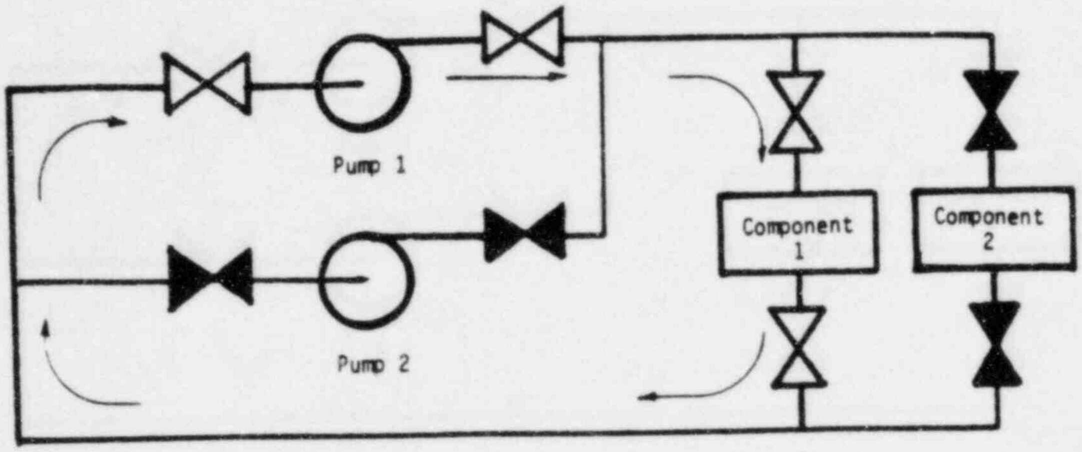
QUESTION 4.11 (3.00)

According to GP-2, 'Normal Plant Startup':

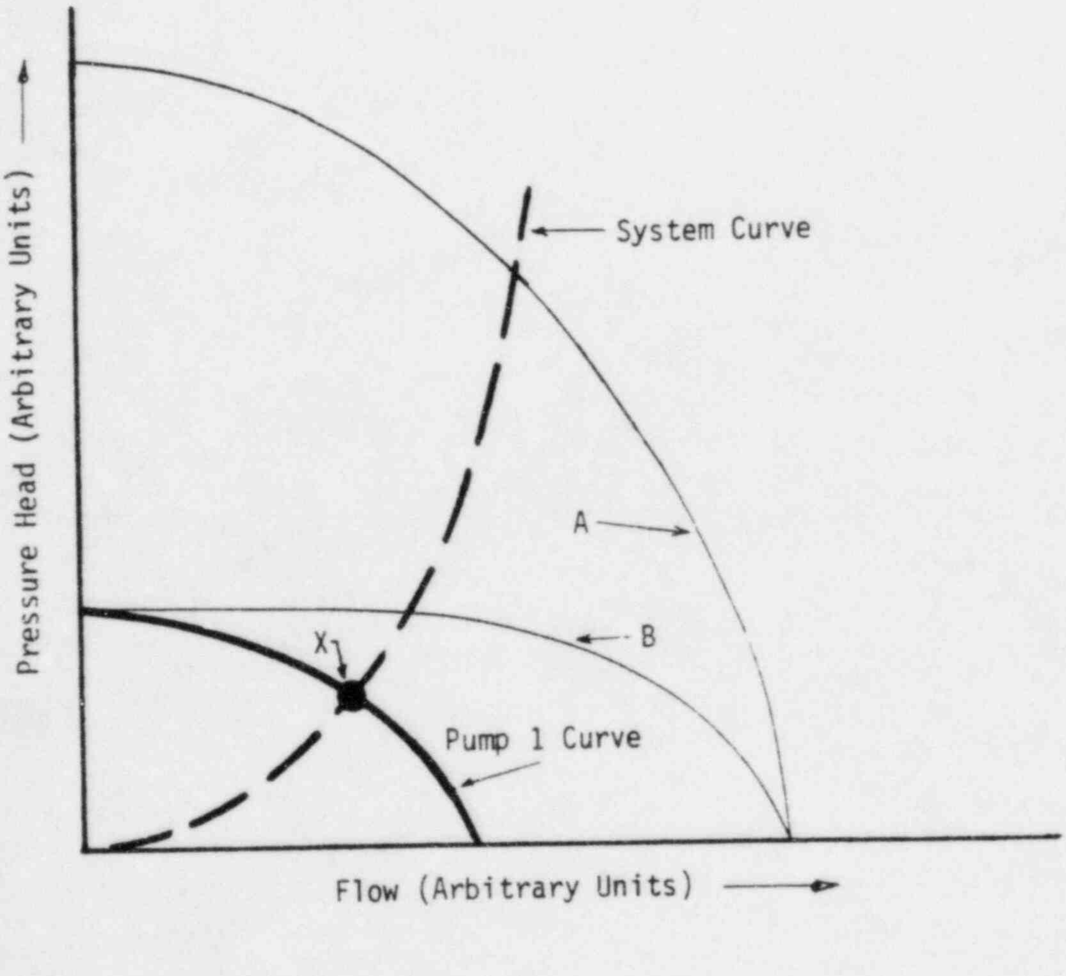
A. During the approach to critical, WHICH rod(s) in a new Rod Group are likely to exhibit high notch worth? (1.0)

B. During heatup to rated temperature and pressure after raising the EHC pressure setpoint to 600 psig, EXPLAIN WHY one turbine bypass valve is opened to 10 to 20% (with the bypass valve jack)? (2.0)

FIGURE . for Question 5.01

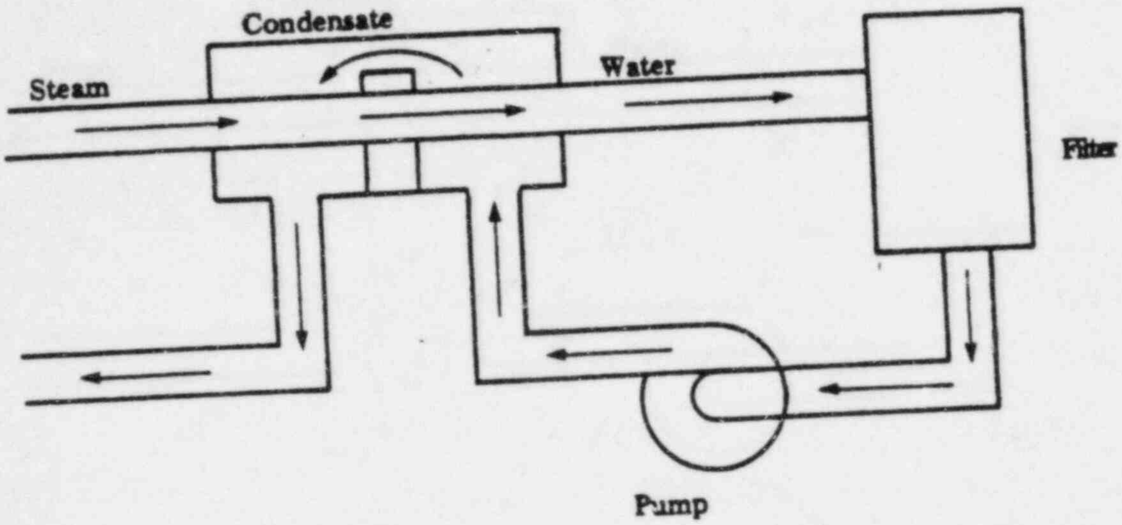


SYSTEM



SYSTEM HEAD VS. FLOW PLOT

FIGURE FOR QUESTION 1.03



ANSWER 6.01 (1.50)

Reactor pressure less than or equal to 135 psig
Drywell pressure < 2 psig
Reactor level > 162 1/2 inches
(0.5 each) (1.5)

REFERENCE
RHR Study Guide pg 9 DNG59

ANSWER 6.02 (3.00)

a. No effect(0.5). The EHC system has a permanent magnet generator on the turbine which would continue to provide power(0.5). (1.0)
b. Reactor feed pump controls lock up(0.5) due to loss of RFP control signal(0.5). (1.0)
c. Condenser vacuum would decrease(0.5) due to the air ejectors tripping (0.25) and the loss of 2 CW intake pumps(0.25). (1.0)

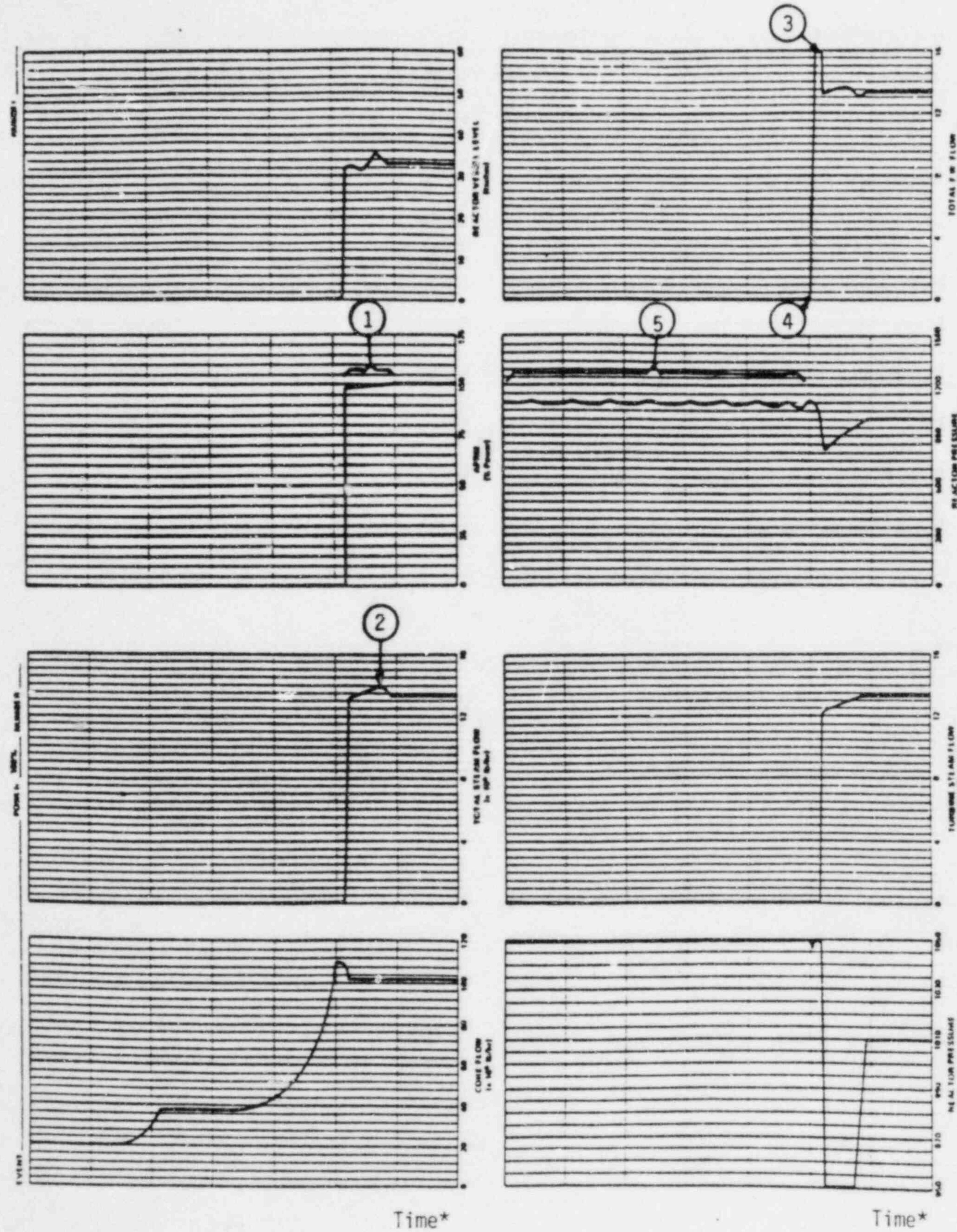
REFERENCE
UPS Study Guide pg 6 DNG62

ANSWER 6.03 (3.00)

a. Input: Any of the LPRM inputs
b. Count: The number of LPRM inputs which are operable
c. Reference: The reference APRM input
d. Block: The trip level reference
e. Flow: The flow input to the slope and bias circuit
f. Average: The RBM channel output
(0.5 each) (3.0)

