U.S. NUCLEAR REGULATORY COMMISSION
REGION I

EXAMINATION REPORT NOS. 50-272/86-09(OL)
50-311/86-09(OL)

FACILITY DOCKET NOS. 50-272
50-311

FACILITY LICENSE NOS. DPR-70
DPR-75

LICENSEE: Public Service Electric and Gas Company
P. O. Box 236
Hancock's Bridge, New Jersey 08038

FACILITY: Salem 1 and 2

EXAMINATION DATES: April 8-10, 1986

CHIEF EXAMINER: _____ 15 May 86
Barry S. Norris Date
Reactor Engineer (Examiner)

REVIEWED BY: _____ 5/21/86
Robert M. Keller, Chief Date
Projects Section 1C

APPROVED: _____ 5/21/86
for Harry B. Kister, Chief Date
Projects Branch No. 1

SUMMARY: One Senior Reactor Operator (SRO) and three Reactor Operator (RO) candidates were examined during this period; all received their licenses.

REPORT DETAILS

TYPE OF EXAMS: Replacement

EXAM RESULTS:

	RO Pass/Fail	SRO Pass/Fail
Written Exam	3/0	0/0
Oral Exam	2/0	1/0
Simulator Exam	2/0	1/0
Overall	3/0	1/0

CHIEF EXAMINER AT SITE: B. S. Norris (NRC)

OTHER EXAMINERS: N. F. Dudley (NRC)
D. M. Silk (NRC)

1. Summary of generic deficiencies noted from grading of RO written exam:

Question No.	Comment
1.05.b	Candidates had difficulty in predicting how parameters would trend on a loss of natural circulation flow.
2.07.d	Candidates did not know the design requirements for minimum flow for the Auxiliary Feed Water System.
2.08 a	Candidates did not know the requirements for termination of the injection phase for the Residual Heat Removal System.
3.05.b	Candidates did not know the meaning of the phrase "lock-up of a power cabinet" with respect to the Rod Control system.
3.09.a	Candidates could not explain the significance of both Intermediate Range detectors being overcompensated.

3.10.b	Candidates were not familiar with how the Letdown line radiation monitor could differentiate between increased activity due to core age and fuel failure.
3.11	Candidates were unfamiliar with the electrical interlocks associated with various RHR valves.
4.05	Candidates were not able to state the reasons for controlling feed flow when all steam generators are depressurized.
4.06.b	Candidates did not know whose approval was required to increase an individual's exposure limit.
4.10.b	Candidates were not familiar with the reason for securing Number 21 and 22 AFW pumps on a loss of Control Air.

2. Personnel present at Entrance Meeting:

NRC Personnel

B. S. Norris - Chief Examiner

Facility Personnel

J. K. Lloyd - Principal Training Supervisor, Salem Operations
A. Orticelle - Operations Engineer, Salem
R. Best - Simulator Training Supervisor
K. Moore - Operations Training Supervisor

3. Personnel present at Exit Meeting:

NRC Personnel

B. S. Norris - Chief Examiner
D. M. Silk - Examiner

Facility Personnel

J. K. Lloyd - Principal Training Supervisor, Salem Operations
R. Best - Simulator Training Supervisor
K. Moore - Operations Training Supervisor
R. Schaeffer - Assistant Manager, Operations Training
H. D. Hanson - Manager, Nuclear Training
J. Gueller - Operations Manager, Salem

4. Summary of Comments Made at Exit Meeting:

   a. Concern was expressed by the examiners for the condition when a casualty situation is addressed by both an Emergency Operating Procedure (EOP) and an Emergency Instruction (EI); in that, the lower tier procedure did not reference the higher tier EOPs. Example: Loss of all Feedwater (Open item 86-09-01)

      The facility recognized the problem and stated that all of the EI's were undergoing review to eliminate redundant procedures. The Operations Manager committed that this effort would be accomplished within the next year.

   b. The facility expressed a concern over the complexity of the simulator scenarios; in that, the candidates were placed in a situation beyond the "single-fault" FSAR design accidents.

      The examiners stated that the symptom based EOPs were written to prioritize unanalyzed combinations of casualties, and the scenarios were written to examine the candidate's ability to follow procedures and use their judgment when conditions did not exactly match the procedures.

   c. The facility expressed appreciation for the time spent by the examiners for review/resolution of comments on the RO written examination.

   d. The examiners noted the assistance of the simulator instructors.

5. Facility comments on the RO written examination are listed in Attachment 2, with the NRC resolution detailed in Attachment 3.

Attachments:

1. Written Examination with Answer Key (RO)
2. Facility comments on the written examination
3. NRC resolution of facility comments

Attachment 1

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: SALEM 1&2

REACTOR TYPE: PWR-WEC4

DATE ADMINISTERED: 86/04/07

EXAMINER: SILK, D.

APPLICANT: Master w/ Key

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~~ 23.50			4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
100.00	~~100.00~~ 98.50			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)

a. Describe the conditions under which cavitation occurs. (1.0)

b. What are two noticeable effects of cavitation? (0.5)

QUESTION 1.02 (1.50)

Describe how a water hammer physically occurs in terms of fluid dynamics. (1.5)

QUESTION 1.03 (1.25)

The reactor is at 10% power. What is the initial effect of an increase in steam demand on steam generator level (increase, decrease, no effect)? Explain your answer assuming feedwater flow remains constant.

QUESTION 1.04 (1.50)

Explain why the Axial Flux Difference would become more negative or less negative for the following conditions. Consider each separately.

a. OTDelta-T runback from 100% power with rods in automatic (0.5)

b. Feed flow increases to the steam generators with rods in manual (0.5)

c. Xenon is building in to the bottom of the core (0.5)

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.05 (2.25)

a. After operating at 100% power for three months, power is suddenly lost to all of the reactor coolant pumps. Below are three things that can be done to enhance natural circulation. Why is each done? (1.5)

1. Pressurizer level should be maintained at 50% or greater
2. Maintain at least 15 F subcooling in RCS
3. Maintain heat sink

b. Briefly explain how the following parameters will be trending if natural circulation is LOST:

1. RCS differential temperature (.25)
2. Steam generator steam pressure (.25)
3. Steam generator level (.25)

QUESTION 1.06 (2.25)

a. State how the following parameter changes affect the critical heat flux (increase, decrease, no effect):

1. Reactor coolant flow decreases (.25)
2. Reactor coolant temperature increases (.25)
3. Reactor coolant system pressure increases (.25)

b. Sketch the approximate coolant temperature profile across the two flow channels shown in Figure 1. Which channel is operating closer to Departure from Nucleate Boiling (DNB)? Justify your answer.

QUESTION 1.07 (2.00)

The reactor is at 30% of full power. Briefly explain how and why each of the following parameters will change if one reactor coolant pump (RCP) is shut off with rods in manual and the turbine is in P-impulse mode.

a. Reactor coolant flow in the unaffected loops (0.5)
b. Indicated reactor coolant flow in affected loop (0.5)
c. Steam flow in the unaffected loops (0.5)
d. T-ave (0.5)

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.08 (2.25)

a. Define Shutdown Margin (SDM). (1.25)

b. Give three reasons for Rod Insertion Limits. (1.0)

QUESTION 1.09 (2.25)

The reactor is at 100% power at EOL. Rods are at 220 steps on Bank D. Boron concentration is 300 ppm. Power must be reduced to 30%. If rods will be inserted to 100 steps on Bank D, what will be the final boron concentration at equilibrium conditions at 30% power? Use the attached figures. Show all work and state all assumptions.

QUESTION 1.10 (2.00)

If rods are in manual and a steam generator safety valve opens, explain how and why reactor power responds. Assume reactor is at 75% power. (2.0)

QUESTION 1.11 (3.25)

a. Briefly explain the production and removal of Xenon (Xe) in the core? (1.25)

b. After three months of steady state 100% power operations, the reactor trips. A two month outage follows. After the trip:

1. When will Xe reach its peak concentration in the core and what will be its maximum reactivity worth? (1.0)
2. When will Samarium (Sm) reach its peak concentration in the core and what will be its maximum reactivity worth? (1.0)

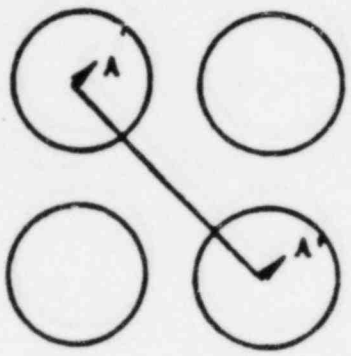
QUESTION 1.12 (3.00)

a. Give two reasons why the Doppler Coefficient is of importance to reactor safety. (1.5)