REFERENCE
RBM Study Guide pg 19-20 DNG69

FIGURE for Question 1.08



EHC PRESSURE SETPOINT DECREASE

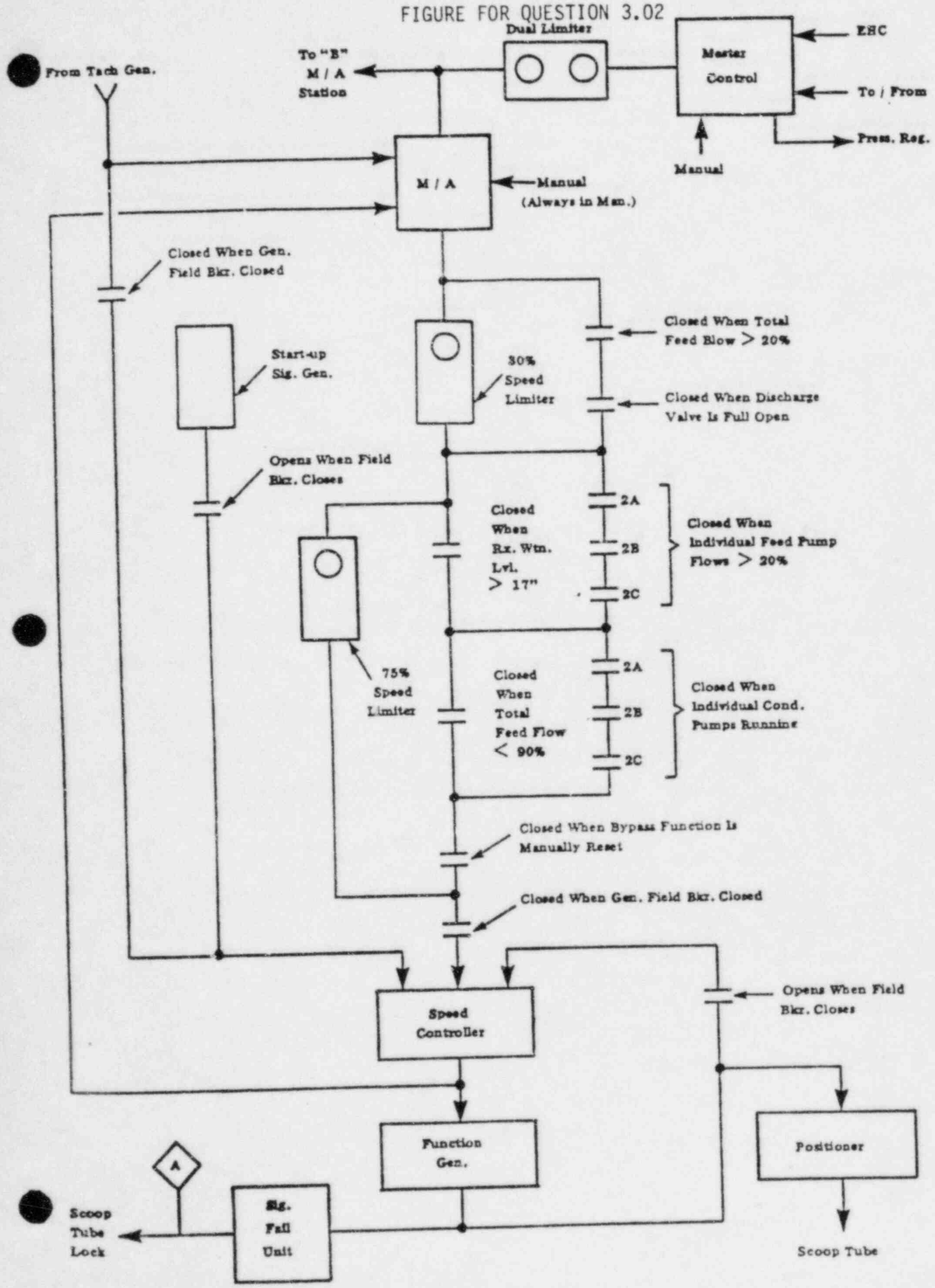
*Each time increment is one (1) minute

STEAM TABLE

PROPERTIES OF SATURATED STEAM AND SATURATED WATER (TEMPERATURE)

Temp F	Press. psia	Volume, ft³/lb Water v_f	Evap v_{fg}	Steam v_g	Enthalpy, Btu/lb Water h_f	Evap h_{fg}	Steam h_g	Entropy, Btu/lb x F Water s_f	Evap s_{fg}	Steam s_g	Temp F
32	0.08859	0.01602	3305	3305	−0.02	1075.5	1075.5	0.0000	2.1873	2.1873	32
35	0.09991	0.01602	2948	2948	3.00	1073.8	1076.8	0.0061	2.1706	2.1767	35
40	0.12163	0.01602	2446	2446	8.03	1071.0	1079.0	0.0162	2.1432	2.1594	40
45	0.14744	0.01602	2037.7	2037.8	13.04	1068.1	1081.2	0.0262	2.1164	2.1426	45
50	0.17796	0.01602	1704.8	1704.8	18.05	1065.3	1083.4	0.0361	2.0901	2.1262	50
60	0.2561	0.01603	1207.6	1207.6	28.06	1059.7	1087.7	0.0555	2.0391	2.0946	60
70	0.3629	0.01605	868.3	868.4	38.05	1054.0	1092.1	0.0745	1.9900	2.0645	70
80	0.5068	0.01607	633.3	633.3	48.04	1048.4	1096.4	0.0932	1.9426	2.0359	80
90	0.6981	0.01610	468.1	468.1	58.02	1042.7	1100.8	0.1115	1.8970	2.0086	90
100	0.9492	0.01613	350.4	350.4	68.00	1037.1	1105.1	0.1295	1.8530	1.9825	100
110	1.2750	0.01617	265.4	265.4	77.98	1031.4	1109.3	0.1472	1.8105	1.9577	110
120	1.6927	0.01620	203.25	203.26	87.97	1025.6	1113.6	0.1646	1.7693	1.9339	120
130	2.2230	0.01625	157.32	157.33	97.96	1019.8	1117.8	0.1817	1.7295	1.9112	130
140	2.8892	0.01629	122.98	123.00	107.95	1014.0	1122.0	0.1985	1.6910	1.8895	140
150	3.718	0.01634	97.05	97.07	117.95	1008.2	1126.1	0.2150	1.6536	1.8686	150
160	4.741	0.01640	77.27	77.29	127.96	1002.2	1130.2	0.2313	1.6174	1.8487	160
170	5.993	0.01645	62.04	62.06	137.97	996.2	1134.2	0.2473	1.5822	1.8295	170
180	7.511	0.01651	50.21	50.22	148.00	990.2	1138.2	0.2631	1.5480	1.8111	180
190	9.340	0.01657	40.94	40.96	158.04	984.1	1142.1	0.2787	1.5148	1.7934	190
200	11.526	0.01664	33.62	33.64	168.09	977.9	1146.0	0.2940	1.4824	1.7764	200
210	14.123	0.01671	27.80	27.82	178.15	971.6	1149.7	0.3091	1.4509	1.7600	210
212	14.696	0.01672	26.78	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	212
220	17.186	0.01678	23.13	23.15	188.23	965.2	1153.4	0.3241	1.4201	1.7442	220
230	20.779	0.01685	19.364	19.381	198.33	958.7	1157.1	0.3388	1.3902	1.7290	230
240	24.968	0.01693	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240
250	29.825	0.01701	13.802	13.819	218.59	945.4	1164.0	0.3677	1.3323	1.7000	250
260	35.427	0.01709	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260
270	41.856	0.01718	10.042	10.060	238.95	931.7	1170.6	0.3960	1.2769	1.6729	270
280	49.200	0.01726	8.627	8.644	249.17	924.6	1173.8	0.4098	1.2501	1.6599	280
290	57.550	0.01736	7.443	7.460	259.4	917.4	1176.8	0.4236	1.2238	1.6473	290
300	67.005	0.01745	6.448	6.466	269.7	910.0	1179.7	0.4372	1.1979	1.6351	300
310	77.67	0.01755	5.609	5.626	280.0	902.5	1182.5	0.4506	1.1726	1.6232	310
320	89.64	0.01766	4.896	4.914	290.4	894.8	1185.2	0.4640	1.1477	1.6116	320
340	117.99	0.01787	3.770	3.788	311.3	878.8	1190.1	0.4902	1.0990	1.5892	340
360	153.01	0.01811	2.939	2.957	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360
380	195.73	0.01836	2.317	2.335	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380
400	247.26	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400
420	308.78	0.01894	1.4808	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420
440	381.54	0.01926	1.1976	1.2169	419.0	785.4	1204.4	0.6161	0.8729	1.4890	440
460	466.9	0.0196	0.9746	0.9942	441.5	763.2	1204.8	0.6405	0.8299	1.4704	460
480	566.2	0.0200	0.7972	0.8172	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480
500	680.9	0.0204	0.6545	0.6749	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500
520	812.5	0.0209	0.5386	0.5596	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520
540	962.8	0.0215	0.4437	0.4651	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540
560	1133.4	0.0221	0.3651	0.3871	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560
580	1326.2	0.0228	0.2994	0.3222	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580
600	1543.2	0.0236	0.2438	0.2675	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600
620	1786.9	0.0247	0.1962	0.2208	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620
640	2059.9	0.0260	0.1543	0.1802	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640
660	2365.7	0.0277	0.1166	0.1443	714.9	392.1	1107.0	0.8995	0.3502	1.2498	660
680	2708.6	0.0304	0.0808	0.1112	758.5	310.1	1068.5	0.9365	0.2720	1.2086	680
700	3094.3	0.0366	0.0386	0.0752	822.4	172.7	995.2	0.9901	0.1490	1.1390	700
705.5	3208.2	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	705.5

FIGURE FOR QUESTION 3.02



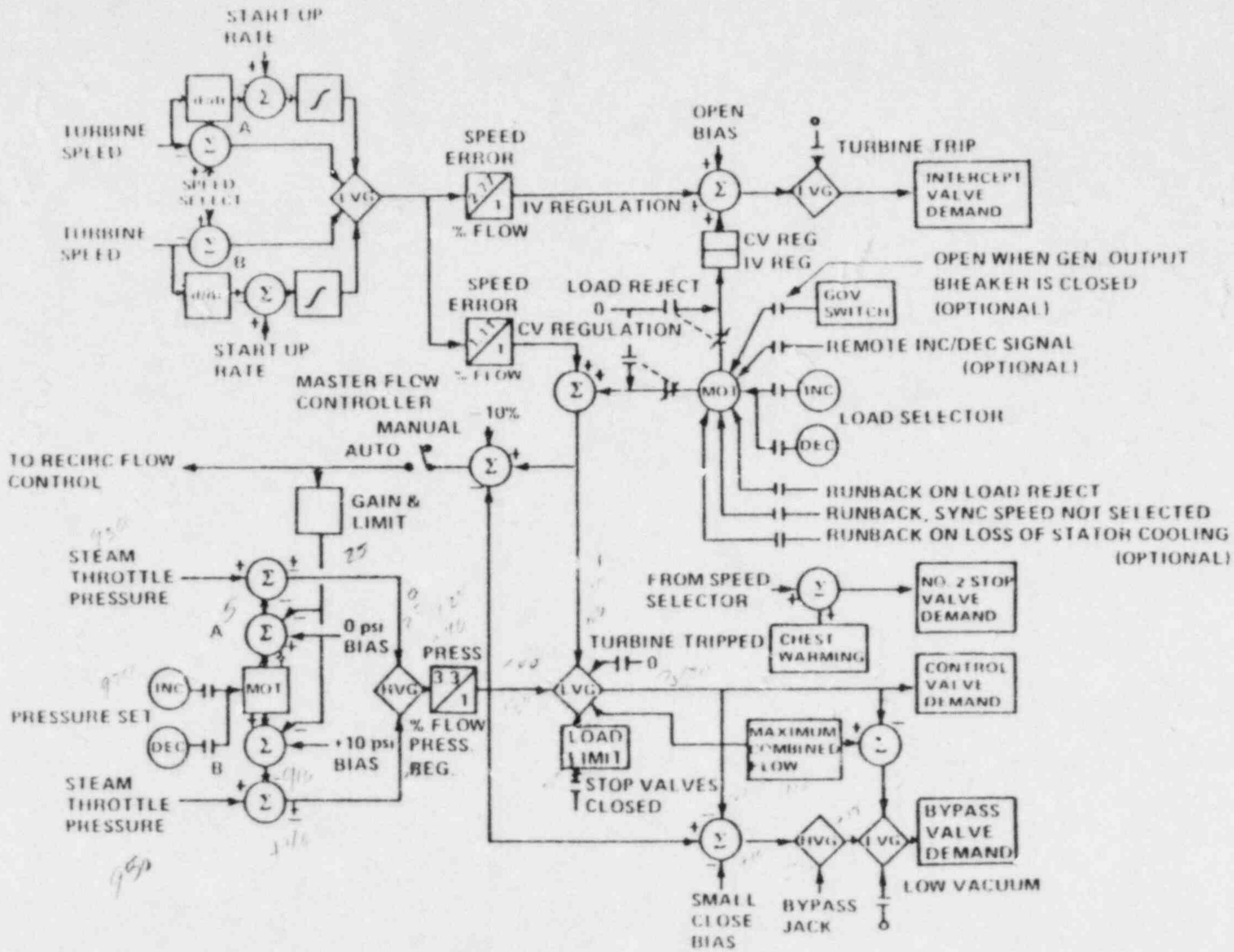


FIGURE 7.3-3 TURBINE CONTROL LOGIC (EHC)