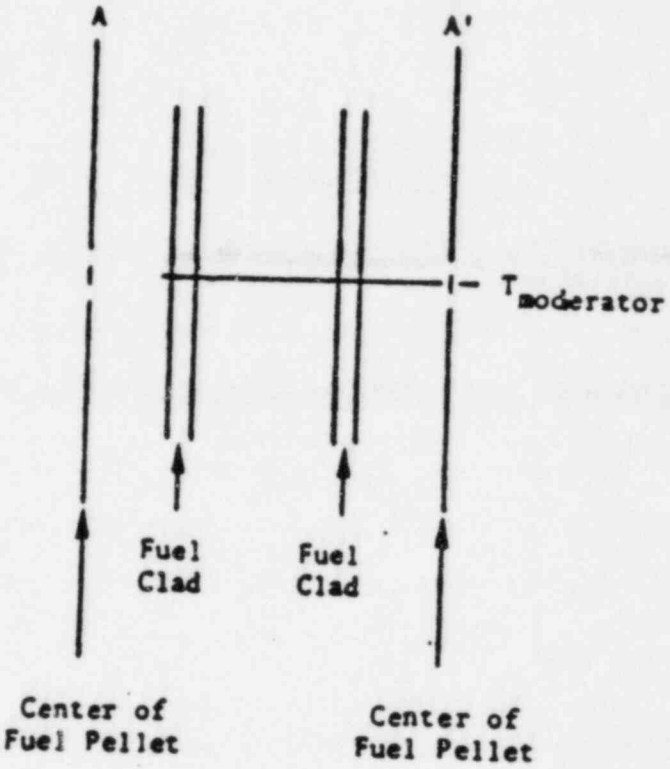
b. Explain how the Moderator Temperature Coefficient could become positive during high boron concentrations? (1.5)

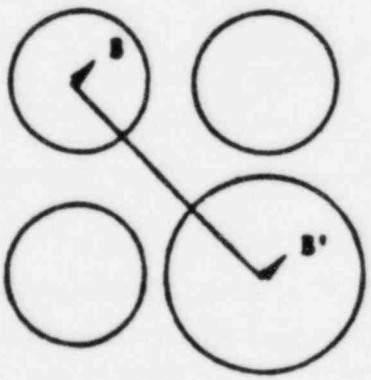
(***** END OF CATEGORY 01 *****)