0679

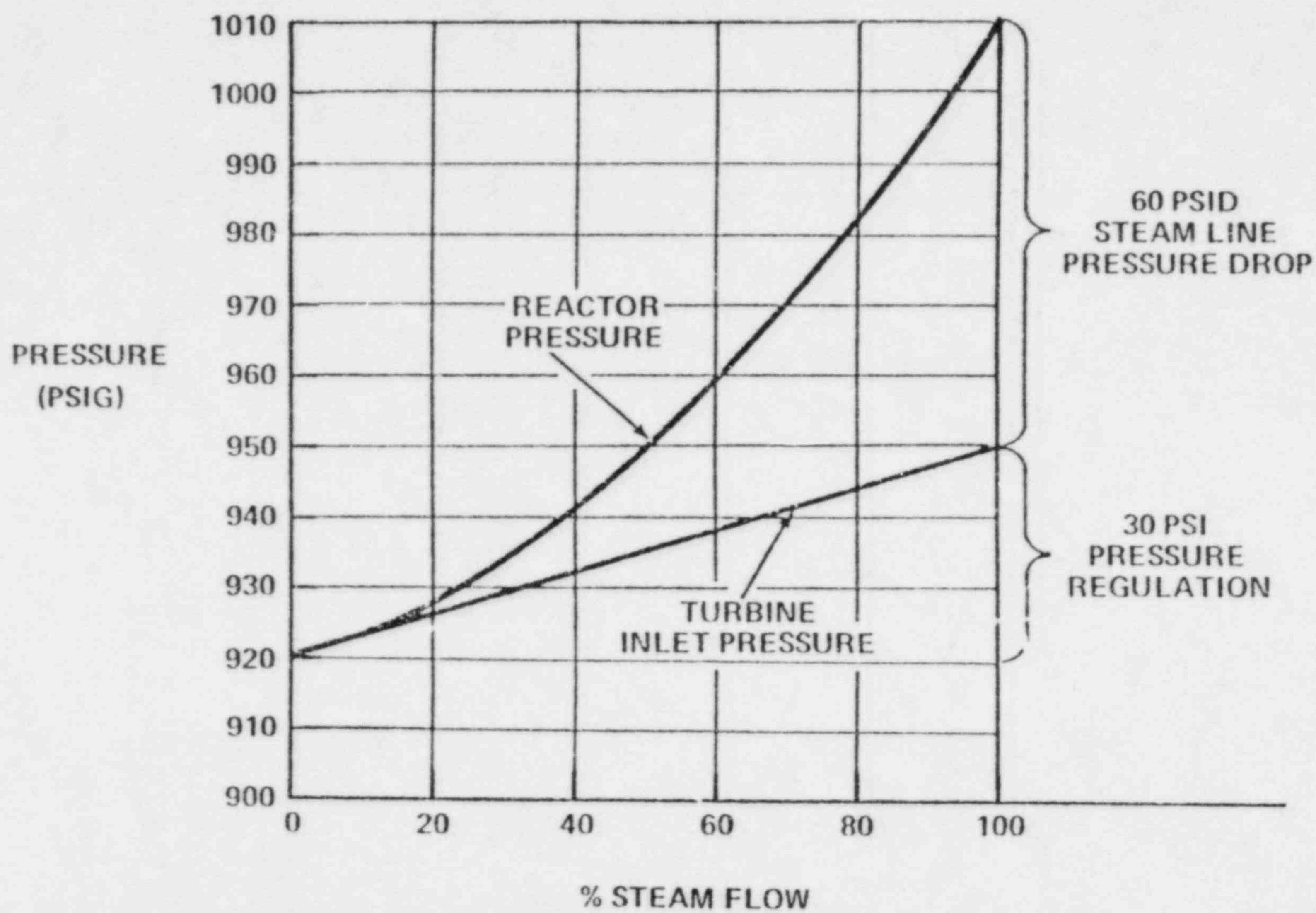


Figure 7.3-1 Pressure Control

0679

ANSWERS -- PEACH BOTTOM 2&3 -84/08/28-KVAKME, J.

ANSWER 1.01 (1.50)

a. System operating point. (0.5)

b. Curve B. (0.5)

c. Right. (0.5)

REFERENCE
LOT-1240 Rev 0

ANSWER 1.02 (3.00)

reactivity due to void change = (-1 X 10 E-3 / %)(1.5%)
= -1.5 X 10 E-3 (1.25)

reactivity due to doppler = (-1 X 10 E-5 / deg F)(40 Deg F)
= -.4 X 10 E-3 (1.25)

The rod worth was 1.9 X 10 E-3 (0.5)

REFERENCE
LOT-1440 pg 7 Rev 0

ANSWER 1.03 (3.00)

a. 2-phase (1.0)
b. Regenerative (1.0)
c. Cross-flow OR COUNTER flow. (1.0)

REFERENCE
LOT-1190 pg 24 Rev 0

ANSWER 1.04 (3.25)

a.- Power, Local power, Flux, or Local flux
- Flow
- Pressure
- Inlet subcooling
(3 of 4 req. @ 0.333 each)

b. 1. MAPRAT is the ratio of APLHGR(act) to MAPLHGR(LCO).[0.75]
2. NO [0.5]
3. The clad temperature can exceed 2200 deg. F during a DBA LOCA.[1.0]

REFERENCE
Peach Bottom Thermal Limits

ANSWER 1.05 (3.00)

a. Using P = Po e to the t/T then P = 75 e to 60/-80
P = 75 e to -0.75 = 35 on Range 4 [1.5]

b. On down-power transients, the rate of power change is limited by the rate of decay of the longest lived precursors, thus retarding the rate of power decrease.[1.5] (55.6 sec half life)

REFERENCE
LOT-1430 Rev 0

ANSWER 1.06 (3.00)

a. 1. Fuel depletion
2. Fission product poison buildup
3. Plutonium 240 buildup
(0.5 each) (1.5)

b. 1. Increase in moderator temperature
2. Decrease in Kexcess/p excess
3. Increase in control rod density
4. Increase in poison concentration
(3 at 0.5 each) (1.5)

REFERENCE
LOT-0950 pg 3,6 Rev 0

ANSWER 1.07 (1.50)

a. 1. Xenon has a higher absorption cross section for thermal neutrons.
   2. Xenon has a higher concentration.
   3. Xenon has a more transient behavior.
   (2 required at 0.5 each) (1.0)

b. False (0.5)

REFERENCE
LOT-1510 pg 5 Rev 0

ANSWER 1.08 (3.00)

a. The decreasing reactor pressure is causing an increase in core voids. (0.5)

b. Steam flow through the turbine bypass valves. (0.5)

c. The FWCS responding to the rapid decrease in reactor water level. (0.5)

d. The RFPs ran out of steam following the MSIV closure. (0.5)

e. SRVs lifting to control reactor pressure. (0.5)

f. Less core decay heat. (0.5)

REFERENCE
BWR Transients, HXY-12.

ANSWER 1.09 (.75)

C. Steam pressure increased, steam enthalpy decreased.

REFERENCE
Steam Tables

ANSWER 1.10 (3.00)

a. Decreases [0.25]. There is less steam flow, therefore, less pressure drop through the main steam lines [0.75]. (1.0)

b. Increases [0.25]. With the same amount of cooling water through the condenser and less of a heat load, condensate depression will increase [0.75]. (1.0)

c. Decreases [0.25]. Less extraction steam from the turbine to heat the feedwater [0.75]. (1.0)

REFERENCE
LOT-1270 Rev 0
LOT-1190 Rev 0

ANSWER 2.01 (3.00)

1. F(.5) Scram valves are normally held shut by air pressure and opened by spring pressure.(.75)

2. T(.5)

3. F(.5) Cooling water flow enters the insert port and leaks past seals into the Reactor Vessel.(.75)

REFERENCE
LOT-0070-REV 0- pg 5,13,16,17

ANSWER 2.02 (3.50)

A. Poison injection must be fast enough to overcome reactivity due to cooldown. (1.0)

B. o Core plate dp
o Core spray system line break detection
o Jet pump dp (3 @ .5 each)(1.5)

C. - red indicating light for the pump run indication
- storage tank level decreasing
- system pressure increasing
- Reactor power decreasing (1.0)

REFERENCE
LOT-0310, REV 0, pg 6,12

ANSWER 2.03 (3.00)

A. - reactor water level 0"
- D/W press 2 psig
- Rx Bldg exhaust 16 mr/hr
- refuel floor exhaust 16 mr/hr (.5 each)(1.5)

B. Unit 2: PRIMARY: fan A, train A B/U: fan B, train A (.75)
Unit 3: PRIMARY: fan C, train B B/U: Fan B, train B (.75)
On initiation both isolation dampers open so both trains are in service.

REFERENCE
LOT- 0210, REV 0, pg 3,5,7

ANSWER 2.04 (1.50)

1. low suction pressure - (2 psig)(.75)
2. low skimmer surge tank level - (213')(.75) (1.5)

REFERENCE
LOT-0750-REV0, pg 6

ANSWER 2.05 (3.75)

A. 1. Triple low reactor water level -130"
   2. High D/W pressure 2 psig
   3. Loss of off-site power (.75 each) (2.25)

B. On an auto start of the D/G, at ~~225~~ 255 rpm the ESW discharge valve opens.(.5) ESW and ECW pumps start after 22 seconds.(.5) 23 seconds later if the discharge pressure is availible from ESW, the ECW pumps stop.(.5) (1.5)

REFERENCE
LOT-0670, REV 0, pg 3,19

ANSWER 2.06 (3.50)

A. NRHX (.75)
B. Recirculation pump seal and motor oil cooler (.75)
C. RBCCW flow isolated to:
   -Inst. N2 coolers(.33)
   -NRHX(.33)
   -RWCU pump seal coolers(.33) (1.0)
   RBCCW flow supplied to:
   -recirc pump motor coolers(.33)
   -D/W air coolers(.33)
   -D/W equipment drain sump coolers(.33) (1.0)

REFERENCE
LOT-0460, REV 0, pg 7,5

ANSWER 2.07 (3.25)

A. HP- 'A' MSL (.5)
LP- cross around steam(.5) (1.0)

B. 1. False(.25) This valve provides for more accurate vessel level control during low power ops.(.5) (.75)

2. False(.25) MSC can regulate between zero and full speed.(.5) (.75)

3. True(.75) (.75)

REFERENCE
LOT-0540, Rev 0, pg 3,6,8,11

ANSWER 2.08 (1.00)

1. Normal discharge to 'A' feedwater line(.25)
2. Minimum flow discharge to suppression pool(.25)
3. Test discharge to CST(.25)
4. Test discharge bypass to suppression pool(.25) (1.0)

REFERENCE
LOT-0340, REV 0, pg 4&TP2

ANSWER 2.09 (2.50)

A. Following the SRV's first actuation, the steam in its discharge line(.5) would condense causing a vacuum in the line(.5) This would result in suppression pool water being drawn up into the line(.5) which would cause overpressurization of the line on the next actuation(.5) (Also acceptable) Water hammer and excessive jet forces on the diffuser. (2.0)

B. Increases (.5)

REFERENCE
LOT-0330, REV 0, pg 4

ANSWERS -- PEACH BOTTOM 2&3 -84/08/28-KVAMME, J.