Figure 1

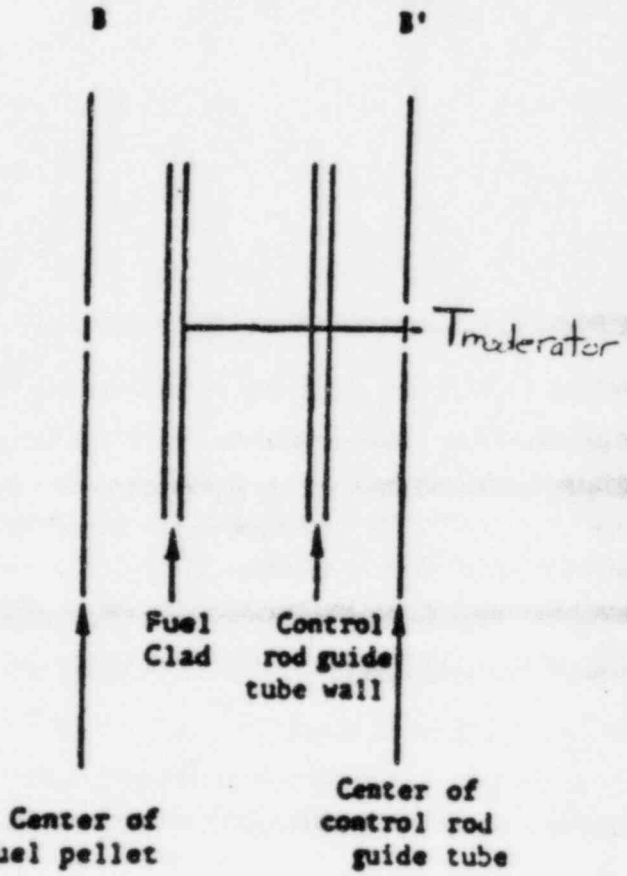


A Unit Channel



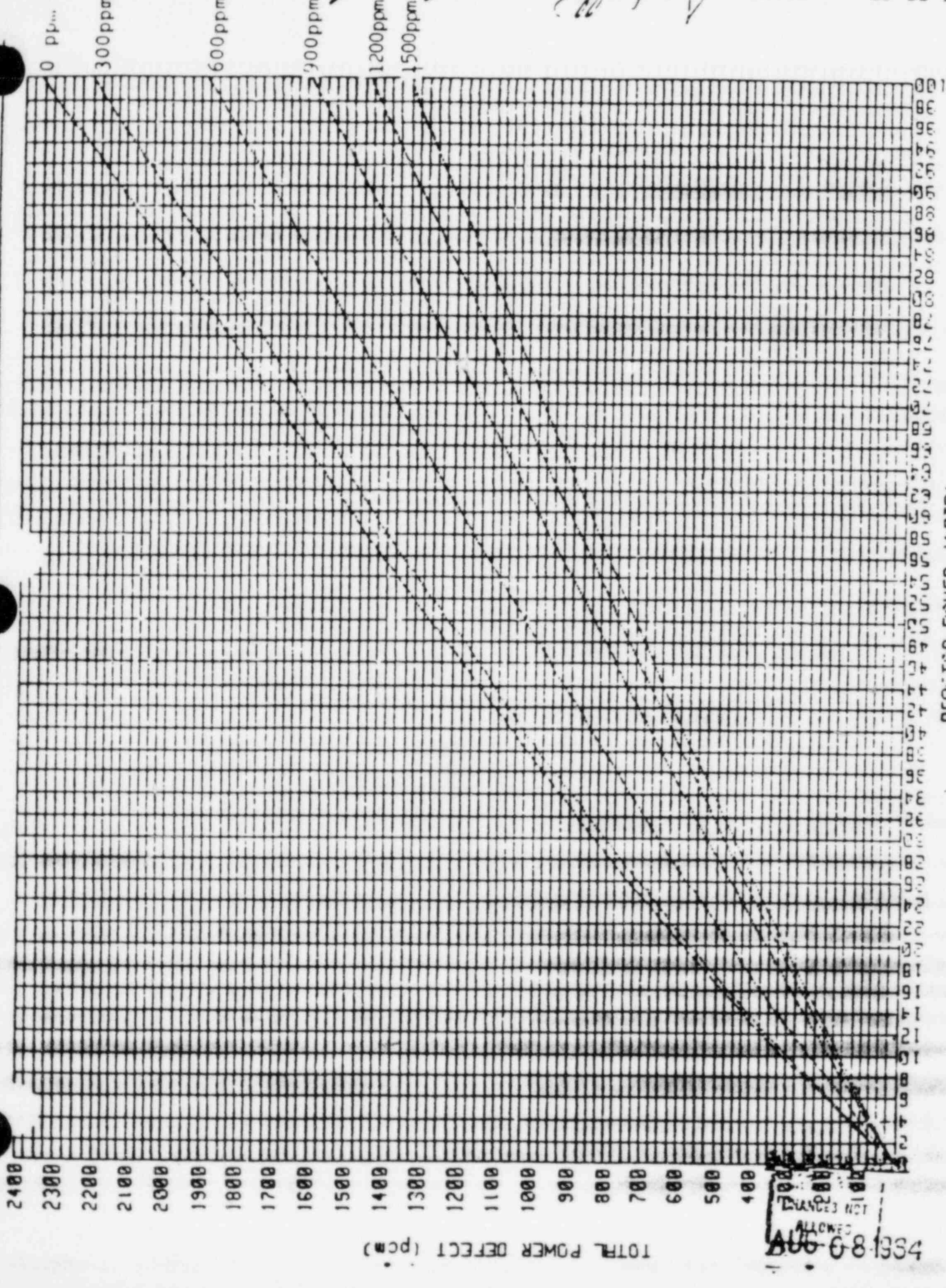


A Control Rod Channel



POWER DEFECT Vs. REACTOR POWER

PREPARED BY ___ TECH ENG ___ DATE ___



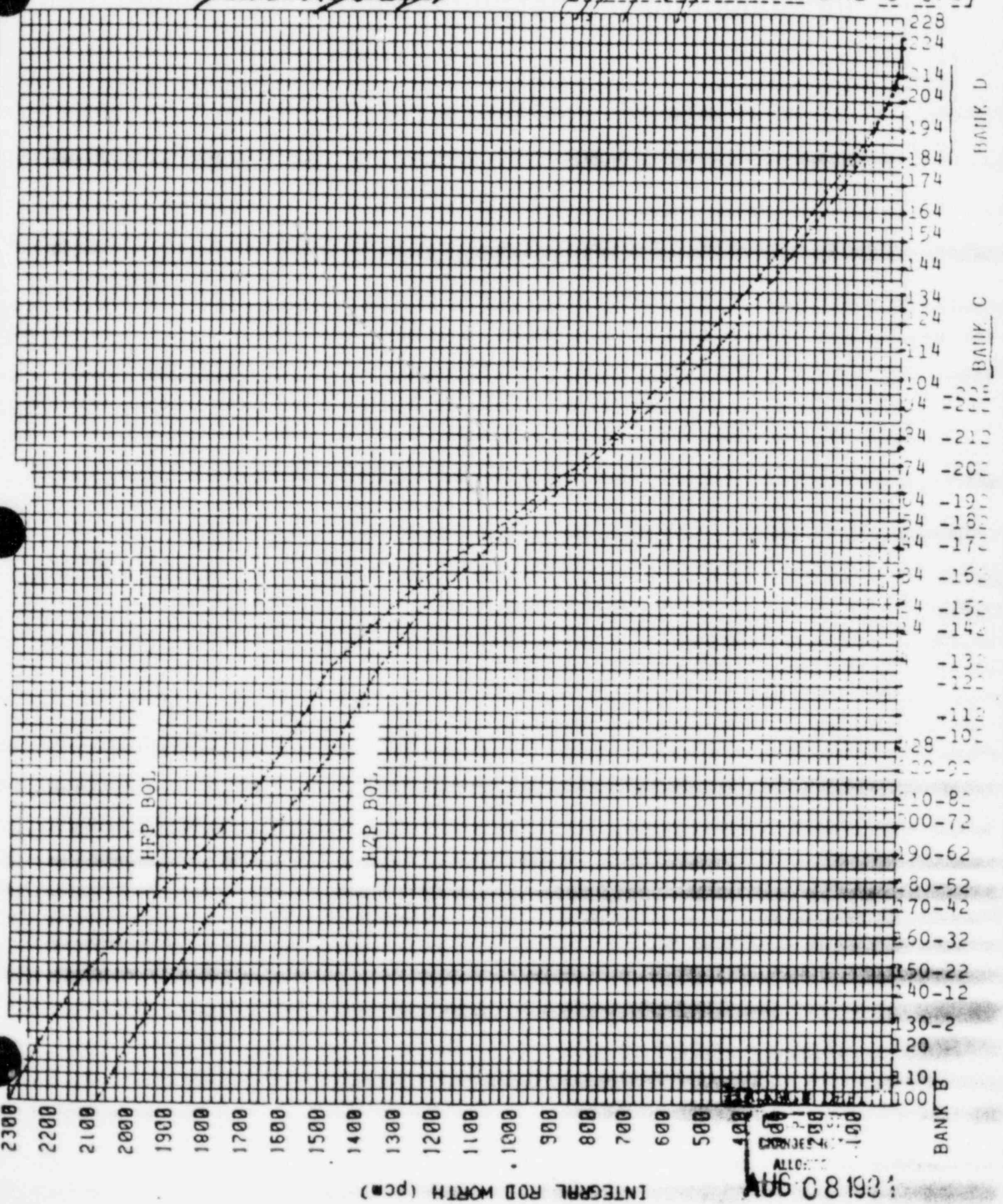
SALEM 1 CYCLE 6

FIGURE 4

INTEGRAL ROD WORTH vs. POSITION IN OVERLAP

FOR HFP & HZP ROD WORTHS

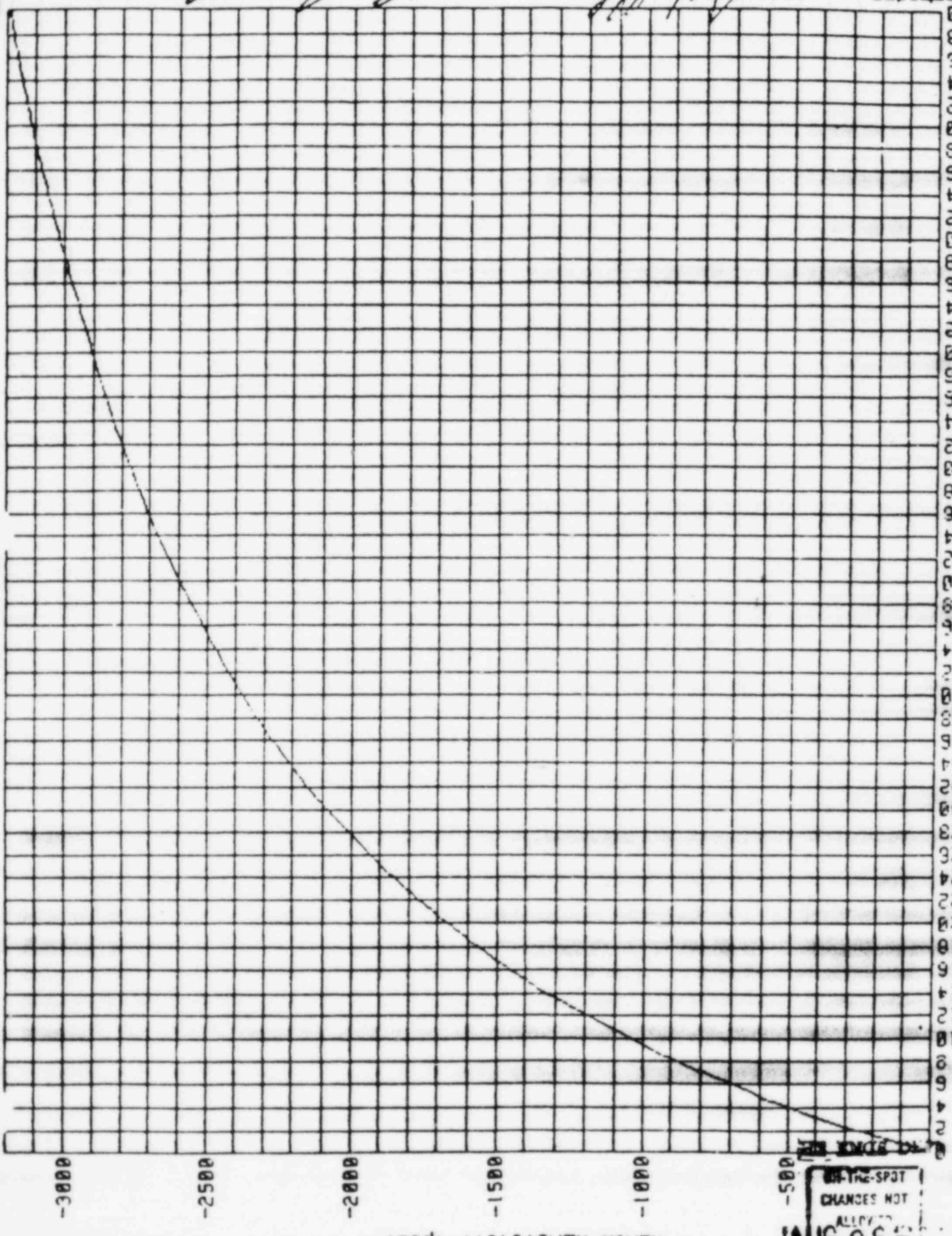
PREPARED BY James L. Boyd TECH ENG Jeffrey D. Faulkner DATE 8/8/84



SHEET 1 CYCLE 8

EQUILIBRIUM XENON REACTIVITY vs REACTOR POWER

Prepared by [signature] TECH Engineer [signature] Date 8/8/84



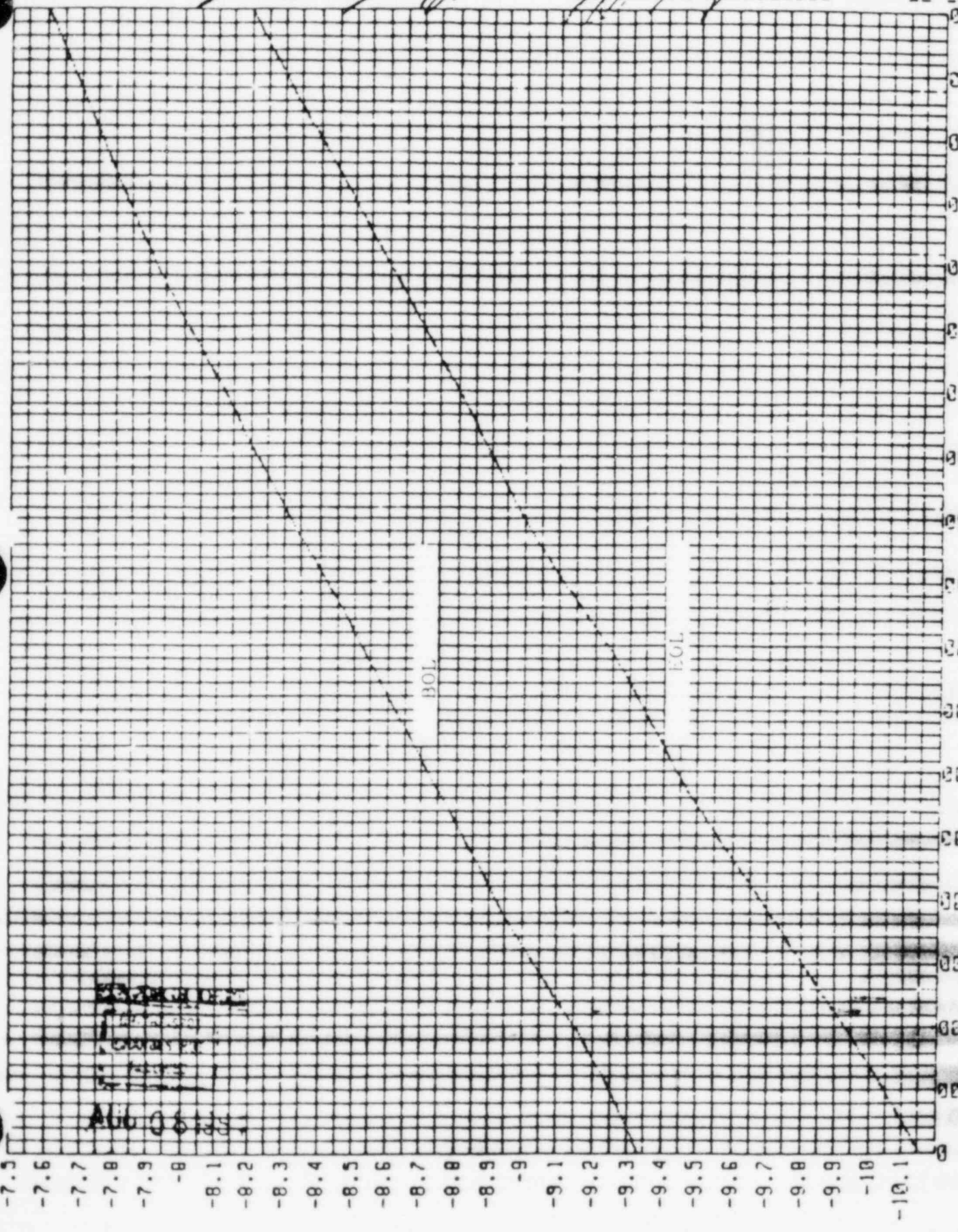
[illegible] SPOT
CHANGES NOT
ALLOWED

[illegible] 30 DAYS

DIFFERENTIAL BORON WORTH vs. BORON CONCENTRATION

REACTOR ENGINEERING MANUAL

PREPARED BY James A. Jones Jr. TECH ENG Jeffrey L. Jackson DATE 8-8-84



QUESTION 2.01 (1.00)