ANSWER 3.01 (2.00)

1. Low water level
2. High discharge temperature on non-regen HTX
3. SLC initiation
4. RWCU suction line high flow (.5 each) (2.0)

REFERENCE
LOT-0110, REV 0, pg 6

ANSWER 3.02 (3.00)

A. Increase(.5) Master limiter, low speed limit(1.0) (1.5)

B. The setpoint must be manually runback on each pump (If M/A transferred to MANUAL) prior to resetting the runback(.75) Otherwise the recirc pumps will ramp up to the previous setting causing a possible scram(.75) (1.5)

REFERENCE
LOT-0040, Rev 0

ANSWER 3.03 (2.50)

1. -130" vessel water level(.25) Indicates severe core degradation(.25)

2. +2 psig D/W press(.25) Positive indication of a rupture(.25)

3. +6" vessel level permissive(.25) Verifies triple low level from another instrument(.25)

4. TD of 105 seconds timed out(.25) Allows HPCI time to recover(.25)

5. One RHR @ 50 psig or two Core Spray @ 185 psig(.25) Ensures low pressure system are availible prior to blowdown(.25)

(2.5)

REFERENCE
LOT-0330, REV 0, pg 5

ANSWER 3.04 (3.00)

Turbine Control Valve fast closure is determined by pressure switches which monitor RELAYED Emergency Trip Supply (ETS) pressure. (1.5)
~~to the Fast Acting Solenoid on the Control Pac of the TCV (1.5)~~
There are four pressure switches, one for each RPS subchannel, A1, A2, B1, B2 (1.5) FAST ACTING SOLENOID IS ONLY ACTUATED BY LOAD UNBALANCE RELAY. (NOT REQUIRED.) (3.0)

REFERENCE
LOT-0300, REV 0, pg 11

ANSWER 3.05 (4.00)

A. RWM is inserted or reactivated. ALSO WILL ACCEPT ALTERNATE ANSWER dealing with response of F.W. Control System to Feed Flow/Stm Flow mismatch (1.0)

B. A recirc pump runback to 60% is initiated and an EHC runback initiated. ~~until~~ @ 1%/second until total FW flow < 95% (1.0)

C. A recirc pump runback to 30% is initiated. (1.0)

D. Recirc pump runback to 60% and EHC runback initiated until feedwater flow < ~~75%~~ 95%. (1.0)

REFERENCE
LOT-0550, Rev 0, pg 11

ANSWER 3.06 (2.50)

1. Feedwater Control Range: (.1)
   0" to 60" (.2)
   reference to instrument zero (538") (.1)
   calibrated hot (.1) (.5)

2. Active Core Range:
   -325" to 0"
   reference to instrument zero
   calibrated hot (.5)

3. Refuel Range:
   -21" to +379"
   reference to instrument zero
   calibrated cold (.5)

4. Shutdown Range:
   -178" to -78"
   reference to instrument zero
   calibrated cold (.5)

5. Yarway Range:
   -165" to +50"
   reference to instrument zero
   calibrated hot (.5)

REFERENCE
LOT-0050, REV 0, pg 5-7

ANSWER 3.07 (3.00)

A. At low power levels, the signal produced by decay or background gamma overshadows the signal produced by neutrons and fission gamma. (1.0)

B. 0.66W + 54 where W=% recirc loop flow
   0.66(50) + 54 = 33 + 54 = 87% (1.0)

C. 1. High voltage low(.25) 2. Module unplugged(.25) 3.Selector switch not in operate(.25) 4.<14 operable LPRM inputs(.25) (1.0)

REFERENCE
LOT-0270, REV 0, pg 5 & LOT-0240

ANSWER 3.08 (2.00)

The withdrawal portion of a normal notch out sequence takes about 1.5 seconds. The 2 second timer monitors this interval(.5). If the withdrawal signal is sent to directional control vlaves for > 2 seconds, the timer times out. It will generate a select block which deselects the rod(1.0) This prevents a faulty master timer from causing an uncontrolled withdrawal signal(.5) (2.0)

REFERENCE
LOT-0080, REV 0, pg 5,13

ANSWER 3.09 (3.00)

A. 'A' Pressure Regulator:
Steam throttle pressure=950psig
Pressure set plus new bias=920+5=925
therefore 950-925=25ma signal out of 'A' pressure regulator(.5)
'B' Pressure Regulator:
Throttle Pressure=950 Pressure set plus bias; 920+10=930
therefore 950-930=20 ma signal out of 'B' regulator(.5)
'A' regulator signal passes 25x3.3=82.5% signal. Control valves begin to close to 82.5% but as press increases reopen to 100% with new throttle pressure. 30+925=955psig and Rx press=1020psig(.5) (1.5)

B. In the speed circuits, both summers will see a -4.5 rpm speed error since the generator is in sync. and will follow the grid. The LVG will pass one of these to the CV & IV regulation blocks. The IV reg. block will see a demand decrease of 12.5% but the open bias will hold them open. The CV reg. block will develope a -5% demand which sums with the load select to send a 95% signal to the pressure load gate. CV's will close to 95%. Since Rx demand has not changed, the BPV's will open to 5%. This condition will hold as long as the frequency holds at 1804.5 rpm. (1.5)

REFERENCE
LOT-0590 & EHC Logic transients

ANSWERS -- PEACH BOTTOM 2&3 -84/08/28-KVAMME, J.

ANSWER 4.01 (2.00)

1. It seals in the scram signal by inserting an additional scram signal for ten seconds. (1.0)

2. It changes the plant mode such that if the MSL pressure decreases to GP I isolation setpoint, MSIV's will NOT shut. This is desirable to keep the feedpump, SJAE, and off-gas thereby maintaining the condenser as a heat sink. (1.0)

REFERENCE
T-100, REV 0, pg 1,2

ANSWER 4.02 (2.00)

1. Run recirc flow back to reduce Rx pressure < 1040 psig. (1.0)

2. Control Rx pressure <1040 psig with the bypass valves using the jack. (1.0)

REFERENCE
OT-102, REV 0, pg 1

ANSWER 4.03 (.50)

'C' (.5)

REFERENCE
ON-100, REV 0, pg 1

ANSWER 4.04 (3.00)

When the control rod system is incapable of shutting down the reactor and: (.75)
1. Rx power is increasing as indicated by NI's AND stm flow. (.75)
OR
2. If five or more adjacent CR's or thirty or more CR'S can't be inserted past position 06 AND level can't be maintained. (.75)
OR
3. If five or more adjacent CR's or thirty or more CR's can't be insertd past position 06 AND suppression pool temp reaches 110 F. (.75)

ANSWERS -- PEACH BOTTOM 2&3 -84/08/28-KVAMME, J.

REFERENCE
S.B.6.B., REV 7, pg 1

ANSWER 4.05 (2.00)

A. 1. Normal power availible- 10 seconds (.5)
2. After diesel power availible - 5 seconds (.5) (1.0)

B. Manually start the pump. (.5)

C. < 450 psig injection valve opens & pump rated at 100% at ~~225~~ 250 psig head. (no one specific # required) (.5)

REFERENCE
S.3.4.B., REV 5, pg 1,2

ANSWER 4.06 (3.00)

A. 1. Generator load reduction or bypass valve closure.
2. 'Blow Down Relief Valve HI Temp' or 'Safety Relief Valve Open' alarm.
3. Relief Valve position lights.
4. Increasing Torus temp. ALSO ACCEPT SRV ACOUSTIC MONITORING system. (.5 each) (2.0)

B. 1. Place both loops of Torus cooling in service.(.5)
2. If Torus temp reaches 95 F enter T-102.(.5) (1.0)

REFERENCE
OT-114,pg 1,2

ANSWER 4.07 (2.00)

A. All core flow being diverted through the idle jet pump (bypassing the core). WILL ALSO ACCEPT discussion or ANSWER ON stratification (1.0)

B. Metal surface temperatures below water level will be less than indicated coolant temperature. (1.0)

REFERENCE
GP-12, REV 5, pg 9

ANSWER 4.08 (2.00)

1. Ensures sufficient shaft driven lube oil pump pressure and flow. (1.0)

2. Ensures high enough steaming rate to avoid exhaust line check valve 'chatter' and possibly subsequent damage. (1.0)

REFERENCE
LOT-1560, REV. 0, pg 14

ANSWER 4.09 (3.00)

1. RPV level below -48" or unknown.
2. Drywell pressure is above 2 psig.
3. A Group I isolation occurs.
4. Scram condition with power above 3% or unknown.

(.75 each) (3.0)

REFERENCE
LOT-1560, REV 0, pg 7, & T-101

ANSWER 4.10 (2.50)

A. 1. Group IIa isolation (OR MO-12-15, MO-12-18, and MO-12-68 close).
2. RWCU pumps trip.
3. RWCU demin hold pumps start. (3 at .5 each) (1.5)

B. Within 10 minutes. (.5)

C. To minimze the reactor transient. (.5)

REFERENCE
ON-113, REV 0, pg 1 & ON-113 BASES, pg 1

ANSWER 4.11 (3.00)

A. The first rod(s) (1.0)

B. To establish a constant flow in and out of the reactor vessel (OR a constant feed flow demand)(.66) to minimize temperature fluxuations on the feedwater nozzles(.67), thus minimizing the probability of thermal stess cracking(.67). (2.0)

REFERENCE
GP-2, REV 35, pg 12,16

QUESTION	VALUE	REFERENCE
01.01	1.50	JCK0000280
01.02	3.00	JCK0000281
01.03	3.00	JCK0000282
01.04	3.25	JCK0000284
01.05	3.00	JCK0000285
01.06	3.00	JCK0000286
01.07	1.50	JCK0000287
01.08	3.00	JCK0000288
01.09	.75	JCK0000289
01.10	3.00	JCK0000290
	25.00	
02.01	3.00	JCK0000291
02.02	3.50	JCK0000292
02.03	3.00	JCK0000293
02.04	1.50	JCK0000294
02.05	3.75	JCK0000295
02.06	3.50	JCK0000296
02.07	3.25	JCK0000297
02.08	1.00	JCK0000298
02.09	2.50	JCK0000299
	25.00	
03.01	2.00	JCK0000300
03.02	3.00	JCK0000301
03.03	2.50	JCK0000302
03.04	3.00	JCK0000303
03.05	4.00	JCK0000304
03.06	2.50	JCK0000305
03.07	3.00	JCK0000306
03.08	2.00	JCK0000307
03.09	3.00	JCK0000308
	25.00	
04.01	2.00	JCK0000045
04.02	2.00	JCK0000074
04.03	.50	JCK0000075
04.04	3.00	JCK0000076
04.05	2.00	JCK0000078
04.06	3.00	JCK0000309
04.07	2.00	JCK0000310
04.08	2.00	JCK0000311
04.09	3.00	JCK0000312
04.10	2.50	JCK0000313
04.11	3.00	JCK0000314
	25.00	
	100.00	

MASTER COPY

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

FACILITY: _PEACH_BOTTOM_2&3________

REACTOR TYPE: _BWR-GE4________________

DATE ADMINISTERED: _84/08/28______________

EXAMINER: _HILL,_D.________________

APPLICANT: _________________________

INSTRUCTIONS_TO_APPLICANT:

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	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	25.00	___________	________	5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
25.00	25.00	___________	________	6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
25.00	25.00	___________	________	7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
25.00	25.00	___________	________	8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
100.00	100.00	___________	________	TOTALS

FINAL GRADE _________________%

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

____
APPLICANT'S SIGNATURE

QUESTION 5.01 (1.50)

Regarding the core thermal limits:

a. The process computer output, CMFLPD, is used to monitor WHICH core thermal limit? (.75)

b. WHICH core thermal limit ensures peak cladding temperature will not exceed 2200 degrees F following a LOCA? (.75)

QUESTION 5.02 (3.00)

Briefly EXPLAIN WHAT happens to the magnitude of the moderator temperature coefficient of reactivity (MORE OR LESS NEGATIVE) and WHY considering the following changes:

a. An increase in moderator temperature. (1.5)

b. A decrease in control rod density. (1.5)