The plant is at 75% power and all systems are in automatic. What systems will help the plant stabilize itself after a main feedwater pump tripped because of low feed pump turbine bearing oil pressure? Assume no reactor trip. (1.0)

QUESTION 2.02 (1.70)

a. The plant is at 100% power. The high flow alarm is actuated by high flow in the discharge header of the Component Cooling Water System (CCWS). The surge tank level is rising and radiation monitors on the CCWS are alarming. What should the operator suspect as the cause of the event? (0.5)

b. What are the safety-related loads serviced by the CCWS? (1.20)

QUESTION 2.03 (2.00)

State six of the places where the Chemical and Volume Control System (CVCS) interfaces with the Reactor Coolant System (RCS). (2.0)

QUESTION 2.04 (2.40)

Describe the flow path used during Rapid Boration. Begin at the source of the boron, and mention major components along the flow path and end when the boron reaches the RCS. (2.4)

QUESTION 2.05 (2.00)

a. What effect, if any, does a Phase-A Containment Isolation Signal have on seal leakage flow? (1.0)

b. What damage, if any, would result to the RCP's if they were left running following a Phase-B Containment Isolation Signal? Explain. (1.0)

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.06 (3.00)

a. Give two purposes of the containment spray system. (1.0)

b. How is hydrogen concentration controlled in containment and what are three potential sources of hydrogen following a LOCA? (2.0)

QUESTION 2.07 (3.60)

a. From which busses do the 11 and 12 Motor Driven Auxiliary Feedwater Pumps draw their power? (0.6)
b. Which steam generator(s) supplies steam to the 13 Turbine Drive Auxiliary Feedwater Pump? (0.5)
c. List the four sources of water that can be supplied to the Auxiliary Feedwater System (AFWS) in the preferred order of use. (1.0)
d. For a transient or accident condition, the flow provided by the AFWS must meet what requirements in addition to the minimum flow rate? (1.5)

QUESTION 2.08 (3.10)

a. What busses feed Unit 1's Residual Heat Removal (RHR) pumps? (0.6)

b. What functions do the RHR system provide as part of the Emergency Core Cooling System (ECCS)? (1.5)

c. When and why is the Injection Phase for the RHR system terminated? (1.0)

QUESTION 2.09 (3.20)

a. What are four conditions that will generate a Safety Injection Signal? Include setpoints and coincidences. (1.2)

b. During a continued RCS depressurization caused by a LOCA, indicate the order in which the ECCS subsystems will inject into the RCS and the pressure at which each will inject. (2.0)

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.10 (3.00)

Starting from a diesel generator, explain how power would be supplied to a Vital Instrument Bus. Include major components and voltages. (3.0)

(***** END OF CATEGORY 02 *****)

QUESTION 3.01 (1.50)

The plant is at 100% power. Explain the response of the Steam Dump System (SDS) if PT-506 fails low?

QUESTION 3.02 (1.70)

a. Will the plant depressurize from a PORV opening if a high failure of the master control pressure channel occurs ? Explain (1.0).

b. With the control bezel selected to automatic, when will the air-operated relief valves open and what is the reset value? (0.7)

QUESTION 3.03 (1.20)

a. Why are the wide-range RTD's not used for protection related functions?

b. Why are the narrow-range RTD's not used during natural circulation?

QUESTION 3.04 (2.50)

a. Explain the purpose of the variable gain unit in the power mismatch circuit? (1.0)

b. What are the six rod control interlocks and in what modes (automatic and/or manual) do they function? (1.5)

QUESTION 3.05 (2.50)

a. During a logic cabinet urgent failure, how is it possible to regain control of the rods? (0.5)

b. What is meant by a "lock-up of the power cabinet"? (2.0)

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.06 (2.25)

The selected channel to the pressurizer level control system fails low.

a. What component responses will be initiated by the channel failure? (1.75)

b. If no operator action is taken, what will eventually trip the plant? (0.5)

QUESTION 3.07 (2.05)

a. If the level in the reference leg of the level transmitters on a steam generator decreases, will the control system cause actual steam generator level to increase, decrease, or remain the same? Explain. (1.0)

b. What three conditions cause automatic closure of the feedwater regulating valves? (1.05)

QUESTION 3.08 (2.30)

a. What is the purpose of the Overtemperature Delta-T and the Overpower Delta-T trips? (1.3)

b. Explain how the Overtemperature Delta-T Turbine Runback works. (1.5)

QUESTION 3.09 (2.50)

a. If both Intermediate Range Detectors are overcompensated, what could happen during a reactor shutdown regarding the source range detectors and the Reactor Protection System? Explain. (1.0)

b. How is nuclear power indication adjusted to match secondary power?(0.5)

c. What does the detector current comparator do and when will it give an alarm? (1.0)

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.10 (3.00)

a. What three process radiation monitors can be indicative of primary to secondary leakage? (1.8)

b. As the reactor ages, RCS activity increases. How does the process radition monitoring system distinguish between RCS activity from reactor age and fuel failure? (1.2)

QUESTION 3.11 (3.00)

a. What electrical interlock prevents the operator from opening the containment sump to RHR pump isolation valves (21SJ44 and 22SJ44)? (0.5)

b. What electrical interlocks prevent the operator from opening the RHR to Safety injection pump and charging pump suction isolation valves (21SJ45 and 22SJ45)? (1.5)

c. What electrical interlocks prevent the operator from opening the RHR to containment spray isolation valves (21CS36 and 22CS36)? (1.0)

(***** END OF CATEGORY 03 *****)

QUESTION 4.01 (1.00)

a. A shift crew may be one less than the minimum requirement for a period of time of two hours. If your replacement is late, can you leave when your shift is over? (0.5)

b. What is the maximum amount of time an operator can be on shift during a 24 hours period? (0.5)

QUESTION 4.02 (1.00)

What is the limit for a cooldown rate of the RCS and what is its basis? (1.0)

QUESTION 4.03 (1.50)

a. In accordance with EOP-LOCA-2, Post LOCA Cooldown and Depressurization, why might pressurizer level rapidly increase? (0.5).

b. In accordance with EOP-LOCA-3, Transfer to Cold Leg Recirculation, Charging and Safety Injection Pump flow are monitored when closing RWST suction valves. What actions should be taken if a large flow decrease occurs? (1.0)

QUESTION 4.04 (2.00)

The plant is at 100% power and both Main Feed Pumps trip. 21 and 22 auxiliary feedwater pumps have started. No flow is indicated and pump discharge pressure is greater than 1350 psig. In accordance with EOP-TRIP-1, Reactor Trip or Safety Injection, and EI-I 4.12, Loss of Feedwater:

a. Why depress the PRESS OVERRIDE DEFEAT push button? (1.0)

b. What protective feature is removed by the PRESS OVERRIDE DEFEAT? (0.5)

c. When auxiliary feedwater flow is initiated to the steam generators, what condition takes precedence over water hammer considerations?(0.5)

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.05 (2.50)

For a multiple steam generator depressurization, what are three reasons for carefully controlling feed flow to the steam generators?

QUESTION 4.06 (2.50)

A 24 year old, with a life time exposure through the last quarter of 23 rem, will be working in a 200 mrem/hr radiation field during a planned refueling outage. In addition to his life time exposure, he has received 2100 mrem in the present quarter.

a. What provisions must be met to allow an individual, in non-emergency situations, to exceed the quarterly regulatory limit? (1.0)

b. Who's approval is needed, in this case, to increase this individual's exposure limit? (1.0)

c. How long may this individual work before he reaches the maximum quarterly limit allowed at Salem under these conditions? (0.5)

QUESTION 4.07 (2.50)

The plant is being maintained in hot standby.

a. How often must the shutdown margin be checked? What is its limit? (1.0)

b. If the shutdown margin is required to be increased, how is this done and what action should follow to ensure safe plant conditions? (1.5)

QUESTION 4.08 (2.00)

a. Once in the EOP's, what are three conditions that result in transitioning to EOP-SGTR-1, Steam Generator Tube Rupture? (1.0)

b. What is the principle behind isolating the ruptured steam generator? (1.0)

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.09 (3.50)

a. List the bases for the following the below statement out of IOP-3, "Hot Standby to Minimum Load"? (2.5)

"Within fifteen minutes prior to criticality, verify RCS Tavg to be greater than or equal to 541 F"

b. If, during power operation, Tavg drops below 541 F, what actions must be taken as per the Technical Specifications? (1.0)

QUESTION 4.10 (3.00)

A Control Air Header Pressure Low alarm comes in. Attempts to increase header pressure failed and the reactor was manually tripped when pressure in the instrument air header fell to 65 psig. It has been decided to go to cold shutdown.

a. Why does EI-I-4.18, Loss of Control Air, stop the No. 22 and 24 reactor coolant pumps? (1.5)

b. Why does EI-I-4.18 use only No. 21 and 22 AFW pumps to maintain steam generator level at approximately 33%? (1.5)

QUESTION 4.11 ~~(3.50)~~ (2.0)

a. Besides the overhead annunicators alarming, what other indications will the control room operator have that 2C 115V vital instrument bus has been lost? (1.0)

DELETED b. ~~What affect will the loss of 2C 115V vital instrument bus have on pressurizer pressure? Explain. (0.5)~~

c. What manual actions will be taken to regain pressurizer pressure control? ~~(1.5)~~ List 2 (1.0)

(***** END OF CATEGORY 04 *****)

(********** END OF EXAMINATION **********)

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 1.01 (1.50)

a. Cavitation occurs when the pressure of the fluid is reduced to a pressure below that of its saturation pressure for a given temperature which will allow boiling to occur. (1.0)

b. Noise, excess vibrations, and reduced pump capacity. (Any two .25 each)

REFERENCE
Heat Transfer, Thermodynamics, and Fluid Flow (HTTFF) pgs. 319, 320

Appendix Components: Pump Centrifugal 3.4

ANSWER 1.02 (1.50)

Water hammers occur when slugs of liquid are separated by vapor pockets (0.5). When flow is suddenly increased, the slugs of liquid are accelerated through the system (0.5). When the liquid is suddenly forced to change direction, it imparts a great deal of its momentum to the constraining elements (0.5).

REFERENCE
HTTFF pg. 346

3.5 059 000 K 5.04 2.3

ANSWER 1.03 (1.25)

Increase (.25). As steam flow increases the number and size of steam bubbles in the steam generator increases (0.5). This reduces the density, thus increasing the specific volume of the mass in the steam generator, which causes a swell in level (0.5).

REFERENCE
HTTFF pgs. 46-50
IOP-3 pg. 14

3.4 035 010 K 5.03 2.8

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 1.04 (1.50)

a. More negative (.25) because rods are inserted and push the flux to the bottom of the core (.25)

b. More negative (.25) because more moderation will occur in the bottom of the core due to T-cold decreasing (.25)

c. Less negative (.25) because Xe inserts negative reactivity in the bottom of the core and thus flux moves to the top of the core (.25)

REFERENCE
Rx Th pgs. 196-210, 232-233
TS pgs. 1-1 and B 3/4 2-1

3.1 001 000 K 5.06 3.8
K 5.38 3.5

ANSWER 1.05 (2.25)

a. 1. To ensure that no vapor pockets form in the loops (0.5)
2. To prevent steam pocket formation (0.5)
3. To help thermal driving head (0.5)

b. 1. Will exceed 100% full power value (.25)
2. Pressure will decrease (.25)
3. Level will increase (.25)

REFERENCE
HTTFF pgs. 356, 357

3.4 000 015 EK 1.01 4.4

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 1.06 (2.25)

a. 1. Decrease (.25)
2. Decrease (.25)
3. Increase (.25)

b. The control rod channel will operate closer to DNB (.25) because the cross-sectional flow area is less while the fuel rods are producing almost the same amount of heat as fuel rods in the unit channel (.75). 0.5 for sketch.

REFERENCE
HTTFF pgs. 226, 231-234

3.4 003 000 K 5.01 3.3

ANSWER 1.07 (2.00)

a. Flow will increase (.25) due to head loss caused by lost RCP (.25)

b. Indicated flow will initially decrease to zero as the RCP coasts down (.25) but will increase due to backflow (.25)

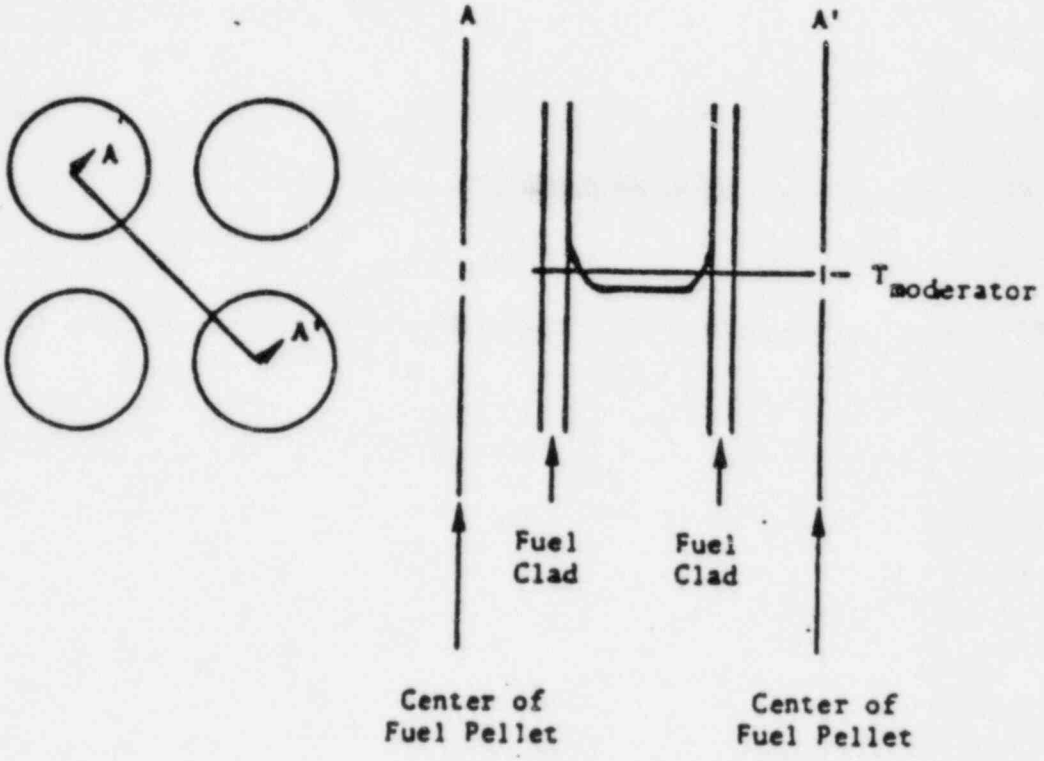
c. Steam flow will increase (.25) to account for affected steam generator (.25)

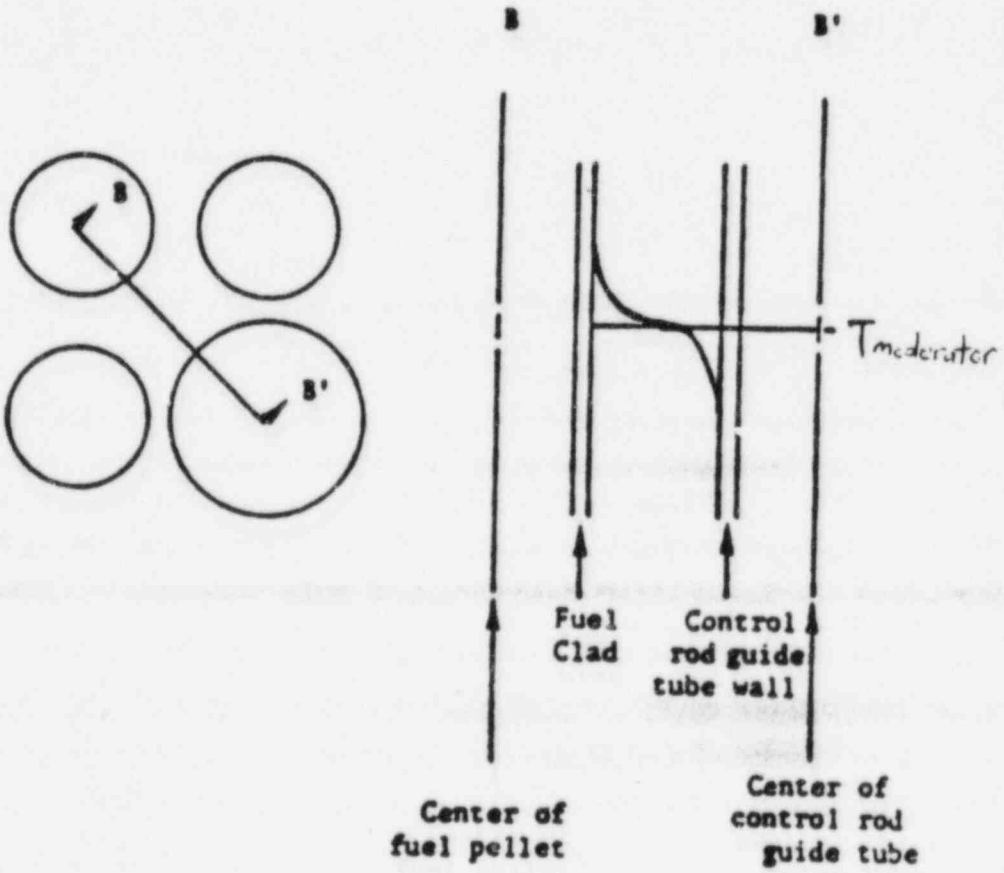
d. Tave will increase initially then decrease (.25) because load remains constant (.25)