QUESTION 5.03 (3.00)

Concerning heat transfer in the reactor:

a. Briefly EXPLAIN WHY nucleate boiling improves the heat transfer characteristics of the core over simply forced convection? (1.8)

b. Considering the heat transfer mechanism following fuel dryout after a large break LOCA from a high reactor power, WHY are the central fuel rods in a fuel bundle more likely to exceed the 2200 degree F limits for peak clad temperature than the edge or corner rods which have higher local peaking factors? (1.2)

QUESTION 5.04 (3.00)

Following an auto initiation of RCIC at a reactor pressure of 800 psig, reactor pressure decreases to 400 psig. HOW ARE THE FOLLOWING PARAMETERS AFFECTED (INCREASES, DECREASES, REMAINS CONSTANT) by the change in reactor pressure? BRIEFLY EXPLAIN YOUR CHOICE. ASSUME the RCIC system is operating as designed.

a. RCIC flow to the reactor. (1.0)

b. RCIC pump discharge head (assuming NPSH remains constant). (1.0)

c. RCIC turbine RPM (1.0)

QUESTION 5.05 (3.50)

Regarding the xenon transient following a significant DECREASE in reactor power from high power operation:

a. Briefly, EXPLAIN WHY the xenon concentration will peak following the manuever. (1.0)

b. HOW will peripheral control rod worth be affected (INCREASE, DECREASE, REMAIN THE SAME) during the xenon peak? BRIEFLY EXPLAIN your answer. (1.5)

c. If the decrease in reactor power was from 100% to 50%, would the new (50% power) equilibrium xenon reactivity be MORE THAN, LESS THAN or EQUAL TO one half the 100% equilibrium value? BRIEFLY EXPLAIN YOUR ANSWER. (1.0)

QUESTION 5.06 (3.00)

The reactor is operating at 70% power with all systems functioning normally when Recirc Flow Controller 'A' fails HIGH. Using attached Figure 2, IDENTIFY the CAUSE of the recorder indication changes at EACH of the NUMBERED POINTS described below.

NOTES: o Time intervals on the graph are in 1 minute increments
o The transient begins 1 minute, 15 seconds from the beginning of each graph.

(1) The decrease in reactor water level. (0.5)

(2) The increase in reactor power. (0.5)

(3) The decrease in core flow. (0.5)

(4) The increase in reactor pressure. (0.5)

(5) The increase in total feedwater flow. (0.5)

(6) The slight increase in total steam flow. (0.5)

QUESTION 5.07 (3.00)

Attached Figure 3 shows selected plant parameter responses for a TURBINE TRIP transient initiated from rated conditions with NO OPERATOR ACTION.

NOTES: (1) Time intervals on graphs are 1 minute each.
(2) Use of graphs not directly referred to in question MAY be required to correctly answer all parts.
(3) Malfunction(s) other than the initiating one MAY be involved.

ANSWER the following:

a. Why does core flow decrease [Point 1] and why doesn't it decrease to zero [Point 2]? (1.0)

b. Why does reactor pressure increase [Point 3] and remain high [Point 4]? (1.0)

c. Why does reactor level decrease initially [Point 5] and what is causing the peaks in level later [Point 6]? (1.0)

QUESTION 5.08 (2.75)

Consider the attached process computer P-1 printout, Figure B, part of an ACTUAL P-1.

a. IS the output signal from APRM 1 MORE or LESS conservative than the output signal from APRM 3? (.75)

b. If all the fuel has a design LHGR limit of 13.4 KW/ft., WHAT is the HIGHEST actual LHGR in the core? (1.25)

c. IS the axial power distribution bottom or top core peaked? (.75)

QUESTION 5.09 (2.25)

The following statements are concerned with subcritical multiplication. CHOOSE ONE of the capitalized words to make each statement true.

a. As K-effective approaches unity, a (LARGER/SMALLER) change in neutron level occurs for a given change in K-eff. (.75)

b. As K-eff approaches unity, a (SHORTER/LONGER) period of time is required to reach the equilibrium neutron level for a given change in K-eff. (.75)

c. As k-eff approaches unity, the count rate doubling technique becomes (MORE/LESS) accurate. (.75)

QUESTION 6.01 (3.00)

When operating the Residual Heat Removal (RHR) system in SHUTDOWN COOLING MODE:

a. WHY is it necessary to have the recirc pump in the return loop shutdown with its discharge valve ~~and discharge bypass valves~~ shut? (1.0)

b. WHY must power be secured to the minimum flow valve? (1.0)

c. HOW will the system be effected if reactor pressure exceeds 75 psig? (1.0)

QUESTION 6.02 (3.50)

With the plant operating at 100% power (Unit 2), recirc in Master Manual, an operator inadvertently DECREASES the 'Pressure Set' by 5 psi. WHAT will be the INITIAL response and FINAL status of the following parameters due to this action? Briefly EXPLAIN. Assume NO operator action. See attached Figure 0590-6, EHC Logic Diagram. ANSWER on the attached handout page.

a. TCV position

b. BPV position

c. Power

d. Pressure

QUESTION 6.03 (2.50)

Concerning the Control Rod Drive (CRD) Hydraulic System:

a. Upon completion of a reactor scram with all CRDs fully inserted, WHAT are the TWO (2) sources of water continuing to fill the scram discharge volume until the scram is reset? (1.0)

b. Briefly EXPLAIN WHY pressure equalizer valves were installed between the cooling water line and the exhaust water header. (1.5)

QUESTION 6.04 (3.00)

With regard to the Reactor Recirculation Flow Control System:

a. WHAT plant conditions will cause a 60 % recirc pump runback? (Setpoints required) (2.0)

b. With the plant operating at 23% power and minimum flow, an operator inadvertently shifts the M/A transfer station for recirc pump 'A' from 'Manual' to 'Auto.' Assuming NO further operator action, briefly EXPLAIN WHAT will happen to the speed of 'A' recirc pump. Continue your discussion to the final steady state speed. (1.0)

QUESTION 6.05 (3.00)

WHAT are SIX (6) different automatic actions which should occur if Main Steam Line Radiation Monitors 'C' and 'D' exceed their high-high trip setpoint (3 x normal FPB) while operating at rated conditions? Specify individual component actions. (3.0)

QUESTION 6.06 (3.00)

Concerning the Standby Liquid Control System:

a. WHY is it necessary for the system to be capable of injecting the contents of the SLC tank in a MAXIMUM time of 125 minutes? (1.0)

b. WHY is the SLC pump suction piping heat traced? (1.0)

c. WHAT are THREE (3) uses of the SLC injection sparger, OTHER THAN poison injection? (1.0)

QUESTION 6.07 (3.00)

With Unit 2 operating at 50% power in 3-element control, HOW will the Feedwater Control System (FWCS) respond to each of the following instrument failures? Your answer should include how the instrument will fail (high or low), the FWCS response and effect on actual water level, as well as any automatic actions as a result of the change in actual vessel level.

a. A steam flow detector's sensory diaphragm ruptures. (1.0)

b. The level channel selected for input to the FWCS loses instrument power. (2.0)

QUESTION 6.08 (4.00)

For each of the HPCI (High Pressure Coolant Injection) System component failures listed below, STATE WHETHER OR NOT HPCI WILL AUTO INJECT into the reactor vessel, IF IT WILL NOT INJECT WHY, AND IF IT WILL INJECT, provide ONE POTENTIAL ADVERSE EFFECT OR CONSEQUENCE of system operation with the failed component.
Assume NO OPERATOR ACTION, and the component is in the failed condition at the time HPCI receives the auto initiating signal.

a. The GLAND SEAL EXHAUSTER fails to operate. (1.0)

b. The turbine AUXILIARY LUBE OIL PUMP fails to operate. (1.0)

c. The MINIMUM FLOW VALVE fails to auto open (STAYS SHUT) when system conditions require it to be open. (1.0)

d. The HPCI PUMP DISCHARGE FLOW ELEMENT output signal to the HPCI flow controller is failed at its maximum output. (1.0)

QUESTION 7.01 (3.00)

According to GP-2, 'Normal Plant Startup':

a. During the approach to critical, WHICH rod(s) in a new Rod Group is(are) likely to exhibit high notch worth? (1.0)

b. During heatup to rated temperature and pressure after raising the EHC pressure setpoint to 600 psig, EXPLAIN WHY one turbine bypass valve is opened 10 to 20% (with the bypass valve jack)? (2.0)

QUESTION 7.02 (2.00)

With the reactor shutdown and cooled down to less than 212 degrees F, according to GP-12, 'Core Cooling Procedure':

a. If only one loop of Shutdown Cooling is ON with NO recirc flow through the other loop, reactor level must be maintained high enough to prevent WHAT from occurring? (1.0)

b. HOW would coolant temperature stratification be indicated by reactor vessel metal surface temperatures? (1.0)

QUESTION 7.03 (3.00)

When starting a recirc pump at power (the other recirc pump operating) in accordance with Start-Up of a Recirculation Pump,' procedure S.2.3.1.A:

a. WHAT ARE THE BASIS for the two (2) coolant temperature conditions that must be met prior to starting a pump? (2.0)

b. WHY must the speed of the operating loop be less than or equal to 40%? (1.0)

QUESTION 7.04 (2.00)

If an unexpected or unexplained increase in drywell pressure occurs, WHAT TWO (2) immediate operator actions should be performed per OT-101, 'High Drywell Pressure Procedure,' assuming pressure did NOT reach the scram setpoint?

QUESTION 7.05 (2.50)

Regarding ON-113, 'Loss of RBCCW':

a. WHAT THREE (3) automatic actions should be verified if the non-regen heat exchanger outlet temperature reaches 200 degrees F? (1.5)

b. When shutting down the recirc pumps, WHY are they first runback to minimum speed, then tripped 10 seconds apart? (1.0)

QUESTION 7.06 (3.00)

Briefly discuss WHY each of the overall plant precautions below for the Transient Response Implementation Plan (TRIP) procedures are necessary.

a. Do NOT depressurize the reactor below 100 psig unless motor driven pumps are ready to inject. (1.5)

b. Do NOT initiate drywell sprays unless torus water level is below 18.5 feet. (1.5)

QUESTION 7.07 (3.00)

WHAT are the FOUR (4) entry conditions for the 'Reactor Pressure Vessel (RPV) Control,' TRIP procedure, T-101?

QUESTION 7.08 (2.00)

WHAT are TWO (2) reasons for requiring by procedure that HPCI and RCIC NOT be operated at less than 2200 RPM?

QUESTION 7.09 (3.00)

WHAT are the entry conditions for a 'Loss of Stator Cooling,' per OT-113?

QUESTION 7.10 (1.50)

MATCH the following whole body Emergency Exposure Limits with the appropriate emergency function as provided in the plant Emergency Procedures.

EXPOSURE LIMIT	EMERGENCY FUNCTION
a. 5 REM	1. Operation of equipment to mitigate an emergency.
b. 25 REM	2. Life saving and reduction of injury.
c. 75 REM	3. Protection of health and safety of the public.