REFERENCE
HTTFF pgs. 322-329, 264-266

3.4 000 015 EK 1.04 2.9

Figure 1


A
A'
A
A'
$T_{moderator}$
Fuel Clad
Fuel Clad
Center of Fuel Pellet
Center of Fuel Pellet


B
B'
B
B'
$T_{moderator}$
Fuel Clad
Control rod guide tube wall
Center of fuel pellet
Center of control rod guide tube

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 1.08 (2.25)

a. SDM shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all full length rod cluster assemblies are fully inserted except for the single rod cluster assembly of the highest reactivity worth which is assumed to be fully withdrawn. (1.25)

b. 1. To ensure that acceptable power distributions are maintained (.34)
2. To ensure that the minimum SDM is maintained (.33)
3. To limit the potential effects of a rod ejection accident (.33)

REFERENCE
Rx Th pg 323
Technical Specifications (TS) Unit II pgs 1-6 and B 3/4 1-4

3.1 001 000 K 5.08 3.9

ANSWER 1.09 (2.25)

Power Defect:	2225 pcm	- 800 pcm	= +1425 pcm	(0.5)
Xe:	3200 pcm	- 2080 pcm	= +1120 pcm	(0.5)
Rods:	0 pcm	- 650 pcm	= - 650 pcm	(0.5)
			+1895 pcm	

Boron must supply 1900 pcm of negative reactivity

1900 pcm X (ppm/10 pcm) = 190 ppm (0.5)

~~250~~ 300 ppm + 190 ppm = ~~540~~ 490 ppm (.25)

REFERENCE
Reactor Engineering Manual (REM) Part 1 ECP

3.1 001 010 K 5.21 3.4

ANSWER 1.10 (2.00)

When steam demand increases Tcold will decrease which will cause T-ave to decrease (0.5). When T-ave decreases Moderator Temperature Coefficient adds positive reactivity which causes reactor power to increase (0.5). When reactor power increases fuel temperature increases which adds negative reactivity from the doppler coefficient (0.5). Reactor power will increase until the reactivity changes from MTC and doppler are equal (0.5).

REFERENCE
Rx Th pg. 308

3.1 001 000 K 5.29 3.7

ANSWER 1.11 (3.25)

a. Xe is produced directly as a fission product (.25) and also indirectly from the decay of Te-135 to I-135 which decays to Xe-135 (0.5). Xe is removed by decay and by burnout (0.5).

b. 1. 9 hours 5000 pcm
2. 10 days 1050 pcm

REFERENCE
Reactor Theory (Rx Th) TP 37.2 to 39.6

3.1 001 000 K 5.13 3.7
5.38 3.5

ANSWER 1.12 (3.00)

a. 1. It is always negative and thus provides a negative reactivity insertion when fuel temperature rises (.75)

2. It acts immediately to inhibit a power increase (.75)

b. At high RCS temperatures (0.5) the moderator expands and displaces boron form the core which is a positive reactivity insertion (1.0)

REFERENCE
Rx Th pg. 170, 152

3.1 001 000 K 5.48 3.3

1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION,
THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

K 5.20 2.8

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 2.01 (1.00)

Steam dump system (.33)
Rod control system (.33)
Auxiliary feedwater system (.34)

REFERENCE
LP SDS pg 8
Emergeny Instruction EI I-4.12 pgs 2, 5

3.5 039 000 system generic 4 3.5

ANSWER 2.02 (1.70)

a. Thermal barrier cooling coil rupture (0.5)

b. RHR Hx
RHRP seal Hx
SIP seal Hx
Charging SIP seal Hx (0.3 each)

REFERENCE
SN Vol 2 CCWS pgs 13, 8, Fig·CC-1

3.10 008 000 K 1.02 3.3
K 1.04 3.3

ANSWER 2.03 (2.00)

Letdown from cold leg # 4
Excess letdown from cold leg # 3
Charging to cold leg # 3
Alternate charging to cold leg # 4
Auxiliary spray
RCP seal injection ~~(.33 each)~~ (.1 for loop .23 for system)

REFERENCE
SN Vol 1, CVCS Fig CV-4

3.1 004 000 K 4.05 3.3

ANSWER 2.04 (2.40)

Boric acid is pumped from the boric acid tanks (0.~~25~~ .34) through the boric acid transfer pumps (0.~~25~~ .34) through CV175 bypassing the blender going to the suction of the charging pumps (0.~~25~~ .34). ~~Flow exits the pumps then goes through flow control valve CV55 (0.3),~~ seal pressure control valve CV71 (0.~~25~~ .34), and charging line isolation valves CV68,69 (0.~~25~~ .34). Flow then goes through the regenerative heat exchangers (0.~~25~~ .34) and goes into the RCS on the #3 cold leg (0.~~25~~ .34).

REFERENCE
SN Vol 1, CVCS pg 38, Fig CV-4, CV-8

3.1 004 010 K 6.09 4.4

ANSWER 2.05 (2.00)

a. Seal leakoff cannot exit containment (0.5). It exits through a relief valve upstream of the isolation valves and goes to the PRT (0.5).

b. Damage could result to the upper bearing (~~.25~~ .33), lower bearing (~~.25~~ .33), ~~lower radial bearing (.25) and seals (.25)~~ due to lack of proper cooling (.34)

REFERENCE
SN Vol 1, RCP pgs 23, 15

3.10 008 000 K 3.01 3.4
3.4 003 000 K 4.11 3.0

ANSWER 2.06 (3.00)

a. 1. Spray cool water into the containment atmosphere in the event of a LOCA to ensure that containment pressure does not exceed its design pressure. (0.5)
2. Remove elemental iodine from containment atmosphere. (0.5)

b. Hydrogen recombiners (0.5) reduce hydrogen that comes from zirconium-water reaction (0.5), radiolytic decomposition of emergency core cooling solution (0.5) and corrosion of construction materials (0.5).

REFERENCE
SN Vol 2 Containment and Containment Spray, pgs 20, 22, 23

3.6 026 000 K 4.04 3.7

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

3.6 028 000 System generic 4 3.5
K 5.03 2.9

ANSWER 2.07 (3.60)

a. 11 - 1A Vital 4KV Bus (0.3)
12 - 1B Vital 4KV Bus (0.3)

b. 11 and 13 (0.5)

c. 1. AFW storage tank 3. Fresh water and Fire Protection Tanks
2. DM water storage tanks 4. Service water (.25 each)

d. The minimum flow (must be delivered within one minute) to at least two effective steam generator (.75) and capable (of maintaining the required flow) to attain (stable zero-load) hot standby for at least 8 hours (.75).

REFERENCE
Lesson Plan (LP) AFWS pgs 8, 21, 18, 19, 15
Student Notebook (SN) Aux Feed System pg 14

3.5 061 000 K 2.02 3.7
K 1.03 3.5
K 4.01 3.9
Sys Gen 5 3.3

ANSWER 2.08 (3.10)

a. 11 - 1A 4 KV Vital Bus (0.3)
12 - 1B 4 KV Vital Bus (0.3)

b. Low head injection during injection phase (.3)
Recirculate water from the containment sump back to the RCS during recirculation phase (.3)
Provide suction to the: High head SI pumps (.3)
Intermediate head SI pumps (.3)
Provide flow to the Containment spray headers (.3)

c. RWST low level alarm indicates the switch to the recirculation mode (0.5). At this time sufficient water level should exist in the containment sump to provide the required net positive suction head for the RHR pumps (0.5).

REFERENCE
SN Vol 2, RHRS, pgs 19, 20
LP RHRS pg 13

3.4 005 000 K 2.01 3.0
System generic 3.6
K 4.02 3.2

ANSWER 2.09 (3.20)

a. Low pressurizer pressure 1765 psig 2/3
High containment pressure 4.0 psig 2/3
High steamline differential pressure 100 psid 2/3
High steamline flow, 2/4, with low low Tave, 543 F, or low steamline pressure, 500 psig (0.3 each)

b. High head injection 1765 psig
Intermediate head injection 1520 psig
Accumulators 650 psig
Low head injection 170 psig (.25 for each respons

REFERENCE
SN Vol 2 ECCS, pgs 8, 9, 27

3.2 006 000 K 4.05 4.3
K 6.02 3.4
K 6.03 3.6

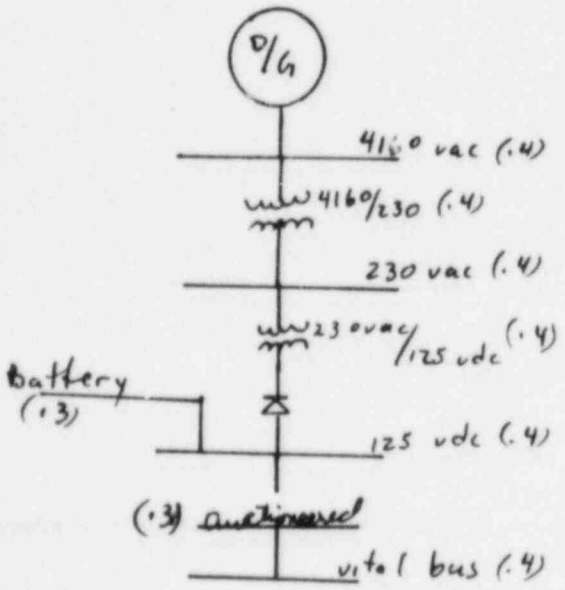
ANSWER 2.10 (3.00)

The diesel generators tie into the 4160V vital busses (.33). The voltage is stepped down by a 4160/240 transformer (.33) to the 230V vital busses (.33). The 230V AC is transformed and rectified to approximately 125V DC in the power supply cabinets (1.0) where the rectified voltage is compared with an infeed from a 125V DC bus (.33). The higher voltage is sent to an inverter (.33) which feeds a vital instrument bus (.33).

REFERENCE

SN Vol 7 Electrical Distribution, pg 35, Fig ED-6, 8

3.7 064 000 K 1.01 4.1



ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 3.01 (1.50)

There will be no response by the SDS (0.5). PT506 feeds the arming signal (0.5) but there is no demand signal because PT505 provides Tref input for the demand signal (0.5).

REFERENCE
LP, SDS pg 15; SN Vol 4 Fig SD-4, 10

3.9 016 000 K 3.03 3.0

ANSWER 3.02 (1.70)

a. A pressure channel, set at 2335 psig, provides an interlock to prevent plant depressurization if the master control pressure channel failed high (1.0).

b. Open at 2335 psig (.35) and close at 2315 psig (.35).

REFERENCE
SN Vol 4 PZR Press and Level Control pgs 12 - 13

3.3 010 000 K 4.03 3.8

ANSWER 3.03 (1.20)

a. The wide-range RTD's have a relatively slow response time.

b. At low flow rates the narrow-range RTD's are inaccurate.

REFERENCE
SN Vol 4 RCSTIS pgs 5 - 7

3.9 012 000 K 6.06 2.7

ANSWER 3.04 (2.50)

a. The variable gain at high power prevents the power mismatch circuit from demanding rapid rod withdrawal which could result in an excess power overshoot (1.0).

b. Auto and Manual
IR Nuclear Overpower
PR (High Range) Nuclear Overpower
OTdT
OPdT

Auto
Turbine first stage pressure less than 15%
Control Bank D Withdrawal Limit (.25 each)

REFERENCE
SN Vol 4 Rod Control System pgs 22 - 24, Table 1
LP Rod Control System pg 16

3.1 001 000 K 4.08 3.2
K 4.07 3.7

ANSWER 3.05 (2.50)

a. Use individual bank selection on the Bank Selector switch. (0.5)

b. An 'Inhibit' signal is generated which prevents a power cabinet from responding to any more current orders from its slave cycler (1.0). All groups on that cabinet receive orders for reduced current to both stationary and movable gripper coils, as well as zero current to all lift coils (1.0).

REFERENCE
SN Vol 4 Rod Control System pgs 48 - 50

3.1 001 000 K 4.07 3.7

ANSWER 3.06 (2.25)

a. CVCS letdown isolation valve closes (.43)
All CVCS letdown orifice isolation valves close(.43)
All pressurizer heater groups are turned off (.43)
~~PDP goes to full speed~~ Increased charging flow (.46)
~~CVCS flow control valve opens fully (.35 each)~~

b. Reactor will trip on high pressurizer level at 92%. (0.5)

REFERENCE
SN Vol 4 PZR Press and Level Control pgs 26, 27, 29

3.2 011 000 K 3.01 3.2
K 4.05 3.7

ANSWER 3.07 (2.05)

a. The indicated level will be higher than actual, causing the feed water control signal to decrease feed flow (.5) ~~until indicated was equal to program (1.0), therefore~~, actual level will decrease (.5)

b. Steam generator Hi Hi level of 67%
SI signal
Reactor trip coincident with low Tavg ~~540~~ 554°F (.35 each)

REFERENCE
SN Vol 4 SGWLC pgs 19, 20, 21, 34

3.9 015 000 K 3.12 3.4
3.5 059 000 K 4.19 3.2

ANSWER 3.08 (2.80)

a. OTdT - To ensure operation within the DNB criteria (.65)
OPdT - To protect the reactor core from overpower conditions (.65)

b. The signal is initiated at 3% below the reactor trip set point (0.5). ~~The turbine control system decreases turbine load at an average of 10% per minute (0.5)~~ by running the turbine back at 200% per minute for 1.5 seconds with a 28.5 second interval between load reductions (0.5). (0.5)

REFERENCE
SN Vol 4 RCSTIL pgs 9, 12

3.9 012 000 K 4.02 3.9
K 1.03 3.7
K 1.06 3.1

ANSWER 3.09 (2.50)

a. Overcompensation results in a lower indicated flux which could cause the source range detectors to be reinstated too early (0.5) thus causing a reactor trip from source range high flux trip (0.5).

b. Adjust the gain of the summing and level amplifier (0.5).

c. Signal outputs from the detectors are compared with the average of the corresponding signal from the appropriate detector sections (0.5). An alarm actuates from a 2% deviation from average when power is greater than 50% (0.5).

REFERENCE
SN Vol 3 Excore Nuclear Instrumentation pgs 16 - 19

3.9 015 000 K 3.01 3.9
System generic K 4 3.6

ANSWER 3.10 (3.00)

a. Condenser Air Removal Gas Monitors (0.6)
Steam Generator Blowdown Liquid Monitors (0.6)
Condensate Polishing Filters Monitors (0.6)

b. The letdown line monitors look at iodine and gross gamma activity (0.6). Fuel failures cause the ratio of iodine to gamma activity to increase (0.6).

REFERENCE
SN Vol 3 RMS pgs 22 - 25
EI I-4.7 pg 1 & EI I-4.16, pg 5

3.9 073 000 K 1.01 3.6
K 4.02 3.3

ANSWER 3.11 (3.00)

a. BOTH of the RWST to RHR pump isolation valves (21RH4 and 22RH4) are CLOSED (0.5)

b. 1. Either 2RH1 OR 2RH2 is CLOSED (RCS #21 hot leg suction isolation valves) (0.5)
2. BOTH 21SJ44 AND 22SJ44 are OPEN (Containment sump isolation valves) (0.5)
3. Either 2SJ67 OR 2SJ68 are CLOSED (Safety Injection miniflow isolation valves) (0.5)

c. Either 2RH1 OR 2RH2 is CLOSED AND 21SJ44 AND 22SJ44 are OPEN (1.0)

REFERENCE
SN Vol 2 ECCS pg. 43

3.2 006 000 K 4.08 3.2
K 4.06 3.9
3.6 026 020 K 4.03 4.1

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 4.01 (1.00)

a. No (0.5)
b. 16 hours (0.5)

REFERENCE
TS pgs 6-1, 6-5

Generic Knowledges 1 3.5

ANSWER 4.02 (1.00)

The RCS cooldown rate shall not exceed 100 F/hr (0.5). This limit is imposed to ~~prevent an excessive cooldown that could fracture the RCS~~ minimize thermal stresses, (0.5).

REFERENCE
TS pg 3/4 4-27
TS pg B 3/4 4-8

3.2 002 020 Sys Gen 5 2.9

ANSWER 4.03 (1.50)

a. Voiding in RCS (0.5)

b. Stop affected pumps and verify proper valve alignment for recirculation (1.0).

REFERENCE
EOP-LOCA-2 pg. 6
EOP-LOCA-3 pg. 18

3.3 000 009 EK 3.10 3.4
3.3 000 011 EK 3.12 4.4

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 4.04 (2.00)

a. Overrides a failure in the pump run out protection circuitry that preventing the discharge valves from opening (1.0)

b. Pump run out protection (0.5)

c. Conditions requiring maximum flow for decay heat removal (0.5)

REFERENCE
EI-I 4.12 pgs. 4, 5

3.5 000 054 EK 3.04 4.4

ANSWER 4.05 (2.50)

1. Minimize any additional cooldown of the RCS (.83)
2. Keep steam generator tubes ~~covered~~ wetted (.83)
3. Minimize source of steam flow to containment (.83)

REFERENCE
EOP-LOSC-2 pgs. 3, 6 & ERG Background Documents

3.5 000 040 EK 3.04 4.5

ANSWER 4.06 (2.50)

a. Dose to whole body should not exceed 3 rem per quarter (.33)
The 5(N - 18) limit must not be exceeded (.33)
The individual's exposure history is documented on NRC Form 4 (.34)

b. Senior supervisor-RP (0.5) and the individual's senior supervisor (0.5)

c. 2500 mrem/Q = 2100 mrem + 200 mrem/hr X T ; T = 2 hours (0.5)

REFERENCE
10 CFR 20.101 b
AP-24 pg 13

System wide and plant wide generic knowledge 15 3.5

ANSWER 4.07 (2.50)

a. Once per 24 hours (0.5) and it is limited to greater than 1.6% delta k/k (0.5).

b. ~~Rapid~~ borate (0.5) ~~for one minute with one BA pump (30 seconds with two BA pumps) for each 200 PCM required (1.5)~~ Boron Sample (0.5)
Ensure pressurizer and RCS boron concentration are within 50 ppm (0.5)
~~by manually energizing pressurizer heaters with sprays in auto (0.5)~~

REFERENCE
IOP 8 pg 5
~~OP II-3.3.8 pg 2~~ OP-II-3.3.6, pg 6

3.1 004 020 Sys Gen 5 2.9
000 K 6.01 3.1

ANSWER 4.08 (2.00)

a. Uncontolled increase in steam generator level (.34)
Secondary radiation alarms (.33)
Boron and activity present in steam generator (.33)

b. ~~To increase the pressure in the ruptured SG (.33) to reduce or reverse flow from the primary system (.33) and minimize release (.33).~~
To minimize release (1.0)

REFERENCE
EOP-LOSC-1 pg. 6
EOP-FRHS-3 pg. 3
EOP SGTR-1 pgs. 3, 13

3.3 000 037 EK 3.07 4.2

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 4.09 (3.50)

a. 1. MTC is within the analyzed temperature range
   2. Protective instrumentation is within normal operating range
   3. P-12 (Tavg > 543 F) above its setpoint
   4. Pressurizer is operable
   5. Reactor vessel is above minimum temperature (RT-NDT) (0.5 each)

b. 1. Restore Tavg > 541 F within 15 minutes, or (0.5)
   2. Be in hot standby within next 15 minutes (0.5)

REFERENCE
IOP-3, Hot Standby to Minimum Load, pg. 6
TS, pgs. 3/4 1-6 & B3/4 1-2

3.1 001 000 K 5.15 3.4
K 5.16 3.4

ANSWER 4.10 (3.00)

a. Reduces heat input to RCS (0.5). Leaving 21 and 23 RCP's in service gives best RCS pressure control (1.0).

b. Using No. 23 AFW pump may reduce the pressure in 21 and 23 steam generators enough to cause a Steam Line Differential Pressure Safety Injection (1.5).