QUESTION 8.01 (2.50)

Regarding the Technical Specifications for Core Alterations:

a. HOW MANY SRM's must be operable? (0.5)

b. WHERE must the OPERABLE SRM detectors be located? (1.0)

c. WHAT conditions must be satisfied before an SRM is considered OPERABLE? LIST TWO (2). (1.0)

QUESTION 8.02 (3.00)

Assume that Unit 2 is at approximately 85% power and that all conditions are normal when you relieve the shift at midnight. Later in the shift WIDE RANGE DRYWELL PRESSURE RECORDER PR-4805 (0-70 psig) fails low. In accordance with the Technical Specifications, WHAT ACTIONS MUST YOU TAKE IN THIS SITUATION? (3.0)

****
* NOTE: USE THE ATTACHED SECTIONS OF THE TECHNICAL SPECIFICATIONS TO *
* TO ANSWER THIS QUESTION. FULLY REFERENCE ALL APPLICABLE SEC- *
* TIONS OF THE T.S. THAT YOU USE TO DEVELOP YOUR ANSWER. *
****

QUESTION 8.03 (3.00)

In reference to the procedure for Control of Ignition Sources:

a. WHEN is a Tech Spec fire watch required? (1.0)

b. HOW are the duties of a Tech Spec fire watch different from those of a Dedicated fire watch? (2.0)

QUESTION 8.04 (1.50)

WHAT is the significance of the WHITE, YELLOW, and GREEN color coding on ALARM CARDS? (1.5)

QUESTION 8.05 (2.00)

a. WHAT are the THREE (3) parameters you use to determine whether a jet pump is OPERABLE? (1.0)

b. WHY must the plant be in COLD SHUTDOWN within 24 hours if one or more jet pumps is INOPERABLE? (1.0)

QUESTION 8.06 (1.50)

WHY is the reactor pressure vessel, rather than the recirc piping, the most limiting component of the reactor coolant system when considering the high pressure safety limit? (1.5)

QUESTION 8.07 (3.50)

Unit 2 is at 65% power and all conditions are normal with the following exception: One Diesel Generator is INOP due to water being found in the fuel during the monthly fuel check.
Subsequently, during the Core Spray Operability check, the 'A' Core Spray Pump would not start.
In accordance with the Technical Specifications, WHAT ACTIONS MUST YOU TAKE IN THIS SITUATION? (3.5)

```
**********************************************************************
*   Note: USE THE ATTACHED SECTIONS OF THE TECHNICAL SPECIFICATIONS TO   *
*   ANSWER THIS QUESTION.  FULLY REFERENCE ALL APPLICABLE SECTIONS OF    *
*   THE T.S. THAT YOU USE TO DEVELOP YOUR ANSWER.                        *
**********************************************************************
```

QUESTION 8.08 (2.50)

For the suppression chamber water temperatures listed below, WHAT ACTION(S) in(are) required by the Unit 2/3 Technical Specifications with the unit MODE SWITCH in RUN. (2.5)

a. 97 degrees F.

b. 106 degrees F. during HPCI testing

c. 121 degrees F. following a scram with the MSIV'S SHUT

QUESTION 8.09 (2.00)

With Unit 3 at 100% power, an inconsistency in the temperature indications for the main steam line tunnel exhaust duct is observed by the STA. Investigation reveals that temperature elements, TE-5931A and TE-5931B are pulled out of the exhaust duct. In accordance with the Technical Specifications, WHAT ACTIONS MUST YOU TAKE IN THIS SITUATION? (2.0)

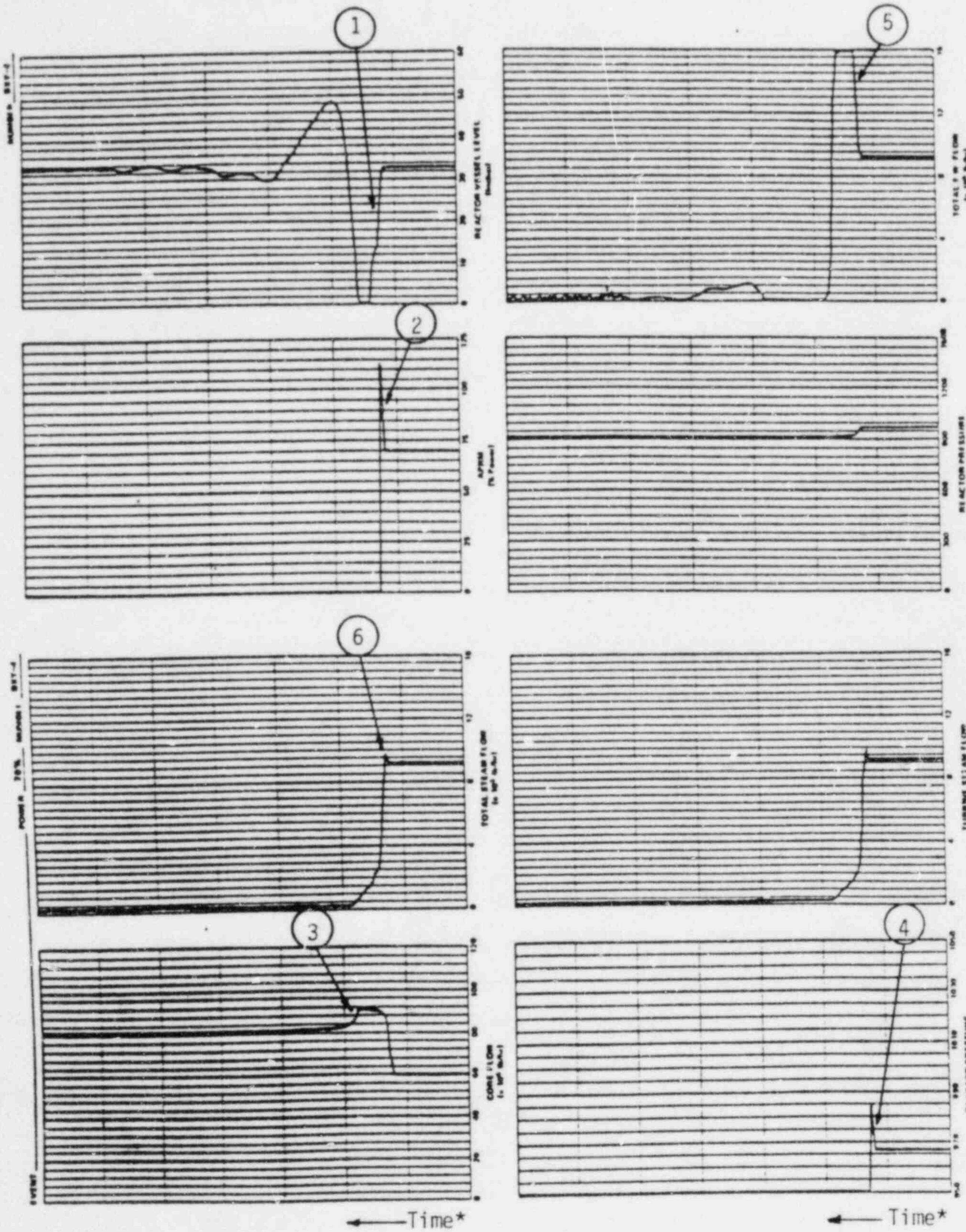
```
***************************************************************************
*   NOTE: USE THE ATTACHED SECTIONS OF THE TECHNICAL SPECIFICATIONS TO    *
*   ANSWER THIS QUESTION.  FULLY REFERENCE ALL APPLICABLE SECTIONS OF     *
*   THE T.S. THAT YOU USE TO DEVELOP YOUR ANSWER.                         *
***************************************************************************
```

QUESTION 8.10 (3.50)

Preparations are underway for a reactor startup on Unit 2 when the '125 VDC BATTERY CHARGER FAILURE' alarms. Upon investigation, it is found that the 2BCA 125VDC Battery Charger output is 90VDC.
In accordance with the Technical Specifications, WHAT ACTIONS MUST BE TAKEN DUE TO THIS INSTRUMENT FAILURE? (3.5)

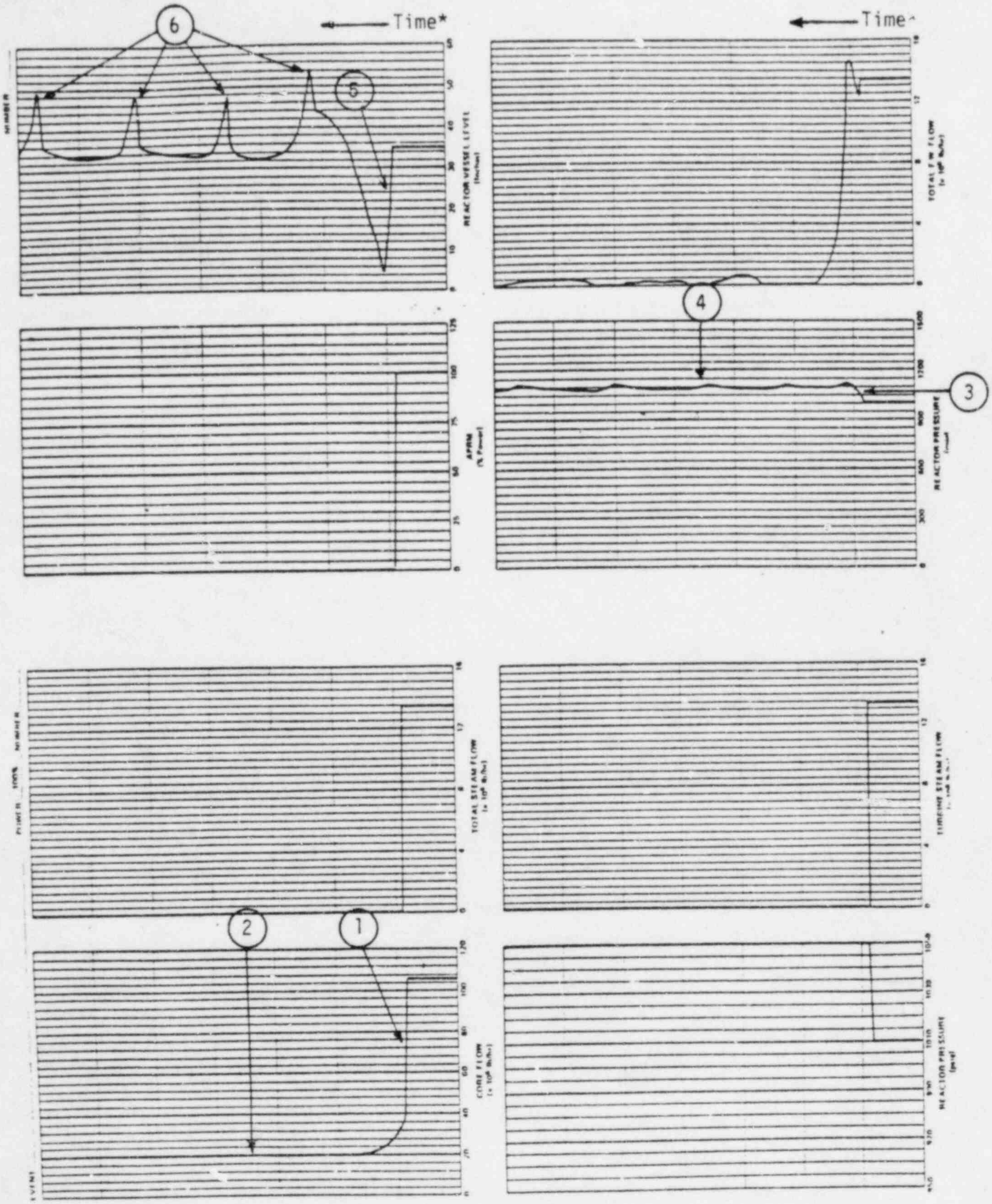
```
***************************************************************************
*   Note: USE THE ATTACHED SECTIONS OF THE TECHNICAL SPECIFICATIONS TO    *
*   ANSWER THIS QUESTION.  FULLY REFERENCE ALL APPLICABLE SECTIONS OF     *
*   THE T.S. THAT YOU USE TO DEVELOP YOUR ANSWER.                         *
***************************************************************************
```

FIGURE 2 for Question 5.06



*Each time increment is one (1) minute

Figure 3 for Question 5.07



*Each time increment is one (1) minute

Figure 4 for Question 5.08

DATE 1-25-84 TIME 0949 PEACHBOTTOM UNIT 2 SEQ. NO. 3

PERIODIC NSS CORE PERFORMANCE LOG

LOCATION	1	2	3	4	5	6	7	8	9	10	11	12
AXIAL REL PWR	0.48	0.92	1.02	1.09	1.14	1.20	1.20	1.21	1.15	1.10	0.90	0.60
REGION REL PWR	0.88	1.07	0.87	1.09	1.25	1.09	0.88	1.07	0.88			
RING REL PWR	1.11	1.27	1.24	1.24	1.14	1.18	1.01	0.57				
APRM GAF	1.01	1.00	0.99	1.01	1.01	1.00						

REGION	1	2	3	4	5	6	7	8	9
MFLCPR	0.819	0.869	0.819	0.868	0.837	0.868	0.819	0.869	0.819
LOC	19-18	37-18	41-18	19-32	37-26	41-32	19-44	23-44	41-44
FLOW	0.1172	0.1160	0.1172	0.1162	0.1174	0.1162	0.1172	0.1160	0.1172
PKF	1.38	1.45	1.38	1.44	1.40	1.44	1.38	1.45	1.38
MFLPD	0.799	0.829	0.799	0.846	0.833	0.846	0.799	0.829	0.799
LOC	19-18-12	35-16-12	41-18-12	21-28-12	23-36-12	39-34-12	19-44-12	25-46-12	41-44-12
PKFL	2.04	2.12	2.04	2.16	2.13	2.16	2.04	2.12	2.04
MAXEQ	0.211	0.225	0.211	0.225	0.215	0.225	0.211	0.225	0.211
LOC	19-18	37-18	41-18	21-28	37-26	39-34	19-44	23-44	41-44
FLOW	0.1172	0.1160	0.1172	0.1160	0.1174	0.1160	0.1172	0.1160	0.1172
PKF	1.38	1.45	1.38	1.44	1.40	1.44	1.38	1.45	1.38

CMWT	3104.
GMWE	1039.5
CMFCP	0.069
CMFLPD	0.846
CMPF	2.164
CMEQ	0.225
CAEQ	0.124
CAQA	0.136
CAVF	0.351
CAPD	45.90
CRD	0.041
CRSYM	2.
PR	1002.
DPC-M	19.22
DPC-C	23.14
RWL	24.49
DHS	23.00
WFW	12.45
WD	46.63
WTSUB	101.66
FRP	0.942
WT	102.27
WTFLAG	2.
ITER	2.
IREC	0.
IEQL	0.
IXYFLG	0.