REFERENCE
EI-I-4.18 Loss of Control Air pg 2

3.8 000 065 EK 3.08 3.7

ANSWERS -- SALEM 1&2 -86/04/07-SILK, D.

ANSWER 4.11 ~~(3.50)~~ (2.0)

a. There will be a midscale indication on all instruments with indicators powered from the bus (0.5), but a zero indication on all instruments with only transmitters powered from the bus (0.5).

~~b. Pressure will decrease (as) because of spray mini-flow valves are open (0.5)~~

c. Control charging to establish pressurizer level at 20% ~~(0.5)~~
Establish excess letdown and balance charging and letdown ~~(0.5)~~
Energize the pressurizer heaters from the emergency power supply ~~(0.5)~~
Verify spray values status (any two required, 0.5 each)

REFERENCE
AOP-ELEC-VIB-C pgs 1, 2

3.7 000 057 EK 3.01 4.1

Attachment 2

Facility Comments on the RO Written Examination

Question No.	Comment
1.01.b	Possibly also fluctuating amps, flow oscillations.
1.02	Key should also reference pressure decreases.
1.03	What would happen if examinee correctly explains the wrong answer?
1.05.a.1	Key - incorrect and not applicable. EOP no longer calls for 50% PL. The reference is not the technical document utilized for procedure development.
1.05.b	The question asks for a trend - the key gives a value for Delta T. Also, pre-EOP reference. SG level is not an absolute guarantee of natural circulation.
1.06.b	Drawing is hard to decipher; especially on a timed examination. The actual flow channels are shown as the same size. Question "a" discusses CHF and "b" switches to DNB - this adds a minor degree of confusion and is not used at the NTC as an acceptable way to develop exams. In addition, the term "almost" is used in the key. "Almost" is subjective. We do not feel the "b" is a suitable question for RO's and that the drawing adds additional confusion.
1.07.d	Eliminate short term Tavg perturbation. Which Tavg?
1.08 b	These are T.S. Basis - beyond RO level.
1.09	If curve is used boron worth is not exactly 10. There are other questions which have numerical values but no latitude for answers on the key.
1.10	The final (.5) answer may not be stated in those words.
1.11.a	Is Te required?
1.11.b	RO's are not required to recall curves from memory. They are available in the Control Room. There should be an acceptable range of answer as the Rx Eng. curves should be the reference.
2.01	Question does not state whether or not there is operator action. How many answers are required - that should be stated up front. AFW would not be utilized if the reactor did not trip. Other acceptable answers - EHC, SGWLC, SGFPC, PP, PL.

2.02.a	The only Hi flow alarm is RCP Thermal Barrier. This is the key answer but the stated alarm (high flow) does not exist.
2.03	Does loop have to be identified?
2.04	CV-55 is not in PDP flow path. Should CV-71 be required. It would be easier to answer, grade, etc., if a drawing and hi-liter were provided.
2.05.a	Should read RCP seal leakoff flow.
2.05.b	Some of key assumes loss of normal seal supply.
2.06.b	Sources: H_2 inventory in RCS.
2.07.d	High point value and questionable RO knowledge level.
2.09.a	Could add automatic somewhere in question.
2.09.b	Band of acceptable answers, HHSI-1765 assumes an auto SI.
2.10	The examinee may assume that the DG is the source and might not mention battery or auctioneering.
3.04.a	The examinee's answer may be longer and associated with Delta K/K.
3.05.a	You do not regain conrol of the "failed" rods.
3.05.b	Is key answer appropriate for RO? We do not use the term "lock-up of the power cabinet."
3.06.a	Key calls for PDP and CV-55 change. PDP and CCP are not run at same time.
3.07.a	The key doesn't really answer the question.
3.07.b	Low Trip - 554°F not 543°F.
3.08.b	Do not expect 10%/minute.
3.10.a	Some more acceptable answers: R-46, Steam line, all vent channels.
3.11.a	Unit 2 has semi-automatic switchover.
4.01.b	This is an Administrative/Supervisory function.
4.02	Bases for RO. Limit thermal stresses - fracture is not guaranteed.

4.04.c	There is no ref. to water hammer in EOP-Trip 1.
4.05	RO scope? Bases behind steps. Answer 2 - tubes don't really need to be covered. The stated reference does not contain these answers.
4.06	This is really a supervisory and HP function. An NCO is no more responsible for this than any other radworker at the plant.
4.07.b	There are no stated conditions. Key answer is too specific for general question.
4.08.b	The bottom line is to minimize the release.
4.09.a	Bases and very high point value for RO's.
4.10	Again, very high point value.
4.10.a	Only the first half is asked. Looks for recall from memory of subsequent actions, comments, etc. Subsequent actions are performed with procedure in hand.
4.10.b	Same as above (a).
4.11	There are 0.5 missing. AOP's are not memorized. They are ABNORMAL OPERATING PROCEDURE. These are performed "procedure in hand." There is one for each bus, each is different, etc. It is not fair game from memory.

Attachment 3

NRC Resolution of Facility Comments

Question No.	Resolution
1.01.b	Subjective comment.
1.02	Subjective comment.
1.03	Subjective comment.
1.05.a.1	Answer key is based on some level in the pressurizer, not specifically 50% .
1.05.b	With respect to Delta T, consideration will be given during grading; the question asked how parameters would trend, it did not imply that the parameters were an indication of natural circulation. [Note: with respect to the Facility's comment about the references, they need to ensure that generic theory texts do not contain information that conflicts with their facility.]
1.06.b	Subjective comment.
1.07.d	Subjective comment.
1.08.b	Not accepted, K&A Catalog gives an Importance Factor of 3.9.
1.09	Subjective comment.
1.10	Subjective comment.
1.11.a	No.
1.11.b	Subjective comment.
2.01	Subjective comment.
2.02.a	The question did not quote an alarm window but posed a problem with a high flow alarm as one of the indications.
2.03	Yes.
2.04	Answer key modified.
2.05.a	Will be considered for future examinations.

2.05.b	Answer key corrected.
2.06.b	Considered in grading.
2.07.d	Subjective comment.
2.09.a	Will be considered for future examinations.
2.09.b	Subjective comment.
2.10	Points redistributed on answer key.
3.04.a	Subjective comment.
3.05.a	Subjective comment.
3.05.b	Subjective comment. The terminology is directly from the reference material.
3.06.a	Answer key modified.
3.07.a	Answer key corrected.
3.07.b	Answer key corrected.
3.08.b	Answer key modified.
3.10.a	Will be considered during grading.
3.11.a	Will be considered during grading.
4.01.b	Not accepted, NCO's need to know how long they can safely be on shift.
4.02	Subjective comment. Answer key modified.
4.04.c	Water hammer is referenced in EI I-4.12.
4.05	Answer key modified; additional reference is the ERG Background Documents. K&A catalog gives rating of 4.5.
4.06	Not accepted. K&A catalog gives this concept a rating of 3.5.
4.07.b	Initial conditions were given as Hot Standby; however, answer key modified to be more general.
4.08.b	Answer key corrected.
4.09.a	Subjective comment.

4.10 Subjective comment. The question did not ask for recall of the steps; instead it stated what the procedural steps were and asked for the reason for these steps.

4.11 Part b deleted and points redistributed.

NRC:1 Form 6a Rev. Oct 80 (

OUTSTANDING ITE[illegible]ILE
MULTIPLE DOCKET ENTRY FORM

Transaction Type

- [x] New Item
- [ ] Modify
- [ ] Delete

NORRIS, B.S. — Originator
Keller, R.M. — Reviewing Supervisor Name

Docket #	Docket #	Docket #	Docket #
50-272			
50-311			

Item Number	Type	Module #	Area	Resp	Action Due Date (MM DD YY)	Updt/Clsout Rpt #	Date O/M/Closed (MM DD YY)
86-09-01			PSC	Z	01-01-87		

Originator: NORRIS

Modifier/Closer:

Descriptive Title

Casualty situations are addressed by both an Emergency Operating Procedure and by an Emergency Instruction, the two procedures are not necessarily consistent.