FAILED SENSORS

FAILED LPRM LIST

2409,C,4	3209,C,4	4009,C,4	0817,A,4
0817,D,4	2417,A,4	2417,B,2	0825,D,4
1625,B,2	1625,C,2	1625,D,4	4025,B,2
4025,C,2	2433,C,2	2433,D,4	3233,D,4
4033,B,2	4033,C,2	4033,D,4	4833,A,4
4833,C,2	2441,A,4	3241,D,4	4041,C,2
3249,C,2	3249,D,1	4049,C,2	2457,B,4

BASE CRIT CODE

3217,2 3249,2 1657,1

ANSWER SHEET for Question 6.02

INITIAL RESPONSE:

a. TCV position ____________ (in % steam flow demand)

b. BPV position ____________ (in % steam flow demand)

c. Power ____________

d. Pressure ____________

(increase, decrease, or remain the same)

Reason: ____

____

____

FINAL STATUS:

a. TCV position ____________ (in % steam flow demand)

b. BPV position ____________ (in % steam flow demand)

c. Power ____________

d. Pressure ____________

(higher than, lower than, or the same as the initial value)

Reason: ____

____

____

EQUATION SHEET

$f = ma$

$v = s/t$

Cycle efficiency = (Net work out)/(Energy in)

$w = mg$

$s = V_o t + 1/2\ at^2$

$E = mc^2$

$KE = 1/2\ mv^2$

$a = (V_f - V_o)/t$

$A = \lambda N$

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

$PE = mgh$

$V_f = V_o + at$

$w = \theta/t$

$\lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

$W = \nu \Delta P$

$A = \frac{\pi D^2}{4}$

$t_{1/2}eff = \frac{[(t_{1/2})(t_b)]}{[(t_{1/2}) + (t_b)]}$

$\Delta E = 931\ \Delta m$

$\dot{m} = V_{av} A \rho$

$I = I_o e^{-\Sigma x}$

$\dot{Q} = \dot{m} Cp \Delta t$

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

$Pwr = W_f \Delta h$

$I = I_o e^{-\mu x}$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

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

$HVL = -0.693/\mu$

$P = P_o e^{t/T}$

$SUR = 26.06/T$

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

$CR_x = S/(1 - K_{effx})$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$

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

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$T = \ell/(\rho - \beta)$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$

$SDM = (1 - K_{eff})/K_{eff}$

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

$\ell^* = 10^{-4}$ seconds

$\bar{\lambda} = 0.1\ \text{seconds}^{-1}$

$\rho = [(\ell^*/(T\ K_{eff})] + [\bar{\beta}_{eff}/(1 + \bar{\lambda}T)]$

$I_1 d_1 = I_2 d_2$

$I_1 d_1^{\ 2} = I_2 d_2^{\ 2}$

$P = (\Sigma\phi V)/(3 \times 10^{10})$

$\Sigma = \sigma N$

$R/hr = (0.5\ CE)/d^2 (\text{meters})$

$R/hr = 6\ CE/d^2\ (\text{feet})$

Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 lbf/in.

Miscellaneous Conversions

1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)
1 BTU = 778 ft-lbf

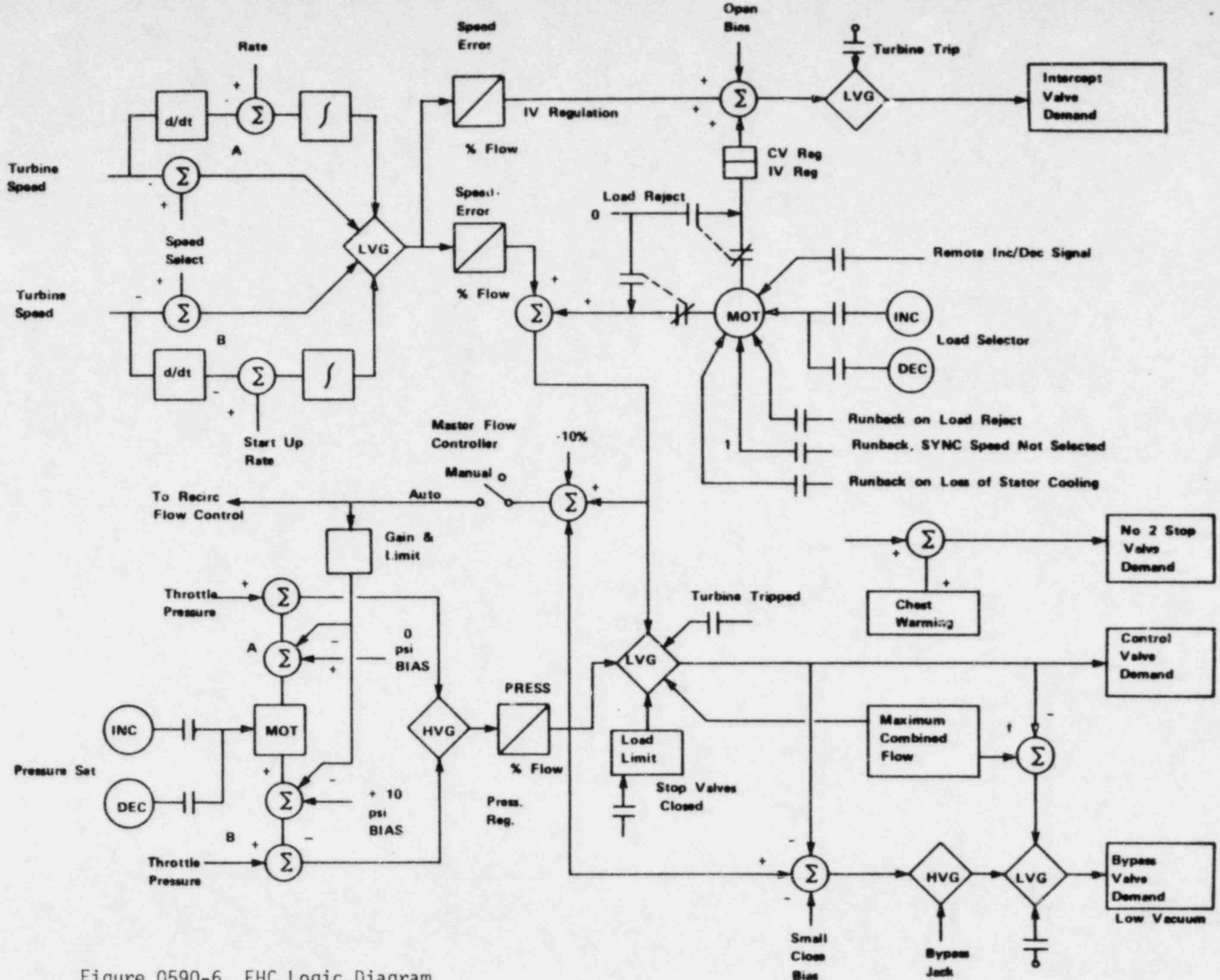


Figure 0590-6 EHC Logic Diagram

ANSWER 5.01 (1.50)

a. LHGR. (.75)

b. APLHGR or MAPLHGR (.75)

REFERENCE
PBAPS L/P Vol. 6, Lot 1400, pg. 10
1410, pg. 2 EDH-378

ANSWER 5.02 (3.00)

a. More negative [0.5]. Because each degree increase in moderator temperature results in a larger moderator density decrease [1.0]. (1.5)

b. Less negative [0.5]. Because as control rod density decreases, neutrons leaking from the volume near the fuel rods have less of a chance for non-fission absorption [1.0] (and a greater chance to cause fission). (1.5)

REFERENCE
PBAPS L/P Vol. 6, Lot 1450, pg. 4 EDH-379

ANSWER 5.03 (3.00)

a. The formation of bubbles serves to agitate and break-up [0.6] the relatively stagnant fluid boundary film [0.6]. As nucleate boiling progresses, relatively colder water replaces the gaps on the clad surface left by the bubbles as they detach and move into the coolant stream [0.6]. (1.8)

b. The edge and corner rods can dissipate heat by radiation away from the bundle [0.6] while the central rods radiate much of their heat to other central rods [0.6]. (1.2)

REFERENCE
PBAPS L/P Vol. 6, Lot 1340, pg. 1-6 EDH-380

ANSWER 5.04 (3.00)

a. Remains constant [.25]. Flow is controlled by the RCIC flow controller which will attempt to maintain a constant output flow regardless of reactor pressure [.75]. (1.0)

b. Decreases [.25]. The flow controller functions to maintain a constant flow, thus pump discharge pressure is decreased along with the decreasing reactor pressure to maintain constant flow. OR Since the flow controller maintains flow to the reactor, as reactor pressure decreases, the pump discharge head must decrease to maintain a constant flow (constant NPSH) [.75]. (1.0)

c. Decreases [.25]. Since pump discharge head is decreasing to maintain a constant flow, turbine RPM must also decrease [.75]. (1.0)

REFERENCE
PBAPS L/P Vol. 2, Lot 0380

ANSWER 5.05 (3.50)

a. The decrease in the burnout term [0.5] with the production of Xenon from Iodine still at the higher power rate dominates [0.5] causing the xenon concentration to increase. (1.0)

b. Peripheral rod worth will increase [0.5] because the highest xenon concentration will be in the center of the core where the highest flux existed previously [0.5]. This will suppress the flux in the center of the core and increase the flux in the area of the peripheral rods, thereby, increasing their worth [0.5]. (1.5)

c. More than one half the value at 100% power. The removal of xenon is directly proportional to the xenon concentration but it also depends on flux (power). Therefore the removal rate would become less significant. (1.0)

REFERENCE
PBAPS L/P Vol. 6, Lot 1510, pg. 6,7

ANSWER 5.06 (3.00)

(1) Due to void collapse caused by the high APRM scram or increased recirc suction flow from the annulus. (0.5)

(2) Due to the increase in recirc flow. (0.5)

(3) Due to the unaffected recirc pump runback to min. when feedflow decreases to <20%. (0.5)

(4) Due to increasing reactor power. (0.5)

(5) Due to FWCS response to decreasing reactor water level. (0.5)

(6) Due to TCVs opening to control reactor pressure. (0.5)

REFERENCE
BWR-4 Transients BXY-4 EDH-385

ANSWER 5.07 (3.00)

a. RPT on turbine trip [0.5]. Natural circulation from decay heat [0.5]. (1.0)

b. Turbine BPV's fail closed [0.5]. SRV's control pressure at higher value [0.5]. (1.0)

c. Void collapse due to pressure increase and the scram [0.5]. Level swell from SRV's lifting [0.5]. (1.0)

(a. No RPT trip) - Accept trip of recirc pumps.

REFERENCE
BWR-4 Transients DXY-4 EDH-386

ANSWER 5.08 (2.75)

a. Less (.75)

b. Maximum LHGR = 0.846 × 13.4 kw/ft = 11.34 KW/ft (1.25)

c. Top (.75)

REFERENCE
PBAPS L/P Vol. 6, Lot 1400, pg. 9-10 EDH-387

ANSWERS -- PEACH BOTTOM 2&3 -84/08/28-HILL, D.

ANSWER 5.09 (2.25)

a. Larger (.75)

b. Longer (.75)

c. More (.75)

REFERENCE
PBAPS Reactor Theory; Vol. 6, Lot 1430 EDH-388

ANSWER 6.01 (3.00)

a. To prevent recirc pump bearing damage due to reverse flow. (1.0)

b. To prevent draining the reactor vessel to the torus. (1.0)

c. Inboard and outboard suction valves shut, RHR pumps trip. (1.0)

REFERENCE
PBAPS Lot Lesson Plan 0370, pg. 16,17 EDH-356

ANSWER 6.02 (3.50)

INITIAL RESPONSE:

a. TCVs - Remain at 100% open (or open to 100%) [.35].

b. BPVs - Open 16.5% [.35].

c. Power - Decreases [.35].

d. Pressure - Decreases [.35].

REASON: Above caused by PCU calling for ~115% steam flow ((950-915) x 3.3) [.35].
(Load limit set @ 105% - MCF set at 110%)

FINAL STATUS:

a. TCVs - At 100% position (or initial) [.35].

b. BPVs - Shut [.35].

c. Power - Slightly lower [.35].

d. Pressure - Slightly lower [.35].

REASON: Above caused by the decrease in pressure and power causing BPVs to shut -- PCU cycling to new equilibrium state ((945-915) x 3.3) [.35].

REFERENCE
PBAPS Lot Lesson Plan 0590, pg. 6-17 EDH-359

ANSWER 6.03 (2.50)

a. Reactor water leaking past the CRD seals [0.5] and charging water from the CRDH System [0.5]. (1.0)

b. To repressurize the exhaust header following a scram[0.5] and prevent excessively high crd operating dp[0.5] during subsequent operation of a selected rod[0.5] (1.5)

REFERENCE
PBAPS Lot Lesson Plan 0070, pg. 13,16,17 EDH-360

ANSWER 6.04 (3.00)

a. 1. Reactor water level <17"[0.5] AND
2. An individual RFP flow <20%[0.5] OR
3. Total feed flow >90%[0.5] AND
4. Any condensate pump not running[0.5] (2.0)

b. Pump speed will increase to 50% at which time the Master Controller low speed limiter will be limiting. (1.0)

REFERENCE
PBAPS Lot Lesson Plan 0040, pg. 9,10 EDH-361

ANSWER 6.05 (3.00)

1. Reactor Scram
2. MSIV closure
3. Recirc sample line isolates (close)
4. Main Steam sample line isolates (close)
5. RHR sample line isolates (close)
6. Main Steam line drains isolate (close)
(6 required @ 0.5 each) (3.0)
7. Mechanical vacuum pump trip

REFERENCE
PBAPS Lot Lesson Plan 0180, TP #3 EDH-362

ANSWER 6.06 (3.00)

a. Poison injection must be fast enough to overcome reactivity due to cooldown. (1.0)

b. To ensure that the poison solution does not solidify in the lines and make the system inoperable. (1.0)

c. o Core plate dP.
   o Core Spray System line break detection.
   o Jet pump dP.

   (3 at 0.33 each) (1.0)

REFERENCE
PBAPS Lot Lesson Plan 0310, pg. 6,7 and TP #2 EDH-363

ANSWER 6.07 (3.00)

a. Fails low[.25] causing SF/FF mismatch[.25] decreasing feed pump speed[.25]. Actual level will be maintained a few inches lower [.25]. (1.0)

b. Fails low[.25] causes level error[.25] increasing feed pump speed[.25] to HSS[.25]. Actual level increases[.25] resulting in Main Turbine trip[.25], Feed pump trips[.25], and Reactor scram[.25]. (2.0)

REFERENCE
PBAPS Lot Lesson Plan 0550, pg. 19,20 EDH-364

ANSWER 6.08 (4.00)

a. Will inject [0.25]. Turbine seal leakage resulting in potential air-borne activity in the HPCI room [0.75]. (1.0)

b. Will not inject [0.25]. Turbine stop and control valves will not open [0.75]. (1.0)

c. Will inject [0.25]. Pump overheating and seal damage may result during low or no flow conditions [0.75]. (1.0)

d. Will not inject [0.25]. Maximum signal from the flow element will cause the controller to keep turbine speed at minimum [0.75]. (1.0)

REFERENCE
PBAPS L/P Vol. 2, Lot 0340

ANSWERS -- PEACH BOTTOM 2&3 -84/08/28-HILL, D.

ANSWER 7.01 (3.00)

a. The first rod(s). (1.0)

b. To establish a constant flow in and out of the reactor vessel (OR a constant feed flow demand) [0.66] to minimize temperature fluxuations on the feedwater nozzles [0.67], thus minimizing the probability of thermal stress cracking [0.67]. (2.0)

REFERENCE
GP-2, Rev. 35, pp. 12 & 16.

ANSWER 7.02 (2.00)

a. All core flow being diverted through the idle jet pumps (bypassing the core). (1.0)

b. Metal surface temperatures below water level will be less than indicated coolant temperature. (1.0)

REFERENCE
GP-12, Rev. 5, p. 9.

ANSWER 7.03 (3.00)

a. Assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable. (1.0)

Assures that ASME Codes are not exceeded when recirc pumps are started and the colder water in the bottom of the vessel is forced up to the upper regions of the vessel. (1.0)

b. To avoid receiving a APRM Hi flux scram from the power spike following the pump start. (1.0)
Also accept "vibration of the jet pumps induced by flow reversal"

REFERENCE
S.2.3.1.A, Rev. 4, p. 2, and

LOT-0030, p. 26.

ANSWER 7.04 (2.00)

o Maximize drywell cooling (1.0)

o Terminate drywell inerting (1.0)

REFERENCE
OT-101, Rev. 0, p. 1.

ANSWER 7.05 (2.50)

a. o Group IIa isolation (OR MO-12-15, MO-12-18, and MO-12-68 close).

o RWCU pumps trip.

o RWCU demin hold pumps start.

(3 at 0.5 each) (1.5)

b. To minimize the reactor transient. (1.0)

REFERENCE
ON-113, Rev. 0, p. 1, and

ON-113 Bases, p. 1.

ANSWER 7.06 (3.00)

a. Ensures depressurization below the HPCI and RCIC isolation setpoints will not occur unless motor driven injection pumps available. (1.5)

b. The suppression chamber to drywell vacuum breakers would be covered with water [0.5] making it possible to exceed the design DW negative internal pressure [0.5] following the drastic reduction in DW internal pressure caused by DW spray initiation [0.5]. (1.5)

REFERENCE
LOT-1560, Rev. 0, pp. 8 & 9.

ANSWER 7.07 (3.00)

1. RPV level below -48" or unknown.

2. Drywell pressure is above 2 psig.

3. A Group I isolation occurs.

4. Scram condition with power above 3% or unknown.

(4 required @ .75 each) (3.0)

REFERENCE
LOT-1560, Rev. 0, p. 7, and

T-101.

ANSWER 7.08 (2.00)

1. Ensures sufficient shaft driven lube oil pump pressure and flow. (1.0)

2. Ensure high enough steaming rate to avoid exhaust line check valve "chatter" and possibly subsequent damage. (1.0)

REFERENCE
LOT-1560, Rev. 0, p. 14.

ANSWER 7.09 (3.00)

A stator coolant system trouble alarm in conjunction with (.75)

- o an automatic turbine generator runback OR (.75)
- o the trip of both recirc pumps OR (.75)
- o a "Generator Stator Slots Hi Temp." alarm (.75)

REFERENCE
OT-113.

ANSWER 7.10 (1.50)

a. 3

b. 1

c. 2

(3 at 0.5 each)

REFERENCE
EP-103, Rev. 9, p. 9.

ANSWER 8.01 (2.50)

a. Two (0.5)

b. One in the core quadrant where fuel or control rods are being moved and one in the adjacent quadrant. (1.0)

c. 1. The SRM shall be inserted to the normal operating level. (0.5)
2. The SRM shall have a minimum of 3 cps with all rods fully inserted in the core. (0.5)

REFERENCE
Technical Specifications 3.10.B.1, pg. 227,228 EDH-347

ANSWER 8.02 (3.00)

Table 3.2.F. SURVEILLANCE INSTRUMENTS [1.0] requires a minimum of 2 operable instruments [0.5] however NOTE #1 to the table [1.0] states that if the parameter is reduced to one indication that continued operation is permissible only during the succeeding 30 days unless such instrumentation is sooner made operable [0.5].

REFERENCE
Technical Specifications Table 3.2.F., pg. 77-78 EDH-348

ANSWER 8.03 (3.00)

a. When an ignition source is to be used in an area, governed by T.S. 3.14, which has, or will have as a result of the work scope inoperable fire protection equipment. [T.S. number not required] (1.0)

b. The Dedicated fire watch is not required during periods when the ignition source is not in use and which are at least 30 minutes after the most recent use of the ignition source. The Tech Spec firewatch is continuous regardless of whether or not the ignition source is in use, until SS/SSV advises that the inop fire system is back in service. (2.0)

REFERENCE
Admin Procedure A-12, pg. 3,4 EDH-350

ANSWER 8.04 (1.50)

White-common to both units (0.5)
Yellow-unit 2 only (0.5)
Green-unit 3 only (0.5)

REFERENCE
Admin Procedure A-11, pg.1 EDH-351

ANSWER 8.05 (2.00)

a. 1. Recirculation Pump Flow
 2. Total Core Flow
 3. Diffuser-to-Lower Plenum dp or Jet pump dp
 (3 required for full credit) (1.0)

b. In the case of a DBA, the blowdown area is increased and the capability for reflooding the core is reduced. (1.0)

REFERENCE
Technical Specifications 4.6.E, pg. 148; Bases, pg. 159 EDH-352

ANSWER 8.06 (1.50)

Even though the recirculation suction piping design pressure is lower (1148), the ANSI code allows 120% (1377.6) of design for piping. ASME codes allow 110% of design pressure for maximum allowable pressure transients. (1250 x 110% = 1375) (1.5)

REFERENCE
PBAPS L/P Book VIII, Lot 1820, pg. 15 EDH-353

ANSWER 8.07 (3.50)

T.S. 3.9.B.3 [1.0] states continued reactor operation is permissible in accordance with 3.5.F. if 3.9.A.1 is satisfied [0.5]. Both off-site sources and both the startup and emergency transformers are available so 3.9.A.1 is satisfied [.25]. 3.5.F.1 [1.0] states that with one D/G inop, all low pressure core cooling must be operable [0.5]. Therefore an orderly shutdown of the reactor must be initiated and the reactor must be in Cold Shutdown in 24 hours[.25].
(Reference to T.S 3.9 not required for full credit)

REFERENCE
Technical Specifications 3.9.B.3, 3.5.F.1, pg. 132,221

ANSWER 8.08 (2.50)

a. Restore the temperature below 95 degrees F. ie. initiate suppression pool cooling. (0.5)

b. Stop HPCI testing and reduce temperature below 95 degrees F. ie. initiate suppression pool cooling. (1.0)

c. Depressurize to less than 200 psig at normal cooldown rates. (1.0)

REFERENCE
Technical Specifications 3.7.A.c, pg. 165a EDH-355

ANSWER 8.09 (2.00)

T.S. Table 3.2.A [0.5] requires two operable instrument channels per trip system and one of two instrument channels is defeated in each trip system [0.5]. Note 2B for Table 3.2.A [0.5] states to initiate an orderly load reduction and have Main Steam Lines isolated within eight hours [0.5] (2.0)

REFERENCE
Technical Specifications, Notes for Table 3.2.A, and Table 3.2.A

ANSWER 8.10 (3.50)

T.S. 3.9.A.4 [1.0] requires 4 unit batteries and their chargers to be operable if the reactor is to startup [0.5]. T.S. 3.9.B.5 [1.0] allows continued reactor operation during the succeeding 3 days within electrical safety considerations, provided repair work is initiated [0.5]. T.S. 3.0.D allows operation to be governed by the LCOs for the power source, not the individual action statements for each system determined to be inoperative solely because of the power source [0.5]

(First sentence acceptable for full credit)

REFERENCE

Technical Specifications, 3.9.A.4, 3.9.B.5, 3.0.D